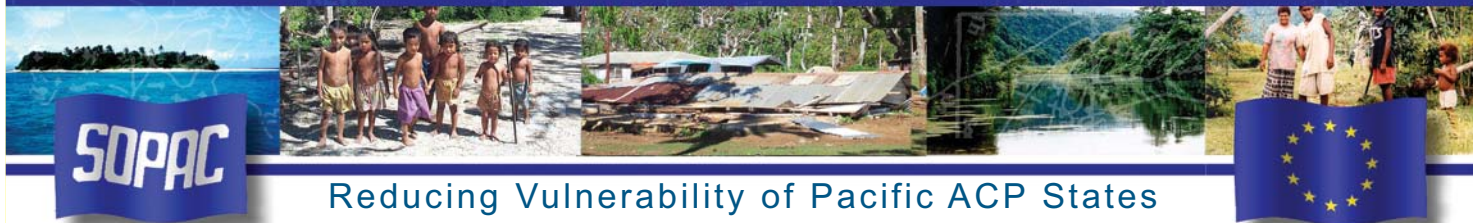


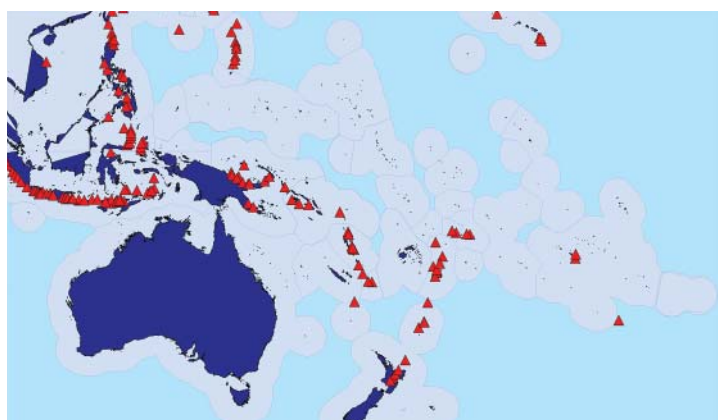
Volcanoes

NATURAL HAZARDS IN THE PACIFIC - FACT SHEET 5



Reducing Vulnerability of Pacific ACP States

The Pacific Rim is often called the “Ring of Fire” due to the large number of volcanic eruptions that occur along its plate boundaries. Volcanic eruptions are the greatest single cause of natural hazard induced deaths in the Pacific, having caused over 3500 fatalities in the last 100 years.



Map of active volcanoes within the Pacific Region.

What is a Volcano?

A volcano is a mountain formed by erupted lava, rock fragments and ash. Volcanic eruptions occur when magma (molten rock) from inside the Earth rises to the surface along plate boundaries or at weak points within the plates called hotspots. There are many different types of volcanoes associated with different eruption types.






Volcano Type	Characteristics	Example	Picture
Shield Volcano	Gently sloping, shield shaped volcano built by non-violent lava eruptions.	Giluwe, PNG	
Cinder Cone Volcano	Small cone shaped volcano usually found on other volcanoes or in cone fields. Built by small explosive eruptions blowing lava into the air, which fragments and falls as cinders.	Cone on Mauna Kea, Hawaii	
Composite Volcano	Steep volcano built by alternating layers of gentle lava flows and explosive eruption products usually found along destructive plate boundaries.	Manam volcano, PNG	
Lava Dome	Dome shaped pile of lava created by individual flows of thick, sticky lava.	Bamus, PNG	
Caldera	Large crater shaped basin, formed during large, violent eruptions, when either the summit is blown away or the volcano collapses into the emptied magma chamber.	Billy Mitchell Volcano, PNG	

Image sources: 1. PNG Rabaul Volcanic Observatory, 2. Vic Camp, San Diego State University, 3. Micheal Bonte, 4. PNG Rabaul Volcanic Observatory, 5. PNG Rabaul Volcanic Observatory.

Eruption Frequency and Variability

Small eruptions are much more frequent and usually less disastrous than large, violent eruptions, which can take several thousand years to build up gas pressure before exploding. The explosivity of eruptions depends on the composition of the magma and the amount of water present. If more silica is in the magma it is less fluid and fewer gas bubbles can escape from it, leading to more violent eruptions. However, if water is present during the eruption, even highly fluid magma can erupt explosively - these hydrovolcanic eruptions lead to violent steam explosions, fragmenting the magma into fine-grained ash.



Image source: Cronin, Massey University NZ



Image source: Rabaul Volcanic Observatory, PNG

- 1 Huge eruption column of a violent, large eruption at Lopevi, Vanuatu.
2. Hot ash flows are amongst the deadliest volcanic hazards, as shown here in Manam, PNG in 1996. In 1951 nearly 3,000 people were killed by hot ash flows at Lamington volcano, PNG.

Volcanic Hazards

Hot ash flows are the most dangerous hazard because they are fast-moving (up to 240 km/h) avalanches of hot (up to 800°C) ash, rock fragments and gas. They flow down the flanks of the volcano during explosive eruptions and tend to follow valleys, destroying everything in their path.

Lava flows can reach far distances and are capable of destroying all in their path, although they are usually fairly slow moving and thus not really life threatening.

Volcanic gases such as poisonous sulphur and carbon monoxide are emitted during eruptions. Acid rain damages crops and vegetation and carbon monoxide is lethal to animals and people.

Volcanic bombs (lava fragments larger than 64 mm across) blasted during eruptions can damage buildings and start fires.

Ash falls can rain down during eruptions burying people, crops and livestock and causing buildings to collapse.

Ash clouds pose a serious risk to air traffic.

EXAMPLE: In September 1994, two volcanoes, Vulcan and Tavurvur erupted and buried the town of Rabaul, PNG under millions of tonnes of ash and made 80,000 people homeless.

Secondary Effects

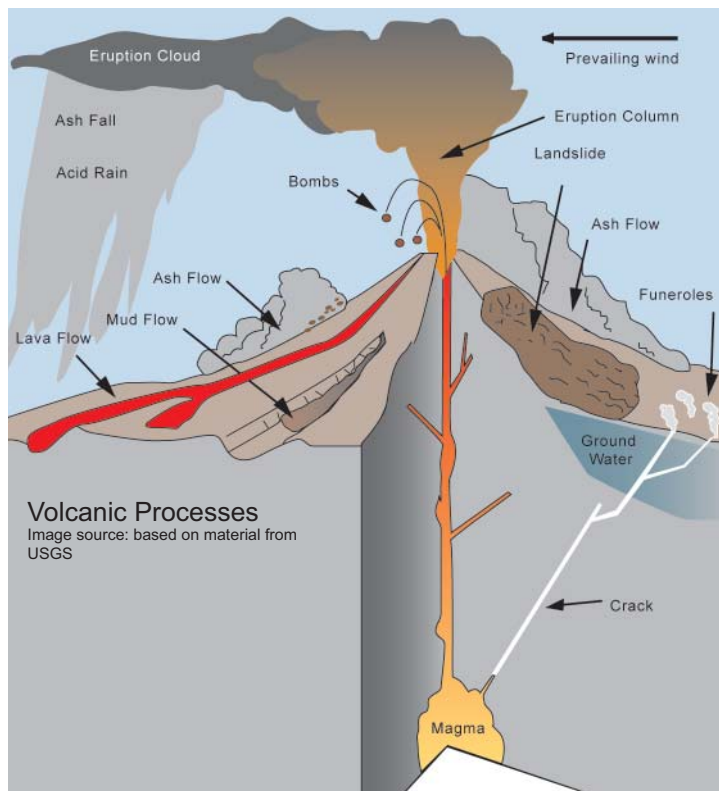
Landslides on steep, unstable flanks can have disastrous impacts. For example during the 1985 eruption in Colombia 23,000 people were killed by a fast moving mudflow of ash and water.

Tsunamis can be triggered by violent submarine eruptions or major volcanic landslides entering the sea.

Earthquakes can be caused by the intrusion or release of magma.

Fires can be caused by hot ash, bombs or lava.

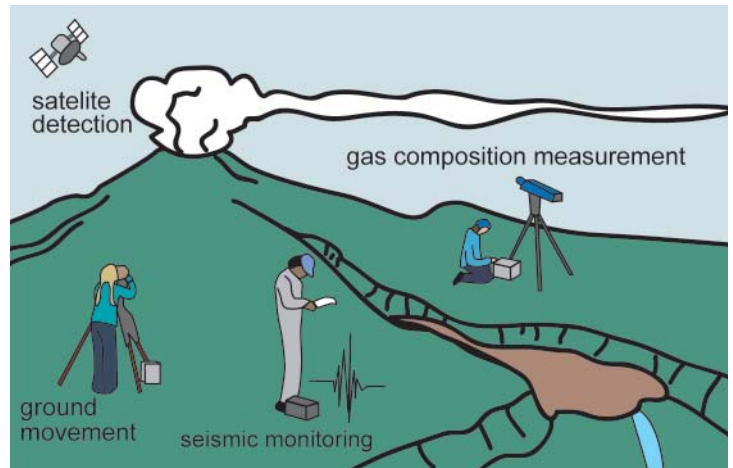
World's climate is affected by the gases and particles forced high into the atmosphere during eruptions.



Volcano Warning

Effective management of volcanic activity and good prediction saves lives. Volcano monitoring is designed to detect and measure changes within a volcano caused by magma moving beneath it. A combination of observing stations, expert teams and a well educated and aware community is crucial to avoiding disasters during eruptions. An alert system should outline crucial emergency response actions for the different stages of volcanic activity.

However, Pacific island countries suffer from both many dangerous volcanoes and a lack of resources and often require outside help to properly monitor and assess their volcanoes.



Predicting volcanic crises: Ground and satellite sensors can detect earth tremors, ground distortion due to rising magma, changes in temperature and composition of steam and gas emissions.

Image source: based on material from USGS

For more information, see the following links.

Observatories:

- RVO-PNG: <http://www.mineral.gov.pg/volcObs/volcanObs.htm>
- DGMWR-Vanuatu: observatoire@vanuatu.com.vu
- USGS - Hawaii: <http://hvo.wr.usgs.gov>
- IGNS - NZ: <http://www.geonet.org.nz>
- DVAAC-AUS: <http://www.bom.gov.au/info/vaac>

Educational:

- http://www.geology.sdsu.edu/how_volcanoes_work/

What you can do before, during and after a volcano

Volcanic eruptions are preceded by signs, some of which are not detected by instruments, nor observed by a volcanologist. The following are some points that should be taken into account to effectively respond to a volcanic eruption.

PREPARE FOR AN ERUPTION

- Make evacuation plans. If you live in a known volcanic hazard area, plan a route out and have a backup route in mind.
- Always keep an emergency kit in your home. Include water, food, necessary medicine, a reliable torch with fresh batteries and spares, portable radio, first aid kit, emergency phone numbers.
- Report any and all unusual physical changes around volcanoes e.g. the drying up of vegetation, rumbling sounds, earthquakes, landslides and other possible abnormalities.

2. DURING THE ERUPTION

- Listen to the radio for information and advice. Pay attention to warnings, which include evacuation notices.
- Escape from area as quickly as possible.
- Find shelter, but NOT in a building with low-pitched or flat roof, if heavy ash is falling.
- Avoid basements and closed spaces where gases may accumulate.
- Wear protective clothing over head and body if you have to move in an ash shower.
- Breathe through a handkerchief.
- Always carry a flashlight, even during the daytime.

3. MITIGATION MEASURES

- Establish permanent danger zones (4 to 6 km radius circle) around the summit of active volcanoes.
- Educate population about volcano risks.
- Improve warning and evacuation systems.