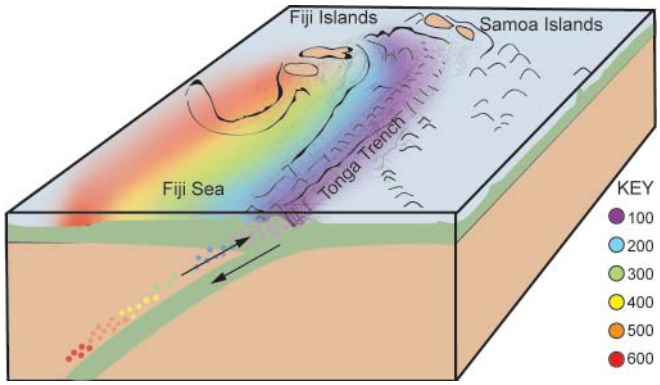
Earthquakes

NATURAL HAZARDS IN THE PACIFIC - FACT SHEET 2

Reducing Vulnerability of Pacific ACP States

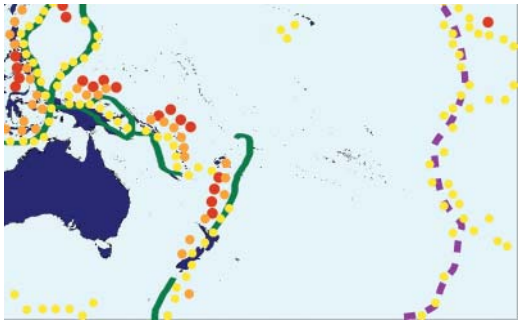
81% of the world's largest earthquakes occur at the edge of the Pacific, which is known as the "Pacific Ring of Fire" because it is renowned for earthquakes, volcanic eruptions and tsunamis. These hazards are caused by the movement of the Earth's tectonic plates, especially when one plate is dragged under another at what is known as a convergent margin.



The Tonga Trench, an ocean-ocean convergent margin.

What is an Earthquake?

As plates collide and grind over or past each other, stress builds up locally within the rock until the rock breaks along lines of weakness (faults). An earthquake is the vibration of the earth due to the energy released as the rock breaks. Additionally some earthquakes can be caused by volcanic activity or underground collapse. Both shallow (0-70 km deep) and deep (down to 700 km) earthquakes are associated with oceanic subduction zones such as the Tonga trench connecting New Zealand, Tonga and Samoa and the New Hebrides trench, which connects Vanuatu, Solomon Islands and Papua New Guinea. Regionally, these countries and Fiji are at greatest risk from earthquakes.



Earthquake location map: Pacific Ring of Fire

Earthquake Hazards

Earthquakes, both deep and shallow, can release huge amounts of energy and so can be extremely damaging to Pacific island countries.

EXAMPLE: The earthquake in East New Britain, Papau New Guinea in 2000 cost the country 14 million Kina in infrastructure and property damage and affected 100,000 people.

Ground shaking is caused by energy waves known as seismic waves hitting the surface of the earth. They cause the ground to shake up and down, back and forth and from side to side. This causes damage to buildings, roads, dams and reservoirs, buried pipelines, infrastructure, and overhead cables, leading to dangers from collapsing buildings, falling debris, uneven ground, landslides, flooding and fires.

Ground shaking occurs at different intensities according to distance from and magnitude of the earthquake. The larger and shallower the earthquake and the closer to the centre of it you are, the more intense the ground shaking.

EXAMPLE: A powerful Ms 7.3 earthquake struck Port Vila, Vanuatu 2002.
First picture shows the damaged Teouma Bridge.
Second picture shows a bungalow damaged by rock fall.

Surface faulting is where an earthquake causes the ground surface to permanently split apart along a fault within the ground rock and soil. Faulting tends to occur when the earthquake is very shallow (0-10 km deep) and strong.

Liquefaction is where the vibrations of the ground cause the soil to behave like a liquid. It happens on mainly sand and mud/clay soils – the soil flows, acting like quicksand, and results in failure of building foundations. It is an especially dangerous effect in urban areas.

EXAMPLE: In 2002 a Ms 7.4 earthquake caused liquefaction of unconsolidated sediments, destruction of houses and water supply of islands offshore Wewak, PNG due to the remarkable uplift of 30-40 cm along faults.

Secondary Hazards. In addition, earthquakes can trigger secondary hazardous events such as **health problems** due to interrupted water supply or broken sewage disposal systems, **landslides**, **tsunamis**, **seiches**, **fires** (due to gas leaks and broken live electricity wires) and **flooding**.

Modified Mercalli Earthquake Intensity Scale

I. Instrumental. Not felt except by a very few under especially favourable conditions detected mostly by Seismography. (2)
II. Feeble. Felt only by a few persons at rest, especially on upper floors of buildings. (2)
III. Slight. Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing cars may rock. Vibration similar to the passing of a truck. (3)
IV. Moderate. Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like a heavy truck striking building. Standing cars rock noticeably. (3)
V. Rather Strong. Felt by nearly everyone; many awakened. Some dishes, windows broken. Un-stable objects overturned. Pendulum clocks may stop. (4)
VI. Strong. Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight. (5)
VII. Very Strong. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures. (5)
VIII. Destructive. Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of factory stacks, columns, monuments, walls. Heavy furniture overturned. (6)
IX. Ruinous. Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations. (7)
X. Disastrous. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bend greatly. (7)
XI. Very Disastrous. Few (masonry) structures remain standing. Bridges destroyed. Rails bend greatly. (8)
XII. Catastrophic. Damage total. Lines of sight and level are distorted. Objects thrown into the air. (8)

EXAMPLE: Several earthquakes in 1993/4 in the Finisterre Range, PNG caused massive and widespread landsliding resulting in damming of streams with subsequent flooding and huge sediment problems.

Image source: Geological Survey PNG

Earthquake Warning

Currently there are no effective prediction or warning systems to provide advance warning that an earthquake is about to happen. Thus, it is vitally important that you are aware of what to do should one occur.

For more information, see the following links:

US Federal Emergency Management Agency:
http://www.fema.gov/hazards/earthquakes
US Geological Survey: http://earthquake.usgs.gov

What you can do before, during and after an earthquake

PREPARE FOR AN EARTHQUAKE

Always keep an emergency kit in your home. Include water, food, necessary medicines, a reliable torch with fresh batteries and spares, portable radio, first aid kit, emergency phone numbers.

DURING AN EARTHQUAKE

If you are inside:

- Drop, cover and hold.
- Stay inside — do not attempt to run outside. However, be prepared for aftershocks and evacuate if necessary. Listen to your radio for information and advice.
- Take cover under strong support like an internal door frame, table, desk or bed. Stay away from windows, overhead fittings, shelves containing heavy objects etc.
- If in a high-rise building, stay away from windows and outer walls. Never use the elevator.
- If in a crowded public place, try not to panic. Do not attempt to barge at the door.

If you are outdoors:

- Keep well clear of buildings, power lines, trees etc. and stay in the open. Do not attempt to seek shelter in a building.
- If you are in a vehicle, pull off the road to a clear area and stop the car.
- Beware of fallen power lines, damaged roads and bridges.

AFTER AN EARTHQUAKE

- Check people for injuries and apply first aid. Call the ambulance and do not move the seriously injured unless they are in immediate danger.
- Do not use the telephone unless it is absolutely necessary.
- Do not use your vehicle unless there is an emergency.
- Do not enter damaged buildings.
- Turn off cooking stoves. Do not light matches until you have checked for gas or fuel leaks.
- Turn utility off at source if you have water leaks or damaged electrical wires or sewerage lines.
- Check food and water supplies.
- Stay calm and lend a hand to others if possible.

Earthquakes are sudden, striking with little or no warning. Be prepared in case it happens!

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