

TSUNAMI WARNING!



AMERICAN SAMOA



United Nations
Educational, Scientific and
Cultural Organization



Intergovernmental
Oceanographic
Commission



National Oceanic and Atmospheric
Administration



International Tsunami
Information Center



National Weather
Service, WSO
Pago Pago



American Samoa
Dept of Homeland
Security

ACKNOWLEDGMENTS

The International Coordinating Group for the Tsunami Warning System in the Pacific of the Intergovernmental Oceanographic Commission of UNESCO, at its Thirteenth Session in Ensenada, Mexico (September 1991), requested a book designed to inform young persons about tsunamis, the dangers which they present, and what should be done to save lives and property.

The original authors of this book are Dr. George Pararas-Carayannis, Ms. Patricia Wilson, and Mr. Richard Sillcox, and the illustrations were created by Mr. Joe Hunt. Since then, it has been adapted for use in different tsunami source regions by countries and ITIC, and translated into many languages.

To learn more about tsunamis and what you should do when a tsunami is coming, we encourage you to read *Tsunami, The Great Waves* (IOC Brochure 2012-4. (English.), rev 2014). You may also visit www.tsunamiwave.org

This American Samoan version was created by the American Samoa Department of Homeland Security (ASDHS), ITIC, the US National Weather Service - Weather Service Office in Pago Pago (WSO Pago Pago), and the Pacific Tsunami Warning Center (PTWC). The adaption was led by Mr. Faletoa Ulufale (ASDHS), Laura Kong (ITIC), and Elinor Lutu-McMoore (WSO Pago Pago), with illustrations drawn by Mr. Christopher Lafoa'i of ASDHS.

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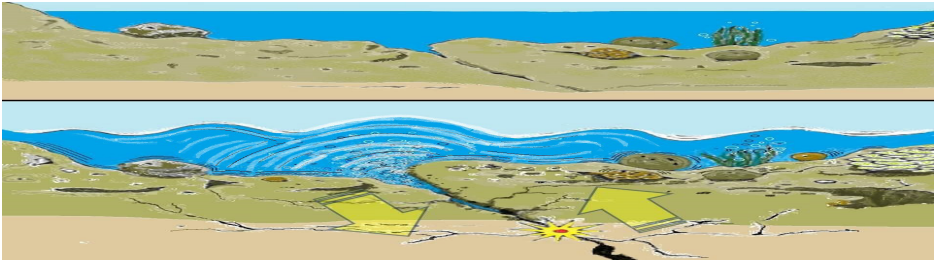
Over the blue, calm water of the Pacific Ocean, fishing boats surround the coast of American Samoa. It is warm and sunny in the tropical Pacific.



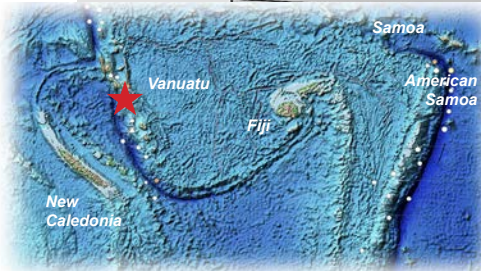
It is seven-thirty (7:30 a.m.) in the morning, and it is breakfast time in Pago Pago. Children are getting ready to go to school.



Parents are getting ready for work. Some of them work at the Weather Service Office (WSO Pago Pago) and the American Samoa Department of Homeland Security's Territorial Emergency Management Coordinating Office (TEMCO).



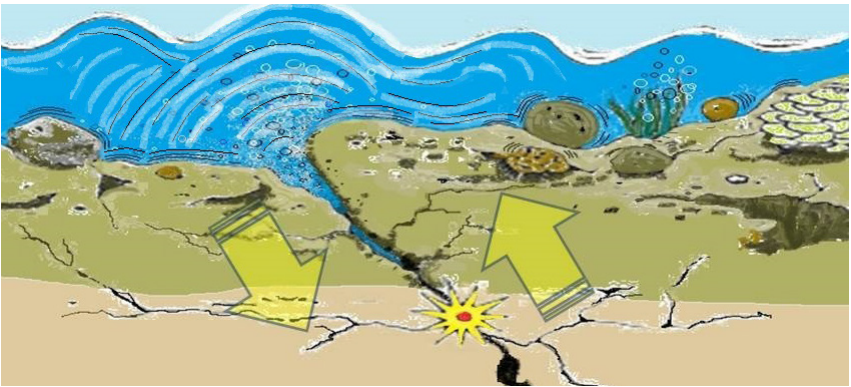
Suddenly, a strong earthquake strikes off the coast of Vanuatu, deep down beneath the sea floor in the New Hebrides Trench. The sea floor moves up and down. The water is violently disturbed.



In Port Vila, Vanuatu, the walls and floors of the house suddenly start to shake. Chairs topple over. Books slide off tables. Dishes rattle and crash to the floor.

“ EARTHQUAKE ! ”

People know what to do. They do not run outside. They take cover under tables or in doorways.



The earthquake sends out shock waves in all directions. The sea surface is also disturbed. Big powerful waves called tsunamis form. These waves travel fast across the sea. They are dangerous and they can kill.

When the shaking stops, people living by the sea know what to do. A tsunami might come. They do not start to clean up the mess. Instead, they quickly leave their homes and move inland away from water to higher ground.

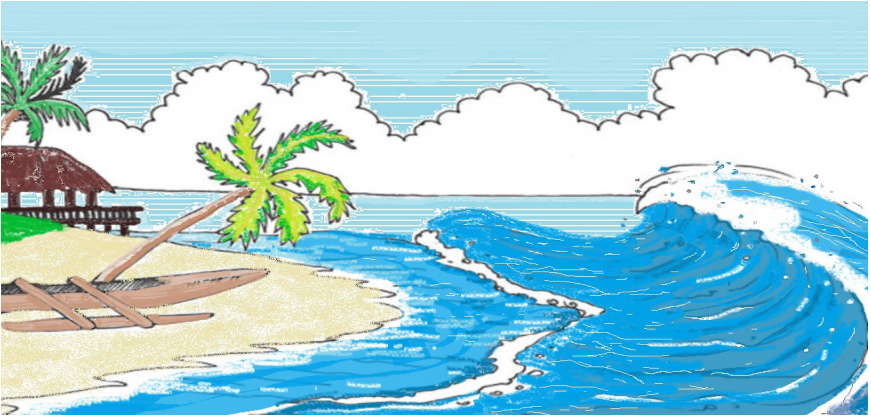


The Tsunami Warning Center in the Vanuatu Meteorology and Geo-Hazards Department (VMGD) issues a **TSUNAMI WARNING**.



Then the VMGD and the National Disaster Management Office sound sirens and warn people on the radio and by cell phone text message that a tsunami is expected. There is not much time.

In Louganville and Port Vila, the tsunami waves start to roll in 15 minutes after the earthquake. The first two waves are not very big, but the third wave is huge and over 25 feet high. The waves come every 5 to 20 minutes.



Like a great sea monster, it crushes homes along the coasts. It uproots trees, and splinters telephone and electricity poles.



It tosses cars and buses, as it sweeps inland. It floods the coast and pushes everything inland over a half-mile.

The tsunami waves keep coming, but the waves grow smaller. However, the danger continues for hours. The tsunami has caused a lot of damage, but luckily, no one has been killed.



When the shaking stopped, everyone near the sea immediately evacuated. They moved inland to higher ground where it was safe.

Meanwhile in American Samoa, breakfast is finished and parents and children leave home. They have not yet heard about the earthquake or tsunami off Vanuatu.



But scientists at the Pacific Tsunami Warning Center (PTWC) in Hawaii already know. Earthquake alarms sound. The scientists analyze the seismograph data to find out where the earthquake took place and how big it was.



The PTWC scientists work all day and all night in shifts. There is always someone on duty. Staff at the WSO Pago Pago and ASDHS TEMCO Emergency Operations Center (EOC) are also always on duty ready to act on PTWC's alerts.

The New Hebrides Trench earthquake was big. PTWC issues a **TSUNAMI WATCH** for American Samoa since the tsunami is still more than 3 hours away and calls WSO Pago Pago.

WSO Pago Pago sees the earthquake on its real-time earthquake display. They call TEMCO EOC and everyone gets ready.



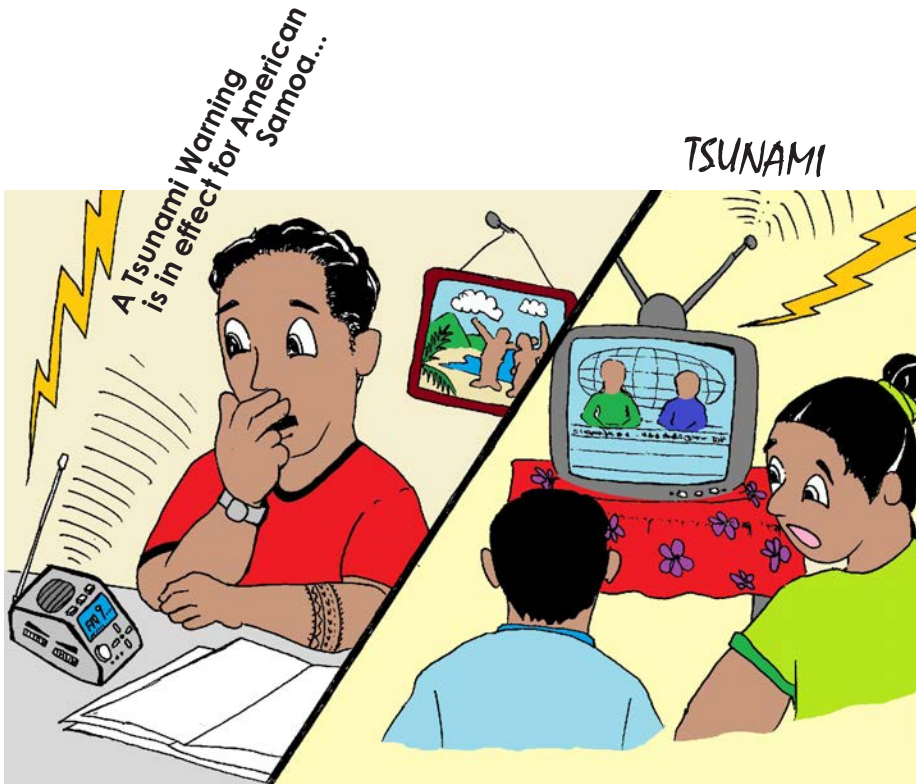
At 8:30 a.m., 3 hours before the tsunami hits, PTWC upgrades the Watch to a **TSUNAMI WARNING**.

The PTWC also sends international tsunami alerts to tsunami warning centers in other Pacific Island countries.

The ASDHS TEMCO prepares for a tsunami.

The Emergency Alert System (EAS) is activated and the TEMCO sounds the sirens to alert everyone.

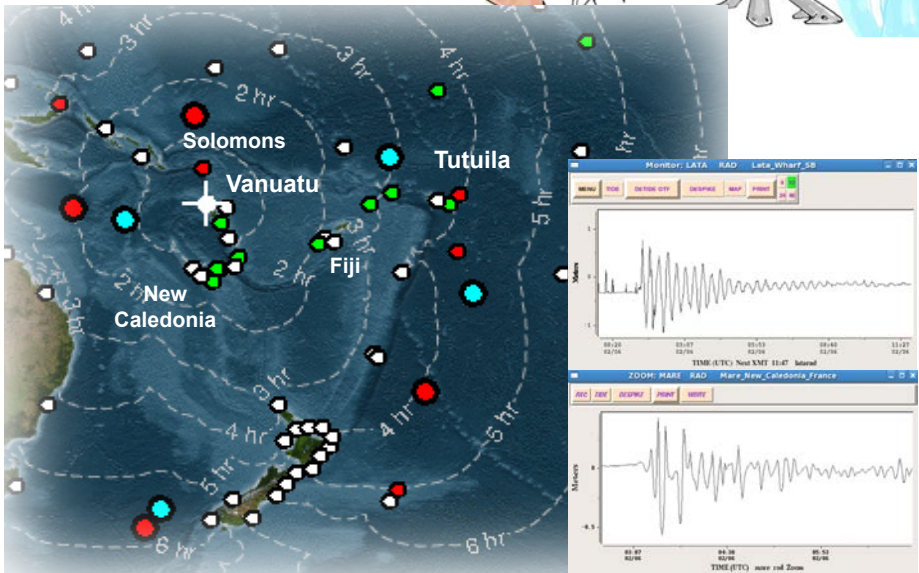
All media broadcast the **TSUNAMI WARNING** and village leaders warn their people.



Now everyone in American Samoa knows about the earthquake off Vanuatu and tsunami.

A tsunami is on its way across the Pacific.

During the **TSUNAMI WARNING**, PTWC scientists contact other warning centers around the Pacific to assess the size of the tsunami. They talk by telephone and send messages by satellite, e-mail, and fax.



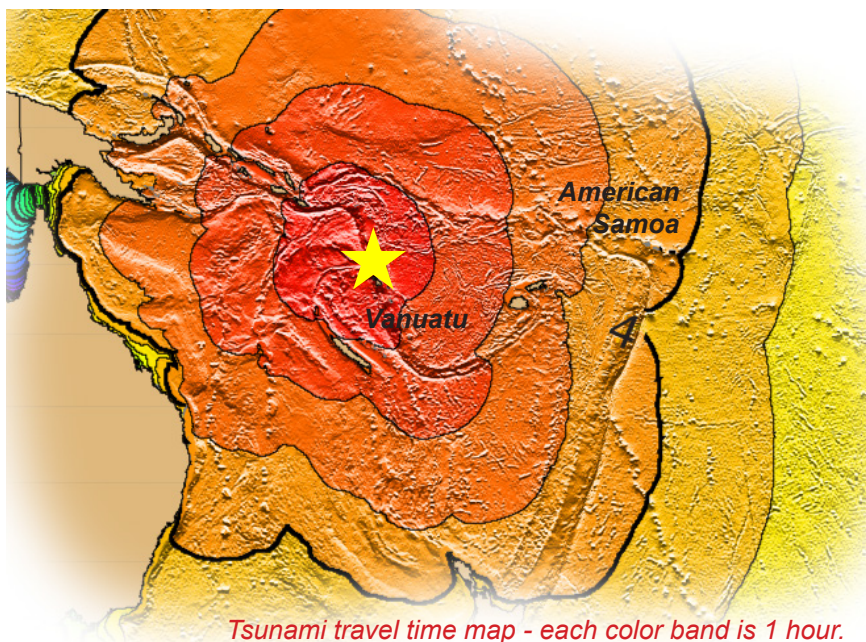
They check their instruments to look if sea levels are rising or falling, and look for a big tsunami. PTWC and WSO Pago Pago monitor the tsunami on their Tide Tool display. They see that a tsunami hit the Solomon Islands and New Caledonia. They wait to see if a tsunami will hit Fiji. All the information is shared with TEMCO EOC.

By now the the PTWC and WSO Pago Pago have a lot of information. They confirm that a dangerous tsunami has been generated. Waves up to 15 feet high attacked Fiji's coasts where there are tourist hotels and resorts.



PTWC updates their wave forecasts and send messages to everyone that tsunamis were seen in Fiji. WSO Pago Pago provides updates to the public via NOAA Weather Radio.

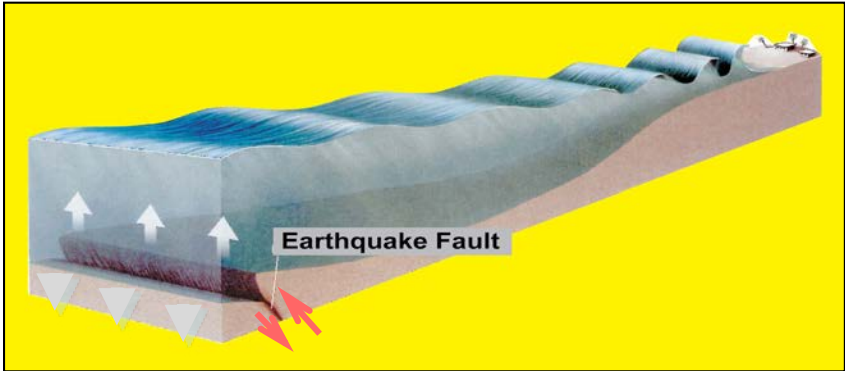
The tsunami that damaged Vanuatu was a local one because it happened in the same place as the earthquake and people felt the ground shake immediately. Local tsunamis do not give people much time to reach safety.



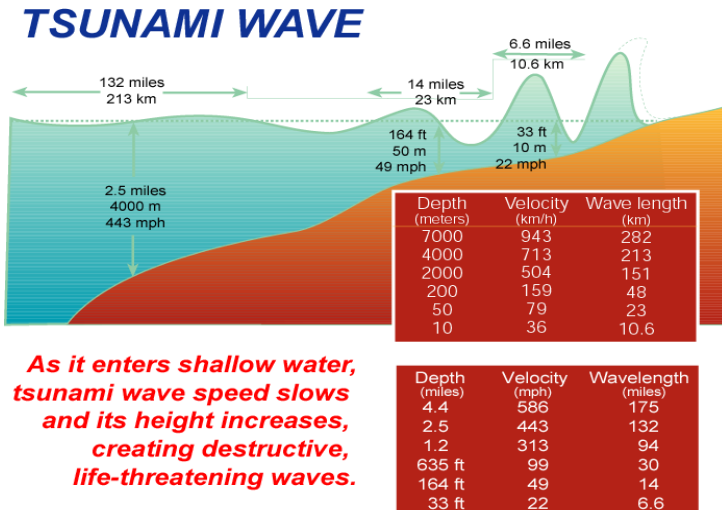
For American Samoa, the tsunami from Vanuatu is nearby, but will take about 4 hours to arrive. Luckily, there is some time to evaluate whether a warning and evacuation are necessary.

If this earthquake had been in the northern Tonga Trench, like in September 2009, the TSUNAMI WARNING and sirens would have been immediately triggered, because the local tsunami would hit in less than 30 minutes.

The big earthquake in the New Hebrides Trench generated a tsunami. The tsunami that is on its way is made up of many individual waves that can keep hitting the shore for hours.



Waves can be over 100 miles apart. The speed of the tsunami depends on the depth of the water. In very deep water, the waves travel as fast as a jet plane going up to 500 mph.



Tsunami waves cannot be felt or seen by ships at sea. The captain of a fishing boat has heard about the tsunami on his radio, but nobody on the boat can feel the waves as they pass under the boat. The tsunami cannot be seen by planes from the air.



Tsunami waves in the deep ocean are very small. They may only be a few inches high. Out in the ocean, far from land, the tsunami racing towards American Samoa is not dangerous.

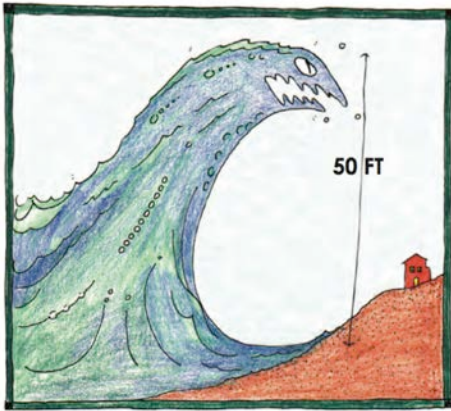
But as the tsunami approaches land, it becomes dangerous because the waves grow in shallow water.



The waves slow down when they hit shallow water. In 30 feet of water, a tsunami travels at 25 mph. That is the speed of a slow car but it is still faster than a person can run.

The first wave slows down when it enters shallow water. Although the second wave is tens of miles away, it is still traveling faster and catches up to the first wave. The result is that the distance between the waves gets smaller so the waves bunch up. This squashing together makes the waves bigger and more powerful.

This is when tsunami waves become very dangerous. A small wave only 12 inches high in the deep ocean may grow into a monster wave 50 feet high as it sweeps over the shore.



But people will be fine if they evacuate to the safe area.



The scientists at the Pacific Tsunami Warning Center can calculate when the first wave of the tsunami will reach American Samoa and other Pacific Ocean coastlines.

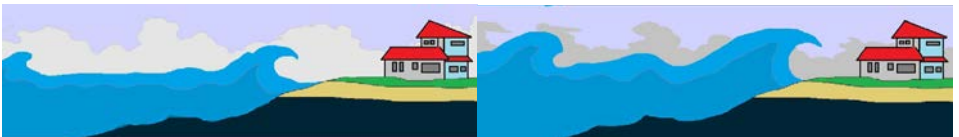


It will reach American Samoa just before 11:30 a.m., 4 hours after the earthquake occurred off Vanuatu.

The scientists can also forecast how big and how dangerous the waves will be.

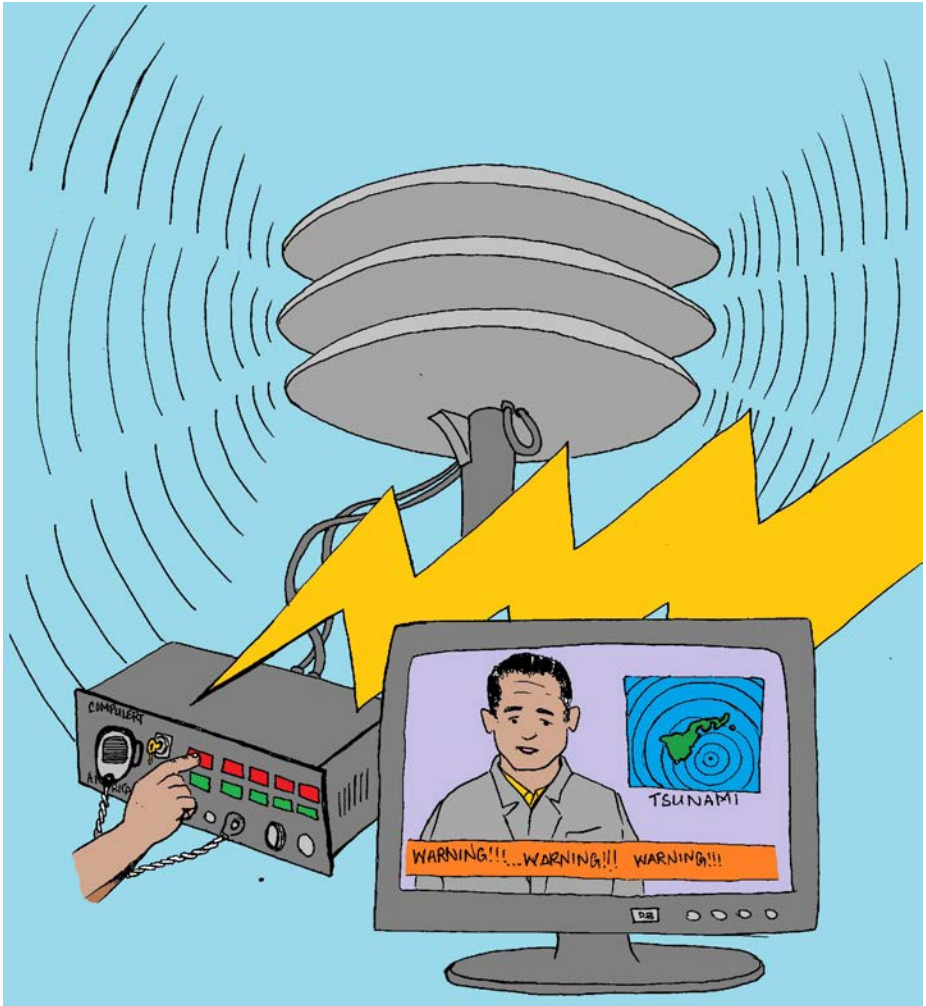


Along some coasts, they could be smaller, and in some bays they could become gigantic.



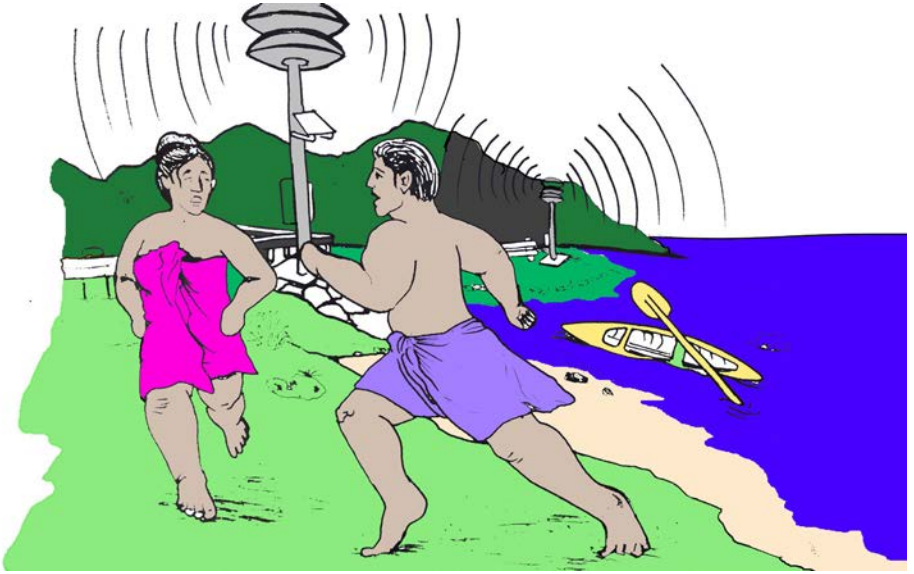
They could be harmless. They could be killers. People must be prepared for the worst and hope for the best.

At 9:30 a.m., 2 hours before the tsunami will arrive, the TEMCO sounds the sirens again. They wait for 5 seconds and then the **TSUNAMI WARNING** is read on the loudspeaker in English and Samoan.



People all over the islands listen to their radios and televisions to hear the latest news.

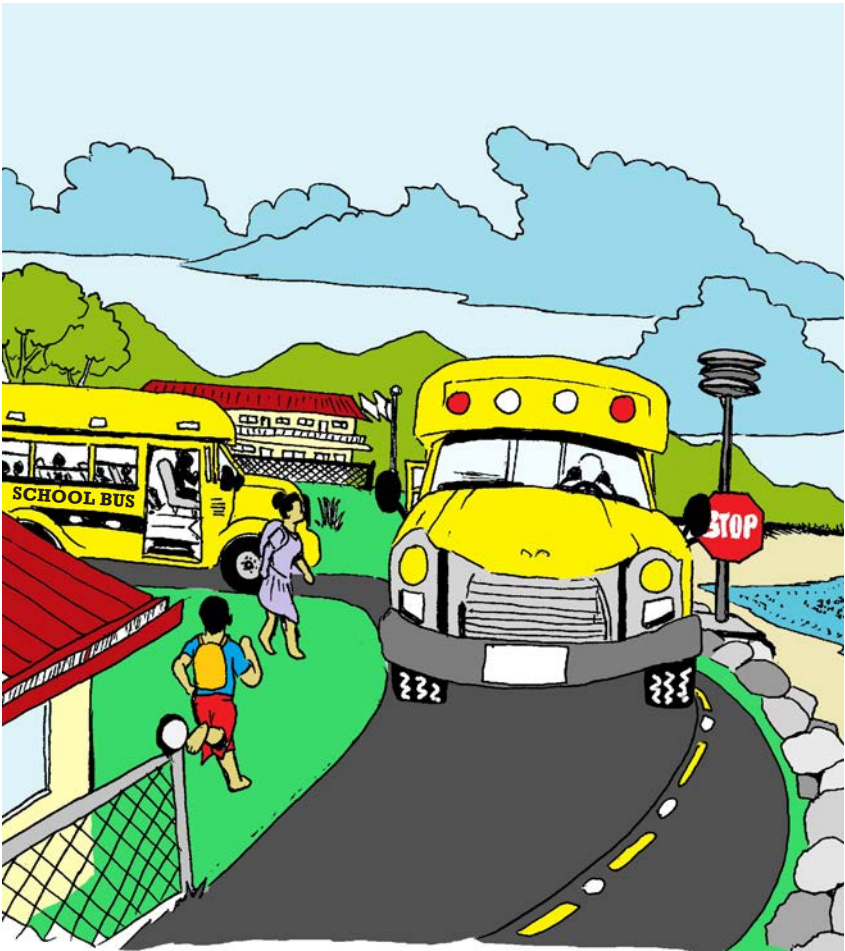
Beaches and low-lying areas along the coast that will get flooded are in the tsunami hazard zone.



Everyone in the tsunami hazard zones must evacuate. Swimmers and people on vacation leave the beaches. hotel staff help guests to evacuate. Starkist factory workers move to their safe zone. People at work and in shops in the hazard zones also evacuate.



Some schools are in the tsunami hazard zones. Teachers will stay with the children. They evacuate by foot. If there is enough time, they can evacuate Special Education students and teachers by school bus to safer places outside the hazard zones.



Teachers will look after the children until the tsunami danger has passed. Then the parents will come to get the children.

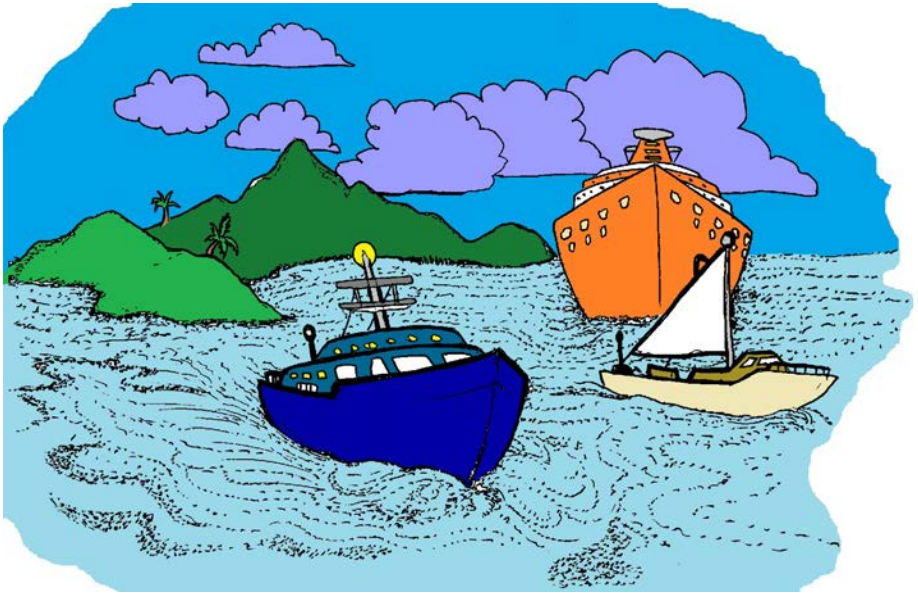
People leave the dangerous areas and evacuate to safe areas inland or to higher ground.



Schools and villages follow the evacuation trails that go up the hillside. They will be safe from the big tsunami.

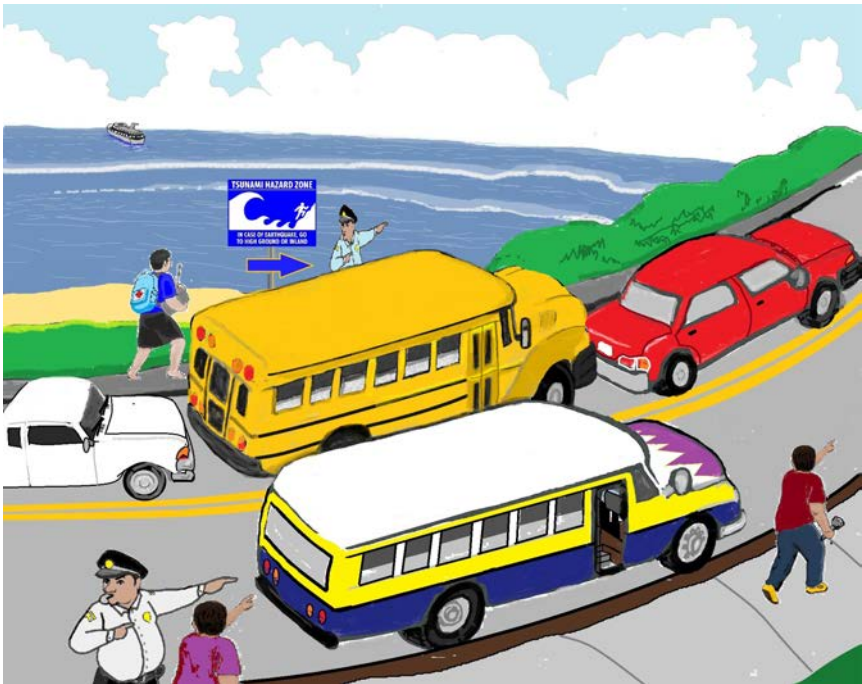


The fishing boat does not pull into the harbor at Pago Pago. It will remain out on the ocean where it will be safe. The other boat owners take their boats out to sea where the water is more than 50 fathoms (300 ft) deep. They won't be harmed there by the tsunami waves.



Boats won't return until it is safe and the Port Authority and U.S. Coast Guard issue authorization that it is safe to re-enter the port through marine channel 16.

It is 10:30 a.m.. The tsunami will arrive in about 1 hour. The sirens wail again for 5 seconds for the **TSUNAMI WARNING**. People are leaving the hazard zones. Surfers get out of the water. They know tsunamis are not surfing waves. Tsunami waves are full of rocks, trees and floating debris. They are very dangerous and can kill people.

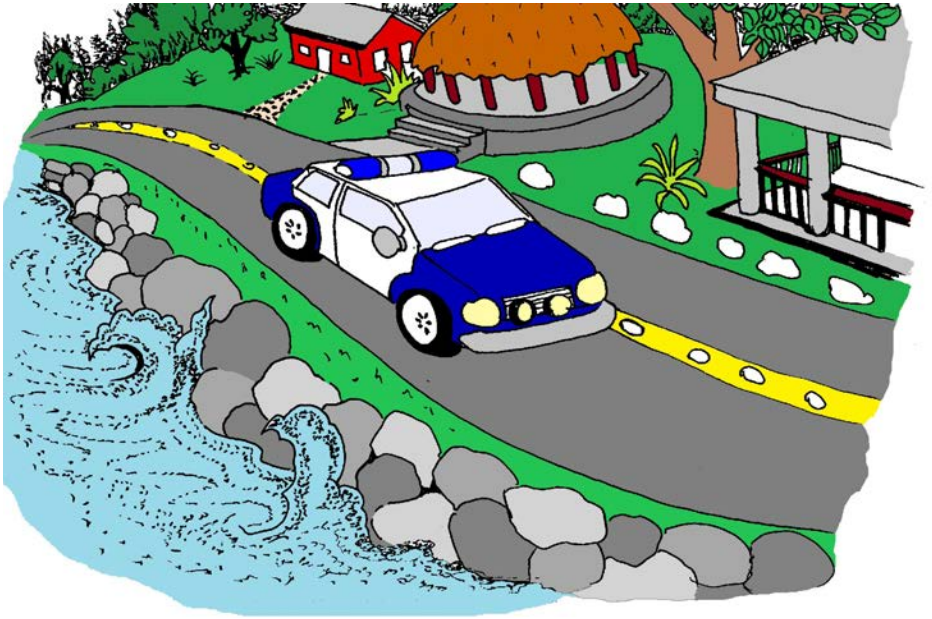


Everyone should **walk** to the safe area. Avoid driving your cars or taking buses. You do not want to be stuck in traffic when the tsunami arrives.

Everyone helps each other. The policemen and pulenu'u of each village are all busy evacuating people. There is a lot of traffic on the roads.

The Department of Public Safety is busy checking to make sure everyone evacuated.

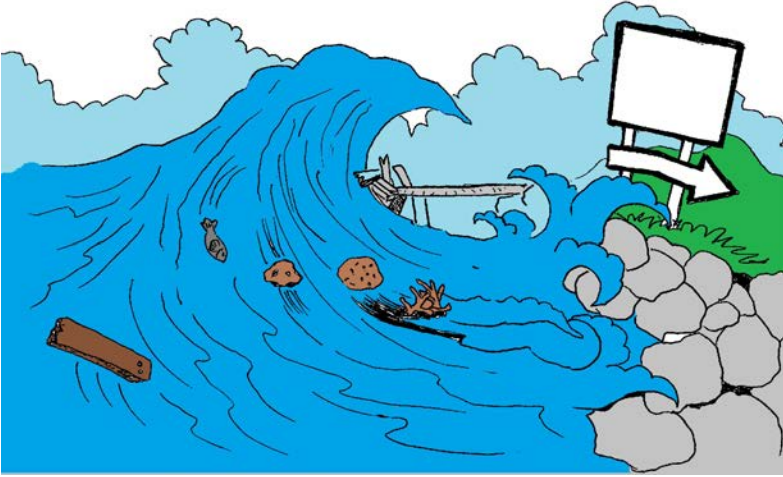
They make sure no one has been left behind in the hazard zones. Then they block off the roads so no one can return to the dangerous areas.



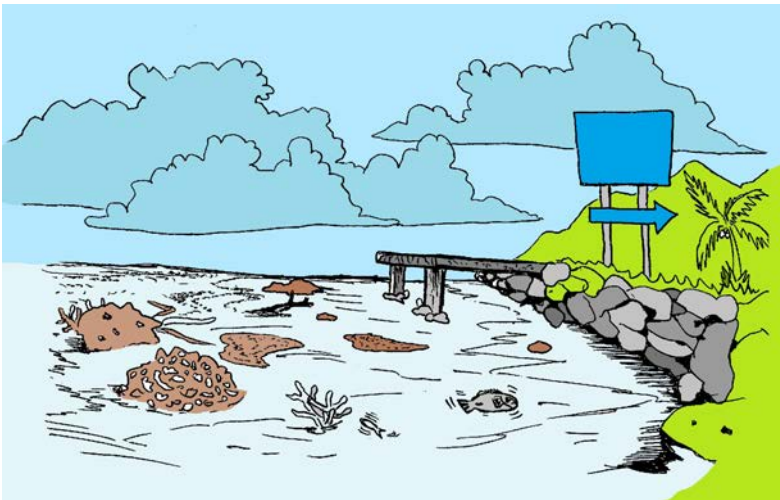
At 11 o'clock, the sirens sound for the last time.

There is nothing left to do but wait.
Everyone expects the first wave to come soon.

A few minutes later something strange happens at the beaches. In some places, the sea is rising gently.

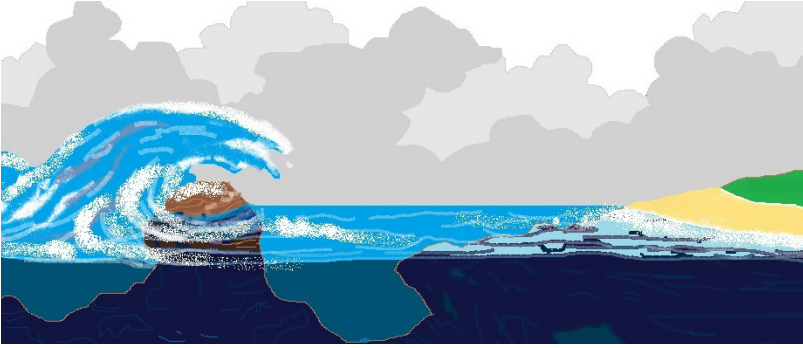


At others, the water is moving back from the shore and fish are left flapping on the dry beaches.



Both rising water and receding water are sure signs that a tsunami is arriving soon.

At 11:15 a.m., the first tsunami wave arrives. It quickly travels around the island. In some parts, coral reefs help to break the force of the tsunami.



Some shores are protected by trees and mangroves which lessens the wave force even more. But the waves in these areas can still be large and dangerous.



In bays or harbors such as Pago Pago, the waves can be very big because the sides of the bay shorten the length of the wave and push it upwards. There are six waves in this tsunami and they come every 10-30 minutes for the next three hours.

People wait in safe areas with family and friends. Some have taken food to the mountains.



Everyone waits patiently for the TEMCO to give the “**ALL-CLEAR**” message through the siren loudspeaker and on the radio.

When the tsunami waves become small so they do not cause damage, the PTWC cancels the **TSUNAMI WARNING** for American Samoa.

TEMCO begins its search-and-rescue operations to help people and assess the damage. If roads are blocked and power lines are down, people should not return to their village yet. When it is safe to return, TEMCO gives the **“ALL-CLEAR”** to the public.



The tsunami thrashed coastal villages and fales, crushed boats, and tossed cars around like toys. It flooded all the hazard zones.

But everyone was glad that no one was hurt. They were prepared and knew what to do. Everyone left the hazard zones when they heard the tsunami warning. People work to repair buildings so life can now return to normal.

It is nice to know that the Pacific Tsunami Warning Center, WSO Pago Pago, and the American Samoa TEMCO are always on watch for the next sign of a tsunami to protect lives today and in the future.





After an earthquake, a tsunami may follow.
Move quickly to higher ground.



Words to Know

Tsunamis: A series of waves of extremely long length and time period, usually caused by shallow undersea earthquakes. In the deep ocean, they can travel at speeds of more than 500 mph. Other causes of tsunamis include volcanic eruptions, submarine landslides, and coastal rock falls. Tsunamis are not tidal waves. You cannot swim or surf tsunamis because they flood the land like a rushing river, or fast-rising tide.

A distant tsunami has its source far away, and will take more than 6 hours to reach American Samoa.

A local tsunami has its source nearby. You may feel strong, or unusually long, shaking from the earthquake. The tsunami can arrive in minutes or within 1 hour.

Tsunami Warning: A Tsunami Warning is issued by the National Weather Service over the radio and TV. A Tsunami Warning is issued for a locality when significant widespread land flooding is certain or expected. When an evacuation is necessary, sirens will sound.

Tsunami Advisory: A Tsunami Advisory is issued when there is a marine threat. The tsunami may have generated strong currents or waves dangerous to those in, or near, the water.

Tsunami Watch: A Tsunami Watch is issued to alert the public that a distant tsunami may later impact the Watch area. The tsunami is more than 3 hours away. Listen to the radio or TV for updates.

Earthquake: Shaking created in the earth's crust by land movement.

Evacuate: To leave a place in a quick and organized way.

For more information on tsunamis, contact
National Weather Service, WSO Pago Pago, Tel: (684) 699-9130
American Samoa, Dept. of Homeland Security, Tel: (684) 699-3800

International Tsunami Information Center
Tel: (808) 725-6050, E-mail: itic.tsunami@noaa.gov
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