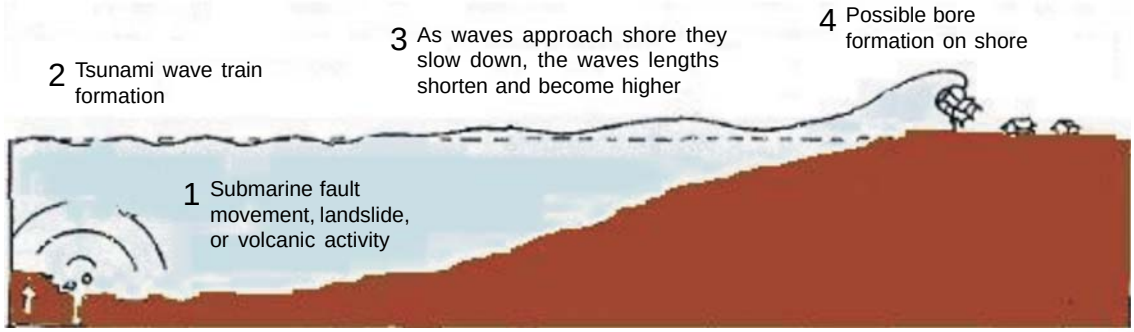
2. Tsunami – The killer sea wave

FOCUS

A killer Tsunami hit 11 South Eastern Countries of Asia on the 26th of December 2004 killing more than 1,50,000 precious lives. The count hasn't stopped.... At the end of the day statistics only remain. The emotional, economical and ecological toll of the disaster can't be calculated. Many villages have lost an entire generation. This was the biggest earthquake to hit the world in 40 years and no one could have thought that its effects would ripple worldwide overnight.

Do you know what Tsunamis are? How they can be predicted and how you can save yourself from the deadly Tsunami? Read the section below and you will know more about it. Follow the instructions if you reside in any of the coastal states of the country.

The term 'Tsunami' has been coined from the Japanese term Tsu meaning 'harbour' and nami meaning 'waves'. Tsunamis are waves generated by earthquakes, volcanic eruptions, or underwater landslides and can reach 15m or more in height devastating coastal communities. In recorded history, tsunamis worldwide have killed hundreds of thousands of people. Tsunamis caused by nearby earthquakes may reach the coast within minutes. When the waves enter shallow water, they may rise to several feet or, in rare cases, tens of feet, striking the coast with devastating force. The Tsunami danger period can continue for many hours after a major earthquake.

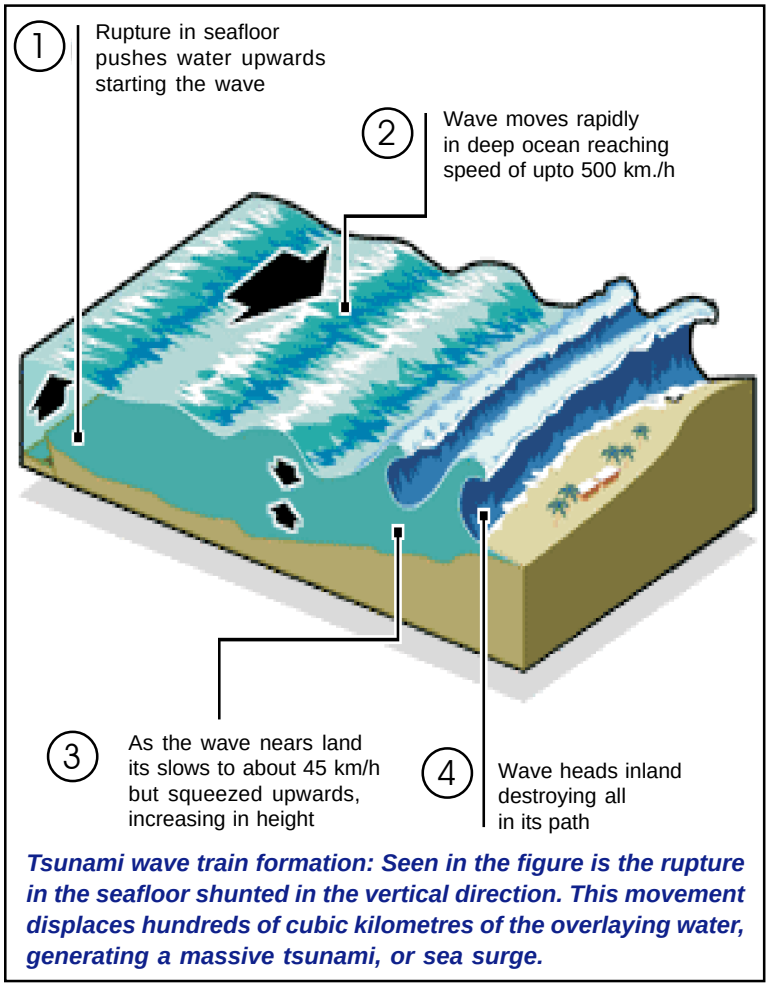


In 1883, the violent explosion of the famous volcano, Krakatoa in Indonesia, produced tsunamis measuring 40 meters which crashed upon Java and Sumatra. Over 36,000 people lost their lives as a result of tsunamis that are capable of crossing oceans. Tsunamis are nearly always created by movement of the sea floor associated with earthquakes which occur beneath the sea floor or near the ocean.

Tsunamis may also be generated by very large earthquakes far away in other areas of the Ocean. Waves caused by these travel at hundreds of kilometers per hour, reaching the coast several hours after the earthquake. Unlike ordinary tides, which are short, frequent and surface level, tsunami, are barely noticeable in their deep-sea formation stage. At this point despite a wavelength up to 100 km, they are shallow in depth and move at hundreds of kilometer per hour. *If a quake hits Los Angeles, a Tsunami can reach Tokyo in a time less than a Jet would take to traverse the same distance.*

Important Facts About Tsunamis

- Some tsunamis can be very large. In coastal areas their height can be as great as 10m or more (30m in extreme cases), and they can move inland several hundred meters.
- All low-lying coastal areas can be struck by tsunamis.
- A tsunami consists of a series of waves. Often the first wave may not be the largest. The danger from subsequent tsunami waves can last for several hours after the arrival of the first wave.
- Tsunamis can move even 50 km per hour on coastal plain, faster than a person can run.
- Sometimes a tsunami causes the water near the shore to recede, exposing the ocean floor. This is nature's Tsunami warning and should be heeded.
- The force of some tsunamis is enormous. Large rocks weighing several tons along with boats and other debris can be moved inland several meters by tsunami wave activity. Homes and other buildings are destroyed. All floating material and water move with great force and can kill or injure people.
- Tsunamis can occur at any time of day or night.
- Tsunamis can travel up rivers and streams that lead to the ocean.



Tsunami wave train formation: Seen in the figure is the rupture in the seafloor shunted in the vertical direction. This movement displaces hundreds of cubic kilometres of the overlaying water, generating a massive tsunami, or sea surge.

Detecting Tsunamis

With the use of satellite technology it is possible to provide nearly immediate warning of potentially tsuna-migenic earthquakes. Warning time depends upon the distance of the epicenter from the coast line. The warning includes predicted times at selected coastal communities where the tsunami could travel in a few hours.
Coastal tidal gauges can stop tsunamis close to the shore, but they are useless in deep oceans. Tsunami detectors, linked to land by submarine cables, are deployed 50 odd kms. out at sea. 'Tsunameters' transmit warnings of buoys on the sea surface, which relay it to satellites.

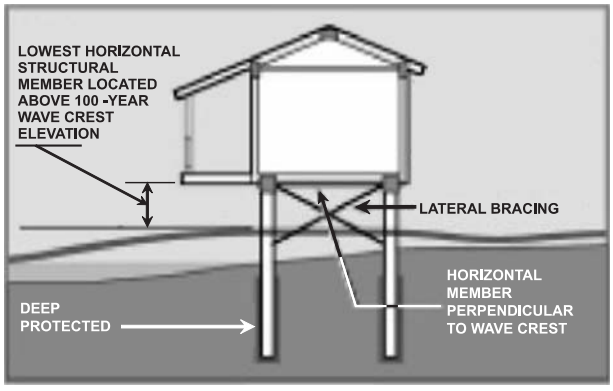
What to do BEFORE a Tsunami

Myth...
Tsunamis are caused by moon's pull.

- Find out if your home, school, workplace, or other frequently visited locations are in tsunami hazard prone areas.
- Know the height of your street above sea level and the distance of your street from the coast or other high-risk waters.
- Plan evacuation routes from your home, school, workplace or any other place you could be where tsunamis present a risk.
- Practice your evacuation routes
- Have disaster supplies on hand.
- Discuss tsunamis with your family
- Develop an emergency communication plan. In case family members are separated from one another during a tsunami have a plan for getting back together. Ask an out-of-state relative or friend to serve as the family contact (After a disaster, it is often easier to call long distance).

If you are at risk from tsunamis, you should:

- Avoid building or living in buildings within several hundred feet of the coastline.
- Make a list of items to bring inside in the event of a tsunami.
- Elevate coastal homes. Most tsunami waves are less than 10 feet (3 meters). Elevating your house will help reduce damage to your property from most tsunamis.
- Take precautions to prevent flooding.
- Have an engineer check your home and advise about ways to make it more resistant to tsunami water.
- Use a local radio or television station for updated emergency information.
- Follow instructions issued by local authorities.



Design Solution to Tsunami effect

What to do DURING a Tsunami

- If you are at home and hear there is a tsunami warning, you should make sure your entire family is aware of the warning. Your family should evacuate the house if you live in a tsunami prone area. Evacuate to a safe elevated area and move in an orderly, calm and safe manner to the evacuation site.

- Take your Disaster Supplies Kit. Having supplies will make you more comfortable during the evacuation.
- If you evacuate, take your animals with you.
- If you are at the beach or near the ocean and you feel the earth shake, move immediately to higher ground. Do not wait for Tsunami warning to be announced. Stay away from rivers and streams that lead to the oceans.
- High multi-storey, reinforced concrete buildings (like hotels etc.) are located in many low-lying coastal areas. The upper floors of these buildings can provide a safe place.
- Offshore reefs and shallow areas may help break the forces of tsunami waves, but large and dangerous waves can still be a threat to coastal residents in these areas. Staying away from low-lying coastal areas is the safest advice when there is a tsunami warning.
- Update yourself on emergency information or warning announced on radio and television from time to time.

Eyewitness...

I saw the water disappearing and the water went back so far away and everyone wondered what it was – a full moon or what? Then we saw the waves come, and we ran," said Katri Seppanen a tourist from Finland

If you are on a boat or ship

- Since tsunami wave activity is imperceptible in the open ocean, do not return to port if you are at sea and a tsunami warning has been issued for your area. Tsunami can cause rapid changes in water level and unpredictable dangerous currents in harbors and ports.
- If there is time to move your boat or ship from port to deep water (after you know a tsunami warning has been issued), you should weigh the following considerations:
  - Most large harbors and ports are under the control of a harbor/port authority. These authorities direct operations during periods of increased readiness. Keep in contact with the authorities should a forced movement of vessels is directed.
  - Smaller ports may not be under the control of a port authority. If you are aware there is a tsunami warning and you have time to move your vessel to deep water, then you may do so in an orderly manner. Owners of small boats may find it safest to leave their boat at the pier and physically move to higher grounds.

Damaging wave activity and unpredictable currents can affect harbors for a period of time following the initial tsunami impact on the coast. Contact the harbor authority before returning to port.

What to do AFTER a Tsunami

After a tsunami, you should:

- Continue using a radio or television for updated emergency information. The tsunami may have damaged roads, bridges, or other places that may be unsafe.
- Check yourself for injuries and get first aid if necessary before helping injured or trapped persons. If someone needs to be rescued, call professionals with the right equipment to help. Many people might get killed or injured while trying to rescue others in flooded areas.
- Help people who require special assistance-infants, elderly people, those without transportation, large families who may need additional help in an emergency situation, people with disabilities, and the people who care for them.
- Avoid disaster areas. Your presence might hamper rescue and other emergency operations and put you at further risk from the residual effects

of floods, such as contaminated water, crumbled roads, landslides, mudflows, and other hazards.

- Use the telephone only for emergency calls. Telephone lines are frequently overwhelmed in disaster situations. They need to be cleared for emergency calls to get through.
- Stay out of a building if water remains around it. Tsunami water, like floodwater, can undermine foundations, causing buildings to sink, floors to crack, or walls to collapse.
- When re-entering buildings or homes, be very careful ! Tsunami-driven floodwater may have damaged buildings where you least expect it. Carefully watch every step you take.
- Wear long pants, a long-sleeved shirt, and sturdy shoes. The most common injury following a disaster is cut feet.
- Use battery-powered lanterns or flashlights when examining buildings. Battery powered lighting is the safest and easiest to use and it does not present a fire hazard for the user, occupants, or building. DO NOT USE CANDLES.
- Examine walls, floors, doors, staircases, and windows to make sure that the building is not in danger of collapsing.
- Inspect foundations for cracks or other damage. Cracks and damage to a foundation can render a building uninhabitable.
- Look for fire hazards. There may be broken or leaking gas lines, flooded electrical circuits, or submerged furnaces or electrical appliances. Flammable or explosive materials may have come from upstream. Fire is the most frequent hazard following floods.
- Check for gas leaks. If you smell gas or hear a blowing or hissing noise, open a window and get everyone outside quickly. Turn off the gas using the outside main valve if you can, and call the gas company from a neighbor's home. If you turn off the gas for any reason, it must be turned back on by a professional.
- Look for electrical system damage. If you see sparks or broken or frayed wires, or if you smell burning insulation, turn off the electricity at the main fuse box or circuit breaker. If you have to step in water to get to the fuse box or circuit breaker, call an electrician first for advice. Electrical equipment should be checked and dried before being returned to service.
- Check for damage to sewage and water lines. If you suspect sewage lines are damaged, avoid using the toilets and call a plumber. If water pipes are damaged, contact the water company and avoid using water from the tap. You can obtain safe water from undamaged water heaters or by melting ice cubes that were made before the tsunami hit. Turn off the main water valve before draining water from these sources. Use tap water only if local health officials advise it is safe.
- Watch out for wild animals, especially poisonous snakes that may have come into buildings with the water. Use a stick to poke through debris. Tsunami floodwater flushes snakes and animals out of their homes.
- Watch for loose plaster, drywall, and ceilings that could fall.
- Open the windows and doors to help dry the building.
- Shovel mud before it solidifies.

The above brief on Tsunami teach us clearly that we can no longer afford to ignore the forces of nature and it should serve as a wake up call to us to rebalance our relationship with our environment.

Yield not to misfortunes, but advance all the more boldly against them.

Reference for further reading:

- http://ioc.unesco.org/itsu/ IOC/UNESCO International Coordination group for the Tsunami Warning System in the Pacific (ICG/ITSU), Paris, France.
- http://quake.usgs.gov//tsunami/ Tsunamis and Earthquakes, USGS, USA.
- www.asc-india.org Amateur Seismic Centre is a comprehensive website carrying details of state wise seismicity for the country. This also has extensive reports on various past Earthquakes/ Tsunamis.
- http://www.prh.noaa.gov/pr/itic/ International Tsunami Information Center, Honolulu, Hawaii.
- http://www.tsunami.org/ Pacifc Tsunami Museum site. Includes answers to frequently asked questions, links, and information related to Pacific Ocean tsunamis.

1. Name three causes of Tsunami and explain its impact.
2. Explain two different ways of detecting Tsunami.
3. State two preparedness measures each in pre, during and post tsunami scenario.