

Tsunami Fact Sheet

Tsunamis are a big risk for coastal communities as they can appear with minimal warning, cause huge levels of destruction and lead to many deaths.

Learning about tsunamis is vital to ensure that coastal communities are well prepared and have tsunami warning systems in place to help save the lives of people in communities worldwide.

Where Do Tsunamis Occur?

Most tsunamis occur in the Pacific Ring of Fire but can also occur in areas close to the ocean.

What Is the Pacific Ring of Fire?

The area around the Pacific Ocean has many plate boundaries; this region stretches for approximately 40 000km (24 900 miles). Volcanoes are associated with the Pacific Ring of Fire throughout its length; for this reason, it is known as the 'Ring of Fire'. The Earth's most destructive seismic events also happen in the red areas shown in **Figure 2**.

tsunami: A series of enormous ocean waves caused by earthquakes, underwater landslides, volcanic eruptions or asteroids.

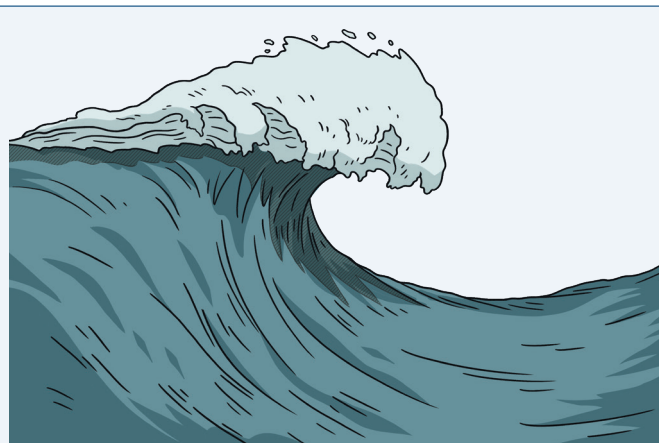
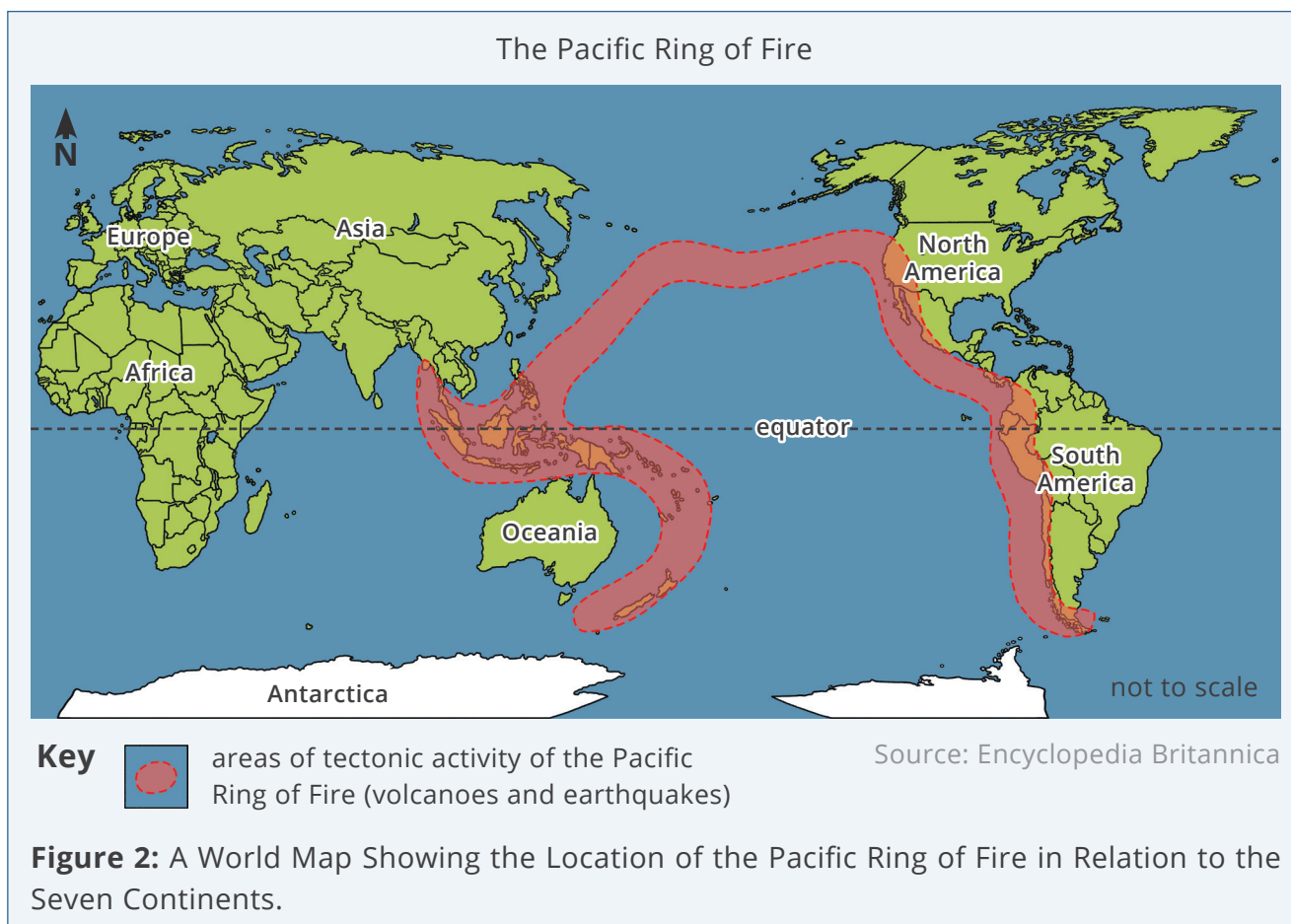


Figure 1: A tsunami is a giant wave or series of waves.



How Do Tsunamis Form?

Generally, tsunamis are formed by underwater events, most likely an underwater earthquake. Earthquakes are caused by tectonic plates moving on the surface of the Earth. The earthquake suddenly causes the seafloor to move upwards, transferring energy into the water above. The sudden movement and energy transfer create the conditions for forming large waves. The waves can travel at 500mph (800km/h) across the ocean. However, they are not noticeable in deep water. Tsunami waves form as the waves travel into shallow water. When the tsunami wave forms, it can cause extensive flooding and damage to the local coastline.

tectonic plate: A giant block of solid rock. The world's oceans and landmasses sit on top of these tectonic plates.

earthquake: A sudden or violent movement within the Earth's crust followed by a series of shocks.

Underwater earthquakes are the most common cause of tsunamis, but other influences, such as volcanic eruptions, underwater landslides or meteorite impacts can also produce them. These events can cause a large amount of water to be displaced, creating powerful waves that can travel across entire oceans and cause widespread destruction when they reach land.

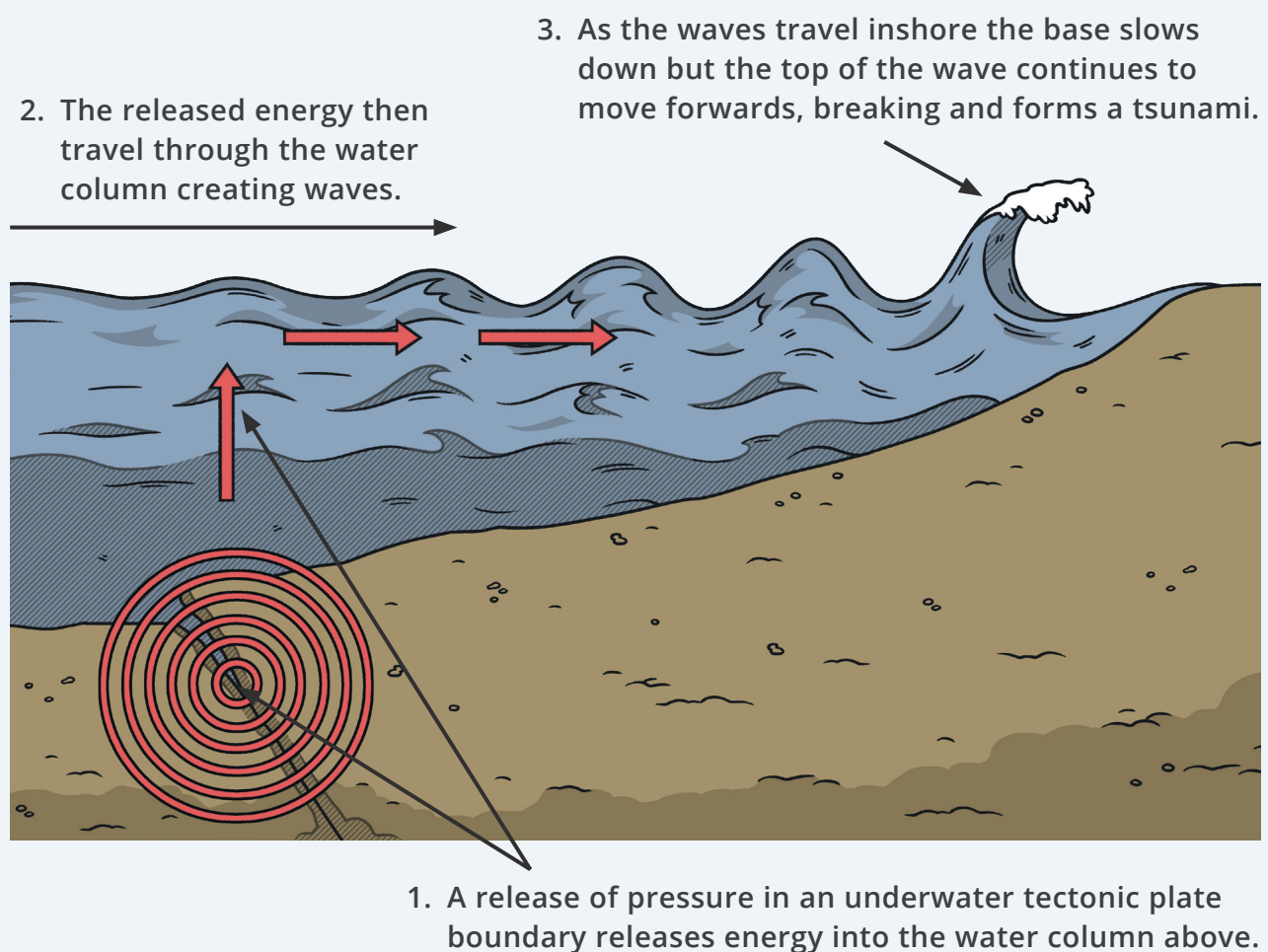


Figure 3: Tsunami Formation

What Are the Features of a Tsunami?

Tsunamis are not like regular waves; they are much faster and taller. After a major underwater earthquake, more than one large wave usually hits the coastline.

Speed

Tsunamis are some of the fastest waves on record, with the largest reaching speeds of over 500mph (800km/h).

Wavelength

Not all waves are the same size; some are larger than others. Wavelength is the measurement of the top of one wave to the top of the next wave.

A tsunami wavelength is usually very long, meaning the wave can cover over 100 kilometres. The wave is almost unnoticeable in deep water and only begins to form a giant wave in deep water.

Wave Height

Wave height is the distance between a wave's highest and lowest points. The taller the wave, the more energy it will break with as it hits the shoreline.

Due to their low wave height, tsunamis are not usually noticeable in deep water. However, the waves can rise over 100 metres tall as they move into shallow water.

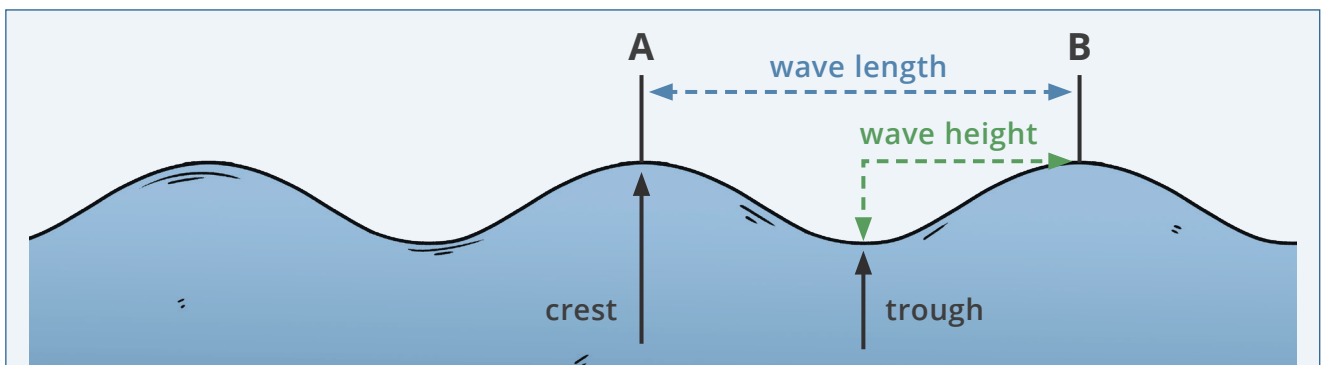


Figure 4: Wavelength and Wave Height

What Are the Warning Signs of a Tsunami?

There may be signs of a tsunami before it reaches the land. Some of these warnings include:

- an earthquake could be felt in local communities in the surrounding coastal regions;
- emergency sirens may start in areas that are prepared for a tsunami;
- text message notifications to smartphones can be sent to people living in areas that are prepared for a tsunami;
- the sea level may change rapidly just before a tsunami reaches the shoreline, such as the sea retreating suddenly before the giant wave arrives;
- news broadcasters may display or produce warnings in areas prepared for a tsunami.

Did You Know? Some people who have witnessed a tsunami have heard a loud roar before the tsunami hit. Some geographers believe this is due to the force of the waves as they advance to the coastline.



Figure 5: The wave can cause enormous damage as it moves through an urban area.

What Are the Short-Term Impacts of a Tsunami?

The short-term impacts of a tsunami are related to the immediate effects of the wave hitting the coastline. Short-term impacts could include:

- flooding of coastal areas;
- destruction of property, vehicles and personal belongings;
- loss of life;
- destruction of infrastructure, such as bridges, roads, gas and electric mains;
- injuries for people caught in the pathway of the wave; the wave often contains debris that can cause injuries;
- hospitals can be overwhelmed by the number of people needing help;
- displacement of people who have had their homes destroyed by the wave;
- destruction of the local environment;
- contamination of water sources;
- uprooting trees;
- transportation interruption;
- communication can stop in areas affected by the wave;
- healthcare supplies can be disrupted;
- education centres can be disrupted.

What Are the Long-Term Impacts of a Tsunami?

The long-term impacts of a tsunami are related to the wave's effects in the weeks, months and years after the initial event. Long-term impacts could include:

- huge numbers of buildings may need to be rebuilt;
- infrastructure such as roads, electrical mains and water supplies may need to be rebuilt;
- psychological stress for survivors;
- loss of livelihoods and a lack of employment opportunities;
- economic costs;
- some people may never return to the area;
- changes to the environmental habitat;
- areas can become very vulnerable to another natural hazard event;
- loss of farming land due to flooding by salt water.

How Can Communities Manage the Impacts of Tsunamis?

Communities in areas at risk from tsunamis often develop strategies to reduce the destruction caused by the huge waves.

Some strategies that communities can implement to reduce the impact of tsunamis include:

- early warning systems are used to give residents more time to evacuate from risk zones;
- preparedness and education for local communities on the best evacuation routes;
- practice tsunami drills can be used to increase preparedness;
- a ban on building on low lying areas;
- building natural barriers such as mangroves or coral reefs to break up the power of waves as they move inland;
- building hard engineering management structures, such as sea walls to protect areas;
- sharing information and links with other international organisations to build a good knowledge base of the best possible strategies.

How Does an Early Warning System Work?

The Tsunami Early Warning System (TEWS) uses underwater sensors programmed to identify changes in the ocean or sea floor. The sensors can detect underwater earthquakes and send warnings to satellites.

The sensors monitor the area and gather information and data on normal conditions. The sensors can then spot when a strong wave moves past it. If the sensors detect a tsunami wave is forming, it will send an early warning message or alert. The message is sent to local communities and emergency responders. The warning can also be sent to local communities via satellite communication to the internet or radio systems.

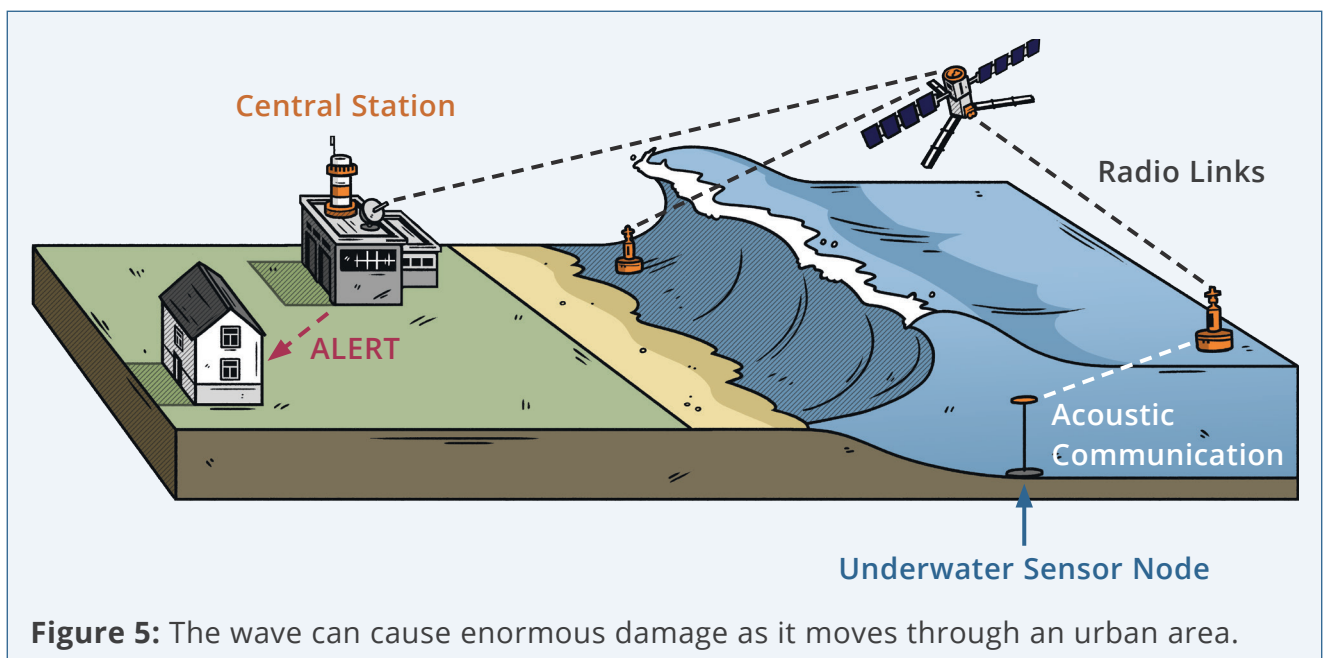


Figure 5: The wave can cause enormous damage as it moves through an urban area.