

Six Tsunami Lesson Plans

Attorney-General's Department 2010

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1. What is a tsunami?

1. There are many misunderstandings about tsunami. Complete the following table inserting the correct information. [Lifesaving Australia](#) and the first 4 minutes of the [Tsunami Awareness Show](#) by Questacon will be of assistance.

| Myth | Correct information |
|-------------------------------------|---------------------|
| 1. A tsunami is a single wave | |
| 2. A tsunami is a cresting wave | |
| 3. A tsunami is a wave in the ocean | |
| 4. A tsunami is a tidal wave | |

2. How do tsunami and normal waves differ? You may use a visual organiser, like a Venn diagram, to complete this activity.

3. Present the information you have gathered in question 1 and 2 in a visual manner to teach others about tsunami.

4. Clearly define shoaling, drawdown, wave length, wave crest, wave trough, wave period and run up. Draw a sketch diagram to help explain these terms.

There is more information about the features of tsunami waves at the following site

[Enchanted Learning](#)

Useful sites with animations showing the movement of tsunami waves are found at [Tsunami How Stuff Works](#) and [Savage Earth Animations](#)

5. Use these terms (and a sketch) to describe what happens to a tsunami as it approaches the coast.

6. Name five events that may cause a tsunami to occur?

7. Do any of the events that cause a tsunami occur more often than others? Which is the least likely to occur? Which is the most likely to cause a tsunami?

8. Describe a clue that might warn people on a beach that a tsunami is approaching.

9. Develop and draw your own symbol, to appear on a sign at a beach, warning people about tsunami waves and the action they should take. This sign needs to be understood by people regardless of their language and/or education backgrounds.

10. Collect equipment (bowl, water and rocks) and make a model of a tsunami. You may like to create a coastline with many characteristics such as wetlands and mangroves with a lot of vegetation; built-up areas; agricultural areas. Create your

tsunami and describe what happens as the wave approaches and hits the different coastline areas.

11. At the site [1960 Chilean tsunami](#) you can study a map to show the travel time of the 1960 tsunami generated by an earthquake off the coast of Chile that measured 9.5 on the Richter Scale. This is the largest earthquake ever recorded.

Use an atlas to study the countries affected by a tsunami after the Chilean earthquake in 1960.

It took ____ hours to reach New Zealand.

It took ____ hours to reach Tasmania and ____ hours to reach the Australian mainland.

It took ____ hours to reach Taiwan.

It took ____ hours to reach the Aleutian Islands.

It took ____ hours to reach Papua New Guinea.

It took ____ hours to reach Hawaii.

It took ____ hours to reach Western Australia.

It took ____ hours to reach the Canadian coastline.

2. Where do tsunamis occur?

Tsunamis do not occur everywhere and on every coastline – there is a pattern to their distribution. The majority of tsunamis – over 90 per cent – occur in the Pacific Ocean.

1. Use the data from the Bureau of Meteorology [History of tsunamis](#) and an atlas to locate the sites of major tsunamis on an outline map of the world.

2. Make sure your completed map displays a border, a north arrow, a legend, a clear title, the scale and the source of the data.

3. Add to the following information to the map:

- Pacific Ocean
- Indian Ocean
- Atlantic Ocean

4. What is a tectonic plate?

5. Produce an overlay map to add information about tectonic plates, earthquakes and volcanoes.

One way to complete an overlay is to use tracing paper. Place the tracing paper over your world map and mark in the border to align the two pieces of paper. You do not need to trace any markings from the underneath map. You can see them. The finished overlay map will have an informative title and a legend.

a. On the overlay clearly mark the major tectonic plates and earthquake zones. These can be found at

[Learn About Earthquakes In My Backyard](#)

b. Clearly write in the name of each major tectonic plate.

c. In the legend provide the symbol for the plate boundary and the symbol for the earthquake zones

d. On the overlay clearly show the major active volcanoes. These can be seen at

[Learn About Tsunami In My Backyard](#)

e. Clearly label the 'Ring of Fire'

f. In the legend provide a symbol for the active volcanoes.

5. Carefully study the two maps. Make a copy of the following statements and choose the correct option in each sentence.

a. Most tsunamis **do/do not** occur around the Pacific Ocean.

b. There appears to be a **very strong/very weak** match between the distribution of earthquakes and the location of tectonic plate boundaries.

c. There appears to be a **very strong/very weak** match between the distribution of volcanoes and the location of tectonic plate boundaries.

d. There appears to be a **very strong/very weak** match between the distribution of earthquakes and the distribution of tsunamis.

6. In at least one summary sentence answer the following question: How closely matched are tectonic plate boundaries, earthquakes, volcanoes and occurrence of tsunamis?

7. Check the data collected by the National Oceanic and Atmospheric Administration [Recent and Historical Tsunami Events](#) to see where recent tsunami events have occurred. Is the pattern you have observed in the earlier questions continuing?

8. Why are subduction zones likely to be the origin of tsunamis? Use a diagram to explain.

9. Which parts of Australia are at risk from tsunamis and why?

3. Tsunami warnings

A tremendous amount of energy is released on impact when a tsunami reaches the coast. Each cubic metre of water weighs about one tonne. Several thousands of cubic metres of water can be washed up on affected coastlines. If a tsunami strikes and people have been warned and evacuated, the number of deaths and injuries are low or even non-existent. In this case, buildings and other structures can be damaged or destroyed and, often, large areas of land become contaminated with sea water. It is important that the public is educated about tsunami so they can respond quickly to warnings. It is not always possible to provide a warning hours in advance.

1. Describe how scientists are able to detect and monitor a potential tsunami.

2. Visit NOAA Pacific Tsunami warning centre [Tsunami warnings](#) for global tsunami warnings.

a. Describe the location and severity of any warnings for Pacific region.

b. Describe the location and severity of any warnings for the Indian Ocean?

c. Describe the location and severity of any warnings for the Caribbean Sea?

3. Australian warnings are also issued by the Bureau of Meteorology [Australian tsunami warnings](#)

a. What is the name of the Australian warning centre? Which two organisations are involved?

b. Describe the location and severity of any warnings that currently apply.

4. JATWC identifies four warning levels for Australia: No threat, Watch, Marine warning and land warning.

a. Find out the meanings for each of these warning levels [tsunami warnings](#)

b. Use the example provided at [tsunami warnings](#)

to write your own sample tsunami warning for a designated coastal region.

5. Identify at least four ways you might hear about a tsunami warning?

6. Even if you didn't hear an official warning, identify three signs that could warn you about a approaching tsunami.

7. Once an official tsunami warning has been issued individuals and communities need to know what to do. Refer back to the information at [Tsunami – Ready and Able](#) as well as other sources such as [Webmaster](#) and [Tsunami Preparedness Guidebook](#) and think about what needs to happen to ensure people survive.

Make a list of things that should be organised well before a tsunami warning.

8. Should people in tsunami-prone areas rely on the tsunami warning system? When might there not be enough time to rely on this system?

9. Look at a map of the Pacific Ocean and the extent of habitable coastline. Is it feasible that all habitable areas can be educated about and ready for a tsunami?

10. The Pacific Tsunami warning system has hundreds of seismic stations worldwide, coastal tide gauges and sophisticated buoys in the Pacific Basin capable of detecting a one-centimetre difference in ocean height. Watch the video, Pacific Warning System, at [How stuff works](#) and complete the following:

a. describe how the system works.

b. how strong does an earthquake need to be before it is likely to cause a tsunami?

c. is a deep or shallow earthquake more likely to cause a tsunami?

d. in 2004 there were not similar gauges and buoys in the Indian Ocean and scientists were not able to detect a tsunami there. Describe how a tsunami warning system might have changed the outcome of the Indian Ocean tsunami in 2004?

11. Prepare a brochure or other piece of information (radio or television advertisement) to distribute to help people understand the dangers of tsunami and the appropriate way to behave.

4. Be prepared

1. What is a tsunami?
2. How is a tsunami different to a normal wave?
3. What does a tsunami look like out in the ocean?
4. What does a tsunami look like near the shore?
5. What causes a tsunami?
6. How might you know a tsunami could be on its way?
7. Who provides warnings in Australia?
8. How can you check for tsunami warnings in Australia?
9. What is the difference between a marine warning and a land warning?
10. What is the main thing to do if a tsunami is approaching?
11. If the warning provides time, how can you look after pets?
12. When is it safe to return to a tsunami affected region?
13. Name at least three places where tsunamis have had a big impact.

5. Report a tsunami

Instructions

1. Conduct a brainstorm in your class to create a list of glossary terms.
2. Students can work individually or in pairs to produce either a written report (including images) that might end up in a newspaper or online or prepare an interview that might be suitable for television or online news.
3. The finished report can be presented to a small group of peers who can provide feedback.
4. Points to consider in the feedback include the number of correctly used glossary terms, the logical structure of the interview or article, the accuracy of the information about physical processes, an understanding of the range of impacts, an understanding of the response process in terms of emergency response, recovery and preparedness and the attention grabbing potential of the interview or article.
5. Students can reflect on the feedback and revise their article or script before submitting for teacher assessment.

6. Build your own resource guide

During your study of tsunamis you have referred to data from a range of sources.

Set up a table like this one and complete it to provide an outline of valuable sources for this topic.

| Key question | Website (Include the group or author of the site) No more than 2 per question. | Key information at site (in dot point form) | Text | Visual | Audio |
|--|---|--|-------------|---------------|--------------|
| What is a tsunami? | | | | | |
| Where do tsunamis occur? | | | | | |
| What impact do tsunamis have on people and on the environment? | | | | | |
| How can people be prepared for a tsunami event? | | | | | |

Key points to cover:

Definition of tsunami

The causes of tsunami

Major regions where tsunami occur

Appearance of tsunami

Difference between tsunami and normal wave

Movement of tsunami (speed and direction)

Changes as shore line approached

Warning signs

How official warnings are gained

Impact on coastal regions in short term

Impact on coastal regions in long term

Impact on people in short term

Impact on people in long term

Emergency responses

Preparation for future event