Tsunamis

Tsunamis are one of the most powerful and dangerous natural forces on Earth.

What Does the Word 'Tsunami' Mean?

The word tsunami is pronounced 'soo-nah-mee'. It comes from two Japanese words: 'tsu' and 'nami'. Tsunami means 'harbour wave' and it was used because tsunamis only seem to become visible when they are near the coast.

津

tsu
harbour

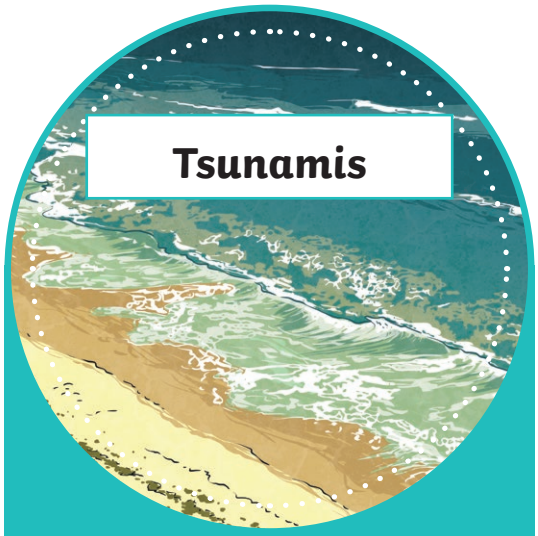
波

nami
wave

Is a Tsunami the Same as a Tidal Wave?

Tsunamis are sometimes called 'tidal waves' by mistake. However, they are not related to the tides, which are controlled by the Moon and the Sun.

- are shallow water waves;
- can be large in size;
- are always controlled by the Moon and the Sun;
- contain energy that comes from the wind;
- can only ever reach a limited size and speed.



- are a series of much larger waves;
- are not controlled by the Moon and the Sun;
- are caused by the movement of a large amount of energy through the water but this energy does not come from the wind.

The energy in tsunami waves is caused by an underwater volcanic eruption, an underwater landslide or an earthquake on the ocean's floor. No one knows for sure how many volcanoes are in the ocean but scientists think that up to 80% of volcanic eruptions on Earth happen beneath the waves.

How Is a Tsunami Formed?

A huge amount of energy under the water tries to rise to the ocean's surface. As it does, it pushes water up with it. This causes the sea level to rise but **gravity** pulls this water back towards Earth. This means that the energy spreads out to the sides.

Water begins to race towards the land faster than an aeroplane can travel. A tsunami's waves can cross an entire ocean in less than one day without losing energy.

When the tsunami is far away from the shore, it can be hard to spot. This is because the energy is moving through very deep water and the waves of the tsunami can be as small as one metre tall.

Yet, when the tsunami gets closer to the shore and the water becomes shallower, there is less water for the energy to move through. This slows the waves down and the water becomes much taller.

Why Are Tsunamis Dangerous?

It is not always possible to spot a tsunami because they move quickly across the ocean and the waves are not much bigger than sea level. Defences built by humans cannot stand up the sheer power of the tsunami so the waves cause a lot of damage. Boulders are lifted, buildings are destroyed and vehicles are swept away as the water races up to one mile

Glossary

gravity:	The force that pulls an object towards the centre of Earth.

Did You Know...?

A tsunami is not just one wave. It is a group of waves commonly known as a 'wave train'.

It is not always the first wave of a tsunami which is most destructive.

Tsunami waves are very long, and they can reach the shore at different times. Some waves can be as far as one hour apart from each other.

Questions

1. What does the word 'tsunami' mean? Tick one.
   - ○ great wave
   - ○ wave at the coast
   - ○ harbour wave
   - ○ powerful and dangerous

2. **Defences built by humans cannot stand up the sheer power of the tsunami...**
   Which word means the same as sheer in this sentence? Tick one.
   - ○ tall
   - ○ absolute
   - ○ towering
   - ○ transparent

3. Fill in the missing words.

   _____ are sometimes called '_____' by mistake.

4. List **two** events that can cause the energy found in tsunami waves.

   1. _____

   2. _____

5. **This causes the sea level to rise but gravity pulls this water back towards Earth.**
   What does the word 'gravity' mean in this sentence?

   _____

6. A tsunami is one huge wave.
   Is this sentence true or false? Explain how you know.

   _____

   _____

   _____

7. Comment on **two** ways that you know that a tsunami moves quickly.

8. What do you think that scientists should focus on to stop tsunamis being so dangerous? Explain your answer.

Answers

1. What does the word 'tsunami' mean? Tick one.
   - ○ great wave
   - ○ wave at the coast
   - ⊘ **harbour wave**
   - ○ powerful and dangerous

2. **Defences built by humans cannot stand up the sheer power of the tsunami...**
   Which word means the same as sheer in this sentence? Tick one.
   - ○ tall
   - ⊘ **absolute**
   - ○ towering
   - ○ transparent

3. Fill in the missing words.
   Tsunamis are sometimes called '**tidal waves**' by mistake.

4. List **two** events that can cause the energy found in tsunami waves.
   Accept any two of the following answers: an underwater volcanic eruption; an underwater landslide; an earthquake on the ocean's floor.

5. **This causes the sea level to rise but gravity pulls this water back towards Earth.**
   What does the word 'gravity' mean in this sentence?
   The word gravity means the force that pulls an object towards the centre of Earth.

6. A tsunami is one huge wave.
   Is this sentence true or false? Explain how you know.
   Pupils own responses, such as: This sentence is false. I know this because the text states that a tsunami is a group of waves commonly known as a 'wave train'.

7. Comment on **two** ways that you know that a tsunami moves quickly.
   Pupils' own responses, such as: I know that a tsunami moves quickly because the text says that it can 'race towards the land faster than an aeroplane' and that it can 'cross an entire ocean in less than one day'.

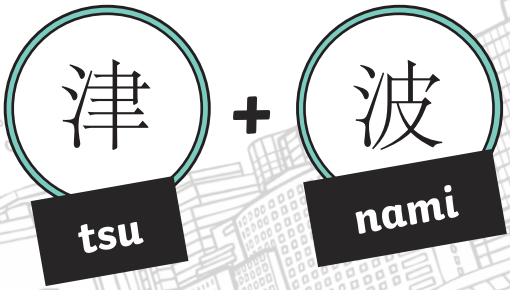
8. What do you think that scientists should focus on to stop tsunamis being so dangerous? Explain your answer.
   Pupils' own responses, such as: I think that scientists should focus on monitoring the ocean's floor so that earthquakes, landslides or eruptions can be spotted quickly and people can be prepared.

Tsunamis

Tsunamis are one of the most powerful and destructive natural forces on planet Earth.

Origin of the Name

The word tsunami is pronounced 'soo-nah-mee'. It originates from two Japanese words: 'tsu' meaning 'harbour' and 'nami' meaning 'wave'. The name means 'harbour wave' because tsunamis only seem to become visible when they are near the coast.



Tsunami or Tidal Wave?

Often, tsunamis are mistakenly called 'tidal waves'. However, they are not related to the tides, which are controlled by the Moon and the Sun.

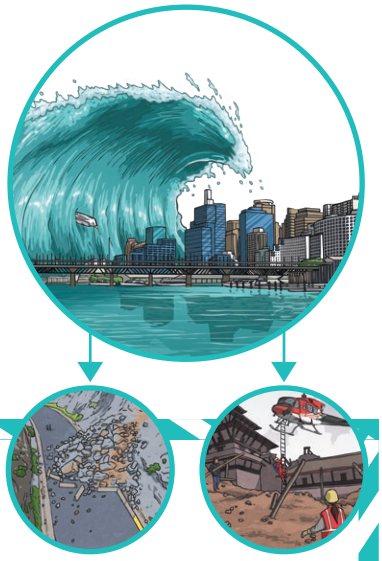
Tidal waves are shallow water waves which can be large in size but are always controlled by the Moon and the Sun. The waves are shallow and the energy moving within them comes from the wind. Tidal waves can only ever reach a limited size and speed.

A tsunami is a series of much larger waves. These waves are caused by the movement of a large amount of energy through the water, but this energy does not come from the wind. Instead, the energy is caused by an underwater volcanic eruption, an underwater landslide or, most commonly, an earthquake on the ocean's floor.

How a Tsunami Is Formed

A huge amount of energy under the water tries to travel to the ocean's surface. As it does, it pushes water up with it and this causes the sea level to rise. However, **gravity** pulls this water back towards Earth. This spreads the energy out to the sides. Water begins to race towards the land at speeds of up to 500 miles per hour, which is faster than an aeroplane can travel. The waves can cross an entire ocean in less than one day without losing energy.

When the tsunami is far away from the shore, it can be hard to spot. This is because the energy is moving through the entire depth of the water and the waves of the tsunami can be as small as one metre tall. However, as the tsunami gets closer to shore and the water becomes shallower, there is less water for the huge amount of energy to move through. This causes the waves to slow down and the water to become much taller.



Destructive Power

It is not always possible to spot a tsunami due to their quick yet barely noticeable journey across the ocean.
As humanly constructed defences cannot to stand up the sheer power of the tsunami, immediate devastation occurs. Boulders are lifted, buildings are destroyed and vehicles are swept away as the water races up to one mile inland before retreating back away from the coast.

A tsunami is not just one wave; it is a series of waves commonly known as a 'wave train'. It is not always the first wave of a tsunami which is most destructive. As tsunami waves are very long, they can reach the shore as far as one hour apart. This can give survivors a false sense of security.

How Science Can Help

As trying to stop a tsunami is impossible, scientists focus on developing ways of spotting tsunamis earlier so that people can be safely **evacuated**. They use advanced systems to monitor underwater activity which may show that an earthquake or eruption is imminent. They also invest time and effort into making sure that global communication systems are quick, effective and extensive.

Glossary	
evacuated	When something is removed from a dangerous place and taken to a safer place.
gravity	The force that pulls an object towards the centre of Earth.
originates	Originally comes from.

Questions

1. **This can give survivors a false sense of security.**
   What does this sentence mean? Tick one.
   - ○ Survivors feel safe and secure because the tsunami is over.
   - ○ Survivors contact security services at the wrong time.
   - ○ Survivors feel as though the danger is over when it isn't.
   - ○ Survivors evacuate from the area at the correct time.

2. From which language does the word 'tsunami' originate? Tick one.
   - ○ English
   - ○ Chinese
   - ○ Swahili
   - ○ Japanese

3. What does the word tsunami translate into English as?

   _____

4. Look at the section called **Tsunami or Tidal Wave?**
   Find and copy one word which means that it is an error to call a tsunami a tidal wave.

   _____

5. Which event most commonly causes the energy found in a tsunami's waves?

   _____

6. Summarise what happens when a tsunami's waves reach shallow water.

   _____

   _____

   _____

7. Explain why a tsunami is difficult to spot when it is far away from the shore.

   _____

   _____

   _____

8. What do you think scientists' main focus should be: underwater monitoring or communication systems? Give a reason for your answer.

9. Give **two** common misconceptions about tsunamis and correct them.

Answers

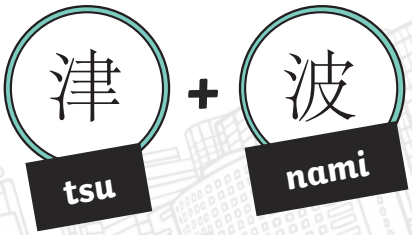
1. **This can give survivors a false sense of security.**
   What does this sentence mean? Tick one.
   - ○ Survivors feel safe and secure because the tsunami is over.
   - ○ Survivors contact security services at the wrong time.
   - ✓ **Survivors feel as though the danger is over when it isn't.**
   - ○ Survivors evacuate from the area at the correct time.
2. From which language does the word 'tsunami' originate? Tick one.
   - ○ English
   - ○ Chinese
   - ○ Swahili
   - ✓ **Japanese**
3. What does the word tsunami translate into English as?
   The word tsunami translates into English as 'harbour wave'.
4. Look at the section called **Tsunami or Tidal Wave?**
   Find and copy one word which means that it is an error to call a tsunami a tidal wave.
   mistakenly
5. Which event most commonly causes the energy found in a tsunami's waves?
   The energy is most commonly caused by an earthquake on the ocean's floor.
6. Summarise what happens when a tsunami's waves reach shallow water.
   Pupils' own responses, such as: When a tsunami's waves reach shallow water, there is less water for the energy to move through so the waves slow down and the water becomes much taller.
7. Explain why a tsunami is difficult to spot when it is far away from the shore.
   Pupils' own responses, such as: It is difficult to spot a tsunami when it is far away from the shore because the energy is moving through the entire depth of the water and the waves of the tsunami can be as small as one metre tall.
8. What do you think scientists' main focus should be: underwater monitoring or communication systems? Give a reason for your answer.
   Pupils' own responses, such as: I think that underwater monitoring should be the main focus of scientists. Without this, there will be no point having communication systems if no one knows that there is a message to pass on.
9. Give **two** common misconceptions about tsunamis and correct them.
   Pupils' own responses, such as: One common misconception is that tsunamis and tidal waves are the same but tsunamis are not controlled by the Moon or the Sun. Secondly, it is a misconception that a tsunami is a single wave when they are actually a series of waves.

Tsunamis

Tsunamis are one of the most powerful and destructive natural forces on planet Earth.

Origin of the Name

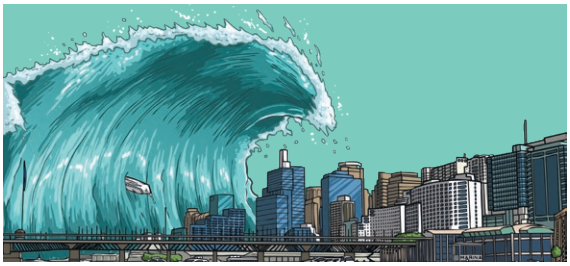
The word tsunami is pronounced 'soo-nah-mee' and it originates from two Japanese words: 'tsu' meaning 'harbour' and 'nami' meaning 'wave'. Therefore, tsunami translates as 'harbour wave' – a name given to this natural phenomenon due to the fact that they only seem to become visible when near the coast.



Key Distinctions

Often, tsunamis are mistakenly called 'tidal waves'; however, they are unrelated to the tides and are not linked to the gravitational forces of the Moon and the Sun. Although both types of waves have crests and troughs, there are distinct differences between tidal waves and the waves seen during a tsunami.

Tidal waves are shallow water waves which can be large in size but are always controlled by the gravitational forces of the Moon and the Sun. As the waves are shallow and the energy moving within them comes from the wind, they can only ever reach a limited size and speed.



A tsunami, however, is a series of much larger waves which are caused by the movement of a greater amount of energy through the water. This energy does not come from the wind; instead, it is caused by an underwater volcanic eruption, an underwater landslide or, most commonly, an earthquake on the ocean's floor. Very rarely, tsunamis can also be caused by a giant meteor hitting the ocean.

Formation of a Tsunami

As a huge amount of energy caused by the underwater event tries to travel to the ocean's surface, it pushes water up with it – causing the sea level to rise. However, gravity pulls this water back towards Earth, quickly spreading the energy out to the sides.

Water begins to race towards the land at speeds of up to 500 miles per hour – faster than an aeroplane. The waves can cross an entire ocean in less than one day without losing energy.

When the tsunami is far from the shore, it can be hard to detect; this is because the energy is moving through the entire depth of the water and the waves of the tsunami can be as small as one metre tall. However, as the tsunami gets closer to shore and the water of the ocean becomes shallower, there is less water for the huge amount of energy to move through. This causes the waves to slow down but, when they do so, the water becomes much taller.

If the trough of the tsunami reaches the shallow water of the shore first, it can make the ocean seem as if it is withdrawing back on itself much further than normal. It is this phenomenon, coupled with the unrivalled height of the waves created (around ten times of those seen during average storms), that are key features of a tsunami.

Destructive Power

Due to their rapid yet barely noticeable journey across the ocean, it is not always possible to spot a tsunami with enough time to act. With humanly constructed defences unable to stand up the sheer power of the tsunami, immediate devastation of all structures occurs. Boulders are lifted, buildings are destroyed and vehicles are swept away as the water races up to one mile inland before retreating back away from the coast carrying all debris with it.

Additionally, contrary to popular belief, a tsunami is not just one wave (it is a series of waves commonly known as a 'wave train') and it is not always the first wave of a tsunami which is most destructive. As tsunami waves are very long, they can reach the shore as far as one hour apart, giving survivors a false sense of security.

Preventative Measures

As trying to stop a tsunami is futile, scientists focus instead on developing ways of detecting tsunamis earlier so that people can be safely evacuated. They use advanced systems to monitor underwater activity which may indicate an earthquake or eruption is imminent and they invest time and effort into ensuring that global communication systems are quick, effective and extensive.

Questions

1. Which of these statements are true? Tick **two**.
   - ○ The origin of the word tsunami is Japanese.
   - ○ The word tsunami translates as 'great wave'.
   - ○ The word tsunami is pronounced 'too-nah-mee'.
   - ○ The meaning of the word tsunami is 'harbour wave'.

2. Number the sub-headings below to show the order in which they appear in the text.
   - ☐ Formation of a Tsunami
   - ☐ Key Distinctions
   - ☐ Preventative Measures
   - ☐ Origins of the Name
   - ☐ Destructive Power

3. Find and copy one word from the section **Origin of the Name** which means the same as 'occurrence'.

   _____

4. **...coupled with the unrivalled height of the waves created...**
   Why did the author choose to use the word 'unrivalled' in this sentence?

   _____

5. Look at the section called **Destructive Power**.
   Find and copy a phrase which shows that the fact given would surprise a lot of people.

   _____

6. Briefly explain how tsunamis got their name.

   _____

   _____

   _____

7. Summarise the key differences between tsunamis and tidal waves.

   _____

   _____

   _____

8. What events can generate enough energy to cause a tsunami?

9. Why are tsunamis hard to detect when far from the shore?

10. Tsunamis are the most dangerous natural force on Earth.
Do you agree with this statement? Fully explain your answer using evidence from the text.

Answers

1. Which of these statements are true? Tick **two**.
   - ☑ **The origin of the word tsunami is Japanese.**
   - ○ The word tsunami translates as 'great wave'.
   - ○ The word tsunami is pronounced 'too-nah-mee'.
   - ☑ **The meaning of the word tsunami is 'harbour wave'.**

2. Number the sub-headings below to show the order in which they appear in the text.
   - [3] Formation of a Tsunami
   - [2] Key Distinctions
   - [5] Preventative Measures
   - [1] Origins of the Name
   - [4] Destructive Power

3. Find and copy one word from the section **Origin of the Name** which means the same as 'occurrence'.

   phenomenon

4. **...coupled with the unrivalled height of the waves created...**
   Why did the author choose to use the word 'unrivalled' in this sentence?

   Pupils' own responses, such as: The author used the word unrivalled to show that nothing else even comes close.

5. Look at the section called **Destructive Power**.
   Find and copy a phrase which shows that the fact given would surprise a lot of people.

   contrary to popular belief

6. Briefly explain how tsunamis got their name.

   Pupils' own responses, such as: Tsunamis got their name, which means harbour wave, because they only because apparent when near the shore or harbour.

7. Summarise the key differences between tsunamis and tidal waves.

   Pupils' own responses, such as: Tidal waves are controlled by gravitational forces and the energy within them is from the wind whereas tsunamis are not controlled by gravitational forces and the energy within them does not come from wind.

8. What events can generate enough energy to cause a tsunami?
   Pupils' own responses, such as: The events that can generate enough energy to cause a tsunami are an underwater volcanic eruption, an underwater landslide, an earthquake on the ocean's floor or, very rarely, a giant meteor hitting the ocean.

9. Why are tsunamis hard to detect when far from the shore?

   Pupils' own responses, such as: Tsunamis can be hard to detect when they are far from the shore because the energy is moving through the entire depth of the water and the waves of the tsunami can be as small as one metre tall. This would make them look like normal waves.

10. Tsunamis are the most dangerous natural force on Earth.
    Do you agree with this statement? Fully explain your answer using evidence from the text.

    Pupils' own responses, such as: I do not agree that tsunamis are the most dangerous natural force on Earth – I think that earthquakes are. This is because there would be far less tsunamis if there were less earthquakes. Earthquakes can also be destructive inland, not just for up to one mile around the shoreline.