

TSUNAMI



**Lesson Learnt from Japanese Story
"Inamura No Hi"**

Indian Ocean

TSUNAMI on 26 December 2004



Brief Explanation of Disaster Situation

The 2004 Indian Ocean earthquake was an earthquake that struck under the ocean, occurring at 00:58:53 UTC (07:58:53 local time) on December 26, 2004. The earthquake generated one of the deadliest in modern history, killing over 200,000 people.

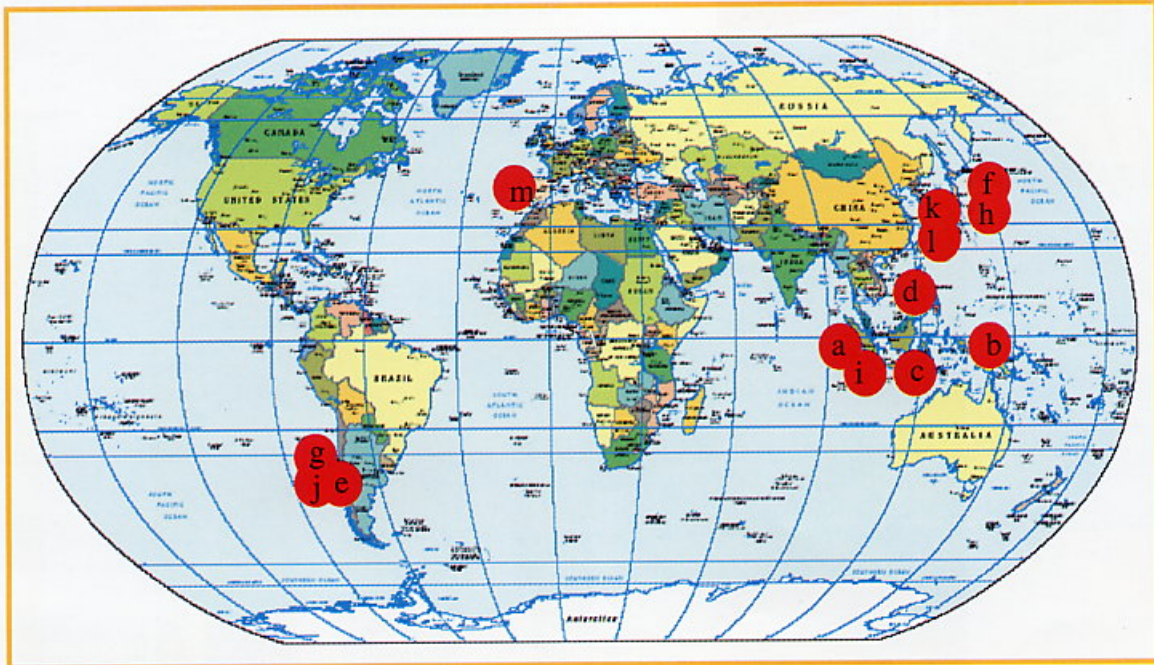
Reaching a magnitude of 9.0 on the Richter scale, it was the largest earthquake since the 9.2 magnitude Earthquake of Alaska in 1964, and is also the fourth largest earthquake since 1900.

The earthquake originated in the Indian Ocean just north of Simeulue Island, off the western coast of northern Sumatra, Indonesia. The resulting tsunami destroyed the shores of Indonesia, Sri Lanka, South India, Thailand and many other countries lining the Indian Ocean with waves towering as high as 30 km. The tsunami caused serious damages and deaths, reaching the east coast of Africa, taking thousands of lives as far as Port Elizabeth in South Africa, located 8,000km (5,000 miles) away from the epicenter.



Past Recorded

TSUNAMI Disasters in the World (1750-2004)



- | | |
|--|--|
| a. 2004 Indian Ocean earthquake with tsunami :
more than 200,000 deaths | g. 1906 Chile : 3,760 deaths |
| b. 1998 Aitape, Papua New Guinea : 2,300 deaths | h. 1896 Sanriku, Japan, earthquake and tsunami :
22,000 deaths |
| c. 1992 Indonesia Flores : 1,700 deaths | i. 1883 Krakatoa volcano eruption and tsunami :
36,000 deaths |
| d. 1976 Moro Gulf, Philippines : 8,000 deaths | j. 1868 Chile : 25,000 deaths |
| e. 1960 Great Chilean Earthquake, deaths in Chile,
U.S. (Hawaii), Philippines and Japan : 5,700
deaths | k. 1792 Mt. Unzen, Japan landslides and tsunami,;
15,200 deaths |
| f. 1933 Sanriku, Japan, earthquake and tsunami :
3,000 deaths | l. 1771 Ryukyu Trench : 9,000 deaths |
| | m. 1755 Lisbon earthquake : 62,000 deaths |

How can we save our lives from a Tsunami disaster?

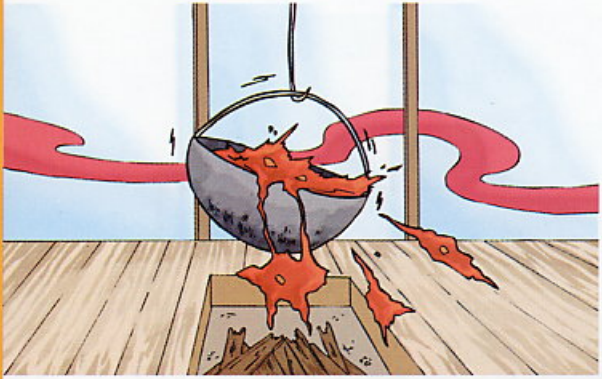
We would like to introduce a Japanese story "Inamura-no-hi". This is an account of a village chief who saved the lives of his villagers from a big Tsunami disaster.

The village chief had noticed a precursor to a large tsunami during its earlier stage, and had led the village inhabitants to higher grounds by burning harvested rice stacks.

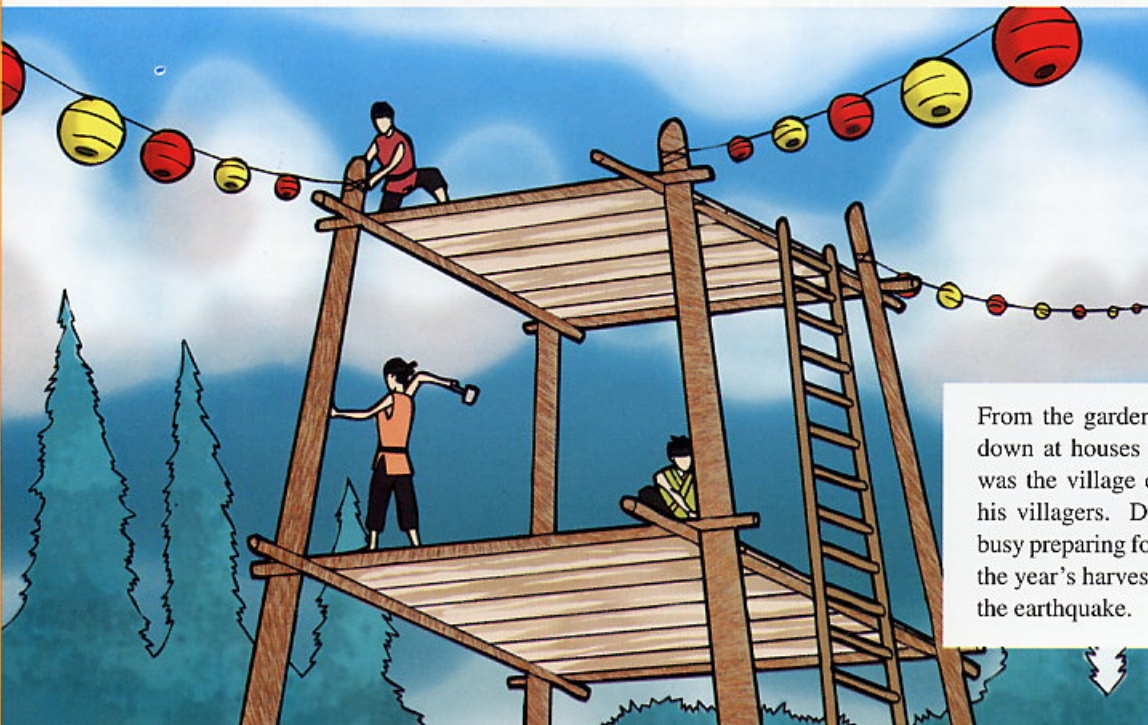
This is a true story of the Ansei-Nankai Tsunami which happened in 1854, and which was told in the textbooks of elementary schools in Japan.

The Fire of

INAMURA (rice sheaves)



"Oh, this is out of the ordinary," said Gohei, coming out of his house on the hill. The earthquake was not so strong, but it was different from what he had experienced before: the quake was long and slow, and the rumbling on the ground was like a roar.



From the garden of his house, Gohei looked down at houses situated along the coast. He was the village chief, and was worried about his villagers. Down on the shore, they were busy preparing for the night festival to celebrate the year's harvest. They did not seem to notice the earthquake.



Gohei shifted his focus from the village to the sea. He was puzzled at the scene there. The wind was blowing from the sea to the coast, but the water was quickly drying out. Soon after, he could see large areas of sand and rocks on the seabed.

“Oh, a tsunami is approaching!” he said to himself. “I should warn the villagers at once, or the lives of 400 people will be lost!”



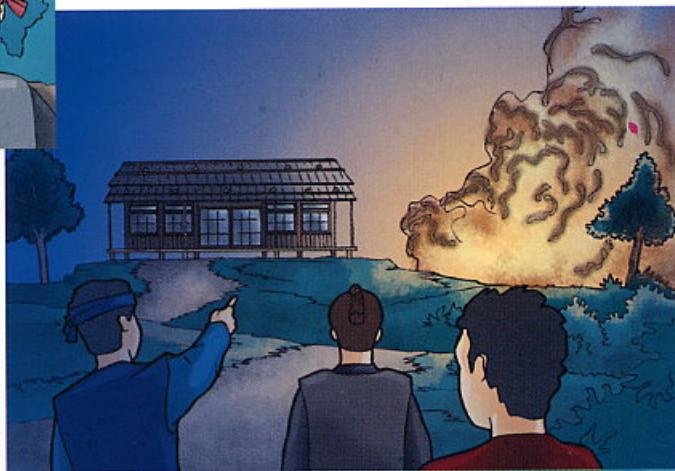
He rushed into his house, grabbed a large torch, and ran to his rice field. There, he had a lot of rice sheaves which he had just harvested and dried. "The harvest is precious, but I can save the people's lives with it." He set fire on one sheaf with his torch. The fire burned, fanned by the wind from the sea. He ran from one sheaf to another and set them on fire. After he fired all his rice sheaves, he threw away the torch and stood still, looking at the sea.



The sun had already set, and it was getting darker and darker. The fire of the sheaves got brighter. A man on a watch tower located near a temple spotted it, and rang the fire bell. People shouted, "There is fire! at the house of the village chief!"

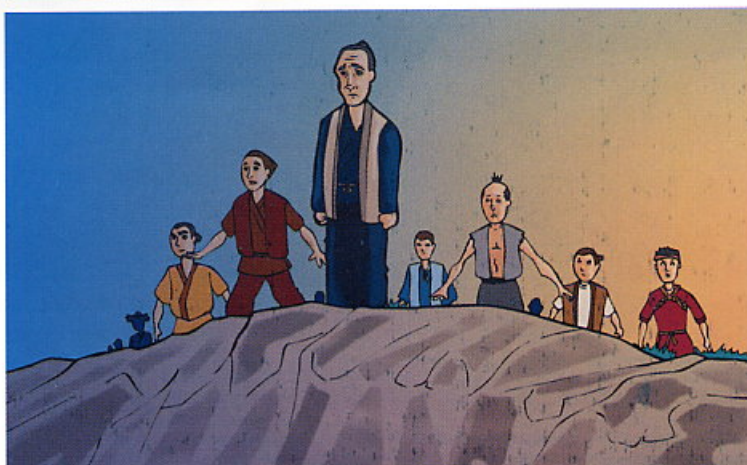
Young men, who could run fast, reached the hill first. Then, all the other people, including women, old men and children, followed them.

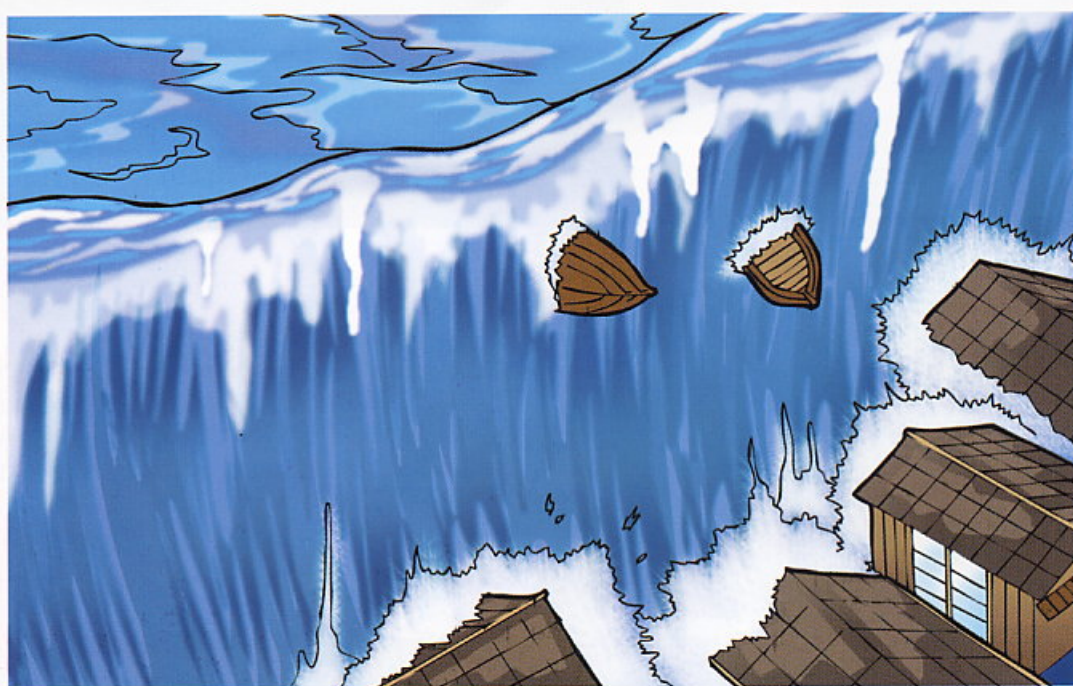
Gohei looked at fellow villagers rushing up the hill. To him they seemed to be walking slowly, like ants.



Finally, about 20 young men arrived at Gohei's house. They tried to put out the fire at once. But Gohei exclaimed in a loud voice, "Leave the fire as it is. A disaster is coming. Tell everyone to hurry up the hill!"

More and more villagers made their way up to the hill. Gohei counted the number of people to see if everyone had safely reached the top of the hill. The people were shocked to see the burning sheaves, and turned to look at Gohei. They couldn't understand what was happening.





Just then, Gohei pointed out to the sea, and shouted as loud as he could, "Look. It's coming!" Through the dim light of the twilight, the villagers witnessed the approaching tsunami. They could see a thin dark horizontal line far away. The line quickly became thick and long. At high speeds, it soon approached the coast.

"It's a tsunami!" someone shouted. The sea water stood up like a wall. It hit the land with a heavy force and a thunderous explosion. Everyone on the hill was so stunned. The only thing they could do was to run away from the big wave. As Gohei had expected, the wave did not hit the hill, instead the people were surrounded by a spray of sea water, which rose up like clouds.



The villagers saw the terrible white water destroying their village. The wave retreated once, but charged up again and again.

On the hill, everyone turned speechless for a while. All they could do was stare at the destruction.

Fanned by the wind, the fire of the sheaves flared up again and lit the hill. Just then, the villagers finally realized the reason behind the fire. They understood that it was the fire that saved them. They could not find the words to thank Gohei. Instead, they knelt down in front of him.

This story is written based on the translation by Mr. Yashushi Ninomiya, Lecturer of Kokugakuin University. From "Inamura no Hi" in Authorized Reading Textbook of Japanese for elementary school vol. 10, 1937-1946.

Background of “INAMURA NO HI” story

“Inamura no Hi” is based on a historical fact, recounting real-life experiences during a massive tsunami disaster, resulting from the Ansei Nankai Earthquake in 1854. The tsunami attacked Hiromura, a little village on the Kii Peninsula in western Japan (present Hirokawa town, Wakayama Prefecture). Against the surging waves which was threatening its way to the village, Hamaguchi Goryo led the village inhabitants to the safety of the higher grounds of the Hirohachiman Shrine, by setting fire to his precious rice stacks, his whole year’s harvest.

Koizumi Yakumo is the pen name of Lafcadio Hearn who was inspired by the story of Hamaguchi Goryo, or Gohei, and was later inspired to write the book “A Living God” in 1896.

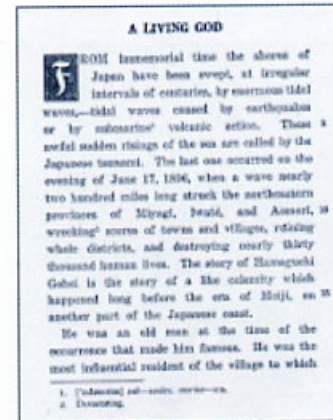
Hearn theorised that the Japanese have a unique concept of ‘god’, advancing the conception that personalities who have gained great respect will be given the status of divinity during their lifetime.

Hamaguchi Goryo was enshrined as a living God, an honour he received through a selfless act that saved the lives of his people. Hamaguchi Goryo lit his recently harvested rice-stacks, which attracted the attention of the villagers, bringing



Statue of “Inamura no Hi” in Hirokawa Town

The first page of “A Living God” in English textbook.



them up to the safety of higher grounds. Hearn’s story was a mix of fiction and facts; nevertheless, has been, for generations, a source of insight and good practice on disaster preparedness.

Tsunezo Nakai, was a teacher practising in Nanbu elementary school, one of the neighbouring towns of Goryo’s village. He was impressed by “A Living God”, and decided to retell the story in a language that is easily comprehended by children. His book was later entitled “Inamura no Hi”, and was included in the elementary school national language textbook for 5th grade students for a period of ten years since 1937.

Inamura no Hi influenced and moved many children, and was highly regarded as a work of lasting merit that serves as a valuable material for disaster preparedness amongst the young.

Hamaguchi Goryo’s deeds and story continues on with his efforts to lay the groundwork for disaster preparedness among his community. He implanted the seeds of prevention and preparedness amongst his people in anticipation of future disasters. Using his own money, he devoted to build a 5m high embankment which is 600m long, and planted trees along the coast. This was a 4 year project which managed to retain the community as an entity, and was the key contributor to providing job opportunities for the villagers who were affected by the tsunami.

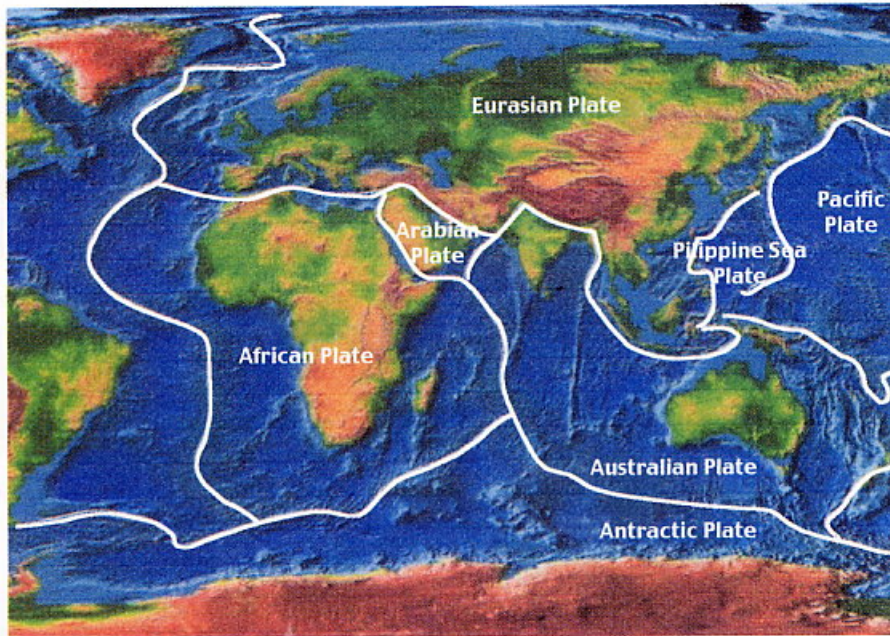
Today, Hamaguchi Goryo’s spirit of disaster preparedness lives on through mind-like efforts such as accumulation of knowledge on disasters, and the construction of banks for tsunami related funds.

What is TSUNAMI?

Factors Causing a Tsunami?

Tsunami is generated by sudden submarine topographic movement, such as:

- Submarine volcanic eruption;
- Landslide near a coastline or the bottom of the ocean; and
- Submarine crustal deformation accompanying earthquake.

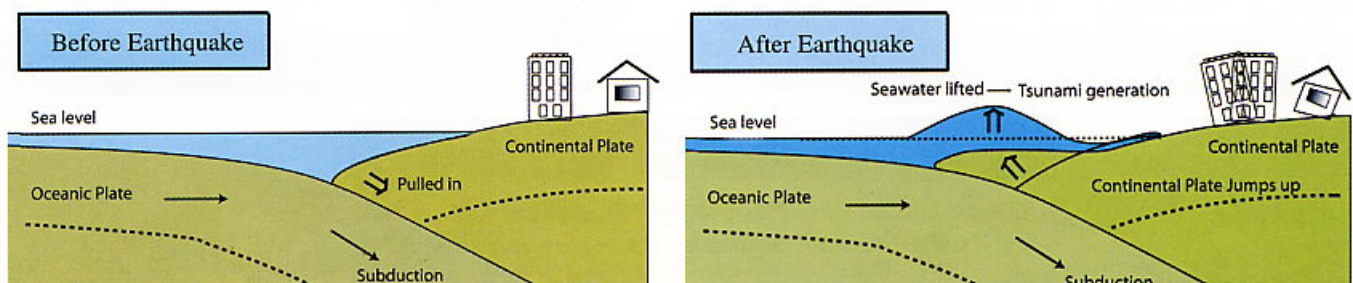


Almost all tsunamis, however, are caused by earthquakes.

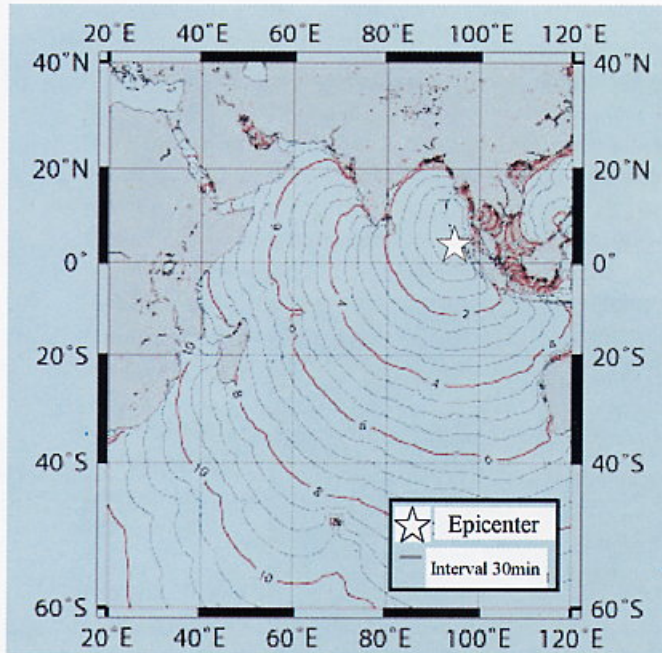
One of the disastrous tsunamis which occurred in August 1883 was caused by a volcanic eruption on Krakatau Island located between Java and Sumatra, Indonesia, killing more than 36,000 people.

In 1792, an earthquake occurred near the coast of Northern Kyushu, Japan, triggered a landslide. The debris which flowed into the bay caused a large tsunami, and killed about 15,000 people despite the fact that the causal earthquake was not strong enough to generate a tsunami.

The surface of the Earth consists of seven major tectonic plates and many more minor ones. Such plates move over time, through a process known as continental drift. The solid earth is in slow but constant motion and earthquakes occur where the resulting stress exceeds the capacity of Earth materials to support it. Crustal deformation caused by a sudden rupture along a submarine fault may cause a drastic change of the topography of the ocean bottom. Huge amounts of seawater is lifted or pulled down and eventually generating a destructive tsunami. A tsunami is thus a result of an earthquake or an earthquake fault.



TSUNAMI Propagation



Propagation contours of the recent Indian Ocean tsunami on 26 December 2004.

A tsunami may hit an area with no signs of a tremor from an earthquake

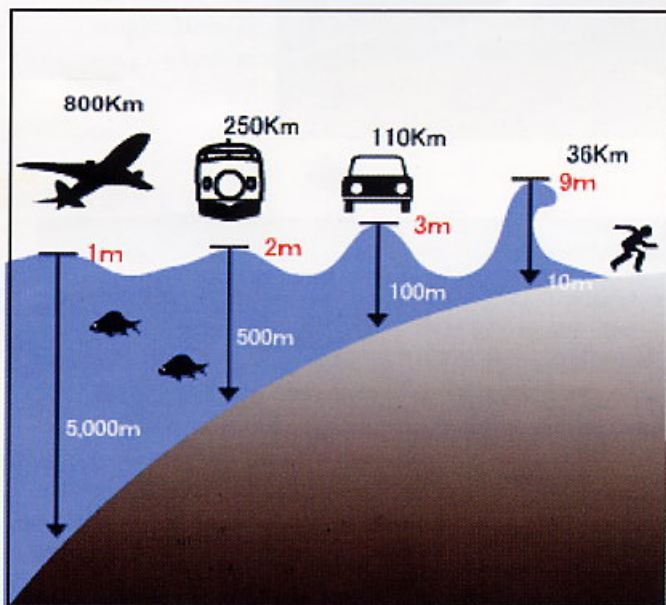
Tsunamis act very differently from typical surf swells; they move the entire depth of the ocean (often several kilometers deep) rather than just the surface. So they generate immense energy, moving at high speeds and can travel great transoceanic distances with little overall energy loss. Areas that are located very close to the source of the earthquake will suffer the immediate effects of the tsunami.

Quick evacuation to higher grounds / buildings after experiencing the shock / receiving an alarm is very important

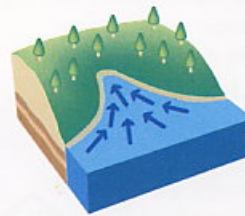
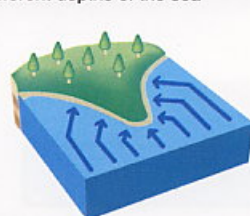
Tsunami propagation speed depends on the depth of the ocean as the speed increases with the depth of the ocean. At a depth of about 5,000m, the speed of a tsunami is about 800 km/hour, which is the speed of a jet plane. Over the continental shelf of 10m deep, the speed is about 36km/hour, like that of a motorbike. Thus, the wave of a tsunami easily catches up with you while you are trying to escape it from the moment you notice its approach.

Very High!

The height of a tsunami varies according to the topography near the coastline. Tsunami is a Japanese word that means harbor wave, which was derived from an observation that a tsunami is low offshore and becomes very high in the harbor. Also, at the top of the cape or at the closed-off section of the bay, the tsunami height is larger than its neighborhood. Usually, there are more than one wave in a tsunami. In some cases, the first wave comes in quite gently, and the later waves charge in violently with greater heights.



The speed of tsunami generated on different depths of the sea



A Tsunami may come without a withdrawal of sea water.

A withdrawal of the sea is often observed before the arrival of a tsunami wave. Nevertheless, there are tsunamis that begin with a rise of the sea level.

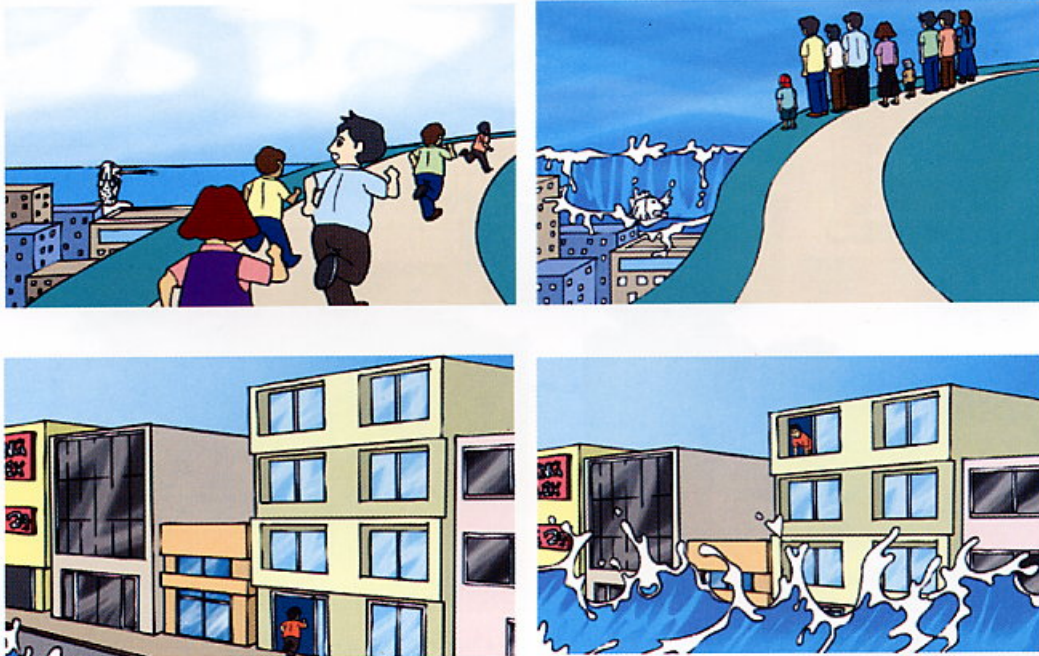
Protect yourself from **TSUNAMI**

When you experience a strong shake or a weak but continuous slow shake*:

1. Leave the seashore immediately and run to higher grounds or to tall & tough buildings that are more than three stories high.
2. Do not wait until you see the wave.
3. Do not pack.
4. Do not go to the seashore for bathing or fishing.
5. Stay at the safe area for several hours until the warning is called off because a tsunami may attack repeatedly.
6. Keep away from rivers.

(*In case of a distant tsunami, you will not feel a quake, however, take quick action after receiving the warning.)

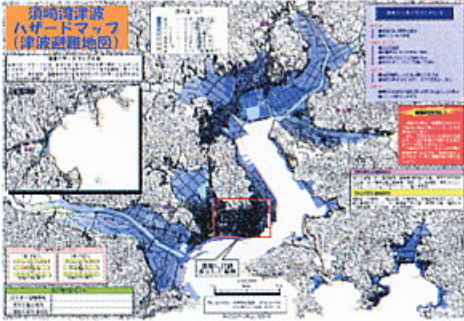
Run to Higher Grounds Immediately!



Preparedness before a tsunami strikes:

1. Learn the location to identify the nearest shelter/safe area
2. Learn the safe evacuation route
3. Have family discussions about tsunamis and evacuation plans

Various Measures To Protect against TSUNAMI



(1) Creation of Tsunami hazard map



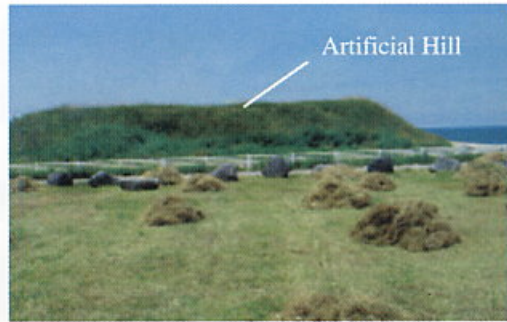
(2) Having community workshops for discussing safe tsunami evacuation



(3) Conducting evacuation drills
"Let's check the evacuation route!"



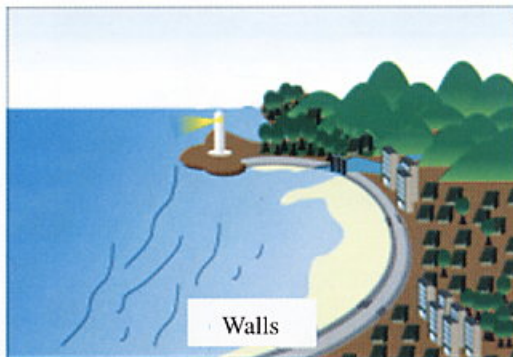
(4) Building signboards with directions to evacuation areas



(5) Constructing an artificial hill



(6) Building signboards indicating tsunami hazard areas



(7) Constructing Sea walls



(8) Planting Mangrove Trees

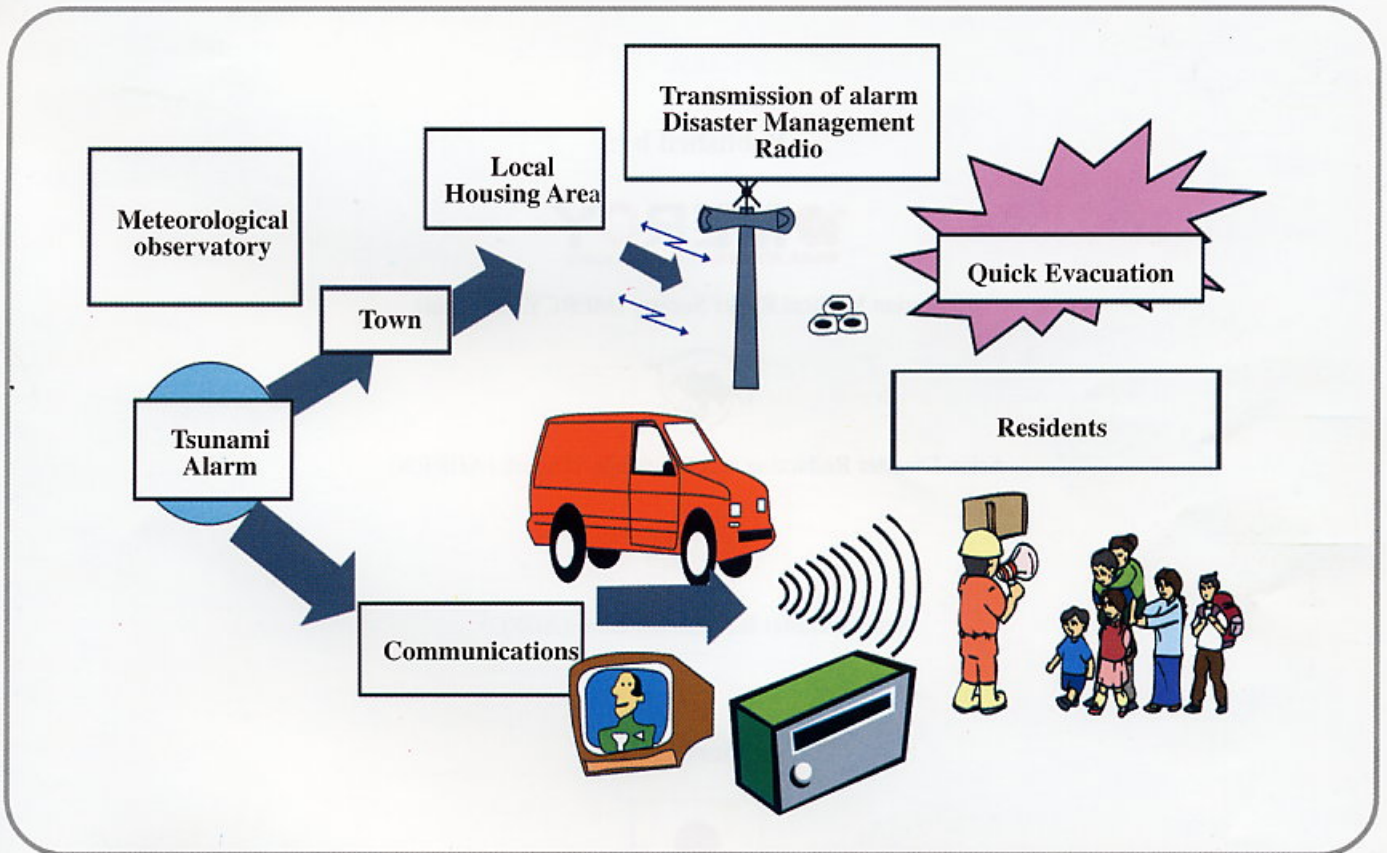


(9) Constructing Break Water

(10) Designation of pictograms on Tsunami (Left: Tsunami Hazard Zone, Right: Tsunami Evacuation Place)



Building emergency information system for quick evacuation



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