

# Tsunami and Environmental Consequences

By Golam Kibria, Ph.D; March 2011

**Key points:** Apart from human casualties, Tsunamis can cause a severe and long term damages to environment and natural resources including mangroves, coral reefs, forests, biodiversity, coastal wetlands, agriculture, fisheries and fishing, freshwater and groundwater resources. Tree plantations in coastal areas could offer a much cheaper and longer-lasting means of tsunami mitigation.

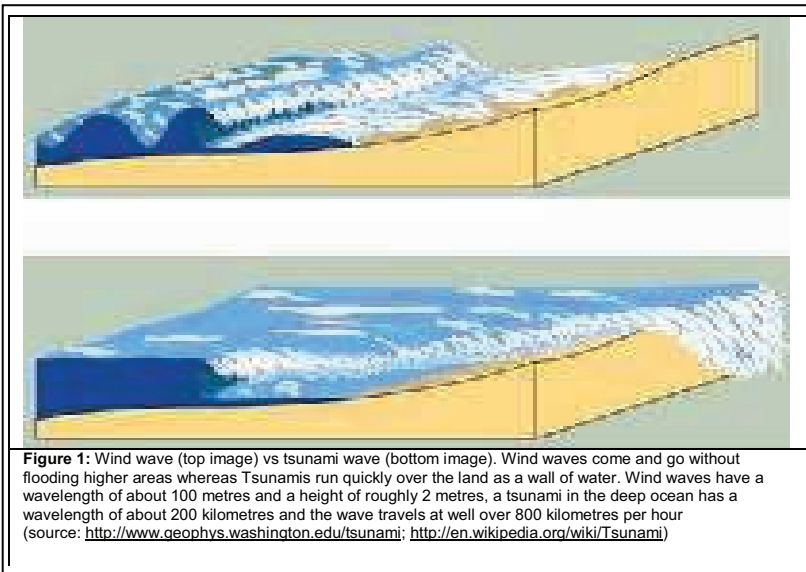
A tsunami is a series of ocean waves (Figure 1) with very long wavelengths (10-500 kilometres) and caused by large-scale disturbances of the ocean, such as earthquakes, landslide, volcanic eruptions, explosions and meteorites. The word tsunami, is a Japanese word, where "tsu" means harbour and "nami" means wave ('harbour wave') and usually generated by any rapid, large scale undersea disturbance/ or undersea earthquakes. As well as travelling at high speeds, tsunamis can also travel large distances with limited energy losses

Apart from heavy toll on human lives (see Table 1), tsunami may cause a severe and long term damages to environment and natural resources including mangroves, coral reefs, forests, biodiversity, coastal wetlands, agriculture, fisheries and fishing, freshwater and groundwater resources. Freshwater wells and inland soils can be poisoned or contaminated with salt in most tsunami affected countries or areas. And many aquifers may be unusable for many years.

The spread of solid and liquid waste, industrial chemicals and destruction of sewage collectors and treatment plants due to tsunami would threaten the environment. Much debris flushed out to sea may have contained hazardous chemicals, paints, oils, cleansers thereby could cause stress or harm to corals, fish, algae and invertebrates and could bioaccumulate in seafood organisms (fish, oysters, prawns).

Though it may not be possible to prevent mega tsunamis like Sendai (March 2011) and Indian Ocean (December 2004) however many tsunami prone countries have built tsunami walls (up to 4.5 metres) to protect populated coastal areas. Other countries have built floodgates and channels to redirect the water from incoming tsunami. According to a report of the United Nations Environment Programme (UNEP) the tsunami of December 26, 2004 (see Table 1) caused less damage in the areas where natural barriers were present, such as mangroves, coral reefs or coastal vegetation.

Furthermore shoreline tree cover (such as coconut palms and mangroves) reduced tsunami effects during 2004 Indian Ocean tsunami. Therefore tree plantations in coastal areas could offer a much cheaper and longer-lasting means of tsunami mitigation than artificial barriers.



**Figure 1:** Wind wave (top image) vs tsunami wave (bottom image). Wind waves come and go without flooding higher areas whereas Tsunamis run quickly over the land as a wall of water. Wind waves have a wavelength of about 100 metres and a height of roughly 2 metres, a tsunami in the deep ocean has a wavelength of about 200 kilometres and the wave travels at well over 800 kilometres per hour (source: <http://www.geophys.washington.edu/tsunami>; <http://en.wikipedia.org/wiki/Tsunami>)

Date	Location	Magnitude of earthquake (Richter scale)	Human fatality and other information
March 11, 2011 (Sendai earthquake)	Northeast coast of Japan (see Figure 2.1)	8.9	- currently estimated to be 3,373 but expected to reach more than 10,000 - waves upto 10 meters
December 26, 2004 (Indian Ocean earthquake)	Indian Ocean (see Figure 2.2)	9.0	- 230,000 in a dozen countries - waves upto 15 meters
March 27, 1964 (Alaska earthquake)	Prince William Sound, Aleutian Islands, Alaska, USA	9.2	- 131 - waves upto 9.1 meters
May 22, 1960 (Valdivia earthquake)	Southern Chile	9.5	- 2,231-5,700 - waves upto 25 meters
November 4, 1952 (Kamchatka earthquake)	Hawaiian islands	9.0	- no reported deaths - waves upto 9.1-meters



**Figure 2.1:** Epicentre of March 11, 2011 earthquake (Sendai)



**Figure 2.2 :** Epicentre of December 26, 2004 earthquake (Indian Ocean)

## Key references

- <http://www.bom.gov.au/tsunami/info/index.shtml> (Tsunami Facts and Information; 15 March 2011)
- <http://en.wikipedia.org/wiki/Tsunami> (Tsunami)
- <http://www.google.com/hostednews/canadianpress/article/ALeqM5jMzfauDOF3NpDqXPaY1xwfoxlYA?docId=6213273>
- US Geological survey
- WHO data base

## Note

The article is based on various sources and was compiled by Golam Kibria, Ph.D in March 2011 for <http://www.sydneybashi-bangla.com> (22) for community benefits. Views expressed in this article are those of the author and are not to be taken to be the views of any others including third parties. The information in this article may be assistance to you but the author donot guarantee that it is without flaw of any kind and therefore disclose any liability for any error, loss or other consequences which may arise from relying on any information in this article.

**Table 1: Worlds five strongest earthquakes or (megathrust earthquakes) since 1900**

Date	Location	Magnitude of earthquake (Richter scale)	Human fatality
March 11, 2011 (Sendai earthquake)	Northeast coast of Japan (see Figure 2)	8.9	Currently > 2,000 but expected to reach more than 10,000 (upto 10 m wave)
December 26, 2004 (Indian Ocean earthquake)	Indian Ocean (see Figure 2)	9.0	230,000 in a dozen countries (Upto 15 m wave)
March 1964 (Alaska earthquake)	Prince William Sound, Aleutian Islands, Alaska, USA (Alaska earthquake)	9.2	131
May 1960 (Valdivia earthquake)	Southern Chile	9.5	1,716
November 1952	Kamchatka, Hawaii	9.0	no reported deaths despite setting off 30-foot (9.1-meter) waves

Kibria,

011, 2p.