What are potential sources of tsunamis that may affect Barbados?

A tsunami is a series of ocean waves caused by a major disturbance of the sea floor. Barbados and the other islands of the Eastern Caribbean lie in a tectonic setting where the North American plate is sinking beneath the Caribbean plate giving rise to earthquakes and volcanic activity. In this setting underwater earthquakes that rupture the crust may generate tsunamis. Volcanic eruptions and landslides (coastal or beneath the ocean) following earthquakes may also generate tsunamis. As a consequence, the entire arc may be considered a potential source for tsunami generation capable of affecting every island.

Can tsunamis be predicted?

Current understanding does not allow the date, time, magnitude and precise location of a future earthquake to be specified and so scientists cannot predict when an earthquake or landslide-generated tsunami might occur. However, tsunamis that are triggered by volcanic activity (e.g. underwater volcanic eruptions or pyroclastic flows) may be forecast if the volcano is carefully monitored as is the case with volcanoes in the Eastern Caribbean.

Why are locally generated tsunamis so dangerous and how can I protect myself?

A local tsunami is one in which the shores that are affected are relatively close (<100 Km) to the source of the tsunami. Generally, local tsunamis may reach the shores of nearby islands in less than ten minutes which is generally insufficient time for local authorities to receive and issue an official warning. This short time between generation and arrival of the first wave requires critical life saving decisions to be made rapidly and emphasizes the importance of being able to recognise the natural warning signs of a tsunami and responding appropriately.

Have tsunamis ever affected Barbados?

On the 5th May 1902, a tsunami was generated by the volcanic eruption of Mt. Pelée in Martinique. On May 7th, underwater communication cables from Martinique were cut. The cause of this is reportedly associated with sea level disturbances observed at the harbours of Grenada, Barbados and Saint Lucia. On July 24th 1939, the eruption of Kick 'em Jenny submarine volcano generated a 2m tsunami noticed in northern Grenada, the southern Grenadines and Barbados.

Can an earthquake from outside of the Caribbean region generate a tsunami?

Yes, a tsunami may be generated from earthquakes occurring both within and outside of the region. In 1755 the Great Lisbon earthquake near Portugal caused a tsunami "as high as the upper storey's of houses" on the east coast of Martinique. Waves 2m high were also observed at the east coast of Barbados. Tsunamis generated from sources outside of the region are called 'tele-tsunamis'.

Do all earthquakes cause tsunamis?

No, all earthquakes do not cause tsunamis. Four conditions usually favour the generation of a tsunami by an earthquake: (1)The earthquake occurs at shallow depth, less than 70 km, (2)The earthquake magnitude is 6.5 or larger, (3)The earthquake is submarine and ruptures the Earth's surface or causes material to collapse into the ocean and (4)The earthquake causes vertical movement of the fault and sea floor (up to several metres).

Can an eruption from the Kick 'em Jenny submarine volcano generate a tsunami?

Although relatively infrequent, violent underwater volcanic eruptions may displace a large volume of water and generate tsunami waves in the immediate source area. In this case, waves may be generated by the sudden displacement of water caused by large volumes of volcanic material displacing the ocean.

Kick 'em Jenny is a submarine (underwater) volcano located 9 km northwest of Grenada. Currently, scientists consider that there is a very small chance that an eruption of the volcano would trigger a tsunami. Any tsunamis triggered by underwater eruptions are a potential hazard for neighbouring islands.

Is it true that there is a volcano in the Canary Islands that can cause a mega-tsunami in the Caribbean?

The Cumbre Vieja Volcano is on the Island of La Palma in the Canary Islands (off the west coast of Africa). Some researchers suggest that if the western flank (side) of the volcano were to suffer catastrophic failure and drop 150 to 500km³ of rock into the sea, massive tsunamis could be generated which could devastate islands in the Caribbean as well as coastal areas in North America. While this may be a possible scenario it is considered by other researchers to be unlikely.

If a tsunami is detected by scientists how long would it take for a warning to be issued?

Following an earthquake, scientists need 5–20 minutes before a tsunami warning can be issued. However, if you live in Barbados and a local tsunami is generated by an earthquake near Grenada, waves could impact your island in less than 15 minutes with little or no time for an official warning. This means that coastal residents must be able to recognise a tsunami's natural warning signs. Alternatively, if an earthquake were to occur off the west coast of Africa, a tsunami generated by that earthquake (teletsunami) would take several hours before reaching the Caribbean, allowing ample time to issue an official warning.

Is there a tsunami early warning system for Barbados?

Seismic monitoring and government agencies in the Caribbean and adjacent areas (Central America, South America) are in the process of developing a tsunami warning system for the region, including Barbados.

In the mean time, if an earthquake occurs that can or has triggered a tsunami that may affect the Caribbean, the Pacific Tsunami Warning Center (PTWC) will send a warning to specific government agencies in the Caribbean. Publicising this warning within countries, however, is the responsibility of the Meteorological Office and the National Disaster Organisation.

Which areas in Barbados are most vulnerable to tsunamis?

Coastal areas are most vulnerable to the impact of tsunamis. Low lying areas could be severely flooded by the waves. In the 2004 Indian Ocean tsunami, the waves impacted areas as far as 3km inland. However, the areas that are affected will depend on their relation to the source of the tsunami and topography. The height of the wave will depend on the characteristics of the event that triggered the tsunami.

Are there any natural solutions to reducing the impacts of tsunamis?

Many studies following the 2004 Indian Ocean tsunami, suggest that mangroves and coastal tree plantations reduced tsunami wave heights and protected shorelines against damage when compared to those without vegetated buffer zones. Coastal ecosystems such as sand dunes, coastal forest and coral reefs are also cited as serving the same protective role against these destructive waves. The preservation of coastal ecosystems is fundamental to reducing the impact of tsunamis in the face of development.

While tsunamis generally do not occur frequently, implementing risk reduction measures should be encouraged as tsunamis are very high impact events that can set back development for many years.

Can I be safe surfing a tsunami wave?

Absolutely not! Tsunami waves should not be surfed as they possess tremendous destructive power from BOTH the strength and size of the waves. The large amount of seafloor material (mud and sediment) caught up in the wave also makes them very dangerous for surfing.

Where can I find more information on tsunamis in Barbados?

Coastal Zone Management Unit - www.coastal.gov.bb
Department of Emergency Management - www.dem.gov.bb
UWI Seismic Research Centre - www.uwiseismic.com
Caribbean Disaster Emergency Management Agency
www.cdema.org www.weready.org

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