

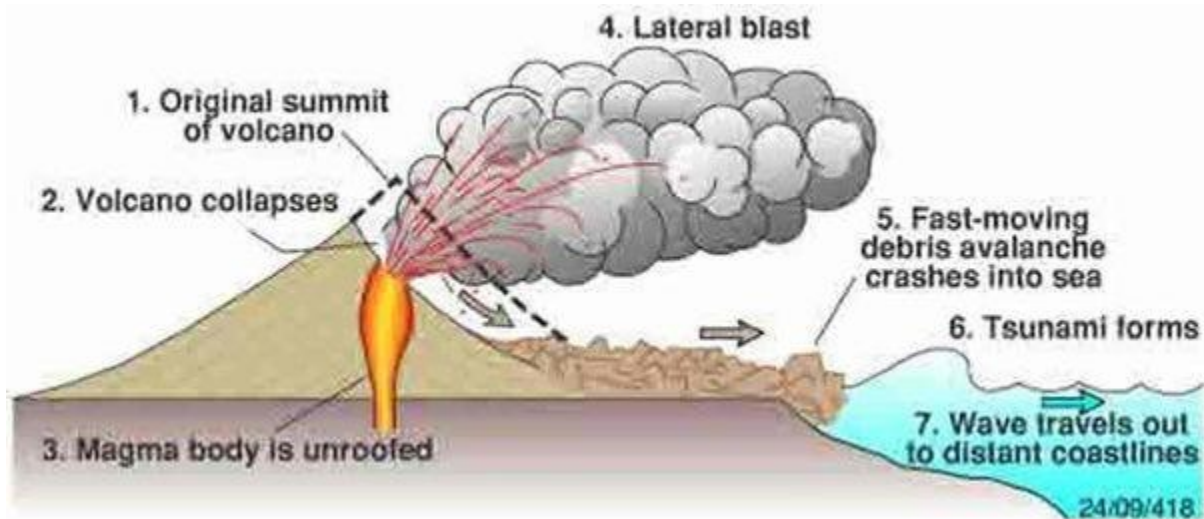
The December 22, 2018 Sunda Strait tsunami

On December 22, 2018, a tsunami struck the coastal communities in Lampung and Banten provinces situated along Sunda Strait in between Java and Sumatra, Indonesia, 24 minutes later following the eruption of an island volcano at around 21:03 local time. According to Indonesia's Meteorological, Climatological and Geological Agency, the tsunami may have been caused by underwater landslides generated from the partial collapse of the *Anak Krakatau* volcano, and probably worsened by the spring tide, where tidal water levels are at the highest. Satellite and aerial images confirmed the collapse of the southwestern part of the volcano, the following day.

Historical records show that the Krakatoa volcanic eruption in 1883 brought about the massive tsunami that killed over 36,000 people in this area. From where this volcano nearly disappeared, arose the Anak Krakatau (Child of Krakatoa) volcano, believed to be the source of the current tsunami, which is a continuing threat to the area while it's still erupting due to possible underwater landslide-induced tsunamis it could generate. Knowing these potential risks in the area and how to appropriately act on it are critical in ensuring safety of the communities.

The infographic and videos below from Geoscience Australia show how a tsunami is generated from volcanic eruptions and landslides, while International Tsunami Information Center (ITIC) provides a brief explanation on the mechanism in the following link:

http://itic.ioc-unesco.org/index.php?option=com_content&view=article&id=1159:how-do-volcanic-eruptions-generate-tsunamis&catid=1340&Itemid=2059



Source: Geoscience Australia

Link to video on tsunami caused by volcanic sources:

<https://www.youtube.com/watch?v=AXHN14IHtLY&feature=youtu.be>

Source: Geoscience Australia

Link to video on tsunami caused by landslide:

<https://www.youtube.com/watch?v=feXCIfatJYo>

Source: Geoscience Australia

A rough reconstruction of the event could be found in the following link:

<https://www.volcanodiscovery.com/krakatau/news/72510/Large-part-of-Anak-Krakatau-has-collapsed-into-the-sea-reconstruction-of-the-eruption.html>

The tsunami apparently inundated some 20 meters inland, causing more than 420 deaths, over 1,480 injuries, 154 missing and damage to hundreds of residential and commercial establishments, and vehicles according to Indonesia's disaster agency, with Pandeglang, a popular destination for tourists, as the worst-affected district, followed by South Lampung and Serang.

Due to its nature, there were no warnings issued since current tsunami early warning systems are based on earthquake activity, while warning time hinged on sea level monitoring of tide gauges may not be enough due to proximity to the source, considering the speed of tsunamis. Usually, for a localized tsunami generated from earthquake, the communities are advised to respond as soon as they feel the ground shaking, which could serve as a natural warning sign and considering a very short lead time. Tsunamis preceded by an earthquake could provide coastal communities a few minutes to go to high ground. Tsunamis caused by underwater landslides, as in this case, occurs fast and without or very little time for warning.

Scientists noted that the volcano has been particularly active since June, where the latest intense explosions which enlarged the crater, occurred sometime in October. In fact, the tsunami risk may have already been predicted since 2012 by Giachetti et al in their work *Tsunami hazard related to a flank collapse of Anak Krakatau Volcano, Sunda Strait, Indonesia* as noted by Volcano Discovery (<https://www.volcanodiscovery.com/krakatoa/2018/dec/eruption-tsunami/updates.html>).

Link to article published by Giachetti et al, 2012:

https://www.researchgate.net/publication/235225380_Tsunami_hazard_related_to_a_flank_collapse_of_Anak_Krakatau_Volcano_Sunda_Strait_Indonesia

However, there are no existing early warning systems in place yet for tsunamis caused by underwater landslides and volcanic eruptions, which led to Indonesia's disaster agency raising the need to build such systems. In addition, more work is needed in enhancing capacities of communities at risk, especially in determining and knowing existing and potential threats, such as volcanic eruptions leading to underwater landslides and tsunami as in this case, or the Palu tsunami event which may have been further aggravated by submarine landslide, liquefaction and natural coastal landform (narrow bay shape acts as a funnel), to cite a few examples, and how to swiftly and appropriately act on it as the event transpires, or as measures for mitigation of future events.

Updates:

A post-tsunami survey conducted from 24 December 2018 – 1 January 2019 by the Tsunami and Disaster Mitigation Research Center of Syiah Kuala University led by Dr. Syamsidik and Mumtaz Luthfi can be found in the following link: http://tdmrc.unsyiah.ac.id/the-latest-update-from-post-sunda-strait-tsunami-survey/?fbclid=IwAR2JGLnbrxW1uHIPBhFA10DXmfulgJimFA1_p04KkoZeWJMN_1KqpWd-RxU.

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