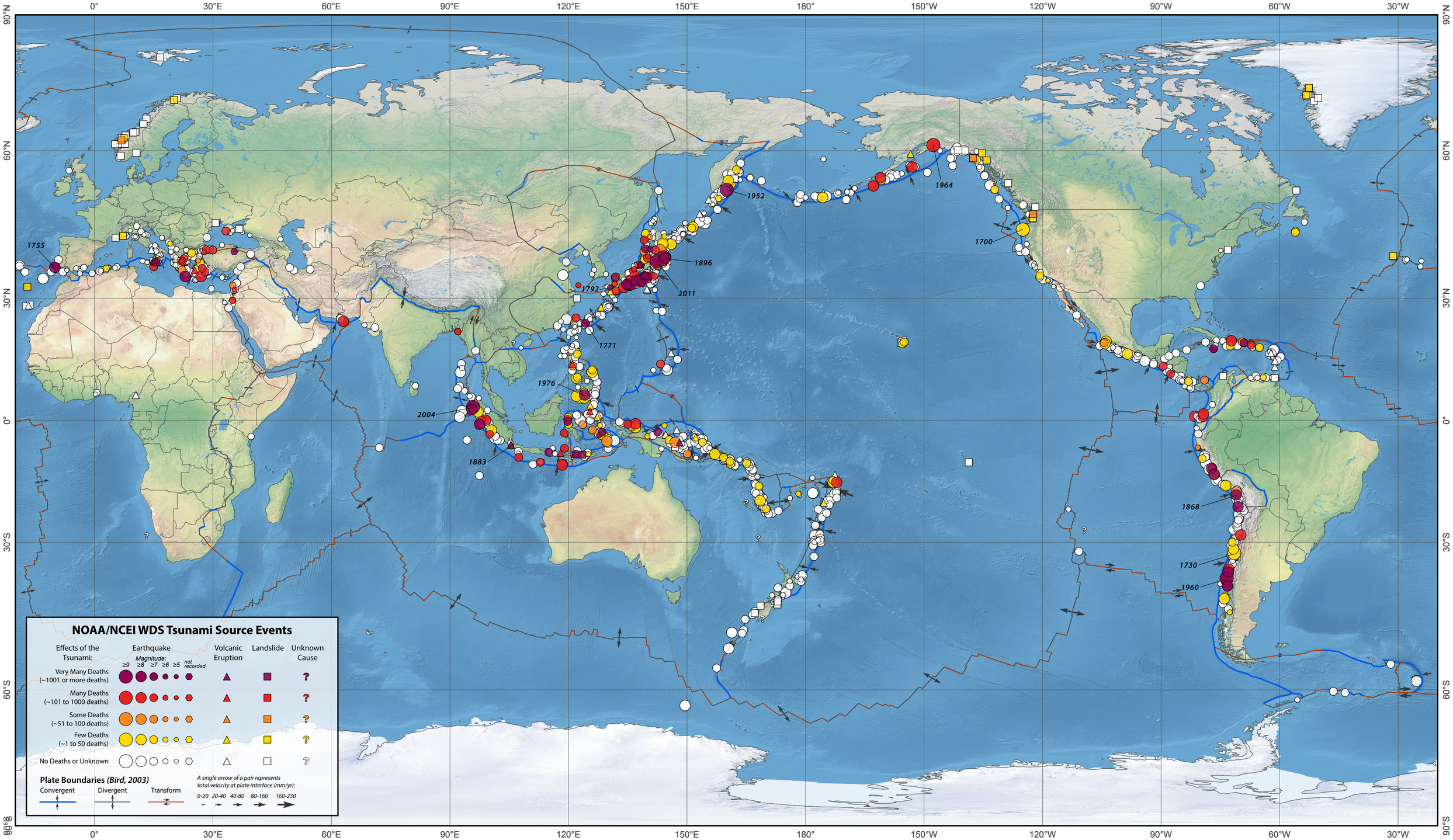
# Tsunami Sources 1610 B.C. to A.D. 2023

## From Earthquakes, Volcanic Eruptions, Landslides, and Other Causes




Patterson Cylindrical Projection

Symbol drawing order: more deaths on top of fewer deaths; volcanoes and landslides on top of earthquakes; lower magnitude earthquakes on top of higher magnitude.

unesco
Intergovernmental Oceanographic Commission

ICSU WORLD DATA SYSTEM

September 2023

NOAA's National Centers for Environmental Information (NCEI) and co-located World Data Service (WDS) for Geophysics and the International Tsunami Information Center (ITIC), a UNESCO/IOC-NOAA partnership, have collaborated to produce a map showing tsunami sources. The information comes from the NCEI Global Historical Tsunami Database that includes information on tsunami source events throughout the world that range in date from 1610 B.C. to A.D. 2023. The tsunami definitions are from the Tsunami Glossary 2016 published by UNESCO.

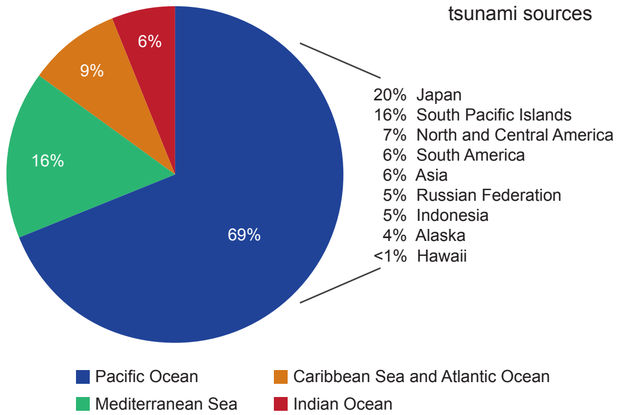
Of the 2,600 events in the NCEI Global Historical Tsunami Database, over 1,400 confirmed tsunami source events are displayed on the map. A total of 271 confirmed deadly tsunamis have resulted in over 544,000 known (or confirmed) deaths. The death total may include deaths from the generating event (e.g. earthquake) as it is not always possible to separate deaths from the different causes. These figures should be much higher, but in many events the actual number of fatalities is not known. The reporting of deadly tsunamis is not homogeneous in space or time, particularly for periods prior to the 1900s.

Tsunamis are also classified by how far away the effects of the waves were observed. For example, the effects of a local tsunami are confined to coasts within about 100 km (62 miles) or less than 1 hour tsunami travel time from its source. A tsunami capable of destruction within 1,000 km (621 miles) or 1-3 hours travel time from its source is considered a regional tsunami. Most destructive tsunamis can be classified as local or regional. It follows that many tsunami-related deaths and considerable property damage result from these tsunamis (Table 1). In fact, 90% of all tsunami deaths in the historic record occurred in the local or regional area within the first 3 hours of the event. Between 1990 and 2023 there were 38 local or regional confirmed tsunamis that resulted in deaths and property damage (Table 2); 26 of these were in the Pacific and its adjacent seas.

A distant or teletsunami is a tsunami originating from a far away source, generally more than 1,000 km (621 miles) or more than 3 hours tsunami travel time away. They usually start as a local tsunami that causes extensive destruction near the source; the waves then continue to travel across the entire ocean basin with sufficient energy to cause additional deaths and destruction on distant shores. In the last 300 years, there have been at least 47 confirmed damaging teletsunamis and 18 caused deaths more than 1,000 km (621 miles) from the source (Table 3).

The events in the NCEI Global Historical Tsunami Database were gathered from the NOAA Tsunami Warning Centers, NOAA National Data Buoy Center, NOAA National Ocean Service, UNESCO/IOC-NOAA International Tsunami Information Center, NOAA Pacific Marine Environmental Laboratory, U.S. Geological Survey, national and government databases and reports, tsunami catalogs, post-event reconnaissance reports, journal articles, newspapers, internet sources, email, and other written documents. This compilation does not include sources inferred from the study of tsunami deposits. Tsunami deposits are the physical evidence left behind when a tsunami impacts a shoreline or affects submarine sediments. For a complete listing of references used in compiling the database, please visit: http://www.ngdc.noaa.gov/hazard/.

Global distribution of confirmed tsunami sources




Distribution of confirmed tsunamis by generation mechanism

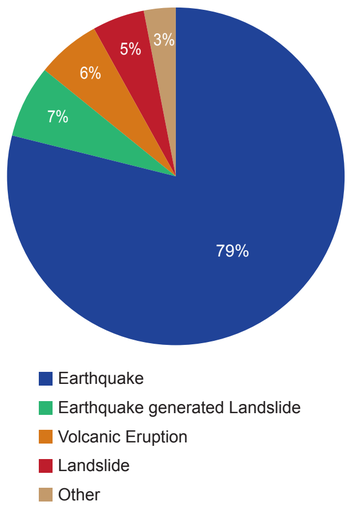



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**Table 1. Regional and local tsunamis causing 2,000 or more deaths**

| Date Year | Mon | Day | Source Location | Estimated Dead or Missing |
|---|---|---|---|---|
| 365 | 7 | 21 | Crete, Greece | 5,000 |
| 887 | 8 | 2 | Niigata, Japan | 2,000 |
| 1341 | 10 | 31 | Aomori Prefecture, Japan | 2,600 |
| 1498 | 9 | 20 | Enshunada Sea, Japan | 5,000 |
| 1570 | 2 | 8 | Central Chile | 2,000 |
| 1605 | 2 | 3 | Nankaido, Japan | 5,000 |
| 1611 | 12 | 2 | Sanriku, Japan | 5,000 |
| 1674 | 2 | 17 | Banda Sea, Indonesia | 2,244 |
| 1687 | 10 | 20 | Southern Peru | *5,000 |
| 1692 | 6 | 7 | Port Royal, Jamaica | 2,000 |
| 1703 | 12 | 30 | Boso Peninsula, Japan | *5,233 |
| 1707 | 10 | 28 | Enshunada Sea, Japan | 2,000 |
| 1707 | 10 | 28 | Nankaido, Japan | *5,000 |
| 1741 | 8 | 29 | Hokkaido, Japan** | 2,000 |
| 1746 | 10 | 29 | Central Peru | 4,800 |
| 1751 | 5 | 20 | Northwest Honshu, Japan | 2,100 |
| 1755 | 11 | 1 | SW Iberian Margin, Portugal | *50,000 |
| 1771 | 4 | 24 | Ryukyu Islands, Japan | 13,486 |
| 1792 | 5 | 21 | Kyushu Island, Japan** | 15,000 |
| 1854 | 12 | 24 | Nankaido, Japan | *3,000 |
| 1868 | 8 | 13 | Northern Chile | *25,000 |
| 1877 | 5 | 10 | Northern Chile | 2,282 |
| 1883 | 8 | 27 | Krakatau, Indonesia** | 34,417 |
| 1896 | 6 | 15 | Sanriku, Japan | *27,122 |
| 1899 | 9 | 29 | Banda Sea, Indonesia | *2,460 |
| 1907 | 1 | 4 | Sumatra, Indonesia | 2,188 |
| 1908 | 12 | 28 | Messina Strait, Italy | 2,000 |
| 1923 | 9 | 1 | Sagami Bay, Japan | 2,144 |
| 1933 | 3 | 2 | Sanriku, Japan | 3,022 |
| 1952 | 11 | 4 | Kamchatka, Russia | 10,000 |
| 1960 | 5 | 22 | Southern Chile | 2,000 |
| 1976 | 8 | 16 | Moro Gulf, Philippines | 6,800 |
| 2004 | 12 | 26 | Banda Aceh, Indonesia | *^227,899 |
| 2011 | 3 | 11 | Tohoku, Japan | *^18,428 |
| 2018 | 9 | 28 | Sulawesi, Indonesia | *4,340 |
| | | | **Total** | **508,565** |

*May include earthquake deaths
**Tsunami generated by volcanic eruption
^Includes dead/mising near and outside source region

**Table 2. Regional and local tsunamis causing deaths since 1990**

| Date Year | Mon | Day | Source Location | Estimated Dead or Missing |
|---|---|---|---|---|
| 1991 | 4 | 22 | Limon, Costa Rica | 3 |
| 1992 | 9 | 2 | Off coast Nicaragua | 170 |
| 1992 | 12 | 12 | Flores Sea, Indonesia | 1,169 |
| 1993 | 7 | 12 | Sea of Japan | 208 |
| 1994 | 6 | 2 | Java, Indonesia | 238 |
| 1994 | 10 | 8 | Halmahera, Indonesia | 1 |
| 1994 | 11 | 4 | Skagway Alaska, USA** | 1 |
| 1994 | 11 | 14 | Philippine Islands | *81 |
| 1995 | 5 | 14 | Timor, Indonesia | 11 |
| 1995 | 10 | 9 | Manzanillo, Mexico | 1 |
| 1996 | 1 | 1 | Sulawesi, Indonesia | 9 |
| 1996 | 2 | 17 | Irian Jaya, Indonesia | 110 |
| 1996 | 2 | 21 | Northern Peru | 12 |
| 1998 | 7 | 17 | Papua New Guinea | 1,636 |
| 1999 | 8 | 17 | Izmit Bay, Turkey | 155 |
| 1999 | 11 | 26 | Vanuatu Islands | 5 |
| 2000 | 5 | 4 | Sulawesi, Indonesia | *54 |
| 2001 | 6 | 23 | Southern Peru | 26 |
| 2003 | 9 | 25 | Hokkaido, Japan | 2 |
| 2004 | 12 | 26 | Banda Aceh, Indonesia | *^227,899 |
| 2006 | 3 | 14 | Seram Island, Indonesia | 4 |
| 2006 | 7 | 17 | Java, Indonesia | 802 |
| 2007 | 4 | 1 | Solomon Islands | 50 |
| 2007 | 4 | 21 | Southern Chile | 8 |
| 2007 | 8 | 15 | Southern Peru | 3 |
| 2009 | 9 | 29 | Samoa Islands | 192 |
| 2010 | 1 | 12 | Haiti | 7 |
| 2010 | 2 | 27 | Southern Chile | 156 |
| 2010 | 10 | 25 | Mentawai, Indonesia | 431 |
| 2011 | 3 | 11 | Tohoku, Japan | *^18,428 |
| 2013 | 2 | 6 | Solomon Islands | 10 |
| 2015 | 9 | 16 | Central Chile | 8 |
| 2017 | 6 | 17 | Greenland** | 4 |
| 2018 | 9 | 28 | Sulawesi, Indonesia | *4,340 |
| 2018 | 12 | 22 | Anak Krakatau, Indonesia*** | 437 |
| 2020 | 10 | 30 | Aegean Sea | 1 |
| 2022 | 1 | 15 | Tonga Islands*** | 4 |
| 2023 | 7 | 16 | Sand Point, Alaska, USA | ^^1 |
| | | | **Total** | **256,677** |

*May include earthquake deaths
**Tsunami generated by landslide
*** Tsunami generated by volcanic eruption
^Includes dead/missing near and outside source region
^^Death during evacuation

**Table 3. Tsunamis causing deaths greater than 1000 km from the source location**

| Date Year | Mon | Day | Source Location | Estimated Dead or Missing Local | Distant | Distant locations that reported casualties |
|---|---|---|---|---|---|---|
| 1700 | 1 | 27 | Cascadia Subduction Zone, USA | | 2 | Japan |
| 1755 | 11 | 1 | SW Iberian Margin, Portugal | 50,000 | 3 | Brazil |
| 1837 | 11 | 7 | Southern Chile | 0 | 16 | USA (Hawaii) |
| 1868 | 8 | 13 | Northern Chile** | *25,000 | 7 | New Zealand, Samoa, Southern Chile |
| 1877 | 5 | 10 | Northern Chile | 277 | 2,005 | Fiji, Japan, Peru, USA (Hawaii) |
| 1883 | 8 | 27 | Krakatau, Indonesia | 34,417 | 1 | Sri Lanka |
| 1901 | 8 | 9 | Loyalty Islands, New Caledonia | 0 | Several | Santa Cruz Islands |
| 1923 | 2 | 3 | Kamchatka, Russia | 2 | 1 | USA (Hawaii) |
| 1945 | 11 | 27 | Makran coast, Pakistan | *300 | 15 | India |
| 1946 | 4 | 1 | Unimak Island, Alaska, USA | 5 | 163 | Marquesas Is, Peru, USA (California, Hawaii) |
| 1957 | 3 | 9 | Andreanof Islands, Alaska, USA | 0 | 2 | USA (Hawaii, indirect deaths from plane crash doing tsunami reconnaissance) |
| 1960 | 5 | 22 | Central Chile | 2,000 | 226 | Japan, Philippines, USA (California, Hawaii) |
| 1964 | 3 | 28 | Prince William Sound, Alaska, USA | 106 | 18 | USA (California, Oregon) |
| 2004 | 12 | 26 | Banda Aceh, Indonesia*** | *175,827 | 52,072 | Bangladesh, India, Kenya, Madagascar, Maldives, Myanmar, Seychelles, Somalia, South Africa, Sri Lanka, Tanzania, Yemen |
| 2005 | 3 | 28 | Sumatra, Indonesia | 0 | 10 | Sri Lanka (deaths during evacuation) |
| 2011 | 3 | 11 | Tohoku, Japan | *18,426 | 2 | Indonesia, USA (California) |
| 2012 | 10 | 28 | Haida Gwaii, Canada | 0 | 1 | USA (Hawaii, death during evacuation) |
| 2022 | 1 | 15 | Tonga Islands | 4 | 2 | Peru |

*May include earthquake deaths **Local and regional deaths in Chile and Peru ***Local and regional deaths in Indonesia, Malaysia, and Thailand