

GS PAPER 1**Geography of World****Science Of Indonesia's Surprise Tsunami**

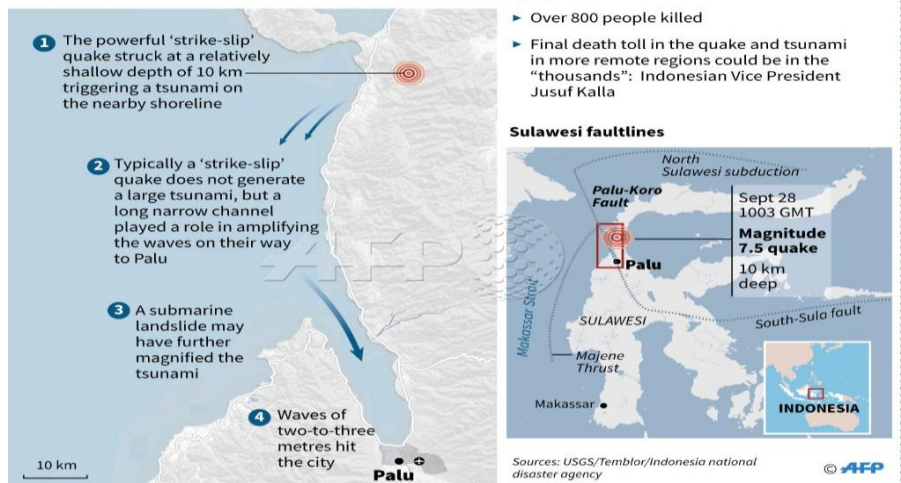
Syllabus: Important Geophysical phenomena such as earthquakes, Tsunami,

In News

- 7.5-magnitude earthquake shook the Indonesian island of Sulawesi.
- Scientists were surprised by the strength of the ensuing tsunami. And experts suggest that the area's unique geology could be to blame for the unexpected progression of the disaster.
- tsunamis typically are the result of the abrupt motion of large submarine earthquakes at tectonic plate boundaries.

How the Palu tsunami amplified as it travelled

Shape of bay funnelled water towards the Indonesian city of 350,000 people



- **And earthquakes are not uncommon in Indonesia; the island chain sits within what's known as the Ring of Fire, a curving horseshoe-shaped chain of tectonic plate boundaries that hugs the Pacific basin.** It is home to around 90 percent of the world's earthquakes.
- The **7.5-magnitude** earthquake appears to be the result of what's known as a strike-slip fault, which takes place as two blocks of crust grind against one another, largely in a horizontal direction.
- Tsunamis more commonly follow vertical movement in the crust, which disrupts the overlying water and can generate massive waves crashing onshore.

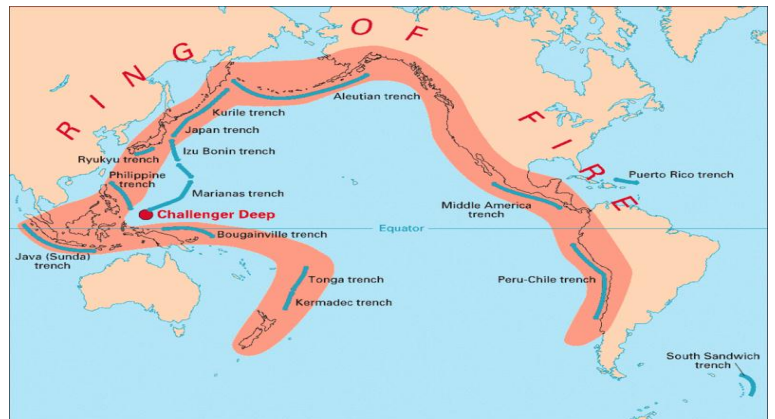
Indonesia's geology is highly complex. A spidery web of different types of faults cut through the region. It is also possible that the fault cut through a submarine slope, so the horizontal movement offset the underwater hillside, causing the destructive waves. The Palu bay is like a **bath tub. When you move one half of it, the horizontal displacement of the sea floor also pushed the water away and when it returned it came back as a tsunami wave.** New estimates suggest the land was displaced through Palu City and the bay area, supporting this interpretation.

Tsunami: Facts and Information

A tsunami is a series of ocean waves that sends surges of water, sometimes reaching heights of over 100 feet (30.5 meters), onto land. These walls of water can cause widespread destruction when they crash ashore.

What Causes A Tsunami?

- These awe-inspiring waves are typically caused by large, undersea earthquakes at tectonic plate boundaries. When the ocean floor at a plate boundary rises or falls suddenly, it displaces the water above it and launches the rolling waves that will become a tsunami.
- Most tsunamis—about 80 percent—happen within the Pacific Ocean’s “**Ring of Fire**,” a geologically active area where tectonic shifts make volcanoes and earthquakes common
- Tsunamis may also be caused by **underwater landslides or volcanic eruptions**. They may even be launched, as they frequently were in Earth’s ancient past, by the impact of a large meteorite plunging into an ocean.
- **Tsunamis** race across the sea at up to 500 miles (805 kilometers) an hour—about as fast as a jet airplane. At that pace, they can cross the entire expanse of the Pacific Ocean in less than a day. And their long wavelengths mean they lose very little energy along the way.
- In Deep Ocean, tsunami waves may appear only a foot or so high. But as they approach shoreline and enter shallower water they slow down and begin to grow in energy and height. The tops of the waves move faster than their bottoms do, which causes them to rise precipitously.



What Happens When It Hits Land?

- A tsunami’s trough, the low point beneath the wave’s crest, often reaches shore first. When it does, it produces a vacuum effect that sucks coastal water seaward and exposes harbor and sea floors.
- This retreating of sea water is an important warning sign of a tsunami, because the wave’s crest and its enormous volume of water typically hit shore five minutes or so later. Recognizing this phenomenon can save lives.
- A tsunami is usually composed of a **series of waves, called a wave train**, so its destructive force may be compounded as successive waves reach shore. People experiencing a tsunami should remember that the danger may not have passed with the first wave and should await official word that it is safe to return to vulnerable locations.
- The best defense against any tsunami is early warning that allows people to seek higher ground.

The **Pacific tsunami Warning System**, a coalition of 26 nations headquartered in Hawaii, maintains a web of seismic equipment and water level gauges to identify tsunamis at sea. Similar systems are proposed to protect coastal areas worldwide.