



## TSUNAMI SCIENCE: GEOGRAPHY

**NEWS:** *How the 2004 Indian Ocean earthquake transformed tsunami science*

### WHAT'S IN THE NEWS?

The 2004 Indian Ocean earthquake and tsunami, caused by a magnitude 9.1 quake near Sumatra, devastated 17 countries, claiming over 227,000 lives. It spurred advancements in tsunami warning systems, disaster preparedness, and research into seismic and tsunami risks.

### 2004 Indian Ocean Earthquake and Tsunami

#### Overview of the 2004 Disaster:

- **Date:** December 26, 2004.
- **Magnitude:** 9.1 earthquake near Sumatra.
- **Origin:** Sunda Trench, 30 km below the ocean floor.
- **Plate Movement:** Indo-Australian plate subducting beneath Burma microplate.
- **Impact:**
  - Affected 17 countries in the Indian Ocean region.
  - Over 227,000 deaths and 1.7 million displaced.
  - Massive destruction in Indonesia, India, Sri Lanka, Thailand, etc.

#### Lessons Learned:

- Disaster highlighted vulnerabilities of coastal regions to seismic events.
- Emphasized the need for disaster preparedness and resilience strategies.

#### Scientific Advancements Post-2004:

- **Indian Tsunami Early Warning Centre (ITEWC):**
  - Established in 2007.
  - Provides warnings within 10 minutes of detecting potential tsunamis.
  - Operates seismological and ocean monitoring systems.
- **Tsunami Research:**
  - Development of tsunami geology.
  - Discoveries of ancient tsunamis through sediment studies, e.g., in Mahabalipuram.

#### Nuclear Risks:

- Kalpakkam nuclear plant withstood the tsunami but highlighted vulnerabilities.
- Post-2011 Fukushima disaster, safety measures for coastal nuclear facilities intensified.

#### Emerging Risks:

- **Makran Coast:** Potential threat to India's west coast, including Mumbai.
- **Slow Seismic Slips:** Studied for insights into earthquake and tsunami predictions.



## Seismological Milestones:

- Enhanced understanding of earthquake generation and tsunami formation.
- Advances in research on seismic slips and pre-earthquake phenomena.

## WHAT IS A TSUNAMI?



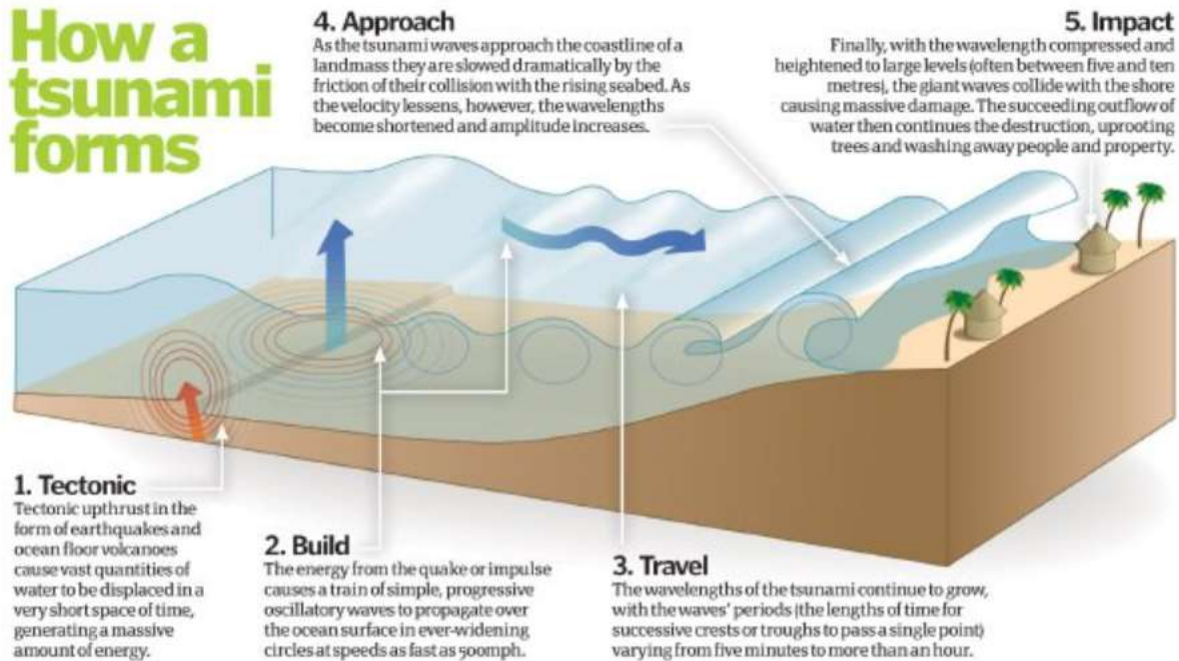
Tsunamis are giant waves caused by earthquakes or volcanic eruptions under the sea.

Tsunamis can also be caused by landslides, certain types of weather or even objects like asteroids.

When a tsunami is formed in the ocean floor, the waves can travel really far and they get very dangerous when they reach the shore. The reason is when waves enter shallow waters, they compress, their speed slows, and they build in height.



## How a tsunami forms



Source: <https://www.thehindu.com/sci-tech/science/how-the-2004-indian-ocean-earthquake-transformed-tsunami-science/article69025686.ece>

