Strongest Earthquakes in History

Source: TH

Why in News?

- Recently, a powerful 6.8 magnitude **earthquake struck Morocco** killing over 2,900 people.
  - According to the **Significant Earthquake Events (SEE) database**, this is the strongest quake to hit Morocco.
  - The SEE database maintains some of the oldest earthquake records that fulfil certain criteria.

Note:

- The Significant Earthquake Database is maintained by the **National Centers for Environmental Information (NCEI)**, a US government agency.
- It contains information on earthquakes **from 2150 BCE to the present** that meet at least one of the following criteria:
  - **Moderate damage** (approximately USD 1 million or more)
  - **10 or more deaths**
  - **Magnitude of 7.5 or more**
  - **An earthquake that generated a** tsunami

EARTHQUAKE

ABOUT

- Shaking of the earth; caused due to release of energy, generating seismic waves in all directions

HYPOCENTER

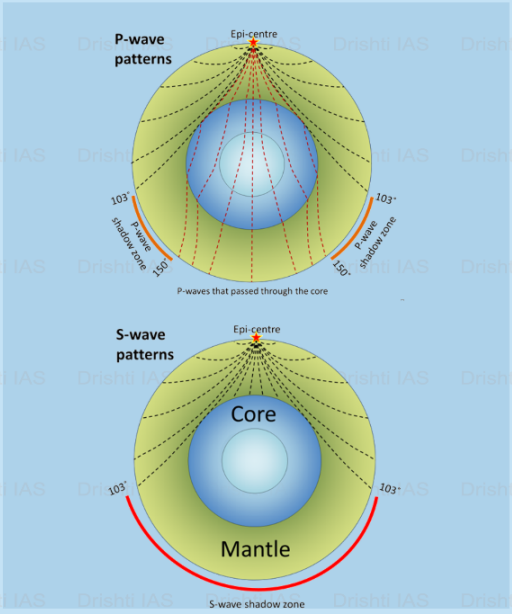
- Location where the earthquake starts (below earth's surface)

EPICENTER

- Location right above the Hypocenter (on the earth's surface)

EARTHQUAKE WAVES

- Body Waves: Move in all directions travelling through the body of the earth
  - P Waves: Move faster, First to arrive at surface, Similar to sound waves, Travel through gaseous, liquid and solid materials
  - S Waves: Arrive at surface with some time lag, Travel only through solid materials
- Surface Waves: Last to report on seismographs, More destructive, Cause displacement of rocks
  - Love Waves: Same motion as S-waves (horizontal) without vertical displacement, Sideways motion perpendicular to the direction of propagation, Faster than Rayleigh waves
  - Rayleigh Waves: Cause the ground to shake in an elliptical pattern, Spread out the most of all seismic waves, Move vertically and horizontally in a vertical plane



CAUSES OF EARTHQUAKES

- Release of energy along a Fault/Fault Zones (break in the crustal rocks)
- Movement of tectonic plates (most common)
- Volcanic eruption (stress changes in rock-injection/withdrawal of magma)
- Human activities (mining, explosion of chemical/nuclear devices etc.)

MEASURING EARTHQUAKE

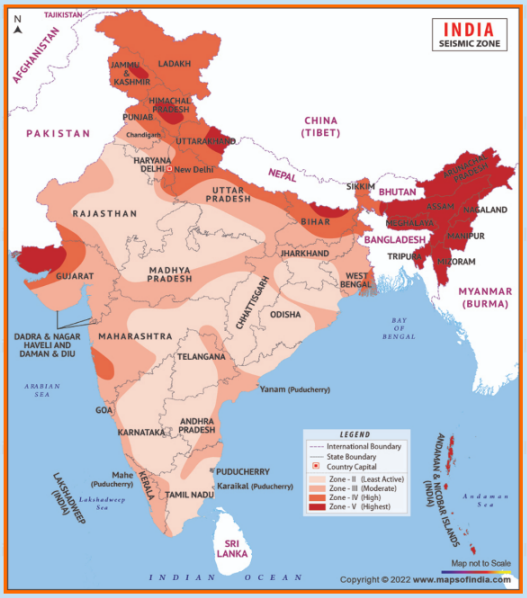
- Seismometers - Measures seismic waves
- Richter Scale - Measures magnitude (energy released; range: 0-10)
- Mercalli - Measures intensity (visible damage; range: 1-12)

DISTRIBUTION

- Circum-Pacific Belt - 81% of earthquakes
- Alpide Earthquake Belt - 17% of the largest earthquakes
- Mid-Atlantic Ridge - Mostly submerged underwater

EARTHQUAKE IN INDIA

- India is one of the highly earthquake affected countries due to the presence of technically active mountains - the Himalayas.
- India has been divided into 4 seismic zones (II, III, IV, and V)



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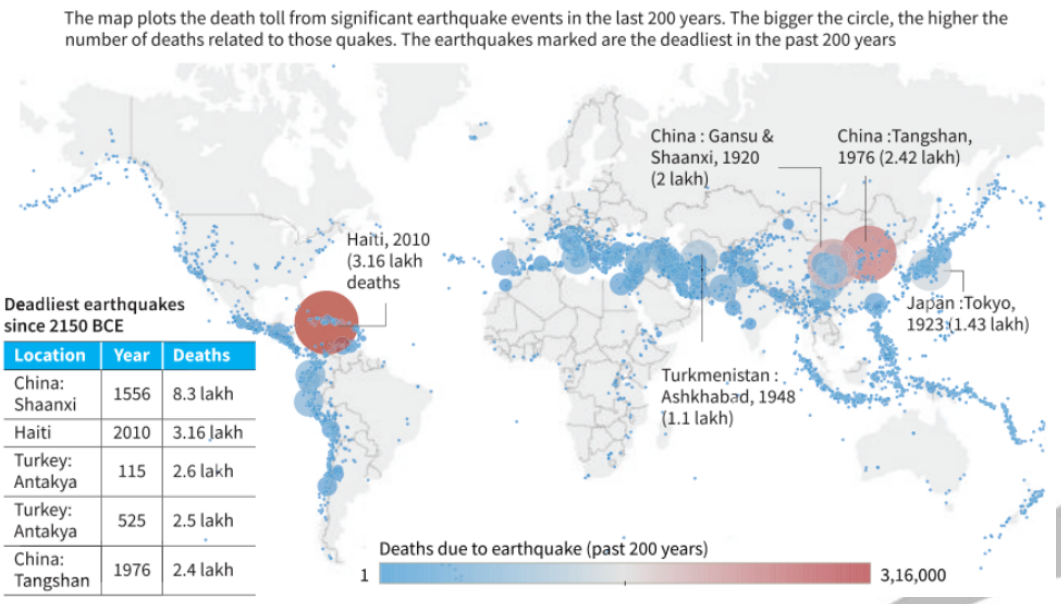
What is the NCEI's Data on Earthquakes?



Deadliest earthquakes since 2150 BCE

Location	Year	Deaths
China: Shaanxi	1556	8.3 lakh
Haiti	2010	3.16 lakh
Turkey: Antakya	115	2.6 lakh
Turkey: Antakya	525	2.5 lakh
China: Tangshan	1976	2.4 lakh

- **Global Highest Earthquakes**: As per NCEI, in the last 200 years, **China has suffered the highest number of quakes — 428.**
    - It is followed by **Indonesia** (366 quakes), **Iran** (272), **Japan** (256), and **Turkey** (209).
- **Most Severe Earthquakes:** In the past 200 years, there have been **four quakes with a magnitude of 9+.**
    - The most severe quake struck the **Chilean city of Puerto Montt in 1960** (9.5).
        - This is followed by **Alaska** in 1964 (9.2), **Honshu** (Japan) in 2011 (9.1), and **Sumatra** (Indonesia) in 2004 (9.1).
    - Of the **10 most severe** earthquakes since 2150 BCE, **seven have occurred in the last 200 years.**
- **Morocco:** The recent one that occurred is the strongest that hit Morocco. The **deadliest ever to hit the country occurred in 1960** and killed about 13,100 people (Magnitude at 5.9).
- **India**: As per NCEI, India has recorded 85 quakes in the last 200 years and ranks 16 on the list of countries with highest earthquakes.
    - The deadliest earthquake to hit India (either in the last 200 years or since 2150 BCE), occurred in 2001 in Gujarat.
        - The **Bhuj earthquake (magnitude - 7.6)**, as it is commonly known, is considered to be the deadliest as it killed over 20,000 people.
    - However, the Bhuj earthquake was not the strongest; the **1941 earthquake in Andaman** (poorly recorded due to **WW-II**), and the **1897 earthquake in Assam,** were both considered the strongest with a magnitude of 8.

Major Earthquakes in and around India

Number	Place	# of Deaths	Date, Time, and Year	Magnitude	Epicenter
1	Indian Ocean	> 283,106	08:50, December 26th, 2004	9.1–9.3	West coast of Sumatra, Indonesia
2	Kashmir	130,000	08:50:38, October 8th, 2005	7.6	Muzaffarabad, Pakistan-administered Kashmir
3	Bihar and Nepal	> 30,000	14:13, January 15th, 1934	8.7	South of Mount Everest
4	Gujarat	20,000	08:50, January 26th, 2001	7.7	Kutch, Gujarat
5	Kangra	> 20,000	06:10, April 4th, 1905	7.8	Himalayas
6	Latur	> 9,748	22:25, September	6.4	Killari, Latur

UPSC Civil Services Examination, Previous Year Questions

Prelims:

Q. Consider the following: (2013)

1. Electromagnetic radiation
2. Geothermal energy
3. Gravitational force
4. Plate movements
5. Rotation of the earth
6. Revolution of the earth

Which of the above are responsible for bringing dynamic changes on the surface of the earth?

(a) 1, 2, 3 and 4 only
(b) 1, 3, 5 and 6 only
(c) 2, 4, 5 and 6 only
(d) 1, 2, 3, 4, 5 and 6

Ans: (d)