



Earthquake Tremors in Rajasthan

Why in News?

Recently the residents of Barmer, Rajasthan, experienced **mild [earthquake tremors](#)**.

- The tremors led to a brief period of panic, with people vacating buildings and gathering in open spaces.

Key Points

- **Location:** Barmer, Rajasthan
- **Magnitude:** 3.5 on the [Richter scale](#)
- **Structural Damage:** No major structural damage has been reported. Some minor cracks in buildings were observed.
- **Emergency Response:** Local authorities quickly responded, ensuring that emergency protocols were followed. They have advised residents to stay alert and follow safety guidelines in case of aftershocks.
- **Seismic Waves:** Seismic waves are the vibrations from earthquakes that travel through the Earth and are recorded on instruments called [seismographs](#).
 - Seismographs record a **zigzag trace** that shows the **varying amplitude** of ground oscillations beneath the instrument.
- **Richter Scale and Mercalli Scale:** The earthquake events are **scaled** either according to the **magnitude** or **intensity** of the shock.
 - The **magnitude scale** is known as the **Richter scale**. The magnitude relates to the energy released during the earthquake which is expressed in absolute numbers, **0-10**.
 - The **intensity scale or Mercalli scale** takes into account the visible damage caused by the event. The range of intensity scale is from **1-12**.

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EARTHQUAKE



ABOUT

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

HYPOCENTER

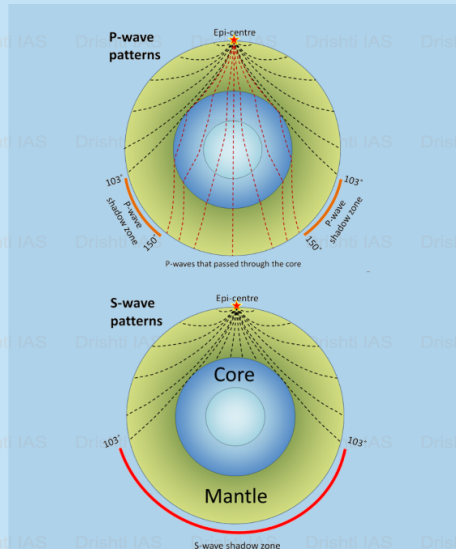
- Location where the earthquake starts (below earth's surface)

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.)

EARTHQUAKE IN INDIA

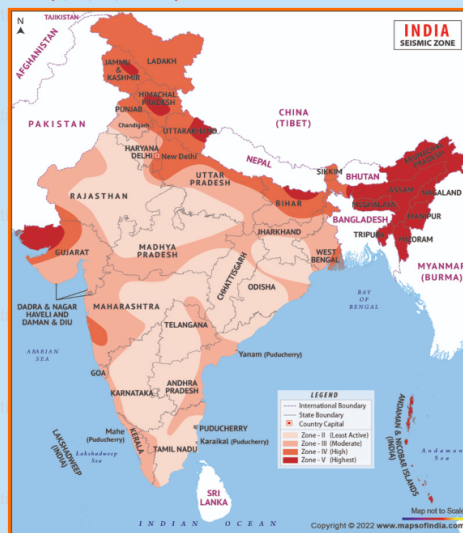
- India is **one of the highly earthquake affected countries** due to the presence of technically active mountains - the Himalayas.
- India has been divided into **4 seismic zones** (II, III, IV, and V)

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
- Alpine Earthquake Belt** - 17% of the largest earthquakes
- Mid-Atlantic Ridge** - Mostly submerged underwater



Seismic Zones in India

- There are **four seismic zones (II, III, IV, and V)** in India based on scientific inputs relating to seismicity, earthquakes that occurred in the past and tectonic setup of the region.
 - Previously, earthquake zones were divided into five zones with respect to the severity of the earthquakes but the **Bureau of Indian Standards (BIS)** grouped the country into **four**

- seismic zones** by unifying the first two zones.
- **BIS** is the **official agency** for publishing the seismic hazard maps and codes.
 - **Seismic Zone II:**
 - Area with minor damage earthquakes corresponding to intensities **V to VI of MM scale (MM-Modified Mercalli Intensity scale).**
 - **Seismic Zone III:**
 - Moderate damage corresponding to intensity **VII of MM scale.**
 - **Seismic Zone IV:**
 - Major damage corresponding to intensity **VII and higher of MM scale.**
 - **Seismic Zone V:**
 - The area around **major fault systems** is where seismic activity is concentrated, making it the most **earthquake-prone region.**
 - **Earthquake zone V** is the most vulnerable to **earthquakes**, where historically some of the country's most powerful shocks have occurred.
 - Earthquakes with magnitudes in excess of **7.0** have occurred in these areas, and have had intensities higher than 9.

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