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Q8

Discuss about the vulnerability of India to earthquake related hazards. Give examples including the salient features of major disasters caused by earthquakes in different parts of India during the last three decades.

UPSC Civil Services Mains 2021 · GS III · 10 marks · Disaster Management

Disaster and disaster management.

Core demand of the question

- Discuss about the vulnerability of India to earthquake related hazards. Give examples including the salient features of major disasters caused by earthquakes in different parts of India during the last three decades
- Keep the explanation within a 10-mark length

Revision summary

Himalayan collision and the north-east put large populations in Zones IV and V; alluvium can amplify shaking in the plains.

The peninsula is not risk-free, as Latur 1993 showed.

Bhuj 2001 was a great urban disaster of failed multi-storeys on Republic Day.

The 2004 tsunami made Andaman and Tamil Nadu earthquake-coast disasters.

Kashmir 2005, Sikkim 2011, and Nepal 2015 extended the Himalayan lesson into the 2010s.

Introduction

India sits where the Indian plate drives under Eurasia. That collision makes the Himalaya and the north-east highly seismic, while the peninsula is not immune to intraplate shocks. Vulnerability is the product of that geology plus dense towns, poor masonry, and long hospital-to-fault distances.

Body**Why India is vulnerable**

- The **Himalayan arc**, **Kashmir**, **Uttarakhand**, **Nepal border**, **Sikkim**, and the **north-east** lie in **BIS seismic Zones IV and V**.
- The **Indo-Gangetic plains** can shake from Himalayan ruptures and from soft alluvium that amplifies motion under mega-cities.
- The **peninsula** is stable relative to the arc, yet **Killari 1993** and **Bhuj 2001** showed intraplate and failed-rift earthquakes can devastate unprepared Deccan and Kachchh towns.
- **Andaman-Nicobar** and the east coast are exposed to **tsunami** when a great submarine earthquake occurs, as in 2004.

- **Risk is social:** unreinforced brick, hillside cutting, and lifeline failure (power, water, hospitals) kill after the wave has passed. **NDMA** and **NDMF** exist because geology will not pause.

Major disasters of the last three decades (from 2021)

- **Uttarkashi 1991** and **Chamoli 1999:** Garhwal Himalayan shocks that flattened hill masonry and showed the central seismic gap is not a comfort.
- **Latur / Killari, Maharashtra, 1993:** about magnitude 6.2 intraplate earthquake before dawn; roughly **8,000-10,000** dead in poorly built village houses on the **Deccan plateau**, a region once sold as "safe".
- **Bhuj, Gujarat, 26 January 2001:** about magnitude **7.6-7.7**; on the order of **13,000-20,000** dead, Ahmedabad multi-storeys failed far from the epicentre, and Republic Day gatherings raised the human toll. Salient feature: urban RC-frame failure plus a long Kachchh rupture.
- **Indian Ocean earthquake and tsunami, 26 December 2004:** Sumatra megathrust; **Andaman and Nicobar** and the **Tamil Nadu** coast took the Indian death toll. Salient feature: the hazard was water, not only shaking.
- **Muzaffarabad / Kashmir, 2005:** a great Himalayan earthquake that killed tens of thousands in Pakistan-administered Kashmir and hundreds on the Indian side; landslides cut valleys.
- **Sikkim 2011** (about 6.9) and the **2015 Gorkha, Nepal** earthquake: Himalayan events that killed in Sikkim, Bihar, and Uttar Pradesh through shaking, landslides, and collapsed brick. Salient feature: trans-boundary rupture and hill-road failure.

What the record teaches

- Intraplate "surprise" and Himalayan "expected" events both kill when codes are not built.
- Tsunami warning, **seismic microzonation**, and retrofit of hospitals are as much the answer as a new map colour.

Flow diagram

Indian plate collision -> Himalaya NE Zone IV-High vulnerability
 Indian plate collision -> Intraplate peninsula
 Indian plate collision -> Andaman tsunami
 Himalaya NE Zone IV-High vulnerability -> Disasters 1991-2015
 Intraplate peninsula -> Disasters 1991-2015
 Andaman tsunami -> Disasters 1991-2015
 Weak masonry cities -> High vulnerability

Conclusion

India's earthquake hazard is Himalayan collision, a live north-east, a tsunami coast, and a peninsula that can still break. The last three decades - Latur, Bhuj, the 2004 tsunami, Kashmir 2005, Sikkim 2011 - show that vulnerability is bad buildings on a live plate.

Facts & figures

BIS seismic zones

India mapped in Zones II to V; IV and V cover the Himalaya, north-east, and parts of Kachchh and the west coast.

Killari 1993

Intraplate Maharashtra earthquake that killed on the order of 10,000 in weak village masonry.

Bhuj 2001

Magnitude about 7.7 Kachchh earthquake; very large death toll and distant urban collapse in Ahmedabad.

26 December 2004

Indian Ocean megathrust tsunami that hit Andaman-Nicobar and the Tamil Nadu coast.

National Disaster Management Authority (NDMA)

National Disaster Management Authority: national policy, guidelines, and earthquake-preparedness architecture after the [Disaster Management Act, 2005](#).

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