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CUET · GEOGRAPHY · CLASS XI · CODE 313

# Natural Hazards and Disasters

CUET unit: Geomorphic Processes

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# 📌 Snapshot

- A natural hazard becomes a natural disaster when its magnitude of destruction crosses a threshold; India is especially vulnerable.
- Natural disasters fall into four broad categories — Atmospheric, Terrestrial, Aquatic, and Biological.
- Five major disasters need depth: Earthquakes, Tsunamis, Tropical Cyclones, Floods, and Droughts, along with Landslides — their causes, consequences, and mitigation in India.
- Key institutional milestones (IDNDR, Yokohama Strategy 1994, Disaster Management Bill 2005, National Institute of Disaster Management) feed policy-based CUET questions.
- This topic is tested heavily because it links physical geography to socio-economic impacts, disaster zones, and map-based identification of vulnerable regions across India.

# 📖 Detailed Notes

## 2.1 Core concepts

- **Hazard vs. Disaster:** Natural Hazards are elements of circumstances in the Natural environment that have the potential to cause harm to people or property or both; they may be swift or permanent aspects of the environment such as ocean currents, steep slopes, and unstable structural features in the Himalayas or extreme climatic conditions in deserts. Natural disasters, by contrast, are relatively sudden and cause large-scale, widespread death, loss of property, and disturbance to social systems over which people have little or no control. (NCERT §Introduction, p. 54)
- **Definition of Disaster (box):** "An undesirable occurrence resulting from forces largely outside human control, strikes quickly with little or no warning, causes or threatens serious disruption of life and property including death and injury to a large number of people, and requires mobilisation of efforts in excess of that normally provided by statutory emergency services." (NCERT §What is a Disaster?, p. 53)
- **Human role in disasters:** Disasters are not caused by natural forces alone. Bhopal Gas tragedy, Chernobyl, wars, release of CFCs, environmental pollution, deforestation, and unscientific land use are examples of human-caused or human-intensified disasters. (NCERT §Introduction, p. 54)

- **Classification of Natural Disasters (Table 6.1):** Four categories — (i) Atmospheric: blizzards, thunderstorms, lightening, tornadoes, tropical cyclone, drought, hailstorm, frost, heat wave/loo, cold wave; (ii) Terrestrial: earthquakes, volcanic eruptions, landslides, avalanches, subsidence, soil erosion; (iii) Aquatic: floods, tidal waves, storm surge, tsunami; (iv) Biological: plants and animals as colonisers (locusts), insects' infestation, fungal/bacterial/viral diseases such as bird flu, dengue. (NCERT §Classification of Natural Disasters, p. 55)
- **Yokohama Strategy / IDNDR:** Disaster losses were raised at the U.N. General Assembly in 1989 and formalised at the World Conference on Disaster Management in May 1994 at Yokohama, Japan; this was called the Yokohama Strategy and Plan of Action for a Safer World. The decade 1990-2000 was declared the International Decade for Natural Disaster Reduction (IDNDR). (NCERT §p. 55–56)
- **Earthquakes — cause in India:** The Indian plate is moving at one centimetre per year northward/northeastward and is obstructed by the Eurasian plate; the resulting locking and energy accumulation along the Himalayan arch produces earthquakes. Tectonic earthquakes are most devastating and have the largest area of influence. (NCERT §Earthquakes, p. 55–56)
- **Earthquake Zones in India:** India is divided into five damage risk zones — (i) Very high damage risk zone, (ii) High damage risk zone, (iii) Moderate damage risk zone, (iv) Low damage risk zone, (v) Very low damage risk zone. The Very High Damage Risk Zone includes the Northeast states, areas north of Darbhanga and Araria (Bihar), Uttarakhand, Western Himachal Pradesh (Dharamshala), Kashmir Valley, and Kuchchh (Gujarat). The High Damage Risk Zone includes remaining parts of J&K, Ladakh, Himachal Pradesh, Northern Punjab, Eastern Haryana, Delhi, Western UP, and Northern Bihar. Most safe areas are in the stable Deccan Plateau. (NCERT §Earthquakes, p. 56–57)
- **Effects of Earthquakes (Table 6.2):** On Ground — fissures, settlements, landslides, liquefaction, earth pressure, possible chain-effects; On Manmade Structures — cracking, slidings, overturning, buckling, collapse, possible chain-effects; On Water — waves, hydro-dynamic pressure, tsunami, possible chain-effects. Seismic waves also produce fissures on upper layers of the crust through which water and volatile materials gush out. (NCERT §Effects of Earthquakes, p. 57)
- **Earthquake Hazard Mitigation:** Since earthquakes cannot be prevented, emphasis is on preparedness and mitigation — establishing seismological monitoring centres; using GPS to monitor tectonic plate movement; preparing and disseminating vulnerability maps; modifying house types and building designs (discouraging high-rise buildings and large industrial establishments in vulnerable areas); making earthquake-resistant designs mandatory for major construction. (NCERT §Earthquake Hazard Mitigation, p. 57)
- **Tsunami:** High vertical waves caused by abrupt movement of the sea-floor due to earthquakes or volcanic eruptions; also called harbour waves, seismic sea waves, or Shallow Water Waves. Speed is greater in shallow water than in the ocean deep, so

impact is less over the ocean and greater near the coast. In deep water, tsunamis have very long wave-length and limited wave-height (raising a ship only a metre or two). As a tsunami enters shallow water, wave-length reduces, period remains unchanged, and wave-height can reach 15 m or more. Tsunamis are frequent along the Pacific ring of fire — Alaska, Japan, Philippines, South-East Asia, Indonesia, Malaysia, Myanmar, Sri Lanka, and India. (NCERT §Tsunami, p. 59)

- **2004 Tsunami:** The December 26, 2004 tsunami killed more than 300,000 people; India subsequently volunteered to join the International Tsunami Warning System. Mitigation is difficult because losses occur on a much larger scale than other hazards; combined international efforts are required. (NCERT §Tsunami, p. 59)
- **Tropical Cyclone:** Intense low-pressure areas confined between 30°N and 30°S latitudes; horizontal extent 500–1,000 km; vertical extent from surface to 12–14 km; energised by latent heat released by warm moist air. Four initial conditions required: (i) large, continuous supply of warm and moist air capable of releasing enormous latent heat; (ii) strong Coriolis force to prevent filling of low pressure (hence tropical cyclones do not form between 0°–5° latitude); (iii) unstable conditions through the troposphere to create local disturbances; (iv) absence of strong vertical wind wedge to allow vertical transport of latent heat. (NCERT §Tropical Cyclone, p. 59–60)
- **Spatio-temporal distribution of cyclones in India:** Most cyclones originate between 10°–15°N latitudes during the monsoon season; Bay of Bengal cyclones mostly develop in October–November, originating between 16°–2°N latitudes and west of 92°E. By July the origin shifts to ~18°N latitude and west of 90°E near the Sunderban Delta. Coastal areas are struck by severe cyclonic storms with an average velocity of 180 km/h, causing storm surge — abnormal rise in sea level. (NCERT §Spatio-temporal Distribution, p. 60)
- **Storm Surge:** A surge is generated due to interaction of air, sea, and land. The cyclone provides the driving force in the form of very high horizontal pressure-gradient and very strong surface winds; sea water flows across the coast resulting in inundation of human settlements, agricultural fields, and destruction of structures. (NCERT §Consequences of Tropical Cyclones, p. 60)
- **Floods:** Inundation of land and human settlements by the rise of water in channels and its spill-over. Unlike other natural disasters, floods are relatively slow and predictable and often occur in well-identified regions at expected times of year. Floods commonly occur when surface run-off exceeds the carrying capacity of river channels and streams. Rashtriya Barh Ayog (National Flood Commission) identified 40 million hectares of land as flood-prone in India. Assam, West Bengal, and Bihar are the highest flood-prone states; Tamil Nadu experiences flooding during November–January due to the retreating monsoon. (NCERT §Floods, p. 60–62)
- **Flood consequences and control:** Floods destroy crops, damage physical infrastructure (roads, rails, bridges), render millions homeless, and spread water-borne diseases (cholera, gastro-enteritis, hepatitis). One positive contribution: floods deposit fertile silt on agricultural fields; Majuli (Assam) — the largest riverine island in

the world — benefits from Brahmaputra floods for paddy crops. Mitigation: construction of flood protection embankments, dams, afforestation, removing human encroachment from river channels, depopulating flood plains, cyclone centres in coastal areas. (NCERT §Consequence and Control of Floods, p. 62)

- **Droughts:** Extended period of shortage of water availability due to inadequate precipitation, excessive evaporation, and over-utilisation of water. Drought is a complex phenomenon involving elements of meteorology (precipitation, evaporation, evapotranspiration), ground water, soil moisture, storage and surface run-off, agricultural practices, types of crops, socio-economic practices, and ecological conditions. About 19 per cent of India's total geographical area and 12 per cent of its total population suffer due to drought every year; approximately 30 per cent of the country's total area is drought-prone, affecting around 50 million people. (NCERT §Droughts, p. 64)
- **Types of Droughts:** (i) Meteorological Drought — prolonged period of inadequate rainfall with mal-distribution over time and space; (ii) Agricultural Drought (soil moisture drought) — low soil moisture characterised by crop failures; an area with more than 30% of its gross cropped area under irrigation is excluded from the drought-prone category; (iii) Hydrological Drought — availability of water in aquifers, lakes, and reservoirs falls below what precipitation can replenish; (iv) Ecological Drought — productivity of a natural ecosystem fails due to shortage of water causing ecological distress. (NCERT §Types of Droughts, p. 64)
- **Drought Prone Areas in India:** Extreme Drought Affected Areas — most parts of Rajasthan (particularly west of Aravallis), Marusthali and Kachchh regions of Gujarat, districts of Jaisalmer and Barmer (receiving less than 90 mm average annual rainfall). Severe Drought Prone Areas — parts of eastern Rajasthan, most of Madhya Pradesh, eastern Maharashtra, interior AP and Karnataka Plateau, northern interior Tamil Nadu, southern Jharkhand, and interior Odisha. Moderate Drought Affected Areas — northern parts of Rajasthan, Haryana, southern UP districts, remaining Gujarat (except Konkan), Maharashtra except Konkan, Jharkhand, Coimbatore plateau of Tamil Nadu, interior Karnataka. (NCERT §Drought Prone Areas, p. 64–65)
- **Landslides:** Rapid sliding of large masses of bedrocks. Unlike most disasters, landslides are largely controlled by highly localised factors (geology, geomorphic agents, slope, land-use, vegetation cover, human activities), making monitoring difficult and cost-intensive. India divided into landslide vulnerability zones. (NCERT §Landslides, p. 66)
- **Landslide Vulnerability Zones:** Very High Vulnerability Zone — highly unstable, relatively young mountainous areas in the Himalayas and Andaman and Nicobar, high rainfall regions with steep slopes in the Western Ghats and Nilgiris, north-eastern regions, areas with frequent ground-shaking, and areas of intense human activities (road/dam construction). High Vulnerability Zone — all Himalayan states and north-eastern states except plains of Assam (similar to Very High but lower combination of controlling factors). Moderate to Low Vulnerability Zone — Trans-Himalayan areas of

Ladakh, Spiti, undulated yet stable relief and low precipitation areas (Aravali), rain shadow areas in Western and Eastern Ghats, Deccan plateau. Other Areas (safe from landslides) — Rajasthan, Haryana, UP, Bihar, West Bengal except Darjiling, Assam except Karbi Anglong, coastal regions of southern states. (NCERT §Landslide Vulnerability Zones, p. 66–67)

- **Landslide consequences and mitigation:** Consequences include roadblocks, destruction of railway lines, channel-blocking by rock-falls, diversion of river courses leading to floods, and loss of life and property. Mitigation — restrict construction on roads and dams in vulnerable zones; limit agriculture to valleys and moderate slopes; control development of large settlements in high vulnerability zones; promote large-scale afforestation; construct bunds to reduce water flow; encourage terrace farming in north-eastern hill states where Jhumming (slash and burn/shifting cultivation) is prevalent. (NCERT §Consequences of Landslides; Mitigation, p. 67)
- **Disaster Management — Three Stages:** (i) Pre-disaster management — generating data, preparing vulnerability zoning maps, disaster planning, preparedness and preventive measures; (ii) During disasters — rescue and relief operations (evacuation, shelters, relief camps, water, food, clothing, medical aids); (iii) Post-disaster — rehabilitation and recovery of victims, capacity-building to cope with future disasters. (NCERT §Disaster Management; Conclusion, p. 68)
- **Disaster Management Bill, 2005:** Defines disaster as a catastrophe, mishap, calamity or grave occurrence from natural or man-made causes or by accident or negligence resulting in substantial loss of life or human suffering or damage to/ destruction of environment, of such nature or magnitude as to be beyond the coping capacity of the community. India has about two-thirds of its geographical area and equal proportion of its population vulnerable to disasters. (NCERT §Disaster Management Bill, 2005 box, p. 68)

## 2.2 Definitions to memorise

| Term | Definition | Page |
|---|---|---|
| Natural Hazard | Elements of circumstances in the Natural environment that have the potential to cause harm to people or property or both; may be swift or permanent aspects of the environment. | 54 |
| Natural Disaster | Relatively sudden events causing large-scale, widespread death, loss of property, and disturbance to social systems over which people have little or no control. | 54 |
| Disaster (official) | An undesirable occurrence resulting from forces largely outside human control, strikes quickly with little/no warning, causes serious disruption of life/property, requires mobilisation beyond statutory emergency services. | 53 |
| Tsunami | High vertical waves (harbour waves/seismic sea waves/Shallow Water Waves) caused by abrupt sea-floor movement due to earthquakes or volcanic eruptions. | 59 |

| Term | Definition | Page |
|---|---|---|
| Storm Surge | Abnormal rise in sea level generated by the interaction of air, sea, and land during a tropical cyclone. | 60 |
| Meteorological Drought | Prolonged period of inadequate rainfall with mal-distribution over time and space. | 64 |
| Agricultural Drought | Also called soil moisture drought; characterised by low soil moisture causing crop failures. | 64 |
| Hydrological Drought | Availability of water in aquifers, lakes, and reservoirs falls below what precipitation can replenish. | 64 |
| Ecological Drought | Productivity of a natural ecosystem fails due to water shortage, inducing ecological distress. | 64 |
| Landslide | Rapid sliding of large mass of bedrocks; controlled by highly localised factors including geology, slope, land-use, vegetation cover, and human activities. | 66 |
| IDNDR | International Decade for Natural Disaster Reduction; the decade 1990-2000 declared by the World Conference on Natural Disaster Reduction at Yokohama, 1994. | 56 |
| Jhumming | Slash and Burn / Shifting Cultivation prevalent in north-eastern hill states, which contributes to landslide vulnerability. | 67 |

## 2.3 Diagrams / processes to remember

- **Table 6.1 — Classification of Natural Disasters** (p. 55): A four-column table organising disasters as Atmospheric, Terrestrial, Aquatic, and Biological. Essential for "which category" type MCQs (e.g., blizzards = Atmospheric; earthquakes = Terrestrial; tsunami = Aquatic; locusts = Biological).
- **Figure 6.2 — India: Earthquake Hazard Zones** (p. 58): Shows five MSK-scale zones across India (Very High MSK IX, High MSK VIII, Moderate MSK VII, Low MSK VI, Very Low MSK V). Key: Northeast states and Kuchchh = MSK IX; Deccan Plateau = safest. Read alongside Table 6.2 on earthquake effects.
- **Table 6.2 — Effects of Earthquakes** (p. 57): Three-column table (On Ground / On Manmade Structures / On Water). Frequently tested — students must distinguish which effects fall under which category (e.g., liquefaction = Ground; buckling = Manmade Structures; hydro-dynamic pressure = Water).
- **Figure 6.4 — Wind and Cyclone Hazard Zones** (p. 61): Shows six wind-speed-based zones from Very High Damage Risk Zone-A (V = 55 m/s) to Low Damage Risk Zone (V = 34 m/s). Coastal belt including J&K/Ladakh (Very High-A) and parts of the northeast/Bay of Bengal coast (Very High-B) are most vulnerable.
- **Figure 6.6 — Flood Hazard Zones** (p. 63): Map showing areas liable to flood concentrated along major river systems — Ganga-Brahmaputra plains in the north and northeast, parts of eastern coastal deltas.

- **Figure 6.7 — Drought Prone Areas** (p. 65): Four-zone map (Extreme, Severe, Moderate, Drought Free). Rajasthan (Marusthali/Kachchh) = Extreme; large swathes of peninsular India = Severe/Moderate.

### 2.4 Common confusions / NTA trap points

- **Hazard vs. Disaster:** Students confuse the two. Remember: a hazard becomes a disaster when the magnitude of destruction is very high. Not every hazard triggers a disaster; the difference is in the scale of damage and societal disruption.
- **Blizzards fall under Atmospheric, not Terrestrial:** NTA commonly tests Table 6.1 categories. Blizzards, thunderstorms, tornadoes, droughts, hailstorms, and heat waves are all Atmospheric — not Terrestrial. Earthquakes and volcanic eruptions are Terrestrial.
- **Tsunami wave speed:** Tsunamis are faster in shallow water than in the ocean deep — the opposite of ordinary wind waves. Students often invert this. Also, over deep ocean a tsunami has long wave-length and low wave-height; it is only near the coast (shallow water) that wave-height grows to 15 m or more.
- **Cyclone latitude limit:** Tropical cyclones cannot form between 0°–5° latitude because the Coriolis force is absent near the equator. NTA may frame this as "which of the following latitudes does NOT experience tropical cyclones?" with 0°–5° as the correct answer.
- **Agricultural drought exclusion rule:** An area with more than 30 per cent of its gross cropped area under irrigation is excluded from the drought-prone category — a counter-intuitive fact that NTA uses as a distractor.
- **Majuli and floods:** Floods are generally harmful, but they also make a positive contribution — annual floods deposit fertile silt. Majuli (Assam, Brahmaputra) is the best example. NTA may frame assertion-reason questions testing whether students know that Majuli is the largest riverine island.

## 🎯 Practice MCQs

## 📊 PYQ Alignment

This chapter appears frequently in CUET Geography papers, particularly through map-based and classification questions on India's earthquake zones, drought-prone regions, flood-prone states, and cyclone hazard zones, as well as definition-based questions that test the distinction between natural hazards and natural disasters and the types of droughts. Statement-based MCQs on tsunami wave behaviour and cyclone formation conditions are also commonly drawn from this chapter.

Natural Hazards and Disasters appears in CUET (UG) Geography across 1 cycle(s). The questions below were extracted from official CUET (UG) papers and matched to this chapter by topic — see `/pyq/geography` for the full PYQ archive.

## CUET 2025 — Actual PYQs from this chapter

**Q.39 (CUET 2025)** Which type of pollution is considered the world's top environmental health risk by the World Health Organization?

- A) Noise pollution
- B) Water pollution
- C) Air pollution
- D) Soil pollution

Tests: aligns with chapter content Answer: Not in extracted key — verify against official NTA key

**Q.41 (CUET 2025)** Which of the following activities contribute to water pollution?

- A) Disposal of untreated sewage
- B) Industrial effluents
- C) Agricultural chemicals
- D) All of the above

Tests: aligns with chapter content Answer: Not in extracted key — verify against official NTA key

**Q.42 (CUET 2025)** Which pollutant is mainly responsible for acid rain?

- A) Carbon dioxide
- B) Sulphur dioxide
- C) Oxygen
- D) Nitrogen

Tests: aligns with chapter content Answer: Not in extracted key — verify against official NTA key

**Q.44 (CUET 2025)** Which of the following is a major cause of land degradation in India?

- A) Over-irrigation
- B) Deforestation
- C) Mining
- D) All of the above

Tests: aligns with chapter content Answer: Not in extracted key — verify against official NTA key

**Q.45 (CUET 2025)** Which environmental issue results from excessive use of fertilisers and pesticides?

- A) Soil erosion

- B) Water pollution
- C) Deforestation
- D) Desertification

Tests: aligns with chapter content Answer: Not in extracted key — verify against official NTA key