



# CIVIL SERVICES ACHIEVERS' POINT

**CSAP's SMART BOOK**

# DISASTER MANAGEMENT IN INDIA

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## CHAPTER 1 DISASTER AND HAZARD

### DISASTER

**United Nations Office for Disaster Risk Reduction (UNDRR)** defines disaster as "a serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts." (UNISDR 2016).

**DM Act 2005** defines disaster as: "Disaster" means a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or manmade causes, or by accident or negligence which results in substantial loss of life or human suffering or damage to, and destruction of, property, or damage to, or degradation of, environment, and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area."

### HAZARDS

According to the United Nations International Strategy for Disaster Reduction (UNISDR), a hazard is a natural process or phenomenon that may pose adverse impacts on the economy, society, and ecology, including both natural factors and anthropogenic factors. For example, Typhoons, floods and fire are hazards.

A **hazard becomes a disaster** when it **occurs in an area where many people live or work** and it **harms them and their property**. It is also a threat, a future source of danger with the potential to cause damage to:

- ✓ **People:** Death, injury, disease, and stress
- ✓ **Property:** Damage to property, economic and monetary loss, loss of livelihood
- ✓ **Environment:** Loss of flora and fauna, pollution, loss of biodiversity, degradation of land

### DISASTER VS HAZARD

DISASTER	HAZARD
Disaster is an event that occurs suddenly/unexpectedly in most cases and disrupts the normal course of life in affected area. It results in loss or damage to life, property or environment. This Loss is beyond the coping capacity of local affected population/ society. And therefore, requires external help.	Hazard is an event that has potential for causing injury/ loss of life or damage to property/ environment.

### Hazards may be Classified as

<b>Geophysical hazard</b>	Hazard emanating from solid earth.
<b>Hydrological hazard</b>	This hazard caused due to the occurrence, movement, and distribution of the surface and subsurface freshwater or saltwater.
<b>Meteorological hazard</b>	Hazard occurs because of short lived micro- to meso-scale extreme weather and atmospheric conditions that could last from minutes to days.
<b>Climatological hazard</b>	Hazard caused by long-lived, meso to macro-scale atmospheric processes ranging from intra-seasonal to multi-decadal climate variability.
<b>Biological hazard</b>	Hazard caused by the exposure to living organisms and/or the toxic substances or vector-borne diseases that they may carry
<b>Extraterrestrial hazard</b>	Hazard caused by asteroids, meteoroids, and comets as they pass near earth, enter the earth's atmosphere, and/or strike the earth, or change in interplanetary conditions that affect the earth's magnetosphere, ionosphere, and thermosphere

## BASIC TERMINOLOGIES

1. **Natural Disaster:** Naturally-occurring destructive incidents, such as Earthquakes, Floods, Droughts, Cyclones, Landslides, Coastal erosion, Avalanche, etc., are Destructive.
2. **Man-made Disasters:** Fire, industrial, technological, transportation, nuclear accidents, biological disaster and war.
3. **Vulnerability:** The potential for loss to an individual, community or place because of a disaster that is affected by geographical as well as social conditions.
4. **Emergency:** Local event within a community that affects a limited number of people or property.
5. **Disaster Risk Reduction (DRR):** Systematic development and application of policies, strategies and practices to minimize vulnerabilities and disaster risks.
6. **Mitigation:** The process or result of making disaster less severe, dangerous, painful.
7. **Preparedness:** Contributes to DRR through measures taken in advance, timely and effective early warnings and the temporary evacuation of people and property from threatened locations.
8. **Disaster Response:** The provision of assistance or intervention during or immediately after a disaster to meet the life preservation of people affected.

## RISK AND VULNERABILITY



- Risk is "a measure of the predicted losses resulting from a hazard occurring in a particular place over a particular time". Risk depends on the likelihood of a certain hazardous occurrence and the losses each might bring about.

- **Vulnerability:** The potential for loss to an individual, community, or place because of a disaster that is affected by geographical as well as social conditions. It includes -
  - ✓ **Economic Vulnerabilities:** People working in unorganized sectors and people having lack basic amenities, suffer more during the disaster. They can even lose their source of livelihood.
  - ✓ **Social Vulnerabilities:** During disaster children, the elderly, and differently able, may be unable to protect themselves or evacuate if necessary.
  - ✓ **Physical Vulnerabilities:** Feeble and old homes are more vulnerable.

## CAPACITY AND COPING CAPACITY

- Capacity can be characterized as the combination of all the strengths, attributes, and resources available within an organization or community to manage and reduce disaster risks and strengthen resilience.
- **Coping Capacity:** The ability of individuals, groups, and systems to deal with risky situations, disasters, and bad conditions is known as coping capacity.
  - ✓ The ability to deal involves ongoing knowledge, access to resources, and effective management, both in regular times and in the face of emergencies or challenging circumstances.
  - ✓ Disaster risks are reduced in part due to coping mechanisms.

## DISASTER MANAGEMENT CYCLE



All possible Pre, During, and Post-Disaster Actions, programmes, and measures are included in disaster risk management.

Three important stages of activities which are taken up within disaster risk management are:

1. **Pre-Disaster:** It includes actions made to limit losses to people and property brought on by possible hazards.
  - Pre-disaster risk management includes prevention, mitigation, and readiness, make up a typical disaster management continuum
  - For instance, launching awareness campaigns, bolstering the weak systems already in place, creating strategies for crisis management at the family and community levels, etc.
  - These risk reduction actions are referred

to as mitigation and preparation activities at this stage.

2. **During Disaster:** Actions made to ensure that victims' requirements are satisfied, their needs are provided for, and their suffering is kept to a minimum. Emergency response actions are those undertaken during this time.
3. **Post-Disaster:** The post-disaster crisis management phase, which entails assistance, intervention, recovery, rehabilitation, and reconstruction.
  - Actions conducted right away when a tragedy hits with the aim of achieving early recovery and rehabilitation of impacted communities.
  - These actions are referred to as Response and recovery efforts.

**DISASTER MATRIX**

Disaster Caused by	Natural Events						Accidents			Biological	Disruption of Essential Services
	Climatic			Geological			Industrial	Nuclear	Fire		
Features	Drought	Cyclone	Tsunami	Floods	Earthquake	Landslide				Industrial	Nuclear
Is Early Warning Possible?	Yes	Limited	Very Limited	Limited	No	No	No	No	No	Yes	Limited
Level of Community participation	Some Extent	Some Extent	Nil	Some Extent	Nil	Nil	Nil	Nil	Limited	Nil	Limited
Duration of Disaster	Few Months	Few Days	Few Hours	Few Days	Few Minutes	Few Minutes	Few Days	Prolonged	Few hours/day	Prolonged	Few Days
Whether Building Structure important?	No	Yes	Yes	Yes	Yes	Limited	No	No	Yes	No	No
Affected Areas	Large	Large	Large	Medium	Large	Limited	Limited	Medium	Limited	Medium	Large
Is Mitigation measures Possible?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Is Rescue Required?	No	Yes	Yes	Yes	Large Scale	Yes	Yes	Yes	Yes	No	No

## CHAPTER 2 NATURAL DISASTER

India has faced some of the deadliest disasters in recent history. From natural disasters like earthquakes and floods to man-made disasters like the Bhopal gas tragedy, it is important to manage calamities with proper planning and mitigate these issues fast, reducing the loss of human lives and biodiversity. Disasters in India have founded the National Disaster Management Authority, an apex body that controls all disaster management-related tasks.

### Types of Disasters

There are two types of disasters: -

1. Natural Disasters
2. Man-made or technological disasters

**Natural Disasters:** A natural disaster is an event that can result in injury, loss of assets and death too. Examples of Natural Disasters are earthquakes, landslides, volcanic eruptions, floods, hurricanes, tornadoes, blizzards, tsunamis, cyclones, wildfires, pandemics etc.

**Man-made and technological disasters:** Human-caused disasters are the result of technical or human-caused risks. War, civil unrest, stampedes, fires, transport accidents, industrial accidents, conflicts, oil spills, terrorist attacks, and nuclear explosions/radiation few examples.

### EARTHQUAKE

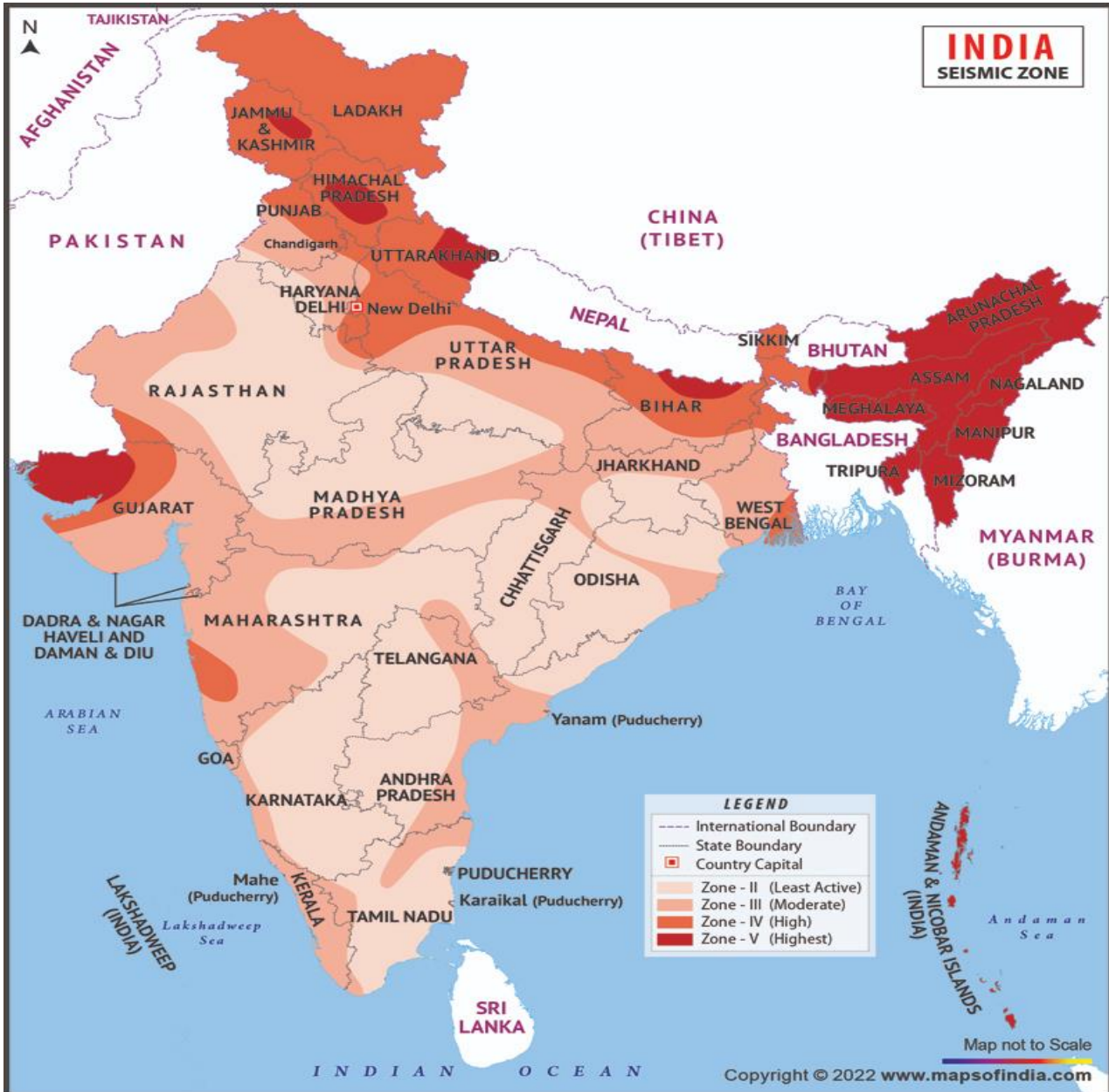
An earthquake is a geographical phenomenon that happens due to sudden movement of underneath crustal plates and causes the ground and everything on it to shake violently. It happens when accumulated stress from shifting crustal or lithospheric plates is released. Earthquakes have tectonic origins, that is.

### Types of Earthquakes

<b>Tectonic Earthquake</b>	<ul style="list-style-type: none"> <li>• Most common type of earthquake</li> <li>• It occurs when shifting of plates are responsible for the occurrence of strong tremors, strength at a point of rock due to strain exceeds the strength of the rocks. As a result, fracture develops and the same propagate rapidly through the rock.</li> </ul>
<b>Volcanic Earthquake</b>	<ul style="list-style-type: none"> <li>• This occurs because of Volcanic activity. Rising lava or magma beneath active volcanoes causes violent movement of plates results into volcanic earthquakes.</li> <li>• Ex. Earthquake in Indonesia, Andaman &amp; Nicobar Islands</li> </ul>
<b>Collapse Earthquake</b>	These are small earthquakes in underground caverns and mines that are caused by seismic waves produced due to explosion in rocks during mining.
<b>Explosion Earthquake</b>	This earthquake is the result of the detonation of a nuclear and/or chemical device.
<b>Reservoir Induced Earthquake</b>	It occurs in the areas of huge reservoirs like dams.

### 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 the tectonic setup of the region.
- **Bureau of Indian Standards (BIS)** is the official agency for publishing seismic hazard maps and codes.
- Earthquakes prone area: 59% of India's territory is vulnerable to earthquakes.



**Seismic Zone Designation**

**Seismic Zone II:**

- Area with minor damage earthquakes corresponding to intensities V to VI of MM scale (MM-Modified Mercalli Intensity scale)
- It covers remaining parts (Areas other than Seismic Zone III, IV, V) of the country.

**Seismic Zone III:**

- Moderate damage corresponding to intensity VII of MM scale.

- It covers the parts of Uttar Pradesh, Gujarat and West Bengal, Parts of Punjab, Rajasthan, Madhya Pradesh, Bihar, Jharkhand, Chhattisgarh, Kerala, Goa, Lakshadweep islands, Maharashtra, Orissa, Andhra Pradesh, Tamil Nadu, and Karnataka.

**Seismic Zone IV:**

- Major damage corresponding to intensity VII and higher of MM scale.
- It covers the parts of Jammu and Kashmir and Himachal Pradesh, Delhi, Sikkim, parts of Gujarat and small portions of Maharashtra

near the west coast, Rajasthan, Northern Parts of Uttar Pradesh, Bihar and West Bengal.

### Seismic Zone V:

- Area determined by pro seismically of certain major fault systems and is seismically the most active 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 IX.
- It covers Northeast India, Some parts of Jammu and Kashmir, Himachal Pradesh, Uttaranchal, Rann of Kutch in Gujarat, part of North Bihar and Andaman & Nicobar Islands.

### Measurement of Strength of Earthquake

Although the shape of earthquake waves is captured by seismographs, the Richter Scale and Mercalli Scale are used to assess the strength and magnitude of earthquakes.

**Richter Scale:** It was developed by Charles Richter, measures the magnitude of the energy released during the Earthquake. The Richter scale is logarithmic and based on 10 in nature. Although there is no limit to this scale, it has never recorded an earthquake of a magnitude greater than 8.9.

**Mercalli Scale:** It was developed by Giuseppe Mercalli, and expanded to include 12 degrees of intensity by Adolfo. It measures the intensity of an earthquake based on its real impacts on people, the environment and the Earth's surface. It is a closed-ended linear scale with a range of 1 to 12 or I to XII, with intensity 1 earthquakes having little impact and intensity 12 earthquakes completely destroying everything.

### Earthquake Risk in India

1. India's increasing population and extensive unscientific constructions mushrooming all over keep India at high risk

2. During the last 15 years, the country has experienced some major earthquakes which have resulted in enormous losses.
3. As per the current seismic zone map of the country, over 59 per cent of India's land area is under threat of moderate to severe seismic hazard (Prone to shaking of MSK Intensity VII and above).
4. The Himalayan region has witnessed four earthquakes of magnitude exceeding 8.0 [1897 Shillong (M8.7); 1905 Kangra (M8.0); 1934 Bihar-Nepal (M8.3); and 1950 Assam-Tibet] in the last 50 years.
5. The Koyana earthquake (1967) and Killari earthquake in 1993 have endorsed the theory of the emergence of a fault line and energy build-up along the fault line of the river Bhima (Krishna) near Latur and Osmanabad (Maharashtra).
6. The increase in earthquake risk is due to a spurt in developmental activities driven by growing
7. Urbanisation, globalisation, and economic progress of India's economy.

### NDMA Guidelines on Earthquake Management

Guidelines issued by NDMA rest on six pillars of seismic safety for improving the effectiveness of earthquake management in India:

1. **PILLAR 1: Earthquake Resistant Construction of New Structures:** All central ministries and departments and state governments will facilitate the implementation of relevant standards for seismically safe design and construction of buildings and other lifeline and commercially important structures falling within their administrative control such as bridges, flyovers, ports, harbours etc.
2. **PILLAR 2: Selective Seismic strengthening & retrofitting of existing Priority structures and Lifeline Structures:** All central ministries and state governments are required to draw up programs for seismic strengthening of priority structures through ULBs and PRIs. Buildings of national importance such as Raj Bhavans, Legislatures, Courts, critical buildings like academic institutions, public utility structures like reservoirs, dams and