Mains Practice Question

Q. Differentiate between Hazard, Vulnerability, and Risk in the context of disaster management, and explain their interrelationship with suitable examples. **(150 words)**

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Approach

- Introduction the answer by highlight the significance of recognizing distinction in hazard, vulnerability, and risk
- Define Hazard, Vulnerability and Risk and its their with examples
- Show the interlinkage between the three with suitable example
- Conclude suitably

Introduction

In disaster management, recognizing **distinction in hazard, vulnerability, and risk** is essential for developing effective **mitigation and response strategies**. These concepts are interconnected and together determine the potential impact of a disaster.

Body

Hazard: It is a potentially damaging physical event, phenomenon, or human activity that can cause harm to life, property, or the environment. Hazards can be:

- **Natural Hazards:** Earthquakes, floods, cyclones, wildfires.
  - ***Example:*** A **7-magnitude earthquake** in a seismically active zone like the Himalayas.
- **Anthropogenic Hazards**: Industrial accidents, deforestation, chemical spills.
  - ***Example:*** The **Bhopal Gas Tragedy of 1984** caused by a chemical leak.

Vulnerability
Vulnerability refers to the susceptibility of a community, system, or asset to the impact of hazards. It varies across:

- **Economic Vulnerability:** Limited financial resources and dependence on primary sectors like agriculture increase vulnerability. (**Farmers in flood-prone Bihar** losing their crops annually).
- **Physical Vulnerability**: Poorly constructed buildings or settlements in hazard-prone areas. (**Coastal areas in Odisha** face cyclones regularly due to lack of resilient infrastructure).
- **Social Vulnerability:** Disadvantaged groups, such as the elderly, children, and disabled, are disproportionately affected. (Low evacuation rates for **disabled individuals during the 2004 Indian Ocean Tsunami).**
- **Environmental Vulnerability:** Degradation of ecosystems amplifies disaster impacts. **(Loss of mangroves in Gujarat** reducing resilience against cyclones).

Risk
Risk is the likelihood of loss or damage from a hazard, determined by the interaction between the hazard

and the community's vulnerability. It is quantified using the formula:

Risk = Probability of Hazard × Degree of Vulnerability

Types of Risk Management:

- **Risk Acceptance**: Choosing to live with known risks. (Farmers cultivating on volcanic soils despite eruption risks).
- **Risk Avoidance**: Eliminating exposure to hazards. (Prohibiting construction in flood-prone zones).
- **Risk Reduction:** Minimizing the impact of hazards. (Constructing earthquake-resistant buildings in **Japan)**.
- **Risk Transfer:** Sharing risks through mechanisms like insurance. (Crop insurance schemes for farmers in drought-prone regions).

Interrelationship Between Hazard, Vulnerability, and Risk
The three concepts are intricately linked: A **hazard** becomes a **risk** only when it interacts with a community's **vulnerability. Risk can be mitigated by reducing vulnerability o**r minimizing exposure to hazards.

Examples:

- **Cyclone in Coastal Odisha:**
  - **Hazard**: Cyclone-induced winds and storm surges.
  - **Vulnerability:** Poorly constructed houses, high poverty levels.
  - **Risk:** High loss of life and property.
  - **Mitigation**: Cyclone shelters and early warning systems have reduced risks in recent years.

Conclusion

The relationship between **hazard, vulnerability, and risk** underscores the importance of **comprehensive disaster management strategies**. While hazards are unavoidable, reducing vulnerabilities through preparedness, resilient infrastructure, and community awareness can significantly mitigate risks.