Times asked: 6 times
5 times
4 times
3 times
2 times
1 time
# indicates 5-mark question
No repeated questions in module 3

DMMM Question bank

1. Introduction

1. Define the terms disaster, hazard, risk and vulnerability. #
2. Explain Global warming and its effects. #
3. What is climate change? Discuss its causes, ecological repercussions and implications. #
4. Discuss the direct and indirect impacts of disasters on human life, infrastructure, and socioeconomic development.
5. What is the Disaster Scenario of India? #

2. Natural Disasters and Manmade disasters

6. Explain the various types of man-made disasters, including technological disasters. Discuss their causes, impacts, and mitigation measures.
7. What are the different types of flood? Enlist structural mitigation measures for flood.
8. Explain disaster management strategies for floods in urban areas and discuss the implications of urban flooding for major cities.
9. What are droughts? Classify their types and state the mitigation measures taken in drought prone areas.
10. Discuss various types of natural disasters in India and highlight their impacts on life. #
11. Explain man-made hazards. Discuss radiation hazards and the possibilities of chemical spills. #
12. Explain volcanic eruptions and discuss the various hazards associated with them.
13. Explain various terms and concepts related to earthquakes and outline the key guidelines for earthquake safety.

4. Institutional Framework for Disaster Management in India

14. Discuss the role and applications of GIS, GPS, and Remote Sensing in the disaster management process.
15. Explain the scope, responsibilities, and guidelines of NDMA.
16. Explain the scope, functions, and responsibilities of NIDM.
17. Write a short note on DM Act 2005.
18. Explain the institutional mechanism for disaster management in India and discuss the roles, functions, and coordination of various government agencies involved.

5. Financing Relief Measures

19. Explain various ways of raising finance for mitigating and managing disasters.
20. What is the role of NGOs in disaster management? Enlist major NGOs working on disaster management.
21. Explain the role and contributions of international aid organizations in crisis response.

6. Preventive and Mitigation Measures

22. Write a short note on Triage. #
23. Explain Bio shield and Sea wall in detail with a diagram. Define embankments.
24. Define Capacity building and explain its application with a case study of Community-Based Disaster Management (CBDM).
25. Enumerate the essential Do's and Don'ts in the event of the following disasters:
    i. Covid-like pandemic
    ii. Earthquake
    iii. Tsunami
    iv. Cyclone
26. Explain non-structural mitigation measures. Describe non-structural measures for pandemic containment, tsunamis and cyclones.
27. Explain structural mitigation measures. Describe non-structural measures for tsunamis and cyclones.

	1	2	3	4	5	6
2025 May	10	43	5	30	15	17
2024 Dec	15	18	5	30	23	39
2024 May	15	15	15	30	20	35
2023 Dec	6	39	5	31	12	47
2023 May	15	35	0	40	20	15
2022 Dec	20	25	0	40	10	30
Estimate	**15**	**30**	**5**	**30**	**20**	**30**
Total	81	175	30	201	100	183

Asked once:

# indicates 5-mark question

1. Introduction

1. Differentiate between Risk and Vulnerability. #

2. Natural Disasters and Manmade disasters

2. Discuss the role of growing population, industrialization, urbanization, and changing lifestyles in contributing to environmental degradation. What measures can be taken to mitigate their impact?
3. Delve into the paradox of industrialization: economic progress versus the threat of industrial mishaps. [8]
4. Write a short note on Environmental hazard. #
5. Is rapid depletion of ground water a type of disaster? To which category does this belong? What are the reasons for this problem? #
6. Explain disasters related to industries. Discuss the socioeconomic impact of industrial disasters with a case study.
7. Explain the types of landslide and factors affecting them. Give a case study for the same.

3. Disaster Management, Policy and Administration

8. Explain PDCA cycle of disaster management. #
9. Explain the evolving approaches to disaster management in India.
10. Justify the significance of studying Disaster Management, highlighting its role in enhancing resilience, minimizing risks, and promoting sustainable development. #
11. Describe the Search and Rescue (SAR) procedure in disaster response, supported by a case study illustrating its implementation and effectiveness.
12. Write a short note on National Disaster Management Policy. #

4. Institutional Framework for Disaster Management in India

13. Assess the involvement of different stakeholders in mass casualty situations. [6]
14. Discuss the framework for disaster management in India. [8]
15. What are different government agencies responsible for various types of disasters?

5. Financing Relief Measures

16. What are the various methods of financial management during a disaster? #
17. Examine the collaborative efforts of government bodies and NGOs in disaster management. [6]

6. Preventive and Mitigation Measures

18. Explain components of Disaster Management: preparedness, response, recovery, and mitigation strategies. List preparedness measures for:
    i. Minimizing chemical disaster losses.
    ii. Minimizing vulnerabilities related to Tsunami.
19. Define early warning systems and illustrate their benefits through recent instances of flood, cyclone, and tsunami alerts. [8]
20. Highlight the protective role of natural ecosystems against disasters, with examples. [6]

21. Define liquefaction and debate the merits of retrofitting versus relocation in landslide-prone areas. [6]
22. and discuss the importance of forecasting, warning and monitoring system in India. [8]
23. Explain in detail the design concepts involved in as well as the construction materials used for the safe construction of facilities in case of earthquakes and cyclones. Also discuss the fire-resistant facilities that need to be essentially provided in a building/industry. [8]
24. Write a short note on Community based disaster preparedness. #
25. What is Community Base Disaster Management (CBDM)? Discuss how it is useful in Indian scenario.

1. Introduction

1. Define the terms disaster, hazard, risk and vulnerability. (5 Marks)

Disaster

A disaster is a sudden, catastrophic event that causes widespread loss of life, property, and environmental damage.
It overwhelms the capacity of the affected community to cope using its own resources.

Hazard

A hazard is a potentially harmful physical event or human activity (natural or manmade) that may cause loss of life, injury, or damage.
A hazard becomes a disaster **only** when it interacts with vulnerable communities.

Risk

Risk refers to the probability of harmful consequences resulting from the interaction of hazard, vulnerability, and capacity.
Formula:
Disaster Risk = Hazard × Vulnerability / Capacity

Vulnerability

Vulnerability is the degree to which a community, system, or individual is likely to suffer damage when exposed to a hazard.
It may be **physical, social, economic, or environmental**.

2. Explain Global Warming and its effects. (10 Marks)

Meaning

Global warming is the long-term increase in Earth's average temperature due to excessive buildup of greenhouse gases (CO_2, CH_4, N_2O).
It is caused by human activities such as burning fossil fuels, deforestation, industrial emissions, and agriculture.

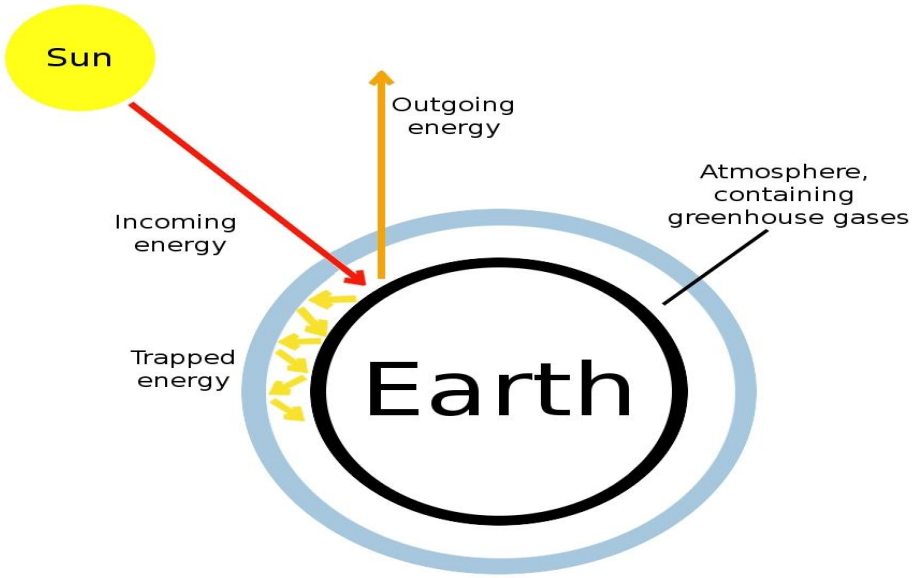
Causes of Global Warming

1. **Burning of Fossil Fuels** – Coal, oil, natural gas release CO_2.
2. **Deforestation** – Reduces natural CO_2 absorption.
3. **Industrial Activities** – Emit CO_2, CH_4, harmful pollutants.
4. **Agriculture** – Livestock produces methane; fertilizers emit nitrous oxide.

5. **Urbanization and Energy Use** – Increased fuel consumption and pollution.

Greenhouse Effect (Short Explanation)

Greenhouse gases trap heat in the atmosphere and re-radiate it back to Earth.
Human activities intensify this natural effect, leading to warming.



Effects of Global Warming

1. Environmental Effects

- Melting of glaciers and polar ice caps
- Sea level rise and coastal erosion
- Increased frequency of floods, droughts, cyclones
- Ocean warming and acidification
- Loss of biodiversity and habitat destruction

2. Climatic Effects

- Increase in global average temperature
- Extreme heatwaves
- Irregular monsoon patterns
- Increased intensity of storms

3. Socio-Economic Effects

- Reduced crop productivity
- Water scarcity

- Spread of vector-borne diseases
- Migration and displacement of coastal communities
- Economic losses in agriculture, fisheries, and tourism

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3. What is climate change? Discuss its causes, ecological repercussions and implications. (10 Marks)

Meaning

Climate change refers to long-term alterations in Earth's temperature, rainfall patterns, sea levels, and weather conditions.
It includes global warming and its wider effects.

Causes of Climate Change

1. **Greenhouse Gas Emissions** – CO_2, CH_4 from industries, vehicles, and agriculture.
2. **Deforestation** – Reduces carbon absorption.
3. **Industrialization** – High energy consumption and pollution.
4. **Urbanization** – Heat islands, increased fuel use.
5. **Ozone Layer Depletion** (indirect impact).
6. **Natural Causes** – Volcanoes, ocean currents (small contribution).

Ecological Repercussions

1. **Melting of Glaciers & Ice Caps** – Threatens freshwater supplies.
2. **Sea Level Rise** – Flooding of low-lying and coastal regions.
3. **Change in Ecosystems** – Loss of species, coral bleaching.
4. **Extreme Weather Events** – Cyclones, droughts, heatwaves.
5. **Forest Fires** – Increased frequency due to rising temperatures.
6. **Ocean Acidification** – Affects marine life and fisheries.

Implications (Human, Social, Economic)

1. **Agricultural Impact** – Reduced yields, food insecurity.
2. **Water Scarcity** – Drying rivers, reduced rainfall.
3. **Health Issues** – Heat strokes, spread of diseases like malaria.
4. **Economic Losses** – Damage to infrastructure, tourism, and coastal economies.

5. **Migration & Displacement** – Climate refugees from sinking coastal areas.
6. **National Security Threats** – Resource conflicts and instability.

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4. Discuss the direct and indirect impacts of disasters on human life, infrastructure, and socioeconomic development. (10 Marks)

Direct Impacts

A. On Human Life

- Loss of human lives
- Injuries and disabilities
- Displacement of people
- Immediate disruption of livelihoods

B. On Infrastructure

- Collapse of buildings, bridges, roads
- Destruction of water supply, power, and communication networks
- Damage to hospitals, schools, essential services

Indirect Impacts

A. Socioeconomic Impacts

- Economic losses due to halted businesses
- Long-term unemployment
- Increase in poverty levels
- High cost of reconstruction
- Inflation and reduced economic growth

B. Health & Social Effects

- Psychological trauma, anxiety, depression
- Outbreak of diseases due to poor sanitation
- Malnutrition due to food shortages
- Migration and overcrowding in cities

C. Environmental Impacts

- Soil erosion and land degradation
- Water contamination

- Loss of biodiversity
- Long-term ecosystem damage

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5. What is the Disaster Scenario of India? (5 Marks)

Disaster Scenario in India

India is one of the most disaster-prone countries due to its diverse geography and climate.
It experiences almost all major natural and manmade disasters.

Key Facts

- **60%** of landmass is prone to earthquakes
- **40 million hectares** are flood-prone
- **70%** of agricultural land is drought-prone
- **8%** of coastline is vulnerable to cyclones
- Himalayan region faces frequent landslides & avalanches

Major Disaster Examples

- Gujarat earthquake (2001)
- Indian Ocean Tsunami (2004)
- Uttarakhand floods (2013)
- Cyclone Phailin (2013)
- Assam & Bihar floods
- Latur earthquake (1993)

Institutional Framework

- **Disaster Management Act, 2005**
- **National Disaster Management Authority (NDMA)**
- **National Institute of Disaster Management (NIDM)**

Conclusion

India's scenario highlights the need for strong policies, early warning systems, preparedness, and community-level resilience.

2. Natural Disasters and Manmade disasters

6. Explain the various types of man-made disasters, including technological disasters. Discuss their causes, impacts, and mitigation measures. (10 Marks)

Meaning

Man-made disasters originate due to human negligence, technological failures, unsafe industrial practices, urbanization, or deliberate actions like terrorism.

Types of Man-Made Disasters

1. Industrial Disasters

- Industrial explosions, gas leaks, fires
- Example: **Bhopal Gas Tragedy (1984)**

2. Chemical Disasters

- Release of hazardous chemicals due to storage failure, transport accidents
- Example: **Beirut ammonium nitrate explosion (2020)**

3. Nuclear Disasters

- Radiation release due to malfunction or natural triggers
- Example: **Chernobyl (1986)**, **Fukushima (2011)**

4. Fire Hazards

- Urban fires, factory fires, electrical fires

5. Transportation Accidents

- Train derailments, aviation crashes, oil spills

6. Cyber & Technological Disasters

- System failures, power grid failures, cyberattacks compromising critical infrastructure

7. Environmental Degradation

- Deforestation, mining, overuse of pesticides causing soil pollution and ecological collapse

Causes

- Negligence and human error
- Lack of regulation and oversight

- Unsafe storage and poor maintenance
- Technological malfunction
- Terrorism or sabotage
- Rapid urbanization and population pressure

Impacts

Human

- Mass casualties, long-term health issues, burns, poisoning
- Psychological trauma

Environmental

- Air, water, soil pollution
- Loss of biodiversity

Economic

- Shutdown of industries
- High compensation and rehabilitation costs

Social

- Migration, loss of livelihood, mistrust in authorities

Mitigation Measures

- Strict safety laws and audits
- Emergency response teams and drills
- Hazard analysis and risk assessments
- Safe storage, labeling, and transport of chemicals
- Worker training, PPE, alarms, and sensors
- Community awareness and evacuation planning
- Use of GIS, IoT, and monitoring technologies

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7. What are the different types of flood? Enlist structural mitigation measures for flood. (10 Marks)

Types of Floods

1. River Floods

Caused by river overflow due to heavy rainfall or snowmelt.

2. Flash Floods

Sudden, high-velocity floods triggered by cloudbursts or dam failure.

3. Urban Floods

Caused by poor drainage, blocked sewage, and rapid urbanization.

4. Coastal Floods

Due to cyclones, storm surges, or sea-level rise.

5. Coastal/Storm Surge Flooding

High sea waves pushed inland by strong winds during cyclones.

6. Groundwater Floods

Rise in groundwater level after prolonged rainfall.

Structural Mitigation Measures

1. **Dams and Reservoirs** – Regulate water flow
2. **Levees and Embankments** – Prevent river overflow
3. **Detention Basins & Check Dams** – Reduce water velocity
4. **Stormwater Drainage Systems** – Prevent urban waterlogging
5. **River Channelization** – Straightening and deepening channels
6. **Construction of Flood Walls** – For urban and industrial areas
7. **Sea Walls, Tidal Barrages** – Protect coastal regions
8. **Watershed Management Structures** – Contour bunding, terracing

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8. Explain disaster management strategies for floods in urban areas and discuss the implications of urban flooding for major cities. (10 Marks)

Urban Flood Disaster Management Strategies

1. Structural Measures

- Upgradation of stormwater drainage

- Construction of retention ponds
- Rainwater harvesting systems
- Building embankments and flood walls
- Pumping stations in low-lying areas

2. Non-Structural Measures

- Flood forecasting and early warning systems
- GIS-based flood mapping
- Banning construction in floodplains
- Urban planning with permeable surfaces
- Public awareness and mock drills

3. Emergency Response

- Integrated communication system
- Immediate evacuation and relief shelters
- Medical camps and rescue operations

4. Long-term Measures

- Smart city drainage with IoT sensors
- Revising building codes for flood zones
- Ecosystem restoration (wetlands, lakes)

Implications of Urban Flooding

1. Human Impact

- Deaths due to drowning and electrocution
- Displacement of urban populations

2. Infrastructure Damage

- Waterlogging of roads, flyovers, tunnels
- Damage to power supply & communication lines
- Disruption of transport, metro services

3. Economic Loss

- Business interruption
- High property damage
- Increased insurance burden

4. Environmental Impact

- Contamination of water bodies
- Overflow of sewage
- Spread of diseases like cholera & dengue

Examples

- Mumbai Floods (2005)
- Chennai Floods (2015)
- Bengaluru Floods (2022)

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9. What are droughts? Classify their types and state the mitigation measures taken in drought-prone areas. (10 Marks)

Meaning

A drought is a prolonged period of deficient rainfall causing acute water scarcity.
It develops slowly and affects agriculture, water supply, economy, and environment.

Types of Drought

1. Meteorological Drought

Rainfall much below normal average.

2. Agricultural Drought

Soil moisture insufficient for crop growth.

3. Hydrological Drought

Low water levels in rivers, lakes, reservoirs.

4. Socioeconomic Drought

When water scarcity affects livelihoods, economy, and society.

Mitigation Measures

1. Water Conservation

- Rainwater harvesting
- Check dams, percolation tanks
- Drip and sprinkler irrigation

2. Crop Management

- Drought-resistant crop varieties
- Shift to millets and pulses
- Efficient irrigation scheduling

3. Government Initiatives

- NDMC – National Drought Mitigation Centre
- PMKSY – irrigation schemes
- MGNREGA – water conservation works
- Crop insurance – PM Fasal Bima Yojana

4. Community-based Measures

- Awareness programmes
- Maintaining village ponds and wells
- Watershed development

5. Environmental Measures

- Afforestation
- Soil conservation
- Wetland restoration

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10. Discuss various types of natural disasters in India and highlight their impacts on life. (5 Marks)

Types of Natural Disasters in India

1. **Earthquakes** – Himalayan belt highly prone
2. **Floods & Flash Floods** – Ganga & Brahmaputra basins
3. **Cyclones** – Bay of Bengal & Arabian Sea
4. **Landslides** – Himalayas, Western Ghats
5. **Droughts** – Maharashtra, Rajasthan
6. **Heatwaves** – North & Central India
7. **Avalanches** – Himalayan regions
8. **Volcanic Activity** – Barren Island (Andaman)

Impacts on Life

- Loss of life & severe injuries

- Psychological trauma
- Destruction of homes and infrastructure
- Water and food scarcity
- Spread of epidemics
- Economic losses and unemployment
- Displacement and migration

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11. Explain man-made hazards. Discuss radiation hazards and the possibilities of chemical spills. (5 Marks)

Man-Made Hazards

These arise from human activities like industrialization, technology use, transport, and negligence.

Radiation Hazards

- Caused by nuclear plant leaks, medical radiation misuse, or accidents
- Effects:
    - Acute radiation sickness
    - Cancer, genetic mutations
    - Environmental contamination
- Examples: **Chernobyl**, **Fukushima**

Chemical Spills

- Occur during transport, storage failure, industrial operations
- Consequences:
    - Toxic gas release (MIC in Bhopal)
    - Soil and water contamination
    - Fire and explosion risks
- Prevention:
    - MSDS usage
    - Safe storage & labeling
    - Automatic leak detection systems

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12. Explain volcanic eruptions and discuss the various hazards associated with them. (10 Marks)

Volcanic Eruption – Meaning

A volcanic eruption is the expulsion of magma, ash, and gases from a volcano through Earth's crust.

Hazards Associated with Volcanic Eruptions

1. Lava Flows

- Destroy everything in path
- Slow-moving but extremely hot

2. Ash Fall

- Causes roof collapse, crop failure, health issues
- Disrupts air travel

3. Pyroclastic Flows

- Fast-moving clouds of hot gas & ash
- Extremely lethal

4. Volcanic Gas Emissions

- CO_2, SO_2 cause breathing problems and acid rain

5. Lahars (Volcanic Mudflows)

- Mix of ash and water
- Damage rivers, bridges, settlements

6. Tsunamis

- Triggered by submarine eruptions

7. Climate Effects

- Global cooling due to ash blocking sunlight

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13. Explain various terms and concepts related to earthquakes and outline the key guidelines for earthquake safety. (10 Marks)

Key Terms

1. Focus

Point inside Earth where earthquake originates.

2. Epicenter

Point on Earth's surface directly above the focus.

3. Seismic Waves

Energy waves produced during an earthquake (P-waves, S-waves).

4. Richter Scale

Measures magnitude (energy released).

5. Mercalli Scale

Measures intensity (damage caused).

6. Fault Lines

Fractures along which crustal plates move.

7. Aftershocks

Smaller tremors following a major quake.

Earthquake Safety Guidelines

Before an Earthquake

- Follow building codes (IS 1893)
- Secure furniture, gas cylinders
- Prepare emergency kits

During an Earthquake

- **Drop, Cover, Hold**
- Stay away from windows
- Do not use elevators

After an Earthquake

- Evacuate safely
- Turn off gas and electricity
- Avoid damaged buildings
- Listen to official announcements

4. Institutional Framework for Disaster Management in India

14. Discuss the role and applications of GIS, GPS, and Remote Sensing in the disaster management process. (10 Marks)

GIS (Geographical Information System)

Role

GIS integrates spatial and non-spatial data to create maps, analyse hazards, and support decision-making in all phases of disaster management.

Applications

1. **Hazard Zonation Maps** – Flood zones, earthquake fault lines, landslide-prone areas.
2. **Risk Assessment** – Overlay of population, infrastructure, and hazard data.
3. **Evacuation Planning** – Identifying shortest safe routes.
4. **Resource Allocation** – Locating hospitals, shelters, relief centers.
5. **Real-time Monitoring** – Flood levels, storm tracks, rainfall.
6. **Damage Assessment** – Comparison of pre- and post-disaster images.

GPS (Global Positioning System)

Role

GPS provides accurate location and time data useful during rescue, relief, and mapping operations.

Applications

1. **Locating Victims & Rescue Teams**
2. **Tracking Relief Vehicles & Supplies**
3. **Mapping Disaster-hit Areas**
4. **Field Data Collection**
5. **Coordination Between Agencies**

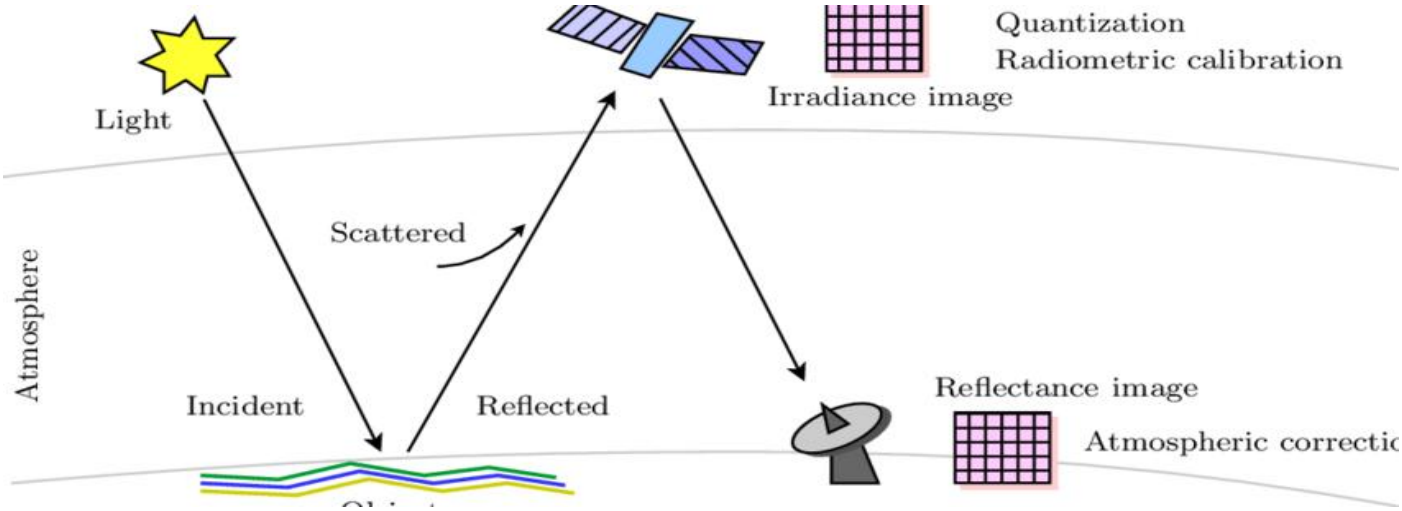
Remote Sensing

Role

Remote sensing uses satellite imagery and aerial photography to detect, monitor, and assess hazards.

Applications

1. **Monitoring Cyclones, Storms, Forest Fires**
2. **Detecting Flood Extent & Water Levels**
3. **Earthquake Damage Assessment**
4. **Landslide Detection**
5. **Drought Monitoring**
6. **Climate Analysis**



Integration of GIS–GPS–RS

- GIS provides analytical power
- GPS offers accuracy
- Remote sensing supplies large-scale real-time data
  Together they strengthen early warning, preparedness, response, and recovery.

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15. Explain the scope, responsibilities, and guidelines of NDMA. (10 Marks)

NDMA (National Disaster Management Authority)

Established under the **DM Act 2005**, headed by the **Prime Minister of India**.

Scope of NDMA

1. Formulation of national-level disaster management policies
2. Coordination between ministries, states, and agencies
3. Approving national disaster plans
4. Strengthening early warning systems

5. Promoting research and training

Responsibilities

1. **Policy Making** – National Disaster Management Policy & guidelines
2. **Planning** – Prepares National Disaster Management Plan (NDMP)
3. **Coordination** – Between ministries, defence, health, telecom, etc.
4. **Mitigation Measures** – Structural and non-structural
5. **Capacity Building** – Training programs, simulations
6. **Awareness Campaigns** – School safety program, community training
7. **Support During Disasters** – Oversight on response, relief, and rehabilitation
8. **International Cooperation** – UN agencies, SAARC disaster framework

Guidelines Issued by NDMA

1. **Earthquake, Flood, Cyclone Management** guidelines
2. **Urban Flooding Guidelines (2010)**
3. **Heatwave Management Guidelines**
4. **Chemical, Biological, Radiological, Nuclear (CBRN)** guidelines
5. **School Safety & Hospital Safety Guidelines**
6. **Landslide & Avalanche Management Guidelines**

These guidelines support uniform planning and preparedness across India.

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16. Explain the scope, functions, and responsibilities of NIDM. (10 Marks)

NIDM (National Institute of Disaster Management)

An apex training and research institute established under the **DM Act 2005**.

Scope

1. Training & capacity building in disaster management
2. Research, documentation, and publication
3. Development of educational materials
4. Consultancy and advisory support to governments
5. Collaboration with international and national universities

Functions

1. **Training Programs** – For officials, NGOs, community workers
2. **Research Projects** – Case studies, vulnerability analysis
3. **Documentation of Disasters** – Best practices, lessons learned
4. **Development of DM Curricula** – For schools, colleges, academies
5. **Professional Courses** – Online and offline DM certifications
6. **Technical Support to NDMA and States**

Responsibilities

1. Strengthening DM preparedness at national and state levels
2. Creating awareness campaigns
3. Training IAS, IPS, engineers, health professionals
4. Conducting simulations and mock drills
5. Coordinating with ministries, UNDP, WHO, SAARC
6. Publishing manuals, handbooks, guidelines

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17. Write a short note on DM Act 2005. (5 Marks)

DM Act 2005

The **Disaster Management Act, 2005** provides a legal and institutional framework for disaster management in India.

Key Features

1. **Establishment of NDMA** at national level (headed by PM).
2. **State Disaster Management Authorities (SDMA)** headed by Chief Ministers.
3. **District Disaster Management Authorities (DDMA)** headed by District Collector.
4. **Creation of NIDM** for training and research.
5. **National Disaster Response Force (NDRF)** for specialized rescue operations.
6. Defines roles, responsibilities, and coordination mechanisms.
7. Ensures planning at national, state, and district levels (NDMP, SDMP, DDMP).
8. Addresses mitigation, preparedness, response, relief, and recovery.

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18. Explain the institutional mechanism for disaster management in India and discuss the roles, functions, and coordination of various government agencies involved. (10 Marks)

Institutional Mechanism in India

1. National Level

a) NDMA

- Policy-making body
- Issues guidelines
- Approves national plans
- Coordinates with ministries

b) NDRF

- Specialized disaster response force
- Search, rescue, medical support

c) NIDM

- Training, research, capacity building

d) National Executive Committee (NEC)

- Implements NDMA policies
- Coordinates major operations
- Headed by Home Secretary

2. State Level

SDMA (State Disaster Management Authority)

- Headed by Chief Minister
- Prepares State Disaster Management Plan
- Coordinates departments like health, PWD, irrigation

State Executive Committee

- Implements SDMA decisions

3. District Level

DDMA (District Disaster Management Authority)

- Headed by District Collector
- Prepares DDMP

- Coordinates on-ground response

Coordination with Other Government Agencies

1. Armed Forces

- Major role in rescue, relief, evacuation
- Airlifting, medical aid, logistics

2. Central Ministries

- **IMD** – weather forecasting
- **ISRO** – satellite data
- **MoHFW** – medical response
- **MoWR** – flood control
- **MoEF** – environmental safety

3. Local Authorities

- Municipal corporations
- Police & fire departments
- Health workers
- Volunteers & community groups

4. International Cooperation

- UN agencies, WHO, SAARC, Red Cross
- Support during large disasters

Flow of Coordination

NDMA → NEC → State Authorities → District Authorities → Local Bodies
Supported by **NDRF, Armed Forces, IMD, ISRO, NGOs**, and community participation.

5. Financing Relief Measures

19. Explain various ways of raising finance for mitigating and managing disasters. (10 Marks)

Financing is a crucial component of disaster preparedness, response, mitigation, and recovery. Effective financial mechanisms ensure timely relief and long-term resilience.

1. Government Funding

a) Budgetary Allocations

- Central and state governments allocate annual funds for disaster prevention and preparedness.

b) National Disaster Response Fund (NDRF)

- Used for immediate relief after severe natural calamities.

c) State Disaster Response Fund (SDRF)

- State-level fund used for relief measures, early warning systems, and preparedness.

2. International Funding

a) World Bank

- Loans and grants for flood control, cyclone shelters, disaster-resilient infrastructure.

b) UN Agencies (UNDP, UNICEF, UNDRR)

- Technical assistance, capacity building, humanitarian support.

c) IMF Emergency Financing

- Rapid credit during major humanitarian crises.

3. Public–Private Partnerships (PPP)

- Private sector supports construction of shelters, early warning systems, and CSR-based relief programs.
- Examples: telecom companies during cyclones, banks funding relief camps.

4. Insurance-Based Financing

a) Catastrophe Insurance

- Protects infrastructure, industries, and homes.

b) Crop Insurance (PM Fasal Bima Yojana)

- Mitigates farmer losses due to floods, droughts, or cyclones.

c) Microinsurance

- Affordable coverage for low-income groups.

5. Community-Based Financing

- Local contributions, self-help groups (SHGs), and village-level funds.
- Useful for small mitigation projects: check dams, watershed work, community shelters.

6. NGO & Philanthropic Contributions

- NGOs raise funds through donations, partnerships, and global campaigns.
- Used for medical help, food distribution, rebuilding homes.

7. Corporate Social Responsibility (CSR)

- Companies contribute finances, relief materials, technology support, and workforce.
- Example: CSR-funded flood shelters, mobile hospitals.

8. Bonds & Financial Instruments

a) Catastrophe Bonds

- High-risk, high-return bonds used to support governments during major disasters.

b) Green Bonds

- Finance resilient infrastructure and climate adaptation projects.

9. Technology & Digital Platforms

- Crowdfunding platforms (Ketto, Milaap, GoFundMe)
- UPI-based government donation portals
- Social media drives for quick fundraising

10. Reconstruction Aid

- Long-term loans and reconstruction grants after earthquakes, tsunamis, and floods.

- Often coordinated by NDMA, NDRF, and international agencies.

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20. What is the role of NGOs in disaster management? Enlist major NGOs working on disaster management. (10 Marks)

Non-Governmental Organizations (NGOs) play a vital role in all phases of disaster management — preparedness, response, mitigation, and recovery.

Roles of NGOs in Disaster Management

1. Preparedness

- Community training, awareness campaigns
- Mock drills and first-aid training
- Preparing local disaster plans
- Capacity building for vulnerable groups

2. Early Warning & Communication

- Disseminating warnings through local networks
- Liaising with communities in remote areas

3. Response & Relief

- Search and rescue (along with NDRF and local teams)
- Medical camps, treatment, psychological counselling
- Distribution of food, water, clothes, shelter materials

4. Rehabilitation

- Rebuilding houses and community centres
- Restoring livelihoods (tools, seeds, livestock)
- Providing long-term education and health support

5. Advocacy

- Promoting disaster-safe infrastructure
- Influencing policy for climate and disaster resilience

6. Coordination

- Working with governments, UN agencies, social workers
- Acting as a bridge between authorities and affected communities

7. Specialised Support

Some NGOs focus on specific areas such as:

- Child protection
- Women's safety
- Mental health
- Water and sanitation (WASH)

Major NGOs Working in Disaster Management (India & International)

India

1. **Red Cross Society of India**
2. **CARE India**
3. **SEEDS India**
4. **Goonj Foundation**
5. **HelpAge India**
6. **Caritas India**
7. **Oxfam India**

International NGOs

1. **International Federation of Red Cross (IFRC)**
2. **Doctors Without Borders (MSF)**
3. **CARE International**
4. **Save the Children**
5. **World Vision International**
6. **ActionAid**
7. **Catholic Relief Services (CRS)**

---

21. Explain the role and contributions of international aid organizations in crisis response. (10 Marks)

International aid organizations support countries facing major natural or human-made disasters. Their contributions include relief, technical expertise, funding, and long-term recovery support.

1. Humanitarian Assistance

Organizations deliver food, water, clothing, medicine, temporary shelter.
Example: **UNICEF supplying emergency kits after earthquakes**.

2. Search and Rescue Operations

Teams like **UN Disaster Assessment and Coordination (UNDAC)** and **Red Cross** deploy rescue specialists, medical teams, dogs, and equipment.

3. Medical Support

Provided by:

- **WHO**
- **Doctors Without Borders (MSF)**
- **International Medical Corps**

Services include:

- Emergency surgeries
- Field hospitals
- Vaccination campaigns
- Disease control during floods and outbreaks

4. Financial Aid

Funding sources:

- **World Bank Emergency Loans**
- **IMF Rapid Credit Facility**
- **UN OCHA humanitarian funds**

Used for:

- Rebuilding infrastructure
- Relief camp operations
- Livelihood restoration

5. Technical Support & Capacity Building

International agencies offer:

- GIS, satellite data (via **UNOSAT**)
- Early warning systems
- Training programs for government officials

- Climate risk modelling

6. Logistics & Supply Chain Support

Organizations like **World Food Programme (WFP)** manage:

- Transportation of relief
- Storage and distribution
- Emergency airlifts

7. Policy & Coordination

UN agencies coordinate global humanitarian efforts through:

UNOCHA

- Manages international response
- Mobilizes resources
- Coordinates between governments and NGOs

UNDRR

- Supports disaster risk reduction frameworks
- Promotes resilience and sustainable development

8. Long-Term Rehabilitation

Post-disaster support includes:

- Construction of schools, clinics, homes
- Psychological support
- Water and sanitation (WASH) projects
- Community livelihood programs

9. Monitoring & Accountability

International organizations ensure:

- Transparent use of funds
- Fair distribution of aid
- Assessment of disaster impacts

10. Climate & Environmental Support

- IPCC studies climate-related disasters
- UNEP works on ecosystem restoration
- Green Climate Fund supports adaptation projects

6. Preventive and Mitigation Measures

22. Write a short note on Triage. (5 Marks)

Meaning

Triage is the process of prioritizing patients based on the severity of their injuries during a disaster or mass-casualty situation.
Its goal is to **save the maximum number of lives** with the available resources.

Objectives

1. Identify patients needing immediate life-saving treatment
2. Optimize resource allocation (medical staff, equipment, transport)
3. Reduce mortality during emergencies
4. Ensure systematic and ethical treatment of victims

Triage Categories

1. **Red (Immediate)** – Life-threatening injuries; urgent care required
2. **Yellow (Delayed)** – Serious injuries but stable condition
3. **Green (Minor)** – Walking wounded; minimal injuries
4. **Black (Expectant)** – Dead or extremely critical; survival unlikely

Applications

- Earthquakes, floods, accidents, pandemics
- Hospitals, field medical camps, military operations

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23. Explain Bio-shield and Sea Wall in detail with a diagram. Define embankments. (10 Marks)

Bio-Shield

Bio-shields are **natural barriers** created by planting vegetation such as mangroves, casuarina, palm trees, and coastal forests.
They reduce the force of cyclones, storm surges, and tsunamis.

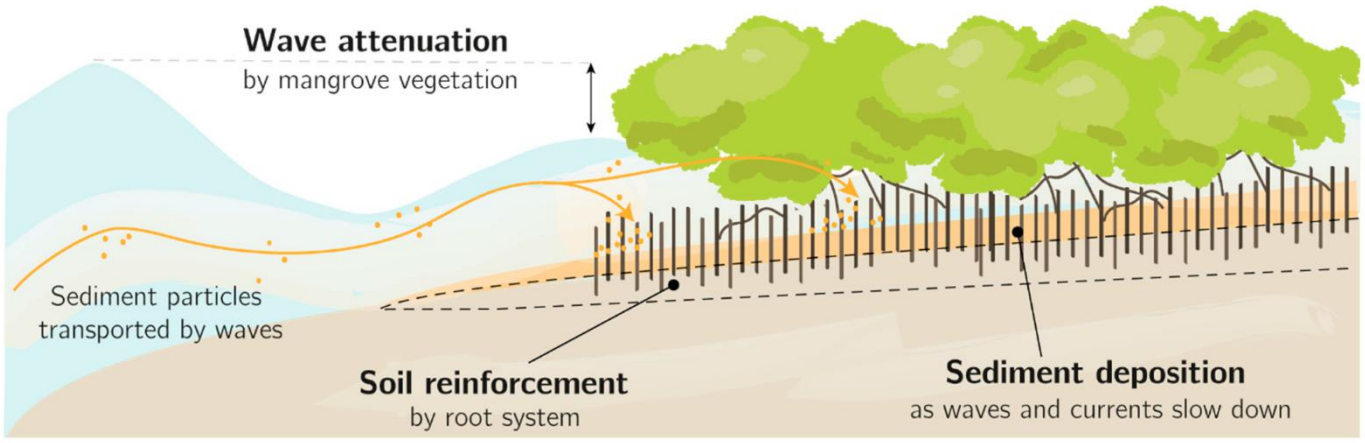
Functions

- Dissipate wave energy

- Reduce coastal erosion
- Protect villages and farmlands
- Enhance biodiversity
- Act as carbon sinks

Examples

- Mangrove bio-shields in Tamil Nadu after the 2004 Tsunami
- Pichavaram & Sundarbans mangroves protecting coastal areas



Sea Wall

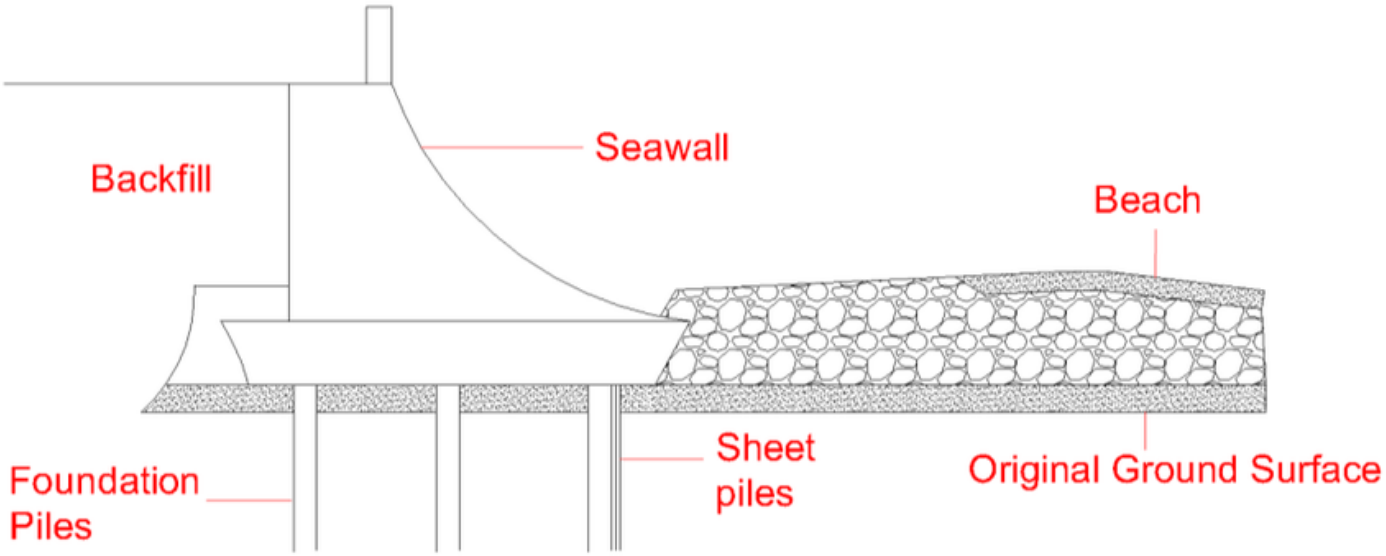
A sea wall is a **hard-engineered structure** constructed parallel to the coastline to prevent sea erosion and protect coastal settlements.

Functions

- Reflects and absorbs wave energy
- Protects coastal roads, ports, and buildings
- Prevents saline water intrusion
- Acts as a permanent barrier against storm surges

Examples

- Sea walls in Mumbai, Kerala, and Japan
- Proposed sea wall along Tamil Nadu coast for tsunami protection



Embankments (Definition)

Embankments are raised earth or concrete structures built along rivers, lakes, or coastlines to prevent flooding from overflowing water bodies.

They are commonly used for:

- Flood protection
- Riverbank reinforcement
- Coastal defense

---

24. Define Capacity Building and explain its application with a case study of CBDM. (10 Marks)

Definition of Capacity Building

Capacity building refers to developing skills, knowledge, tools, resources, and community strength to effectively prepare for, respond to, and recover from disasters.

Components of Capacity Building

- **Training & education**
- **Community participation**
- **Resource mobilization**
- **Institutional strengthening**
- **Infrastructure improvement**

Application in CBDM (Community-Based Disaster Management)

CBDM emphasizes **bottom-up planning**, where communities actively participate in disaster risk reduction.

Key Features

1. Community mapping of risks
2. Formation of local task forces
3. First-aid and search-rescue training
4. Local evacuation plans
5. Mock drills and early-warning dissemination

Case Study Example — Orissa Cyclone (1999) & CBDM

Before CBDM

- Heavy loss of life
- Poor evacuation planning
- Lack of shelters
- No community awareness

After CBDM Implementation

1. **Cyclone shelters built** in coastal villages
2. **Evacuation teams** trained in each community
3. **Women's SHGs** taught first-aid and relief management
4. **Fishermen trained** to monitor sea conditions
5. **Village Disaster Management Committees (VDMCs)** formed

Outcome

- Drastic reduction in deaths during Cyclone Phailin (2013)
- Better evacuation, communication, and community preparedness

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25. Enumerate the essential Do's and Don'ts in the event of the following disasters:

i. Covid-like pandemic
ii. Earthquake
iii. Tsunami
iv. Cyclone (10 Marks)

i. Covid-like Pandemic

Do’s

- Wear masks and maintain distancing
- Wash hands frequently
- Use sanitizers
- Follow government guidelines
- Stay home when sick
- Get vaccinated

Don’ts

- Avoid crowded places
- Do not spread rumors
- Don’t ignore symptoms
- Don’t hoard essential goods

ii. Earthquake

Do’s

- Drop, Cover, and Hold
- Stand under door frames or sturdy furniture
- Move to open space after shaking stops
- Turn off gas and electricity

Don’ts

- Don't use elevators
- Don’t run during shaking
- Don’t stand near windows or tall shelves

iii. Tsunami

Do’s

- Move to higher ground immediately
- Follow sirens and warning messages
- Carry emergency kits
- Stay away from low-lying coastal areas

Don’ts

- Don’t go near the shore to watch waves
- Don’t return until official clearance
- Don’t rely on rumors or unverified news

iv. Cyclone

Do’s

- Secure windows and doors
- Evacuate if instructed
- Keep emergency lights, radio, and power banks
- Stay indoors during landfall

Don’ts

- Don’t drive or go outdoors
- Don’t stand near glass windows
- Don’t ignore official warnings

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26. Explain non-structural mitigation measures. Describe non-structural measures for pandemic containment, tsunamis and cyclones. (10 Marks)

Non-Structural Mitigation Measures

Non-structural mitigation refers to policies, planning, awareness, and management systems used to reduce disaster risk **without building physical structures**.

General Non-Structural Measures

- Early warning systems
- Land-use planning
- Public education & awareness
- Evacuation drills
- Community training
- Legislation and policy frameworks
- Insurance schemes
- Emergency communication systems

A) Pandemic Containment (Non-Structural Measures)

- Social distancing norms
- Mask mandates
- Lockdown and mobility restrictions
- Testing, tracking, and isolation
- Vaccination drives
- Telemedicine
- Awareness campaigns
- School/workplace guidelines

B) Tsunamis

- Coastal zoning laws
- Tsunami hazard mapping
- Early-warning sirens
- Evacuation signage
- Community drills
- Coastal ecosystem protection (mangroves)
- Tourist safety guidelines

C) Cyclones

- Warning systems from IMD
- Cyclone preparedness education
- Building code enforcement
- Coastal land-use policies
- Stockpiling essential supplies
- Evacuation plans and designated shelters
- Communication protocols

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27. Explain structural mitigation measures. Describe structural measures for tsunamis and cyclones. (10 Marks)

Structural Mitigation Measures

Structural measures involve physical constructions designed to protect life and property from disasters.

General Structural Measures

- Dams & reservoirs
- Embankments and levees
- Sea walls & breakwaters
- Stormwater drainage systems
- Cyclone shelters
- Earthquake-resistant buildings
- Retention ponds

A) Structural Measures for Tsunamis

1. **Sea Walls** – Reduce wave force
2. **Breakwaters** – Offshore barriers to dissipate tsunami energy
3. **Raised Platforms & Shelters** – Elevated safe zones
4. **Mangrove Bio-Shields (eco-structural)**
5. **Tsunami-resistant construction** in coastal areas

B) Structural Measures for Cyclones

1. **Cyclone Shelters** – Multi-purpose concrete buildings
2. **Storm Surge Barriers** – Protect low-lying regions
3. **Wind-resistant Buildings** – Reinforced roofs, walls
4. **Underground power cables** – Reduce risk of damage
5. **Sea Dykes & Embankments** – Prevent coastal flooding
6. **Drainage improvement** – To prevent waterlogging

Asked once:

# indicates 5-mark question

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1. Introduction

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1. Differentiate between Risk and Vulnerability. (5 Marks)

Risk	Vulnerability
Risk is the *probability* of harmful consequences occurring due to the interaction of hazard and vulnerable conditions.	Vulnerability is the *degree of susceptibility* of people, property, or the environment to a hazard.
Expressed as: **Risk = Hazard × Vulnerability / Capacity**	Depends on physical, social, economic, and environmental factors.
Predicts the *likelihood* and *severity* of damage.	Explains *why* certain communities suffer more damage than others.
Dynamic—changes with preparedness and mitigation.	Deep-rooted and usually long term.
Measured for planning and disaster management.	Used to identify weak groups and areas needing support.

2. Natural Disasters and Manmade disasters

2. Discuss the role of growing population, industrialization, urbanization, and changing lifestyles in contributing to environmental degradation. What measures can be taken to mitigate their impact? (10 Marks)

1. Growing Population

- Increased demand for food, water, land, and energy
- Pressure on forests → deforestation
- More waste generation
- Over-extraction of natural resources

2. Industrialization

- Emission of pollutants (CO_2, SO_2, NOx)
- Chemical waste discharge into rivers
- Thermal pollution and toxic spills
- Land contamination due to mining and dumping

3. Urbanization

- Loss of agricultural land
- Overcrowding → slums → poor sanitation
- Heat island effect
- Increased vehicular emissions
- Stress on sewage, drainage, and water systems

4. Changing Lifestyles

- Rising consumerism and electronic waste
- High energy consumption
- Plastics, packaging material usage
- Food waste and fast fashion industries

Measures to Mitigate Impacts

1. Policy & Governance

- Strict environmental laws

- Enforcement of waste management rules
- Eco-friendly industrial zoning

2. Technology Solutions

- Adoption of renewable energy
- Cleaner industrial technologies
- Smart water management

3. Urban Planning

- Green belts, urban forests
- Efficient public transport
- Sewage and drainage improvement

4. Community Measures

- Awareness programs
- Reduction of plastic use
- Encourage recycling and sustainable lifestyles

5. Conservation Efforts

- Rainwater harvesting
- Soil and water conservation
- Afforestation campaigns

---

3. Delve into the paradox of industrialization: economic progress versus the threat of industrial mishaps. (8 Marks)

Industrialization creates a paradox: while it drives economic growth, it also increases the risk of industrial hazards and environmental damage.

Economic Progress

- Creates employment opportunities
- Boosts GDP and national income
- Improves infrastructure & technology
- Increases production efficiency
- Raises the standard of living

Threat of Industrial Mishaps

- Chemical leaks (Bhopal Gas Tragedy)
- Explosions, fires, radiation accidents
- Environmental contamination
- Worker health hazards
- Long-term soil and water pollution

Reasons for This Paradox

1. Rapid industrial growth without adequate safety measures
2. Poor enforcement of industrial regulations
3. Lack of worker training and emergency plans
4. High dependence on hazardous chemicals
5. Negligence and outdated equipment

Balancing the Paradox

- Adoption of safe industrial design
- Regular audits and strict compliance
- Worker training & mock drills
- Use of green and clean technologies
- Emergency preparedness plans
- Transparent reporting and community awareness

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4. Write a short note on Environmental Hazard. (5 Marks)

Environmental hazards are **dangerous events or processes** that arise from natural, technological, or human-induced factors, causing harm to people, property, and ecosystems.

Types of Environmental Hazards

1. **Physical** – floods, earthquakes
2. **Chemical** – toxic spills, pesticides
3. **Biological** – viruses, bacteria
4. **Cultural** – unsafe lifestyles, pollution
5. **Social** – poor sanitation, overcrowding

Impacts

- Air and water pollution
- Soil degradation
- Loss of biodiversity
- Health problems like cancer, respiratory diseases
- Climate change and ecological imbalance

Environmental hazards require mitigation through policies, awareness, and sustainable development practices.

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5. Is rapid depletion of groundwater a type of disaster? To which category does this belong? What are the reasons for this problem? (5 Marks)

Is it a disaster?

Yes. Rapid depletion of groundwater is considered a **slow-onset environmental disaster**.

Category

It belongs to the category of **environmental / hydrological disasters**.

Reasons for Groundwater Depletion

1. Over-extraction for agriculture (70% of groundwater use)
2. Rapid urbanization → increased water demand
3. Poor recharge due to concrete surfaces
4. Climate change → reduced rainfall
5. Lack of rainwater harvesting
6. Industrial overuse
7. Pollution making groundwater unusable

Result: Water scarcity, land subsidence, crop failure, and long-term ecological damage.

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6. Explain disasters related to industries. Discuss the socioeconomic impact of industrial disasters with a case study. (10 Marks)

Industrial Disasters Include

1. Chemical leaks (MIC gas, ammonia, chlorine)
2. Explosions & fires (boilers, reactors)
3. Oil spills
4. Nuclear radiation accidents

5. Pipeline ruptures
6. Mining disasters
7. Structural collapses in industrial areas

Socio-Economic Impacts

Human Impact

- Immediate deaths and injuries
- Long-term respiratory and genetic diseases
- Psychological trauma

Economic Impact

- Shutdown of industries
- Massive compensation costs
- Unemployment
- Drop in productivity
- High healthcare expenses

Environmental Impact

- Soil and water contamination
- Long-term ecological imbalance
- Death of fish and livestock

Social Impact

- Migration and displacement
- Loss of livelihoods
- Community distrust in industry

Case Study — Bhopal Gas Tragedy (1984)

Cause: Leakage of Methyl Isocyanate (MIC) from Union Carbide plant.
Impact:

- 3,000+ deaths within hours; thousands more over time
- Eye, lung, neurological diseases
- Soil and water pollution around Bhopal
- Economic collapse in affected zones

- Long-term health compensation and legal battles

Outcome

- First major push for Chemical Disaster Management Rules in India
- Formation of stricter industrial safety regulations

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7. Explain the types of landslide and factors affecting them. Give a case study for the same. (10 Marks)

Types of Landslides

1. Fall

Sudden vertical movement of rocks from cliffs.

2. Slide

Downslope movement of soil/rock along a plane.

3. Flow

Fluid-like movement; includes mudflows, debris flows.

4. Creep

Slow, continuous movement of soil.

5. Topple

Forward rotation of rock mass.

6. Debris Avalanche

Rapid movement of mixed material after heavy rainfall.

Factors Affecting Landslides

Natural Factors

- Heavy rainfall
- Earthquakes
- Slope angle and geology
- Weathering of rocks
- Soil moisture content

Human Factors

- Deforestation
- Slope cutting for roads

- Mining and quarrying
- Construction activity
- Poor drainage

Case Study — Kerala Landslides (2020, 2021)

Causes

- Excessive monsoon rainfall
- Unstable Western Ghats slopes
- Deforestation and settlement expansion

Impacts

- Large-scale loss of life
- Entire villages buried
- Damage to tea and spice plantations
- Roads and bridges washed away
- Economic losses and displacement

Outcome

- Stricter land-use planning
- Hazard zonation mapping
- Community awareness programs

3. Disaster Management, Policy and Administration

8. Explain PDCA cycle of disaster management. (5 Marks)

The **PDCA Cycle** (Plan–Do–Check–Act) is a continuous improvement model used to strengthen disaster management systems.

1. Plan

- Identify hazards, vulnerabilities, and risks
- Develop Disaster Management Plans (DMP)
- Set objectives, policies, standard operating procedures
- Allocate resources and responsibilities

2. Do

- Implement preparedness measures
- Conduct training, drills, community awareness
- Build early warning systems
- Coordinate with agencies, NGOs, and local bodies

3. Check

- Monitor and evaluate performance during drills or real disasters
- Assess communication, response time, logistic efficiency
- Identify gaps and weaknesses

4. Act

- Make improvements based on evaluation
- Update plans and policies
- Introduce corrective actions, new technologies, and training

Conclusion:
The PDCA cycle ensures continuous learning, stronger preparedness, and efficient disaster response.

9. Explain the evolving approaches to disaster management in India. (10 Marks)

Disaster management in India has evolved from reactive relief-based methods to proactive, scientific, and community-driven approaches.

1. Traditional Relief-Centric Approach (Pre-2000)

- Focus on post-disaster relief: food, shelter, medical aid
- No long-term planning
- Lack of early warning systems
- Weak coordination among agencies

2. Shift after Major Disasters

Key turning points:

- **1999 Odisha Super Cyclone**
- **2001 Gujarat Earthquake**
- **2004 Indian Ocean Tsunami**

These events highlighted the need for preparedness, mitigation, and institutional frameworks.

3. Establishment of Legal & Institutional Framework (2005 onwards)

- **Disaster Management Act 2005**
- Formation of **NDMA, SDMA, DDMA, NIDM, NDRF**
- Mandatory DM plans at all levels

4. Science & Technology-Based Approach

- Use of GIS, Remote Sensing, and GPS
- Satellite-based cyclone tracking (INSAT, RISAT)
- Mobile-based early warnings

5. Community-Based Disaster Management (CBDM)

- Focus on local participation
- Village DM committees
- Evacuation drills and first-aid training

6. Multi-Hazard & Integrated Approach

- Combining flood, cyclone, landslide, earthquake plans
- Sector-specific plans for health, power, telecom, transport

7. Climate-Resilient and Sustainable Approach

- Integration with SDGs
- Coastal zone regulations
- Ecosystem-based mitigation (mangroves, wetlands)

8. Modern Approaches

- Smart cities with IoT flood sensors
- Drone-based search & rescue
- Use of social media for communication
- International cooperation with UNDRR, SAARC DM

India's approach has evolved from "relief" to "risk reduction + resilience + sustainability."

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10. Significance of studying Disaster Management. (5 Marks)

(Enhancing resilience, minimizing risks, promoting sustainability)

1. Enhances Preparedness & Resilience

- Helps individuals and communities face disasters confidently
- Improves survival skills and emergency awareness

2. Reduces Risk & Saves Lives

- Teaches hazard identification, mitigation, and early warning response
- Prevents major losses of life and property

3. Promotes Sustainable Development

- Encourages safer construction, environmental protection, and resource conservation
- Integrates climate change adaptation with development

4. Strengthens Institutional Capacity

- Supports better planning at national, state, and district levels

- Builds skilled workforce for disaster response

5. Improves Community Participation

- Empowers citizens to contribute during rescue, relief, and recovery
- Reduces dependency on government

Conclusion

Studying disaster management builds a **safer society**, ensures **sustainable development**, and creates a **culture of prevention**.

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11. Describe the Search and Rescue (SAR) procedure in disaster response with a case study. (10 Marks)

Search and Rescue (SAR) Procedure

1. Activation & Assessment

- Disaster reported → control room activated
- NDRF/SDRF/Fire services mobilized
- Rapid assessment of damage and risk zones

2. Search Operations

- Use of GPS, drones, dogs, and sensors
- Identification of trapped victims
- Marking safe and unsafe zones

3. Rescue Operations

- Breaking debris, cutting tools, cranes
- First-aid and medical triage
- Safe evacuation of injured
- Transport to hospitals or relief camps

4. Coordination

- Joint operations by NDRF, Army, Fire, Police, NGOs
- Communication through wireless, satellite phones

5. Post-Rescue

- Documentation
- Body retrieval (if any)
- Counselling and medical support

Case Study – Nepal Earthquake 2015

Scenario

- 7.8 magnitude earthquake
- Over 8,000 lives lost

SAR Implementation

1. **Indian NDRF** was the first international team to arrive
2. Used deep radars, thermal sensors, sniffer dogs
3. Rescued several people alive from debris
4. Provided medical assistance & trauma care
5. Coordinated with Nepal Army, UNDAC, and NGOs

Effectiveness

- Hundreds of lives saved
- Quick response reduced secondary casualties
- Model example of international SAR coordination

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12. Write a short note on National Disaster Management Policy. (5 Marks)

The **National Disaster Management Policy (NDMP)** outlines India's strategic framework for preventing, mitigating, preparing for, and responding to disasters.

Key Features

1. **Holistic Approach**
    - Includes preparedness, mitigation, response, rehabilitation.
2. **Multi-Hazard Framework**
    - Covers cyclones, earthquakes, floods, CBRN, pandemics.
3. **Institutional Strengthening**
    - NDMA, SDMA, DDMA, NIDM, NDRF.
4. **Community Participation**
    - Focuses on local resilience and public awareness.
5. **Technology Integration**
    - GIS, remote sensing, early warning systems.
6. **Sustainable Development**

- Aligns with SDGs, climate adaptation, and environmental protection.

7. **International Cooperation**
    - Supports UNDRR, SAARC DM Framework.

4. Institutional Framework for Disaster Management in India

13. Assess the involvement of different stakeholders in mass casualty situations. (6 Marks)

Mass casualty incidents require coordinated efforts from multiple stakeholders.

1. Government Agencies

- Police, fire services, district administration
- Maintain law & order, evacuation, traffic control

2. Medical Services

- Doctors, nurses, paramedics
- Triage, emergency treatment, field hospitals

3. NDRF/SDRF & Armed Forces

- Search & rescue
- Logistics, airlifting, technical support

4. NGOs & Volunteers

- Provide food, shelter, counselling
- Assist with relief distribution
- Manage missing-persons information

5. Local Community

- First responders during initial “golden hours”
- Help in evacuations, identifying victims

6. International Agencies (if large-scale)

- UNDAC, Red Cross
- Field hospitals, medical supplies

Conclusion: Effective stakeholder coordination saves lives and reduces chaos.

14. Discuss the framework for disaster management in India. (8 Marks)

The DM framework is based on the **Disaster Management Act, 2005** and includes institutions from national to local levels.

1. National Level

NDMA

- Headed by Prime Minister
- Makes policies, guidelines, national plans

NEC (National Executive Committee)

- Implements NDMA policies
- Headed by Home Secretary

NDRF

- Specialized response force

NIDM

- Training, capacity building, research

2. State Level

SDMA

- Headed by Chief Minister
- Prepares State DM Plan

SEC

- Implements SDMA directions

3. District Level

DDMA

- Headed by District Collector
- Prepares District DM Plan
- Manages local response

4. Local Authorities

- Municipalities, panchayats

- Enforce building codes, awareness, evacuation

5. Line Ministries

- IMD, ISRO, MoHFW, MoRTH, MoEF
- Provide hazard-specific expertise

6. Community & NGOs

- CBDM, volunteers, SHGs
- First responders, capacity building

7. Private Sector

- CSR funding, infrastructure restoration
- Technical support and logistics

The framework ensures a coordinated top-down + bottom-up disaster management structure.

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15. What are different government agencies responsible for various types of disasters? (10 Marks)

1. Earthquakes

- **IMD** – monitoring & forecasting
- **NDMA / SDMA** – mitigation guidelines
- **NDRF** – rescue

2. Cyclones

- **IMD & INCOIS** – cyclone tracking and alerts
- **Coast Guard & Navy** – coastal evacuation
- **NDMA** – cyclone management guidelines

3. Floods

- **Central Water Commission (CWC)** – flood forecasting
- **State Irrigation Departments** – embankments
- **NDRF** – flood rescue

4. Tsunamis

- **INCOIS** – tsunami warning centre

- **Indian Navy / Coast Guard** – coastal evacuation

5. Droughts

- **Ministry of Agriculture**
- **IMD** – rainfall data
- **State Relief Departments**

6. Industrial & Chemical Disasters

- **MoEFCC** – regulation & EIA
- **Factory Inspectorates** – safety audits
- **NDMA** – CBRN guidelines

7. Health Emergencies / Pandemics

- **Ministry of Health & Family Welfare**
- **ICMR** – testing, protocols
- **NCDC** – surveillance

8. Fire Hazards

- **Fire Services Department**
- **Municipal Corporations** – enforcement of fire safety rules

9. Nuclear/Radiation Hazards

- **DAE (Department of Atomic Energy)**
- **AERB (Atomic Energy Regulatory Board)**

10. Landslides

- **GSI (Geological Survey of India)** – hazard zonation
- **BRO** – hill road protection

5. Financing Relief Measures

16. What are the various methods of financial management during a disaster? (5 Marks)

1. Government Disaster Funds

- **NDRF** (National Disaster Response Fund) for immediate relief.
- **SDRF** (State Disaster Response Fund) for state-level emergencies.

2. Budget Reallocation

- Reprioritizing government spending towards relief, rescue, medical care, and rehabilitation.

3. Insurance Mechanisms

- Crop insurance, catastrophe insurance, property insurance support long-term recovery.

4. International Aid & Loans

- World Bank, IMF, UN agencies provide grants, emergency credit, and reconstruction support.

5. Public–Private Partnerships (PPP)

- Private sector assists through CSR, logistics, shelters, and rebuilding infrastructure.

6. Community-Based Financing

- Local donations, SHGs, cooperative funds for small mitigation projects.

7. Crowdfunding & Digital Platforms

- Online platforms (UPI portals, NGO drives) raise quick funds during crises.

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17. Examine the collaborative efforts of government bodies and NGOs in disaster management. (6 Marks)

1. Preparedness

- NGOs conduct community training, first-aid awareness, evacuation drills.
- Government provides hazard maps, early warning systems, and DM plans.

2. Response

- Joint operations during rescue and relief (e.g., NDRF + Red Cross).
- NGOs distribute food, temporary shelters, medicines; government ensures security & logistics.

3. Recovery

- NGOs rebuild homes, restore livelihoods; government provides compensation and infrastructure repair.

4. Policy and Planning

- NGO inputs used for national/state DM guidelines (e.g., School Safety Program).
- Joint workshops and capacity-building programmes (NIDM + NGOs).

5. Case Example: Kerala Floods 2018

- Government: NDRF, Indian Navy, Air Force evacuations.
- NGOs: Goonj, Red Cross, SEEDS provided food, clothing, and rebuilding kits.
- Effective partnership saved thousands of lives.

6. Preventive and Mitigation Measures

18. Explain components of Disaster Management: preparedness, response, recovery, and mitigation. List preparedness measures for:

i. Minimizing chemical disaster losses
ii. Minimizing tsunami vulnerabilities (10 Marks)**

A) Components of Disaster Management

1. Preparedness

- Planning, training, drills, early warning systems
- Stockpiling essential supplies
- Community awareness and capacity building

2. Response

- Search & Rescue (SAR)
- Evacuation, emergency medical care
- Setting up shelters, distributing relief

3. Recovery

- Restoration of services (power, water, roads)
- Reconstruction of homes and infrastructure
- Psychosocial support
- Livelihood restoration

4. Mitigation

- Structural & non-structural measures
- Risk assessments, hazard zonation
- Building codes and land-use planning
- Environmental protection

B) Preparedness Measures

i. Minimizing Chemical Disaster Losses

1. On-site emergency plans for industries
2. Regular safety audits and alarms

3. Proper labeling & safe storage
4. Worker training on handling hazardous materials
5. Installation of gas detectors & sprinkler systems
6. Buffer zones around industrial plants
7. Community awareness of evacuation routes

ii. Minimizing Tsunami Vulnerabilities

1. Coastal hazard maps and warning sirens
2. Construction of cyclone/tsunami shelters
3. Evacuation drills in schools & coastal villages
4. Signage marking safe zones and escape routes
5. Protection of mangroves (bio-shields)
6. Coastal regulation zone (CRZ) enforcement
7. Community education on natural tsunami indicators (receding water, tremors)

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19. Define early warning systems and illustrate their benefits through recent instances of flood, cyclone, and tsunami alerts. (8 Marks)

Definition

Early Warning Systems (EWS) are integrated communication systems that detect hazards in advance and provide timely alerts to authorities and communities to prevent loss of life and minimize damage.

Components of EWS

1. **Risk Knowledge** – Hazard maps, vulnerability data
2. **Monitoring & Detection** – Sensors, satellites, weather radars
3. **Communication** – SMS alerts, sirens, TV/radio broadcasts
4. **Response Capability** – Evacuation, shelters, emergency action plans

Benefits with Recent Examples

1. Flood Alerts

- **2023 Himachal Pradesh Floods:**
  CWC real-time river level alerts enabled pre-evacuation in vulnerable districts, reducing casualties.

2. Cyclone Alerts

- **Cyclone Biparjoy (2023):**
  IMD issued 72-hour warnings; Gujarat conducted mass evacuations → zero major casualties.

3. Tsunami Alerts

- **INCOIS Tsunami Warning Centre (recent drills 2022–2023):**
  Successfully issued mock alerts to Indian Ocean countries.
  Enabled evacuation drills in Tamil Nadu and Andaman regions.

Advantages

- Saves thousands of lives
- Reduces economic losses
- Strengthens community preparedness
- Allows timely evacuation and resource mobilization
- Builds public confidence and trust in government systems

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20. Highlight the protective role of natural ecosystems against disasters, with examples. (6 Marks)

1. Mangroves

- Reduce tsunami and cyclone wave energy
- Example: Tamil Nadu mangroves protected villages during 2004 tsunami

2. Coral Reefs

- Act as underwater barriers
- Absorb storm surge and wave action
- Example: Lakshadweep and Andaman reefs reduce coastal erosion

3. Wetlands

- Store excess floodwater
- Reduce peak flood levels
- Example: East Kolkata Wetlands absorb heavy monsoon runoff

4. Forests

- Prevent landslides and soil erosion
- Regulate water cycles
- Example: Himalayan forests stabilize slopes

5. Sand Dunes

- Protect against coastal storms and wind erosion
- Naturally buffer coastal communities

Conclusion:
Natural ecosystems function as cost-effective, sustainable shields against disasters.

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21. Define liquefaction and debate the merits of retrofitting versus relocation in landslide-prone areas. (6 Marks)

Liquefaction – Definition

Liquefaction occurs when saturated soil loses strength during an earthquake and behaves like a liquid, causing buildings to tilt, sink, or collapse.

Retrofitting vs. Relocation in Landslide-Prone Areas

1. Retrofitting (Strengthening Existing Structures)

Merits

- Preserves existing homes and cultural ties
- Cost-effective compared to full relocation
- Reinforces buildings using retaining walls, soil nailing, drainage control
- Suitable for moderate-risk areas

Limitations

- Not effective in extremely unstable slopes
- Requires engineering expertise

2. Relocation (Moving Entire Communities)

Merits

- Safest option for high-risk zones
- Eliminates exposure to repeated landslides
- Allows planned settlements with proper drainage

Limitations

- Expensive and time-consuming
- Emotional, social, and livelihood displacement
- Resistance from communities

Conclusion

- **Retrofitting** is ideal for areas where slopes can be stabilized.
- **Relocation** is necessary where hazards are extreme and uncontrollable.
  A combined approach is often recommended for long-term safety.

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22. Discuss the importance of forecasting, warning and monitoring system in India. (8 Marks)

Modern disaster management relies heavily on scientific forecasting, early warning systems (EWS), and real-time monitoring.
India has developed one of the most advanced multi-hazard early warning frameworks in Asia.

1. Forecasting

Meaning

Forecasting uses scientific tools (satellites, radars, GIS, sensors) to predict hazards such as cyclones, floods, landslides, and heatwaves.

Importance

- Provides lead-time to prepare
- Reduces loss of lives and livestock
- Supports risk-informed planning
- Helps government mobilize forces (NDRF, army, police)
- Enables protection of infrastructure

Examples

- IMD cyclone tracking
- CWC river-level flood forecasting
- GSI landslide susceptibility forecasts

2. Warning Systems

Meaning

Timely communication of forecasted hazards to communities and authorities.

Importance

- Alerts coastal communities to evacuate
- Activates SAR teams

- Ensures early closure of schools, fishing bans
- Helps reduce panic through verified communication

Examples

- **Cyclone warnings:** Biparjoy (2023) and Tauktae (2021) — 48–72 hours lead time saved thousands
- **Heatwave warnings:** IMD advisories in 2023 prevented mass casualties

3. Monitoring Systems

Meaning

Continuous observation of hazard parameters—rainfall, river discharge, seismic activity, wind speed, sea level.

Importance

- Supports real-time decision making
- Detects escalation of hazards (e.g., dam water release)
- Prevents secondary disasters
- Enhances accuracy of future forecasts through updated data

Examples

- **ISRO satellites** monitor cyclones, floods, forest fires
- **Seismic monitoring** by IMD for earthquake data
- **INCOIS** for tsunami buoys and ocean sensors

Conclusion

Forecasting + Warning + Monitoring =
Reduced casualties + Better planning + Stronger community resilience.
India's system is a global model for disaster preparedness.

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23. Design concepts & construction materials for earthquake- and cyclone-safe structures, and fire-resistant facilities. (8 Marks)

India, being prone to earthquakes and cyclones, requires strong engineering design and appropriate materials to ensure safety.

A) Earthquake-Resistant Design Concepts

1. Light and Flexible Structures

- Avoid heavy roofs
- Use lightweight materials (steel, timber, aluminum)

2. Symmetrical Building Layout

- Square/rectangular floor plans reduce torsion
- Avoid irregular shapes

3. Reinforced Concrete Frames

- Ductile detailing per **IS 13920**
- Strong columns, flexible beams

4. Base Isolation

- Buildings placed on rubber bearings that absorb vibrations
- Common in hospitals and important buildings

5. Shear Walls

- Provide lateral strength
- Useful in high-rise buildings

6. Strong Foundation

- Deep foundations in soft soil
- Avoid liquefaction-prone areas

Construction Materials (Earthquake-Safe)

- Reinforced cement concrete (RCC)
- Structural steel
- High-strength bolts
- Timber (good flexibility)
- Lightweight blocks (AAC blocks)

B) Cyclone-Resistant Design Concepts

1. Aerodynamic Roof Shapes

- Sloped roofs reduce uplift pressure
- Anchored roof trusses

2. Strong Connections

- Cyclone straps, bolts, and ties

- Reinforced doors & windows

3. Elevated Structures

- Especially in coastal areas
- Prevents damage from storm surge

4. Wind-Resistant Materials

- RCC, steel frames
- Fiber cement boards
- Storm shutters

5. Safe Shelter Design

- Multi-purpose cyclone shelters with RCC superstructures

C) Fire-Resistant Facilities (Buildings / Industries)

1. Fire-Resistant Materials

- Fire-rated doors
- Gypsum boards
- Concrete & brick walls
- Intumescent paints (expand on heating)

2. Essential Safety Features

- Automatic sprinklers
- Fire alarms & smoke detectors
- Hydrant system
- Fire extinguishers on every floor
- Emergency exits and evacuation signage
- Fire escape staircase
- Heat & smoke ventilators

3. Industrial Safety

- Hazardous material storage rooms
- Explosion-proof electrical fittings
- Safe gas pipelines and valves

Conclusion

Hazard-resilient design ensures structural safety, reduces casualties, and prevents catastrophic losses during disasters.

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24. Write a short note on Community Based Disaster Preparedness (CBDP). (5 Marks)

Community-Based Disaster Preparedness (CBDP) is a bottom-up approach where **local communities actively participate** in planning, preparing for, and responding to disasters.

Key Features

1. **Community Risk Assessment**
    - Local mapping of hazards, vulnerable groups.
2. **Formation of Disaster Committees**
    - Youth groups, women's SHGs, volunteers.
3. **Local Preparedness Plans**
    - Evacuation routes, safe shelters, emergency contacts.
4. **Training & Capacity Building**
    - First-aid training
    - Search & rescue drills
    - Fire safety workshops
5. **Resource Inventory**
    - Tools, water tanks, medical kits stored locally.

Benefits

- Quick response within the "golden hour"
- Reduces casualties
- Cost-effective and sustainable
- Empowers communities
- Improves coordination with local authorities

CBDP is the foundation of effective disaster management in rural and urban India.

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25. What is Community Based Disaster Management (CBDM)? Discuss how it is useful in the Indian scenario. (10 Marks)

Definition

CBDM (Community Based Disaster Management) refers to a holistic approach where **communities are the central actors** in disaster planning, mitigation, response, and recovery.

Key Components of CBDM

1. **Community Participation**
2. **Local Risk Mapping**
3. **Capacity Building (training, drills)**
4. **Resource Mobilization**
5. **Evacuation and Response Teams**
6. **Monitoring & Maintenance of local systems**

Usefulness of CBDM in India

1. High Disaster Vulnerability

India faces cyclones, floods, earthquakes, droughts — communities must be first responders.

2. Rural Dominance

70% of India lives in villages; local participation is essential for quick action.

3. Social Capital & Local Knowledge

Traditional knowledge helps in:

- Predicting weather
- Locating safe places
- Managing local water bodies

4. Quick Response

Local youth groups, SHGs, and panchayats respond faster than external agencies.

5. Cost-Effective

CBDM uses community resources rather than expensive external aid.

6. Supports Government Efforts

Helps NDMA/SDMA/DDMA implement early warnings, drills, and evacuation.

7. Case Examples

Odisha Cyclones

- Community shelters, trained volunteers, and village DM committees led to a dramatic drop in casualties during Phailin (2013).

Kerala Floods 2018

- Fishermen (“Kerala Warriors”) voluntarily rescued thousands using boats.

Conclusion

CBDM builds resilience from the ground up, empowers people, and ensures faster, more effective disaster management in India.