



**JECRC Foundation**  
TWO DECADES OF NURTURING TALENT



# Jaipur Engineering College and Research Centre

## Department of Computer Science and Engineering

**Year/ Semester:** IV/VIII

**Subject:** Disaster Management (8TT6-60.2)

**Unit-Ist and IInd**

**Presented By:**

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# VISSION AND MISSION OF INSTITUTE

**Vision of the Institution:** To become a renowned centre of outcome based learning and work toward academic, professional, cultural and social enrichment of the lives of individuals and communities.

## **Mission of the Institution:**

M1: Focus on evaluation of learning outcomes and motivate students to inculcate research aptitude by project based learning.

M2: Identify, based on informed perception of Indian, regional and global needs the areas of focus and provide platform to gain knowledge and solutions.

M3: Offer opportunities for interaction between academia and industry.

M4: Develop human potential to its fullest extent so that intellectually capable and imaginatively gifted leaders can emerge in a range of professions.

# VISSION AND MISSION OF DEPARTMENT

**Vision of the Department:** To become renowned centre of excellence in Computer Science and Engineering and make competent engineers & professionals with high ethical values prepared for lifelong learning.

## **Mission of the Department :**

M1: To impart outcome based education for emerging technologies in the field of Computer Science and Engineering.

M2: To provide opportunities for interaction between academia and industry.

M3: To provide platform for lifelong learning by accepting the change in technologies.

M4: To develop aptitude of fulfilling social responsibilities.



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Open Electives Syllabus

B. Tech.: IV Year- VII & VIII Semester

### 8TT6-60.2 : DISASTER MANAGEMENT

**Credit: 3**  
**3L+0T+0P**

**Max. Marks: 150(IA:30, ETE:120)**  
**End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Understanding Disasters and Hazards and related issues social and environmental. Risk and Vulnerability. Types of Disasters, their occurrence/ causes, impact and preventive measures:	12
3	Natural. Disasters- Hydro-meteorological Based Disasters like Flood, Flash Flood, Cloud Burst, Drought, Cyclone, Forest Fires; Geological Based Disasters like Earthquake, Tsunami, Landslides, Volcanic Eruptions.	12
4	Man made Disasters: Textile Processing Industrial Hazards, Major Power Break Downs, Traffic Accidents, Fire Hazards.	12
5	Management roll in mitigating Disaster in Indian Textile Industries. Roll of production people in Disaster Management.	3
	<b>Total</b>	<b>40</b>

# Content (to be covered)

- Objectives of Disaster Management
- Scope of Disaster Management
- What is Disaster
- Types of Disaster
- Natural Disaster
- Types of Natural Disaster
- Man Made Disaster
- Types of Man Made Disaster
- Disaster Management
- Disaster Management Cycle
- What is Hazard
- Types of Hazards
- Vulnerability
- Types of Vulnerability
- What is Risk
- Key Concept of Risk
- Relationship between risk and vulnerability
- Impacts of Disaster
- Preventive Measures
- Beyond Curricula : Levels of Disaster (National, State and District)

## **Course Description & Objectives:**

To impart the fundamental knowledge to the student on the importance of impact and consequences of such disasters on people and the environment. The subject provides different disasters, tools and methods for disaster management.

## **Course Outcome**

At the completion of the course the student will be able to:

CO1: To understand disaster management, related issues and preventive measures.

CO2: To understand and analyze the natural disasters.

CO3: To analyze various man-made disasters.

CO4: Evaluate the role of management and people in mitigation of disaster.

# PROGRAM OUTCOMES

**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

**Problem analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

# PROGRAM OUTCOMES

**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.



# PROGRAM OUTCOMES

**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

# List of reference books:

<b>Text / Reference Books:</b>	
1	D B N Murthy Disaster Management: Text & Case Studies, Deep & Deep Pvt. Ltd.
2	S L Goel, Encyclopedia of Disaster Management, Deep & Deep Pvt. Ltd.
3	G K Ghosh, Disaster Management, A P H Publishing Corporation.
4	Satish Modh, Citizen's Guide to Disaster Management Macmilan.
5	Manual on Disaster Management, National Disaster Management, Agency Govt of India.
6	Disaster Management by Mrinalini Pandey Wiley 2014.
7	Disaster Science and Management by T. Bhattacharya, McGraw Hill Education (India) Pvt Ltd Wiley 2015

# Objectives of Disaster Management

- The world over disaster management is seen as evolving process. There cannot be a single model or approach towards management of disasters.
- Thus the objective of disaster management comprises six elements: the pre-disaster phase includes prevention, mitigation and preparedness.
- While the post disaster phase includes response, rehabilitation, reconstruction and recovery.

# Objectives of Disaster Management

The actions taken to address a specific disaster vary depending on the hazard, four objectives of disaster management apply to every situation:

1. Reduce Damages and Deaths
2. Reduce Personal Suffering
3. Speed Recovery
4. Protect Victims

# Objectives of Disaster Management

Basically the main objective of disaster management is to reduce the damage. However, there are several objectives are integrated with it. Those are

1. Identifying the hazard and its cause.
2. Reducing vulnerability and potential losses of hazard.
3. Assessing, reviewing and controlling the risk.
4. Applying efficient, effective, sustainable relief (food, shelter and money), medical and other facilities in disaster affected people thus they can survive.
5. Reducing the damage, death, sufferings and destruction of any natural and human induced disaster.

# Objectives of Disaster Management

6. Giving protection to victims.
7. Increasing the strength among people to survive against disasters.
8. Building up capacity in every sector like- individual, social, economic, environmental, regional, national and international.
9. Ensuring the availability of local emergency equipment and transportation.

# Scope of the Disaster Management

Disaster management covers a much broader scope, and many modern disaster managers may find themselves far more involved in pre-disaster activities than in post-disaster response. Those are

1. The refugee field of disaster management is highly specialized and requires not only many development skills but also a broader awareness of political, legal, and humanitarian issues.
2. DM aims and objectives, elements, Natural/man-made Disasters,
3. Victims, Relief Systems,
4. Phases of Disaster Response/Relief Operations, Government's Role,
5. Refugee Assistance Models,
6. Prevention and Mitigation Tools, Preparedness Tools,
7. Tools of Post-Disaster Management, Mapping,
8. Aerial Photography and Remote Sensing,
9. Information Management,
10. Logistics, Epidemiology.

# What is Disaster ?

- Disaster is a sudden, calamitous event bringing great damage, loss and destruction and devastation to life and property.
- The damage caused by disasters is immeasurable and varies with the geographical location, climate and the type of the earth surface / degree of vulnerability.
- This influences the mental, socio-economic, political and cultural state of the affected area.



# Types of Disaster

- Natural Disaster
- Man Made Disaster

# Natural Disaster

- Natural Disaster is a natural process or phenomenon that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.

# TYPES OF NATURALDISASTER

- Wind Related:- Storm ,Cyclone ,Tornado , Storm Surge and Tidal waves.
- Water Related:- Flood ,Cloudburst , Flash Flood , Excessive and Drought.
- Earth Related:- Earthquake, Tsunamis , Avalanches , landslides and Volcanic eruptions.

# Man Made Disaster

- A disastrous event caused directly and principally by one or more identifiable deliberate or negligent human actions.

# Types OF Man Made Disaster

- Accidents:- Road , Rail , Air , Sea and building collapse.
- Industrial Mishaps:- Gas Leak ,Explosion , Sabotage ,and Safety breach
- Fire:- Building , Coal and Oil.
- Forest Fire:- Most forest fires are man made •  
Poisoning :-Food, Water ,Illicit Liquor and Epidemic

# Types OF Man Made Disaster

- Terrorists Activities :-Destructive activities by terrorists
- Ecological:-Pollution ,Soil degradation , loss of biodiversity, Global Warming, Sea level rise, Toxic wastes an nuclear accidents.
- Warfare:- Conventional, Chemical and nuclear

# Disaster Management

- Disaster Management can be defined as the organization and management of resources and responsibilities for dealing with all humanitarian aspects of emergencies, in particular preparedness, response and recovery in order to lessen the impact of disasters.

# Disaster Management Cycle

## DISASTER MANAGEMENT





# Disaster Management Cycle

- **Mitigation:** Measures put in place to minimize the results from a disaster. Examples: building codes and zoning; vulnerability analyses; public education.
- **Preparedness:** Planning how to respond. Examples: preparedness plans; emergency exercises/training; warning systems.
- **Response:** Initial actions taken as the event takes place. It involves efforts to minimize the hazards created by a disaster. Examples: evacuation; search and rescue; emergency relief.
- **Recovery:** Returning the community to normal. Ideally, the affected area should be put in a condition equal to or better than it was before the disaster took place. Examples: temporary housing; grants; medical care.

# What is hazard?

- A hazard is a situation or an occurrence with capacity to bring damages to lives, properties and environment.
- Hazards can include latent conditions that may represent future threats and can have different origins: natural ( geological, hydrometeorological, and biological) or induced by human processes (environmental degradation and technological hazards)

# Types of Hazard

- Natural Hazards
- Human Made Hazards
- Combination or Socionatural Hazards

# Natural Hazards

- Natural phenomena that pose threats or cause negative impacts to people and property .  
Examples are: Typhoon, storm surge, floods, drought, red tide, pestilence and fire.

# Human Made Hazards

- Includes civil conflict, displacement due to development projects, environmental degradation, industrial technological hazards like leakage of toxic wastes, oil spill, fish kills, nuclear, gaseous, chemical contamination, famine, drought, fires and flood.

# Combination or Socionatural Hazards

- Flooding and drought can fall under this category if these are due to deforestation. Most events are combinations of both natural and human-made factors. Typhoons are natural hazards that can also cause flash floods. At the same time, environmental degradation like excessive and illegal logging can also be a cause of flash floods

# Vulnerability

- The concept of vulnerability comes from many aspects, specifically, those that arise from various social, economic, physical, and environmental factors.
- Examples may include poor design and construction of buildings, inadequate protection of assets and lack of public awareness, limited official recognition of risks and preparedness measures, and disregard for wise environmental management.

# Physical/ Material Vulnerability

- Location or type of housing/building materials
- Land, water, animals, capital, other means of production.
- Infrastructure and services: roads, health facilities, schools, electricity, communications, transport, housing etc.
- Human capital: population, mortality, diseases, nutritional status, literacy, numeracy, poverty levels.
- Environment factors: forestation, soil quality, and erosion



# Social/Organizational Vulnerability

- Family structure (weak/strong)
- Leadership qualities and structure
- Legislation
- Administrative structures and institutional arrangements
- Decision-making structures
- Participation levels

# Social/Organizational Vulnerability

- Divisions and conflicts: ethnic, class caste, religion, ideology, political groups, language groups, and structures for mediating conflicts
- Degree of justice, equality, access to political processes.
- Community organizations: formal; informal; traditional; governmental; progressive.
- Relationship to government
- Isolation and connectedness

# Environmental Vulnerability:

- Natural resource depletion and resource degradation are key aspects of environmental vulnerability.
- Example: Wetlands, such as the Caroni Swamp, are sensitive to increasing salinity from sea water, and pollution from storm water runoff containing agricultural chemicals, eroded soils, etc

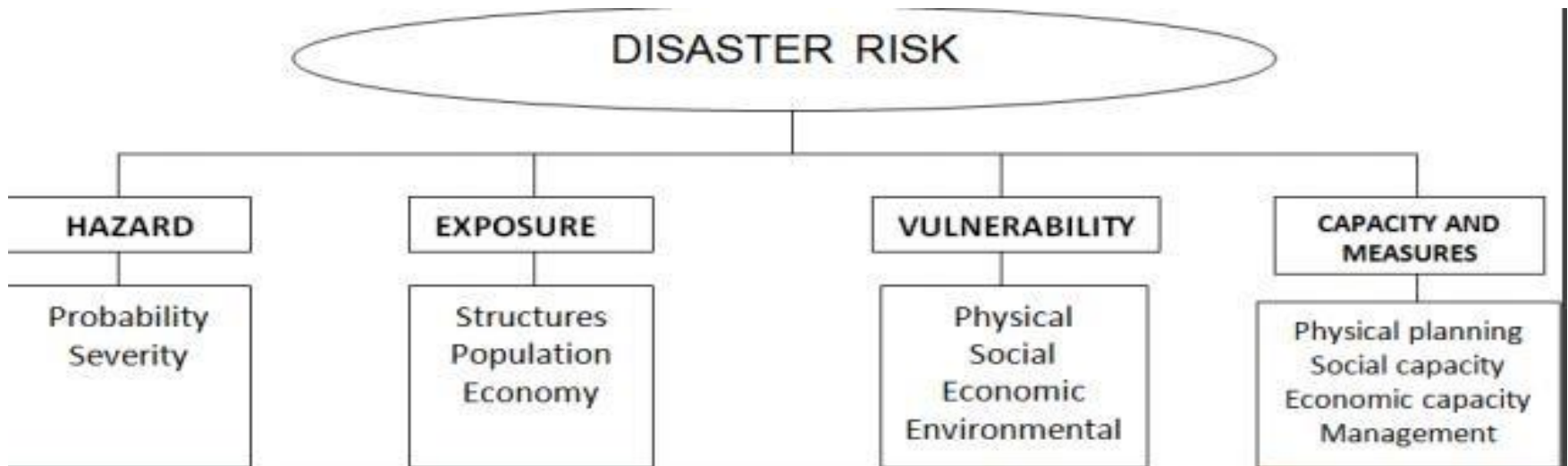
# What Is Risk ?

- The probability that a community's structure or geographic area is to be damaged or disrupted by the impact of a particular hazard, on account of their nature, construction, and proximity to a hazardous area.

# What Is Risk ?

- Risk is a function of threats exploiting vulnerabilities to obtain, damage or destroy assets. Thus, threats (actual, conceptual, or inherent) may exist, but if there are no vulnerabilities then there is little/no risk.

# Key Concept of Risk



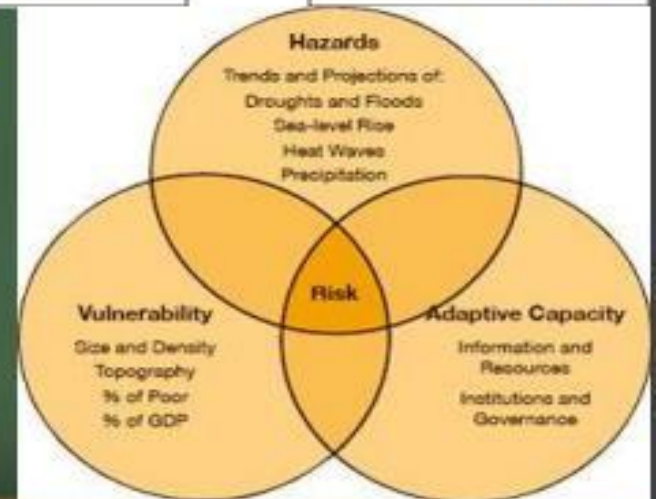
$$\text{Risk Disaster Index (R)} = (\text{H} + \text{V} + \text{E}) - \text{C}$$

H= Hazard Index

V= Vulnerability Index

E= Exposure Index

C= Capacity & Measure Index



# Relationship Between Risk & Vulnerability

Risk' is essentially the level of possibility that an action or activity will lead to lead to a loss or to an undesired outcome, when 'vulnerability' is a weakness that makes one susceptible to an attack, a loss or an undesired outcome.





# Impacts of Disaster (Physical)

- Injuries
- Death
- Physical disability
- Burns
- Epidemic
- Weakness/uneasiness
- Physical illness
- Sanitation
- Miscarriage
- Reproductive health
- Fatigue, Loss of Sleep
- Loss of Appetite

# Impacts of Disaster (Economic)

- Loss of life
- Unemployment
- Loss of Livelihood
- Loss of property/Land
- Loss of household articles
- Loss of crops
- Loss of Public Infrastructure

# Impacts of Disaster (Social)

- Change in individual's role
- Disruption of social fabric
- Isolation
- Change in marital status
- Domestic violence
- Orphans
- Single parent children
- Family & social disorganization
- Migration
- Life style changes
- Breakdown of traditional Social Status

# Prevention

- Prevention is defined as those activities taken to prevent a natural phenomenon or potential hazard from having harmful effects on either people or economic assets.
- Delayed actions drain the economy and the resources for emergency response within a region.
- For developing nations, prevention is perhaps the most critical components in managing disasters, however, it is clearly one of the most difficult to promote.

# Preventive Measures

- Prevention planning is based on two issues: hazard identification (identifying the actual threats facing a community) and vulnerability assessment (evaluating the risk and capacity of a community to handle the consequences of the disaster).
- Once these issues put in order of priority, emergency managers can determine the appropriate prevention strategies.

# Beyond Curriculum

## Levels of Disaster

The disaster management and its planning at various tiers must take into account the vulnerability of disaster-affected area, and the capacity of the authorities to deal with the situation. Using this approach, the High Power Committee on Disaster Management, in its report of 2001, categorized disaster situations into three 'levels': L1, L2, and L3. The period of normalcy, L0, should be utilized for disaster risk reduction.

### Level-L1:

The level of disaster that can be managed within the capabilities and resources at the District level. However, the state authorities will remain in readiness to provide assistance if needed.

# Levels of Disaster

Level-L2: This signifies the disaster situations that require assistance and active mobilization of resources at the state level and deployment of state level agencies for disaster management. The central agencies must remain vigilant for immediate deployment if required by the state.

Level-L3: This corresponds to a nearly catastrophic situation or a very large-scale disaster that overwhelms the State and District authorities.

The categorization of disaster situations into levels L0 to L3 finds no mention in DM Act 2005. Further, the DM Act does not have any provision for notifying any disaster as a 'national calamity' or a 'national disaster'.

# Disaster management plans at various levels

## Steps taken before disaster

### Identification of vulnerable areas

- Monitoring and setting up of control rooms
- Warnings
- Arrangements for relief campus, food, essential commodities,
- medical facilities, etc
- Fund allocation
- Alerting administration
- Community preparedness



# Disaster management plans at various levels

Steps to be taken during disaster

- Evacuation
- Settings up of relief camps and handling
- Monitoring and report
- VIP visit

# National Level Supervision

The overall coordination of disaster management vests with the Ministry of Home Affairs (MHA). The Cabinet Committee on Security (CCS) and the National Crisis Management Committee (NCCMC) are the key committees involved in the top-level decision-making with regard to disaster management. The NDMA is the lead agency responsible for the preparation DM plans and the execution at the national level.

State governments will be carrying out disaster management with the central government playing a supporting role. The central agencies will participate only on the request from the state government. Within each state, there is a separate institutional framework for disaster management at the state- level.

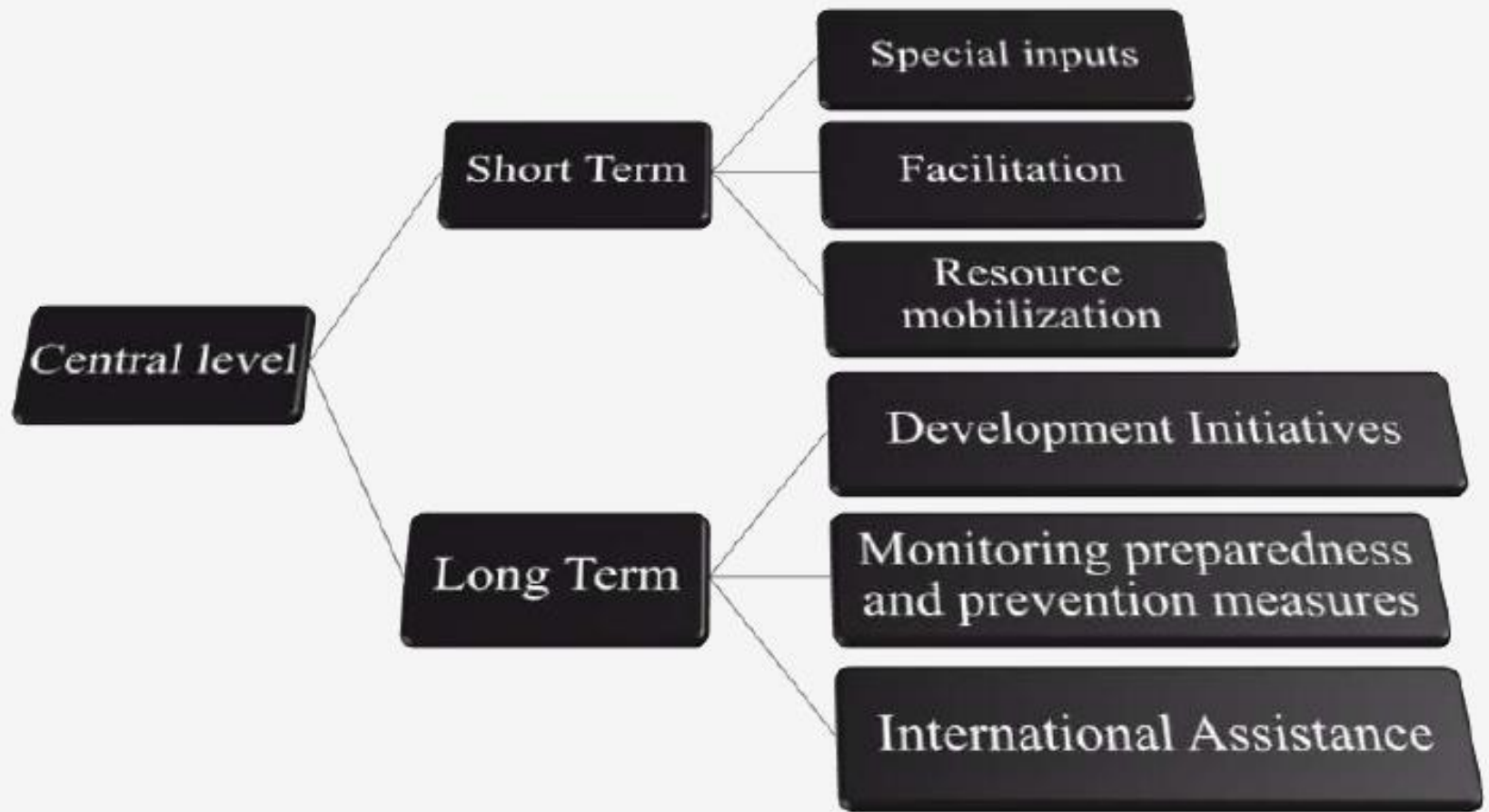
# *Key national-level decision-making bodies for disaster management*

1	<b>Cabinet Committee on Security (CCS)</b>	Prime Minister, Minister of Defence, Minister of Finance, Minister of Home Affairs, and Minister of External Affairs	<ul style="list-style-type: none"> <li>• Evaluation from a national security perspective, if an incident has potentially security implications</li> <li>• Oversee all aspects of preparedness, mitigation and management of Chemical, Biological, Radiological and Nuclear (CBRN) emergencies and of disasters with security implications</li> <li>• Review risks of CBRN emergencies from time to time, giving directions for measures considered necessary for disaster prevention, mitigation, preparedness and effective response</li> </ul>
2	<b>National Crisis Management Committee (NCMC)</b>	<ul style="list-style-type: none"> <li>• Cabinet Secretary (Chairperson)</li> <li>• Secretaries of Ministries / Departments and agencies with specific DM responsibilities</li> </ul>	<ul style="list-style-type: none"> <li>• Oversee the Command, Control and Coordination of the disaster response</li> <li>• Give direction to the Crisis Management Group as deemed necessary</li> <li>• Give direction for specific actions to face crisis situations</li> </ul>

3	<p><b>National Disaster Management Authority (NDMA)</b></p> <ul style="list-style-type: none"> <li>• Prime Minister (Chairperson)</li> <li>• Members (not exceeding nine, nominated by the Chairperson)</li> </ul>	<ul style="list-style-type: none"> <li>• Lay down policies, plans and guidelines for disaster management</li> <li>• Coordinate their enforcement and implementation throughout the country</li> <li>• Approve the NDMP and the DM plans of the respective Ministries and Departments of Government of India</li> <li>• Lay down guidelines for disaster management to be followed by the different Central Ministries, Departments and the State Governments</li> </ul>
4	<p><b>National Executive Committee (NEC)</b></p> <ul style="list-style-type: none"> <li>• Union Home Secretary (Chairperson)</li> <li>• Secretaries to the GOI in the Ministries / Departments of Agriculture, Atomic Energy, Defence, Drinking Water and sanitation, Environment, Forests and Climate Change Finance (Expenditure), Health and Family Welfare, Power, Rural Development, Science and Technology, Space,</li> </ul>	<ul style="list-style-type: none"> <li>• To assist the NDMA in the discharge of its functions</li> <li>• Preparation of the National Plan</li> <li>• Coordinate and monitor the implementation of the National Policy</li> <li>• Monitor the implementation of the National Plan and the plans prepared by the Ministries or Departments of the Government of India</li> <li>• Direct any department or agency of the Govt. to make available to the NDMA or SDMA's such men, material or resources as are available with it for the purpose of emergency response, rescue and relief</li> <li>• Ensure compliance of the directions issued by the Central Government</li> <li>• Coordinate response in the event of any threatening disaster situation or disaster</li> <li>• Direct the relevant Ministries / Departments of the GOI, the State Governments and the SDMA's</li> </ul>

## Nodal Ministry for Management / Mitigation of Different Disasters

	Disaster	Nodal Ministry/ Department
1	Biological	Min. of Health and Family Welfare (MoHFW)
2	Chemical and Industrial	Min. of Environment, Forest and Climate Change (MoEFCC)
3	Civil Aviation Accidents	Min. of Civil Aviation (MoCA)
4	Cyclone/Tornado	Min. of Earth Sciences (MoES)
5	Tsunami	Min. of Earth Sciences (MoES)
6	Drought/Hailstorm/Cold Wave and Frost/Pest Attack	Min. of Agriculture and Farmers Welfare (MoAFW)
7	Earthquake	Min. of Earth Sciences (MoES)
8	Flood	Min. of Water Resources (MoWR)
9	Forest Fire	Min. of Environment, Forests, and Climate Change (MoEFCC)
10	Landslides	Min. of Mines (MoM)
11	Avalanche	Min. of Defence (MoD)
12	Nuclear and Radiological Emergencies	Dept. of Atomic Energy (DAE)
13	Rail Accidents	Min. of Railways (MoR)
14	Road Accidents	Min. of Road Transport and Highways (MoRTH)
15	Urban Floods	Min. of Urban Development (MoUD)



## **Facilitation**

- Central govt role becomes of that of a facilitator during emergency,
- Gives assistance to state govt's.

## **Resource mobilization**

- Providing additional funds, support from army, etc

## **Special inputs**

- By providing various national or international institutions specialized work  
in disaster management

## **International assistance**

- Through bilateral or multilateral agreements providing loans.

## **Monitoring preparedness and prevention measures**

- Provide necessary support to hazard prone area.

## **Development Initiatives**

- Through niti aayoga and other agencies should start initiatives to prepare  
plans

# State Level Supervision

It will, inter alia approve the State Plan in accordance with the guidelines laid down by the NDMA, coordinate the implementation of the State Plan, recommend provision of funds for mitigation and preparedness measures and review the developmental plans of the different Departments of the State to ensure the integration of prevention, preparedness and mitigation measures.

The State Government shall constitute a State Executive Committee (SEC) to assist the SDMA in the performance of its functions. The SEC will be headed by the Chief Secretary to the State Government. The SEC will coordinate and monitor the implementation of the National Policy, the National Plan, and the State Plan. The SEC will also provide information to the NDMA relating to different aspects of DM.



State Government shall take necessary steps for the preparation of state DM plans, integration of measures for prevention of disasters or mitigation into state development plans, allocation of funds, and establish EWS. Depending on specific situations and needs, the State Government shall also assist the Central Government and central agencies in various aspects of DM. Each state shall prepare its own State Disaster Management Plan.



## 1. Co-ordination

- Crucial role as co-ordinator.
- State govt should initiate counter measures.
- SG needs to maintain close liaison with the central as well as the district authorities.

## 2. Preparedness

- Advance warnings
- Inform district authorities and advise them on suitable line of action.

## 3. Resource mobilisation

- Provide necessary funds from state budgeting

# District Disaster Management

Each State Government shall establish a District Disaster Management Authority for every district in the State. DDMA will be headed by the District Collector, Deputy Commissioner, or District Magistrate as the case may be, with the elected representative of the local authority as the Co-Chairperson.

The State Government shall appoint an officer not below the rank of Additional Collector or Additional District Magistrate or Additional Deputy Commissioner, as the case may be, of the district to be the Chief Executive Officer of the District Authority. The DDMA will act as the planning, coordinating and implementing body for DM at the District level and take all necessary measures for the purposes of DM in accordance with the guidelines laid down by the NDMA and SDMA..

It will, inter alia, prepare the DM plan for the District and monitor the implementation of the all relevant national, state, and district policies and plans. The DDMA will also ensure that the guidelines for prevention, mitigation, preparedness, and response measures laid down by the NDMA and the SDMA are followed by all the district-level offices of the various departments of the State Government



# District Disaster Management

## 1. Evacuation

- Advance warnings
- Plans at district level should sufficiently provide for this
- District headquarters is the focal point for all rescue and relief activities

## 2. Relief & Rescue operations

## 3. Damage Assessment and information collection

- Based on the assessment carried out by district authorities funds and other resources can be mobilised at state or national or international level.



**JECRC Foundation**  
TWO DECADES OF NURTURING TALENT



# Thank You