



# **NATURAL DISASTERS & THEIR MANAGEMENT**

# WHAT IS A DISASTER ?

- A disaster is a natural or manmade event which results in widespread human loss, loss of livelihood, property and life.
- Disaster means a catastrophe, mishap, calamity or grave occurrence affecting any area from natural and manmade causes, or by accident or negligence, which results in substantial loss of life or human suffering or damage to, and destruction of property, or damage to, or degradation of environment and is of such a nature and magnitude as to be beyond the capacity of the community of the affected areas. (as per DMAAct,2005)



# TYPES OF DISASTER

Natural  
Disasters

Meteorological

Topographical

Environmental

Man-made  
Disasters

Technological

Industrial  
accidents

Security related



# Natural Disasters

## Meteorological Disasters

- Floods
- Tsunami
- Cyclone
- Hurricane
- Typhoon
- Snow storm
- Blizzard
- Hail storm

## Topographical Disasters

- Earthquake
- Volcanic Eruptions
- Landslides and Avalanches
- Asteroids
- Limnic eruptions

## Environmental Disasters

- Global warming
- El Niño-Southern Oscillation
- Ozone depletion-UVB Radiation
- Solar flare

# Man made Disasters

## Technological

- Transport failure
- Public place failure
- Fire

## Industrial

- Chemical spills
- Radioactive spills

## Warfare

- War
- Terrorism
- Internal conflicts
- Civil unrest
- CBRNE

## Major Disasters in India (last 40 years)

S. N	Event	Year	State & Area	Effects
1	Drought	1972	Large part of country	200 million affected
2	Cyclone	1977	Andhra Pradesh	10,000 people & 40,000 cattle died
3	Drought	1987	15 states	300 million affected
4	Cyclone	1990	Andhra Pradesh	967 died. 435,000 acres land affected
5	Earthquake	1993	Latur, Maharashtra	7,928 people died.30,000 injured
6	Cyclone	1996	Andhra Pradesh	1000 people died.5,80,000 houses destroyed
7	Super cyclone	1999	Orissa	Over 10,000 deaths
8	Earthquake	2001	Bhuj,Gujrat	13,805 deaths,6.3 millions affected



## Major Disasters in India (last 40 years)

S. N	Event	Year	State & Area	Effects
9	Tsunami	2004	Coastline TN, Kerala, AP, A&N islands & Puducherry	10,749 deaths.5,640 missing,2.79 Millions
10	Floods	July 2005	Maharashtra	1094 deaths 167 injured, 54 missing
11	Earthquake	2008	Kashmir	1400 deaths
12	Kosi floods	2008	North Bihar	527 deaths,19,323 cattle died
13	Cyclone	2008	Tamilnadu	204 deaths
14	Krishna floods	2009	Andhrapradesh & Karnataka	300 died
15	Flash flood	June 2013	Uttarakhand	5,700 deaths, 70,000 affected
16	Phailin Cyclone	Oct 2013	Coastline of Orissa, Jharkhand	27 died, 10,00,000 evacuations

# VULNERABILITY PROFILE OF INDIA



58%

16%



12%



8%



3%



# A few disasters in INDIA

Earthquake,  
Oct, 2005

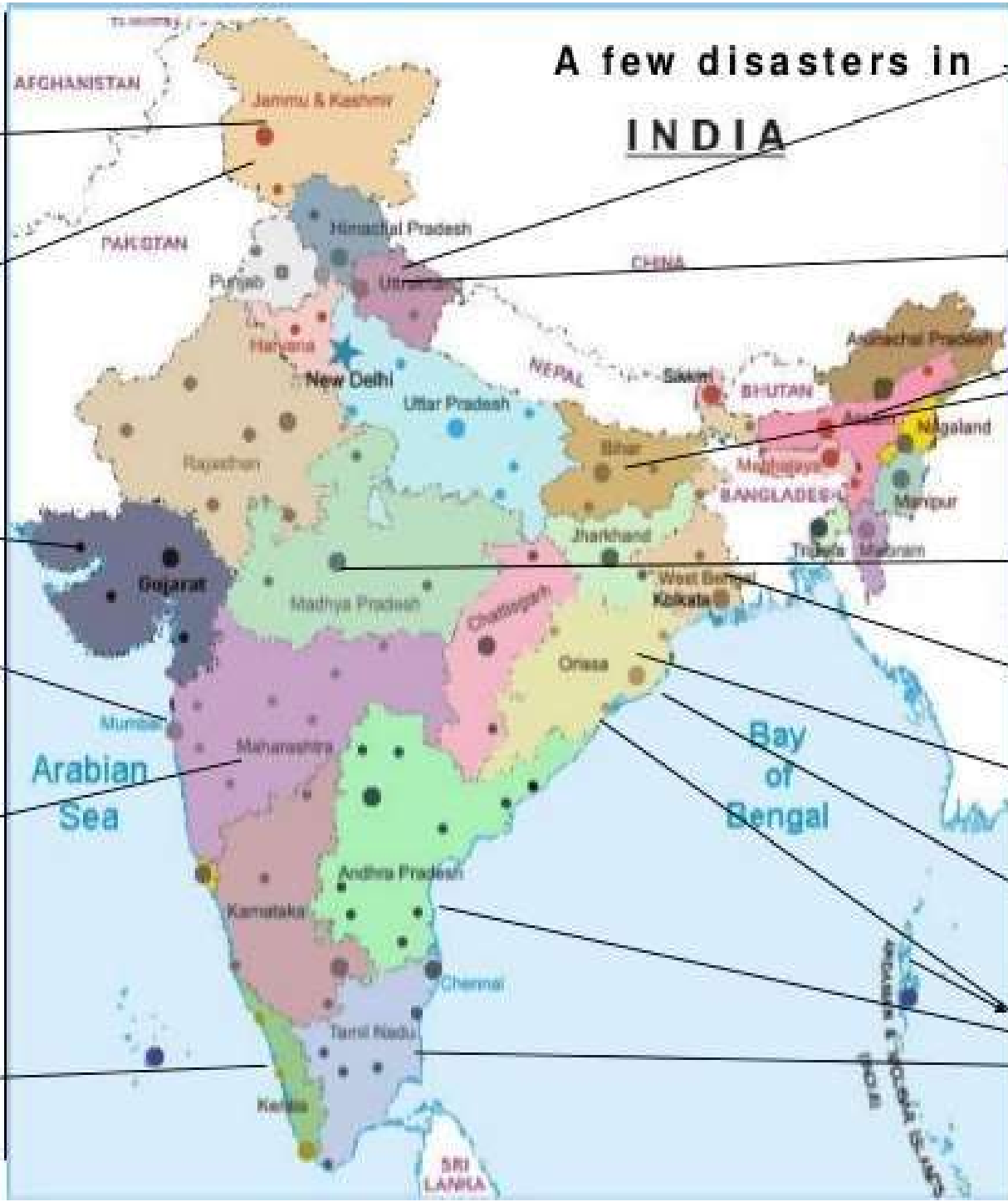
Avalanche  
Feb 2005

Bhuj,  
Earthquake,  
26 January,  
2001

Floods,  
Mumbai,  
26 July 2005

Earthquake,  
Latur, 30  
Sept 1993

Tsunami  
26 Dec 2004



Flood,  
Uttarakhand  
2013

Earthquake  
Uttarkashi, 20  
Oct 1991

Flood, Assam  
& Bihar  
2004

Bhopal Gas  
Tragedy, Dec  
1982

Alia Cyclone  
2009

Cyclone  
29 Oct 1999

PHAILIN  
Cyclone 2013

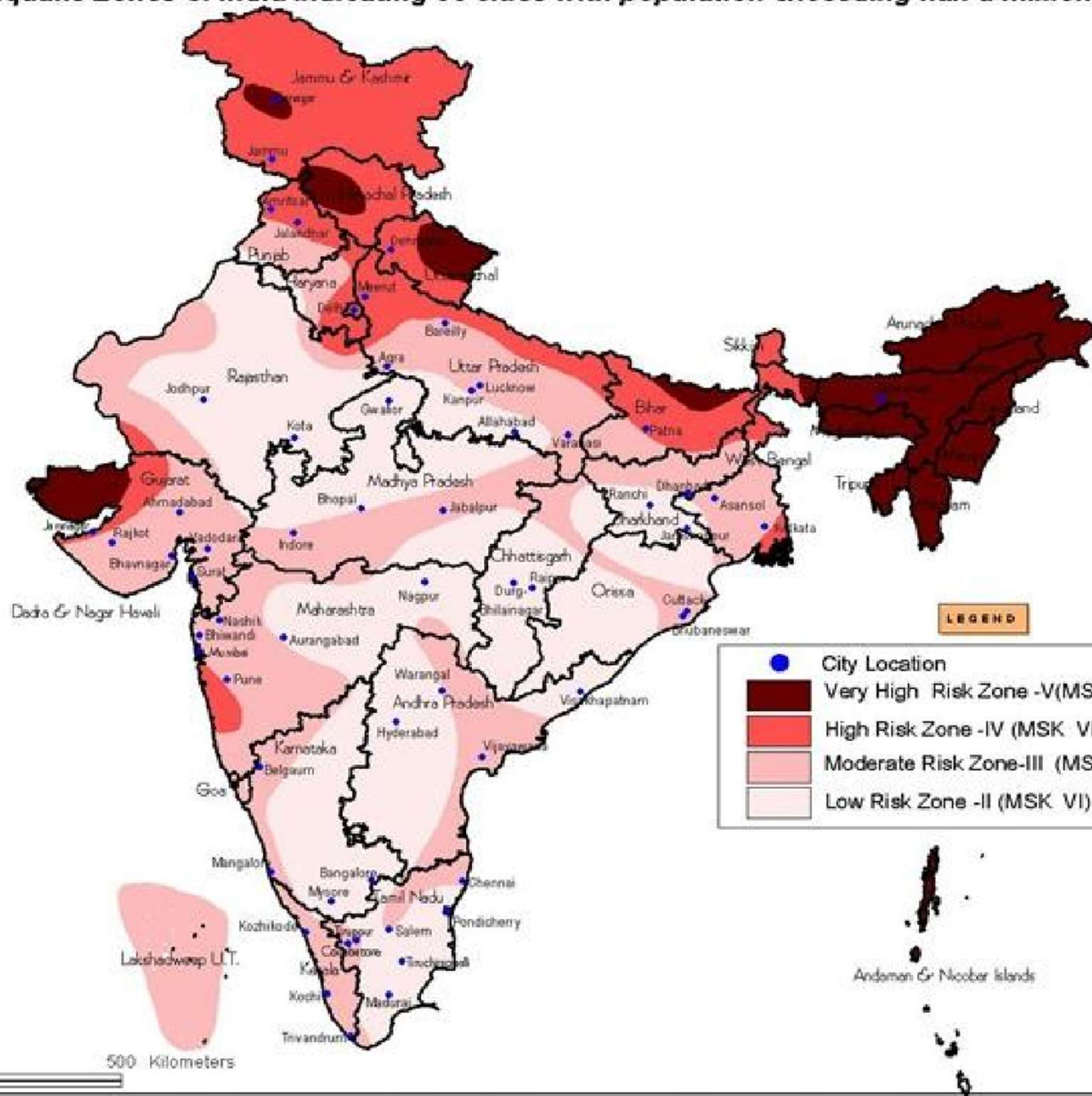
Tsunami  
26 Dec 2004

# EARTHQUAKE

- In India, more than 1200 earthquakes have occurred. Based on this, India is divided into five earthquake zones :
  - ❖ Very high damage risk zone
  - ❖ High damage risk zone
  - ❖ Moderate damage risk zone
  - ❖ Low damage risk zone
  - ❖ Very low damage risk zone

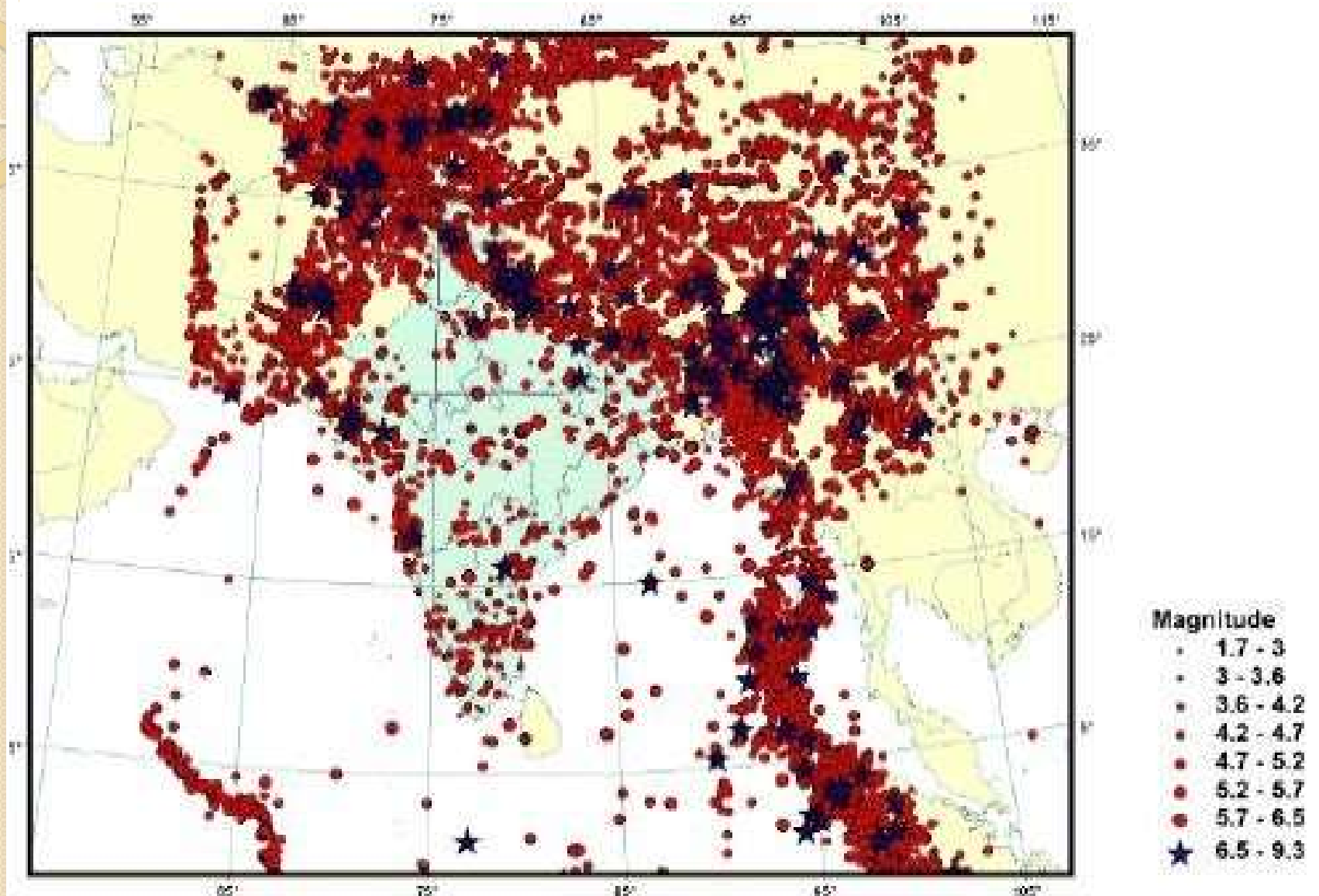


**Earthquake Zones of India indicating 60 cities with population exceeding half a million.**



Disclaimer: This is a draft map prepared referring to IS 1893 (Part 1): 2002. However UNDP do not own any responsibility for the correctness or authenticity of the same.

# Seismic Activity in India

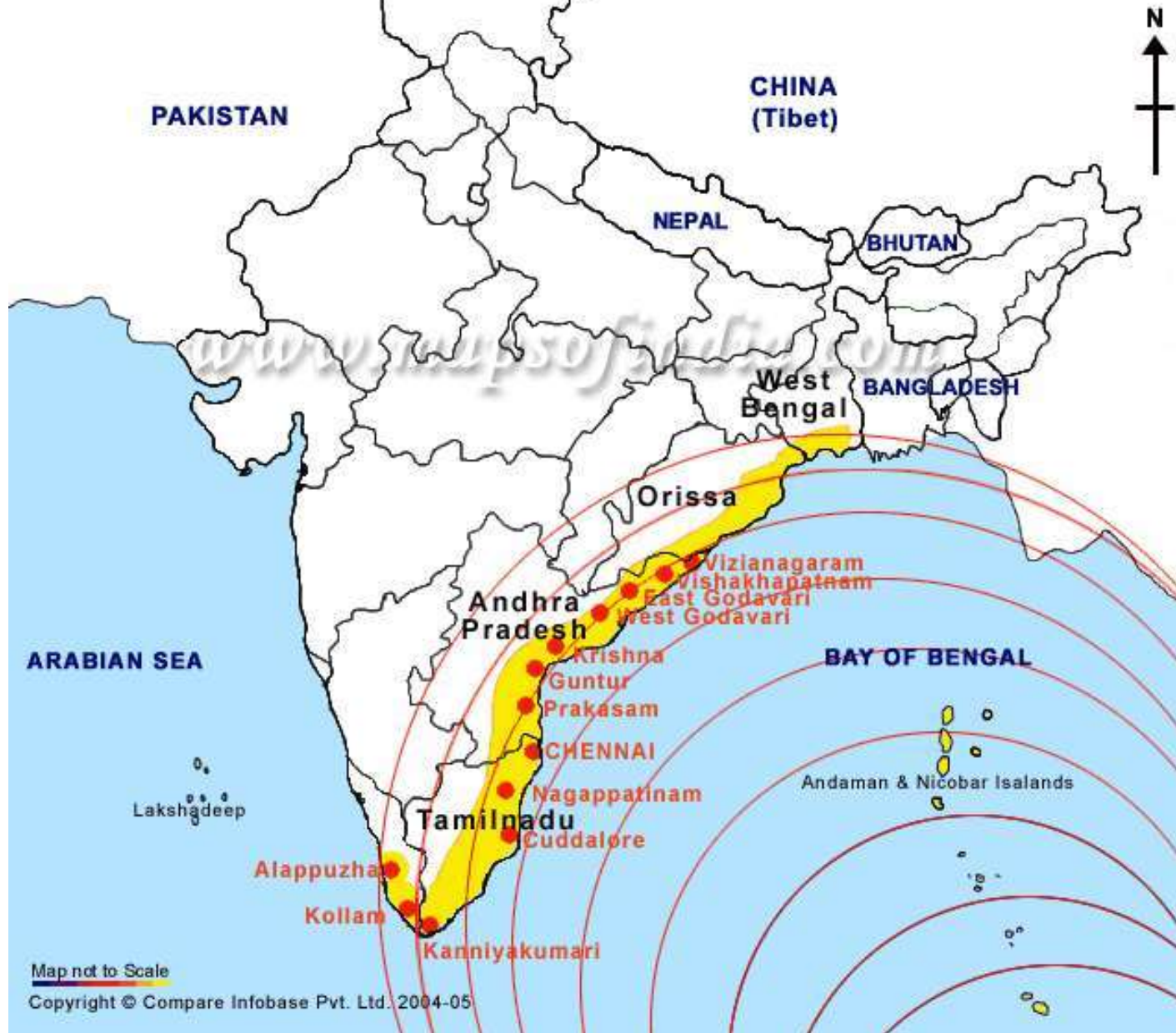


## EARTH QUAKE HAZARD MITIGATION

- Establishing earthquake monitoring centres (**seismological centre**) for regular monitoring. Use GPS (**Geographical Positioning System**) for monitoring the movement of tectonic plates.
  - Prepare vulnerability map of country and educate the people of that area on minimizing the impact of disaster management.
  - Discouraging constructions of high rise building
  - Adopt earthquake resistant designs and use light material for construction.
- 



# Tsunami Hits Eastern and Southern Coastal India





# TSUNAMI

- The biggest tsunami ever happened at Lituya Bay, Alaska on July 9, 1958. The mega tsunami was around 150 meters tall.
- The tsunami caused by 2004 Indian Ocean earthquake, is the 6<sup>th</sup> deadliest natural disaster in recorded history with a death toll of 2,30,210 – 2,80,000



# NATIONAL TSUNAMI HAZARD MITIGATION PROGRAM (NTHMP)

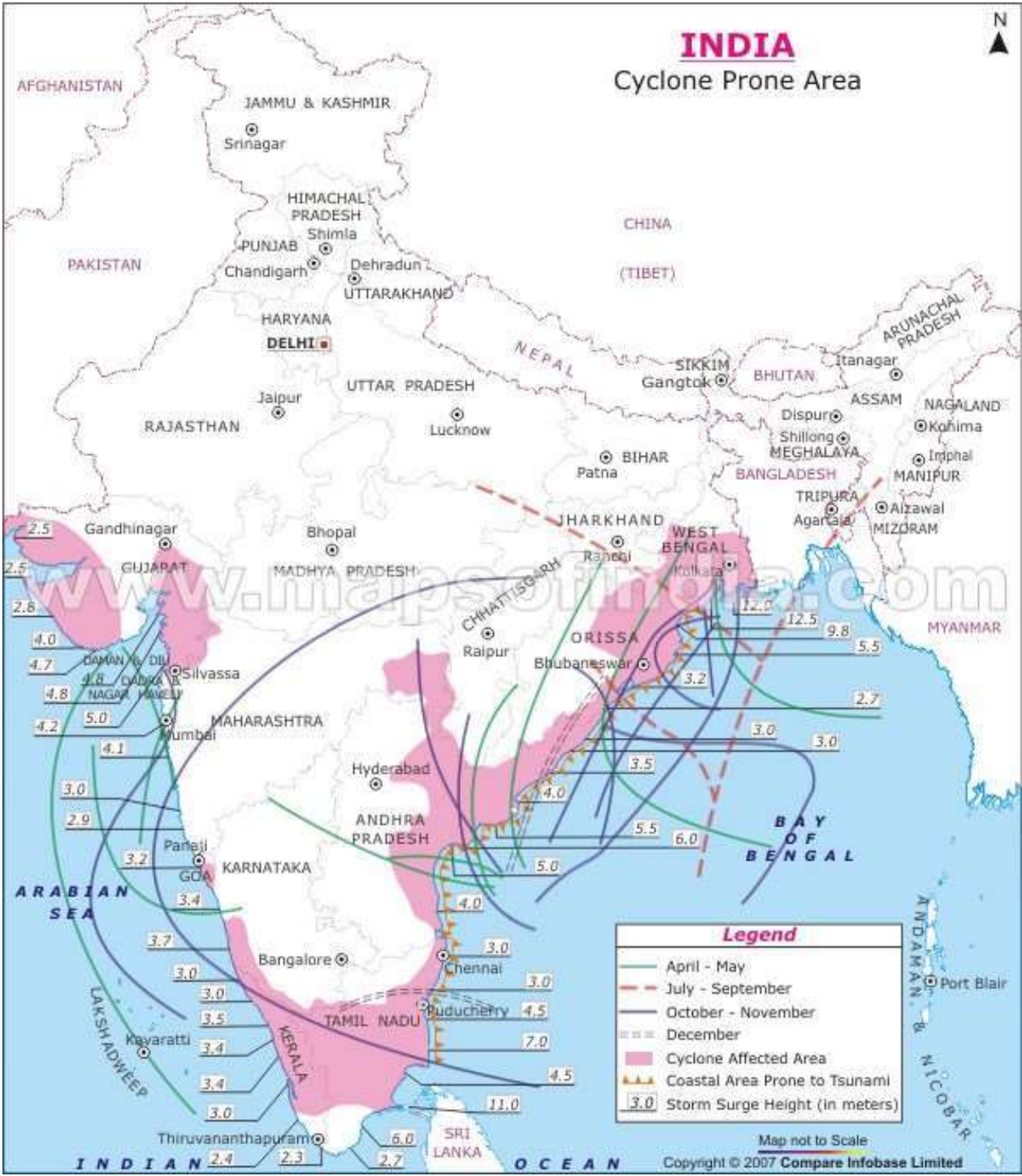
- The National Tsunami Hazard Mitigation Program (NTHMP) is a Federal and State program designed to protect people and reduce property losses in the event of a tsunami.
- Led by the National Oceanic and Atmospheric Administration (NOAA), the NTHMP consists of other primary participants , including the Federal Emergency Management Agency (FEMA).



## TSUNAMI MITIGATION PROGRAM

- Guidance for producing consistent and accurate tsunami inundation and evacuation zones
- Tsunami hazard guidance/products for maritime, land-use, and recovery planning
- Annual national tsunami exercises to test and update response plans and improve the effectiveness of the warning system
- National Tsunami Education and Outreach Action Plan





# **NATIONAL CYCLONE RISK MITIGATION PROJECT (NCRMP)**

- (i)** improved early warning dissemination systems
- (ii)** enhanced capacity of local communities to respond to disasters
- (iii)** improved access to emergency shelter, evacuation, and protection against wind storms, flooding and storm surge in high areas
- (iv)** strengthening DRM capacity at central, state and local levels







## **EXISTING FLOOD MANAGEMENT MECHANISMS IN INDIA**

- **Central Water Commission (CWC)**
- **Brahmaputra Board**
- **Ganga Flood Control Commission**
- **Farakka Barrage Project Authority**
- **National Disaster Management Authority  
(NDMA)**



# **GOVERNMENT'S POLICIES ON FLOODS**

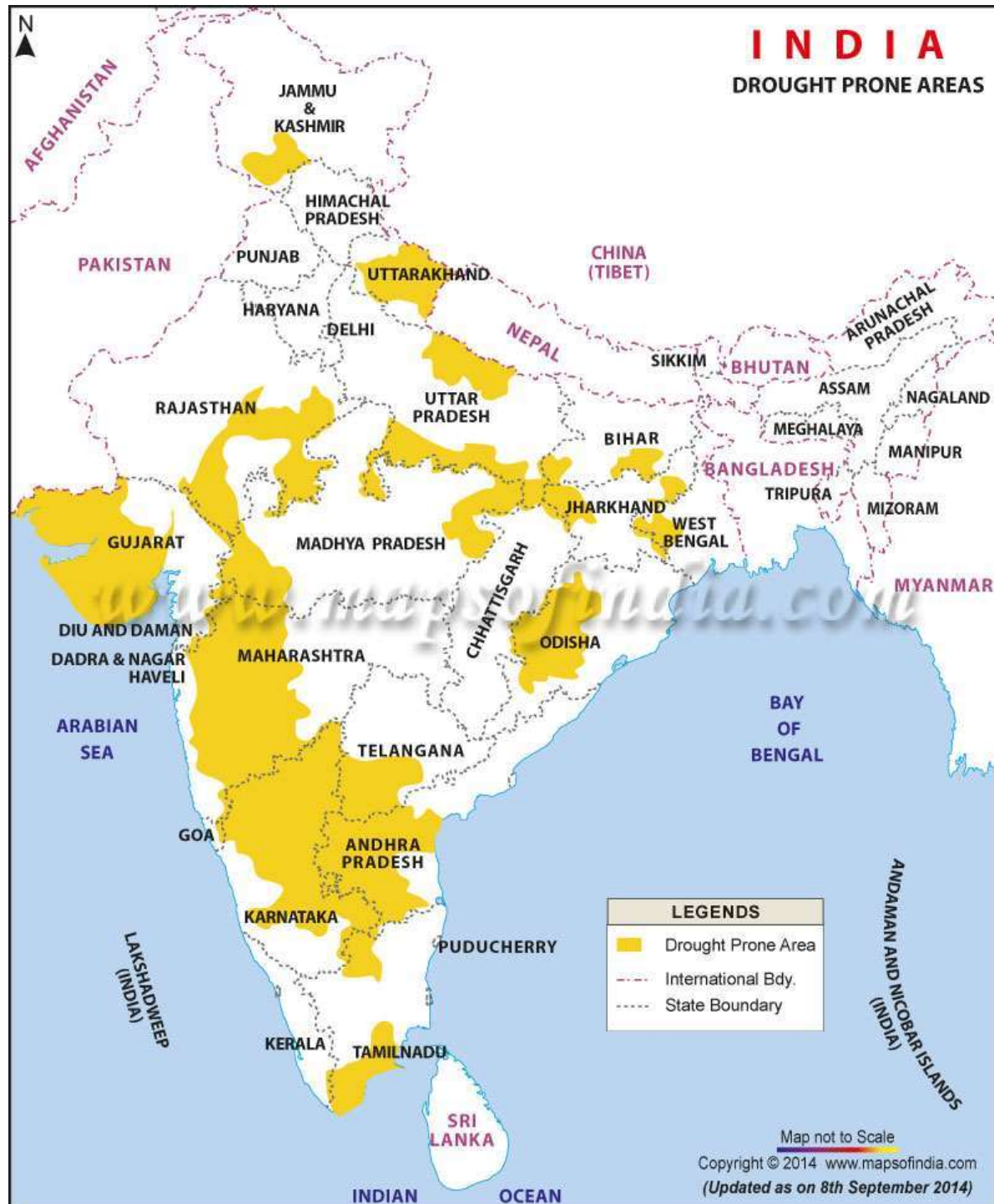
- Policy Statement – 1954**
- High Level Committee On Floods – 1957 & Policy Statement of 1958**
- National Flood Commission (Rashtriya Barh Ayog) – 1980.**
- Expert Committee to Review the Implementation of the Recommendations of National Flood Commission-2003 (Rangachari Committee)**
- National Water Policy ( 1987/ 2002/2012)**



## GENERAL FLOOD MANAGEMENT MEASURES PRACTICED IN INDIA

- An artificially created reservoir behind a dam across a river
- Channelization of river.
- Artificially raised embankments that reduce spilling
- Channel and drainage improvement works, which artificially reduce the flood water level

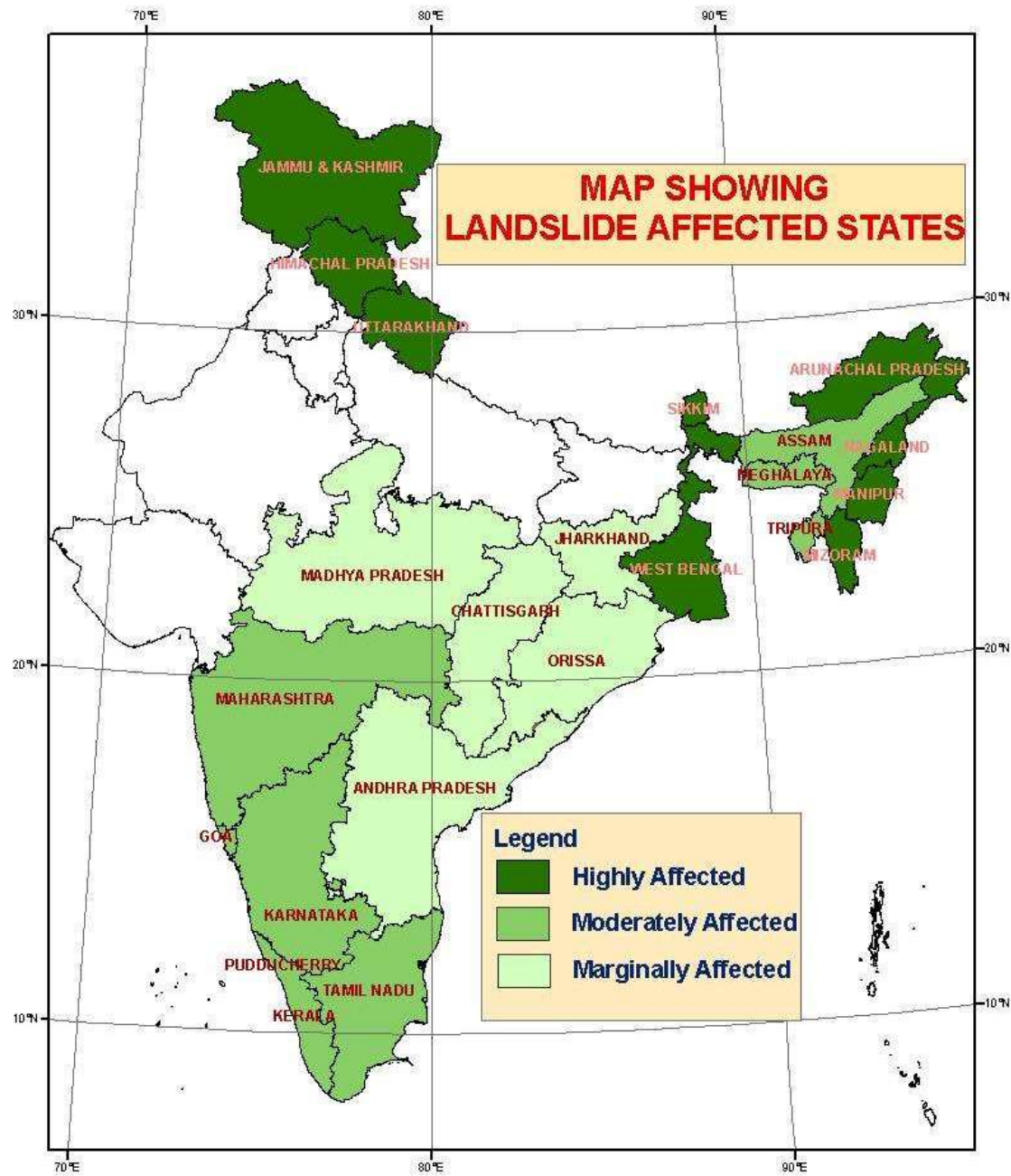




# GUIDELINES ON MANAGEMENT OF DROUGHT

- Creation of Drought Monitoring Cells (DMCs) cells at state level
- Preparation of vulnerability maps for each state
- Development of real-time drought related information by using information and communication technology.
- The watershed development approach would be taken up for drought management







## MEASURES TO PREVENT LANDSLIDE

- Improving surface and subsurface drainage
- Excavating the head
- Buttressing the toe
- Constructing piles and retaining walls



## AVALANCHE PREVENTIVE MEASURES

- Afforestation of avalanche prone area.
- Trapping the avalanche by control measures.
- Disposing the avalanche potential snow packs by artificial triggering
- Predicting the occurrence of avalanches and issuing warning.
- Guiding the residents about the emergency evacuation shelters.



# **GENERAL EFFECTS OF DISASTER**

- LOSS OF LIFE
- INJURY
- DAMAGE TO AND DESTRUCTION OF PROPERTY.
- DAMAGE TO AND DESTRUCTION OF PRODUCTION.
- DISRUPTION OF LIFESTYLE
- LOSS OF LIVELIHOOD.
- DISRUPTION TO ESSENTIAL SERVICES
- DAMAGE TO NATIONAL INFRASTRUCTURE
- DISRUPTION TO GOVERNMENTAL SYSTEMS
- NATIONAL ECONOMIC LOSS
- SOCIOLOGICAL AND PSYCHOLOGICAL AFTER EFFECT.

# Disaster Management

A continuous and integrated process of planning, organizing, coordinating and implementing measures which are necessary or expedient for-

- Prevention of danger or threat of any disaster.
- Reduction of risk of any disaster or its severity or consequences.
- Capacity-building.
- Preparedness to deal with any disaster.
- Prompt response to any threatening disaster situation or disaster.
- Assessing the severity or magnitude of effects of any disaster.
- Evacuation, rescue and relief.
- Rehabilitation and reconstruction.

# **DISASTER MANAGEMENT**

“An applied science which seeks, by the systematic observation and analysis of disasters, to improve measures relating to prevention, mitigation, preparedness, emergency response and recovery.”

# Disaster Management Cycle







# **RESPONSE**

- Response measures are usually those which are taken immediately prior to and following disaster impact.
- Typical measures include :
  - Implementation of plans
  - Activation of the counter-disaster system
  - Search and Rescue
  - Provision of emergency food, shelter, medical assistance etc.
  - Survey and assessment
  - Evacuation measures



# **RECOVERY**

- Recovery is the process by which communities and the nation are assisted in returning to their proper level of functioning following a disaster.
- Three main categories of activity are normally regarded as coming within the recovery segment:
  - Restoration
  - Reconstruction
  - Rehabilitation



# PREVENTION & MITIGATION

- **Prevention** :Action within this segment is designed to impede the occurrence of a disaster event and/or prevent such an occurrence having harmful effects on communities or key installations.
- **Mitigation** : Action within this segment usually takes the form of specific programs intended to reduce the effects of disaster on a nation or community. For instance, some countries regard the development and application of building codes (which can reduce damage and loss in the event of earthquakes and cyclones) as being in the category of mitigation.



# **PREPAREDNESS**

Preparedness is usually regarded as comprising measures which enable governments, organizations, communities and individuals to respond rapidly and effectively to disaster situations.

- Examples of Preparedness measures are :
  - The formulation & maintenance of valid, up-to-date counter-disaster plans
  - Special provisions for emergency action
  - The provisions of warning systems
  - Emergency communications
  - Public education and awareness
  - Training programs, including exercises and tests.



# **Principles of Disaster Management**

- Risk & Hazard Assessment
- Planning
- Organization
- Resource Utilization
- Need for Specialists
- Training



# **RISK AND HAZARDASSESSMENT**

- Disaster risk will be a combination of the likelihood of the event and the vulnerability of a place to that event.
- The hazard assessment will aim to deliver accurate disaster information about individual locations.





# HAZARD ASSESSMENT

Vulnerability to a particular hazard will include :

- Critical products, services, records and operations.
- Hazardous materials
- Potential effects of damage on stakeholders.
- Likely financial costs.
- Resources personnel and time available to make preparations.
- Level of insurance cover.

The combination of hazard and vulnerability assessments will result in formulating total risk assessment.



# Principles of Disaster Management

- **Planning :**
  - to have a clear and logical approach to dealing with disasters.
  - to provide common reference for all departments and authorities with roles.
  - to assist with information for sitting-up a multi-functional organizational structure.
  - to form a basis for coordinated action.
  - to provide clear allocation of responsibilities.
  - to form a basis for reviewing and evaluating current and future disaster management requirements.
  - to give a focus for disaster related training.



# Principles of Disaster Management

- **Organization :**
  - the nature of National Disaster Management Authority (NDMA)
  - Utilization of total governmental structures/ resources i.e. National, State & Local level.
  - Co-ordination of non governmental resources
  - Community involvement
  - Clear lines of Authority and unity of command
  - Special system requirements.



# **Principles of Disaster Management**

## **Organization (Contd.) :**

- Special system requirements.
  - Emergency Operation Center/Control Center
  - Direction & Coordinating Authority
  - Communications
  - Warning Systems
  - Survey & Assessments
  - Information Management
  - Emergency Logistics



# **Principles of Disaster Management**

## **: Resource Utilization**

- Identification of resources
- Assessment of resources with relation to their capability & availability
- Allocation of appropriate tasks
- Level of skill in handling allotted tasks and experience
- Activation time for deployment/availability
- Co-ordination with line authorities of resource organizations
- Coalition of accurate information for effective deployment of resources.

## **• AGENCIES**

- Governmental (Including Military both at National & State Level).
- Non Governmental Organizations.
- Community groups both social & religious.
- International Volunteer organisation.



# **Principles of Disaster Management**

## **Need for Specialists :**

Search & Rescue

- Survey & Damage Assessment
- First Aid & Triage
- Mobile Medical & Health Team
- Evacuation
- Animal Husbandry/Veterinary

– Emergency Welfare

– Emergency Shelter

– Emergency Logistics

– Staff for EOC (Emergency Operating Center)

– Information Management including public information needs.

– Specialists from field of disaster studies and research (Geologists, Meteorologists, etc.)





# Principles of Disaster Management

## **Training :**

- Identification of Training needs.
- Scope of Training programs.
- Training policy.
- Implementation of training.

Design of training should be compatible to support tasks required to be performed after a Disaster at three levels.

- Foundational Training
- Team Training
- Combined Organizational Training.

# Institutional Framework

## Disaster Management Structure

NDMA Apex Body with Prime Minister as Chairperson.  
National Executive Committee - Secretaries of 14 Ministries  
and Chief of Integrated Defence Staff.

## Centre Level

Central Ministries; National Disaster Management Authority,  
National Institute of Disaster Management  
National Disaster Response Force (NDRF).

## State Level

SDMA headed by Chief Minister.  
State Executive Committee (SEC).

## District Level

DDMA headed by District Magistrate.  
Interface between Govt. and Public.

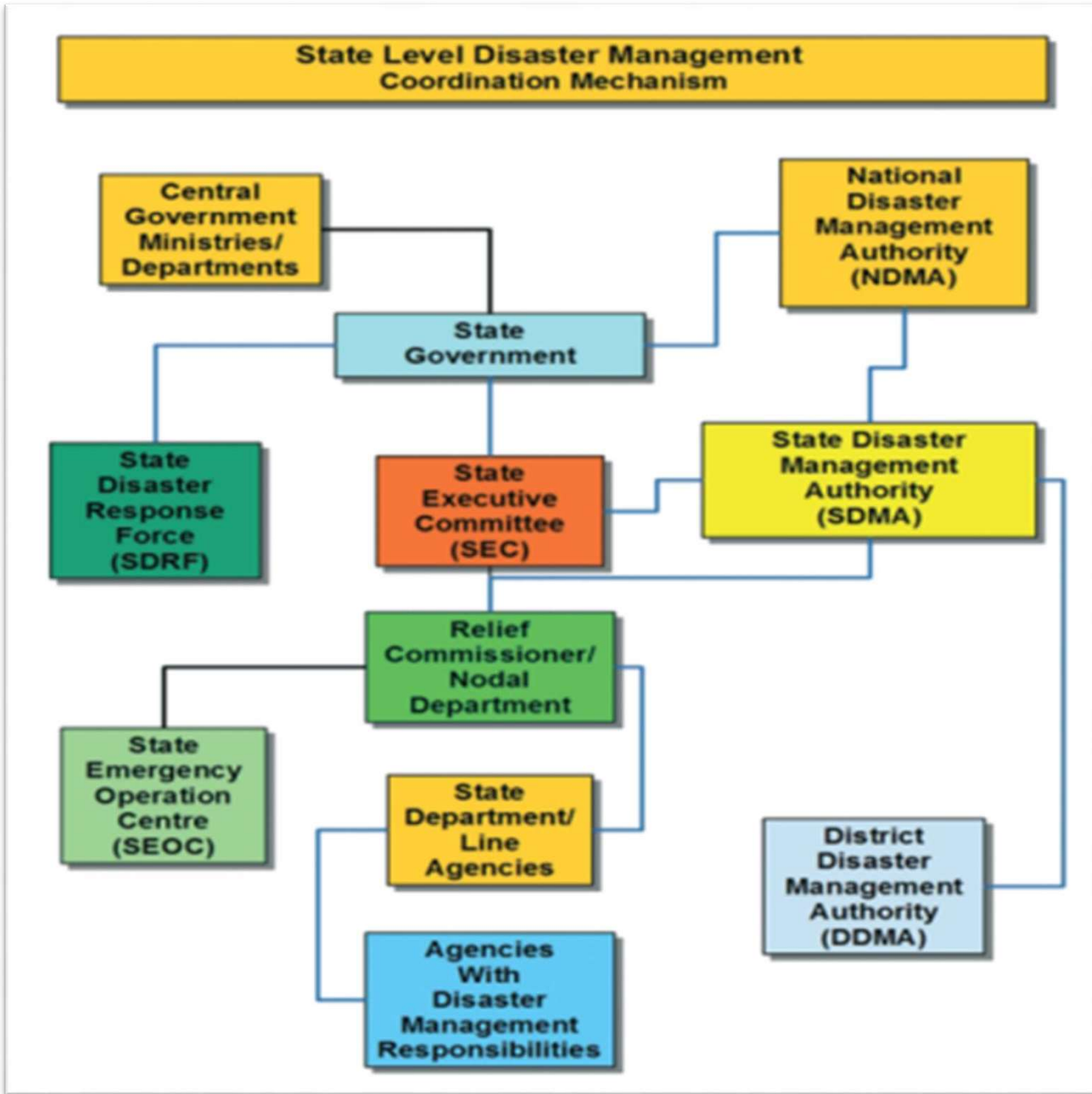


# Nodal Agencies for Disaster Management

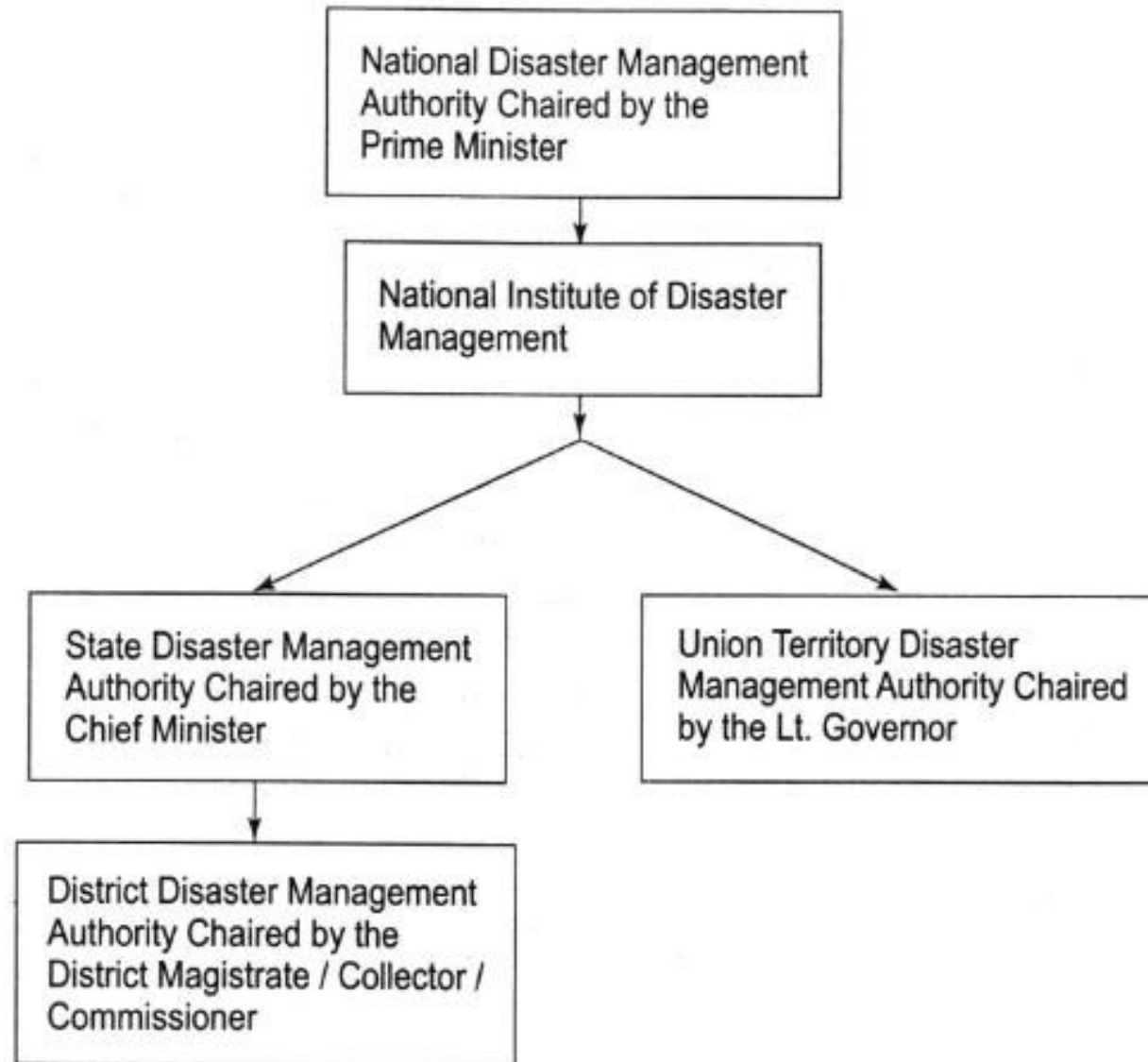
- Floods :Ministry ofWater Resources, CWC
- Cyclones : Indian Meteorological Department
- 1. Earthquakes : Indian Meteorological Department
- Epidemics :Ministry of Health and FamilyWelfare
- Avian Flu: Ministry of Health,Ministry of Environment, Ministry of Agriculture andAnimal Husbandry
- Chemical Disasters : Ministry of Environment and Forests
- Industrial Disasters : Ministry of Labour
- Rail Accidents :Ministry of Railways
- AirAccidents :Ministry of CivilAviation
- Fire : Ministry of HomeAffairs
- Nuclear Incidents : Department ofAtomic Energy
- Mine Disasters : Department of Mines

# Disaster Management Policy, Plans & Guidelines

- **National Policy on Disaster Management, 2009**
- **National Action Plan on Climate Change**-Issued by MOEF
- **Drought Manual** –Prepared jointly by MOA/ NIDM and issued by MOA.
- **Guidelines**- 26 guidelines issued by NDMA.
- **National Disaster Management Plan**
- **State and District Disaster Management Plans**

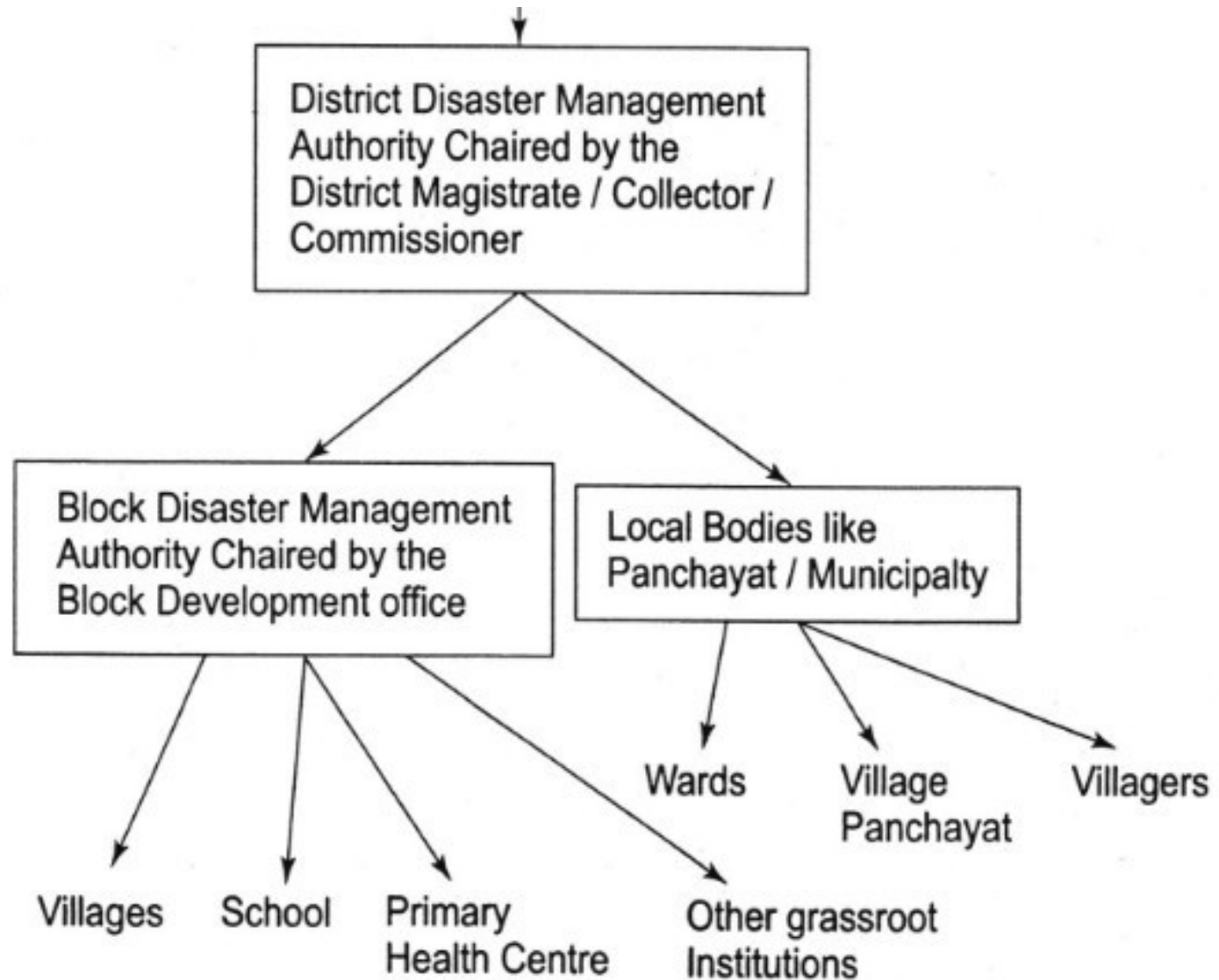


## Organogram of DM authorities from center to state/district





## Organogram of DM authorities from center to state/district





## The District Disaster Management Plan [DDMP]

- The District is primarily responsible for the management of natural and human-caused disasters identified above at the District level and has a shared responsibility with the State Government for preparedness and for identified catastrophic disasters. For this it is need for preparation of a Disaster Management Plan, with detailed operational procedure of each department.
- The District Disaster Management Plan (DDMP) is the guide for achieving the objective i.e. mitigation, preparedness, response and recovery. This Plan needs to be prepared to respond to disasters with sense of urgency in a planned way to minimize human, property and environmental loss.



# **COMPOSITION OF DDMA**

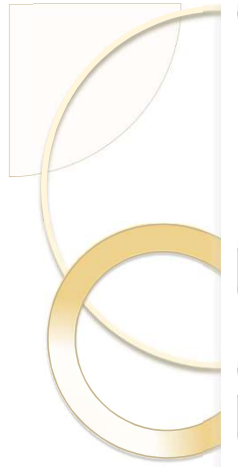
- COLLECTOR & DISTRICT MAGISTRATE ==> CHAIRMAN
- STAKEHOLDER DEPARTMENTS
  - ✓ REVENUE
  - ✓ POLICE
  - ✓ FIRE
  - ✓ MEDICAL & HEALTH
  - ✓ WATER SUPPLY
  - ✓ ROADS & BUILDINGS
  - ✓ TRANSPORTATION
  - ✓ PANCHAYAT RAJ
  - ✓ IRRIGATION
  - ✓ ELECTRICITY POWER SUPPLY
  - ✓ LOCAL BODIES
  - ✓ BSNL, IMD, RAILWAYS, ALL INDIA RADIO
  - ✓ ANIMAL HUSBANDRY
  - ✓ AGRICULTURE
  - ✓ HORTICULTURE



# **ROLES & RESPONSIBILITY**

## **COLLECTOR:**

- Facilitate and, coordinate with, local Government bodies to ensure that pre and post - disaster management activities in the district are carried out.
- Assist community training, awareness programmes and the installation of emergency facilities with the support of local administration, non-governmental organizations, and the private sector.
- Take appropriate actions to smoothen the response and relief activities to minimize the effect of disaster.
- Recommend State Government for declaration of disaster.



# **ROLES & RESPONSIBILITY**

## **LOCAL AUTHORITY**

- Provide assistance to Collector in disaster management activities.
- Ensure training of its officers and employees and maintenance of resources so as to be readily available for use in the event of a disaster.
- Ensure that all construction projects under it conform to the standards and specifications lay down.
- Each department of the Government in a district shall prepare a disaster management plan for the district.
- Carry out relief, rehabilitation and reconstruction activities in the affected area within its jurisdiction.



# **ROLES & RESPONSIBILITY**

## **PRIVATE SECTOR**

- The private sector should ensure their active participation in the pre-disaster activities in alignment with the overall plan developed by the DDMA. They should also adhere to the relevant building codes and other specifications, as may be stipulated by relevant local authorities.

## **Community Groups and Voluntary agencies**

- Local community groups and voluntary agencies including NGOs should actively assist in prevention and mitigation activities under the overall direction and supervision of the DDMA. They should actively participate in all training activities as may be organized and should familiarize themselves with their role in disaster management.

## **CITIZEN**

- It is a duty of every citizen to assist the DDMA or such other person entrusted with or engaged in disaster management whenever his aid is demanded generally for the purpose of disaster management.