DISASTER MANAGEMENT

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DISASTER MANAGEMENT

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INTRODUCTION AND CONCEPTS AND THEIR MEANING

What is a disaster?

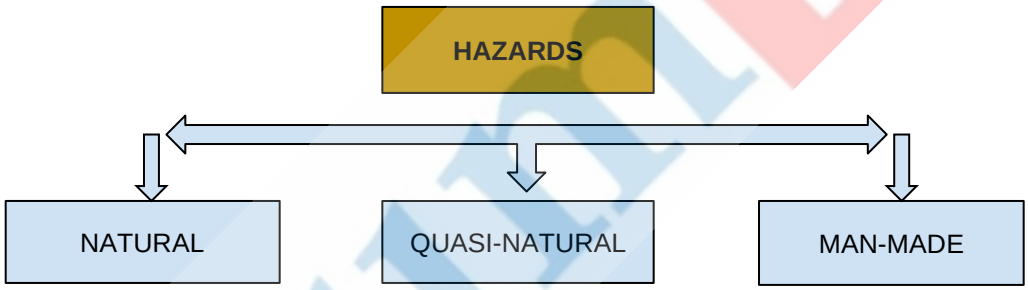
- Definition of disaster- ''A **serious disruption** in the functioning of the community or a society causing **widespread** material, social, financial and environmental **damage** which reduces the ability of a society to manage through the use of its existing resources.''
- **Disaster Management Act 2005** uses the following definition as Disaster: "Disaster" means a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or manmade causes, or by accident or negligence which results in substantial loss of life or human suffering or damage to, and destruction of, property, or damage to, or degradation of, environment, and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area."
- The term disaster owes its origin to the French word ''Desastre'' which is a combination of two words 'des' which means Bad and aster which means star. As a whole these words refer to 'Bad or Evil star'.
- Disasters are natural or manmade, in the past few years there has been a significant increase in the frequency and magnitude of such disasters. The situation in India is especially vulnerable as it is prone to disasters of various types.
- Also, revised **UNISDR** terminology, defines 'disaster' as: "A serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts."

HAZARD

- Any phenomenon that has the potential to cause disruption or damage to people and their environment.
- When hazard involves elements of risks, vulnerabilities and capacities, they can turn into disasters.

- The term is derived from the word 'hasard' from the old French language and 'az-zahr' in Arabic meaning 'chance'/'luck'. It may be defined as ''a dangerous condition or event, that actually or potentially causes injuries to life or damage assets or environment. ''
- Hazards like earthquakes, landslides or cyclone with vulnerabilities like lack of adequate access to resources, lack of awareness about the coping mechanism would lead to disaster causing greater loss to life and property.
- For example, in the case of a cyclone strikes an isolated island, it cannot be considered a disaster, irrespective of the strength of the cyclone, it can be considered a disaster only when it affects people, their assets and the way they live.
- The disaster occurs only when both hazard and vulnerabilities combine. Humans are now more than ever capable of reducing the impact of these disasters with enhanced capacity building.
- A disaster is the sum total of hazard, vulnerabilities and lack of capacity to reduce the potential chances of risk.
- India is among the Top 10 countries which are most vulnerable to natural hazards. **India** has the **greatest** number of people exposed to **natural hazards** (1 billion), followed by China (677 million) as per Forbes.

CLASSIFICATION OF HAZARDS



Natural Hazards: Natural Hazards are naturally occurring **physical phenomena caused by either rapid or slow onset events** which can be Geophysical i.e. (Earthquakes, tsunamis, volcanic eruptions and landslides, Hydrological (Avalanches, Landslides, droughts and floods), Climatological (Extreme temperature, droughts and wildfires, Meteorological (Cyclones, tornadoes and Storms/wave surges) or Biological (Disease epidemics and Insect/ animal plagues).	**Quasi-Natural Hazards:** Smog or Desertification arise through the interaction of natural processes and human activities. A Quasi Natural Hazard is a hazard which is caused by a **bi-product of human activities** especially while using natural resources.	**Man-made Hazards:** Man Made hazards are events that are **caused by humans and occur in or close to human settlements.** The events leading upto a man-made hazard may be the result of deliberate or negligent human actions, but their impact can be equally as devastating. This can include environmental degradation, pollution and accidents. Manmade hazards (complex emergencies/ conflicts, Famine, Displaced populations, Industrial Accidents and Transport accidents).

Classification of Disasters:

Disasters are broadly classified into Natural disasters and Man-made Disasters

Natural Disasters:	***Man-made Disasters:***
Is a situation or an event, which overwhelmed local capacity, necessitating a request to the national or international level for external assistance, an unforeseen and often sudden event that causes great damage, destruction and human suffering. They represent a **serious breakdown in sustainability and disruption of economic and social progress. Example:** • Natural Disasters of geological origin (volcanic eruptions, earthquakes and landslides). • Natural Disasters of Climatic or meteorological Origin (floods, droughts, cold waves, heat waves, avalanches, wave surges including tsunamis and tidal waves, wind storms including cyclones, hurricanes, storms, tornadoes, tropical storms, typhoons and winter storms). • Wildfires, both forest and scrub. • Insect infestations, and • Epidemics of cholera, Diarrhea, Meningitis, dengue fever and malaria.	An element of human intent or negligence that leads to human suffering and environmental damage. Man Made disasters are also known as **anthropogenic disasters** and they occur as a result of human intent, error or as a result of failed systems. **Example** - Economic collapse, Terrorist attacks, Power outages, chemical threat, biological threat, Nuclear accident, war, Explosion, Oil and chemical spills, Dam failure etc.

FEW EXAMPLES OF DISASTERS

Water and Climate Related Disaster	**Geological Related Disasters**	**Industrial and Nuclear Related Disaster**	**Accident Related Disasters**	**Biologically Related Disaster**
Flood, Drought Cyclone, Tsunami, Tornado, Hailstorm, Cloud Burst, Thunderstorm & Lightning, Snow avalanches, Heat & Cold wave, Coastal Sea Erosion	Landslides and Mudflows, Earthquakes Dam failures/Dam Bursts, Mine Fire	Chemical & Industrial, Nuclear, Accident Related Disasters	Forest Fire, Boat Capsizing, Urban Fire, Mine Flooding, Oil-Spill, Major Building Collapse, Serial Bomb Blasts, Festival Related Disasters, Air, Road and Rail Accidents	Biological Disaster and Epidemics Pest Attacks Cattle Epidemics Food Poisoning

- **VULNERABILITIES**- It may be defined as '' conditions determined by physical, social, economic and environmental factors or happenings which increase the susceptibility of a community to impacts of hazards.''

Vulnerabilities of different forms-

1. **Economic Vulnerabilities** – Low income earning families which are living in unsanitary and inhabitable settlements because they cannot afford to live in a safer (more expensive) areas.
2. **Physical Vulnerabilities** – Kuccha/ Makeshift shelters/ slums are most likely to collapse in case of a disaster.
3. **Social Vulnerability** – Women, children and people suffering from old age suffers the most during disaster situations. They are easily susceptible to illness and women and children have been seen to be trafficked in such disaster struck situations in the past.

- **Risk-** It means the expected losses due to a hazard happening in a particular area over a specific period of time. Risk is a function of the probability of a particular hazard and what a loss it is going to cause. The level of risk is based upon the nature of the hazard, vulnerability of the elements and can be shown as

Risk = Hazard x Vulnerability.

Disaster risk with respect to India as per National Disaster Management Authority

- India is one of the ten most disaster-prone countries of the world. It is vulnerable to a large number of natural and manmade disasters because of its **geographical, climatic and socio-economic conditions**.
- **58.6 percent of the landmass** is prone to **earthquakes** of moderate to very high intensity.
- 68% of its cultivable area is vulnerable to droughts.
- Hilly areas are at risk from landslides and avalanches.
- Over **40 million hectares** (12%) of its land is **prone to floods** and river erosion.
- About **5,700 kms**, out of the 7,516 kms long **coastline is prone to cyclones** and **tsunamis.**
- Vulnerability exists of **Chemical, Biological, Radiological and Nuclear (CBRN) disasters.**
- Within the **vulnerable groups**, elderly persons, women which became destitute, children orphaned due to disasters and differently–abled persons are exposed to higher risks.

The five distinctive regions of the country i.e. Himalayan region, the alluvial plains, the hilly part of the peninsula, and the coastal zone have their own specific vulnerabilities.
While on the one hand the Himalayan region is prone to disasters like earthquakes and landslides, the plains are affected by floods almost every year.
The desert part of the country is affected by droughts and famine while the coastal zone is susceptible to cyclones and storms.

Other than natural factors, various **man-made factors/ anthropogenic factors** like increasing population pressure, deteriorating environmental conditions, deforestation, unplanned haphazard development and urbanization, faulty agricultural practices and grazing, construction of large dams on rivers which leads to seismicity etc. are responsible for accelerated impact and increase in frequency of disasters in the country.

Historical Background

- In the pre–Independence era, the policy was relief oriented and relief departments were set up for emergencies during disasters.
- Activities included designing the relief codes and initializing food for work programs.
- After Independence, the task for managing disasters continued to rest with the Relief Commissioners in each state, who functioned under the Central Relief Commissioner, with their role limited to distribution of relief material and money in the affected areas.
- Later JC Pant committee on disaster management was formed so as to establish a permanent mechanism to deal with the disasters.
- Later a permanent and institutionalized setup began in the decade of the 1990s with setting up of a disaster management cell under the Ministry of Agriculture, after the declaration of the decade of 1990 as the 'International Decade for Natural Disaster Reduction (IDNDR) by the UN General Assembly. Thereafter, the disaster management division was shifted under the Ministry of Home Affairs in 2002 and a hierarchical structure for disaster management for the first time evolved in India.
- The Tenth Five–Year Plan document also had, for the first time, a detailed chapter on Disaster Management. Even the Twelfth Finance Commission was mandated to review the financial arrangements for Disaster Management.
- Thus in 2005 National Disaster Management Act was passed and later government brought multiple initiatives to manage disasters which are discussed later in the chapter.

- **Disaster damage**- It occurs during and immediately after the disaster. It is usually measured in physical units (for example 1000 kms of roads or 1000 houses broken), it describes the total or partial destruction of physical property, the disruption of basic services and damages to sources of livelihood in the affected area.
- **Disaster impact**- It is the total effect, including the negative and positive effects (e.g., economic losses and benefits) of a hazard or a disaster. Disaster impact includes environmental, financial and human impacts like deaths, injury, epidemics spreading. For example, Japan suffered a loss of 411 billion $ when Tsunami in 2011 struck. Recently also, during typhoon hagibis nearly 75 people died and many were injured.

DIFFERENCE BETWEEN NATURAL HAZARD AND NATURAL DISASTER?

HAZARD	*DISASTER*
Hazard is a threat and is a dangerous physical condition or event and such a threat	When the hazardous event actually happens and harms humans, we call the event a natural disaster.
Hazards may be inevitable but disasters can be prevented. Also, they don't cause such large-scale destruction of lives.	**Hazards are termed as Disasters when they cause widespread destruction of property and Human lives as a disaster**
A large number of people are affected as disaster leads to widespread loss of life, damage to property. Disaster mainly occur at over populated area.	Disaster is an event and is a calamity or a consequence of a hazard. Natural hazards that cause massive loss to

	human life and property are called disasters. Disasters mainly occur at overpopulated areas.
Hazards are natural or manmade phenomenon that are a feature of our planet and cannot be prevented. Hazard may occur at a place where there is less population like an isolated island gets struck by a tsunami wave as there is no harm to humans or any property such event will be called a hazard.	A disaster disrupts the normal function of the society. Disaster causes damage to property and loss of life but it also disrupts the opportunities of employment. For example, Earthquakes, floods, volcanoes, tsunami, landslide, drought etc. are natural hazards. But if the effect of such event is multifold it is considered as a Disaster.

Causes behind Disasters happening:

- Natural factors: Tectonic plate movements may lead to earthquakes happening, volcanic activities or landslides where the geological changes lead to such events happening.
- Environmental degradation: Cutting down of trees and decline in forest cover from a watershed area have caused, soil erosion, expansion of flood plain area in upper and middle course of rivers and groundwater depletion.
- Industrial expansion: Large scale industrialization has resulted in warming of earth and frequency of extreme weather events has also increased.
- Industrial disasters: Sometimes, Industrial disasters / accidents may happen due to callousness of employees
- Developmental process: Exploitation of land use, development of infrastructure, rapid urbanization and technological development have caused increasing pressure over the natural resources.
- Haphazard expansion of urban areas and poor urban planning are also the reasons which made it possible for urban areas to experience flooding situation. Urbanization is not bad but haphazard urbanization lead to people living in slums and poor living conditions and when flooding happens, they are the one which are affected the most. Poor government policies and practices are also responsible like absence of early warning systems, deforestation, lower and inferior standards of safety in industries, inhabiting in disaster prone areas etc.
- Climate change and global warming is one of the major causes which has increased the veracity and impact of climate change on disasters manifold in the past, the frequency and the impact of disasters has also grown. Earth's carrying capacity also has been significantly reduced which has led to many species becoming extinct.
- Melting of glaciers leads to increased level of water bodies, submergence of coastal areas thus affecting populations residing in such areas.

IMPACTS OF DISASTERS

On economy

- Disaster leads to **huge economic loss** due to large scale destruction of property, human settlements and infrastructure etc.
- Disaster **increases the level of vulnerability further** and leads to increased frequency and occurrence of disasters. Poor financial poverty leads them in a vicious cycle of poverty.
- **Economic loss due to disasters to countries** - As per World Bank, economic loss was 2% of the GDP due to disasters in 2018.

On society and on human development

- Poor availability of medicines leads to spread of illness especially water borne in the event of floods.
- **Impacts individuals as it causes** loss of life, physical injury, illness, physical and **psychological** disability.
- **High-risk populations** like old people and women, children are most vulnerable.
- When a natural disaster strikes, essential products shortage like food and water results into **sale at inflated prices**.
- The disaster results in large scale **displacement of people**, and displaced population often face several challenges in new settlements and poor rehabilitation measures add insult to the injury.
- Disturbance in the social fabric as anarchy sometimes takeover as the situation becomes of every man for himself like recently in Chennai people clashed over a bucket of water and a person was murdered.
- Lowering of morale due to lack of awareness about the way-out creation of panic due to wrong information and rumors spreading.

On environment

Disaster **can change the natural environment and surroundings**, loss of habitat to many plants and animals and cause ecological stress that can result in biodiversity and forest cover loss.

Creates further climate vulnerability and leads to environment becoming less resistant to disasters.

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DISASTER MANAGEMENT IN INDIA

WHAT IS DISASTER MANAGEMENT?

Disaster Management is a strategic planning and procedure that is administered and employed to protect critical infrastructures (also known as "critical assets") from severe damages when natural or human made calamities and catastrophic event occur.

Disaster Management is a holistic activity which is to be done with **synergy between all stakeholders**. It is not a one-time event, it is a continuous activity which starts even before the disaster has happened and works in building resilience against future disasters, thus a never-ending process.

Disaster management is *a continuous and integrated process of planning, organizing, coordinating and implementing measures which are necessary for:*

1. Prevention of danger or threat of any disaster;
2. Mitigation or reduction of risk of any disaster or its severity or consequences
3. Capacity-building;
4. Preparedness to deal with any disaster;
5. Prompt response to any threatening disaster situation or disaster;
6. Assessing the severity or magnitude of effects of any disaster;
7. evacuation, rescue and relief;
8. Rehabilitation and reconstruction
9. Evacuation, rescue and relief.

EVOLUTION OF THE RESPONSIVE AND PREPAREDNESS APPROACH TO DISASTER MANAGEMENT

- The repeated occurrences of disasters compelled the Government of India to take cognizance of the objectives of the International **Decade for Natural Disaster Reduction (1990-2000), Yokohama Strategy for a Safer World (1994), and the Plan of Action for a Safer World (Istanbul, 1996).**
- Consequently, the **High-Power Committee on Disaster Management (HPC)** was set up in 1999 to recommend strategies for Disaster Management Plans.
- Until 2001, the responsibility of Disaster Management was with agriculture Ministry. Following a recommendation of the HPC, it was transferred to the Ministry **of Home Affairs** in 2002.
- The **National Disaster Management Authority (NDMA)** was established in 2005.
- **Disaster Management Act** was passed in 2005.

Action taken by the Indian Government

- The Government of the Republic of India hosted the first **Annual Disaster Management Exercise** for 'Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) countries (**BIMSTEC DMEx-2017**) on 10-13 October, 2017 in New Delhi and the National Capital Region (NCR).
- National Disaster Management Authority (NDMA) in collaboration with United Nations Office for Disaster Risk Reduction (UNISDR), organized the first of its kind International **Workshop on Disaster Resilient Infrastructure (IWDRI)** on 15-16 January, 2018 in New Delhi.

- Ministry of Home Affairs, Government of India, organized the first India-Japan Workshop on Disaster Risk Reduction.
- The Government of India will organize a Joint Urban Earthquake Search and Rescue exercise of **Shanghai Cooperation Organization (SCO)** member states to improve collective preparedness in March, 2019.
- Approve plans prepared by the Ministries or Departments of the Government or Departments of the government of India in accordance with the national plan.

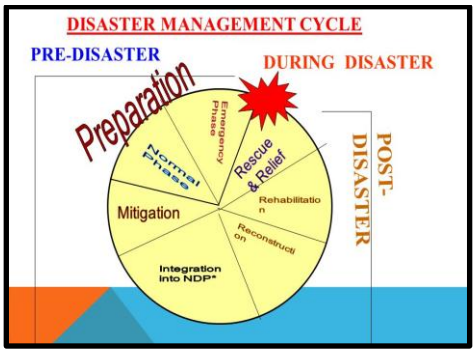
PARADIGM SHIFT IN DISASTER MANAGEMENT

1. There was a paradigm shift from the erstwhile relief centric response to a proactive prevention, mitigation and preparedness-driven approach.
2. The new approach is obtained from the conviction that development cannot be sustainable unless disaster mitigation is built into the development process.
3. This paradigm shift underpins that disasters can be managed through adequate planning and preparedness for response.
4. The new approach also originates from the belief that investments in mitigation are much more cost effective than expenditure on relief and rehabilitation.

DISASTER MANAGEMENT CYCLE

- The Disaster management cycle illustrates the ongoing process by which governments, businesses, and civil society plan for and reduce the impact of disasters, react during and immediately following a disaster, and take steps to recover after a disaster has occurred.
- The complete disaster management cycle includes the **shaping of public policies and plans that either modify the causes of disasters or mitigate their effects on people, property, and infrastructure.**
- The mitigation and preparedness phases occur as disaster management improvements are made in anticipation of a disaster event.

Figures below shows the Disaster management cycle and various steps in the cycle.



PHASES IN DISASTER MANAGEMENT CYCLE:

1. **Pre-Disaster Phase:** Before a disaster to reduce the potential for human, material or environmental losses caused by hazards and to ensure that these losses are minimized when the disaster actually strikes.
2. **During-Disaster:** It is to ensure that the needs and provisions of victims are met to alleviate and minimize suffering.

3. **After Disaster:** After a disaster to achieve rapid and durable recovery which does not reproduce the original vulnerable conditions.

Pre-disaster Phase:

Researchers supports the idea that implementing a more holistic pre-disaster approach is more cost-effective in the long run. ***Every 1$ spent on hazard mitigation saves society 4$ in response and recovery costs.***

For pre-disaster planning to be effective it must be institutionalized in the local decision-making process. Communities must think more holistically about how they prepare for, respond to, and recover from disasters.

Prevention and 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:

- Mitigation includes all measures taken to reduce both the effects of the hazard itself and the vulnerable conditions to it in order to reduce the scale of a future disaster.
- Mitigation also aims at reducing the physical, economic and social vulnerability to threats and the underlying causes for this vulnerability
- Example: 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:

- It includes measures that enable governments, communities and individuals to respond rapidly to disaster situations to cope with them effectively. Example: the formulation of viable emergency plans, the development of warning systems etc.
- Early Warning: This is the process of monitoring the situation in communities or areas known to be vulnerable to slow onset hazards, and passing the knowledge of the pending hazard to people.

During Disaster Phase

Response:

Activation of the counter-disaster machinery, search and rescue should be initiated as soon as possible, provision of emergency food, shelter, medical assistance etc., evacuation measures should kick in and ensuring adequate mechanisms to fund emergency response activities.

Recovery Process

According to UNISDR (2009), recovery is the restoration, and improvement of facilities, livelihoods and living conditions of disaster–affected communities. It includes efforts to reduce disaster risk factors.

Three recovery stages, in which appropriate policies and programs tend to be planned and implemented are:

a) Early, b) Mid–Term, and c) Long–Term.

Major Steps of the recovery

The major steps of the recovery process and the key steps involved are as follows:

1. **Post–Disaster Needs Assessment**: It includes credible damage assessment led by government and assisted by humanitarian response agencies. A qualitative and quantitative baseline assessment is made

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for damage, loss and needs across sectors.

2. **Developing a vision for Build–Back Better:** Wider consultations with experts, civil society and key stakeholders are done and consensus is arrived at.
3. **Ensure coherence of BBB with the development goals:** Discussions at the top level must be done to align the recovery vision with government's broader longer-term development goals.
4. **Incorporating resilience in recovery vision:** It involves consultations on disaster resistant physical recovery, addressing gender and equity concerns, vulnerability reduction etc.
5. **Balancing recovery across sectors:** Public and private sector programs should be balanced. Infrastructure reconstruction should be prioritized while showing sensitivity to affected population.
6. **Prioritizing Sectors for recovery:** Determine the relative importance of various sectors such as housing, water and sanitation, governance, transport, power, communications, infrastructure, environment, livelihoods, tourism, social protection, health, and education.

Reconstruction

Long term recovery efforts must focus on redeveloping and restoring the socio–economic viability of the disaster area(s). The reconstruction phase requires a substantial commitment of time and resources by the Governments (State and Central) and other agencies. These reconstruction efforts include:

- Reconstruction of public infrastructures and social services damaged by the disaster, which can be completed over the long–term
- Re–establishment of adequate housing to replace that has been destroyed
- Restoration of jobs and livelihood that was lost
- Restoration of the economic base of the disaster areas.

Reconstruction:

Reconstruction attempts to return communities to improved pre-disaster functioning.

Example of measures: the replacement of buildings; infrastructure and lifeline facilities etc **Development:**

It is an ongoing activity

Example: Long term disaster reduction measures for examples like construction of embankments against flooding, irrigation facilities as drought proofing measures.

Rehabilitation:

Rehabilitation is defined as a strategy of institutional reform and improvement of infrastructure and services aimed towards supporting the affected populations. Generally, rehabilitation package includes total reconstruction of damaged physical and psychological infrastructure, as well as economic and social rehabilitation of the people in the affected region.

Post- Disaster Phase:

Recovery:

Recovery is the process by which communities and the nation are assisted in returning to their proper level of functioning following a disaster.

Recovery encompasses the three overlapping phases of **emergency relief, rehabilitation and reconstruction.**

Pre-Disaster planning can decrease the potential for loss of life and property, and economic damages from disaster events.

STEPS OF DM CYCLE

1.) Reducing Risk and Enhancing Resilience

- To reduce disaster risk, we need systematized efforts to analyze and manage the causes behind disasters by reducing exposure to hazards and reducing vulnerability of people and property, wise land management and protecting, conserving the environment, and improved preparedness for adverse conditions.
- The **DM Act 2005** defines "Mitigation" as measures aimed at reducing the risk, impact, or effects of a disaster or threatening disaster situation.

Prime Minister's 10-point Agenda

The Prime Minister had listed the agenda during his inaugural speech at the **Asian Ministerial Conference on Disaster Risk Reduction (AMCDRR) 2016,** which was held in New Delhi in November last year. The all-inclusive agenda presents a holistic approach to disaster risk management and addresses a whole range of issues, from community preparedness to use of technology and international cooperation. Following are the **Prime Minister's ten-point agenda on Disaster Risk Reduction which are important to be followed so as to minimize disaster risk.**

1. Building local capacity and initiative to be taken	**6.Ensure that the opportunity to learn from a disaster is not wasted**
2. Work towards risk coverage for all people	**7.Build on local capacity and initiative.**
3. Invest in risk mapping globally	**8.Utilise the opportunities provided by social media and mobile technologies**
4. Develop a network of universities to work on disaster	**9.All development sectors must imbibe the principle of Disaster Risk Management**
5. Bring about a greater cohesion in international response to disasters.	**10.Leverage technology to enhance the efficiency of our disaster risk management efforts. Technology can boost disaster res**

Other than the steps mentioned above following are some multipronged steps for disaster risk reduction and mitigation:

- Integrating risk reduction principles in all development and construction projects.
- Initiating mitigation projects in identified high priority areas through joint efforts of the Central and State Governments.
- Encouraging and assisting State level mitigation projects.
- Paying attention to indigenous knowledge on disaster and coping mechanisms.
- Giving due weightage to the protection of heritage structures.

Principles of **Sendai Framework** state that disaster risk reduction requires **responsibilities to be shared by different divisions of governments and various agencies**.

2) Disaster Preparedness and Response

Response measures are those taken immediately after receiving early warning from the relevant authority or immediately after the occurrence of an event.

The institutional arrangements for the response system are as follows;

a) Nodal Central Ministries with disaster–specific responsibilities for national–level coordination of the response and mobilization of all the necessary resources.
b) Central agencies with disaster–specific responsibilities for Early Warning Systems and alerts.
c) National Disaster Response Force (NDRF).
d) State Disaster Response Force (SDRF).

It is considered as the most visible phase amongst various phases of disaster management.

National Early Warning System

Government has designated specific agencies to monitor the onset of different natural disasters, set up adequate Early Warning Systems (EWS), and disseminate necessary warning of alerts regarding any impending hazard. These agencies provide inputs to the MHA, which will issue alerts and warnings through various communication channels.

Response includes those activities that directly address the immediate requirements, like search and rescue, first aid and temporary shelters, but also rapid mobilization of various necessities to boost the efforts.
Preparedness, as defined by UNISDR, consist of the knowledge and capacities developed by governments, professional response and recovery organizations, communities and individuals to effectively anticipate, respond to, and recover from, the impacts of likely, imminent or current hazard events or conditions.
No single agency or department can handle a disaster situation of any scale alone.
There are specific tasks, roles and responsibilities in the domain of response, which is the most critical and time–sensitive aspect of disaster management.

3.) Disaster Risk Governance

From the mid–2000s onwards, governance was commonly accepted as the crux of Disaster Risk Reduction. Disaster risk governance is the way in which public authorities, civil servants, media, private sector, and civil society cooperate at various levels in order to manage and reduce disaster related risks.
This requires ensuring sufficient levels of capacity and resources available to prevent and prepare for disasters. It also entails institutions and processes for citizens to articulate their interests, exercise their legal rights and obligations, and mediate their differences.

4.) Recovery and Build Back Better (BBB)

Globally, the approach towards post–disaster restoration and rehabilitation has shifted to one of betterment reconstructions. The recovery, rehabilitation and reconstruction phase are seen as an opportunity to "Build Back Better" (BBB) and integrate disaster risk reduction into development measures, making communities resilient to disasters.

The approach to reconstruction and recovery in India is guided by the National Policy on Disaster Management 2009. It states that:

- the reconstruction process has to be comprehensive. Incorporating disaster resilient features to 'build back better' will be the guiding principle.
- Reconstruction plans and designing of houses need to be a participatory process involving the government, affected community, NGOs and the corporate sector. While owner driven construction is a preferred option, participation of NGOs and the corporate sector will be encouraged.
- Essential services, social infrastructure and intermediate shelters/camps will be established in the shortest possible time.
- the plans for reconstruction in highly disaster-prone areas need to be drawn out during the period of normalcy, which may include architectural and structural designs in consultation with the various stakeholders.

Capacity Development

Capacity development covers strengthening of institutions, mechanisms, and capacities at all levels of all stakeholders. In the domain of disaster risk management, the Sendai Framework emphasizes the need for enhancing the technical, financial, and administrative capabilities of institutions, governments, and communities to deal with the identified risks at different levels.

The local leadership can play a big role in disaster management in all stages. The elected leaders and officials of Panchayats and ULBs should be trained to handle different types of crises, contribute to disaster preparedness, make proper use of available warnings, organize operations such as search, rescue, relief, medical help etc.

The capabilities of the local bodies have to be developed where the training institutes will develop need–based training programs for the capacity development of employees and heads of rural and urban local bodies so as to build a sound knowledge base.

Enhancing the capacity of communities, as they are the first responders to disasters, is very important.

CHALLENGES IN DM

1. Promoting an understanding of basic principles of effective early warning systems
2. Cross-sectoral integration of application of communication technologies. Over the last few years, the application of communication technologies has been marred with sectoral isolation.
3. Disparities in communication infrastructure. In the Asian region, there is significant disparity in communication infrastructure across countries and across different kinds of user's groups.
4. While disparities in communication infrastructure do exist, there is a lot of local innovation which needs to be harnessed and integrated with new technologies.
5. Information asymmetry exists sometimes when the disaster struck, which may lead to chaos situation, people feel disconnected from the outer world and the world is not able to understand the predicament of those stuck in disaster situation.

6. Sometimes Data gathering becomes a tough task as experts are not available for data gathering, the quality of data collected after a disaster has struck becomes very important to create resilience in the case of future disaster events.
7. Lack of adequate skills in disaster response personnel causes increased loss of lives which could have been saved if adequately trained personnel would be existing.
8. Governance mechanism should remain robust during disaster situations, unless strong governance mechanism is existing the area the disaster situation would be worsened due to lack of coordination between authorities.
9. Climate change has created a sort of chain reaction when it comes to disaster as the environment has become fragile more than ever, consequentially a disaster can set on multiple disasters which may lead to our planet becoming more vulnerable in future.
10. Many a times it has been seen that rehabilitation attempts have not borne the desired fruit, the reason behind this is that disasters may lead to large scale destruction thereafter rehabilitation attempts become very tedious. Proper coordination between various departments and bodies becomes difficult, lack of funds come in the way of rehabilitation.

While new communications technologies have made the sharing of knowledge and information much faster and reliable, language is going to be a major barrier in the effective application of these technologies.

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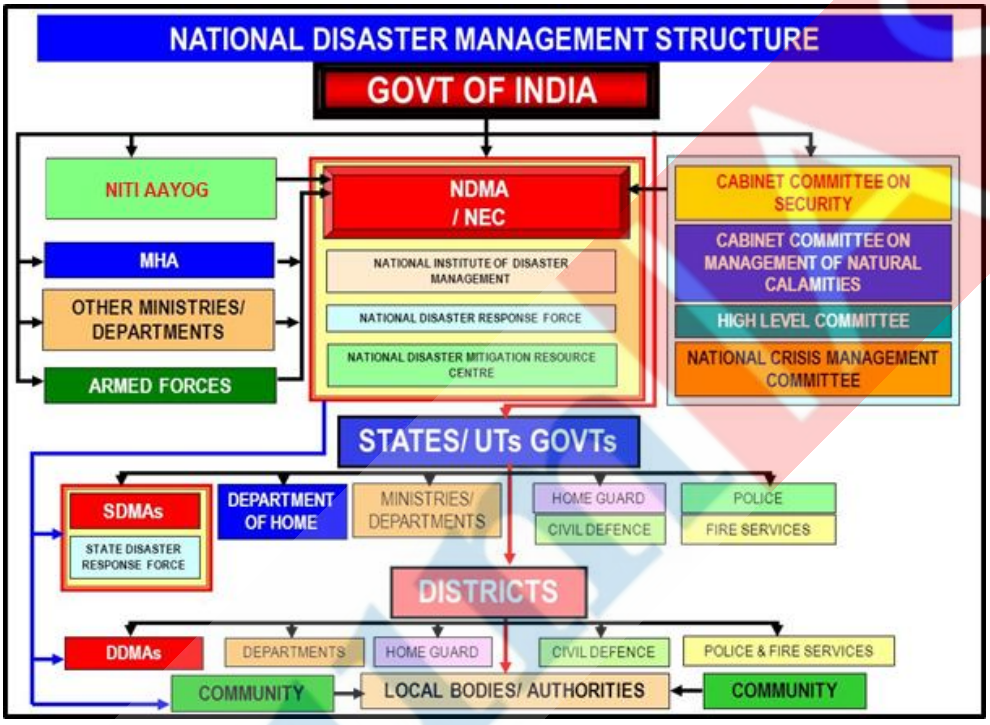
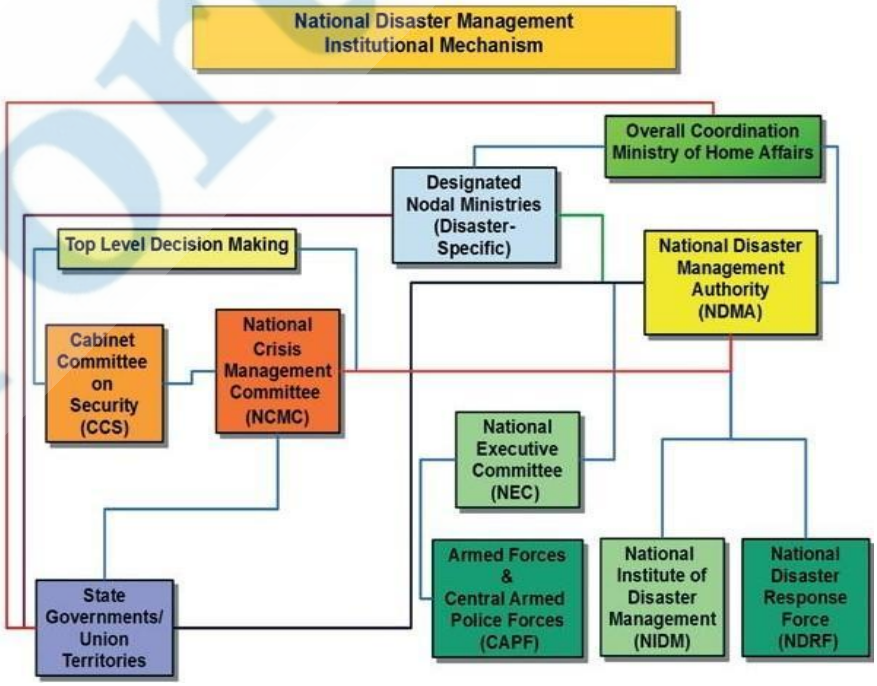
ADMINISTRATIVE STRUCTURE/INSTITUTIONAL FRAMEWORK OF DISASTER MANAGEMENT IN INDIA

The structure of Disaster Management in India has two **distinct features:**

1. The structure is hierarchical and functions at four levels – center, state, district.
2. It is a multi-stakeholder setup, i.e., the structure draws involvement of various relevant ministries, government departments and administrative bodies





On 23rd December 2005, the Government of India enacted the Disaster Management Act, 2005, which envisaged the creation of the National Disaster Management Authority (NDMA), State Disaster Management Authorities (SDMAs) and District Disaster Management Authorities (DDMAs), to adopt a holistic and integrated approach to Disaster Management. This acted as a paradigm shift, from the **relief-centric response to a proactive prevention, mitigation and preparedness-driven approach** to minimize loss of life, livelihood and property.

At the National Level

National Disaster Management Authority (NDMA)

The NDMA, is the apex body for disaster management, which has the responsibility for laying down the policies, plans, and guidelines for DM. The guidelines of NDMA assist the Central Ministries, Departments, and States to formulate their respective Disaster Management (DM) plans. The NDMA has the mandate to deal with all types of disasters – natural or human–induced.

- It approves the National Disaster Management Plans and plans of the Central Ministries*/* Departments.

NDMA Advisory Committee

The 15–member Advisory Committee under NDMA consists of experts from various areas of Disaster Management and allied disciplines and has representatives from academia, governments, NGOs and civil society members.

- The general superintendence, direction, and control of the National Disaster Response Force (NDRF) are vested in and exercised by the NDMA.
- The National Institute of Disaster Management (NIDM) works within the framework of broad policies and guidelines laid down by the NDMA.
- NDMA has the power to authorize the Departments or authorities, to make emergency procurement of materials for rescue and relief in a threatening disaster situation or disaster.
- It takes such other measures, as it may consider necessary, for the prevention of disasters, or mitigation, or preparedness and capacity building, for dealing with a threatening disaster situation or disaster.
- It oversees the provision and application of funds for mitigation and preparedness measures

Other emergencies such as terrorism (counter–insurgency), law and order situations, hijacking, air accidents, CBRN (Chemical, biological, radiological and nuclear) weapon systems, which require the close involvement of the security forces and/or intelligence agencies, and other incidents such as mine disasters, port and harbour emergencies, forest fires, oilfield fires and oil spills are also handled by the **National Crisis Management Committee (NCMC)**.

National Disaster Response Force (NDRF)

The NDRF is a **specialist response force** that can be deployed in a threatening disaster situation or disaster. The general **superintendence, direction and control** of this force is vested in and exercised by the **NDMA** and the command and supervision of the Force vests in the **Director General of National Disaster Response Force**.

At present, National Disaster Response Force consists of **12 battalions**, three each from the BSF and CRPF and two each from CISF, ITBP and SSB.

The "**proactive availability**" of this Force to the States and its "**pre-positioning**" in threatening disaster situations has immensely helped minimize damage, caused due to calamities in the country.

- The first major test of disaster for NDRF was Kosi Floods in 2008. The situation was handled by the NDRF on a war footing by sending flood rescue trained to the five flood affected districts with utmost promptitude. As a result, over 1,00,000 affected people were rescued during the initial stage itself. The prompt and timely response of NDRF was appreciated by the then Chief Minister of Bihar.
- During 2015 earthquake in Nepal (magnitude 7.8) India's National Disaster Response Force made headlines by capitalizing the golden hours' rule of disaster management by being the first on the ground. In the rescue operations, the personnel of NDRF pulled out 11 live victims out of a total figure of 16.
- NDRF has also acquired considerable expertise in facing CBRN (Chemical, Biological, Radiological & Nuclear) challenges. The credible task of NDRF in retrieving Cobalt-60 radiological material at Mayapuri, Delhi, during April and May 2010 has been an acid test of NDRF's CBRN capability.

Disaster Management Division, Ministry of Home Affairs:

The overall coordination of disaster management vests with the Ministry of Home Affairs (MHA). The Disaster Management Division is responsible for response, relief and preparedness for natural calamities and man-made disasters (except drought and epidemics) also DMD co-ordinates with disaster affected State Governments, concerned line ministries departments, National Disaster Management Authority (NDMA), National Disaster Response Force (NDRF), National Institute of Disaster Management (NIDM) and the Directorate General of Fire Services, Home Guards and Civil Defense, and Armed Forces for effective disaster risk reduction.

National Executive Committee:

It acts as the coordinating and monitoring body for DM. It is **chaired by the Union Home Secretary** and comprises of Secretary level officers from the Ministries and departments having control of agriculture, atomic energy, defense, drinking water supply, environment and forests, finance (expenditure), health, power, rural development, science and technology, space, telecommunications, urban development and water resources. The Chief of Integrated Defense Staff of the Chiefs of Staff Committee, is also its member.

The NEC will coordinate response in the event of any threatening disaster situation or disaster where central assistance is needed. The NEC may give directions to the relevant Ministries of the Government of India, the State Governments, and the State Authorities regarding measures to be taken by them in response to any specific threatening disaster situation or disaster as per needs of the State.

National Platform for Disaster Risk Reduction (NPDRR)

The Government of India recognized the need to evolve a participatory process of decision making with active involvement of the Central & State Governments and other stakeholders including people representing different interests in the field of disaster management. Accordingly, a multi-stakeholder and multi-sectoral National Platform for Disaster Risk Reduction (NPDRR) was constituted.

The NPDRR is chaired by the Union Home Minister and Minister of State in- charge of Disaster Management in the Ministry of Home Affairs and Vice-Chairman, National Disaster Management Authority is Vice-Chairperson of NPDRR. Special Secretary/Additional Secretary in-charge of Disaster Management

Division in the Ministry of Home Affairs will be the convener of NPDRR. It reviews disaster management plans and policies and advises regarding reducing disaster risk.

National Institute of Disaster Management (NIDM)

The National Institute of Disaster Management is the nodal agency responsible for human resource development, capacity building, training, research, documentation and policy advocacy in the field of disaster management.

The NIDM has built **strategic partnerships** with various ministries and departments of the central, state, and local governments, academic, research and technical organizations in India and abroad and other bi–lateral and multi–lateral international agencies.

- It **provides technical support** to the state governments through the Disaster Management Centers (DMCs) in the Administrative Training Institutes (ATIs) of the States and Union Territories.
- Presently it is supporting as many as 30 such centers. Six of them are being developed as centers of Excellence in the specialized areas of risk management – flood, earthquake, cyclone, drought, landslides, and industrial disasters.

Cabinet Committee on Security (CCS) and the **National Crisis Management Committee (NCMC)** are the key committees involved in the top–level decision–making with regard to disaster management. The Cabinet Committee on Management of Natural Calamities was discontinued in 2014.

Cabinet Committee on Security (CCS)

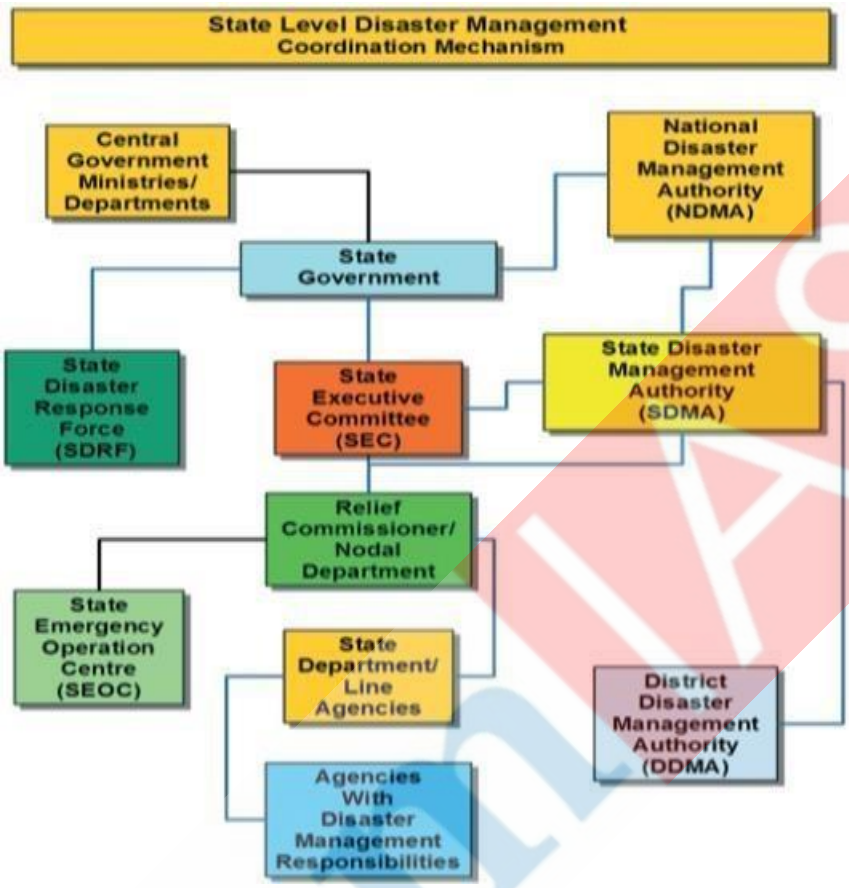
The CCS deals with issues related to defense of the country, law and order, and internal security, policy matters concerning foreign affairs that have internal or external security implications, and economic and political issues impinging on national security. CCS will be involved in the decision making if the disaster has serious security implications.

National Crisis Management Committee (NCMC)

The NCMC deals with **major crises** that have serious or **national ramifications**. These include incidents such as those requiring close involvement of the security forces and/or intelligence agencies such as terrorism (counter – insurgency), law and order situations, serial bomb blasts, hijacking, air accidents, CBRN, weapon systems, mine disasters, port and harbour emergencies, forest fires, oilfield fires, and oil spills.

At the State Level

- As per the DM Act of 2005, **each state in India shall have its own institutional framework** for disaster management and shall prepare its **own Disaster Management Plan**. The DM Act, mandates that each State Government shall take necessary steps for integration of **measures for prevention** of disasters or mitigation into state development plans, **allocation of funds,** and **establish Early Warning Systems.**
- Depending on specific situations and needs, the State Government shall also assist the Central Government and central agencies in various aspects of Disaster Management.
- DM Act, 2005 mandates the setting of a **State Disaster Management Authority (SDMA) with the Chief Minister as the ex officio Chairperson.** Similar system will function in each Union Territory with Lieutenant Governor as the Chairperson.



State Disaster Management Authority (SDMA)

As per the DM Act, each State Government shall establish a State Disaster Management Authority (SDMA) with the **Chief Minister as the Chairperson**. In case of other UTs, the Lieutenant Governor or the Administrator shall be the Chairperson of that Authority. For the UT of Delhi, the Lieutenant Governor and the Chief Minister shall be the Chairperson and Vice–Chairperson respectively of the State Authority.

Responsibilities of the SDMA include:

- To lay down **policies and plans** for Disaster Management in the State.
- To **approve the State DM Plan** in accordance with the guidelines laid down by the NDMA.
- To **coordinate the implementation** of the state disaster management plan and **recommend provision of funds**
  for mitigation and preparedness measures.
- To **review the developmental plans of the different departments** of the State to ensure the integration of prevention, preparedness and mitigation measures.

State Executive Committee

The State Governments constitute a **State Executive Committee (SEC), headed by the Chief Secretary**, to assist the SDMA in the performance of its functions. The SEC will **coordinate and monitor the implementation** of the National Policy, the National Plan, and the State Plans for disaster management. It will also provide information to the NDMA relating to different aspects of disaster management.

At the District Level

District Disaster Management Authority (DDMA)

- DDMA, headed by the District Collector/District Magistrate, is responsible for overall coordination of the disaster management efforts and planning **with** the elected representative of the local authority as the Co-
- As per NDM ACT, each State Government establishes a DDMA for every district in the State and appoints an officer not below the rank of Additional Collector/Additional District Magistrate of the district to be the **Chief Executive Officer of DDMA which** prepares the Disaster Management plan for the District and monitors its implementation. It also ensures that the guidelines laid down by the NDMA and the SDMA are followed by all the district–level offices.
- Local bodies like Municipalities, District and Cantonment Boards, Panchayati Raj Institutions (PRI), and Town Planning Authorities, which control civic duties ensure capacity building of their employees for managing disasters, carrying out relief, rehabilitation and reconstruction activities in the affected areas. They also prepare their disaster management plans as per the national and state guidelines.

FUNDING MECHANISM

National Disaster Response Fund:

It was setup under NDM Act 2005. It is a fund **managed by the Central Government** for meeting the **expenses for emergency response, relief and rehabilitation** due to any threatening disaster situation. In the event of a calamity, if the requirement of funds for relief operations is beyond the funds available in the State Disaster Response Fund account, additional Central assistance is provided from National Disaster Response Fund. The National **Calamity Contingency Fund (NCCF)** introduced by 11th Finance Commission was **merged with NDRF**.

State Disaster Response Fund:

The SDRF is used **only for meeting the expenditure for providing immediate relief** to the victims of disasters. The **state-specific disasters within the local context** in the State, which are not included in the notified list of disasters, **are also eligible** for assistance from State Disaster Response Fund, for example recently Uttar Pradesh announced compensation for the victims of man animal conflicts from the SDRF.

National Disaster Response Fund and State Disaster Response Fund have provision for **Gratuitous Relief, Search and Rescue ops**, Relief measures, Air dropping of essential supplies, Emergency supply of drinking water, Clearance of affected area, including management of debris, Agriculture, Animal husbandry, fishery, Handicraft, artisans, Repair Restoration (of immediate nature) of damaged Infrastructure and Capacity development.

National Disaster Mitigation Fund:

The National Disaster Mitigation Fund (NDMF) **has not been set up but should be setup soon.** The Government feels that at present there are **sufficient existing schemes to take care of mitigation aspect** and the need for creation of separate NDMF has not been felt.

National Disaster Response Reserve:

The 13th Finance commission recommended for creation of a National Disaster Response reserve (NDRR)

with a corpus of Rs.250 crore to meet the immediate requirement of relief material/equipment after a disaster. The purpose of creating National Disaster Response Reserve (NDRR) is to mitigate the sufferings of the victims of the disaster which are beyond the coping capacity of the States.

14th Finance Commission on Fund Mobilization for DM:

Mandate given to FC was to review the arrangements regarding financing of DM funds as envisaged in the Disaster Management Act, 2005.Recommendations of the 14th Finance Commission are:

- It recommended that **up to 10 percent of the funds available under the SDRF** can be used by a State for occurrences which State considers to be '**disasters' within its local context** and which are not in the notified list of disasters of the Ministry of Home Affairs.
- As the financing of NDRF has so far been almost completely through the levy of cess on select items, it recommended that **Union Government must ensure a guaranteed continuing source of funding** for NDRF once the various **cess and levies were subsumed under the GST**.
- The FFC recommended **an allocation of Rs 55,000 crores** to all states under the Disaster Management head.

DISASTER MANAGEMENT LEGISLATIVE ENACTMENTS/ POLICIES AND GUIDELINES

National Disaster Management Act, 2005

Introduction:

- The National Disaster Management Act, 2005 lays down **institutional, legal, financial and coordination mechanisms** at the National, State and District level.
- **Primary responsibility** for the management of disaster lies with the **State Government concerned**. The institutional mechanism at the Centre, State and District levels help states to manage disasters in an effective manner.

Challenges/ issues of the National Disaster Management Act, 2005

- **Slow implementation and excluding in nature**
  - **Implementation** of the **National Disaster Act, 2005** has been **slow, and slack**.
  - After a 10-year delay, **National Plan on Disaster Management** was finally released in 2016.
  - The act has been criticized for **marginalizing Non-governmental organizations (NGOs), elected local representatives, local communities and civic groups**.
- Administrative setup
  - A rigid hierarchical, **bureaucratic, command and control, 'top down approach exists under the act.**
- CAG REPORT
  - **performance audit** report of the disaster management mechanism in the country by was released by the **Comptroller and Auditor General (CAG) of India in 2013**. The CAG report highlighted several other loopholes in the functioning of NDMA it said **none of the major projects taken up by NDMA was complete**. The projects were either abandoned midway or were being redesigned because of **initial poor planning**.
  - CAG report, mentioned NDMA has also not been performing several functions such as recommending provision of funds for the purpose of mitigation and recommending relief in repayment of loans.
  - **Several critical posts in NDMA were vacant** and consultants were used for day to day working.
  - **Public Accounts Committee** submitted its report on **'Disaster Preparedness in India'** in December 2015. It made the following observations: Under the Act, the National Executive Committee is required to meet at least once every three months. However, it was found that the committee met infrequently even when there had been disasters, such as the 2007 floods in West Bengal and the 2008 stampede in Rajasthan.
  - The center, states and districts had not constituted Mitigation Funds which could be utilized for disaster preparedness, restoration, etc.
  - Various projects undertaken for strengthening the communications network for disaster management were either at the planning stage, or were delayed.
  - CAG report also suggested that very small percentage of telemetry station for early warning were properly installed and even many of them were non- functional.

- A lot of posts in the National Disaster Response Force (NDRF) were vacant. The NDRF's training institute, **the National Institute of Disaster Response, had still not been established**, though it had been approved in 2006.

National Policy on Disaster Management 2009

Introduction

- '**National Policy on Disaster Management'** (NPDM) was brought by NDMA in 2009 with the vision-
- "To build **a safer and disaster resilient India** by developing a holistic, proactive, multi–disaster oriented and technology driven strategy **through a culture of prevention, mitigation, preparedness and response**".
- The Policy provides for an **integrated approach for management** with emphasis on building strategic partnerships at various levels.
- It creates an **enabling environment** for all and addresses the concerns of all the sections of the society including differently abled persons, women, children and other disadvantaged groups.
- It aims to bring in transparency and accountability in all aspects of disaster management through involvement of community, community-based organizations, Panchayati Raj Institutions (PRIs), local bodies and civil society.

Objectives of the National Policy on Disaster Management, 2009

- **Culture of prevention**-Promoting a culture of prevention, preparedness and resilience at all levels through knowledge, innovation and education.
- **Various mitigation measures**-Encouraging mitigation measures based on technology, traditional wisdom and environmental sustainability.
- **Involvement in planning**-Mainstreaming disaster management into the developmental planning process.
- **Enabling regulatory environment**-Establishing institutional and techno–legal frameworks to create an enabling regulatory environment and a compliance regime.
- **Disaster risk**-Ensuring efficient mechanism for identification, assessment and monitoring of disaster risks.
- **Early warning system**-Developing contemporary forecasting and early warning systems backed by responsive and fail–safe communication with information technology support.
- **Vulnerable sections**-Ensuring efficient response and relief with a caring approach towards the needs of the vulnerable sections of the society.
- **Infrastructure and habitats**-Undertaking reconstruction as an opportunity to build disaster resilient structures and habitat for ensuring safer living.
- **Partnership**-Promoting a productive and proactive partnership with the media for disaster management.

National Disaster Management Plan, 2016

- **National Disaster Management Plan was launched in 2016** with the Vision of the Plan is to "Make India disaster resilient, achieve substantial disaster risk reduction, and significantly decrease the losses of life, livelihoods, and assets – economic, physical, social, cultural and environmental – by maximizing the ability to cope with disasters at all levels of administration as well as among communities." It was the first ever such plan made in India.

- It has been aligned with the goals and priorities set out in the **Sendai Framework for DRR, the Sustainable Development Goals 2015-2030 and the Paris Agreement on Climate Change at COP-21.**
- For each hazard, the approach used in this national plan incorporates the four priorities enunciated in the Sendai Framework into the planning framework for DRR under the five areas for Actions:
    1. Understanding Risk
    2. Inter–Agency Coordination
    3. Investing in DRR – Structural Measures
    4. Investing in DRR – Non–Structural Measures
    5. Capacity Development
    - It covers all phases of disaster management: Prevention, Mitigation, Response and Recovery and covers human induced disasters like chemical, nuclear etc. It plans for short medium and long run respectively 5, 10, and 15 years in dealing with disasters.
- Integrated approach with role clarity where it provides for horizontal and vertical integration among all the agencies and departments of the Government and also spells out the roles and responsibilities of all levels of Government right up to Panchayat and Urban local body level in a matrix format, ministries are given role for specific disasters,
- The plan has a regional approach, which will be beneficial not only for disaster management but also for development planning and is designed in such a way that it can be implemented in a scalable manner in all phases of disaster management.

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Objectives of the NDMP

- It identifies major activities such as early warning, information dissemination, medical care, fuel, transportation, search and rescue, evacuation, etc. to serve as a checklist for agencies responding to a disaster.
- It also provides a framework for recovery and offers flexibility to assess a situation and build back better.

Impact of the NDMP

- It recognizes the need to minimize, if not eliminate, any ambiguity in the responsibility framework. It, therefore, specifies who is responsible for what at different stages of managing disasters.
- It is envisaged as ready for activation at all times in response to an emergency in any part of the country.
- It provides a framework and direction to the government agencies for all phases of disaster management cycle.
- It is designed in such a way that it can be implemented as needed on a flexible and scalable manner in all phases of disaster management:

- ✓ Mitigation (prevention and risk reduction),
- ✓ Preparedness,
- ✓ Response and
- ✓ Recovery (immediate restoration to build-back better).

Limitations of National Disaster Management Plan, 2016

- It doesn't provide a clear and practical roadmap. It is **too general** in its identification of the activities to be undertaken by the central and state governments for disaster risk mitigation, preparedness, response, recovery, reconstruction, and governance.
- The plan **doesn't provide a time frame** for undertaking these activities beyond vaguely prescribing that these must be taken up in short, medium, mid- and long-term basis.
- The plan does not give clarity on funds needed for undertaking these activities, nor does it provide any clue as to **how funds shall be mobilized** for this purpose
- The plan further does **not provide any framework for monitoring and evaluation** of the plan.
- The plan is aligned with the Sendai Framework for Disaster Risk Reduction and Sustainable Development Goals, but **unlike in the Sendai Framework or the SDGs, the plan does not set any goals or targets**, nor does it spell out how the Sendai goals and targets will be achieved.

Therefore, the national plan needs to be supplemented by national roadmaps for disaster resilience with clear cut goals, targets, timeframe, and idea about how resources and funds should be mobilized for its implementation.

National Disaster Management Plan for Animals 2016

- India launched its first national disaster management plan for animals
- Disaster Management Plan for Animals aims at protecting animals along with preventing and mitigating loss of livestock resources during various disasters.
- Pre-disaster preparedness includes detailed action plan relating to dissemination of early warning, identification of vulnerability amongst livestock, animal vaccination, feed and fodder supply and capacity building of different stakeholders in disaster management etc.
- Disaster response component includes steps relating to effective and prompt response, rescue of livestock, feed & fodder supply, measures against epidemics and diseases and maintenance of Sanitation etc.
- Post disaster component includes strategy for treatment of sick animals, disease surveillance, disposal of carcass, restoration and restocking of livestock population.

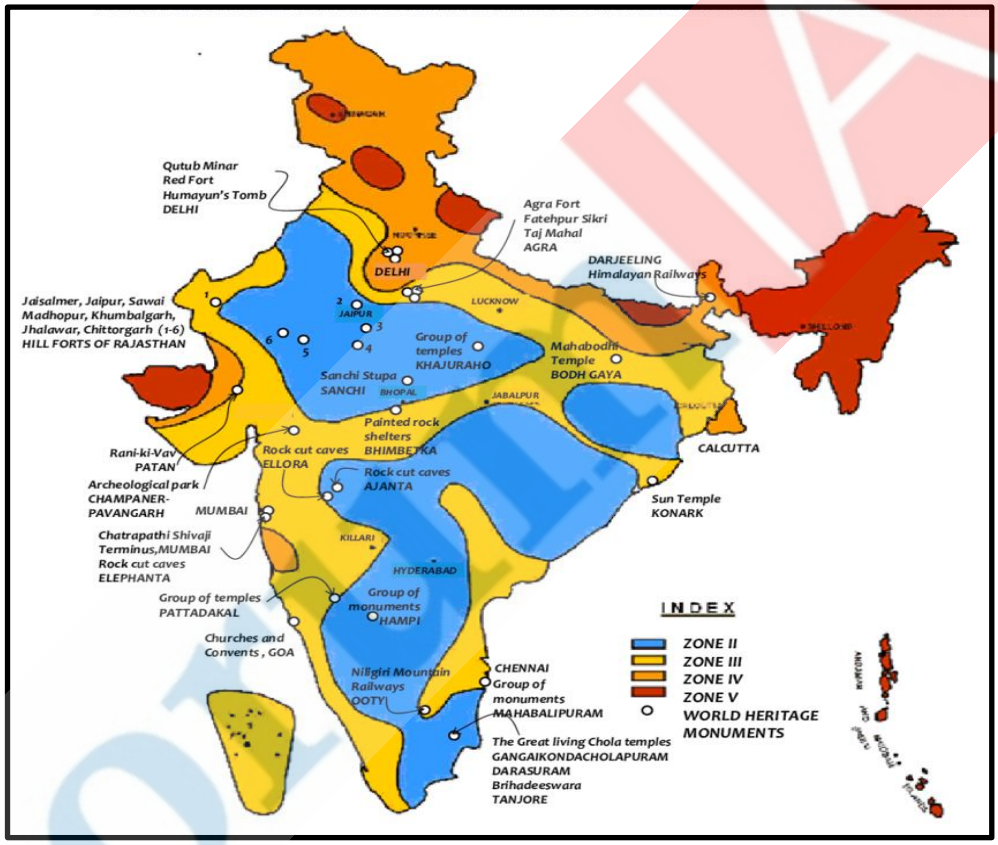
Other measures

Also, other measures like Workshop on Disaster Resilient Infrastructure (DRI) which happened in India where Coalition on DRI was formed, Building Material and Technology Promotion Council (BMTPC) came out with Vulnerability Atlas of India which depicts the vulnerability of various regions of India with respect to disasters.

NATURAL DISASTERS

A. Earthquakes

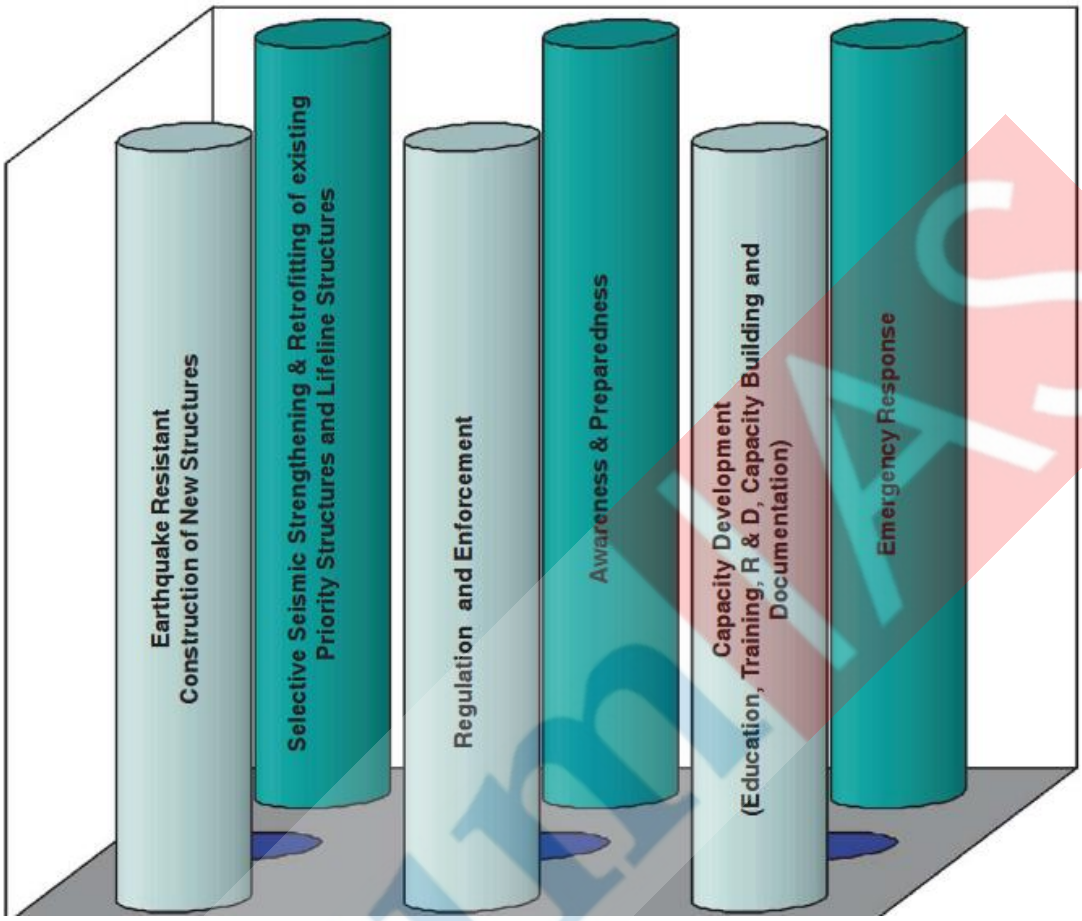
- The **Bureau of Indian Standards** with the help of **Indian Meteorological Department** has grouped the country into **four seismic zones, based on modified Mercalli scale** where shaking happens due to the seismic energy released by an earthquake, earthquakes differ in how much of their energy is released as seismic waves. Thus, the Mercalli scale is used for measuring the intensity of shaking produced by an earthquake.
- Of these, **zone V is the most active** which comprises of whole of Northeast India, the northern portion of Bihar, Uttarakhand, Himachal Pradesh, J&K, Gujarat and Andaman & Nicobar Islands.



Reasons for loss of property and damage due to Earthquakes:

1. Unprecedented growth of population resulting in unplanned urbanization.
2. Mushrooming of unsustainable and weak building structures due to lack of policy implementation ensuring construction standards.
3. Lack of awareness regarding what to do and what not to do during disaster among common masses. Example: 35% of the deaths during earthquakes is due to blasting of cylinders in the kitchen.
4. The increase in use of high-technology equipment and tools in manufacturing and service industries has also made them susceptible to disruption due to relatively moderate ground shaking.
5. Mushrooming of buildings along the inter-late boundaries and fault lines. Example: Bhuj Earthquake.
6. Development of large hydro-electricity projects nearby settlements. Example: Koyna Earthquake.

Disaster Management measures as per NDMA



The above figure shows the 6 pillars of Earthquake management in India as given by NDMA.

NDMA guidelines related to Earthquake Prevention and Mitigation

- When an earthquake strikes, a building is thrown mostly from side to side, and also up and down along with the building foundation the building structure tends to stay at rest, similar to a passenger standing on a bus that accelerates quickly.
- Building damage is related to the characteristics of the building, and the duration and severity of the ground shaking. Larger earthquakes tend to shake longer and harder and therefore cause more damage to structures.
- For better understanding of all the possibilities of earthquake risk reduction, it is important to classify them in terms of the role that each one of them could play. Therefore, in the pre-earthquake phase, preparedness, mitigation and prevention are concepts to work on. Post-disaster, immediate rescue and relief measures including temporary sheltering soon after an earthquake until about 3 months later and re-construction and rehabilitation measures for a period of about six months to three years need to follow.

National Earthquake Risk Mitigation Project:

The project aims at strengthening the **structural and non-structural earthquake mitigation efforts** and reducing the vulnerability in the high-risk districts prone to earthquakes.

National Building Code:

The salient features of the **National Building Code 2005** include meeting the challenges posed by natural calamities and reflecting the state-of-the-art and contemporary applicable international practices.

Seismic retrofitting:

It is the modification of existing structures to make them more resistant to seismic activity, ground motion, or soil failure due to earthquakes

PRE-DISASTER PREVENTIVE MEASURES:

Long-term

- Re-framing buildings' codes, guidelines, manuals and bye laws and their strict implementation through tougher legislations for highly seismic areas.
- Incorporating earthquake resistant features in all buildings in high-risk areas.
- Making all public utilities like water supply systems, communication networks, electricity lines etc. earthquake-proof
- Creating alternative arrangements to reduce damages to infrastructure facilities
- Constructing earthquake-resistant community buildings (used to gather large groups during or after an earthquake) like schools, hospitals, prayer halls, etc., especially in seismic zones of moderate to higher intensities.
- Supporting R&D in various aspects of disaster mitigation, preparedness and prevention and postdisaster management.

Medium -Term

- Retrofitting of weak structures in highly seismic zones.
- Preparation of **disaster related literature in local languages** with the do's and don'ts for construction.
- Getting communities involved in the process of disaster mitigation through education and awareness.
- Networking of local NGOs working in the area of disaster management

POST-DISASTER PREVENTIVE MEASURES

- Maintenance of law and order, prevention of trespassing, looting etc.
- Evacuation of people and recovery of dead bodies and their disposal.
- Medical care for the injured.
- Supply of food and drinking water.
- Temporary shelters like tents, metal sheds etc.
- Repairing lines of communication and information.
- Restoring transport routes.
- Quick assessment of destruction and demarcation of destroyed areas, according to the grade of damage.
- Cordoning off severely damaged structures that are liable to collapse during aftershocks.

B. Tropical Cyclones

What is a Tropical Cyclone?

- A tropical cyclone is a rotating, organized system of clouds and thunderstorms that originates over tropical or subtropical waters and has a closed low-level circulation.
- Tropical cyclones are among nature's most powerful and destructive phenomena.
- Even areas well away from the coastline can be threatened by destructive winds, tornadoes and flooding from these storms.

Reasons for loss of life and property due to cyclones:

1. Heavy settlements growth nearby coastal regions.
2. Majority of the settlements belongs to poor fishermen communities who are not well equipped to fight such calamities.
3. Storm surges lead to inundation of coastal lands before the arrival of cyclones and thus hampers the evacuation process.
4. The eye of the cyclone is the calm zone. The people mistake the arrival of calm zone as the end of cyclones. But in reality, as the eye passes, the cyclone causes much more destruction.
5. Weak building structures along the coasts further enhances the magnitude of damage built in violation of Coastal Regulation Zone.

Disaster Management measures as per NDMA

- There are many structural and non-structural measures for effective disaster management of cyclones.
- The **structural measures** include construction of cyclone shelters, construction of cyclone resistant buildings, road links, culverts, bridges, canals, drains, saline embankments, surface water tanks, communication and power transmission networks etc.
- **Non-structural measures** like early warning dissemination systems, management of coastal zones, awareness generation and disaster risk management and capacity building of all stakeholders involved.
- These measures are being adopted and tackled on State to State basis under **National Cyclone Risk Mitigation Project (NCRMP) being implemented through World Bank Assistance.**
- 12 districts, all along the east coast, are **"very highly prone"** and 41 districts are "**highly prone"** to cyclones in the country, a paper by the **India Meteorological Department** scientist has revealed. 13 coastal states and Union Territories in the country are affected by tropical cyclones (TCs). Four states—West Bengal, Andhra Pradesh, Odisha, Tamil Nadu and one UT Puducherry on the east coast, and Gujarat on the west coast are more vulnerable to the TCs, the study said.

Prevention and Mitigation:

National Cyclone Risk Mitigation Project (NCRMP)

Aim:

1. Upgrade cyclone forecasting, tracking and warning systems.
2. Build capacity in multi-hazard risk management.
3. Construct major infrastructures including multi-purpose cyclone shelters and embankments.

Principal Components:

1. Community mobilization and training.
2. Cyclone Risk Mitigation Infrastructure (construction of cyclone shelters, roads/missing links and construction/repair of Saline Embankments etc.).
3. Technical assistance for capacity building on Disaster Risk Management (risk assessment, damage and need assessment).
4. Capacity Building and knowledge creation along with project management and implementation support.

Integrated Coastal Zone Management Project (ICZMP):

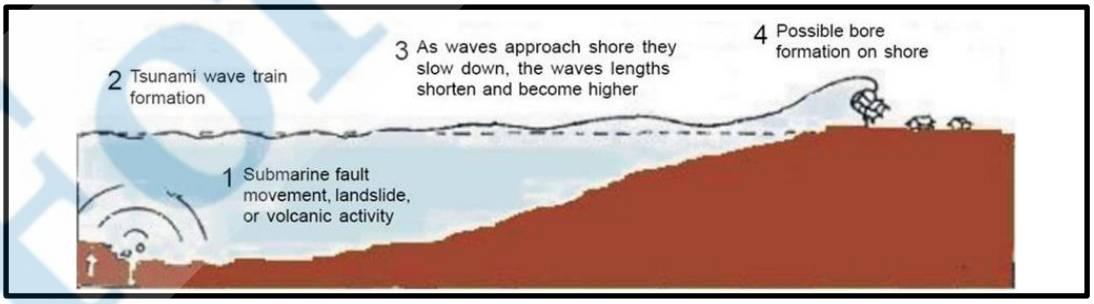
Objective:

To assist the Government in building the national capacity for implementation of a comprehensive coastal management approach in the country and piloting the integrated coastal zone management approach in states of Gujarat, Orissa and West Bengal.

C. Tsunami

What is a Tsunami?

- A tsunami is a series of water waves caused by the displacement of a large volume of a body of water, usually an ocean.
- Tsunamis are gravity waves that propagate near the ocean surface.
- Tsunamis belong to the same family as common sea waves that we enjoy at the beach; however, tsunamis are distinct in their mode of generation and in their characteristic period, wavelength, and velocity.
- Unlike common sea waves that evolve from persistent surface winds, most tsunamis spring from earthquakes, collision between continents and submarine landslides.
- These sudden shifts can originate from undersea landslides and volcanoes, but mostly, submarine earthquakes parent tsunamis. Reflecting this heritage, tsunamis are often called seismic sea waves. Compared with wind-driven waves, seismic sea waves have periods, wavelengths, and velocities ten or a hundred times larger.



The figure here shows the genesis of Tsunami and its impact

Reasons for loss of lives and property due to Tsunamis:

1. Destruction of mangroves and coral reefs along the coasts which acted as barrier during tsunamis.
2. Lack of knowledge among the common masses with respect to the consequences of the receding of water.
3. Heavy urbanization along the coasts in violation of Coastal Regulation Zone.

4. Weak and dilapidated building structures.

Disaster Management measures as per NDMA

Measures for Safety from Tsunamis and Storm Surges in Coastal areas:

Structural measures:

1. Plantation of **mangroves and coastal forests** along the coast lines.
2. Development of a network of **local knowledge centers** (rural/urban) along the coast lines to provide necessary training and emergency communication during crisis time (e.g. centers developed by M.S. Swaminathan Foundation in Pondicherry)
3. Construction of location specific **sea walls and coral reefs** in consultation with experts
4. **Development of break waters** along the coast to provide necessary cushion against tsunami hazards
5. Development of **tsunami detection, forecasting and warning dissemination centers**
6. Development of a "**Bio-Shield" - a narrow strip of land along coastline.**

Identification of vulnerable structures and appropriate retrofitting for tsunami/cyclone resistance of all such buildings as well as appropriate planning, designing, construction of new facilities like:

- Critical infrastructures e.g. power stations, warehouses, oil and other storage tanks etc. located along the coastline.
- All other infrastructure facilities located in the coastal areas
- Public buildings and private houses
- All marine structures
- Construction and maintenance of national and state highways and other coastal roads

Non-Structural Measures:

1. Strict implementation of the **coastal zone regulations** (within 500 m of the high tide line with elevation of less than 15 m above mean sea level
2. **Mapping the coastal area** for multiple hazards, vulnerability and risk analysis up to taluka /village level.
3. Capacity building requirements for the local people and the administration for facing the disasters in the wake of tsunami and cyclone
4. Developing tools and techniques for risk transfer from highly vulnerable areas
5. Launching a series of **public awareness campaign** throughout the coastal area
6. **Training of local administration** in forecasting warning dissemination and evacuation techniques Awareness generation and training among the fishermen, coast guards, officials from fisheries department and port authorities and local district officials etc., in connection with evacuation and post tsunami storm surge management activities.
7. **Studies focusing on the tsunami risk** in India may be taken under NCRM project.

Tsunami Warning and Communication System

- The **Indian Tsunami Early Warning Centre (ITEWC)** has been established at Indian National Centre for Ocean Information Sciences, (INCOIS - ESSO) Hyderabad.
- It has the responsibility to provide tsunami advisories to Indian Mainland and the Island regions.

D. Landslides

What is a landslide?

- Landslide is a process involving the downward and outward movement of a part of the slope forming material due to the action of gravity.
- Areas with steep slopes, for example mountainous regions, are particularly susceptible to landslide hazards.

Landslide Vulnerability in India:

1. Himalayan Mountain ranges and Hilly tracts of North-eastern region:

- Immature and rugged topography
- fragile rock conditions
- High seismicity resulting from proximity to the plate margins
- High rainfall
- Extensive anthropogenic interference, as part of developmental activities

2. Western Ghats:

- Steep hill slopes
- Overburden
- High intensity rainfall.
- **Nilgiris Hills:** High Intensity and protracted rainfall

Reasons for loss of lives and property due to landslides:

1. Unplanned growth of settlements in the fragile zones prone to landslides.
2. Construction of buildings not in adherence to building standards.
3. Practices such as contour bunding facilitated infiltration of water which may in turn may act as a lubricant to promote landslides.
4. Illegal construction of buildings in the domain of the rivers in its mature stage.
5. Illegal quarrying and mining further weaken the structure of the soil and causes damage to nearby settlements.

Disaster Management measures as per NDMA

NDMA Guidelines on Landslide Hazard Management:

1. **Evaluation of slope stability** and landslide threat is crucial during development and assessments which could help in implementation of timely and effective remedial measures.
2. Slump and slide risks can be reduced through suitable **profile modification**s such as that of soil and/or rock.
3. **Improved drainage** for runoff of accumulated water to avoid saturation of water
4. **Stabilization of soils by vegetation** could substantially increase the cohesiveness of subsurface material, preventing surface erosion and shallow mass failures.
5. **Construction of restraining structures**, and **permeable walls** could help impede rock and soil movement and increasing the shear strength.
6. Stabilizing the mobile parts of the affected parts through piles could help minimize the damage.
7. **Ground anchors** supporting mobile mass could help in preventing further movement.

8. Other measures could be **electro-osmosis** (for drainage in less permeable soils), and thermic treatment of soil for hardening.
9. Preparing landslide **hazard/susceptibility zonation** and management maps on 1:25,000 scale based on integration of geological, geo-structural, slope, geomorphological, land use/land cover and other terrain characteristics derived from satellite, topographic and other collateral data.

1. **Landslide Hazard, Vulnerability and Risk Assessment:**
   This includes delineating areas susceptible to landslide hazards and status of landslide hazards in different areas and to assess the resources at risk due to these hazards
2. **Landslide Remediation Practice:** Encouraging implementation of successful landslide remediation and mitigation technologies.
3. **Research and Development:** Monitoring and Early Warning
4. **Knowledge Network and Management:** Establishing an effective system for gathering information on landslides, loss assessment resulting from landslides, and the effective dissemination of technical information and maps is an essential component of the disaster management process.
5. **Capacity Building and Training:** Developing institutional capacity and training for geoscientists, engineers, and planners is necessary for effective management of the landslide hazard.
6. **Public Awareness and Education**
7. **Emergency Preparedness and Response:** Development of coordinated landslide rapid response capability
8. **Regulation and Enforcement:** Establishment of a techno-legal mechanism of landslide hazard assessment and mitigation There have also been talks on formulating National Landslide Risk Management Strategies

E. Floods

What is flood?

- By definition, any land which is usually above water level is said to be flooded if it goes underwater for a period arbitrarily defined as one or two hours.
- Flooding can be owing to many reasons. Usually this happens when the river or the stream draining the area is over balanced by a very large volume of water beyond its capacity.
- A river channel is formed by the forces of nature to be able to convey the flow that is found most of the time. When the volume exceeds this, the water level rises above the banks and spreads in to the adjacent lands. This area is usually called the flood plain of the river.
- People resident or working in the floodplains must be mindful of the fact that there is an ever-present threat of floods.
- The probability may be high as in Kalu Ganga or low as in some dry zone rivers. Yet the possibility is always there.
- Even those who live above the level of possible flood in a floodplain may find their access or services cut off by floods.
- Such people must acquire the knowledge that will help them to face floods with confidence and mitigate the attendant risks and discomforts.

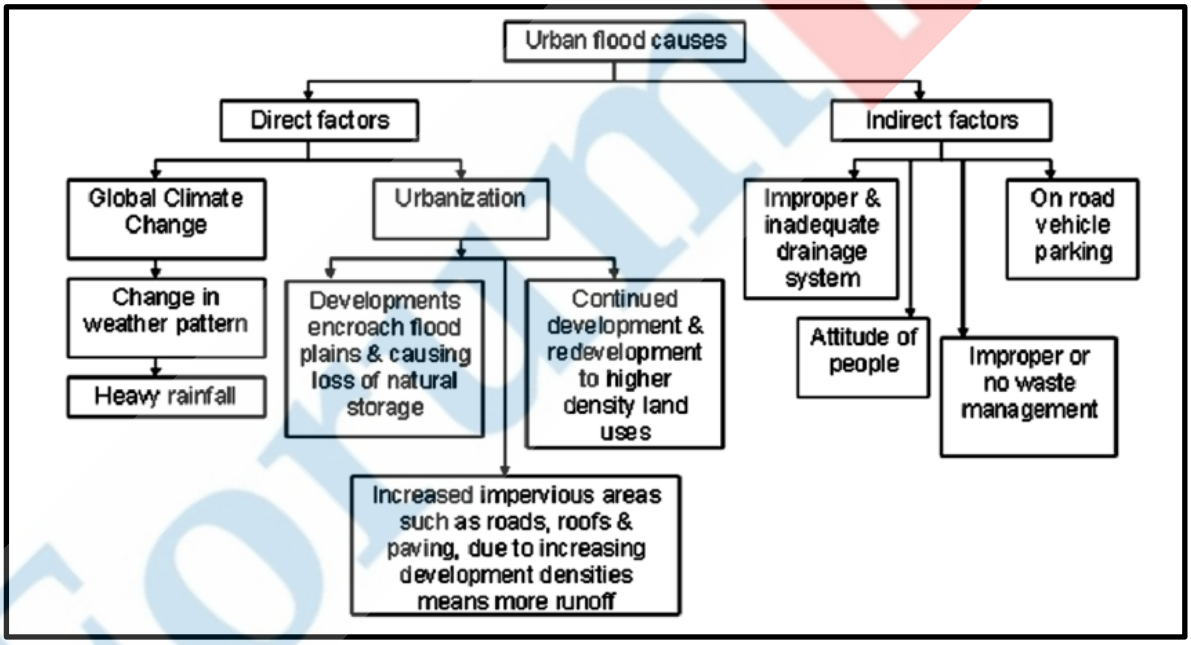
Reasons for loss of lives and property due to floods:

1. Unplanned settlement growth in the river domains.
2. Loss of crops is mainly result of cultivation in the river domain areas. Example: Yamuna and Ganga.
3. Absence of water proof building structures nearby river coast causes collapse of buildings.
4. Absence of drainage in the cities result in stagnation of waters during flash floods causing spread of parasitic and infectious diseases.

Urban floods / Drainage congestion

- In many cases the so-called floods are not caused by rivers overflowing but are caused by the inadequate drainage facilities.
- In urban areas this phenomenon occurs due to haphazard construction with poor planning which does not allow sufficient retention and percolation areas.
- In some cases, people encroach drainage areas, even obstructing drainage paths and disrupting natural drainage patterns.
- Destruction of wetlands through illegal constructions.

What are the causes of urban flooding?



Disaster Management measures as per NDMA

Prevention and Mitigation of Floods:

National Flood Risk Mitigation Project (NFRMP):

- NFRMP has been envisaged for mitigation or reduction in risk, severity or consequences of floods.
- It aims at ensuring that arrangements are in place to mobilise the resources and capability for relief, rehabilitation, reconstruction and recovery from disasters besides creating awareness among vulnerable communities.

Flood Management Programme:

- The scheme provides financial assistance to the state governments for undertaking flood management works in critical areas.

Urban Flood Management measures in India

- In 2010, **NDMA** had issued guidelines on Urban Flood Management in India
- Key guideline was to create a **National Hydro-meteorological Network.**
- The guidelines say that for providing early warning, the **Central Water Commission (CWC)** should maximize the real-time hydro-meteorological network to cover all the urban centers in dealing with urban flooding.

Other important recommendations include:

- Use of **Doppler Weather Radars** to be expanded to cover all urban areas in the country
- Catchment to be the basis for planning and designing the storm water drainage systems in all ULBs.
- All future road and rail bridges in cities crossing drains to be designed such that they do not block the flows resulting in backwater effect
- Every building in an urban area must have rainwater harvesting as an integral component of the building utility.
- Low-lying areas in cities have to be reserved for parks and other low-impact human activities.
- Encroachments on the drain should attract penal action.
- Urban Flooding has to be dealt as a separate disaster, de-linking it from riverine floods which affect the rural areas.

F. Drought

- Drought is a period of time without substantial rainfall that persists from one year to the next. Drought is a normal part of virtually all climatic regions, including areas with high and low average rainfall.
- Drought is the consequence of anticipated natural precipitation reduction over an extended period of time, usually a season or more in length.
- **Droughts can be classified as meteorological, hydrologic, agricultural, and socioeconomic.**
- Droughts are one of the most complex of all-natural hazards, as it is difficult to determine their precise beginning or end.
- In addition, droughts can lead to other hazards, such as extreme heat and wildfires.
- Their impact on wildlife and area farming is enormous, often killing crops, grazing land, edible plants and even in severe cases, trees.
- A secondary hazard to drought is **wildfire** because dying vegetation serves as a prime ignition source.
- Therefore, a **heat wave** combined with a drought is a very dangerous situation.

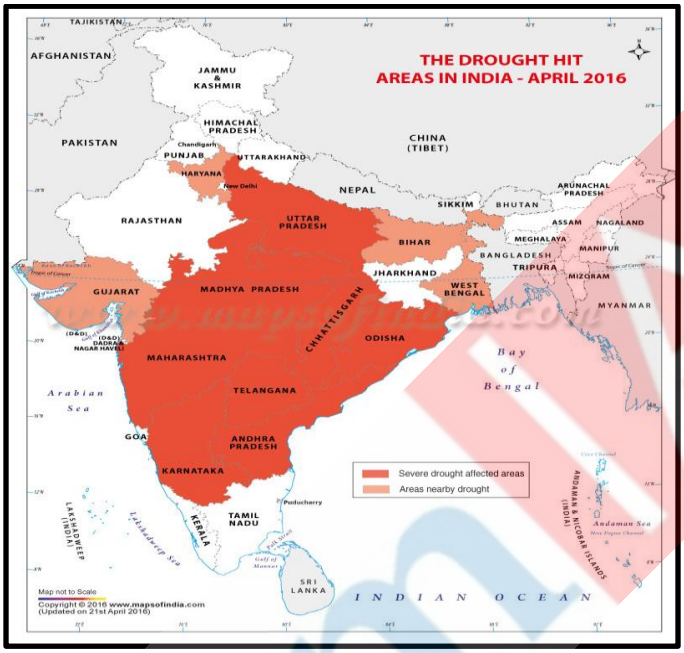
Different Types of Drought as per IMD:

Meteorological Drought: The degree of dryness or departure of actual precipitation from an expected average or normal amount based on monthly, seasonal, or annual time scales.

Hydrological Drought: The effects of precipitation shortfalls on stream flows and reservoir, lake, and groundwater levels.

Agricultural Drought: Soil moisture deficiencies relative to water demands of plant life, usually crops.
Socioeconomic Drought: The effect of demands for water exceeding the supply as a result of a weather-related supply shortfall.

Figure below shows major Drought-Prone Areas in India



Reasons for loss of lives and property due to draughts:

1. Majority of the victims of draughts are poor farmers who are not financially strong.
2. Lack of apathy from the government and delays in anti-draught measures.
3. Majority of the area of India fall under arid and semi-arid regions.
4. Misplaced priorities in the distribution of scarce resource water. Example: Use of millions of gallons of water for IPL and Beer Factories.

Disaster Management measures as per NDMA

Drought Prevention and Mitigation:
Drought can be mitigated by two kinds of measures, either by adopting preventive measures or by developing a preparedness plan

Preparation	Mitigation
✓ Strengthen traditional coping means ✓ Diversification of livelihoods ✓ Strengthen NRM institutions ✓ Institutionalization & Policy enactment ✓ Range reseeding ✓ Enhance disease surveillance ✓ Mass vaccinations ✓ Water conservation ✓ De-silting water pans ✓ Peace building	✓ Forage preservation & conservation (hay baling) ✓ Animal sales (de-stocking/re-stocking) ✓ Strategic water utilization ✓ Livestock access to preserved areas

Drought Management Framework in India

The Government of India has devised many short-, medium- and long-term strategies to mitigate and overcome adverse effects of drought.

Drought management mechanism includes:

- Institutional mechanisms
- Employment generation and social welfare practices
- Assistance/support by Central and State Governments
- Operation of EWS.

Drought management capabilities

Drought management capabilities can also be further strengthened and several studies suggest measures for this purpose.

Effective and timely coordination among various Ministries/Departments/Organisations can enhance the drought management results

NDMA Guidelines at the national and state level are as follows:

National Level

1. Further strengthening of the observational network for drought monitoring to bridge the gap between the existing and desired meteorological and hydrological monitoring network;
2. Improvement in information and communication technologies in an integrated manner for tacking the multifaceted challenge of drought at various spatial scales;
3. Capacity enhancement for medium and long-range drought forecasting;
4. Better coordination among ministries and departments;
5. Developing mechanism for context specific and need based forecasting including local language for better understanding.

Regional Level

1. Enhancement of real time monitoring capabilities at a regional level through training and joint monitoring programmes;
2. Improvement in methodologies and analytical tools for drought analysis and vulnerability assessment at local and regional level;
3. Organization of joint training programmes to build human capacity in improved resilience towards drought;
4. Effective and collaborative implementation of drought relief programmes;
5. Strengthening effective water and commodities supply system.

Institutional Mechanisms:

- The **Drought Management Group** coordinate the efforts to deal with drought in various states.
- The **National Disaster Management Cell**, monitors the drought situation in different states and resource availability
- The **National Agricultural Drought Assessment and Monitoring System, 1989** provides scientific information at district level for most of the states and sub-district levels in a few states.

- **Drought-Prone Area Development Programme and Desert Development Programme** use the plans prepared on the basis of the integrated estimation
- **IMD** and the **National Centre for Medium Range Weather Forecasting** offer meteorological information support for drought preparedness and early warning

Assistance/ Support by Central and State Governments

- Adequate availability of food grains at below poverty level rates, adequate advance stocks in feeder godowns
- Wages and employment programme with food for work (payment at work site) component in order to check migration
- Special health programmes for upkeep of health and nutritional levels of women, children, old and infirm people
- Fodder and livestock management
- Roof water harvesting programmes
- Planning Commission approves plan allocation (assistance) for calamity prevention and preparedness
- Tax exemption on donation/payment to relief activities

G. Forest Fires

Fire has always played a significant role in shaping forests since ancient times. However uncontrolled forest fires is one of the major causes for degradation of forests.

Forest fires can also be classified by what part of the forest they burn in:

1. Ground fires occur on the ground, often below the leaves.
2. Surface Fires occur on the surface of the forest up to 1.3 meters high.
3. Crown fires are the most dangerous fires and can spread the fastest. They occur in the tops of the trees.

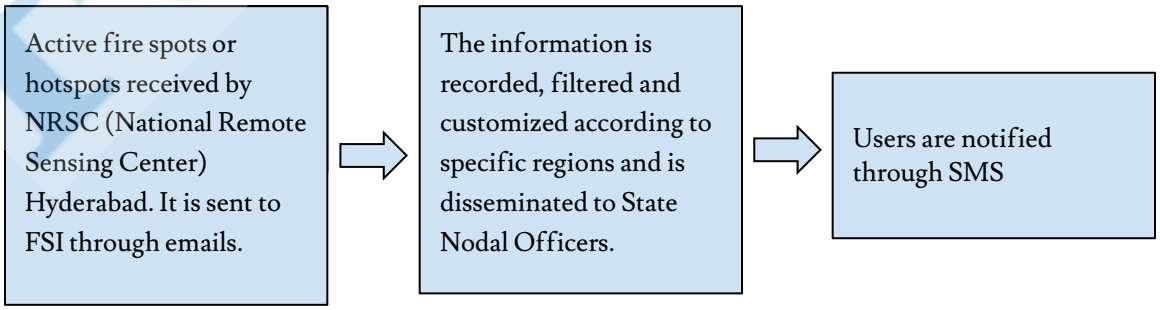
Reasons for loss of lives and property due to forest fires:

1. Illegal constructions in the core forest areas.
2. Growth of settlements nearby forest fire prone areas.
3. Lack of early warning communications to the trekkers and tourists.

Blueprint for mitigating forest fires:

Forest Fire Management initiatives of Forest Survey of India covers the following areas:

1. Near Real Time Forest Fire Alerts.



2. Forest Fire Pre-warning alerts developed by Forest Survey of India.

3. Burnt Scar studies - To assess damage to forest and biodiversity as well as to plan restoration measures.

There are four approaches to fighting forest fires:

1. Technological: helicopters or ground-based personnel spray fire retardant chemicals, or pump water to fight the blaze.
2. The second is to contain the fire in compartments bordered by natural barriers such as streams, roads, bridges, and fire lines along hillsides or across plains. A fire line is a line through a forest which has been cleared of all vegetation. The width depends on the type of forest being protected.
3. The third is to set a counter fire, so that when a fire is unapproachable for humans, a line is cleared of combustibles and manned.
4. The fourth approach, which is the most practical and most widely used, is to have enough people with leafy green boughs to beat the fire out. This is practiced in combination with fire lines and counter fires.

Disaster Management measures as per NDMA

Mitigation measures to reduce the uncertainty

A. Long-term objectives

- To develop a strong scientific programme, **''Forest Fire—Climate Change Interface Programme''** aimed at building baseline information about forest fire–climate change interaction
- To coordinate international **transfer of technology** and training in the field of forest fire management
- Creation of a strong database for: number of fires, area burnt, damage to flora and fauna, effect of fire on land and soil and measures taken
- Assessment of ecological, social, and economic impact of fires
- Strong national extension strategy for people's awareness and their participation in forest fire management through **JFM, VFC, and NGOs**

B. Short-term specific objectives

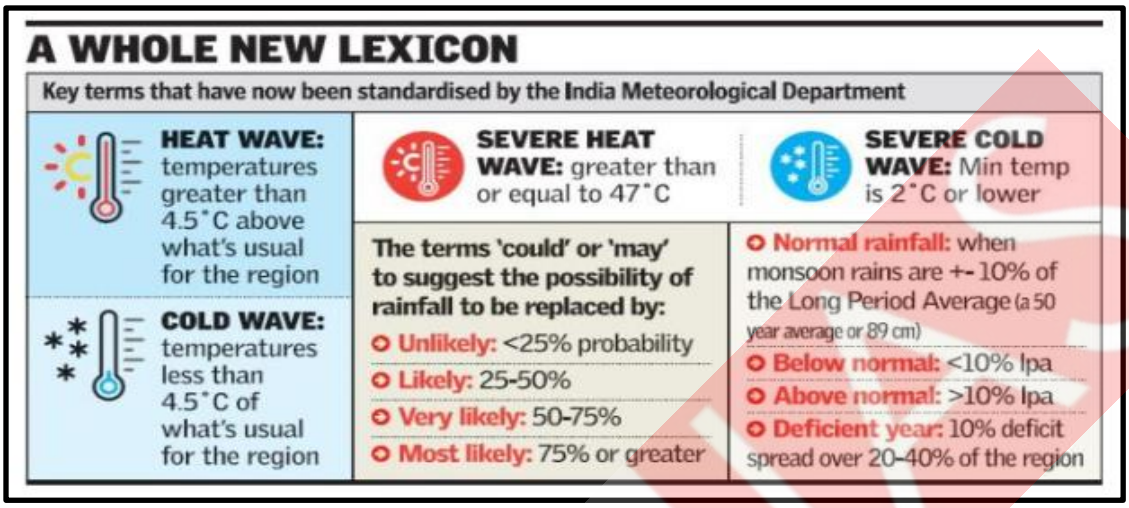
- Initiate R&D works as part of **International Geosphere Biosphere Programme (IGBP)** and Long-Term Ecological Monitoring (LTER).
- Enhance the efficiency of the fire detection by using ATSR series of satellites and BIRD in addition to MODIS and DMSP-OLS.
- Develop a **Fire Atlas** for the country
- Develop a fuel information system and grade the vegetation into different categories based on ignitability

H. Heat Waves and Cold Waves

What is a Heat Wave?

- A Heat Wave is a period of abnormally high temperatures, more than the normal maximum temperature that occurs during the summer season in the North-Western parts of India.
- Heat Waves typically occur between March and June, and in some rare cases even extend till July.

- The extreme temperatures and resultant atmospheric conditions adversely affect people living in these regions as they cause physiological stress, sometimes resulting in death.



Higher daily peak temperatures and longer, more intense heat waves are becoming increasingly frequent globally due to climate change. India too is feeling the impact of climate change in terms of increased instances of heat waves which are more intense in nature with each passing year, and have a devastating impact on human health thereby increasing the number of heat wave casualties.

Reasons for loss of lives and property due to hot and cold waves:

1. Majority of the victims are the poor who are not properly equipped with items such as air conditioners, blankets, etc.
2. Lack of awareness among the common masses to be hydrated and eat onion during summer seasons.
3. Lack of availability of transport services such as buses for nearby distances during night time forces people to do journey during day time.
4. Farmers working in the fields are more susceptible.

Disaster Management measures as per NDMA

NDMA Guidelines for Prevention and Management of Heat Waves

- Recognize Heat Wave as a major Health Risk.
- Map out the 'High Risk' Communities.
- Setting up of 'Public Cooling Places'.
- Issue Heatwave alerts through different media.
- Establish Early Warning System and Inter-Agency Coordination
- Capacity building / training programme.
- Public Awareness and community outreach
- Collaboration with non-government and civil society

What is a cold wave?

- Occurrences of extreme low temperature in association with incursion of dry cold winds from the north into the sub-continent are known as cold waves.
- A region is said to be experiencing cold wave when, according to the IMD, temperatures drop 4.5 degrees below the normal.

Cold Waves in India:

- Cold waves mainly affect areas to the north of 20 degrees. But in association with large amplitude troughs, cold waves are sometimes reported in Maharashtra and Karnataka.
- Maximum number of cold waves occurs in Jammu and Kashmir followed by Himachal Pradesh, Punjab, Bihar, Haryana and Uttar Pradesh

Disaster Management measures as per NDMA

NDMA Guidelines for Prevention and Management of Cold Waves

- Stay indoors as much as possible.
- Check that you have adequate winter clothing.
- Monitor all media outlets for weather and emergency procedure information.
- Check on any neighbors who live alone, especially the elderly.
- Ensure emergency supplies are easily accessible-no power means-no electricity.
- Use only one room-an internal room or passage will be easier to heat. Regular hot drinks will maintain body heat to fight the cold.
- If electricity fails, freezers will preserve food for up to 48 hours if the door is kept shut.
- Ensure that adequate clothing is worn-many light layers are better than one thick layer.
- Hats and mufflers help to prevent heat loss.
- Maintain proper ventilation when using kerosene heater or coal oven to avoid toxic fumes.
- Eat healthy food to supply heat to the body and drink non-alcoholic beverages.
- Visit doctor for signs of frostbite: loss of feeling and white or pale appearance on fingers, toes, earlobes and the tip of the nose.
- Visit doctor for signs of hypothermia (subnormal body temperature); uncontrolled shivering, memory loss, disorientation, incoherence, slurred speech, drowsiness and apparent exhaustion.

I. Biological Disasters

What is Biological Disaster?

- Biological disaster refers to calamity caused by the exposure of living organisms to germs and toxic substances. For instance, the spread of a disease, a virus, an epidemic, and a locust plague. It belongs to the class of natural disasters.
- Biological disasters are causative of process or phenomenon of organic origin or conveyed by biological vectors, including exposure to pathogenic microorganisms, toxins and bioactive substances that may cause loss of life, injury, illness or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.

- Examples of biological disasters include outbreaks of epidemic diseases, plant or animal contagion, insect or other animal plagues and infestation.

Biological disasters may be in the form of:

- **Epidemic** affecting a disproportionately large number of individuals within a population, community, or region at the same time, examples being Cholera, Plague, Japanese Encephalitis (JE)/Acute Encephalitis Syndrome (AES); or,
- **Pandemic** is an epidemic that spreads across a large region, that is, a continent, or even worldwide of existing, emerging or reemerging diseases and pestilences, example being Influenza H1N1 (Swine Flu).

What is biological hazard or biohazard?

- These refer to biological substances or organic matters produced by parasites, viruses, bacteria, fungi and protein that pose a threat to the health of living organisms, primarily that of humans.
- This can include: - Medical waste, samples of a microorganism, virus or toxin (from a biological source) and substances harmful to other animals

Reasons for loss of lives and property due to biological disasters:

1. Mushrooming of slums in urban areas where there is no drainage facilities, sanitation facilities, etc.
2. Rising levels of water pollution both in rural and urban areas.
3. Lack of awareness regarding 'WASH' among the common masses.
4. Open defecation in populated areas.

Effects of Biohazards:

The harmful effects posed to human health by biohazards are mainly of three types:

- Infection
- Allergy
- Poisoning

What is biohazard symbol?

For the purpose of this symbol, the term "biohazard" is defined as one of "those infectious agents presenting a risk or potential risk to the well-being of man, either directly through his infection or indirectly through disruption of his environment."

Biological Warfare:

- It is the use of biological toxins or infectious agents such as bacteria, viruses, and fungi with intent to kill or incapacitate humans, animals or plants as an act of war.
- NBC is the military acronym for nuclear, biological, and chemical warfare using weapons of mass destruction. This can also be termed as **bioterrorism.**

Disaster Management measures as per NDMA

Prevention of Biological Disaster

1. Vulnerability Assessment and Risk Management
2. Environmental management

(i) Safe water supply and proper maintenance of sewage pipeline.
(ii) Awareness about personal hygiene
(iii) Vector control.

- Environmental engineering work and generic integrated vector control measures.
- Elimination of breeding places
- Regular spraying of insecticides
- Burial disposal of dead bodies

3. Prevention of post disaster epidemics
4. integrated disease surveillance systems
5. Detection and containment of or outbreak- this would include:
    - Recognition and diagnosis by primary health care practitioners
    - Communication of surveillance information to public health authorities
    - Epidemiological analysis of the surveillance date
    - Delivery of appropriate medical and public health measures.
6. Pharmaceutical interventions – immunization and other preventive measures
7. Biosafety and Biosecurity
    - System for inventory control in the laboratories dealing with bacteria, viruses or toxins which can be a source of potential causative agents for biological disasters

Legislations:

There are a number of legislations that control and govern the nation's health policies.

1. The Water (Prevention and Control of Pollution) Act, 1974
2. The Air (Prevention and Control of Pollution) Act, 1981
3. The Environmental (Protection) Act, 1986, and the Rules (1986): This Act also provides for the Biomedical Waste (Management and Handling) Rules, 1998 with a view to controlling the indiscriminate disposal of hospital/ biomedical wastes.
4. Disaster Management Act of 2005

Role of World Health Organization (WHO) in dealing with biological disasters:

1. Strengthening national surveillance programmes, particularly in the field of epidemiology and laboratory techniques;
2. Disseminating verified information on outbreaks of diseases, and also by providing technical support for response;
3. Collecting, analyzing and disseminating information on diseases likely to cause epidemics of global importance.

MAN MADE DISASTERS

Industrial Accidents:

- Industrial accident means a sudden and unforeseen event, attributable to any cause, which happens to a person, arising out of or in the course of his or her work, and resulting in an employment injury to that person.
- Accidents are preventable, but steps must be taken to prevent them.
- There may be a number of reasons behind the industrial accidents, however, human factor is one which includes unsafe acts, negligence, lack of knowledge and training. Another leading factor is working conditions.
- Unsafe working conditions can include faulty machines, faulty designs, substandard processes, occupational hazards and other hazards etc. Accidents will continue to happen if preventive measures are not taken.
- Accident prevention can be achieved by commitment and cooperation between management, safety programs, safety culture and accountability. In the present era of privatization and industrialization in every field, it is essential, to coin out this issue.

Role of government in dealing with man- made disasters-

a) Setting up of accident investigation board and chemical accident database

- An accident investigation board should be set up in India to investigate the chemical disasters and bring out guidelines based on lessons learnt in each incident.
- This would help to prevent its recurrence.

b) Awareness Campaigns

This would help workers in reducing unsafe acts and in tackling the disaster if it were to happen.

c) Research and development

Research into new methods of producing the product with less toxicity can to a large extent reduce the adverse effect if any accident were to happen.

d) Offsite Emergency Planning

This would ensure that the local authority adequately discharges his duty to minimize the consequences of major accidents to people and the environment.

e) Transportation of Hazardous chemicals

Swift and timely availability of emergency response during transportation of hazardous chemical

Fire:

- The first factor is that the Fire Accident is an unplanned or unexpected event in the building environment.
- The second factor of fire causes, or sources of ignition in buildings are of two types.
    - The first one is human error type fire, and.
    - The second one is appliances type fire.

- The human error type fires are children playing with matches, rubbish burning, smoking and intentional fire. The appliances types' fires are electrical appliances, gas appliances, other fuel appliances, acetylene and liquefied gas, solid fuel appliances and other specified causes fire.

Explosion:

- An explosion is a rapid expansion of gases.
- Many explosions occur when gases are exposed to a source of heat- such as fire, sparks, even static electricity-or an increase in pressure.
- Explosions can also be caused by chemical reactions.
- For instance, when two or more incompatible substances are combined, they may explode. Some chemicals can even explode if exposed to air or water.

Chemical Hazards:

- A chemical incident has been defined as "an unexpected uncontrolled release of a chemical from its containment". A public-health chemical incident has been defined as "where two or more members of the public are exposed (or threatened to be exposed) to a chemical"
- In the majority of cases, this is an acute release, where the exposure dose is rising or is likely to rise rapidly. When the release is chronic, the exposure and dose do not rise quickly and public-health measures are not taken so rapidly, though the public-health concern may emerge suddenly and acutely.

What are the causative factors behind chemical disaster?

- Ageing of process plants and inadequate steps to pace with modern technologies in Indian chemical industry has increased the vulnerability to chemical disasters.
- Human error as a result of non-compliance of standard operating procedures (SOPs) that have been put into place by a company.
- Defects in design, absence of SOPs to mitigate an early warning in the process. Poor coordination between different departments in a company.
- Improper maintenance of equipment
- Natural disasters like floods and earthquakes.
- Non-availability of an emergency response team to mitigate accidents during the transportation of hazardous chemicals has also resulted in major disasters in several locations in India.

Regulatory Framework for Chemical Safety in India

1. The Environment (Protection) Act was enacted in 1986. Under the Act, two rules have been notified for ensuring chemical safety, namely.
    - The Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989 (MSIHC) amended in 1994 and 2000.
    - The Chemical Accidents (Emergency, Planning, Preparedness, and Response) Rules, 1996 (EPPR) under the Environment (Protection) Act, 1986.
2. The Public Liability Insurance Act 1991(amended in 1992) and the Public Liability Insurance Rules 1991 (amended in 1993) require maximum hazard units to procure an insurance policy and deposit an equal amount in the **Environment Relief Fund** to provide immediate relief to victims of chemical accidents.

DISASTER MANAGEMENT - INTERNATIONAL COOPERATION

Hyogo Framework of Action:

In 2005, 168 Governments adopted a 10-year plan to make the world safer from natural hazards at the **World Conference on Disaster Reduction, held in Kobe, Hyogo, Japan.**

Hyogo Framework for Action (HFA): Building the Resilience of Nations and Communities 2005-2015

India is a signatory of the Hyogo Framework for Action, which was adopted globally to work towards the reduction of disaster losses in lives and economic and environmental assets of communities and countries. The framework has set three strategic goals and five priority action areas regarding the integration of disaster risk reduction (DRR) into sustainable development policies, capacity building and preparedness and vulnerability reduction.

The three strategic goals of the Hyogo Framework for Action along with steps taken by India towards its implementation:

(a) Goal 1: "The more effective integration of disaster risk considerations into sustainable development policies, planning and programming at all levels, with a special emphasis on disaster prevention, mitigation, preparedness and vulnerability reduction;"

- With the enactment of the DM Act, 2005, and preparation of the disaster management plan, 2016, the present focus of the government is to implement the various provisions under them.
- All the government programs are being designed following the principle of "do no harm".

(b) Goal 2: "The development and strengthening of institutions, mechanisms and capacities at all levels, in particular at the community level, that can systematically contribute to building resilience to hazards;"

- Strategies have been adopted to strengthen SDMAs and DDMAs.
- Comprehensive Human Resource Development Program is being prepared for the entire country.
- Partnerships with Civil Society are being strengthened.

(c) Goal 3: "The systematic incorporation of risk reduction approaches into the design and implementation of emergency preparedness, response and recovery programs in the reconstruction of affected communities."

- "Build Back Better" is the underlying principle adopted by the Government for all post reconstruction and recovery activities.

Priority Action Areas:

- Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation,
- Identify, assess and monitor disaster risks and enhance early warning,
- Use knowledge, innovation and education to build a culture of safety and resilience at all levels,
- Reduce the underlying risk factors,
- Strengthen disaster preparedness for effective response at all levels.

Sendai Framework for Disaster Risk Reduction (SFDRR)

Introduction

- Sendai Framework for Disaster Risk Reduction 2015–2030 was adopted at the 3rd UN World Conference on DRR, held in March 2015 in Sendai, Japan. It came after the *Hyogo Framework for Action (HFA) 2005–2015: Building the Resilience of Nations and Communities to Disasters*.
- It is a **15-year, voluntary, non-binding agreement** which recognizes that the government has the primary role to reduce disaster risk and vulnerabilities and also the responsibility should be shared with other stakeholders including local governments, the private sector and other stakeholders.

Sendai Framework's Seven Global Targets

India is committed to achieving the 7 goals set under the framework through systematic and sustainable efforts.

- Substantially reduce global disaster mortality by 2030, aiming to lower average per 100,000 global mortalities between 2020–2030 compared to 2005–2015;
- Substantially reduce the number of affected people globally by 2030, aiming to lower the average global figure per 100,000 between 2020–2030 compared to 2005–2015;
- Reduce direct disaster economic loss in relation to global gross domestic product by 2030;
- Substantially reduce disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities, including through developing their resilience by 2030;
- Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020;

> Sendai Framework Readiness Review, UNISDR 2017
> Critical data gaps exist in specific areas of disaster loss, in all areas of international cooperation, and for many aspects of early warning, risk information and disaster risk reduction strategies.
>
> The Review confirms that unless gaps in data availability, quality and accessibility are addressed, countries' ability to assure accurate, timely and high-quality monitoring and reporting of implementation across all Targets and Priorities of the Sendai Framework will be severely impaired.

- Substantially enhance international cooperation to developing countries through adequate and sustainable support to complement their national actions for implementation of the framework by 2030;
- Substantially increase the availability of and access to multi– hazard early warning systems and disaster risk information and assessments to the people by 2030.

Four Priorities for Action as per the Sendai Framework

- **Understanding disaster risk:** Disaster risk management should be based on an understanding of disaster risk in all its dimensions of vulnerability, capacity, exposure of persons and assets, hazard characteristics and the environment.
- **Strengthening disaster risk governance to manage disaster risk:** Disaster risk governance at the national, regional and global levels is very important for prevention, mitigation, preparedness, response, recovery, and rehabilitation. It fosters collaboration and partnership.
- **Investing in disaster risk reduction for resilience:** Public and private investment in disaster risk

prevention and reduction through structural and non–structural measures are essential to enhance the economic, social, health and cultural resilience of people, communities, countries and their assets, as well as the environment.

- **Enhancing disaster preparedness for effective response, and to "Build Back Better" in recovery, rehabilitation and reconstruction:** The recovery, rehabilitation and reconstruction phase is a critical opportunity to build back better, including through integrating disaster risk reduction into development measures.

United Nations Office for Disaster Risk Reduction

The United Nations Office for Disaster Risk Reduction (UNISDR) serves as the focal point for coordination among all stakeholders involved in disaster reduction activities. The Government of India has contributed US$ 1 million in November, 2016 in 7th Asian Ministerial Conference for Disaster Risk Reduction and signed a Statement of Cooperation to promote regional capacity buildings for the Asia Pacific Region in the field of Disaster Risk Reduction (DRR).

World Conference on Disaster Risk Reduction (WCDRR)

It is a series of United Nations conferences focusing on disaster risk reduction and climate risk management in the context of sustainable development. The conferences bring together government officials and other stakeholders to discuss **how to strengthen the sustainability of development by managing disaster and climate risks.** The conferences have been hosted by Japan: in Yokohama in 1994, in Kobe in 2005 and in Sendai in 2015.

Global Platform for Disaster Risk Reduction (GPDRR)

It acts as the main global forum for emphasis on disaster risk reduction. **It assesses the progress made in the implementation of the Sendai Framework for Disaster Risk Reduction (SFDRR).** It meets biannually and Indian delegation participated in it in Cancun, Mexico in 2017 where NDMA Guidelines on Museums was also launched during the summit.

India's Progress after the Sendai Declaration:

Post Sendai Declaration, The Government of India has taken up several initiatives:

- India has successfully hosted the Asian Ministerial Conference on Disaster Reduction (AMCDRR) in November, 2016 and adopted '**New Delhi Declaration**' and 'Regional Action Plan for implementation of the Sendai Framework'.
- Government of India has issued a set of priority actions to all the State Government based on the goals, targets and priorities of Sendai Framework.
- In line with Sendai priority 4, National Disaster Response Force (NDRF) is strengthened with respect to training and equipment
- Government has expressed keenness to share India's expertise and help other countries in disaster response

United Nations Office for Disaster Risk Reduction (UNISDR) has declared India first regional champion after the **Sendai Agreement** for its efforts to facilitate regional support towards enabling community resilience in the Asia–Pacific region.

Asian Ministerial Conference on Disaster Risk Reduction 2018

The Asia Regional Plan aims to provide:

- Broad policy direction to guide the implementation of the Sendai Framework in the context of the 2030 Agenda for Sustainable Development in the region;
- Long-term road map, outlining a chronological pathway of the Sendai Framework structured around key milestones;
- The Action Plan 2017- 2018 with specific activities, prioritized based on the long-term road map and in line with the policy direction.
- The Action Plan 2018-2020 follows the goals and directions set in the Asia Regional Plan and analyzes the progress made since its development.
- It also provides key highlights of the achievements made by the Member States against the milestones agreed for this period, and extends the scope of the two-year Action Plan for the next biennium.
- The current two-year Action Plan 2018- 2020, is a main outcome document of the 2018 Asian Ministerial Conference on Disaster Risk Reduction, co-hosted by the Government of Mongolia and UNISDR. It builds on the previous Action Plan, taking into account the progress realized in the achievement of the milestones, and recommends actions to advance implementation of the Asia Regional Plan, with a specific focus on target (e) of the Sendai Framework that calls for development of national and local disaster risk reduction strategies.
- Thus, to monitor and **share the country's progress at a regional platform** for Asian–Pacific region, AMCDRR was conceptualized. It provides a platform for engagement of Ministers of about 61 countries, dealing with Disaster Management for plan and policy making at regional level in line with the global framework on disaster risk reduction. It meets biannually. The 2nd and 7th AMCDRR were hosted by the Government of India in 2007 and 2016 respectively.

Sustainable Development and Disaster Management

- Disaster risk reduction is an integral part of social and economic development and is essential if development is to be sustainable for the future.
- The 2030 Agenda for sustainable development adopted by the UN General Assembly in 2015 curetted disaster risk management in most of its Sustainable Development Goals (SDG's) with specific targets for building disaster resilience across different sectors of development.
- There are 25 targets related to disaster risk reduction is 10 of the 17 SDGs firmly establishing the disaster risk reduction as core development strategy.

United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA)

It was formed in December 1991 by the General Assembly to **strengthen the response of United Nations Organizations to complex emergencies and natural disasters.**

United Nations Disaster Assessment and Coordination (UNDAC)

- UNDAC is part of the international emergency response system for sudden-onset emergencies.
- It was created in 1993.
- It aims at facilitating close links between country-level, regional and international response efforts to a disaster.

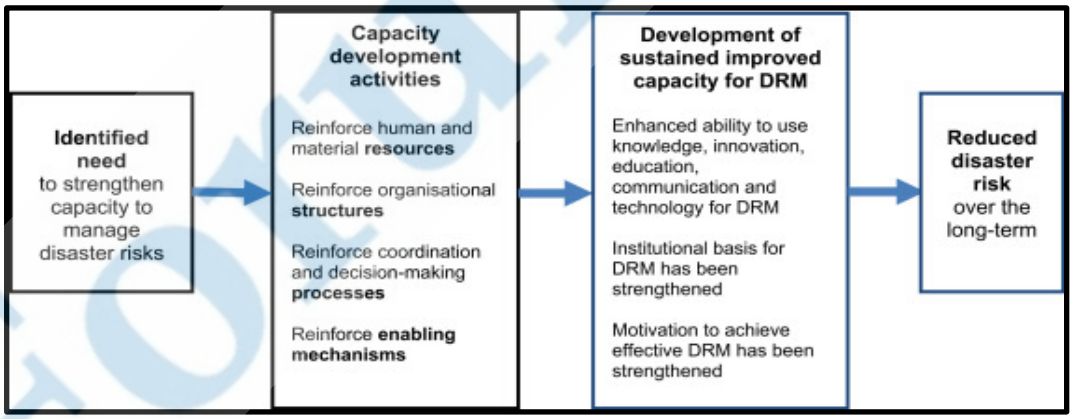
How does it work?

- The office for the Coordination of Humanitarian Affairs (OCHA) at the request of the government affected by a disaster dispatches a UNDAC team to the country within 12 to 48 hours anywhere in the world.
- UNDAC team provides technical services, principally in tasks such as damage, assessment, and onsite coordination and information management.
- When required, the United Nations also sets up an On-site Operations Coordination Centre (OSOCC) to help local authorities in a disaster affected country to coordinate international relief.

Global Facility for Disaster Reduction and Recovery (GFDRR)

- It is a global partnership program administered by the World Bank Group.
- It helps developing countries – where the most vulnerable natural disaster "hotspots" exists – enhance their capacity for disaster prevention, emergency preparedness, response, and recovery.

It also supports developing countries to Mainstream disaster risk management and climate change adaptation in development strategies and investment programs, and Improve the quality and timeliness of resilient recovery and reconstruction following a disaster



Why is disaster risk resilience important in achieving sustainable development?

Few targets of Goal 11 Sustainable cities and communities are:

- By 2030, enhance inclusive and sustainable urbanization and capacity for participatory. Integrated and sustainable human settlement and management in all countries.
- By 2030, significantly reduce the no. of deaths, people affected and also reduce direct economic losses related disasters it focuses on protecting the poor and people in vulnerable situations.

- By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels

1. Disasters are intertwined with development in a three-dimension nexus.
    - Disasters eat away hard- earned gains development.
    - Lack of development exposes unbearable communities to the risk of disasters
    - Development creates new risks of disasters.

    Example: mining and industries in ecologically sensitive zones may destroy the natural buffer to disasters
2. Disaster risk reduction cuts across different sectors of development.
   With every disaster, there is a significant impact on various sectors of development like agriculture, housing, health, education and infrastructure. Disasters are a major obstacle in achieving sustainable socio-economic development
3. To achieve the goal of eradicating extreme poverty. It is an utmost necessity to build disaster resilience. This is because the impacts of disasters drag the poor and most unbearable even deeper into poverty.
4. It is therefore necessary to build and strengthen the resilience of poor communities to prevent future disasters events to pull them into poverty and protect their livelihood and assets to help them recover.
5. The increased invariability to disasters is related much to the unsustainable development activities
   Example: improper use of land and environmental degradation
6. In this context it is important to discuss SDG 11.
7. Goal 11 aims at making cities and human settlement, inclusive, safe, resilient and sustainable.

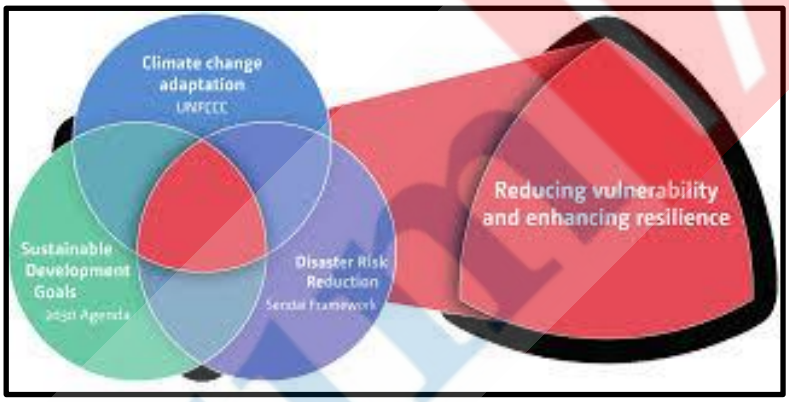
IMPLEMENTATION OF THE SENDAI FRAMEWORK TOGETHER WITH THE SUSTAINABLE DEVELOPMENT GOALS AND PARIS CLIMATE AGREEMENT

- In the year 2015, the Sendai Framework, the Sustainable Development Goals and the Paris climate Change Agreements were adopted
- These policies can facilitate and encourage better participation in disaster risk reduction (DRR), sustainable development and climate-change mitigation and adaptation.
- Sustainable development cannot be attained while disasters continue to undermine economic growth and social progress. Therefore, disaster risk reduction needs to be at the core of sustainable development.
- The Sendai Framework for Disaster Risk Reduction 2015-2030 was the first agreement of the post 2015 development agenda.
- It includes seven global targets accompanied by a comprehensive set of guiding principles that give direction to reduce the impact of disasters
- It also addresses the underlying drivers of disaster risk and safeguarding current and future development gains.
- There are a number of targets across the 17 Sustainable Development Goals that are related to disaster risk reduction
- The Paris Agreement on Climate Change outlined eight specific action areas for enhancing 'understanding, action and Support' for disaster reduction.
    1. Early warning systems;

2. Emergency preparedness;
3. Slow onset events
4. Events that may involve irreversible and permanent loss and damage;
5. Comprehensive risk assessment and management;
6. Risk insurance facilities, climate risk pooling and other insurance solutions;
7. Non-economic losses;
8. Resilience of communities, livelihoods and ecosystems

- The Intergovernmental Panel on Climate Change (IPCC) demonstrated that it is possible to reduce the severity and frequency of extreme weather events caused by anthropogenic climate change through sustainable development practices.
- Achieving the primary goal of the Paris Agreement - to keep the average global temperature rise well below 2°C degrees and as close as possible to 1.5°C above pre-industrial levels - is vital to the achievement of all three Agendas.

Figure below shows the overlap between UNFCCC, SENDAI FRAMEWORK AND SDG 2030 AGENDA.



What should India do to collectively implement these policies?

- Mainstreaming disaster risk reduction into every aspect of development
- Development projects should be planned, designed and implemented in such a way that they do not compound the risks but contribute to the process of mitigating the risks of disasters
- There should be ex-ante risk reduction investment in development planning. Investment should aim at protecting development gains and attaining resilience
- Projects planned for the future in high disaster-prone areas should mandatorily undertake disaster risk audit of the projects.
- Disaster risk reduction practices need to be inclusive and accessible in order to be efficient and effective.
- Governments should facilitate, incentivize and engage with relevant stakeholders especially the private sector in the design and implementation of policies, plans and standards.
- There should be integration of disaster risk into management practices of organizations, businesses for making SDG achievable
- Making disaster management more inclusive by including women, civil society, academia

Importance of community participation in DM

Community is the repository of knowledge and skills which have evolved traditionally, these needs to be integrated in the DM strategy.

Community is the first line of responders; thus, it is necessary to educate the community and impart skills and assign specific roles regarding disaster management to ensure a coordinated response while disaster.

Community also plays an important role in the recovery process including the **socio-psychological rehabilitation** of the victims of the disaster.

During the recent past, it has been experienced that the capacity building of the community has been very helpful. For example, during floods in Chennai, local people were able to help army and other forces in locating the routes as roads were all filled and army was not acquainted with the area as much as locals.

MISCELLANEOUS TOPICS

Importance/ Role of Media in Disaster Management

- People if not provided with the correct information during disaster situation, resulting in the spread of misinformation which creates panic.

Pre-disaster

- The media can enable the government to prioritize and work upon Disaster Risk Issues.
- It can help disaster mitigation experts to recommend early warning systems. Emergency alerts using TV, radio, cable services across the country can be very effective.
- Recently the importance of HAM Radio was in the news as it is very effective when other means of communication stops working.
- Helps in educating the community in early recognition of symptoms and reporting them early so as to prevent large scale destruction.
- Ensuring the cooperation of the community in risk reduction by ensuring increased awareness and warning about the ill effects.

During disaster

During the disaster, what is of most importance is to keep the morale of the people high, to create confidence in them and to prevent panic.

- Continuous and media coverage, especially by local media, can help the authorities, NGOs and volunteers in reaching the affected with assistance and relief.
- Spreading information about the Dos and Don'ts, preventing rumors and panic and confusion.
- Identifying the needs and focusing attention on them, giving details on blocked roadways and broken utility lines i.e. water and electricity.
- Spreading the information to the people and the concerned authorities in advance to enable them to take the necessary steps to minimize the losses of lives and property.
- It provides the outside world information about what that affected community is dealing with.

Post-disaster

- Collection of material resources/donations and the increasing helping hands by appealing to the people to come forward to help.
- Helping the affected in establishing contacts with their closed ones
- Keeping a watch and report on some anti-social elements who try to take advantage of such situations like human trafficking, charging excessive price for essentials.

Negative Effects of Media

- The media may exaggerate some elements of the disaster and create unnecessary panic.
- Influential politicians may try to manipulate the media for personal and political gains.
- Biased coverage for the purposes of sensationalism by choosing to capture only small incidents of horrific devastation leads to misreporting.
- Live coverage of critical operations can disrupt the counter-terrorism strategy of the forces, as was

observed in Mumbai 26/11 attacks.

Mine Disasters

What is a Mine Disaster?

- Mines Act, 1965 defines Disaster as an act of accident (unexpected event) causing loss of more than 10 lives.
- A mining accident is an accident that occurs in the process of mining minerals.

Prevention of Disasters in Mines

- The various safeguards and preventive measures against coal mine fires are outlined in the Coal Mines Regulations, 1957 and related circulars, notifications and technical instructions.
- The Directorate General of Mines Safety (DGMS) examines from each and every application for underground and surface mining from all considerations.
- Wherever necessary the DGMS imposes additional precautionary and preventive measures.
- Thus, the role of DGMS is not only that of an enforcer of legislation but also a facilitator of Mine Safety.

Environmental clearance for mines

- For the new projects and re-organizational projects, after the issuance of the EIA Notification, 1994 under the Environment (Protection) Act, 1986, it has become compulsory to get environmental clearance from the Ministry of Environment and Forests.
- The mines are required to develop their Environmental Management Plans (EMPs) in which the problems of the mine fires are adequately addressed as the mine fires have considerable environmental impacts.

Stampede

What is a stampede?

- The term stampede is applied to a sudden rush of a crowd of people, usually resulting in many injuries and death from suffocation and trampling.
- Stampedes are caused by surge of individuals in a crowd, in response to a perceived danger or loss of physical space.
- It often disrupts the orderly movement of crowds resulting in irrational and dangerous movement for self-protection, leading to injuries and fatalities. Stampedes in India
- According to the **National Crime Records Bureau** figures, from 2000 to 2013, almost 2,000 people died in stampedes.
- A 2013 study published by the International Journal of Disaster Risk Reduction (IJDRR) points out that religious gatherings and pilgrimages have been venues for 79% of the stampede in India.

Triggers/ Factors Leading to Stampedes

- **Structural:** collapse of the temporary structure, steep stairs, narrow exists because of illegal constructions, parking and hawkers etc.
- **Fire / electric:** usually from the makeshift kitchens in the 'pandal', inappropriate use of firecrackers / electrical wiring during the event.

- **Human:** Underestimating the size of crowd, overselling of tickets; lack of coordination with authorities, panicking by rumors, rush to get freebie / celebrity autographs etc. NDMA Guidelines on Crowd Management
- In view of the recurring stampedes at places of mass gathering, including religious places, and typically ad-hoc responses to those, the **National Disaster Management Authority (NDMA)** had prepared 'Suggestive Framework for Preparation of Crowd Management Plan for Events/Venues of Mass Gathering'.

Disaster Management measures/Solutions

1. The organizers of crowded events/venue managers should discourage general admissions and have plans to handle VIP visitors or, alternatively, refuse entry to VIPs where it adds to safety concerns.
2. A public address system, with loudspeakers installed at all crowded points, to communicate with the crowds. The guidelines suggest that there should be a 3-4-meter gap in between a row of 5-6 shops, through which pilgrims can escape during an unexpected rush.
3. The guidelines also call upon the authorities to have separate tracks for pilgrims travelling by foot and those covering the journey on ponies/mules. The event organizers and venue managers should develop, implement, review and revise the disaster management plan in coordination with others including local administration and police.
4. The police should actively participate in venue assessment and preparedness checks and guide crowd and traffic movements.
5. Event/venue managers can involve NGOs and civil defense in traffic control, people flow control, medical assistance, sanitation and mobilization of local resources in case of disaster.
6. The NDMA has also suggested setting up of medical first-aid rooms and emergency operations centers to handle post-disaster emergencies.

Industrial disasters

What are industrial disasters?

- Industrial disasters are disasters caused by chemical, mechanical, civil, electrical or other process failures
- These may occur due to accident, negligence or incompetence, in an industrial plant which may spill over to the areas outside the plant or within
- Such disasters cause damage to life, property and environment

Ways in which Chemical and Industrial emergencies may arise:

- Explosion in a plant, Accidents in storage facilities of chemicals
- Accidents during transportation of chemicals, misuse of chemicals
- Improper waste management, Accident in treatment plants
- Technological system failures or Failures of plant safety design
- Arson and sabotage done deliberately or Human Error in the management of the plant.

Railways

What is a Railway Disaster?

- Railway Disaster is a serious train accident or an untoward event of grave nature, either on railway premises or arising out of railway activity.

- This may occur due to natural or human-made causes, which may lead to loss of many lives and /or grievous injuries to a large number of people, and/or severe disruption of traffic etc.
- Thus, necessitating large scale help from other government/non-government and private organizations

What explains the frequent number of railway accidents?

Accidents due to failure of railway staff:

More than half of the accidents are due to lapses on the part of railway staff (Khanna Committee).

Such lapses include:

- carelessness in working,
- poor maintenance work,
- Adoption of short-cuts
- Non-observance of laid down safety rules and procedures.

Accidents due to loco-pilots:

Accidents also occur due to signaling errors for which loco-pilots are responsible. Under-investment in the Railways leading to Rail accidents:

- Slow expansion of rail networks has put undue burden on the existing infrastructure, leading to severe congestion and safety compromises
- Under-investment in the railways has resulted in congested routes, inability to add new trains, reduction of train speeds and more rail accidents.

Maintenance is compromised due to lack of funds Safety Measures taken on Indian Railways:

- Measures taken to ensure rail safety envisage accident prevention and mitigation directed towards continuous reduction in risk level to its passengers.
- In the Budget 2017-18, setting up of a Rastriya Rail Sanraksha Kosh (RRSK) had been announced.

To improve safety of railway tracks following measures have been taken:

- Usage of prestressed concrete sleepers
- Provision of Thick Web Switches (TWS) for all important routes
- Track Management System
- Condition based monitoring system for rolling stock and track is being tried
- Ultrasonic broken rail detection system to be made operational

Recommendations by Kakodkar Committee on the modernization of railways:

1. The Committee recommends the adoption of an Advanced Signaling System (akin to the European Train Control System) for the entire trunk route length of 19,000 km within 5 years.
2. The Committee recommends the creation of a statutory Railway Safety Authority with enough powers to have a safety oversight on the operational mode of Railways.
3. All Level Crossings (both manned and unmanned) should be eliminated over five years.
4. The Committee also recommends a switch over from the ICF design coaches to the much safer LHB design coaches.

Land:

- "Soil pollution" refers to the presence in the soil of a chemical or substance out of place and/or present at a higher than normal concentration that has adverse effects on any non-targeted organisms.
- Soil pollution often cannot be directly assessed or visually perceived, making it a hidden danger. The Status of the World's Soil Resources Report (SWSR) identified soil pollution as one of the main soil threats affecting global soils and the ecosystem services provided by them.
- The main anthropogenic sources of soil pollution are the chemicals used in or produced as byproducts of industrial activities, domestic, livestock and municipal wastes (including wastewater), agrochemicals, and petroleum-derived products.
- These chemicals are released to the environment accidentally, for example from oil spills or leaching from landfills, or intentionally, as is the case with the use of fertilizers and pesticides, irrigation with untreated wastewater, or land application of sewage sludge.
- Soil pollution also results from atmospheric deposition from smelting, transportation, spray drift from pesticide applications and incomplete combustion of many substances as well as radionuclide deposition from atmospheric weapons testing and nuclear accidents.
- New concerns are being raised about emerging pollutants such as pharmaceuticals, endocrine disruptors, hormones and toxins, among others, and biological pollutants, such as micropollutants in soils, which include bacteria and viruses.
- Based on scientific evidence, soil pollution can severely degrade the major ecosystem services provided by soil.
- Soil pollution reduces food security by both reducing crop yields due to toxic levels of contaminants and by causing crops produced from polluted soils to be unsafe for consumption by animals and humans.
- Many contaminants (including major nutrients such as nitrogen and phosphorus) are transported from the soil to surface waters and groundwater, causing great environmental harm through eutrophication and direct human health issues due to polluted drinking water.
- Pollutants also directly harm soil microorganisms and larger soil-dwelling organisms and hence affect soil biodiversity and the services provided by the affected organisms.

Civil Aviation Accidents

- Air accidents can be of natural, technical or human origin, such as mechanical breakdowns, negligence or terrorist attacks. Usually small aircraft (helicopters, light aeroplanes, gliders) do not cause disasters as such, since the number of victims and the impact of the crash is limited.
- This is not the case for large aircraft such as transport planes or jet fighters, although accidents involving this type of aircraft are relatively rare; when they do occur, it is often in the perimeter of airfields and in the axis of take-off and landing strips.
- These accidents are unpredictable and no real means of protection against them exist.
- After the impact the object disintegrates into thousands of small pieces which scatter over an area of several kilometers.

Disaster Management measures

Intervention and rescue measures

- The control of all accidents is, in the first instance, the responsibility of the commander (chief) and personnel of the affected means of transport.
- It is up to them to limit the resulting damage as much as possible.
- Passengers must obey the directives of the personnel on board (protective and rescue measures) and behave as they are instructed by the regulations on disaster situations, especially air, rail or maritime disasters.
- As far as search, rescue and assistance operations are concerned, the means or system of transport involved and the area (country) where it occurs will determine who is the person in charge at the disaster site.

Disaster Management in Civil Aviation:

- The Directorate General Civil Aviation (DGCA) has the regulatory responsibility for aviation safety.
- Its mandate is to ensure the highest level of safety in the Indian Aviation System by employing International Civil Aviation Organization (ICAO) standards and recommended practices.
- DGCA fosters and assists stakeholders in developing comprehensive Safety Management Systems (SMS) and develops preventive safety strategies for the aviation system
- The responsibility for coordination and search and rescue (SAR) with other agencies is, however vested with the Airports Authority of India (AAI) under the Airports Authority of India Act, 1944, as amended by AAI (Amendment) Rules, 2003
- The SSP is based on comprehensive analysis of the States Aviation System, safety policies, risk management, safety assurances and permission
- An appropriate legislative framework in safety management has been implemented in India in accordance with ICAO Standard and Recommended Practices (SARPs).

For carrying out ICAO functions, India has three layers of legislation

- The Aircraft Act 1934 which is the primary legislation,
- The secondary Aircraft Rules, 1937 and
- The tertiary Aircraft (Carriage of Dangerous Goods) Rules, 2003

A series of **Safety Management System-Civil Aviation Regulation** (SMS-CARs) about operational regulations and implementation policies for the applicable service providers has been released by the DGCA.