DISASTER MANAGEMENT AND MITIGATION

UNIT - I

Introduction

Disaster is a sudden adverse or unfortunate extreme event which causes great damage to human beings as well as plants and animals. *Disasters occur rapidly, instantaneously, and indiscriminately.* These extreme events either natural or man-induced exceed the tolerable magnitude within or beyond certain time limits, make adjustment difficult, result in catastrophic losses of property and income and life is paralyzed. These events which occur aggravate natural environmental processes to cause disasters to human society such as sudden tectonic movements leading to earthquake and volcanic eruptions, continued dry conditions leading to prolonged droughts, floods, atmospheric disturbances, collision of celestial bodies, etc. (Joshi, 2008).

Disasters have always co-existed with civilizations. With technological advancement, development initiatives resulted in the creation of a lot of infrastructure and permanent assets. Gradually material development detached man from nature on one hand, and increased vulnerability of the human population, on the other. The progressive increase in loss of life, property and deleterious effect on environment due to disasters moved the international community to look at disaster management in a new perspective, which transcends international barriers, anticipates possible threats and enables tackling of disasters from the pre-stage. The last decade (990-1999) was observed by the International Community as the "International Decade for natural disaster reduction", a decade dedicated to promoting solutions to reduce risks from natural hazards. The international dimension of disasters was realized, and a protocol sought to be established so that when it comes to suffering of humanity, help from the International community flow in right earnest.

Almost every day, newspapers, radio, and television channels carry reports on disaster striking several parts of the world. But what is a disaster? The term disaster owes its origin to the French word "Desastre" which is a combination of two words 'des' meaning bad and 'aster' meaning star. Thus, the term refers to 'Bad or Evil star'. **The United Nations defined Disasters as 'A serious disruption of the functioning of a community or a society causing widespread human, material, economic and environmental losses which exceed the ability of the affected community/society to cope using its own resources' (UNDP)**. A disaster is

a result from the combination of hazard, vulnerability and insufficient capacity or measures to reduce the potential chances of risk. A disaster happens when a hazard impacts on the vulnerable population and causes damage, casualties, and disruption. Figure 1 gives a better illustration of what a disaster is.

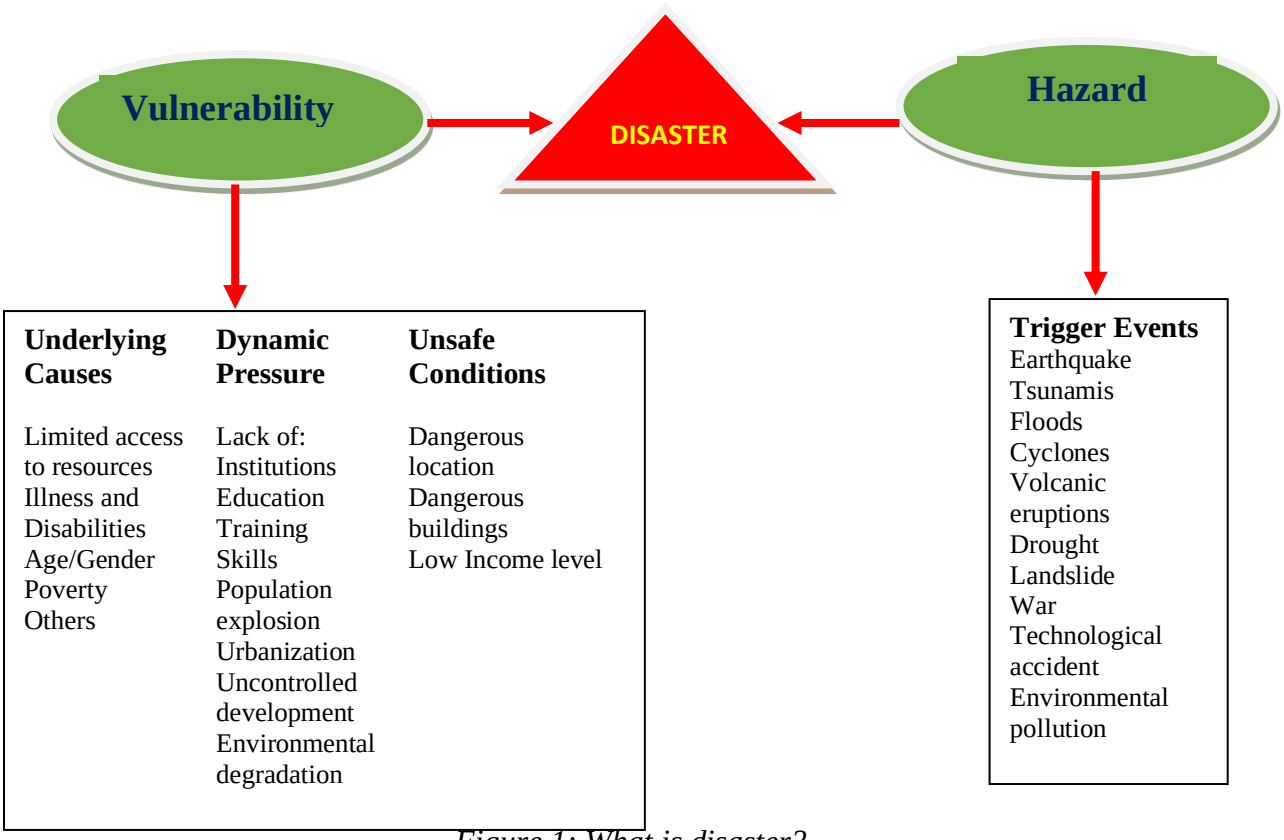


Figure 1: What is disaster?

Any hazard – flood, earthquake or cyclone which is a triggering event along with greater vulnerability (inadequate access to resources, sick and old people, lack of awareness etc) would lead to disaster causing greater loss to life and property. For example, an earthquake in an uninhabited desert cannot be considered a disaster, no matter how strong the intensities produced. An earthquake is disastrous only when it affects people, their properties, and activities. Thus, disaster occurs only when hazards and vulnerability meet. But it is also to be noted that with greater capacity of the individual/community and environment to face these disasters, the impact of a hazard reduces. Therefore, we need to understand the three major components namely hazard, vulnerability, and capacity with suitable examples to have a basic understanding of disaster management.

Main components of disaster management

What is a Hazard?

Hazard may be defined as "a dangerous condition or event, that threat or have the potential for causing injury to life or damage to property or the environment." Hazards can be grouped into two broad categories namely natural and manmade. Natural hazards are hazards which are caused because of natural phenomena (hazards with meteorological, geological, or even biological origin). Examples of natural hazards are cyclones, tsunamis, earthquake, and volcanic eruptions which are exclusively of natural origin. Landslides, floods, drought, fires are socio-natural hazards since their causes are both natural and man-made. For example, flooding may be caused because of heavy rains, landslide or blocking of drains with human waste.

Manmade hazards are hazards which are due to human negligence. Manmade hazards are associated with industries or energy generation facilities and include explosions, leakage of toxic waste, pollution, dam failure, wars, or civil strife, etc. The list of hazards is exceedingly long. Many occur frequently while others take place occasionally. However, based on their genesis, they can be categorized as follows:

Various Types of Hazards

Type	Hazards	
Geological Hazards	1. Earthquake 2. Tsunami 3. Volcanic eruption	4. Landslide 5. Dam burst 6. Mine Fire
Water & Climatic Hazards	1. Tropical Cyclone 2. Tornado and Hurricane 3. Floods 4. Drought 5. Hailstorm	6. Cloudburst 7. Landslide 8. Heat & Cold wave 9. Snow Avalanche 10.Sea erosion
Environmental Hazards Biological	1. Environmental pollutions 2. Deforestation 1. Human / Animal Epidemics 2. Pest attacks	3. Desertification 4. Pest Infection 3. Food poisoning 4. Weapons of Mass Destruction
Chemical, Industrial and Nuclear Accidents	1. Chemical disasters 2. Industrial disasters	3. Oil spills/Fires 4. Nuclear
Accident related	1. Boat / Road / Train accidents / air crash Rural / Urban fires Bomb /serial bomb disasters blasts 2. Forest fires	3. Building collapse 4. Electric Accidents 5. Festival related 6. Mine flooding

Source: CBSE (2006)

Table 1: Various types of hazards

What is Vulnerability?

Vulnerability may be defined as "The extent to which a community, structure, services or geographic area is likely to be damaged or disrupted by the impact of particular hazard, on account of their nature, construction and proximity to hazardous terrains or a disaster prone area." Vulnerabilities can be categorized into physical and socio-economic vulnerability. Physical Vulnerability: It includes notions of whom and what may be damaged or destroyed by natural hazard such as earthquakes or floods. It is based on the physical condition of people and elements at risk, such as buildings, infrastructure etc, and their proximity, location and nature of the hazard. It also relates to the technical capability of building and structures to resist the forces acting upon them during a hazard event.

In shorter words, vulnerability is a set of prevailing conditions which adversely affect the community's ability to prevent, mitigate, prepare, or respond to a hazard. Absence of coping strategies is also a part of vulnerability and must be considered in vulnerability assessment e.g. living in hazard prone locations like near to a sea or river, etc.

Vulnerability are classified as physical, social, economic, and environmental, which shall be explained as follows:

- **Physical Vulnerability:** The physical vulnerability of an area also depends on its geographic proximity to the source and origin of the disasters e.g. if an area lies near the coast lines, fault lines, unstable hills etc. It makes the area more vulnerable to disasters as compared to an area that is far away from the origin of the disaster. Physical vulnerability includes the *difficulty in access* to water resources, means of communications, hospitals, police stations, fire brigades, roads, bridges and exits of a building or/an area, in case of disasters. Furthermore, the lack of proper planning and implementation in *construction of residential and commercial buildings* results in buildings that are weaker and vulnerable in earthquakes, floods, landslides, and other hazards.
- **Social Vulnerability:** As per United Nations office for Disaster Risk Reduction (UNDRR), it refers to the inability of people, organizations and societies to withstand adverse impacts to hazards due to characteristics inherent in social interactions, institutions and systems of cultural values. It is linked to the level of well-being of individuals, communities, and society. It includes aspects related to levels of literacy and education, the existence of peace and security, access to basic human rights, systems of good governance, social equity,

positive traditional values, customs and ideological beliefs and overall collective organizational systems. For example, poverty and inequality, marginalisation, social exclusion and discrimination by gender, social status, disability, and age (amongst other factors), etc.

- **Economic Vulnerability:** The level of vulnerability is highly dependent upon the economic status of individuals, communities, and nations. The poor are usually more vulnerable to disasters because they lack the resources to build sturdy structures and put other engineering measures in place to protect themselves from being negatively impacted by disasters. For example, the uninsured informal sector, vulnerable rural livelihoods, dependence on single industries, globalisation of business and supply chains, etc.
- **Environmental Vulnerability:** Natural resource depletion and resource degradation are key aspects of environmental vulnerability. For example, poor environmental management, overconsumption of natural resources, decline of risk regulating ecosystem services, extraction of soil from river bed, etc.

What is Capacity?

Capacity can be defined as "resources, means and strengths which exist in households and communities and which enable them to cope with, withstand, prepare for, prevent, mitigate or quickly recover from a disaster". People's capacity can also be considered. Capacities could be classified into physical and socio-economic capacities.

- **Physical Capacity:** People whose houses have been destroyed by the cyclone or crops have been destroyed by the flood can salvage things from their homes and from their farms. Some family members have skills, which enable them to find employment if they migrate, either temporarily or permanently.
- **Socio-economic Capacity:** In most of the disasters, people suffer their greatest losses in the physical and material realm. Rich people have the capacity to recover soon because of their wealth. In fact, they are seldom hit by disasters because they live in safe areas and their houses are built with stronger materials. However, even when everything is destroyed, they have the capacity to cope up with it.

Hazards are always prevalent, but the hazard becomes a disaster only when the frequency or likelihood of a hazard and the vulnerability of the community increases the risk of being severely affected.

What is Risk?

Risk is a "measure of the expected losses due to a hazard event occurring in a given area over a specific period. Risk is a function of the probability of particular hazardous event and the losses it would cause." The level of risk depends upon:

- Nature of the hazard;
- Vulnerability of the elements which are affected;
- Economic value of those elements.

A community/locality is said to be at 'risk' when it is exposed to hazards and is likely to be adversely affected by its impact. Whenever we discuss 'disaster management' it is basically 'disaster risk management'. Disaster risk management includes all measures which reduce disaster related losses of life, property, or assets by either reducing the hazard or vulnerability of the elements at risk.

Disaster Management Cycle

Disaster Risk Management includes sum of all activities, programmes and measures which can be taken up before, during and after a disaster with the purpose to avoid a disaster, reduce its impact or recover from its losses. The three key stages of activities that are taken up within disaster risk management are as follows:

Figure 2: Disaster Management Cycle

1. *Before a disaster (pre-disaster).*

Pre-disaster activities those which are taken to reduce human and property losses caused by a potential hazard. For example, carrying out awareness campaigns, strengthening the existing weak structures, preparation of the disaster management plans at household and community level, etc. Such risk reduction measures taken under this stage are termed as mitigation and preparedness activities.

2. *During a disaster (disaster occurrence).*

These include initiatives taken to ensure that the needs and provisions of victims are met and suffering is minimized. Activities taken under this stage are called emergency response activities.

3. *After a disaster (post-disaster).*

There are initiatives taken in response to a disaster with a purpose to achieve early recovery and rehabilitation of affected communities, immediately after a disaster strike. These are called as response and recovery activities. The Disaster risk management cycle diagram (DRMC) highlights the range of initiatives which normally occur during both the Emergency response and Recovery stages of a disaster. Some of these cuts across both stages (such things as coordination and the provision of ongoing assistance); whilst other activities are unique to each stage (e.g. Early Warning and Evacuation during Emergency Response; and Reconstruction and Economic and Social Recovery as part of Recovery).

The DRMC also highlights the role of the media, where there is a strong relationship between this and funding opportunities. This diagram works best for relatively sudden-onset disasters, such as floods, earthquakes, bushfires, tsunamis, cyclones etc, but is less reflective of slow-onset disasters, such as drought, where there is no obviously recognizable single event which triggers the movement into the Emergency Response stage.

According to Warfield (2008) disaster management aims to reduce, or avoid the potential losses from hazards, assure prompt and appropriate assistance to victims of disaster, and achieve rapid and effective recovery. 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. Appropriate actions at all points in the cycle lead to greater preparedness, better warnings, reduced vulnerability, or the prevention of disasters during the next iteration of the cycle. 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. Developmental considerations play a key role in contributing to the mitigation and preparation of a community to effectively confront a disaster. As a disaster occurs, disaster management actors, humanitarian organizations become involved in the immediate response and long-term recovery phases.

The four disaster management phases illustrated here do not always, or even generally, occur in isolation or in this precise order. Often phases of the cycle overlap and the length of each phase greatly depends on the severity of the disaster.

• ***Mitigation*** - Minimizing the effects of disaster.

Examples: building codes and zoning; vulnerability analyses; public education.

• ***Preparedness*** - Planning how to respond.

Examples: preparedness plans; emergency exercises/training; warning systems.

• ***Response*** - Efforts to minimize the hazards created by a disaster.

Examples: search and rescue; emergency relief.

• ***Recovery*** - Returning the community to normal.

Examples: temporary housing; grants; medical care.

To analyse the scope of disaster management in the revised context, it should be studied the cycle of the phenomenon (Figure 3). Disasters are as old as human history, but the dramatic increase and the damage caused by them in the recent past have become a cause of national and international concern. Over the past decade, the number of natural and manmade disasters has climbed inexorably. From 1994 to 1998, reported disasters average was 428 per year but from 1999 to 2003, this figure went up to an average of 707 disaster events per year. Figure 4 presents the deadliest disasters of the decade (1992-2001).

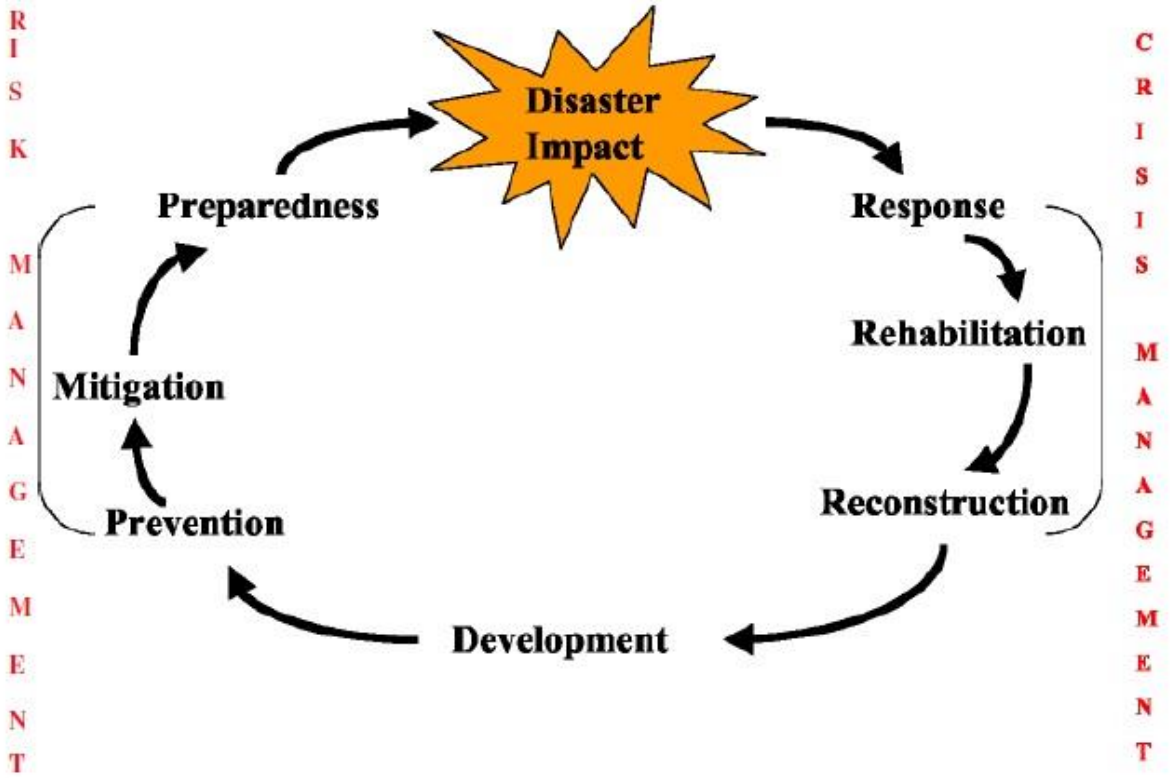


Figure 3: Disaster Management Cycle

Drought and famine have proved to be the deadliest disasters globally (45%), followed by floods (16%), technological disaster (14%), earthquake (12%), windstorm (10%), extreme temperature and others (3%). Global economic loss related to disaster events average around US $880 billion per year (CBSE, 2006).

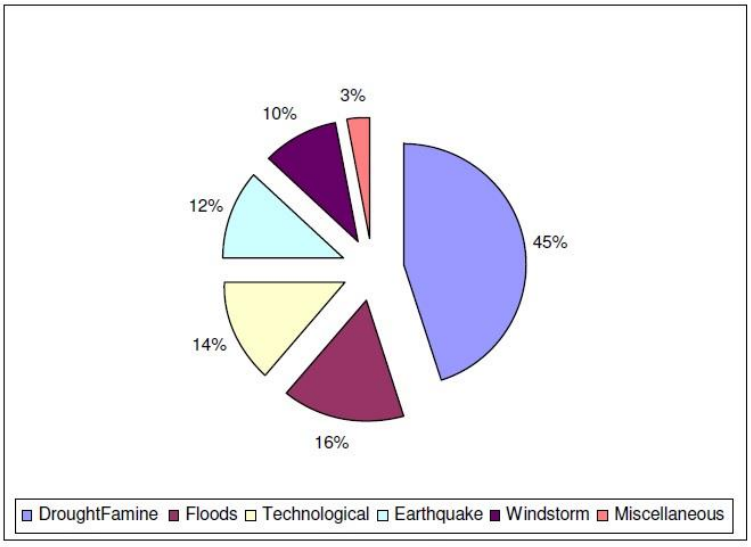


Figure 4: Reported death from all disasters : World Scenario (1992-2001)

The Indian scenario

The Indian subcontinent is highly vulnerable to cyclones, droughts, earthquakes and floods. Avalanches, forest fire and landslides occur frequently in the Himalayan region of northern India. Among the 35 total states/ Union Territories in the country, 25 are disaster prone. On an average, about 50 million people in the country are affected by one or the other disaster every year, besides loss of property worth several million (Table 1).

Table 1: Total number of people reported killed and affected by disasters in India.

Year	Total number of People reported killed	Total number of People reported affected
1986-1995	42,026	561,472,995
1996-2005	85,001	686,724,143
2005	5,405	28,262,805

Source: World Disasters Report 2006- Disaster data

In the 1970s and the 80s, droughts and famines were the biggest killers in India, the situation stands altered today. It is probably a combination of factors like better resources management and food security measures that has greatly reduced the deaths caused by droughts and famines. Floods, high winds, and earthquakes dominate (98%) the reported injuries, with ever increasing numbers in the last ten years. The period from 1973 to 2001 has been associated with many earthquakes in Asia that have a relatively high injury- to death ratio. Floods, droughts, cyclones, earthquakes, landslides, and avalanches are some of the major natural disasters that repeatedly and increasingly affect India. Table-1 depicts an annual damage due to Natural Disasters (for the year 1985 – 1997).

The natural disasters directly impact economies, agriculture, food security, water, sanitation, the environment, and health each year. Therefore, it is one of the single largest concerns for most of the developing nations. Different natural hazards cause varying levels of physical damage to infrastructure and agriculture with implications for their indirect and secondary impacts. Drought causes heavy Crop and Livestock losses over wide areas of land but typically leave infrastructure and productive capacity largely unaffected. Floods and Cyclones cause extensive whereas damage to both infrastructure and agriculture, depending on their timing relative to the agricultural cycle. While Earthquakes have little impact on standing crops excluding localized losses but can cause wide spread devastation of infrastructure and other productive capacity over relatively large areas.

India is hit by one major natural disaster or the other almost every year wherein the loss of life is accompanied by losses of the magnitude that is difficult to comprehend. The decade (1990-99), which was the International Decade for Natural Disaster Reduction (1990-99), it witnessed a spate of large-scale disasters that defied all attempts to stem them. These included the Latur (Maharashtra) Earthquake of 1993 killing about 10,000 persons, the Andhra Pradesh Cyclones of 1990 and 1996, killing about 1000 persons each, the Gujarat Cyclone of 1998 killing over 3,500 persons and the Orissa Super-Cyclone of 1999 killing about 10,000 persons. Besides these major events, there were smaller earthquakes in Uttarkashi, Chamoli and Jabalpur, and frequent floods in the north-east, Uttar Pradesh, Bihar and Kerala. Unfortunately, these disasters were not taken up as learning opportunities, and lessons were not drawn from them to the extent to be prepared in combating future disasters. What happened in Gujarat in 2001and the way it was handled are grim reminders of the fact that we still need to learn and improve much.

The precise cost of the disaster in terms of loss of lives, property, loss of development opportunities, etc. cannot be clearly assessed, counted or scaled. The costs of disaster are clearly inequitable, falling heavily only on the few. Disasters result not only in loss of shelter but also create hardships, lack of food availability, temporary loss of livelihood and disrupt socio-economic activities. Some of the losses may be redeemable and compensated for through disaster relief and insurance. However, apart from economic dimension, such disturbances have their psychological and social dimensions as well, which need to be studied, and documented besides developing appropriate mitigation strategies

The Disaster Management Act, 2005

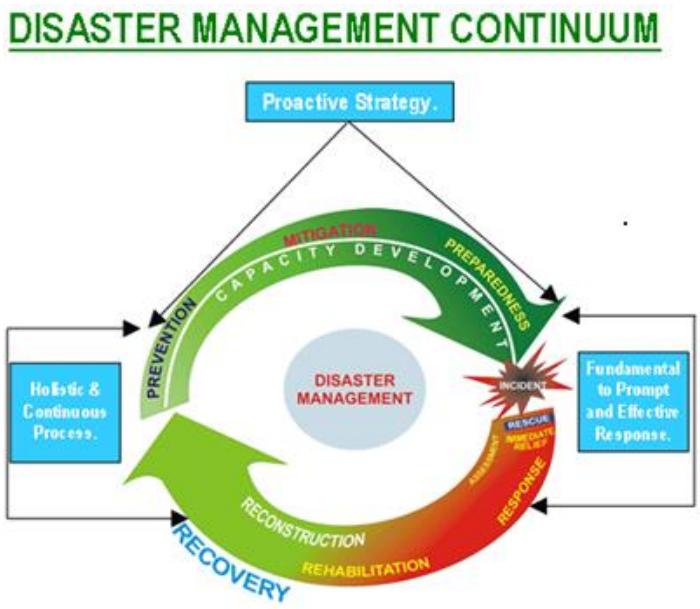
Introductory notes on NDMA, 2005

India has been traditionally vulnerable to natural disasters on account of its unique geo-climatic conditions. Floods, droughts, cyclones, earthquakes and landslides have been a recurrent phenomenon. Being highly vulnerable to natural disaster, 25 states out of a total of 35 states/UTs in India are considered disaster prone. 68% of Indian land is draught prone, 12% to flood and 8% to cyclone. The loss in terms of private, community and public assets has been astronomical. Therefore, disaster management occupies an important place in this country's policy framework as it is the poor and the under-privileged who are worst affected on account of calamities/disasters. At the global level too, there has been considerable concern over natural disasters.

Approach to Disaster Management:

Till recently, the approach to Disaster Management has been reactive and relief centric. A paradigm shift has now taken place at the national level from the relief centric syndrome to holistic and integrated approach with emphasis on prevention, mitigation and preparedness. These efforts are aimed to conserve developmental gains as also minimize losses to lives,

livelihood and property. A typical Disaster Management continuum as shown below, comprising of six elements i.e., Prevention, Mitigation and Preparedness in pre-disaster phase, and Response, Rehabilitation and Reconstruction in post-disaster phase, defines the complete approach to Disaster Management.



The Disaster Management Act – 2005 is aimed at preparedness, prevention and early planning towards disaster. By this Act three authorities namely, National Disaster Management Authority, State Disaster Management Authority and District Disaster Management Authority have been established. As stated in the act, there shall be no discrimination on the of ground of gender, caste and community in providing compensation and relief. The act also provides penalties for obstruction, false claims etc and ensures the establishment of Disaster Response fund and Disaster Mitigation fund at central, state and district level. The Disaster Management Division of Ministry of Home Affairs is the nodal agency for all issues related to disaster management except the drought which is looked after by the Ministry of Agriculture. **The Act comprises of 79 sections and 11 chapters.** The President of India gave his assent to the Disaster Management Bill 2005 on January 9, 2006.

Chapter I -Definition

Section 2 of the Act defines '**Disaster**' as a catastrophe, mishap, calamity or grave occurrence in any area, arising from either natural or man made 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.

'**Disaster Management**' is defined as a continuous and integrated process of planning, organizing, coordinating and implementing measures which are necessary or expedient to prevent danger or threat of any disaster, mitigation or reduce the risk or severity or

consequences of any disaster, capacity-building and preparedness to deal with any disaster, prompt response to any threatening disaster situation or disaster, assessing the severity or magnitude of effects of any disaster, evacuation, rescue and relief, rehabilitation and reconstruction.

Chapter II- National disaster management authority

The Act empowers the Central Government to appoint the National Disaster Management Authority with the Prime Minister of India as the Chairperson and such number of other members, not exceeding nine. The Central Government is to provide the National Authority with such officers, consultants and employees, as it considers necessary for carrying out the functions of the National Authority. The National Authority has the responsibility to lay down, approve the policies, plans and guidelines for disaster management prepared by various departments of Government of India to ensure timely and effective response to disaster. Further the chapter also details about the meetings, executive committee and plans.

Chapter III - State Disaster Management Authorities

Like National Authority at the Centre, the State Government is to establish a State Disaster Management Authority for the State. The State Authority is to be headed by the Chief Minister of the State as the Chairperson and such number of other members, not exceeding nine. The State Authority is empowered as and when it considers necessary to constitute an advisory committee, consisting of experts in the field of disaster management. The State Authority is supposed to lay down the State disaster management policy, approve the State Plan in accordance with the guidelines laid down by the National Authority. Chapter III also specifies on meetings, state executive committee and plans.

Chapter IV - District Disaster Management Authorities

Every State Government, in turn is to establish a District Disaster Management Authority for every district in the State with the Collector or District Collector or Deputy Commissioner as the Chairperson and such number of other members, not exceeding seven. The District Authority is to act as the district planning, coordinating and implementing body for disaster management and take all measures for the purposes of disaster management in the district in accordance with the guidelines laid down by the National Authority and the State Authority.

Chapter V - Measures by the Government and International Agencies for Disaster Management

The Central Government is empowered to take measures as it deems necessary or expedient for the purpose of disaster management like deployment of naval, military and air forces, other armed forces of the Union or any other civilian personnel as may be required for the purposes of this Act, coordination with the United Nations agencies, international organizations and governments of foreign countries for the purposes of this Act and establish institutions for research, training and developmental programmes in the field of disaster

management. It is also empowered to deal with all such other matters as it deems necessary or expedient for securing effective implementation of the provisions of the Act.

Chapter VI - Local Authorities

Subject to the directions of the District Authority, the local authorities shall ensure that the officers and employees are trained, resources are so maintained as to be readily available, carry out relief rehabilitation and reconstruction activities in the affected areas and may take such other measures as may be necessary for the disaster management.

Chapter VII - National Institute of Disaster Management

The Central Government is empowered to constitute an institute to be called the National Institute of Disaster Management. The institute functions within the broad policies and guidelines laid down by the National Authority and is responsible for planning and promoting training and research in the area of disaster management, documentation and development of national level information base relating to disaster management policies, prevention mechanisms and mitigation measures.

Chapter VIII - National Disaster Response Force

A National Disaster Response Force for the purpose of specialist response to a threatening disaster situation or disaster is to be constituted. The general superintendence, direction and control of the Force shall be vested and exercised by the National Authority and the command and supervision of the Force shall vest in an officer to be appointed by the Central Government as the Director General of the National Disaster Response Force.

Chapter IX - Finance, Accounts and Audits

The Central Government is empowered to constitute a fund to be called as the National Disaster Response fund for meeting any threatening disaster situation or disaster and there shall be credited thereto an amount which Central Government may, after due appropriation made by parliament by law in this behalf provide any grants that may be made by any person or institution for the purpose of disaster management.

Chapter X -Offences and Penalties

The Act imposes punishments to persons/companies for contravening the provisions of this Act, 2005 such as obstructing or abandoning, refusing to comply with any of the provisions of this Act, making false claims, misappropriation of money or materials or false warning, etc. The punishment in such cases could be imprisonment or fine or both.

Chapter XI-Miscellaneous

The National Authority, the State Authority, or a District Authority is empowered to recommend the Government to give direction to any authority or person in control of any audio or audiovisual media or such other means of communication as may be available to carry any

warning or advisories regarding any threatening disaster situation or disaster, and the said means of communication and media as designated shall comply with such direction.

Recent Initiatives

Coordinated mock drills under simulated situations like terror attack, earthquake, bomb blast, fire breakouts, flyover collapse etc., are being organized by the National, State & District Management Authorities from time to time. The most calamitous situations had been planned out to test Delhi's disaster preparedness and the venues included Metro stations, schools, colleges, markets, temples, government buildings and five-star hotels. Mock drills will build the awareness of the general population and increase their coping capacity during disaster. This will help all the stakeholders especially the community to know what needs to be done to prevent and safeguard and avoid casualty.

NDMA Act Remarks

Disaster results not only in the loss of life & shelter but also creates lack of food, increase in diseases, and disturb socio-economic activities. Therefore, it is one of the major area of concern for a developing country like India. Disaster Management must be a multi-disciplinary and pro-active approach. Besides various measures for putting in place institutional and policy framework, disaster prevention, mitigation and preparedness initiatives taken by the Central and State Governments the INGOs and NGOs, the community, civil society organizations and the media also have a key role to play in achieving the goal of moving together, towards a safer India.

*****