

DISASTER MANAGEMENT (ELECTIVE)

VII Sem.

DISASTER

1

IMPORTANT QUESTIONS

PART-A

Q1 What is Disaster Management?

Ans. Disaster Management : 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.

Q2 List out the objective of disaster management.

Ans. Disaster management refers to the policies, programs, administrative actions and operations undertaken to address a natural or man-made disaster through preparedness, mitigation, response and recovery. Although the actions taken to address a specific disaster vary depending on the hazard, four objectives of disaster management apply to every situation.

1. Reduce Damages and Deaths ✓
2. Reduce Personal Suffering ✓
3. Speed Recovery ✓
4. Protect Victims ✓
5. Other Objectives ✓

- (i) To reduce or avoid the human, physical, and economic losses suffered by individuals, by the society, and by the country at large.
- (ii) To reduce personal suffering
- (iii) To speed recovery

Q3 What is vulnerability?

Ans. Vulnerability is a set of prevailing or consequential conditions, which adversely affect the community's ability to prevent, mitigate, prepare for and respond to hazardous events.

PART-B

Q4 Describe importance of disaster management in detail.

Ans. Disasters are events that have a huge impact on human and the environment. Disasters are inevitable. We cannot do anything to prevent these but disaster preparedness is only in our hand. Disaster management requires government intervention and a proper planning as well as funding. It is necessary that these disasters are always unpredictable. Flood takes place in valleys and flood plains, drought in areas with unstable ad low rainfall, and oil spills happen in shipping lanes. This predictable provides opportunities to plan for prevent and lessen the impact of disaster. Disasters are inevitable although we do not always know when and where they will happen. But their worst effects can be partially or complete

prevented by preparation, early warning and swift decisive responses.

Disaster management aims to reduce the occurrence of disasters and to reduce the impact of those cannot be prevented. The government White paper and Act on disaster Management defines the role of local authorities as well as State and National Government in disaster management. Disaster management forces come into action as soon as a disaster strikes and help out in relief, rescue and rehabilitation process. These are trained individuals and are given extensive training to perform in the event of disaster or a natural calamity and they work as a team to reduce the loss of life and helping the locals getting back to normal life.

Disaster Management is vital for the following purposes that prove its importance:

1. **To avert a disaster:** Disaster management teams can help to avert a disaster before it occurs. The Disaster management team may examine the possible causes of disaster, and may take appropriate measures to avert a disaster. For instance, forest fires, or even terrorists bombings can be averted through effective planning and pre-emptive action.
2. **To undertake rescue operations:** Disaster management personnel can undertake rescue operations effectively. Trained disaster management personnel can rescue people effectively at the time of floods, major fires, building collapses, and so on.
3. **To provide relief measures:** Disaster management team is responsible to provide relief measures to the victims. For instance, the team can make arrangement for food, clothing, and relief camps, medicines and so on. Such measures would reduce the misery of the disaster victims.
4. **To undertake rehabilitation programmes:** Disaster management team can work effectively to undertake rehabilitation programmes in the affected areas. For instance, in the earthquake affected areas, rehabilitation programmes include:
 - (i) Construction of dwellings.
 - (ii) Schools and other infrastructure.
5. **To undertake liaison work:** The disaster management team undertakes liaison work relating to the disaster. The liaison work is required with various agencies-private and government (including hospitals) in order to obtain funds and donations,

and other resources or services so as to manage and overcome the disaster.

6. **To reduce trauma and tension:** The Disaster management team can help to reduce the trauma and tension before and after the disaster. For instance, before a disaster, the team can properly guide the people to face or handle the disaster such as floods. Also, after the disaster, the team can provide not only material or financial support, but also psychological support to overcome the traumatic effect of disaster.
7. **To protect the Environment:** Disaster management team can help to protect and preserve the environment. For example, a disaster management team can plan pre-emptive action to avert forest fires, etc.
8. **To minimize losses:** Disaster management teams can help to minimize loss of life and property. This is because; the Disaster management team can take pre-emptive actions to avert a disaster.

Q.5 What is the scope of disaster management?

Ans. The term "disaster management" encompasses the complete realm of disaster-related activities. Traditionally people tend to think of disaster management only in terms of the post-disaster actions taken by relief and reconstruction officials; yet disaster management covers a much broader scope, and many modern disaster managers may find themselves far more involved in pre-disaster activities than in post-disaster response.

This is because many persons who work in the development field, or who plan routine economic, urban, regional or agricultural development projects, have disaster management responsibilities. For example, housing specialists planning a low-income housing project in a disaster-prone area have the opportunity (and an obligation) to mitigate the impact of a future disaster if the houses incorporate disaster-resistant construction technologies. In the same manner, agricultural development projects must be planned in such a way that they help stem environmental degradation and thus lower the farmer's vulnerability to losses from droughts, floods, cyclones, or other natural hazards. In fact, in dealing with natural hazards, the vast majority of disaster management activities are related to development projects; only a small portion are related to emergency response.

Disaster Management

Of course, disaster management also encompasses the field of emergency assistance and long-term maintenance for refugees and displaced persons. The refugee field of disaster management is highly specialized and requires not only many development skills but also a broader awareness of political, legal, and humanitarian issues.

Q.6 Explain Levels of disaster in detail.

Ans. The levels of disasters have already been categorized and disseminated as L0, L1, L2 and L3, based on the ability of various authorities to deal with them. Various color codes relating to the level of alerts have also been assimilated.

- L0 denotes normal times which are expected to be utilized for close monitoring, documentation, prevention, mitigation and preparatory activities. This is the planning stage where plans at all levels from community to the State shall be put in place. Training on search and rescue, rehearsals, evaluation and inventory updation for response activities will be carried out during this time.
- L1 specifies disasters that can be managed at the district level, however, the state and centre will remain in readiness to provide assistance if needed.
- L2 specifies disaster situations that may require assistance and active participation of the state, and the mobilization of resources at the state level.
- L3 disaster situations arise from large scale disasters where districts and the state may not have the capacity to respond adequately and require assistance from the central government for reinstating the state and district machinery.
- Even though there cannot be watertight compartmentalization of responsibilities between states and the centre, especially in the case of man-made disasters, the participation by the Centre will normally be at the L3 level.

Q.7 What do you mean by "Disaster"?Ans.

- The 'Disaster' owes its origin to the French word 'Desastre' which is the combination of the article 'des' and 'astre' meaning 'star'. In earlier days a

disaster was considered to be due to some unfavorable star. Nowadays, the term Disaster' is commonly used to denote any odd event, be natural or manmade, which brings about immense misery to a region. So that it becomes difficult to cope with the situation through local resources.

- A situation of hardship and human suffering arising from events which causes physical loss or damage, social and /or economic disruption from which the country or community is unable to fully cope alone. The situation may occur slowly or suddenly making normal life abnormal. The coping mechanism does not work without external support.
- A disaster is a sudden, calamitous event that seriously disrupts the functioning of a community or society and causes human, material, and economic or environmental losses that exceed the community's or society's ability to cope using its own resources. Though often caused by nature, disasters can have human origins.
- Natural disasters – floods, cyclones, landslides and avalanches, droughts, earthquakes, heat waves, fires, tsunami etc.
- Man-made disasters—deforestation, environmental pollution, climate change, epidemics etc.

Q.8 What is hazard? How it is classified.

Ans. **Hazard:** Hazards are defined as physical phenomena that pose a threat to the people, structures or economic assets and which may cause a disaster. Generally speaking, there are two types of hazards, namely:

Natural : These are hazards caused by nature such as floods, droughts, earthquake cyclones, tsunami, landslides etc.

Human made : These are hazards that are caused by human beings either deliberately or by accident such as industrial and chemical accident, road and railway accidents, aviation disasters, fire, building collapse, communal violence, bomb blasts etc. More and more, the distinction between natural and human made hazards is becoming harder to delineate. Some hazards are natural in nature but are exacerbated due to human activities such as flooding and drought. These can be caused due to deforestation, unplanned development, improper drainage

80/14

system etc. For example, flooding may be increased through landfill, drainage or groundwater extraction; storm surge may be worsened by the destruction of mangroves five major groups of hazards in its final report. This exhaustive classification of over thirty hazards is as follows:

Group I: Water and Climate related Hazards

1. Floods and Drainage Management
2. Cyclones
3. Tornadoes and Hurricanes
4. Hailstorm
5. Cloud Burst
6. Heat Wave and Cold Wave
7. Snow Avalanches
8. Droughts
9. Sea Erosion
10. Thunder and Lightning

Group II: Geologically related Hazards

1. Landslides and Mudflows
2. Earthquakes
3. Dam Failures/Dam Bursts
4. Mine Fires

Group III: Chemical, Industrial and Nuclear Hazards

1. Chemical and Industrial Disasters
2. Nuclear Disasters

Group IV: Accident related Hazards

1. Forest Fires
2. Urban Fires
3. Mine Flooding
4. Oil Spill
5. Major Building Collapse
6. Serial Bomb Blasts
7. Festival related disasters
8. Electrical Disasters and Fires
9. Air, Road and Rail Accidents
10. Boat Capsizing
11. Village Fires

Group V: Biologically related Hazards

1. Biological Disasters and Epidemics
2. Pest Attacks
3. Cattle Epidemics
4. Food Poisoning

Q.9 Explain classification of vulnerability in detail.

Ans. Types of Vulnerability

1. Physical/ Material Vulnerability : Depending on physical location of people and elements at risk and technical capacity of buildings, structures, and infrastructure. It varies according to construction techniques, materials used and location. Examples are given below :

- Disaster prone location of community
- Houses
- Farmlands
- Infrastructure
- Insecure sources of livelihood
- Risky sources of livelihood
- Lack of access and control over means of production
- Dependency on money lenders
- Occurrence of chronic and acute food shortage
- Over exploited natural resources
- Exposed to violence

2. Social /Organizational Vulnerability : Some sections of the population are more vulnerable than the others like women, children, elderly, physically and mentally challenged and those dependent on critical facilities.

- Poor leadership
- Poor initiative
- Poor organizational structure
- Ineffective decision making (people/groups are left out)
- Unequal participation in community affairs
- Rumors
- Divisions in community
- Conflicts
- Poor relationship with Government and other stakeholders
- Isolated from outside world

3. Motivational/Attitudinal Vulnerability

- Negative attitude towards change
- Passivity
- Fatalism
- Helplessness

- Lack of initiative
- Lack of unity, cooperation, solidarity
- Negative beliefs/ideologies
- Lack of awareness about hazards and consequences
- Dependent on external support

4. Economic vulnerability: Poor people are considered to be more vulnerable as their houses are built of weak material and in dangerous areas. They do not have the essential safety nets to recover as the affluent population. They loose the essential tools and equipments of their livelihood as well.

Q.10 Show Relationship between hazard, vulnerability and disaster.

Ans. A disaster happens when a hazard impacts on a vulnerable population and causes damage, casualties and disruption. An earthquake in an uninhabited desert cannot be considered a disaster, no matter how strong the intensity might be an earthquake is disastrous when it affects people, infrastructure and activities.

(i) Hazard × Vulnerability = Disaster

When extent of hazard and vulnerability is low, the resulting disaster will also be of small magnitude.

(ii) Hazard × Vulnerability = Disaster

When extent of hazard is high but vulnerability is low then the disaster will be of small magnitude.

(iii) Hazard × Vulnerability = Disaster

When vulnerability is high but extent of hazard is small then the resulting disaster will also be of small magnitude.

(iv) Hazard × Vulnerability = Disaster

When extent of hazard is very high and the vulnerability is also high then it will result in a huge disaster.

Q.11 What are the causes and effect of natural disaster?

Ans. The causes of natural disasters are many. Human activities play a role in the frequency and severity of disasters. A natural disaster is a disruption in the balance of the environment. The human factor raises the cost, in

both property damage and loss of life. Understanding the causes of natural disaster can provide clues to their prevention.

Flood events have both natural and man-made causes. Storm events can create flood waters that exceed the capacity of the environment or manmade structures. Wetlands destruction removed a natural means to absorb floodwaters.

Natural disasters happen all over the world and they can be utterly devastating for people's lives and the environments in which they live. Although natural disasters are caused by nature and there is nothing that we can do to prevent them happening, there are many different natural causes that lead to natural disasters, and being aware of these causes enables us to be better prepared when such disasters do arrive.

One common natural disaster is flooding, which occurs when a river bursts its banks and the water spills out onto the floodplain. This is far more likely to happen when there is a great deal of heavy rain, so during very wet periods, flood warnings are often put in place. There are other risk factors for flooding too: steep-sided channels cause fast surface runoff, while a lack of vegetation or woodland to both break the flow of water and drink the water means that there is little to slow the floodwater down. Drainage basins of impermeable rock also cause the water to run faster over the surface.

Earthquakes are another common natural disaster that can cause many fatalities. The movements of the plates in the earth's crust cause them. These plates do not always move smoothly and can get stuck, causing a build-up of pressure. It is when this pressure is released that an earthquake occurs. In turn, an earthquake under the water can also cause a tsunami, as the quake causes great waves by pushing large volumes of water to the surface.

Tsunamis can also be caused by underwater volcanic eruptions. Volcanic eruptions are another natural disaster, and they are caused by magma escaping from inside the earth. An explosion takes place, releasing the magma from a confined space, which is why there are often also huge quantities of gas and dust released during a volcanic eruption. The magma travels up the inside of the volcano, and pours out over the surrounding area as lava.

One of the most common natural disasters, but also one of the most commonly forgotten, is wildfires. These

take place in many different countries all over the world, particularly during the summer months, and can be caused by a range of different things. Some of the things that can start the wildfires can be totally natural, while others can be manmade, but the speed at which they spread is entirely down to nature.

The two natural causes of wildfires are the sun's heat and lightning strikes, while they can also be caused by campfires, smoking, fireworks and many other things. The reasons that they spread so quickly are prolonged hot, dry weather, where the vegetation dries out, which is why they often take place in woodland.

Q.12 Differentiate between disaster and hazard.

Ans. Hazard and disaster are closely related to each other. A hazard is a natural event while the disaster is its consequence. A hazard is a perceived natural event which threatens both life and property. A disaster is the culmination of such hazards.

A hazard is a potential for a disaster. A hazard becomes a disaster when it hits an area affecting the normal life system. If a hazard like a cyclone hits an unpopulated area, say a populated coast, it need not be considered as a disaster. However, it will be considered a disaster if life and property are seriously damaged. A hazard may be regarded as pre-disaster situation, in which some risk of disaster exists, because the human population has placed itself in a situation of risk.

Disasters are extreme events which cause great loss of life and/or property and create severe disruptions to human activities. They can be created by human actions, e.g., transport accidents and industrial explosions or natural processes like earthquakes. Therefore, a hazard occurs as fatal when extreme events or processes occur in an area of human settlement and could cause loss of life and damage to existing constructed resources or infrastructure.

PART-C

Q.13 Explain different approaches to disaster analysis in detail.

Ans. 1. A Sociological Approach : Over the years Sociologists have agreed on the definition of disaster. They

have "interpreted disasters as special types of social phenomena, in part because they are dramatic historical happenings (events), and also because they compel collective reactions (social catalysts)". The sociologists study a range of different types of events. They are natural hazards (tornadoes, floods, hurricanes, earthquakes, volcanic eruptions), accidents (air disasters, explosions, large scale fires, breaking of dams). Not lots of sociological disaster studies have been done on famines, epidemics, economic depressions, political revolutions and wars.

According to the sociologists, disasters are not more important than another social phenomenon.

However, they are different. According to them the key dimensions are (Kreps 1995) :

- Examining how social systems react to physical harm and social disruption after the occurrence of an event?
- Examining what social systems do to increase or mitigate the risk of physical harm and social disruption before the occurrence of an event?

However, there are other dimensions as well. According to the sociologists, there are different dimensions in thinking disaster as events.

- (i) **Length of Forewarning:** This is the gap between the identification of hazardous conditions and the actual effects on a particular location. This gap in time can be very short or long.
- (ii) **Magnitude of Impact:** This is the magnitude of social disruption and physical harm.
- (iii) **Scope of Impact:** This is the geographical and social boundaries of the physical harm and social disruption. The scope can be a regional one or a global one.
- (iv) **Duration of Impact:** This is the time between the starting of social disruption and physical harm to the end. This duration can be short or long.

2. **An Anthropological Approach :** According to the Anthropologist "Disaster is seen as a process leading to an event that involves a combination of a potentially destructive agent from the natural or technological sphere and a population in a socially produced condition of vulnerability" (Oliver-Smith and Hoffman, 1999). Henry (2005) has given an anthropological contribution to the complete life cycle of disaster, from issues of vulnerable and perceived risk, to individual and social responses and coping strategies, to relief and recovery efforts.

Pre-disaster Risk and Vulnerability : Within the social system, a group of people are more vulnerable to disasters than others. This inequality increases discrimination as well as tensions both during the times of disaster and relief. The severity of disaster impact is increased by conditions like poverty, racism, gender inequality, history of colonial exploitation, global inequities, imbalances of power and under development.

Responses to Disaster : The anthropology of disaster has focused on changes occurring within cultural institutions like religion, ritual, economic organization, politics (local cooperation or conflict), the ability of local institutions to mitigate the impact of a disaster, and the differential capabilities of response due to ethnicity, gender, age and socioeconomic status (Henry, 2005). They have their own adaptive coping strategies that have been used traditionally to cope with disasters. They have noted how disasters change political organizations and power relations between individuals, the state and international actors.

They have also looked at the changes that disasters bring to economic system in the form of employment, housing etc.

Providing Relief : Development and Power: They supported a more developmental approach to prevent future disasters than a top-down strategy.

A Development Studies Approach : This approach looks at the problems of providing aid and relief to Third World Countries. Mainly it addresses the problems of refugee management, health care and the avoidance of starvation (Alexander, 1993). Most of the disaster impact occurs in developing countries. This increases poverty and human vulnerability. This approach is more concerned about the issues of vulnerability and livelihood security.

A Medicine and Epidemiology Approach : This approach mainly focuses on the management of mass casualties, treatment of physical trauma and the epidemiological surveillance of communicable diseases. The incidence of such disease generally increases after a disaster as there is a disruption of public health (Alexander, 1993). Medical support is the first priority after initial search and rescue phase (Beinin, 1985). For example, disasters like floods can create epidemic in the form of diarrhea, respiratory and infectious diseases. Disasters like earthquakes and technological accidents create problems like bone fractures and psychological trauma. If medical facilities are delivered to the victims in the first few hours of disaster, that saves more number of lives (Smith, 2001).

5. A Geographical Approach : This approach has used the social science methods and emphasis is given to the spatio-temporal distribution of hazards, impacts and vulnerability. They have discussed how choices are made between different types of adjustment to natural hazards (Alexander, 1993).

6. A Technical Approach : This is the approach of physical and natural scientists. They give more stress to seismology, volcanology, geomorphology and other geophysical approaches (Alexander, 1993). The emphasis here is on nature, scale, intensity and impacts on human structure or engineering. It may have some elements of human ecology.

~~Q.14 Explain concept of risk in disaster in detail.~~

Ans.

- (i) The combination of the probability of an event and its negative consequences. The risk is generally defined as the expected impact caused by a particular phenomenon. It combines the livelihood or probability of a disaster happening and the negative effects that result if the disaster happens.
- (ii) **Disaster Risk** is the chance of damage and loss as a result of the occurrence of a hazard.
- (iii) **Disaster risk** is expressed as the likelihood of loss of life, injury or destruction and damage from a disaster in a given period of time.
- (iv) **Disaster risk** is widely recognized as the consequence of the interaction between a hazard and the characteristics that make people and places vulnerable and exposed.

$$\text{Risk} = \text{Hazard} \times \text{Exposure} \times \text{Vulnerability}$$

(v) Elements at Risk

- People
- Livestock
- Rural / Urban Houses
- Crops, Trees
- Telephone, Electric poles
- Boats, Looms, Working Implements
- Personal Property
- Electricity, Water and Food Supplies
- Infrastructure Support

(vi) Scale of Disaster is Dependent on

- Lead Time Availability.
- Intensity of Hazard.
- Duration.
- Spatial Extent.
- Density of Population & Assets.
- Time of occurrence.
- Vulnerabilities existing in the Elements at Risk.
- Hazard \times Vulnerability = Disaster

(vii) Disaster risk has many characteristics. In order to understand disaster risk, it is essential to understand that it is :

- **Forward looking** the likelihood of loss of life, destruction and damage in a given period of time
 - **Dynamic:** it can increase or decrease according to our ability to reduce vulnerability
 - **Invisible:** it is comprised of not only the threat of high-impact events, but also the frequent, low-impact events that are often hidden
 - **Unevenly distributed around the earth:** hazards affect different areas, but the pattern of disaster risk reflects the social construction of exposure and vulnerability in different countries
 - **Emergent and complex:** many processes, including climate change and globalized economic development, are creating new, interconnected risks
 - Disasters threaten development, just as development creates disaster risk
- (a) The key to understanding disaster risk is by recognizing that disasters are an indicator of development failures, meaning that disaster risk is a measure of the sustainability of development.
- (b) Hazard, vulnerability and exposure are influenced by a number of risk drivers, including poverty and inequality, badly planned and managed urban and regional development, climate change and environmental degradation.
- (c) Understanding disaster risk requires us to not only consider the hazard, our exposure and vulnerability but also society's capacity to protect itself from disasters.

(d) The ability of communities, societies and systems to resist, absorb, accommodate, recover from disasters, while at the same time improve wellbeing, is known as resilience.

(viii) Risk is the:

- Expected loss (lives lost, persons injured, damage to property and disruption of socio-economic and educational activity)
- Product of hazard and vulnerability

It is important to consider the social contexts in which risks occur, as people do not necessarily share the same perceptions of risk and their underlying causes. Some professionals identify capacity as an element that can drastically reduce the effects of hazards and vulnerabilities. There is no consensus on the use of a particular definition on risk. It is, however, conventionally expressed by the equation:

$$\text{Risk} = \text{Hazard} + \text{Vulnerability} - \text{Capacity}$$

By this definition, vulnerability increases the risk of a hazard turning into a disaster; and capacity has the potential to control the risk factor. If capacity to cope with hazard and vulnerability is high, risk factor would be low and if capacity is low, then risk would be high. Thus, we have to be clear about the terms vulnerability and capacity as well.

Q.15 Explain factors of disaster in detail.

Ans. The severity of the impacts of each disaster is reckoned in terms of deaths, damage, or costs which are dependent on the existing socio-economic conditions of the affected community. In fact, the misery of the affected people is usually increased by the following factors:

1. Poverty : All disaster studies show that the wealthy among the population are less affected and are able to recover quickly. However, poverty generally makes people more vulnerable to all the impacts of disasters. It is only due to poverty that poor people are forced to live in more vulnerable areas such as the flood plains of rivers. Usually droughts claim poor peasant farmers as victims and rarely the wealthy; and famines are the result of a lack of purchasing power to buy food rather than an absence of food. Many people are forced to move from their homes to other parts of their countries or even across borders to survive. Such crisis induced migration poses considerable challenge both in terms of immediate assistance and long-term planning for development.

1. Population Growth : There is an obvious link between the increase in losses from a disaster and increase in population density. If there are more people and structures where a disaster strikes, there will be more impact. Increasing number of people will compete for limited resources (e.g., employment opportunities) which can lead to conflict. This conflict may result in crisis-induced migration. This type of growth occurs predominantly in developing countries, which may aggravate to the disasters.

3. Rapid Urbanization : Rapid population growth and migration are closely related to the major phenomenon of rapid urbanization. It is characterized by rural poor or people in disadvantaged areas moving to urban and metropolitan areas in search of economic opportunities and security. These people find fewer options for availability of safe and desirable places to build their houses. Here again, competition for scarce resources can lead to social conflicts.

Many of the landslides or flood disasters are closely linked to rapid and unchecked urbanization which forces low-income families to settle on the slopes of steep hillsides or banks of rivers.

4. Transitions in Cultural Practices : Many of the inevitable changes that occur in all societies lead to an increase in their vulnerability to disasters. Obviously, all societies are constantly changing and are in a continual state of transition. These transitions are often disruptive and uneven, leaving gaps in social coping mechanisms and available technology. These transitions include nomadic population that becomes sedentary, rural people who move to urban areas, and both rural and urban people who move from one economic level to another. More broadly, these examples are typical of a shift from non-industrialized to industrialized societies.

5. Environmental Degradation : Many disasters are either caused or aggravated by environmental degradation. Deforestation leads to rapid rain runoff, which contributes to soil erosion and flooding. The destruction of mangrove swamps decreases the resistance of the coastline to withstand strong winds and storm surges.

Drought conditions may be intensified by deforestation, overgrazing, the stripping of topsoil, poor conservation techniques and depletion of both the surface and subsurface water supply and to an extent, unchecked population.

6. Lack of Awareness and Information : Lack of awareness and proper information usually converts a hazard into a Disaster. This ignorance may not necessarily be due to poverty, but due to a lack of awareness of what measures can be taken to build safe structures on safe locations. Perhaps some people did not know about safe evacuation routes and procedures. Other population may not know where to turn for assistance in times of acute distress. In most disaster-prone societies, although there is a traditional wealth of understanding about disaster threats and responses, yet, they may not know what specific steps they should take immediately to escape the crisis.

7. War and Civil Strife : War and civil strife are regarded as hazards, that is, extreme events that produce disasters. The causal factors of war and civil strife include competition for scarce resources, religious to ethnic intolerance and ideological differences.

Q.16 What is flood? Explain types of flood. Also describe disaster by flood and cause of flood in detail.

Ans. 1. Floods : Flood is a state of high water level along a river channel or on the coast that leads to inundation of land which is not usually submerged. Floods may happen gradually and also may take hours or even happen suddenly without any warning due to breach in the embankment, spill over, heavy rains etc.

- Every stream flow in a particular stage at a particular place during different intervals of time in a year such as a dry stage, half full stage and bank full stage.
- This depends upon climate and precipitation in the catchment area.
- A flood occurs when the volume of water in the river becomes greater than bank full stage. The extra water spills over the banks and spreads in sheets all along and away from the banks governed by available slope. This condition is called flood.

2. Types of Floods : According to their duration flood can be divided into different categories:

- (a) **Slow Onset Floods:** Slow Onset Floods usually last for a relatively longer period, it may last for one or more weeks, or even months.

- (b) **Rapid Onset Floods:** Rapid Onset Floods last for a relatively shorter period, they usually last for one or two days only.
- (c) **Flash Floods:** Flash Floods may occur within minutes or a few hours after heavy rainfall, tropical storm, failure of dams or levees or releases from dams, and it causes the greatest damages to society.
- (d) **Areal flood**
- (e) **Riverine (Channel)**
- (f) **Estuarine and coastal**
- (g) **Urban flooding**
- (h) **Catastrophic**

Flash Floods : Flash floods, which are short lived extreme events, prove the exception. They usually occur under slowly moving or stationary thunderstorms, which last for less than 24 hours. The resulting rainfall intensity exceeds infiltration capacity, so run off takes place very rapidly. Flash floods are frequently very destructive as the high energy flow can carry much sedimentary material.

- Flash floods are local floods of great volume and short duration.
- A flash flood generally results from a torrential rain or "cloudburst" on relatively small and widely dispersed streams.
- Runoff from the intense rainfall results in high flood waves.
- Discharges quickly reach a maximum and diminish almost as rapidly.
- Flood flows frequently contain large concentrations of sediment and debris.
- Flash floods also result from the failure of a dam.
- Flash floods are particularly common in mountainous areas and desert regions but are a potential threat in any area, where the terrain is steep, surface runoff rates are high, streams flow in narrow canyons, and severe thunderstorms prevail.

River Floods

- may drain large geographic areas and encompass many independent river basins.
- Floods on large river systems may continue for periods ranging from a few hours to many days.

Flood flows in large river systems are the distribution of precipitation.

- The condition of the ground (amount of soil moisture, seasonal variations in vegetation, depth of snow cover, imperviousness due to urbanization, etc.) directly affects runoff.

Coastal Floods/Storm Surge

- Storm surge or tidal surge is an offshore rise of water associated with a low pressure weather system, typically a tropical cyclone.
- Storm surge is caused primarily by high winds pushing on the ocean's surface.
- The wind causes the water to pile up higher than the ordinary sea level.
- Low pressure at the center of a weather system also has a small secondary effect, as can the bathymetry of the body of water.
- It is this combined effect of low pressure and persistent wind over a shallow water body which is the most common cause of storm surge flooding problems.
- The term "storm surge" in casual (non scientific) use is storm tide; that is, it refers to the rise of water associated with the storm, plus tide, wave run up, and freshwater flooding.

Areal Flood : Floods can happen on flat or low-lying areas when water is supplied by rainfall or snowmelt more rapidly than it can either infiltrate or run off. The excess accumulates in place, sometimes to hazardous depths. Surface soil can become saturated, which effectively stops infiltration, where the water table is shallow, such as a floodplain, or from intense rain from one or a series of storms. Infiltration also is slow to negligible through frozen ground, rock, concrete, paving, or roofs. Areal flooding begins in flat areas like floodplains and in local depressions not connected to a stream channel, because the velocity of overland flow depends on the surface slope. Endorheic basins may experience areal flooding during periods when precipitation exceeds evaporation.

Riverine (Channel) : Floods occur in all types of river and stream channels, from the smallest ephemeral streams in humid zones to normally-dry channels in arid climates to the world's largest rivers. When overland flow occurs

on tilled fields, it can result in a muddy flood where sediments are picked up by runoff and carried as suspended matter or bed load. Localized flooding may be caused or exacerbated by drainage obstructions such as landslides, ice, debris, or beaver dams.

Slow-rising floods most commonly occur in large rivers with large catchment areas. The increase in flow may be the result of sustained rainfall, rapid snow melt, monsoons, or tropical cyclones. However, large rivers may have rapid flooding events in areas with dry climate, since they may have large basins but small river channels and rainfall can be very intense in smaller areas of those basins.

Rapid flooding events, including flash floods, more often occur on smaller rivers, rivers with steep valleys, rivers that flow for much of their length over impermeable terrain, or normally-dry channels.

The cause may be localized convective precipitation (intense thunderstorms) or sudden release from an upstream impoundment created behind a dam, landslide, or glacier.

Estuarine and Coastal : Flooding in estuaries is commonly caused by a combination of sea tidal surges caused by winds and low barometric pressure, and they may be exacerbated by high upstream river flow. Coastal areas may be flooded by storm events at sea, resulting in waves over-topping defences or in severe cases by tsunami or tropical cyclones.

A storm surge, from either a tropical cyclone or an extratropical cyclone, falls within this category. Research from the NHC (National Hurricane Center) explains: "Storm surge is an abnormal rise of water generated by a storm, over and above the predicted astronomical tides. Storm surge should not be confused with storm tide; which is defined as the water level rise due to the combination of storm surge and the astronomical tide. This rise in water level can cause extreme flooding in coastal areas particularly when storm surge coincides with normal high tide, resulting in storm tides reaching up to 20 feet or more in some cases."

Urban Flooding : Urban flooding is the inundation of land or property in a built environment, particularly in more densely populated areas, caused by rainfall overwhelming the capacity of drainage systems, such as storm sewers. Although sometimes triggered by events such as flash flooding or snowmelt, urban flooding is a condition,

characterized by its repetitive and systemic impacts on communities that can happen regardless of whether or not affected communities are located within designated floodplains or near any body of water. Aside from potential overflow of rivers and lakes, snowmelt, storm water or water released from damaged water mains may accumulate on property and in public rights-of-way, seep through building walls and floors, or backup into buildings through sewer pipes, toilets and sinks.

In urban areas, flood effects can be exacerbated by existing paved streets and roads, which increase the speed of flowing water.

Mumbai floods of July 2005 turned out to be an eye-opener. Realizing that the causes of urban flooding are different and so also are the strategies to deal with them, National Disaster Management Authority (NDMA) has for the first time decided to address urban flooding as a separate disaster delinking it from floods. NDMA commenced its efforts to formulate the Flood Guidelines in 2006 and released them in 2008. Even while the Flood Guidelines were under preparation, efforts commenced to formulate these Urban Flood Guidelines in August 2007.

Catastrophic : Catastrophic riverine flooding is usually associated with major infrastructure failures such as the collapse of a dam, but they may also be caused by drainage channel modification from a landslide, earthquake or volcanic eruption. Examples include outburst floods and lahars. Tsunamis can cause catastrophic coastal flooding, most commonly resulting from undersea earthquakes.

3. Causes of Floods : There are several causes of floods and differ from region to region. The causes may vary from a rural area to an urban area. Some of the major causes are:

- Rains rapidly on saturated soil or dry soil that has poor absorption ability. The runoff collects in gullies and streams and, as they join to form larger volumes, often forms a fast flowing front of water and debris.
- Flash floods most often occur in normally dry areas that have recently received precipitation, but they may be seen anywhere downstream from the source of the precipitation, even many miles from the source.
- In areas on or near volcanoes, flash floods have also occurred after eruptions, when glaciers have been melted by the intense heat.

- Flash flooding can also be caused by extensive rainfall released by hurricanes and other tropical storms, as well as the sudden thawing effect of ice dams.
- Human activities can also cause flash floods to occur. When dams, constructed for hydro-electricity, fail, a large quantity of water can be released and destroy everything in its path.
- Heavy rainfall.
- Heavy siltation of the river bed reduces the water carrying capacity of the rivers/stream.
- Blockage in the drains lead to flooding of the area.
- Landslides blocking the flow of the stream.
- Construction of dams and reservoirs.
- In areas prone to cyclone, strong winds accompanied by heavy down pour along with storm surge leads to flooding.

The geological factors that facilitate floods are defined by the topography, lithology and character of the drainage basin.

(a) Topography: The nature of slopes along the river bank may vary from slightly sloping to steeply sloping. The steeply sloping land conveys the run off after heavy rains directly to the stream within a short time from both the sides thereby reaching the bank full stage.

(b) Lithology (i.e. type of soil or rock) : When majority of slopes in the catchment are made of pervious open texture soils or highly permeable rocks, a good part of rainwater is absorbed and infiltrates as ground water. However, where slopes are made up of impervious, compacted, solid and massive rocks or soils, greater volumes of run off reach the streams contributing towards the flood stage situation.

(c) Vegetation: Vegetation in the form of grasses, bushes or even forests with well developed root network system act as effective barriers and retarders against run off. Conversely bare slopes not only allow the run off an easy path, they also contribute by providing lot of debris to the down rushing waters. This debris when reaching the streams flattens their channels thereby decreasing their water carrying capacity. Short time sudden floods (flash floods) may be caused on rare occasions by cloud bursts and collapse of dams against reservoir.

4. Consequences of Floods:

- Cause people to flee their house as the water approaches;
- Cause destruction to infrastructure: houses, road, electricity poles, water system, telephone lines etc.;
- Cause food shortage as the water can destroy food stocks, farms, gardens etc.;
- Bring waterborne diseases when the water stagnates for a long time.

5. Typical Adverse Effects : The most important consequence of floods is the loss of life and property. Structures like houses, bridges; roads etc. get damaged by the gushing water, landslides triggered on account of water getting saturated, boats and fishing nets get damaged. There is huge loss to life and livestock caused by drowning. Lack of proper drinking water facilities, contamination of water (well, ground water, piped water supply) leads to outbreak of epidemics, diarrhoea, viral infection, malaria and many other infectious diseases.

Flooding also leads to a large area of agricultural land getting inundated as a result there is a huge crop loss. This results in shortage of food, and animal fodder. Floods may also affect the soil characteristics. The land may be rendered infertile due to erosion of top layer or may turn saline if sea water floods the area.

6. Flood Benefits : Floods (in particular more frequent or smaller floods) can also bring many benefits, such as

- Recharging ground water, making soil more fertile and increasing nutrients in some soils.
- Flood waters provide much needed water resources in arid and semi arid regions where precipitation can be very unevenly distributed throughout the year.
- Freshwater floods particularly play an important role in maintaining ecosystems in river corridors and are a key factor in maintaining floodplain biodiversity.
- Flooding can spread nutrients to lakes and rivers, which can lead to increased biomass and improved fisheries for a few years.
- Fish, such as the weather fish, make use of floods in order to reach new habitats.
- Bird populations may also profit from the boost in food production caused by flooding.

Q.17 What is drought? Also describe disaster by drought and cause of drought in detail.

Ans. Drought : The word 'Drought' is always a difficult one to define, because it is often used in more than one context. In simple terms, it is the absence of water for a long period of time, at a place where it is considered 'not normal' compared to its usual conditions. The distribution of all the water on the earth's surface is not even. Some places have lots of fresh water (rivers, lakes, lagoons, ponds etc.) and are continuously replenished by rainfall, runoff and water from underground. Others places too are known to have very little water. Therefore, if a region that has lots of rainfall, goes for a couple of weeks without rains, and people, animals and plants begin to experience a bit of dryness, it can be called drought. At the same time, that condition may be very normal for places.

Drought is a period of drier-than-normal conditions that lead to water related problems. When rainfall is below normal for weeks, months or even years, it brings about a decline in the flow of rivers and streams and a drop in water levels in reservoirs and wells. If dry weather persists and water supply-related problems increase, the dry period can be called a 'drought'.

For Example, Odisha has many rivers, vast forest cover and it receives above average rainfall annually. But, greed for minerals beneath the land and destruction wreaked by industries hungry to exploit the resources of the state have slowly choked the natural environment of the state. Most farm holdings are small or marginal dependent on the rains for irrigation. The deficit rains in 2015-16 pushed the state over the edge. The state is facing extensive crop loss and severe water shortage. Even after exploiting its resources to the hilt, the people of the state have not been provided with piped water supply. In many ways, the drought in Odisha is man-made.

A total of 27 out of total of 30 districts have been affected by the drought of 2015-16. The food grain production in the state is likely to drop by more than 43% because of the drought.

Ground water level is going down rapidly due to excessive use for irrigation especially in rainfed Sundargarh and Balasore districts. Thousands of deep borewells are being operated by well-off farmers and also by the Odisha Lift Irrigation Corporation (OLIC). The

Rural Water Supply and Sanitation (RWSS) also operates piped water projects using tubewells and deep borewells. Many water bodies have dried up and many have been built over.

The state is heading towards massive degradation of land because of loss of forest lands, agricultural land taken away for other purposes, increase in fallow land and loss of tree cover in plantations. The total degraded land of the state in 2005-2015 is almost 30 percent of its geographical area.

Decrease in moisture of land led to loss of paddy crop in the state. However, as part of drought relief, the government has again announced to provide pump set and deep bore wells for irrigation. Contrary to logic, on May 5, 2016, the Agriculture Department officials announced a plan to increase cotton cultivation in the upcoming Kharif season. Cotton is known to be a water-guzzling crop.

Since the failure of the Kharif crop, farmers in the state have been in a very critical phase. Many farm areas of the state, especially in western and interior Odisha are rain fed. The damage might have been lesser if the areas had irrigation facilities. Lack of irrigation leaves the farmers in distress when the monsoon is deficient or even if the rains are unevenly distributed. Most farmers skipped the Rabi crop because of lack of water in reservoirs and canals.

Consequences of Drought

- Perishing of Crops
- Starving of large number of people
- Death of live stocks
- Decline in surface and groundwater level
- Increasing unemployment and under-employment, migration and indebtedness

Elements at Risk : Drought impacts mostly rainfed crops to start with and subsequently the irrigated crops. Areas with minimum of alternative water sources to rainfall (ground and canal water supplies), areas subjected to drastic environmental degradation such as denuded forest lands and altered ecosystems, and areas where livelihoods as alternative to agriculture are least developed, are most vulnerable to drought. The herdsman, landless labourers, subsistence farmers, the women, children, and farm animals are the most vulnerable groups affected by the drought conditions.

Typical Effects : Drought, different from other natural disasters, does not cause any structural damages. The typical effects include loss of crop, dairy, timber (forest fires), and fishery production; increase in energy demand for pumping water, reduced energy production, increased unemployment, loss of biodiversity, reduced water, air and landscape quality, groundwater depletion, food shortage, health reduction and loss of life, increased poverty, reduced quality of life, and social unrest leading to migration.

Main Mitigation Strategies : Drought monitoring is continuous observation of rainfall situation, water availability in reservoirs, lakes, rivers and comparing with the existing water needs of various sectors of the society. Water supply augmentation and conservation through rainwater harvesting in houses and farmers' fields increase the content of water availability. Water harvesting by either allowing the runoff water from all the fields to a common point (e.g. Farm ponds) or allowing it to infiltrate into the soil where it has fallen (e.g. contour bunds, contour cultivation, raised bed planting etc.) helps increase water availability for sustained agricultural production.

Expansion of irrigation facilities reduces the drought vulnerability.

- Land use based on its capability helps in optimum use of land and water and can avoid the undue demand created due to their misuse.
- Livelihood planning identifies those livelihoods which are least affected by drought. Some of such livelihoods include increased off-farm employment opportunities, collection of non-timber forest produce from the community forests, raising goats and carpentry etc.
- Drought planning: The basic goal of drought planning is to improve the effectiveness of preparedness and response efforts by enhancing monitoring, mitigation and response measures. Planning would help in effective coordination among State and national agencies in dealing with the drought. Components of drought plan include establishing drought taskforce which is a team of specialists who can advise the government in taking decision to deal with drought situation, establishing coordination mechanism among various agencies which deal with the droughts, providing crop insurance schemes to the farmers to cope with the

drought related crop losses, and public awareness generation.

Q.18 What is cyclone? Explain types of cyclone, general characteristics, consequences, effect and mitigation measure of cyclone in detail.

Ans. Cyclone is a region of low atmospheric pressure surrounded by high atmospheric pressure resulting in swirling atmospheric disturbance accompanied by powerful winds blowing in anticlockwise direction in the Northern Hemisphere and in the clockwise direction in the Southern Hemisphere. They occur mainly in the tropical and temperate regions of the world.



Fig.

Cyclones are known by different names in different parts of the world:

- **Typhoons** in the Northwest Pacific Ocean west of the dateline.
- **Hurricanes** in the North Atlantic Ocean, the Northeast Pacific Ocean east of the dateline, or the South Pacific Ocean.
- **Tropical cyclones** in the Southwest Pacific Ocean and Southeast Indian Ocean.
- **Severe cyclonic storm** (the North Indian Ocean)
- **Tropical cyclone** (the Southwest Indian Ocean)
- **Willie Willie** in Australia
- **Tornado** in South America

Types of Cyclones : The term 'cyclone' actually refers to several different types of storms. They occur in different places, and some occur over land while others occur over water. What they all have in common is that they are spinning storms rotating around that low pressure center.

(i) **Tropical Cyclones** are what most people are familiar with because these are cyclones that occur over tropical ocean regions. Hurricanes and typhoons are actually types of tropical cyclones, but they have different names so that it's clear where that storm is occurring. Hurricanes are found in the Atlantic and Northeast Pacific, typhoons are found in the Northwest Pacific. If you hear 'tropical cyclone,' you should assume that it's occurring in the South Pacific or Indian Ocean, but for this lesson, we'll use it refer to all types of tropical ocean cyclones.

We can also further describe tropical cyclones based on their wind speeds. They are called category 1, 2, 3, 4 or 5, increasing with intensity and wind speed as the number increases. A category 1 cyclone is the weakest, with wind speeds of 74-95 mph. A category 5 cyclone, on the other hand, is extremely dangerous and has the potential for major damage. Category 5 cyclones have wind speeds of 155 mph and above.

(ii) **Polar Cyclones** are cyclones that occur in Polar Regions like Greenland, Siberia and Antarctica. Unlike tropical cyclones, polar cyclones are usually stronger in winter months. As you can see, these storms really do prefer the colder weather! They also occur in areas that aren't very populated, so any damage they do is usually pretty minimal.

(iii) **Mesocyclone** is when part of a thunderstorm cloud starts to spin, which may eventually lead to a tornado. 'Meso' means 'middle', so you can think of this as the mid point between one type of storm and the other. Tornadoes all come from thunderstorm clouds, but not all thunderstorm clouds make tornadoes. In order for a tornado to occur, part of that cloud has to spin, and though you can't really see this happening, this is the intermediate, or 'meso' step from regular cloud to dangerous spinning cloud running along the ground.

(iv) **General Characteristics** : Cyclones in India are moderate in nature. Some of the general characteristics of a cyclone are:

1. Strong winds
2. Exceptional rain
3. Storm surge

Cyclones are generally accompanied by strong winds which cause a lot of destruction. In some cases it is accompanied by heavy downpour and also the rise in the sea which intrudes inland thereby causing floods.

The development of a cyclone covers three stages namely :

(a) **Formation and Initial Development State** : Four atmospheric/ oceanic conditions are necessary for the formation of a cyclone namely:

- A warm sea temperature in excess of 26 degree centigrade, to a depth of 60 meters, which provides abundant water vapor in the air by evaporation.
- High relative humidity (degree to which the air is saturated by to a height of about 7000 meters, facilitates condensation of water vapor into droplets and clouds, releases heat energy and induces drop in pressure. Atmospheric instability (an above average decrease of temperature with altitude) encourages considerable vertical cumulus cloud convection when condensation of rising air occurs.
- A location of at least 45 latitude degrees from the Equator allow the influence of the force due to the earth's rotation (Coriolis force) to take effect in inducing cyclonic wind circulation around low pressure centers.

(b) **Fully Matured** : The main feature of a fully mature tropical cyclone is a spiral pattern of highly turbulent giant cumulus thundercloud bands. These bands spiral inwards and form a dense highly active central cloud core which raps around a relatively calm zone. This is called the "eye" of a cyclone. The eye looks like a black hole or a dot surrounded by thick clouds. The outer circumference of the thick cloud is called the 'eye wall'.

(c) **Weakening or Decay** : A tropical cyclone begins to weaken as soon as its source of warm moist air is abruptly cut off. This is possible when the cyclone hits the land, on the cyclone moves to a higher altitude or when there is the interference of another low pressure.

Depending on their track on the warm tropical sea and proximity to land a cyclone may last for less than 24 hours to more than 3 weeks. On an average the life cycle of a cyclone (a cyclone to complete these three stages mentioned above) takes six days. The longest cyclone is typhoon John which lasted for 31 days (August to September, 1994 in the north east and north west pacific basins).

Indian Cyclones : Cyclones vary in frequency in various parts of the world. The 7516.6 kilometers long Indian

coastline is the earth's most cyclone battered stretch of the world. Around 8 percent of the total land area in India is prone to cyclones. About two third of the cyclones that occur in the Indian coastline occur in the Bay of Bengal. The states which are generally affected in the east coast are West Bengal, Orissa, Andhra Pradesh; Tamil Nadu and on the west coast Gujarat, Maharashtra, Goa, Karnataka and Kerala.

Effects of Cyclones and Hurricanes

- Tropical cyclones cause heavy rainfall and landslides.
- They cause a lot of harm to towns and villages, causing severe damage to kuccha houses. Coastal businesses like shipyards and oil wells are destroyed.
- They harm the ecosystem of the surrounding region.
- Agricultural land is severely affected, especially in terms of water supply and soil erosion.
- It causes harm to human, plant and animal life.
- Communication systems are badly affected due to cyclones.

Typical Adverse Effect : First, in a sudden, brief onslaught, high winds cause major damage to infrastructure and housing, in particular fragile constructions. They are generally followed by heavy rains and floods and, in flat coastal areas by storm surge riding on tidal waves and inundating the land over long distances of even upto 15 kilometers inland damaged or destroyed by the wind force, flooding and storm surge. Light pitched roofs of most structures especially the ones fitted on to industrial buildings will suffer severe damage.

Casualties and Public Health caused by flooding and flying elements, contamination of water supplies may lead to viral outbreaks, diarrhea, and malaria.

Water Supplies : Ground and pipe water supply may get contaminated by flood waters.

Crops and Food Supplies high winds and rains ruin the standing crop and food stock lying in low lying areas. Plantation type crops such as banana and coconut are extremely vulnerable. Salt from the sea water may get deposited on the agricultural land and increase the salinity. The loss of the crop may lead to acute food shortage.

Communication severe disruption in the communication links as the wind may bring down the electricity and

communication towers, telephone poles, telephone lines, antennas and satellite disk and broadcasting services. Transport lines (road and rail) may be curtailed, Lack of proper communication affects effective distribution of relief materials.

Consequences of Cyclone

- Storm surge and wind damage
- Inland flooding
- People become shelter less
- Crops get damaged
- Scarcity of food

Management and Mitigation of Cyclones and Hurricanes:

- Coastal areas should be well prepared to meet eventualities that arise from cyclones.
- Houses should be constructed such that they can withstand the heavy rainfall and forceful winds.
- Shelter beds should be created to check soil erosion and speed of winds.
- Remote sensing techniques should be used to forecast cyclones appropriately. v. When a cyclone does occur, rescue and relief operations should be in place.
- Possible Risk Reduction Measures.

Coastal Belt Plantation : Green belt plantation along the coastal line in a scientific interweaving pattern can reduce the effect of the hazard. Providing a cover through green belt sustains less damage. Forests act as a wide buffer zone against strong winds and flash floods. Without the forest the cyclone travel freely inland. The lack of protective forest cover allows water to inundate large areas and cause destruction. With the loss of the forest cover each consecutive cyclone can penetrate further inland.

Hazard Mapping : Meteorological records of the wind speed and the directions give the probability of the winds in the region. Cyclones can be predicted several days in advance. The onset is extensive and often very destructive. Past records and paths can give the pattern of occurrence for particular wind speeds. A hazard map will illustrate the areas vulnerable to cyclone in any given year. It will be useful to estimate the severity of the cyclone and various damage intensities in the region. The map is

prepared with data inputs of past climatological records, history of wind speed, frequency of flooding etc.

Land use control designed so that least critical activities are placed in vulnerable areas. Location of settlements in the flood plains is at utmost risk. Siting of key facilities must be marked in the land use. Policies should be in place to regulate land use and building codes should be enforced.

Engineered Structures: structures need to be built to withstand wind forces. Good site selection is also important. Majority of the buildings in coastal areas are built with locally available materials and have no engineering inputs. Good construction practice should be adopted such as:

- Cyclonic wind storms inundate the coastal areas. It is advised to construct on stilts or on earth mound.
- Houses can be strengthened to resist wind and flood damage. All elements holding the structures need to be properly anchored to resist the uplift or flying off of the objects. For example, avoid large overhangs of roofs, and the projections should be tied down.
- A row of planted trees will act as a shield. It reduces the energy.
- Buildings should be wind and water resistant.
- Buildings storing food supplies must be protected against the winds and water.
- Protect river embankments.
- Communication lines should be installed underground.
- Provide strong halls for community shelter in vulnerable locations.

Q.19 Explain Earthquake in detail. Also explain seismic hazards, cause and mitigation measures in detail.

Ans. Earthquake

- An earthquake is a major demonstration of the power of the tectonic forces caused by endogenic thermal conditions of the interior of the earth.
- An Earthquake is a series of underground shock waves and movements on the earth surface caused by natural processes writhing the earth's crust.

- An earthquake is a motion of the ground surface, ranging from a faint tremor to a wild motion capable of shaking buildings apart and causing gaping fissures to open in the ground.

- The earthquake is a form of energy of wave motion transmitted through the surface layer of the earth in widening circles from a point of sudden energy releases called the focus.

- An earthquake becomes a disaster only when it strikes the populated areas. Sometimes the moderate earthquakes on Richter scale inflict great damages by stimulating and augmenting other natural physical processes such as landslides, tsunami, floods and fire.

Thus, it is obvious that it is not necessary that an earthquake creates havoc itself but it also becomes disastrous indirectly.

Measurement : Magnitude is quantitative measure of the actual size of the earthquake. An increase in magnitude by 1(one) implies ten times higher energy released. Magnitude is measured in Richter scale. The number indicating on this scale ranges between 0 to 9 but in fact the scale has no upper limit of number because it is a logarithmic scale. Magnitude and energy released during an earthquake is generally related to the effects of earthquake in terms of human beings and his habitat.

Intensity is qualitative measure of actual shaking at location during an earthquake and is assigned as roman capital numerals. It is an indicator of the severity of shaking at a given location. Two commonly used measurement scales are modified mercalli intensity scale and the Medvedev-Sponheuer-Karnik (MSK) scale. Both scales are quite similar and range from I (Least perceptive) to XII (Most severe).

The intensity of an earthquake depends on variety of factors:

- Magnitude
- Distance from epicenter
- Acceleration
- Duration amplitude of waves
- Types of ground
- Water table

Terminology

The point on the fault where slip starts is the Focus or hypocenter, and the point vertically above this on the surface of the earth is the epicenter. The depth of focus from the epicenter, called as Focal Depth. Most of the damaging earthquakes have shallow focus with focal depths less than about 70km. Distance from epicenter to any point of interest is called epicentral distance.

Magnitude of Earthquake

1. Magnitude is a quantitative measure of the actual size of the earthquake.
2. Magnitude of an earthquake is a measure of its size.
3. According to Professor Charles Richter :
 - (a) At the same distance, seismograms of larger earthquakes have bigger wave amplitude than those of smaller earthquakes; and
 - (b) For a given earthquake, seismograms at farther distances have smaller wave amplitude than those at close distances.
4. These prompted him to propose the now commonly used magnitude scale, the Richter scale.
5. It is obtained from the seismograms and accounts for the dependence of waveform amplitude on epicentral distance. This scale is also called Local Magnitude scale.
6. Earthquakes are classified based on magnitude as

Group	Magnitude
Great	8 and higher
Major	7 - 7.9
Strong	6 - 6.6
Moderate	5 - 5.9
Light	4 - 4.9
Minor	3 - 3.9
Very Minor	< 3.0

Intensity of Earthquake

1. Intensity is an indicator of the severity of shaking generated at a given location.
2. Intensity is a qualitative measure of the actual shaking at a location during an earthquake, and is assigned as Roman Capital Numerals.

3. There are many intensity scales. Two commonly used ones are the Modified Mercalli Intensity (MMI) Scale and the Medvedev-Sponheuer-Karnik (MSK) Scale.
4. Both scales are quite similar and range from I (least perceptive) to XII (most severe).

Classification of Earthquakes

- (a) Depth of focus as basis:
 - (i) Shallow: Depth of focus lies up to 60 km below the surface.
 - (ii) Intermediate: Depth of focus lies between 60-300 km below the surface.
 - (iii) Deep seated: Depth of focus lies between 300-700 km below the surface.
- (b) Cause of origin as basis:
 - (i) Tectonic earthquakes: Caused due to relative displacements of blocks of the crust of the earth along the rupture planes.
 - (ii) Non-tectonic earthquake: Caused due to volcanic eruptions, atomic explosions landslides and subsidence.

Seismic Hazards

Damage occurs to human settlement, buildings, structures and infrastructure, especially bridges, elevated roads, railways, water towers, pipelines, electrical generating facilities. Aftershocks of an earthquake can cause much greater damage to already weakened structures.

Secondary effects include fires, dam failure and landslides which may block water ways and also cause flooding. Damage may occur to facilities using or manufacturing dangerous materials resulting in possible chemical spills. There may also be a breakdown of communication facilities. The effect of an earthquake is diverse. There are large number of casualties because of the poor engineering design of the buildings and close proximity of the people. About 95 percent of the people who are killed or who are affected by the earthquake is because of the building collapse. There is also a huge loss to the public health system, transport and communication and water supply in the affected areas.

The hazards associated with earthquakes are as follows:

1. **Ground Shaking** : Ground surface may shift during an earthquake (especially if focus is shallow). Vertical displacements of surface produce faults.
2. **Structural Hazards** : Frequency of shaking differs for different seismic wave. High frequency body waves shake low buildings more. Low frequency surface waves shake high buildings more. Intensity of shaking also depends on type of subsurface material.
3. **Liquefaction** : During earthquake, the strength of the soil is reduced drastically to a point where it is unable to support structures.
4. **Lateral Spreading** : It is a phenomenon characterized by incremental displacements that range from negligible to quite large during earthquake shaking.

5. Landslides

6. Lifeline Hazards

- The network of facilities like electrical power and telecommunications, transportation, water and sewage, oil and gas distribution, and waste storage system have collectively come to known as lifelines.
 - Lifeline failures not only have severe economic consequences but can also adversely affect the environment and quality of life following an earthquake.
7. **Tsunami and Seiche Hazards** : Rapid vertical sea floor movements caused by fault rupture during earthquake can produce long period sea waves called tsunamis. In open sea, Tsunami travel great distances at high speeds. Earthquake induced waves in enclosed water bodies (in a lake or reservoir) are called Seiche.

Typical Effects

- **Physical Damage**: Damage or loss of buildings and service structures, disturbances in ground water conditions. Fire, floods due to dam failures, slope instability and failures, tsunamis and landslides can occur.

- **Casualties**: Often high near the epicenter and in places where the population density is high (say, multistoried buildings) and structures which are not resistant to earthquake forces.
- **Public Health**: Multiple fracture injuries, moderately and severely injured is the most widespread problem, breakdown in sanitary conditions and large number of casualties can lead to epidemics.
- **Water supply**: Severe problems due to failure of the water supply distribution network and storage reservoirs. Fire hydrants supply lines, if vulnerable, can hamper fire service operations.
- **Transport network**: Severely affected due to failure of roads and bridges, railway tracks, failure of airport runways and related infrastructure.
- **Electricity and Communication**: All links affected. Transmission towers, transponders, transformers collapse.

Possible Risk Reduction Measures

1. **Community preparedness**: Community preparedness is vital for mitigating earthquake impact. The most effective way to save you even in a slightest shaking is 'DROP, COVER and HOLD'.
2. **Planning** : The Bureau of Indian Standards has published building codes and guidelines for safe construction of buildings against earthquakes. Before the buildings are constructed the building plans have to be checked by the Municipality, according to the laid down bylaws. Many existing lifeline buildings such as hospitals, schools and fire stations may not be built with earthquake safety measures. Their earthquake safety needs to be upgraded by retrofitting techniques.
3. **Public education** : Public education is educating the public on causes and characteristics of an earthquake and preparedness measures. It can be created through sensitization and training programme for community, architects, engineers, builders, masons, teachers, government functionaries teachers and students.
4. **Engineered structures** : Buildings need to be designed and constructed as per the building by laws to withstand ground shaking. Architectural and engineering inputs need to be put together to improve building design and construction practices. The soil type needs to be

analyzed before construction. Building structures on soft soil should be avoided. Similar problems persist in the buildings constructed on the river banks which have alluvial soil.

Earthquake Hazard Mitigation : Unlike other disasters, the damages caused by earthquakes are more devastating. Since it also destroys most of the transport and communication links, providing timely relief to the victims becomes difficult. It is not possible to prevent the occurrence of an earthquake; hence, the next best option is to emphasize on disaster preparedness and mitigation rather than curative measures such as:

- (i) Establishing earthquake monitoring centres (seismological centres) for regular monitoring and fast dissemination of information among the people in the vulnerable areas. Use of Geographical Positioning System (GPS) can be of great help in monitoring the movement of tectonic plates.
- (ii) Preparing a vulnerability map of the country and dissemination of vulnerability risk information among the people and educating them about the ways and means minimizing the adverse impacts of disasters.
- (iii) Modifying the house types and building designs in the vulnerable areas and discouraging construction of high-rise buildings, large industrial establishments and big urban centres in such areas.
- (iv) Finally, making it mandatory to adopt earthquake-resistant designs and use light materials in major construction activities in the vulnerable areas.

Q.20 Define avalanche in detail. Also explain causes and consequences of avalanches.

Ans. Avalanche : An avalanche (also called a snowslide or snowslip) is a rapid snow down a sloping surface. Avalanches are typically triggered in a starting zone from a mechanical failure in the snowpack (slab avalanche) when the forces on the snow exceed its strength but sometimes only with gradually widening (loose snow avalanche). After initiation, avalanches usually accelerate rapidly and grow in mass and volume as they entrain more snow. If the avalanche moves fast enough some of the snow may mix with the air forming a powder snow avalanche, which is a type of gravity current. Slides of rocks or debris, behaving in a similar way to snow, are

also referred to as avalanches. The load on the snowpack may be only due to gravity, in which case failure may result either from weakening in the snowpack or increased load due to precipitation. Avalanches that occur in this way are known as spontaneous avalanches.

Avalanches can also be triggered by other loads such as skiers, snowmobilers, animals or explosives. Seismic activity may also trigger the failure in the snowpack and avalanches. A popular myth is that avalanches can be triggered by loud noise or shouting, but the pressure from sound is orders of magnitude too small to trigger an avalanche.

Although primarily composed of flowing snow and air, large avalanches have the capability to entrain ice, rocks, trees, and other material on the slope, and are distinct from mudslides, rock slides, and serac (A serac is a large chunk of glacial ice which can be as big as a house in some cases) collapses on an icefall. Avalanches are not rare or random events and are endemic to any mountain range that accumulates a standing snowpack.

Avalanches are most common during winter or spring but glacier movements may cause ice and snow avalanches at any time of year. In mountainous terrain, avalanches are among the most serious objective natural hazards to life and property, with their destructive capability resulting from their potential to carry enormous masses of snow at high speeds.

There is no universally accepted classification of avalanches—different classifications are useful for different purposes. Avalanches can be described by their size, their destructive potential, their initiation mechanism, their composition and their dynamics.

Causes of Avalanche

Most avalanches occur spontaneously during storms under increased load due to snowfall. The second largest cause of natural avalanches is metamorphic changes in the snowpack such as melting due to solar radiation. Other natural causes include rain, earthquakes, rockfall and icefall. Artificial triggers of avalanches include skiers, snowmobiles, and controlled explosive work.

Avalanche initiation can start at a point with only a small amount of snow moving initially; this is typical of wet snow avalanches or avalanches in dry unconsolidated snow. However, if the snow has sintered into a stiff slab overlying a weak layer then fractures can propagate very

rapidly, so that a large volume of snow, that may be thousands of cubic meters, can start moving almost simultaneously.

A snowpack will fail when the load exceeds the strength. The load is straightforward; it is the weight of the snow. However, the strength of the snowpack is much more difficult to determine and is extremely heterogeneous. It varies in detail with properties of the snow grains, size, density, morphology, temperature, water content; and the properties of the bonds between the grains. These properties may all metamorphose in time according to the local humidity, water vapor flux, temperature and heat flux. The top of the snowpack is also extensively influenced by incoming radiation and the local air flow. One of the aims of avalanche research is to develop and validate computer models that can describe the evolution of the seasonal snowpack over time. A complicating factor is the complex interaction of terrain and weather, which causes significant spatial and temporal variability of the depths, crystal forms, and layering of the seasonal snowpack.

Consequences of Avalanche

In considering the effects and impacts of landslides and snow avalanches, the following special features of these hazards should be kept in mind:

- These disasters occur in remote mountain areas with difficult terrain and adverse weather conditions.
- The communities (villages and hamlets) are small entities with weak housing, makeshift structures and poor resources.
- Landslides and snow avalanches give almost no notice in most cases and enormous amount of rock, soil or snow come crashing with fantastic speed on the often-unprepared communities.

In the light of the above three considerations, the effects and impacts of landslides and snow avalanches may be divided into:

(i) Direct Effects-physical Damage : Anything in the top of a landslide or in its path or at its bottom will suffer severe damage. The same is the case with a snow avalanche when anything in its path or falling areas will suffer severe damage. In case of a snow avalanche of "slab type" where massive slabs of hardened snow come hurtling down, the hit is very hard and devastating where as the "loose snow" type of snow avalanche may engulf and cover larger area.

Blockages of roads, mountain passes and streams and damage to electric and communication lines are among the direct effects of landslides and snow avalanches apart from injuries and fatalities to human and cattle lives. Blockage of streams and later release of the impounded water create flash floods with disastrous effects. Falling of large volumes of debris from landslides or snow avalanches in mountain lakes can generate flash floods.

Snow avalanches create additional suffering due to extremely low temperatures and the associated freezing effect. Even if there are survivors among the victims, they may suffer hypothermia and frost-bite before help arrives.

(ii) Indirect Effects and Long -term Impacts : Apart from loss of houses, destruction of property and shattering of family life due to death or injury to kith and kin, the indirect effects and long-term impacts of landslides and snow avalanches lead to further loss of productivity (agriculture, poultry, small scale cottage industry, forest produce) in an already marginal productivity scenario.

Q.21 Explain heat wave in brief. Also explain danger and effects of heat wave in detail.

Ans. Heat Wave : A heat wave is a complex phenomenon resulting from a certain combination of temperature, humidity, air movement and duration. Simply stated, a heat wave is an extended period of very high summer temperatures with the potential to adversely affect communities.

Heat wave Dangers and Effects

(i) Human Effects : In many parts of the State, during every summer thousands of people suffer from heat stress when the bodies absorb more heat than they can dispel. Unless prompt preventive measure/treatment is received, they suffer the serious or even fatal consequences of heat stroke. Regardless of these statistics, heat wave is probably the most under-rated of all-natural hazards.

The body responds to this stress progressively through three stages:

- Heat cramps
- Heat exhaustion and
- Heat stroke

(ii) Animals and Agriculture : Animals suffer the same way as humans do, particularly when left without shade and adequate water. During heat waves, especially in times

of drought, livestock losses can be very high. Plants, crops and vegetables are also subject to the effects of the heat. The damage to the standing crops is a common feature during such events.

(iii) Utilities and Services : Water and electricity consumption services increase rapidly during severe heat conditions, often causing shortages. This causes extra demands on electricity and water supplies.

(iv) Community Awareness : There appears to be significant lack of community awareness of the risks associated with heat wave, even though several parts of the country experience such events with some regularity. It is a widely overlooked, even unknown, killer. It is ideal to create awareness among the communities and ask them to take suitable precautionary steps during the peak summer months. Media and Community education can be launched prior to the onset of the heat wave conditions.

Work done during a Heat Wave

- Recognize the signs of heat stroke, heat rash or heat cramps such as weakness, dizziness, headache, nausea, sweating and seizures.
- Drink water and oral hydration drinks.
- Rest in shade, take breaks if you must work in the sun.
- Place a cool, wet cloth on your head to cool off.
- Check on neighbours and elderly family to ensure they are keeping cool.
- Wear light and loose clothes.
- Use an umbrella or hat or cover head with a cloth.

Work not done during a Heat Wave

- Do not go out in the direct sun.
- Avoid extensive physical activity.
- Do not send children or pets out in the sun or leave them in closed vehicles.
- Do not consume caffeinated drinks (like aerated drinks) and alcohol during extreme heat.
- Avoid wearing dark, heavy or tight clothing.
- Avoid cooking during peak heat hours. If you must cook, open doors and windows to ventilate the cooking area adequately.

Q.22 Explain Radiological and Nuclear disaster in detail. Also explain preparation and mitigation measures.

Ans. The phenomenal growth in the applications of radioisotopes and radiation technology has helped in improving the quality of life of the human race. India is also one amongst the seven declared nuclear weapon states, which uses nuclear technology for strategic purposes.

Nuclear plants, in general, adopt a defense-in-depth approach and multiple physical barriers to ensure that radioactivity is contained at all times. However, a finite number of very low probability events are postulated to occur, releasing radioactivity into the environment. Consequently, emergency preparedness and response plans are in place to cope with nuclear or radiological emergency scenarios ranging from minor incidents like a small spillage of radioactive material to a major nuclear accident releasing large-scale radioactivity (like Chernobyl) in the public domain.

Nuclear or Radiological Emergency Disaster : Any radiation incident resulting in, or having a potential to result in, exposure to and/or contamination of the workers or the public, in excess of the respective permissible limits can be termed as a nuclear/ radiological emergency.

These emergencies, which are usually well within the coping capability of the plant/facility authority (along with neighboring administrative agencies, if required) can be broadly classified in the following manner:

1. An accident taking place in any nuclear facility of the nuclear fuel cycle.
2. A 'criticality' accident in a nuclear fuel cycle facility where an uncontrolled nuclear chain reaction takes place.
3. An accident during the transportation of radioactive material.
4. A large-scale nuclear disaster resulting from a nuclear weapon attack (as had happened at Hiroshima and Nagasaki in Japan).

The International Atomic Energy Agency (IAEA) classifies the above emergency scenarios under two broad categories—**nuclear** and **radiological**:

A nuclear emergency refers to an emergency situation in which there is, or is presumed to be, a hazard due to the release of energy along with radiation from a nuclear chain reaction.

All other emergency situations, which have the potential hazard of radiation exposure due to decay of radioisotopes, are classified as radiological emergencies.

Institutional Mechanism

The Government of India has identified Department of Atomic Energy (DAE) as the nodal agency for providing the necessary technical inputs to the national or local authorities for responding to any nuclear or radiological emergency in the public domain.

The Ministry of Home Affairs (MHA) is the nodal ministry in such emergencies. For this purpose, a Crisis Management Group (CMG) has been functioning since 1987 at DAE.

In the event of any nuclear/radiological emergency in the public domain, CMG is immediately activated and it coordinates with the local authority in the affected area and all the concerning authorities at the centre (NCMC/NEC/NDMA) to ensure that the necessary technical inputs are available to respond to the nuclear/radiological emergency.

Emergency Preparedness

Based on the radiological conditions and their consequences, emergencies at nuclear facilities are categorised as emergency standby, personnel emergency, plant emergency, on-site emergency and off-site emergency.

For the first three types of emergencies, in the order of severity, which are foreseen as possible, though with very low probability, detailed plant-specific emergency response plans are already in place. In all these situations, the consequences of the accident are expected to be limited to the plant only.

On-site emergency, where the consequences of an accident are not likely to cross the site boundary, a detailed response plan does exist. This emergency does not lead to any radiation release in the public domain.

The last type of emergency scenario (having the highest level of severity in the category of nuclear emergency in the nuclear facilities), even though with a very low possibility of radioactive releases in the public

domain, is off-site emergency for which detailed response plans are put in place by the district magistrate/ collector of the area in coordination with the plant authorities.

Each nuclear power station of the present generation has :

- An Exclusion Zone surrounding the power station in which no habitation is permitted and this area is under the administrative control of the plant authority. An area of larger radius outside the Exclusion Zone is declared as.
- The Sterilised Zone where growth and development is restricted.
- The Emergency Planning Zone (EPZ) which extends further beyond the Sterilised Zone.

The AERB has also laid down guidelines for the safe use of sources and safe operation of facilities which are to be adopted and followed by all the facilities using radioisotopes/radiation sources. These include safe design of the equipment used, its operation within the permissible range of parameters and availability of a suitably qualified Radiological Safety Officer (RSO) who is responsible for ensuring safe practices.

Emergency Plans to Respond to Transportation Accident

The AERB has laid down guidelines to be adopted for the transport of radioactive materials and emergency response plans for accidents during their transportation.

The consignor of the material is responsible for ensuring that the prescribed safety procedures are followed.

The SOPs also indicate what will be done in the event of any radiation emergency—the precautions to be taken, the agencies to be notified, etc.

Medical Preparedness for Nuclear Emergencies :

In each constituent unit of DAE, a few doctors have been dedicated and given the necessary training in the medical management of radiation emergencies.

All nuclear power plants and the Bhabha Atomic Research Centre (BARC) are equipped with radiation monitoring instruments, have personnel decontamination centres and the necessary stock of antidote medicines and specific de-corporation agents for typical radioisotopes.

Public Awareness : To educate the people about the beneficial aspects of nuclear radiation and to remove their misgivings about it, the authorities of nuclear fuel cycle facilities in general, and that of nuclear power stations in particular, are actively involved in carrying out regular public awareness programmes for people living in the vicinity of these facilities.

Mitigation and Preparation

(i) Goals

- To reduce radiation-induced health effects by preventing.
- To limit, to the extent practicable, the occurrence of stochastic effects in the population.

(ii) Domain of Action : The response actions within the site boundary of the nuclear facility are the responsibility of the management of the nuclear facility whereas the implementation of the emergency response plans in the public domain (beyond the site boundary) is the responsibility of the concerned district authority.

In the event of an off-site emergency having the potential for trans-boundary effects, necessary action is taken by DAE in accordance with the country's international obligations.

(iii) Capacity building for nuclear and radiological emergencies.

Handling Plant Emergency : Nuclear facilities in the country are equipped for the detection, classification, notification and mitigation of any emergency situation. They are capable of the following:

1. Emergency operating procedures for the assessment of an emergency condition and its mitigation.
2. Pre-identification of any facility-specific, abnormality.
3. Facility-specific approved nuclear emergency response plans specifying the jobs.
4. Alerting the plant personnel by sounding the emergency siren and making an emergency announcement.
5. Adequate means for communicating a notification to the emergency response organizations.

6. Identified assembly locations for plant personnel and casual visitors.
7. Formation of rescue teams and activation of a treatment area and decontamination centre.
8. Radiation survey around the plant and outside the plant and site boundaries.
9. Assessment of wind speed, wind direction and the affected sector around the nuclear facility.
10. Whenever required, the nuclear facility is able to mobilize the services of the ambulance and paramedical staff at its site.
11. Equipment and materials for handling a nuclear emergency are kept at a designated place of the nuclear facility and ERC.

Handling On-site Emergency : In addition to all the provisions applicable in a plant emergency, the following additional provisions are ensured:

1. Extensive radiological survey for an assessment of the radiological conditions within the site boundary.
2. Suitable prophylaxis to be made available at all assembly areas.
3. Identification of temporary shelters within the facility/site for shifting plant personnel.
4. Provision of a fleet of vehicles for evacuation of plant personnel.
5. Provision of fixed and portable contamination monitors to check contaminated personnel/vehicles leaving the site.
6. The concerned district authorities are alerted to be on standby for emergency operations in the public domain.
7. Radiological monitoring of the environment in the EPZ (16 km radius around the plant).

Handling Off-site Emergency : In addition to all the provisions applicable in plant emergency and on-site emergency, the following additional provisions are to be ensured for handling a nuclear emergency in the public domain:

1. Pre-identification of plant conditions.
2. An assessment of the radiological status at the site boundary and in the public domain.

- (i) **Specialised Response Teams** : Four battalions of National Disaster Response Force (NDRF) are being specially trained by NDMA with assistance from DAE/DRDO (for detecting and monitoring radiation, for their own protection during response actions, decontamination and triage operation, etc.) to provide specialised response during a nuclear/radiological emergency/disaster.
- (ii) **Role of Civil Defense** : Selected civil defence personnel will be trained extensively in the subjects of radiation, radioactivity, radiation protection, use of monitoring instruments, use of protective gear, shielding, decontamination, waste disposal, etc.
- (iii) **Role of Armed Forces** : The armed forces will also gear up their nuclear disaster preparedness so that they can be inducted in the event of nuclear disasters.
- (iv) **Periodic Exercises and Mock Drills** : It focuses on roles and responsibilities, resource identification, use of equipment, understanding the effects of radiation on human beings, animals and the environment.

The evaluation of an exercise will identify areas of emergency plans and preparedness that may need to be improved or enhanced. It will be the responsibility of the nuclear facility and the district authority to review the evaluation report and ensure implementation of the corrective measures recommended by the evaluators.

(v) Strengthening Infrastructure

- **Emergency Response Centres (ERCs)** : ERCs will be set up at all levels (i.e., state capitals and major cities) with the necessary manpower, instruments and equipment. Depending upon the location and assigned functions, these ERCs will also be maintained in a ready state to quickly respond to any nuclear/radiological emergency.
- **Radiation Detection, Monitoring Instruments and Protective Gear** : In case of any nuclear/radiological emergency, the first need is the availability of instruments for detecting and monitoring the radiation. An inventory of radiation monitoring instruments and protective gear will be built up by all the SDMAs and DDMAs in consultation with DAE.

- **Real Time Monitoring Systems** : A network of simple environmental monitors, the IERMON has been established by BARC. These monitors work on a 24 x 7 basis.

Communication

The specific requirements of a nuclear emergency communication system include:

1. Civil defence communication (siren/signals) to communicate stay-in and evacuation warnings in the event of an off-site emergency or a large-scale nuclear disaster.
2. Reliable and diverse communication systems will be ensured for communication among national, state and district headquarters through Emergency Operations Centres (EOCs) as envisaged in the NDCN of NDMA.
3. All possible communication channels will be explored, including ham radio operators, as per the vulnerability profile of the state/district.
4. SOPs will be laid down for effective communication during a nuclear emergency/disaster.
5. Mock drills will be periodically carried out to test the communication links.
6. A nodal officer (District Information Officer) will be identified for briefing the media.

Transport Network

Identifying and ensuring the availability of access routes and transportation vehicles for evacuation of the affected population are to be ensured as part of the preparedness programme in an all-hazards approach, in consultation with all the stakeholders including DAE.

Shelters

Some places like schools, colleges, community centres, marriage halls, religious places, etc., can be easily converted into shelters in the event of a radiological/nuclear emergency without too much investment.

Q.23 Explain chemical disaster in detail. Also discuss about precautions of chemical disaster.

Ans. Chemical, being at the core of modern industrial systems, has attained a very serious concern for disaster management within government, private sector and

community at large. Chemical disasters may be traumatic in their impacts on human beings and have resulted in the casualties and also damages nature and property. The elements which are at highest risks due to chemical disaster primarily include the industrial plant, its employees & workers, hazardous chemicals vehicles, the residents of nearby settlements, adjacent buildings, occupants and surrounding community. Chemical disasters may arise in number of ways, such as:-

1. Process and safety systems failures
 - Human errors
 - Technical errors
 - Management errors
2. Induced effect of natural calamities
3. Accidents during the transportation
4. Hazardous waste processing/ disposal
5. Terrorist attack/ unrest leading to sabotage

Status of Chemical Disaster Risk in India

India has witnessed the world's worst chemical (industrial) disaster "Bhopal Gas Tragedy" in the year 1984. The Bhopal Gas tragedy was most devastating chemical accident in history, where over 2500 people died due to accidental release of toxic gas Methyl Iso Cyanate (MIC).

Such accidents are significant in terms of injuries, pain, suffering, loss of lives, damage to property and environment. India continued to witness a series of chemical accidents even after Bhopal had demonstrated the vulnerability of the country. Only in last decade, 130 significant chemical accidents reported in India, which resulted into 259 deaths and 563 number of major injured.

There are about 1861 Major Accident Hazard (MAH) units, spread across 298 districts and 25 states and 3 Union Territories, in all zones of country. Besides, there are thousands of registered and hazardous factories (below MAH criteria) and un-organized sectors dealing with numerous range of hazardous material posing serious and complex levels of disaster risks.

Safety Initiatives taken in India to Address Chemical Risk

The comprehensive legal/ institutional framework exists in our country. A number of regulations covering the safety in transportation, liability, insurance and compensations have been enacted.

Following are the relevant provisions on chemical disaster management, prevailing in country :

1. Explosives Act 1884 - Petroleum Act 1934
2. Factories Act 1948 - Insecticides Act 1968
3. Environment Protection Act 1986 - Motor Vehicles Act 1988
4. Public Liability Insurance Act 1991 - Disaster Management Act 2005

Government of India has further reinforced the legal framework on chemical safety and management of chemical accidents by enacting new rules such as MSIHC Rules, EPPR Rules, SMPV Rules, CMV Rules, Gas Cylinder Rules, Hazardous Waste Rules, Dock Workers Rules and by way of amendments to them.

The National Disaster Management Authority (NDMA) of India had come out with very specific guidelines on Chemical Disaster Management. The guidelines have been prepared to provide the directions to ministries, departments and state authorities for the preparation of their detailed disaster management plans.

These guidelines call for a proactive, participatory, multi-disciplinary and multi-sectoral approach at various levels for chemical disaster preparedness and response. Further, NDMA has provided specific inputs to the GOM for avoidance of future chemical disasters in the country, along with suggested amendments on the existing framework.

NDMA is also working on revamping of CIFs (Chief Inspectorate of Factories) to strengthen chemical safety in India. In addition, MoEF and NDMA are in process of finalizing the National Action Plan on Chemical Industrial Disaster Management (NAP-CIDM), which will act as the roadmap for chemical disaster management in India.

Common Hazardous Chemicals

Most commonly used hazardous chemicals are as follows :

- Acetone (177KB)
- Acetylene Gas (177KB)
- Ammonia Gas (179KB)
- Argon Gas (181KB)
- Benzene (180KB)
- Caustic Soda (Sodium Hydroxide) (182KB)

- Chlorine Gas (178KB)
- Hydrochloric Acid (179KB)
- Hydrogen (176KB)
- LPG (Liquefied Petroleum Gas) (180KB)
- Methanol (Methyl Alcohol) (178KB)
- Naphtha (180KB)
- Phosphoric Acid (178KB)
- Sulphuric Acid (180KB)
- Tri Nitro Toluene (TNT) (176KB)

Precautions to be taken during and after the Chemical (Industrial) Accidents

- Do not panic, evacuate calmly and quickly perpendicular to wind direction through the designated escape route.
- Keep a wet handkerchief or piece of cloth/ sari on face during evacuation.
- Keep the sick, elderly, weak, handicapped and other people who are unable to evacuate inside house and close all the doors and windows tightly.
- Do not consume the uncovered food/ water etc. open to the air, drink only from bottle.
- Change into fresh clothing after reaching safe place/ shelter, and wash hands properly.
- Inform Fire and Emergency Services, Police and medical services from safe location by calling 101, 100 and 108 respectively.
- Listen to PA (Public Addressal) System of the plant/ factory, local radio/ TV channels for advice from district administration/fire/health/police and other concerned authorities.
- Provide correct and accurate information to government official.
- Inform others on occurrence of event at public gathering places (like school, shopping centre, theatre etc.).
- Don't pay attention to the rumours and don't spread rumours.

General Precautions During Normal Time

- Do not smoke, lit fire or spark in the identified hazardous area.

- Sensitize the community living near the industrial units and they should be more vigilant about the nature of industrial units and associated risks.
- Keep the contact numbers of nearest hazardous industry, fire station, police station, control room, health services and district control room, for emergency use.
- Avoid housing near the industries producing or processing the hazardous chemicals, if possible.
- Participate in all the capacity building programmes organized by the government/ voluntary organizations/ industrial units.
- Take part in preparing disaster management plan for the community and identify safe shelter along with safe and easy access routes.
- Prepare a family disaster management plan and explain it to all the family members.
- Make the family/ neighbours aware of the basic characteristics of various poisonous/ hazardous chemicals and the first aid required to treat them.
- Adequate number of personal protective equipments needs to be made available, to deal with emergency situation.
- Prepare an emergency kit of items and essentials in the house, including medicines, documents and valuables.

Q.24 Discuss disaster by thunderstorm in detail.

Ans. Thunderstorms : Thunderstorms can be destructive and extremely dangerous weather emergencies. Thunderstorms bring high winds, heavy rains and dangerous lightning, one of the leading causes of weather-related deaths in the United States each year. Being prepared in advance and ready to act quickly will help ensure your safety in the event that one of these weather emergencies occurs.

Severe Thunderstorms

Thunderstorms are common occurrences in the Midwest and Central United States. Each year, an estimated 100,000 thunderstorms occur in the United States. Of those, about 10 percent are classified as severe thunderstorms - those that produce hail at least three-quarters of an inch in diameter, have winds of 58 miles per hour or higher, or produce a tornado.

All thunderstorms are dangerous and can be associated with a number of hazards. Heavy rains can lead to flash flooding events – one of the primary causes of death associated with thunderstorms. Lightning, which is produced by every thunderstorm, causes an average of 80 fatalities and 300 injuries each year. Lightning can also start building fires, damage electrical equipment, electrocute humans and livestock, and is the leading cause of farm fires. High winds generated by thunderstorm can cause damage to homes, overturn vehicles, uproot or damage trees, or blow down utility poles causing wide spread power outages. Hail causes billions of dollars in damage to crops and property each year and can injure people or animals left outdoors.

The following resources will help you prepare your family and home for severe thunderstorm situations.

Take Action Before Thunderstorms

We can find detailed information about thunderstorms on local TV and radio stations, the National Weather Services, local government's emergency management website and social media sites like NOAA's Twitter and Facebook.

Steps to be Ready

1. Complete the Family Emergency Plan and discuss it as a family. This is a simple way of keeping each member of the family informed on critical information: where to reconnect should members become separated, who to call, and what we will do should a thunderstorm occur.
2. Complete the Emergency Contacts Card and place one in Emergency Kit.
3. Prepare an Emergency Kit. The Emergency Kit should be easily accessible should you and your family be forced to shelter in place (stay at home) for a period of time.

Take Action in Your Home

- Remove dead or rotting trees and branches that could fall and cause injury or damage during a severe thunderstorm.
- Secure outdoor objects that could blow away or cause damage.
- Shutter windows and secure outside doors. If shutters are not available, close window blinds, shades or curtains.

- If a thunderstorm is likely in your area, postpone outdoor activities.

Be Safe During a Thunderstorm

- Get inside a home, building, or hard top automobile (not a convertible). Do not touch anything metal. Although you may be injured if lightning strikes your car, you are much safer inside a vehicle than outside.
- Remember, rubber-soled shoes and rubber tires provide NO protection from lightning. However, the steel frame of a hard-topped vehicle provides increased protection if you are not touching metal.
- Avoid showering or bathing. Plumbing and bathroom fixtures can conduct electricity.
- Use a corded telephone only for emergencies. Cordless and cellular telephones are safe to use.
- Unplug appliances and other electrical items such as computers and turn off air conditioners. Power surges from lightning can cause serious damage.

Be Safe Outdoors

- If you are outside during a thunderstorm, avoid:
 - Natural lightning rods such as a tall, isolated tree in an open area.
 - Hilltops, open fields, the beach or a boat on the water.
 - Isolated sheds or other small structures in open areas.
 - Anything metal, such as tractors, farm equipment, motorcycles, golf carts, golf clubs and bicycles.
- In a forest, seek shelter in a low area under a thick growth of small trees. Avoid the tallest trees.
- In an open area, go to a low place like a ravine or valley, but watch for flooding.
- On open water, get to land and find shelter immediately.
- If you feel your hair stand on end, a lightning strike is about to happen:
 - Squat low but do not lie down.
 - Place your hands over your ears and head between your knees.
 - Make yourself the smallest possible target.

Q.25 Explain lightning disaster in detail.

Ans. Lightning or "celestial lightning" is the discharge of an electric charge in the atmosphere (transferring from one object to another) and the thunder produced by it is called lightning. About 160 lakh lightning are produced every year in the world.

The lightning that falls from the sky with a tough one is called lightning. There is a clash between clouds in the sky, i.e., friction suddenly leads to an electrostatic charge. That is, electric charge is created in stormy clouds. It fast comes from the sky to the ground. In the meantime, we hear the sound with a sharp tough and the light is seen like a spark of electricity, the whole process is called celestial power.

Origin of Lightning : Lightning is often produced in cumulonimbus clouds. These clouds have very strong upward wind currents, reaching a height of about 40,000 feet. These are some of the actions that cause the origin and dissociation of electric charges.

For the clarification of these actions, Wilson, Simpson, Scrase, etc., have presented their principles, which are conflicting lives, but all of them say that the process of lightning is in the clouds and for this, the water cyanarks present in those clouds, or the precipitation particles, etc., are responsible for the precipitation particles. Even with regard to the de-propagation in the clouds, all are unanimous that their upper levels are positive and the middle and lower levels are the minus. The division of these charges is also very high above the levels of zero degree to centigrade. This makes it easy to conclude that the charge division is from the snow particles formed in the clouds and the upward wind currents, not the drop of water. Sometimes, even in low levels, there is a centre of money-money.

Due to the generation of debt vesh at low levels of clouds, positiveness is generated by induction at the bottom of the earth below. With the clouds moving forward, these positive lyses on the Earth also go ahead in the same way. Attracted by the negative investments, the surface money is climbed up on the standing conductor or semiconductor objects on the earth. By this method, when the electrification of clouds reaches the extent that the potential gradient between the neighboring charge stations reaches

the breach value, the discharge of electricity is in the form of long sfuling. It is called lightning. The lightning towards the earth reaches several sequences. A hillol of electrons from the clouds comes down 50 meters in 1 micro second (1×10^{-6} seconds) and stops. After about 50 M. C. The second order begins, and so in many sequences, the wave finally reaches the earth. This is called the major stroke. It takes a total of 0.002 seconds to reach the Earth from its place of origin.

The above facts were revealed by a photo photograph taken by Schonland and his colleagues with the help of a highly sensitized camera. The same photo plaque also showed that at the moment the main step leader reached the earth, a very teetering light went from the earth to the clouds in the same sequence as the main order. This is called return stroke. While the average velocity of the principal order is 105 metres per second, the return stroke velocity is 107 metres per second, as its route is already ionized.

Even after the above major and regressive traumas, many traumas are shown to move downwards and upwards, respectively. These are called secondary strokes. These secondary arrivals coming down do not fall in the same sequence as major trauma.

Types of Lightning

There are usually three types of lightning:

- (1) Sheet lightning is very wide in the area and its continuous light spreads far and wide on the clouds.
- (2) Streak lightning is often shown. It has one or more photo lines, straight or crooked moving around. It would have been from the cloud to the cloud, from the cloud to the Earth or from the cloud to the atmosphere. There can be three types of this lightning yourself:
 - (a) Beaded, in which the light is far less in the entire path of lightning and somewhere becomes a Centre of dense light and is seen to resemble the mites,
 - (b) Forked, in which two branches are shown moving in different directions and
 - (c) Heat lightning, which is a far-reaching dissociation, from which the voice cannot reach.
- (3) Ball is seen as a luminous ball coming to the earth. The average diameter is 20 cm. As he moves

towards the earth, its velocity decreases. After being shown for about three to five seconds, it explodes with a very intense sound. It is very rarely shown and the cause of its origin is unknown.

Protecting From Lightning : The Lightning rod system, developed by Benjamin Franklin, is the best way to protect buildings from direct trauma. An iron rod, whose upper end is as sharp as a spear and remains far above the building, is deeply buried inside the land from the side of the building. The lower end is in a copper plate in the ground. This lightning bar does not pave the way for minimal resistance to the lightning present in the cloud, but it immediately reaches the induced electric charges on the building inside the earth. Thus, it also substantially reduces the likelihood of mutual attraction of charges between clouds and building. In the days of electric storms from the past, sailors have been seeing the erosion of cloud power from the masts of their vessels. This erosion is more evident at night. This is called the Fire of European Sailor Saint Elmo (St. Elmo's Fire).

Nowadays, a number of lightning control experiments are being carried out. An entertaining experiment was carried out by sitting a person in a motorcar and sending artificial lightning on that motor from top to bottom. Since the electrons present in the lightning, being equally charged, have mutual distraction, they were scattered as soon as they fell on the roof of the motorcar and went down through its walls into the earth. It could not penetrate them inside the motor and the person remained completely safe. This experiment ensures that in modern metal-covered buildings with a very deep foundation, the person seated is very safe from the lightning. If such buildings, or buildings with lightning, cannot be found, shelter should be taken in a huge building which is very wide. At the time of a storm of lightning, fire places, stoves and other conductors of electricity should keep themselves as far away as possible. Those outside should never live on the top of the hills, on piles of straw, etc., under solitary trees, near flag poles, or near any metallurgical object, nor should anything made of metal should remain in hand. In the mountains, it is absolutely safe to live under dense forests or a sloping hill.

Lightning Arrester : It is a system in which it has a special quality to reduce the potential charged immediately. It also prevents the increase in the intensity of the stream flowing from within. It usually has an internal arrangement which is associated with a resistor in the hierarchy. Its

resistance decreases with the increase in the value of the electric flow flowing in it. The function of the gap device is that it separates the nonlinear resistor from the power path (A.C. power circuit of the alternating current). Both of them are exposed only when a high potential is produced which also makes the air of the gap a conductor. Thus, the lightning current passes through the arrester without damaging the power circuit of the alternating current.

Q.26 Elaborate road accidents and rail accidents in detail.

Ans. Road Accidents : The rapid expansion of road transport has brought with it the challenge of addressing adverse factors such as the increase in road accidents. Road accidents are a human tragedy. It involves high human suffering and monetary costs in terms of premature deaths, injuries, loss of productivity etc. Most deaths and injuries due to road accidents are invisible to society. They are a hidden epidemic. In India, motor vehicles including two wheelers are growing at a faster rate than the economic and population growth.

Global Status Report on Road Safety (WHO, 2009) has estimated that 1.2 million people die on the world's road every year, and as many as 50 million others are injured. Over 90% of deaths occurred in low income and middle-income countries, which have only 48% of the world's registered vehicles. The problem of road safety is acute in India. In the year 2008 alone, number of road accidents were 4.8 lakh resulting in close to 1.2 lakh deaths and 5.2 lakh injured, many of whom are disabled for rest of their lives. Sadly, many of these victims are economically active young people.

Trends in accidents, injuries, fatalities, motor vehicles and road network: Between 1970 and 2008, the number of accidents quadrupled with more than 7 fold increase in injuries and more than 8 fold increase in fatalities in the backdrop of about 64 fold increase in the number of registered motor vehicles and threefold increase in road network.

Profile of road accidents: The proportion of fatal accidents in the total road accidents has consistently increased since 2001 as reflected in Table 1 and 2. The severity of road accidents measured in terms of persons killed per 100 accidents is observed to have increased from less than 20 in 2001 to 24.7 in 2008.

Table 1 : Number of accidents and Number of Persons Involved 2001 to 2008

Year	Number of Accidents		Number of persons		Accident Severity
	Total	Fatal	killed	Injured	
2001	405637	71219(17.6)	80888	405216	19.9
2002	407497	73650(18.1)	84674	408711	20.8
2003	406726	73589(18.1)	85998	435122	21.1
2004	429910	79357(18.5)	92618	464521	21.5
2005	439255	83491(19.0)	94968	465282	21.6
2006	460920	93917(20.4)	105749	498481	22.9
2007	479216	101161(21.1)	114444	513340	23.8
2008	484704	106591(22.0)	119860	523193	24.7

Figure shows that there is increasing trend in road accidents and death from year 2001 - 2008.

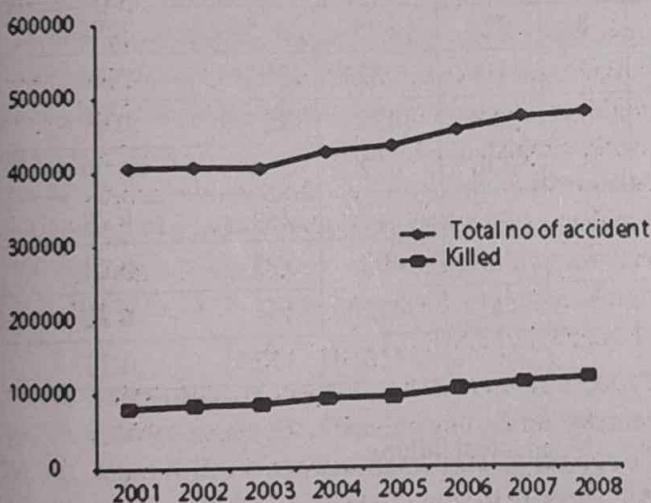


Fig. 1 : Graphic presentation showing number of accidents and person killed (2001-2008)

Road Accidents: Inter State Comparisons:

Maharashtra, TamilNadu and Karnataka which had a share of around 30.4 % in total number of vehicles registered in India in 2006, accounted for about 38% of the total road accidents, 28 % of the total number of persons killed and 35% of the total persons injured in road accidents in year 2008 (Table 1).

Table 2 : All India share of select states (In %) : Road Accidents and Registered Motor Vehicles

State/UT	2005	2006	2007	2008
Top 5 states: Share in Total Number of Road Accidents (in %)				
Share of 5 States	54.4	55.4	55.4	55.4
1. Maharashtra	16.5	16.4	15.4	15.6
2. Tamilnadu	12.3	12	12.3	12.5
3. Karnataka	9.2	9.4	9.7	9.5
4. Madhya Pradesh	8	8.3	8.8	9
5. Andhra Pradesh	8.5	9.5	9.2	8.8
Share of the above 5 states in total Registered Vehicle	43.3	43.6	-	-

Classification of Accidents: National Highways accounted for 29% in total road accidents and 36% in total number of persons killed in 2008. Similarly, State Highways accounted for 26% of total accidents and a share of close to 28 % in the total number of persons killed in road accidents in 2008 (Table 3). Highways permit greater speed resulting in relatively greater number of road accidents and fatalities.

Table 3 : Number of Accidents, persons killed and injured as per road classification (2008)

Road Classification	National Highways	State Highways	Other Roads
No. of Accidents	137995(28.47)	123972(25.58)	222737(45.95)
No. of persons killed	42670(35.60)	34081(28.43)	43109(35.97)
No. of persons injured	149693(28.61)	143708(27.47)	229792(43.92)

Figure 2 shows that, there is increased percentage of accidents in other roads than the national state highways and figure 3 shows that there is loss of life similar to other road and national highways but less life loss in state highways.

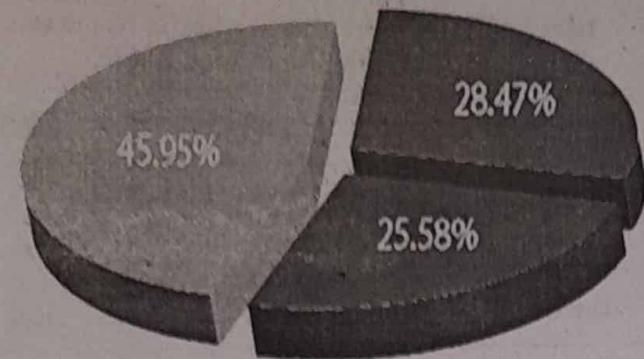


Fig. 2 : No. of Accident as per road classification in 2008

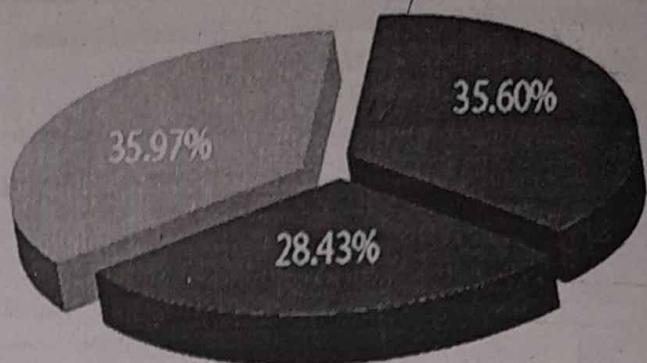


Fig. 3 : No. of Person killed as per road classification in 2008

Rail Accidents : Based on the definition of the Disaster Management Act 2005, Ministry of Railways has adopted the following definition on 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, due to natural or human-made causes, that may lead to loss of many lives and /or grievous injuries to a large number of people, and/or severe disruption of traffic etc. necessitating large scale help from other government/non-government and private organizations."

Table : Train Accidents In India between 1999-2009

Year	collisions	Derailments	LC accidents	fire	Misc	Death	Injured	Total	Acct./ MT Km
1999-00	20	329	93	21	-	616	1121	463	0.65
2000-01	20	350	84	17	2	216	488	473	0.65
2001-02	30	280	88	9	8	326	808	415	0.55
2002-03	16	218	96	14	7	418	982	351	0.44
2003-04	9	202	95	14	5	294	492	325	0.41
2004-05	13	138	70	10	3	236	412	234	0.29
2005-06	9	131	75	15	4	315	627	234	0.28
2006-07	8	96	79	4	8	208	402	195	0.23
2007-08	8	100	77	5	4	186	412	194	0.22
2008-09	13	85	69	3	7	207	416	177	0.20

Top 10 Causes of Train and Railroad Accidents :

There are a variety of reasons why train accidents occur most of which take place at crossings when cars try to "beat" the train. When these accidents occur, they often involve the passengers, driver, and some passersby.

While every case is unique, the most common causes of train accidents include:

- Negligence
- Human error
- Reckless pedestrians and drivers

- Mechanical failure
- Speedy trains
- Defective tracks
- Derailments
- Unprotected railroad crossings
- Stalled cars on the track
- Suicides

1. Negligence : Railroad accidents due to negligence can be blamed on different groups. Some may be the fault of the railway company itself, whereas others are because

A conductor or railroad employee was negligent. Some accidents are even caused by the neglect of a government agency. Or perhaps an equipment manufacturer can be a reason why the accident happened.

One example of railway negligence is when a crossing arm is operated incorrectly. Another careless mistake is if the operator forgot or failed to turn on the signal light, which should have provided adequate warning.

A common factor that contributes to this problem is the decades old, outdated technology still frequently used for railways and trains today. Better technology is available to improve railway safety, but adopting these features is often put on hold because it involves a hefty investment.

For example, all Class I main lines that handle either hazardous materials or passenger trains (or both) were required by Congress to implement a system of train control technology called Positive Train Control (PTC) by the end of 2018. PTC aims to prevent many different types of train accidents such as collisions between trains, grade crossing accidents, and train derailments due to high speeds. However, an estimated two-thirds of U.S. commuter railroads failed to meet the deadline, and PTC is only in operation on 45% of tracks owned by freight railroads and 24% of tracks owned by passenger railways.

2. Human Error : If the conductor is inexperienced, train accidents can easily happen. Even those who have been working in the railroad industry for quite some time may make a mistake that harms other people, including passengers. Another growing problem with both experienced and new conductors is fatigue. They cannot operate the train safely if they're exhausted, yet they do so anyway due to pressure they face from their supervisors and company.

Human error has always been one of the most common reasons for any accident. From poor judgment to vision issues to impaired reactions, these factors can (and do) contribute to train disasters.

3. Reckless Pedestrians and Drivers : Train accidents aren't always the fault of the train operator or company. Sometimes, a reckless or distracted pedestrian can cause a collision by standing on or crossing the tracks at the wrong time. In other scenarios, the driver of a car, truck, motorcycle or other motor vehicle can cause an accident by leaving their vehicle parked on a train track or trying to beat the train across a crossing.

4. Mechanical Failure : The train operator, railway employees and the company itself can do everything within their ability to follow all the required safety procedures, but a train accident can still happen. Mechanical failure and defective parts are more rare than other common causes of train collisions, but they do occasionally happen.

Trains are large machines with complex systems and many moving parts. All of the different systems must work together perfectly to provide locomotive and electric power. If some piece of guidance equipment (such as a rail switch) or safety equipment (such as a rail signal) fails, it can cause a deadly accident.

5. Speedy Trains : Time and again, car accident data proves that driving recklessly fast can lead to serious injuries and deaths. Trains are no exception. Many train accidents in recent years showed that the faster the train, the worse the consequences become in the event of a crash and the higher likelihood of derailment.

6. Defective Tracks : Obstruction is a common issue with the tracks and can cause train derailment. Foreign objects left inadvertently at the site where the train will pass can be deadly. Conductors should be aware of their surroundings at all times to manage a potentially dangerous situation quickly and safely. However, in some cases, a conductor fails to see these obstacles at all or in time to stop a collision.

7. Derailments : A derailment is when a train runs off its rail, either because of a collision with another object, a conductor error, mechanical track failure, broken rails, or defective wheels. A derailment doesn't necessarily mean the train leaves the tracks – some may be minor. However, a serious derailment can be catastrophic if it occurs while the train is moving at a high rate of speed.

8. Unprotected railroad crossings : More than 80 percent of crossings lack adequate warning devices such as lights and gates, and more than half of all railroad accidents occur at unprotected crossings. Tennessee residents know well that there are many unprotected railroad crossings across the state. Accidents at unprotected railroad crossings are most often caused by:

- Poor visibility
- Driver distraction
- Driver inebriation/intoxication
- Driver trying to race the train

- Malfunctioning signals
- Obstacles that block a driver's view
- Conductor failing to sound an alarm

9. Stalled cars on the track : Cars rarely get stuck on railroad grade crossings. More common is when drivers stall out when slowing down to cross bumpy grades due to a poorly tuned engine. If this happens to you, first you try to start it again immediately. If it won't start, put your vehicle in neutral and ask for help to push your vehicle off the tracks. But if a train is rapidly approaching and there's no time to save your car, remember that your life and safety are first priority. Get as far from your vehicle as possible.

10. Suicides : Sadly, some people choose to take their own lives by standing on the tracks or jumping in front of a train. Federal statistics show that 266 people killed themselves by stepping in front of trains in 2017. Unfortunately, this tragic and desperate act also endangers other lives such as train crews, emergency responders, passengers and bystanders.

Train Accident Liability : The details of a train accident must be analyzed thoroughly in order to determine fault and proper compensation. In the Department of Transportation Act of 1966, the Federal Railroad Administration is bestowed with the authority (and responsibility) to oversee and promote railway safety regulations.

Railroad companies and commuter rail lines have a legal obligation to maintain the highest level of safety for all passengers. Also, they are required to install a black box on all locomotives – a device that records information that may be very necessary to review in the event of an accident.

While the railway is responsible for safety, they may not always live up what they're supposed to do. However, it's not always the fault of the railway or conductor. There can be many factors involved in personal injury cases arising from a serious or deadly train accident, which is why it is vital to hire an attorney that is highly knowledgeable in railroad accident litigation.

Train Accident Prevention and Railway Safety : To achieve safety for railroads and railways, companies are obliged to perform everything they can to ensure the protection of the passengers, operators, pedestrians, and the public.

When a train wreck happens, the black box should be recovered right away as it will give details of what led to the accident, such as the speed and direction of the train. The black box is essential in proving whether or not there was negligence on the part of the railway.

Fortunately, everyone's safety is more important than ever for the railroad industry. Operators go through rigorous training and only those who meet strict requirements can be accepted. State inspectors also work with the FRA to make sure all the railroad tracks and facilities across the country are safe and updated according to safety regulations.

While our experienced railroad accident lawyers can help guide you through the legal process of obtaining compensation for serious personal injury or the death of a loved one, it's obviously best to avoid the need for an attorney in the first place.

Here are tips on how to prevent a train accident from occurring:

- Always assume a track is in use.
- Never stop on a railroad track.
- Never enter a train tunnel or cross a trestle where you can get trapped without escape if a train enters.
- Never drive around lowered gates. (If it appears the gate is stuck, find another route or call the 1-800 number that's located at the crossing.)
- Never walk down or play on a train track.
- Never try to race or beat a train.
- Always look both ways before crossing a track.
- Understand that trains are wider than the track they're on.
- (For truck drivers) Lift your trailer jacks in the up position so that your truck doesn't get stuck on track.
- Realize it can take a train traveling 55 mph up to a mile to come to a complete stop.



HAZARD ASSESSMENT

Excellence
Quality
2

IMPORTANT QUESTIONS

PART-A

Q.1 What is capacity assessment?

Ans. Capacity Assessment : Capacity Assessment focuses on identifying locally available assets and resources that can be utilized for building the capacities of the community during and after disasters.

Q.2 What is the aim of disaster management?

Ans. 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.

Q.3 Define risk identification in brief.

Ans. Risk Identification: This includes activities like hazard data collection and mapping to determine the frequency, magnitude and location of any hazard event, vulnerability assessment of the populations and the assets exposed and risk assessment to determine the probability of expected losses.

PART-B

Q.4 Explain hazard assessment in detail. Also explain tools for hazard analysis.

Ans. Hazard assessment: A hazard is measured and defined by its nature (type of hazard), location and extent, scope and intensity (damage potential) and its probability of occurrence, duration and frequency (repetition cycles). Hazard analysis refers to prioritizing disasters based on its frequency and analysis of the estimated losses. This can be carried out by taking the help of elderly people of the village. The community can analyze the losses that they had incurred during various disasters and learn the best practices carried out. This is an important activity as it forms the basis for preparedness and mitigation plans.

The community can be asked to *review and analyze* the occurrence of past disasters and hazards. Group discussions along with the elderly population, teachers and children can be held focusing on the disasters and hazards faced by the community for the past one year to past fifteen years, kind and nature of disasters and hazards faced, experience in the last hazard faced, warning issued, damage caused, response to the disaster, relief and rehabilitation process, traditional methods of coping of the community, gaps in management of the hazard, lessons learnt. It can be useful in understanding the nature, intensity and behavior of the past disasters and hazards.

The elderly population can share vital information and experience about the past while the presence of children in the *group discussion* can ensure that the experience is passed on to the next generation. The community can identify both natural as well as human made hazards to which their area is prone to. Natural hazards may include floods, drought, earthquake, cyclone, sandstorm, cloudburst etc. Human made hazards for the community may include industrial and chemical accidents, road and railway accidents, fire, epidemic, building collapse, communal/caste violence etc.

Tools for Hazard Analysis : Some of the tools that can be used for hazard analysis are as follows:

- (1) **Hazard Mapping:** It is a visual representation of the village by the community. It is a rough spatial overview and sketch of the area and specific locations, which are vulnerable to various hazards. The main feature of hazard mapping is to facilitate discussion on issues pertinent to hazards. It is made by men and women, who know the area and are willing to share their experiences on large sheets.
- (2) **Historical Profile or Timeline:** This tool is used to gather information about what happened in the past. It helps in getting an insight in past hazards, changes in their nature, intensity and behavior. It

helps to understand the present situation in the community and establish the link between hazards and vulnerabilities. The community may also become aware of the changes that have taken place over the past through historical profile or timeline.

- (3) **Seasonal Calendar:** It involves making a calendar showing different events primarily the time of occurrence of hazards throughout the annual cycle. It helps to identify the periods of stress and prepare for the specific stress in normal times before the threat of hazard looms large on the community. The facilitator can arrange sessions for the community members focusing on the issue.

Hazard	J	F	M	A	M	J	J	A	S	O	N	D
Flood												
Drought												
Epidemic												
Any other												

- (4) **Hazard Matrix :** This tool aims at gathering comprehensive information about the past hazards. It helps in having an insight about the future hazards on the basis of gaps and lacunae in the management of past hazards and disasters.

Hazard	Intensity	Early Warning Given or not	Warning Sign	Speed of onset	Frequency	Time	Duration	Impact
Flood								
Earthquake								
Drought								
Industrial Hazard								
Epidemic								
Any other								

Q.5 Explain vulnerability assessment in detail.

Ans. VCA is very crucial for disaster preparedness and mitigation measures as it gives an insight about the means people employ to cope and this is the firmest basis on

which we can build appropriate and cost-effective actions for preparedness and mitigation. Finally, and very importantly, the process of a VCA, if properly conducted, confers advantages to vulnerable people in terms of raising public awareness, sensitizes a community and empowers

them by giving the community knowledge of risks and capacities.

A vulnerability and capacity assessment should be an ongoing process which must address risk and those long term factors which make people more vulnerable to a hazard. It can be carried out at "pre-disaster" stage as a technique of disaster preparedness and made an integral element in the wider process of risk assessment. The process of vulnerability assessment would involve asking the community two major questions namely;

- (1) Who is vulnerable?
- (2) What is vulnerable?

The community would be asked to identify the more vulnerable population, identify the location of women, (pregnant, lactating, widows, single), children, old aged, physically challenged, mentally challenged, those dependent on life support systems and medicines, poor people living by the sea or kutch houses, livestock and cattle etc. The community would also be asked to identify the vulnerable infrastructure like buildings, low lying areas, areas near the water bodies such as the sea and river and direction of wind, livelihood assets such as boats and nets, documents, weak structures, drinking water resources, communication lines, roads, telephone lines etc.

Tools for Vulnerability Assessment : The various tools for vulnerability analysis are as follows:

- (1) **Transect Walk:** The process involves taking a systematic Walk with key informants through the community to explore spatial differences, land use zones by observing, asking, listening, informal interviews and producing a transect diagram.
- (2) **Problem Tree:** The tool involves drawing a tree which shows relations' up between different aspects of vulnerability. It involves identifying major problems and vulnerabilities as well as root causes and their effects. The trunk represents the problems, the root depict the causes while the leaves signify the effects.
- (3) **Livelihood Analysis:** The tool focuses on the studying the vulnerability of the livelihood of the community to various disasters. The tool analyzes

the various livelihood activities that are spread over the year and the impact of hazards on the livelihood activities. It also focuses on understanding livelihood strategies, behavior, decisions and perceptions of risk, capacities and vulnerabilities from different socio-economic background.

- (4) **Vulnerability Assessment:** The vulnerability assessment would focus on the vulnerable community and the vulnerable infrastructure. It assesses and maps the more vulnerable population and the assets of the community.

More Vulnerable Population
• Women
• Elderly
• Children
• Physically handicapped
• Mentally challenged
• Dependent on life support systems, medicines
• Poor people living by the sea, kutch houses etc.

Vulnerable Infrastructure
• Kutch houses
• Low lying areas
• Livelihood assets such as boats, nets,etc.
• Documents
• Houses and weak structure
• Crops and horticulture
• Drinking water resource
• Communication lines, road, telephone lines

Q.6 Explain capacity assessment in detail and also explain tools for capacity assessment.

Ans. Capacity Assessment focuses on identifying locally available assets and resources that can be utilized for building the capacities of the community during and after disasters. The local community has a lot of inbuilt strength and capacity for handling the disasters'. It is important to capture the capacity and strength of the community in resource analysis. Apart from infrastructure and funds, it could be individuals with specific skills, local institutions and people's knowledge as all these have the capacity to create awareness and bring about changes in the community.

Capacity Assessment, is therefore, not limited to a map depicting the available resources but also plotting of

the distribution, access and its use by taking into consideration prevailing sensitiveness within the community. Thus, assessment of resources would involve two components:

(1) Human Resource Assessment

(2) Material Resource Assessment

The process would involve identifying safe houses and buildings for shelter, strong buildings, elevated uplands and structures, safe evacuation routes, health, medical and sanitation facilities, swimmers, doctors, nurses, sources of funds to carry out preparedness activities, volunteers for task force etc.

Tool for Capacity Assessment : One of the tools that can be used for capacity assessment is as follows:

(1) Social and Institutional Analysis: The tool focuses on identifying various government, non-government and private organizations working in the field of disaster management in the local as well as neighboring area. Various other aspects can also be studied such as the role played by the institutions, their area of interest, their importance in the management of disasters, capabilities of such institutions and the perceptions people have about them.

List or organization	Ranking	Scope	Interest	Capability
Government				
Non-government				
Private				

Q.7 What is risk assessment? Also explain risk identification, mitigation, transfer and tools for risk assessment.

Ans. Risk assessment: Risk assessment is necessary so as to determine the nature and extent of risk by analyzing potential hazards and evaluating existing conditions of vulnerability that could pose a potential threat or harm to people, property, livelihoods and the environment on which they depend. A risk assessment provides the factual basis for activities proposed in any strategy to reduce losses from identified hazards.

Local risk assessments must provide sufficient information to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards. Risk assessment is a necessary first step for any serious consideration of disaster reduction strategies. Its relevance for planning and development of disaster risk reduction strategies was explicitly addressed during the International Decade for Natural Disaster Reduction.

Risk Identification : Refer to Q.3.

Risk Reduction/Mitigation: Consists of measures taken to reduce the physical, social and environmental vulnerability and have been achieved through a number of ongoing schemes on resource conservation and management like Integrated Wasteland Development Program (IWDP), Drought Prone Area Program (DPP), Flood Control Programs, National A-forestation and Eco Development Program (NA and ED), Accelerated Rural Water Supply Program (ARWSP), Crop Insurance and Mahatma Gandhi National Rural Employment Guarantee Yojana (MGNREGY) etc. Mitigation measures may include structural and non-structural measures like construction of cyclone/temporary shelters, plantation of mangroves and coastal forests along the coast line as these falls under the non-structural mitigation measures, construction of location specific sea walls and coral reefs in consultation with experts, development of break waters along the coast to provide necessary cushion against cyclone and tsunami hazards; development of tsunami, cyclone detection, forecasting and warning dissemination centers etc.

Risk Transfer: Policies that govern the relief expenditure are based on the recommendations of successive financial commissions. The Calamity Relief Fund (CRF) and the

National Calamity Contingency Fund (NCCF) were two main sources for meeting the relief expenses. Added to these are funds from international or multilateral donor agencies like World Bank, USAID and International and National/ Local NGOs for relief and rehabilitation measures apart from government policies on risk insurance and micro-finance and micro-credit schemes.

Early Warning and Forecasting: There are two distinct types of tsunami warning system - The International tsunami warning systems and Regional warning systems to detect hazards like cyclones and tsunamis and to issue warning to reduce the loss of life and property.

Tool for Risk Assessment : One of the tools that can be used for risk analysis is as follows:

Risk Analysis: The tool is based on determining the risk by analyzing the vulnerabilities and capacities of the community related to each hazard. On the basis of analysis, the risk is determined for a particular hazard in a ranking order. While conducting the risk assessment one should keep the following points in mind:

- Determine the risk by ranking
- Ask the community about the hazard which poses the highest risk.
- Explore the reasons due to which a particular hazard poses the risk

ELEMENTS OF RISK

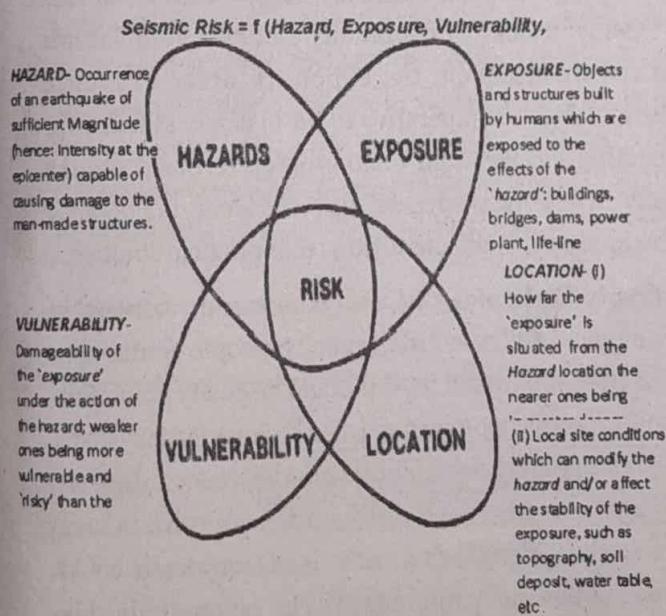


Fig.

Q.8 Describe vulnerability to flood disaster in detail.

Ans. Observation of flood vulnerability : A number of methodological tools are available to study the possible effects of flooding. The techniques applied depend upon the scale of the problem being analysed. For small areas, where detailed maps are available at reasonable costs, quantitative methods are applied. At a small scale, floodplain hydraulic analysis can be carried out through one or two-dimensional modeling of the movement of water. Many such numerical schemes are available for objective assessment of flood impact over an area (Horlick et al., 1995).

Flood hazard affects people as per vulnerability patterns generated by their socio-economic conditions. Class relations and structures of domination are crucial in determining the degree of vulnerability to floods. Ethnic divisions are often superimposed on class patterns to create differential vulnerabilities of groups/segments of population. In some situations where some distinction are adhered more staunchly, become the dominant factor in possession of resources or other forms of "capability deprivation" (Sen, 1990) such as inequalities in access to livelihood opportunities, according to imposed racial or ethnic distinctions. For example, the impact of exceptional flooding around Alice Springs in Central Australia in 1985 was felt more by the 'Aborigines' people, who did not receive any flood warning and who inhabited vulnerable areas in low-lying lands. The radio broadcast that alerted the white people was not on channels, which were customarily used by the 'Aborigines'.

Factors such as the location of houses (and their proneness to inundation) and the structure and type of housing and situation and condition of/at the workplace determine losses due to flood hazards (and their resistance to floods). Both of these are a function of household income, legal or social limitations on land use, availability or cost of building materials and the location of livelihood activities. The daily and yearly pattern of work and other activities interact with the periodicity/ timing of flood occurrence to create losses. These, in turn, interact with the temporal pattern of flood hazard occurrence. This

variability not only affects the risk of death and injury but also the risk of destruction of assets and livelihood "capability". The most vulnerable landscape setting (physical vulnerability) for floods is :

- 1. Low Lying Parts of Active Floodplains and River Estuaries:** The area of Ganga, Brahmaputra and Meghna Basin in India extends over more than 1,750,000 km sq. In an average year it receives about four times the annual rainfall of the Mississippi Basin in USA. In estuarine areas there may be a combined threat from river floods and high tides as in the case of the Thames, in London, England.
- 2. Small Basins Subject to Flash Floods:** Flash floods are found mainly in arid and semi arid zones where there is a combination of steep topography, little vegetation and high intensity short duration convective rain forms. They can also occur in narrow valleys and heavily developed urban settings. For example, the city of Kuala Lumpur is situated at the foot of a relatively steep fan shaped basin, which has almost perfect hydrological conditions for flash floods (Sehmi, 1989).
- 3. Area below Unsafe or Inadequate Dams:** Structurally unsafe dams are hazardous to people living in its vicinity. If the foundation is weak people may die of flash floods or even due to the structure giving in even structurally sound dams may be over topped by surges of water induced by earth movements.
- 4. Low Lying Inland Shorelines:** Inland shoreline facilities are vulnerable to floods due to rising lake levels. This happens mostly after rains. Erosion of barrier islands and dunes or bluffs removes any natural protection from wind driven wave attack, which is responsible for damage to buildings and other immovable property.
- 5. Alluvial Fan Areas:** Such areas as in Western America, though generally dry, can be affected by high velocity winds highly charged with sediments capable of destroying built structures. There is absence of well-defined surface watercourses and the likely damage in case of floods is quite high.

Q.9 Describe dimensions of vulnerabilities in detail.

Ans. Vulnerability dimensions: Concerned by the increasing number and the impact of disasters, the International Decade for Natural Disaster Reduction (IDNDR) was initiated in 1990 to enforce the agenda for disaster reduction. One of its major goals was to reduce vulnerability to natural disasters, "requiring concerted and coordinated efforts of government, UN-system organizations, the world's scientific and technical community, volunteer organizations and educational institutions, the private sector, the media and individuals at risk. Vulnerability assessment is essential" (United Nations, IDNDR, 1992).

The international community was alerted to the fact that if disasters have to be controlled and prevented, vulnerabilities should be assessed and identified in order to design, timely, affordable and effective strategies for reducing the negative effects of disasters (Anderson, 1995). Most of the agencies further recognize that vulnerability is a bigger concern for the poor and that the most vulnerable sectors in society need special attention. Three different views have been identified to address vulnerability:

(1) Natural Causation : This view blames nature and natural hazards as the cause of the peoples' vulnerability, which changes as per the intensity, magnitude, and duration of external shocks. Vulnerability emerges from hazards and risks consequent thereupon. In order to reduce vulnerability, it is imperative to put in place, systems for predicting hazards and technologies to make human structures withstand adverse impacts. Hence, the reliance in this approach is on scientific a technological solution.

(2) Costly Technology : Despite enormous increase in technological and scientific capacity, people continue to suffer. The main reason for this could be costly prediction and mitigation technologies and also because these systems are inappropriately used. Public administrators, disaster management professionals and economists are continuously working to find methods whereby losses could be reduced and risks minimized. The emphasis in this approach is on economic and financial solutions to minimize

costs. This calls for proper vulnerability reduction measures with the active participation of the concerned communities as an essential prerequisite for user-friendly application of technology and development of indigenous low-cost options.

(3) Societal Structures as Cause : This view observes that disasters have differential impacts on people who live in hazard-prone areas. It is not only exposure to hazards that puts the people at risk, but also socio-economic and political processes in society that generate vulnerability as per advantageous/disadvantageous social positioning.

These create the conditions that adversely affect the ability of communities or countries to respond, to cope with or, recover from the damaging effects of the disaster events. These conditions precede the disaster event, contribute to its severity and might continue to exist long afterwards (Anderson, 1989). "Reducing the vulnerability of the poor is a development question and such a question must be answered politically" (Cuny, 1983). The long-term solution lies in transforming the social and political structures that breed poverty and the social dynamics and attitudes that serve to perpetuate it. However, it does not appear to be an easy solution.

The three views, mentioned above, are not independent rather, mutually reinforcing. Invariably, there is more than one view to be considered by policy formulators and executors. Vulnerability is a result of both external dynamics and lack of capacity to resist. It is often felt that the poor are affected by the critical trends, shocks and seasonal problems, which lie far beyond their control. For lasting solutions, there is need for well thought out, detailed disaster mitigation strategy, preparedness planning, risk identification, sharing and transfer, etc.

PART-C

Q.10 Explain concept of risk in detail.

Ans. In general terms, the word Risk means an apprehension or a threat of something untoward happening. In the words of James Neill, the concept of

"risk" usually refers to the probability of loss of a 'valued resource'. The word risk is one of the most notable examples of a word with multiple usages in that a risk may refer to a chance or a probability ("risk of exposure"), a consequence or impact ("the risk from smoking"), or a perilous situation ("a hazardous waste plant creates a risk").

Interpretations of the word "risk" have evolved linguistically on the basis of involuntary or voluntary events. For example, "danger" is often used to describe an involuntary event, whereas "peril" may be used to describe a voluntary event. Despite the widespread use of the word, no single definition can claim to be universal, and there is little likelihood of a common understanding developing without some conscious effort at establishing a consensus. From general usage, the term risk has come to be applied more specifically, in that the nature of 'risk' differs with the type of activity under consideration.

Usage of the word "risk" in the context of health and environmental risks integrates two ideas; firstly, that the situation being discussed has the potential for detrimental consequences and secondly that there is some improbability associated with the circumstances. There is uncertainty whether a hazardous event will occur, when or where it will occur; who or what will be affected and the magnitude of the consequences. "Risk", in this sense, includes both the possibility and the character of the detrimental event.

A statement of risk based solely on one aspect of risk, such as the probability of occurrence, has been referred to as a single dimensional risk. Financial or insurance risks are primarily single dimensional risks as are statements on health risks that are restricted to the chance of occurrence (Hamilton and Viscusi, 1999).

In the specific context of disaster management, risk implies application of specialist knowledge on the part of professionals to forewarn of disasters accurately and anticipate the risks involved in citing, land use management and project planning decisions in hazard prone areas so as to prevent/reduce impact of impending disaster(s).

Thus, in disaster terminology, Risk is defined as "The likelihood of a specified undesired event occurring within

a specified period or in specified circumstances. It may be a frequency or a probability. Often it is expressed in mathematical terms as:

$$\text{Risk} = f(\text{frequency or probability, consequence})$$

Frequency is usually expressed as events per year and probability is a number between 0 and 1. Consequence is usually measured in terms of either money or fatalities. If we constrain ourselves to consider consequence in terms of a single fatality then risk becomes a function of frequency or probability since consequence is a constant (Skelton, 1997).

Understanding risk involves, not deliberating upon the meaning of risk but rather on the way the risk defines a particular situation (in terms of events apprehended and the mitigation measures required) {Jacobs}. Accordingly, the understanding of risk in disaster management literature has gradually become more precise in that phenomena that were previously referred casually as hazards, dangers, or uncertainties are now specifically articulated in terms of 'risks'.

This implies understanding the precise differentiation between the related concepts of hazard, risk, disaster, vulnerability and the processes of disaster management based on these concepts viz. risk assessment/risk analysis, hazard assessment and vulnerability analysis/assessment. As clarified in the first unit, such terminological exactitude is necessitated by the practical concern of conveying to the policy makers in specific terms, the kind and nature of risk(s) involved in a situation(s) or processes to craft specific policy as per needs articulated and also minimize the process of deliberation preceding policy formulation involving questions such as, what is the problem, what exactly needs to be done and how? Though such academic differentiation has been attempted in the previous Unit, the following brief overview would still be necessary/ desirable in the context of this discussion to proceed with a correct analysis and understanding of the concept of 'risk', the 'elements' at risk, leading eventually to deliberating properly on 'risk management.'

- Hazard is a potentially dangerous situation, for example, a chemical plant or population exposed to a flood prone region;

- Disaster is a hazard leading to a catastrophe in response to the stimulus (human induced or natural);
- Vulnerability is the physical, social, economic, cultural/attitudinal predisposition to hazards. These three, taken collectively and studied along with relevant data regarding possible damage or likelihood of repeat occurrence measure the probable damage for a given frequency of hazard and the risk(s) involved. Hence risk is the harm likely from anticipated event, possibly quantified through comparative analysis of data collected over time and scientific simulation studies. Quantification or measurement of risk in disaster management is a complex issue, compared with similar exercises in medical and engineering, simply because events have to be frequent enough to generate adequate data for risk assessment. While minor events like floods can be studied and predicted with relative accuracy, attempting the same in case of large scale catastrophic events which are rare in occurrence (September 11 attacks) or which have probably never yet occurred, (melt down of a nuclear reactor) is quite difficult. Estimating the probability of occurrence, the specific damages involved and the extent of damage likely if risk materializes are estimations carried out as risk assessments. In disasters like war, information is an early casualty.

Understanding risk involves the governance function of risk management. Risk management means reducing the threats posed by known hazards, whilst simultaneously accepting unmanageable risks and maximizing any related benefits. Thus, understanding and managing risks can easily achieve risk mitigation.

Q.11 What is disaster management cycle? Explain stages of disaster management cycle and disaster management activity in detail.

Ans. Disaster Management Cycle : 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, in particular humanitarian organizations become involved in the immediate response and long-term recovery phases. The four disaster management phases illustrated here does not always or even generally, occurs 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.

- Sustainable Development:** Developmental considerations contribute to all aspects of the disaster management cycle. One of the main goals of disaster management and one of its strongest links with development, is the promotion of sustainable livelihoods and their protection and recovery during disasters and emergencies. Where this goal is achieved, people have a greater capacity to deal with disasters and their recovery is more rapid and long lasting. In a development-oriented disaster management approach, the objectives are to reduce hazards, prevent disasters, and prepare for emergencies. Therefore, developmental considerations are strongly represented in the mitigation and preparedness phases of the disaster management cycle. Inappropriate development

processes can lead to increased vulnerability to disasters and loss of preparedness for emergency situations.

- **Humanitarian Action:** During a disaster, humanitarian agencies are often called upon to deal with immediate response and recovery. To be able to respond effectively, these agencies must have experienced leaders, trained personnel, adequate transport and logistic support, appropriate communications and guidelines for working in emergencies. If the necessary preparations have not been made, the humanitarian agencies will not be able to meet the immediate needs of the people.
- **Response:** The aim of emergency response is to provide immediate assistance to maintain life, improve health and support the morale of the affected population. Such assistance may range from providing specific but limited aid, such as assisting refugees with transport, temporary shelter, and food, to establishing semi-permanent settlement in camps and other locations. It also may involve initial repairs to damaged infrastructure. The focus in the response phase is on meeting the basic needs of the people until more permanent and sustainable solutions can be found. Humanitarian organizations are often strongly present in this phase of the disaster management cycle.
- **Recovery:** As the emergency is brought under control, the affected population is capable of undertaking a growing number of activities aimed at restoring their lives and the infrastructure that supports them. There is no distinct point at which immediate relief changes into recovery and then into long-term sustainable development. There will be many opportunities during the recovery period to enhance prevention and increase preparedness, thus reducing vulnerability. Ideally, there should be a smooth transition from recovery to on-going development.

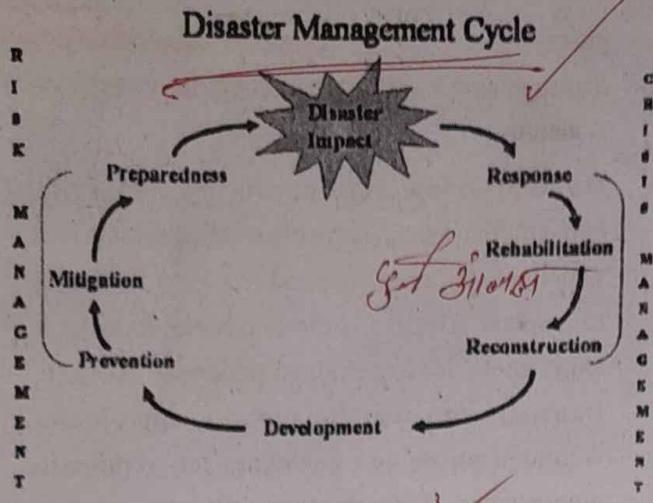


Fig.

Key Phases of Disaster Management : There are three key phases of activity within disaster management:

- 1. Pre – Disaster:** 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. Post Disaster:** After a disaster to achieve rapid and durable recovery which does not reproduce the original vulnerable conditions.

The cycle generally comprises four major stages:

- Disaster Prevention, Preparedness and Mitigation** rest on the principle that prevention is better than cure. This stage or phase involves all the steps necessary for creation of disaster resilient structures and communities.
- Disaster Response and Relief** includes immediate disaster search and rescue operations, provision of food, clothing, and shelter for the affected.
- Disaster Rehabilitation, Reconstruction and Recovery** takes into view the efforts to restore all essential facilities to pre-disaster status. They focus on measures that could pave the way for long-term recovery of social, economic and physical

structures, as well as processes in such a way that future disasters are unable to impact severely and irreversibly.

- **Long-term Development** as the Way Forward focuses on erecting disaster resistant infrastructure and mainstreaming disaster management activities into developmental planning.

Pre – Disaster Phase

Prevention and Mitigation : Reducing the risk of disasters involves activities, which either reduce or modify the scale and intensity of the threat faced or by improving the conditions of elements at risk. Although the term prevention is often used to embrace the wide diversity of measures to protect persons and property its use is not recommended since it is misleading in its implicit suggestion that natural disasters are preventable. The use of the term reduction to describe protective or preventive actions that lessen the scale of impact is therefore preferred. Mitigation embraces 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. In addition to these physical measures, mitigation should also be aimed at reducing the physical, economic and social vulnerability to threats and the underlying causes for this vulnerability. Therefore, mitigation may incorporate addressing issues such as land ownership, tenancy rights, wealth distribution, implementation of earthquake resistant building codes, etc.

Preparedness : This brings us to the all-important issue of disaster preparedness. The process embraces measures that enables governments, communities and individuals to respond rapidly to disaster situations to cope with them effectively. Preparedness includes for example, the formulation of viable emergency plans, the development of warning systems, the maintenance of inventories, public awareness and education and the training of personnel. It may also embrace search and rescue measures as well as evacuation plans for areas that may be at risk from a recurring disaster. All preparedness planning needs to be supported by appropriate rules and regulations with clear allocation of responsibilities and budgetary provision.

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 in harm's way. To be effective, warnings must be related to mass education and training of the population who know what actions they must take when warned.

The Disaster impacts : This refers to the "real-time" event of a hazard occurring and affecting elements at risk. The duration of the event will depend on the type of threat, ground shaking may only occur in a matter of seconds during an earthquake while flooding may take place over a longer sustained period.

During disaster Phase : This refers to the first stage response to any calamity, which include for examples such as setting up control rooms, putting the contingency plan in action, issue warning, action for evacuation, taking people to safer areas, rendering medical aid to the needy etc. Simultaneously rendering relief to the homeless, food, drinking water, clothing etc. to the needy, restoration of communication, disbursement of assistance in cash or kind. The emergency relief activities undertaken during and immediately following a disaster, which includes immediate relief, rescue and the damage needs assessment and debris clearance.

The Post-disaster Phase : Recovery is used to describe the activities that encompass the three overlapping phases of emergency relief, rehabilitation and reconstruction.

Rehabilitation : Rehabilitation includes the provision of temporary public utilities and housing as interim measures to assist long-term recovery.

Reconstruction : Reconstruction attempts to return communities to improved pre-disaster functioning. It includes such as the replacement of buildings; infrastructure and lifeline facilities so that long-term development prospects are enhanced rather than reproducing the same conditions, which made an area or population vulnerable in the first place.

Development : In an evolving economy, the development process is an ongoing activity. Longterm prevention/disaster reduction measures for examples like construction of embankments against flooding, irrigation facilities as drought proofing measures, increasing plant cover to reduce the occurrences of landslides, land use planning, construction of houses capable of withstanding the onslaught of heavy rain/wind speed and shocks of earthquakes are some of the activities that can be taken up as part of the development plan.

Look at the nature of disaster management activity at these stages in detail

Disaster Stage	Nature of Activity
<u>Prevention</u>	Prevention activities aim at totally avoiding the adverse impact of hazards and providing means to minimize environmental, technological and biological disasters. Depending on social and technical feasibility and cost/benefit considerations, investing in preventive measures is justified in areas frequently affected by disasters.
<u>Mitigation</u>	Mitigation means any action taken to minimize the extent of a disaster or potential disaster. Mitigation can take place before, during or after a disaster, but the term is most often used proactively to refer Contract-Expand Approach . This approach assumes that the component or dimensions of disaster management like disaster prevention, mitigation, response and recovery can all be carried out at the same time in a hazard-prone community. However, the relative weighing of each component "contracts" or "expands", depending on the relationship between the hazard and the vulnerability of the community. It believes that disasters occur when a hazard exceeds a community capacity to manage it (i.e., when its vulnerability to the hazard increases) 46 to actions against potential disasters. Mitigation measures are physical and structural both, and also non-structural. Structural measures are measures that can be easily seen or perceived such as strengthening of buildings, disaster-resistant construction, and erection of infrastructure. The non-structural measures are intangible in nature. These cannot be easily quantified, but are very important such as generation of awareness, education and training, adherence to the rules and byelaws.

Prati Jyoti
GATE

Preparedness	Preparedness entails activities and measures taken in advance to ensure effective response to the impact of hazards, including the issuance of timely and effective early warnings, preparation of emergency plans, maintenance of inventories, at-risk planning and temporary evacuation of people and property from threatened locations. It involves measures that enable governments, community and individuals to respond rapidly to disaster situations and effectively cope with them.
Response/Relief	Relief can be of an immediate, short-term, or protracted duration. For example, search and rescue of the affected people and provision of food, temporary shelter and medical care to the persons affected by the disaster are some common areas of intervention after a disaster. Relief involves strategies and ways that can help to reduce the level of suffering and mitigate the distress, so as to bring out the affected people from the shock and trauma of suddenly losing their means of livelihood. Further, the main objective of relief is to assist the affected persons to start their normal activities again.
Rehabilitation	Rehabilitation process includes all operations and decisions taken after a disaster with a view to restoring an affected community to its former living conditions, by encouraging and facilitating the necessary adjustments to the changes caused by the disaster.
Reconstruction	Process of Reconstruction includes the actions taken to re-establish a community, following rehabilitation after a disaster. These actions generally include construction of permanent housing, complete restoration of all services and physical infrastructure to the pre disaster state.
Recovery	Recovery refers to decisions and actions related to rehabilitation and reconstruction taken after a disaster with a view to restoring or improving the pre-disaster living conditions of the affected community. At the same time, encouraging and facilitating necessary adjustments to reduce disaster risk. Recovery activities make use of disaster risk reduction measures to improve the situation in affected areas. The aim is to also develop the areas in a way that vulnerability and risk to disasters are minimized. All development programmes in the area need to be mainstreamed with recovery programmes in order to treat disasters as development opportunities.

Q.12 *Describe the concept of crisis management. what responsibilities will be for relief organization during crisis.?*

Ans. Aims and objects : The Emergency Relief Organization for Crisis Management will be required to :

- (a) Assess the magnitude of the problems arising out of natural calamities in various parts of the State.
- (b) Collect information relating to official agencies that could be deployed for rendering assistance to people affected by these calamities.
- (c) Ascertain the resources available with these agencies for conducting relief operations.
- (d) Co-ordinate the relief activities of the various departments by :
 - (i) evolving an Incident Command System.

(ii) drawing up operational plans in consultation with the related line departments.

(e) Establish liaison between the Central Government and the State Governments.

Classification of Natural Calamities : For the purpose of the scheme, natural calamities have been broadly classified as here under:

- (a) Floods, storms, cyclones, drought, hailstorm.
- (b) Earthquakes, landslides, collapse of buildings, etc.
- (c) Major accidents in railways, docks and mines and at festivals, fairs, other religious and social gatherings.
- (d) Serious fire outbreaks.

Nature of preventive and control measures

- (a) Measures for the prevention and control of natural calamities should as far as possible be devised in

advance of the occurrence of the calamities. In this respect, the experience gathered in the past and data collected over a period of years should afford valuable guidance. The provisions in this regard are laid down in previous chapters.

- (b) The measures to be put into force during the disaster are those intended to mitigate its effects and to administer relief to the people in need.
- (c) The measures to be taken after the disaster will generally be confined to the provision of such rehabilitation assistance as may be immediately necessary to the affected people.

Problems created by natural calamities : It has been observed that the problems created by various types of natural calamities are not similar in all respects, but most of them have certain features in common. Consequently, the relief measures to be undertaken will, to a large extent, conform to a pattern which can be predetermined. For instance, measures, such as :

- (a) Rescue of casualties, repairs to buildings and other structures, and salvage of property, debris clearance, restoration of essential services.
- (b) Removal of those affected to safer areas, traffic control, emergency feeding, sheltering and clothing of the homeless provision of essential supplies and water.
- (c) First-aid and medical attention, emergency sanitation, prevention of epidemics, care of animals, identification and disposal of the dead.
- (d) Prevention of panic, and maintenance of morale would be common to most disasters, like floods, fire, earth-quakes, landslides and large-scale accidents at fairs, festivals and other social and religious gatherings.

Grouping of relief measures : It is proposed that the measures undertaken by the Disaster Management Department should be grouped under the major heads of services. The intention is that proper coordination among each of these services is essential for the purpose of Crisis Management.

Functions of the Department of Disaster Management : The ultimate responsibility for taking preventive and control measures in respect of disasters that could be foreseen will naturally be those of the Government. The Department of Disaster Management will in the circumstances, be concerned with the best and most expeditious manner in which Governmental responsibility for the prevention, regulation and control of the consequences of natural disasters can be discharged and the voluntary assistance of social welfare agencies and of the people at large can be fully and economically harnessed, coordinated and applied to the maximum advantage.

Approach : The Crisis Management is based on the following principles :

- (a) The relief operations should be conducted according to well-laid plans drawn ahead of an emergency and as far as possible, by personnel well-trained in conducting such operations.
- (b) The greatest emphasis should be laid on the principle of self help so that assistance from outside the area immediately affected by a disaster is reduced to the minimum and is not applied for unless there is a real and pressing need.
- (c) Even though disasters may vary in nature and in intensity, certain basic measures of relief will be common to all.
- (d) The district and local authorities and the State Government should take on themselves the responsibility for proper integration of the activities in this respect within their respective areas. For this purpose, it would be necessary to set up advisory committees consisting of their own representatives, and members of the public. Adequate emphasis should be laid on securing the co-operation of the existing social welfare agencies at all stages and kept alive their initiative and enthusiasm for relief work.

Planning for emergency relief at various levels : The success of Crisis Management will depend to a considerable extent on the preparation and implementation of emergency relief plans on proper lines. Those

responsible for the preparation of these plans should, therefore, proceed with the work systematically and ensure that the plans take into account all contingencies and are complete in all respects.

In order to avoid the possibility of any omission, skeleton plans may first be prepared and circulated to the line departments and other concerned with their implementation, inviting their comments with a view to improving these skeleton plans. Alternatively, comprehensive questionnaires, which would bring forth answers that will be helpful in preparing the plans, may be drawn up and circulated to such agencies and thereafter the plans prepared on the basis of the replies received.

It might also be helpful if the plans are divided into parts and responsibility for collecting the necessary information for preparing the part plans, is entrusted to those who have specialized knowledge or previous experience of the particular type of work. For instance,

the functions of the Crisis Management are conveniently grouped under :

- (i) Organization and Training services.
- (ii) Relief Operations and other ancillary services.

These services can be further subdivided into medical and public health services, rescue service, welfare service, etc. The task of the planning authority at the State and District levels will no doubt be made easier if, for instance, the portions relating to medical and public health services in the State plans and District plans are prepared under the supervision of the Secretary to the Health and Family Welfare Department and the Chief Medical Officer of Health respectively. These authorities have the necessary specialized knowledge and experience and, therefore, are in the best position to draw up the plans. The plans, when thus prepared in parts, may then be put together by the planning authority.



3

CAPACITY BUILDING

IMPORTANT QUESTIONS

PART-A

Q.1 What do you understand by capacity building for disaster risk management?

Ans. Capacity building for disaster risk management professionals/emergency responders :

Programme	Description	Duration
Introduction to heritage concerns and issues	This module introduces the specific concerns and scope of cultural heritage and challenges of disaster risk reduction involved in it.	2-3 days
Disaster risk management for cultural heritage sites and precincts	This type of course will provide interdisciplinary training for participants to equip them to undertake integrated disaster risk assessments of cultural heritage, build comprehensive systems for disaster risk management incorporating various measures aimed at reducing risks, respond to disaster and recovering from them to be able to formulate disaster risk management plans for cultural heritage sites and precincts.	1-2 weeks

Emergency response and stabilisation	This module will train emergency responders in the appropriate emergency response procedures applicable for cultural heritage sites and precincts.	3 days to 1 week
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Q.2 What is counter disaster plan?

Ans. Counter Disaster Plan (CDP) : It is a plan that outlines all the mitigating and possible courses of action not only when a disaster occurs but as well as when preparing for possible disasters so that its effect would not be immense.

PART-B

Q.3 What is the central objective of capacity building? Explain capacity building for disaster risk management.

Ans. Central Objective for Capacity Building : Training, capacity building and raising awareness are central aspects of disaster risk management and must be undertaken at multiple scales. With respect to cultural heritage sites and precincts, due to the diversity of stakeholders that are involved, programmes must be developed between agencies and institutions targeted towards different action areas within disaster risk

management. Furthermore, these programmes must be part of a recurring cycle, to ensure continuous upgradation of disaster risk preparedness and ensuring that the continuity of response protocols is maintained. Training and capacity building should be designed with the following central objectives:

- Highlight the need for holistic approach towards disaster risk management that responds to the specific needs of cultural heritage sites and precincts.
- Enable site managers and site staff to carry out basic risk assessment for their sites independently and build systems for management, through risk reduction measures, emergency response protocols and recovery processes.
- Stakeholders including site managers and local communities should be equipped to implement, monitor and update disaster risk management plans in their assigned capacity.
- Networks between different agencies responsible for the management and administration of cultural heritage sites and precincts should be established to build institutional capacity and co-operation.
- Highlight specific issues that deal with a hazard that emerges due to specific geographical and cultural context.

The mandate for training and capacity building for disaster risk management is primarily with the National Institute for Disaster Management (NIDM). However, State Institutes for Disaster Management as well as SDMA/DDMAs should carry out training at their levels.

The following steps should be undertaken prior to personnel training in the form of drills or longer programmes:

1. Undertake risk analysis and risk prioritization and assess existing capacities of the staff.
2. Identify each of the critical functions of staff and design emergency team and structure.
3. Develop standards and protocols for preparedness and response.

4. Identify external resources and partnerships needed to carry out specific drills and exercises.
5. Prepare draft disaster plan and use it as a test for undertaking drills and simulations and update the plan based on the response.
6. Additionally, training and awareness building activities should be undertaken based on specific hazard typologies and specific risks that a site may face.

Capacity Building for Disaster Risk Management : Refer to Q.1.

Q.4 What is counter disaster plan? Explain elements and characteristics of counter disaster plan (CDP).

Ans. Counter Disaster Plan (CDP) : Refer to Q.2.

Significance of CDP in DM : The purpose of planning is to anticipate future situations and requirements, thus, ensuring the application of effective and coordinated counter-measures. This is a useful suggestion to disaster management officials because it indicates the wide nature of requirements for counter-disaster planning. In other words, planning should not be confined merely to preparedness for and response to specific disaster events; it should cater, as far as possible, to the whole scope of the disaster management cycle.

Elements of CDP

1. Introduction

- a. **Rationale :** This is the “why” of the plan. It states the reason why the plan is drafted and the circumstances surrounding the drafting of the Plan.
- b. **Scope :** States the size of the problem/threat, probable effects to people and the environment.
- c. **Assumption :** This is an important step which serves as a background to guide the planning effort. This is resorted to if the situation changes later where there exists the need to revise the plan. Examples of planning assumptions are: (Earthquake)

- Earthquakes may occur without warning and at the time of day that will produce a maximum number of casualties. Access to and from the damaged area may be severely disrupted or destroyed.
 - Damage resulting from a catastrophic earthquake will be widespread. Seismic-caused ground motions will vary within a geographical region and so will resulting damage. Complete facility shutdown may be required for some period of time. Personnel at work will want to return home to check on their families and property.
- d. Concept of Operations :** Talks of the mechanisms employed in responding or reacting to a disaster situation. It also defines the extent of operations by the responding units.
- e. Legal Authorities :** Discusses the legal aspects of disaster prevention and mitigation. It also highlights the legal tension between the interest of the individuals and the community which may arise from the adoption of the techniques discussed.
- 2. Organizational Structure :** A suitable organizational structure is that which owns an 'Emergency Operations Center' or centers and with all functional elements and organizations being given definite responsibilities and authority as appropriate. Provision must also be made for adequate liaison between key persons and organizations. Unless lines of responsibility and authority are clear before an emergency or disaster, effective coordination and control of counter-measures will prove difficult, if not impossible. Care should therefore be taken to establish the type of organization structure that will ensure coordination and control under the pressures of an emergency situation. At the same time, the structure must be sufficiently straight-forward to be operated by available personnel. In allocating roles and responsibilities within a plan, it is very important to do so clearly. Overlapping or duplication of roles causes friction between organizations and leads to loss of organizations involved and leads to loss of effectiveness. Gaps between the roles of organizations may mean that important, perhaps, vital measures are not undertaken.

- 3. Coordinative Tasks :** These tasks include:
- Integration of tasks especially those which are related.
 - Activation of the 'Disaster Coordinating Council'.
 - Coordination with other task units. When a particular task unit coordinates with another unit, it either briefs, consults, considers, decides and plans for effective disaster management.

- 4. Resources :** Resources are of two types i.e. human and material. Again, they should be assessed in terms of:

- Capability
- Availability
- Durability

It is a must for the implementors of disaster preparedness to know what resources are needed and where are they found and available to ensure a smooth and spontaneous disaster response.

- 5. Reporting & Recording :** These processes are paramount for easy locating and consulting by all concerned. It is a sad fact that a disaster is usually nasty and dirty, disruptive and unpleasant. As a result, crisis pressure generated by disaster impact has all kinds of unwanted effects like loss of vital communications, destruction or delayed availability of planned resources (transport, relief supplies), and disruption to the very system which has been designed to deal with disaster. All these effects will necessitate reporting and recording.

- 6. Updating Plans :** This stage will identify those persons who are responsible for updating the plan and it also ensures how often should a plan be updated.

Characteristics of an effective CDP

A disaster plan must be:

- S - simple
- M - measurable
- A - attainable
- R - realistic
- T - time bound

- **Simple** : The plan should be formulated in such a way that it is easy to use. References within the plan should be clear and readily identifiable. The body of the plan needs to be kept as clear and concise as possible with annexes being used for very detailed information.
- **Measurable** : The plan should be measured in terms of effects being mitigated. How many were dead, injured, missing, etc. before and now. This calls for a comparative study of data of effects which will serve as basis for evaluating the effectiveness of the plan.
- **Attainable** : The plan should answer the question: 'Were the objectives met?' It should be fully viable for the purposes for which it is designed.
- **Realistic** : The plan should relate to an accurate assessment of the disaster threat and take into account the scale and capability of counter-disaster resources which are available.
- **Time-bound** : The plan should be able to meet the date which is targeted for the different activities to be undertaken like planning, training, organizing, stockpiling, establishment of EOC, etc.

Q.5 What are the different levels of planning of a counter disaster plan?

Ans. Levels of Planning

1. **National** : The national disaster plan is likely to be the main plan. Therefore, it needs a broad scope, ranging from policy matters down to detailed action. This plan provides government and civilian agencies with a plan of action in the event of natural disaster or calamity. This plan also attempts to place in print all the conceivable actions that may be required of the agencies concerned, government or otherwise, prior to, during and after a disaster. It is by no means complete and its completion will depend on subsequent contributions learned in the future.

2. **Regional** : The regional level plan undertakes all possible contingencies in crisis management making use of all available resources, both government and private. This plan shall be made operational through the

establishment of a regional organization (RDCC) for emergencies that will provide the vehicle for a concerted and coordinated disaster control efforts from the regional level down to the provincial, city/municipal and barangay levels. Also, this organization shall exercise direction and control, through the Office of Civil Defense, over all emergency operations from the province down to the lowest political subdivisions/councils. It shall likewise provide top executive political subdivisions/councils. It shall likewise provide top executive management and control over multi-departmental types of disaster-stabilization operations.

3. **Provincial** : The provincial plan is a plan that addresses the contingencies obtaining in the province utilizing all its available resources, organizations and facilities. The provincial offices of the departments shall provide similar support/assistance to the provincial disaster coordinating councils organized at the provincial level.

4. **Municipal/City** : This municipal/city disaster plan of the disaster coordinating council will be responding to the disasters frequenting the area. This council shall be established to compliment the Regional Disaster Coordinating Council.

5. **Barangay/Community** : One of the main requirements of the local plan is, therefore, to coordinate activities of various existing services (e.g., security, fire brigade, medical and voluntary organizations). Similarly, the plan needs to facilitate the participation of self-help groups and community members, utilizing traditional knowledge, skill, and previous disaster-related experiences. It is at this level that the members of the disaster coordinating organization/council draw up a one-year action plan which will consist of the different disaster-related activities during the three phases of disaster management - before, during and post disaster.

Q.6 What are things include in the counter disaster plan?

Ans. Counter Disaster Plan : The counter-disaster plan might include the following :

- A list of hazards.

- An initial response procedure.
- Disaster kits—list of contents and locations.
- The location and description of smoke detection and fire-fighting equipment.
- Day and night emergency contacts for staff and specialists.
- The names and addresses of suppliers of emergency equipment and materials, including day and night telephone numbers.
- The emergency funding procedures.
- Insurance details.
- The emergency contact for computer problems.
- The contact numbers for the disaster response team, together with notes on their roles and responsibilities.
- An assessment checklist.
- A list of known leaks and problem areas.
- Recovery procedures for types of damage—wet/burnt and different formats.
- Freezing facilities.
- Procedures for dealing with mould.
- Priority lists for recovery.
- Documentation procedures.
- Emergency evacuation procedures.
- Disaster reaction procedures.

PART-C

~~Q.7 Discuss counter disaster resources and their utilities in disaster management in detail.~~

Ans. Counter Disaster Resources :

Purpose

1. The purpose of this chapter is to consider the resources that are available in most countries for disaster management activities.
2. The effective use of available resources is a major disaster management objective. To achieve this

objective, it is evident that there must be:

- Accurate identification of resource.
- Correct assessment of their capability.
- Allocation of suitable roles to resource organizations.
- Plans and procedures to use resource in a timely and effective manner.

3. Therefore covers:

- Types of resources, both national and international.
- Evaluation of resource.
- Roles and responsibility of resource.

4. The information has been drawn from a number of different countries and is intended to provide a general checklist. Obviously, however, users of this handbook need to identify and assess their own resources and allocate roles and responsibilities.

Types of Resources

I. National resources

1. Government resources

Ministry Responsible for Disaster Affairs are following:

- Police ✓
- Agriculture ✓
- Ambulance
- Attorney-General
- Audit
- Broadcasting ✓
- Civil Aviation
- Customs and Excise
- Education ✓
- Electricity Commission
- Environment ✓
- Firefighting Service
- Finance ✓
- Fisheries

- Foreign Affairs
- Forestry
- Immigration
- Information ✓
- Labor ✓
- Lands and Survey
- Marine
- Medical and Health ✓
- Meteorology
- National Development Planning ✓
- Natural Resources
- Post and Telecommunications
- Prime Minister's Office ✓
- Public Service Commission ✓
- Public Works
- Statistics
- Social Welfare
- Transport ✓
- Treasury ✓

2. Non-government resources

- Airlines ✓
- Amateur radio operators ✓
- Aviation resource (flying clubs, private owners, etc.)
- Chambers of Commerce
- Church and religious groups ✓
- Community service clubs ✓
- Food supplier (wholesale and retail) ✓
- General agents ✓
- public (volunteers, blood donors, etc.) ✓
- Red Cross/Red Crescent
- Transport companies (private: land and sea) ✓
- Welfare organizations. ✓

II. International Resource : The use of international resources by any country is likely to depend on factors, such as:

- Scale and effectiveness of its own resources.
- Bilateral assistance arrangements with allied countries.
- Political implications, from a recipient country's viewpoint of accepting international assistance.
- Suitability of international resources in a particular disaster situation.

The type of international resources most generally needed by stricken countries fall into the following broad categories:

Pre-disaster : Equipment and expertise for developing measures of prevention, mitigation and preparedness for instance, providing emergency communications or developing plans and organizational arrangements.

During response operations

- Monitoring and warning of a potential threat.
- Post-impact survey and assessment for instance, by photographic reconnaissance from the air. Providing emergency equipment and facilities such as shelter materials, food supplies.

During recovery programs : Technical and other assistance, usually in the form of building materials, financial grants, agriculture redevelopment programs, etc.

- **For future development :** Assistance from the resources of overseas governments and international organizations, often as an extension of recovery programs. Source of international assistance may vary for individual countries but usually comprise multilateral organizations and agencies, and bilateral organizations.

Evaluation of Resources : It is important to evaluate national resource organizations to determine their suitability and effectiveness for disaster management purposes. This can be done under the following headings:

Capability : The ability of resource organizations to carry out designated disaster related tasks; for instance, first aid, search and rescue, emergency feeding, building repairs, welfare assistance, counselling of victims and disaster workers, and so on. In this regard, the following need to be considered, such as:

- Resource organizations produce their best results when used in their most applicable and experienced roles. It is obviously not prudent to make fundamental changes to the role of a resource organization when it switches to a disaster role.

- Some resource organizations are, by their nature, crisis-oriented; for instance, police, firefighting services, ambulance services, and defence forces. Other resource organizations are not normally crisis-oriented such as welfare departments. Yet these departments may have to work under very difficult and traumatic conditions in providing help to disaster victims. Their capability may, therefore, be reduced during disaster operations, especially if their members are inexperienced. This has happened on various occasions.

- The disaster role capability of resource organizations may vary from time to time. This may arise from changes at leadership levels and/or extensive turnover of staff, both of which tend to lower overall experience within the organization.
- The standard role of a resource organization may change for various reasons, such as government policy and financial constraints. This may affect its capability in its disaster role. The above factors indicate not only the need for careful basic evaluation of capability but also the need to monitor and re-evaluate as circumstances change.

Availability : This is primarily a question of whether the resource organization is immediately available to undertake its disaster task or whether there is a lead time (definite or indefinite) before it can respond.

A number of different factors may affect availability such as:

- Non disaster (or normal) role of organizations. For instance, a hospital is unlikely to be able to respond with all its resources to a disaster impact. It would have to continue normal responsibilities even if reduced and therefore, its disaster availability might have to be made on a graduated scale. This consideration indicates that, in some cases, a gradual availability of resource organizations may have to be recognized and accepted.

- Availability of volunteer organizations may be subject to some initial delays because of difficulties in mobilization.
- Internal arrangements within resource organizations for switching over to disaster roles will also affect availability time scales.

Durability : This concerns the degree to which resource organizations can carry out sustained operations and when they need to be relieved by other organizations. Some considerations which apply to this aspect are:

- Operational circumstances such as extreme weather conditions, limited resources, heavy task loads, high levels of damage and disruption and community trauma and suffering.
- Type of resource organization. A crisis-oriented organization is likely to be highly trained and well equipped. It is usually independent (i.e., with own communications, transport, feeding arrangements, and so on). Also, it is likely to have its own system for rotating personnel. Such crisis-oriented organizations are likely to have high-durability levels. Organizations which are not crisis-oriented are likely to have lower durability.
- Type of operations involved such as some operations (for example, search and rescue in a major building collapse or train collision) can be very demanding physically and traumatic mentally while others are less so. Durability assessment of resource organizations obviously needs to take these factors into account.

Operational integrity : This concerns the ability of a resource organization to undertake an allotted task and complete it satisfactorily without supervision or continuous detailed direction from the disaster direction/coordination authority. This is a significant factor in the effectiveness of a resource organization, since it can be relied on to:

- accepting a task
- completing it
- on reporting completion, be ready to accept re-tasking.

The process of evaluation : The process of evaluating resource organizations should be carried out mutually between the disaster management authority and the resource organization itself. Experience has shown that if the disaster management authority tries to make a general evaluation without consulting the resource organization, the evaluation will be inaccurate and misleading.

Roles and responsibilities of resource organizations : As stated earlier, the information contained in this chapter has been drawn from patterns used in a number of different countries. The roles and responsibilities detailed in paragraph below will therefore need to be adjusted to the circumstances of individual countries. However, they do indicate the wide extent to which both government and

non-government agencies should become involved in disaster management.

Inclusion of roles in plans : Once roles and responsibilities have been established and mutually agreed, they need to be clearly set out in all plans and other relevant documents, such as:

- National disaster plan
- Provincial disaster plan
- Municipal disaster plan
- Local disaster plan
- Departmental operation procedures
- Standard operating procedures



COPING WITH DISASTER

4

IMPORTANT QUESTIONS

PART-A

Q.1 What do you mean by reactive coping?

Ans. Reactive Coping : It is as an effort to deal with an on-going crisis or one that has already happened. In this case, since the crisis has already taken place, coping efforts aim to either compensate for loss or alleviate harm.

Q.2 Write short note on anticipatory coping.

Ans. Anticipatory Coping : It is as an effort to deal with an imminent threat. Thus, the person has to manage this perceived risk, either by solving the actual problem through increased effort, getting help and investing resources, or by redefining the situation as less threatening through distraction or reassurance from others.

Q.3 Define preventive coping.

Ans. Preventive Coping : It is an effort to build up general resistance resources that result in less strain in the future (minimizing the severity of the impact of potential distress) and an overall reduced risk of the crisis.

Q.4 What do you mean by protective coping?

Ans. Protective Coping : It is an effort to build up general

resources that facilitate promotion toward challenging goals. In proactive coping, people have a vision. They see risks, demands, and opportunities in the far future, but they do not appraise these as threats, harm, or loss but as challenges.

PART-B

Q.5 Explain coping strategies employed by households during the natural disasters.

Ans.

1. **Risk Reducing Strategies** : These include strategies that seek to achieve income smoothing in order to reduce household exposure to more volatile sources of income and choosing more secured ones (e.g. pursuance of diversification, less risky specialization, self-sufficiency, and flexibility in their livelihood activities).
2. **Self-insurance** : These strategies include the accumulation and sale of household assets to deal with disaster shocks (e.g. accumulation and later sale of land, livestock, farm implements and other assets; increasing household labor supply; reducing consumption; borrowing from others).
3. **Risk Sharing Strategies** : These include strategies that share risks within a group either implicitly or explicitly (e.g. mutual assistance, barter of goods, joint cultivation, labor pooling).

Q.6 What are the requirements to coping with disaster? Explain in detail.

Ans. Purpose : The purpose of this is to outline the major requirements for coping with disaster, especially in terms of:

- Organization
- Planning
- Use of resources
- Specialist skills
- Training needs

This is intended to provide a preliminary ready reference to major areas of disaster management, especially for persons who may be initially assuming duties in this field.

Scope of Disaster-related Action : In assessing the scale of organizational, planning, and other measures which need to be undertaken to deal with disaster, it is useful to bear in mind the range of responsibilities and tasks that are likely to arise. For instance:

- Providing and disseminating warning
- Search and rescue
- Surveying, assessing, and reporting disaster effects
- Treating and caring of victims
- Clearing debris and rehabilitating roads, airfields, railway systems, ports, and other key areas
- Providing emergency food and water supplies
- Providing shelter
- Evacuating individuals, groups, and communities, and livestock providing health and sanitation measures
- Restoring essential services such as communications, water and power supply
- Directing and coordinating counter-disaster measures
- Informing and advising the public
- Financially assisting victims immediately

- Maintaining public morale
- Counseling victims and relatives
- Controlling and distributing emergency supplies
- Liaising with the media
- Rehabilitating crops, production, and other aspects of subsistence and livelihood
- Emergency building programs
- Measures for long-term recovery
- Applying emergency regulations

Philosophy for Coping with Disaster : Before the requirements for coping with disaster can be determined and adequately met, it is essential to bear in mind the simple but nonetheless important philosophy which is involved. This is that disaster can have wide-ranging effects on a country, its government, and its people. Therefore, the primary responsibility for coping with disaster must rest with government. Government is responsible to the people for meeting the needs created by disaster, in the same way that it is responsible for other aspects of national life. However, a government may, and usually does, need help from NGOs, the private sector, general public and, in many cases, from its international development partners also.

This being so, it is government organization and resources that necessarily have to bear the brunt of counter-disaster action. Further, when government departments and agencies (including emergency services) have to deal with disaster, they invariably have to accept a considerable additional workload.

Moreover, they usually have to function under pressure and in cooperation with a variety of other agencies (government or otherwise). A further point is that disaster produces some needs that may not be covered by normal government organization such as mass feeding.

This is why, in essence, a disaster management system is needed. But the disaster management system does not control other government departments; it does not tell those departments how to do their jobs. The main function of the disaster management system is to ensure that at all times, and as far as possible, the resources and operations of these government departments and, as

appropriate, NGOs are coordinated to produce the best possible counter-disaster effort.

In sum, therefore, the simple philosophy for coping with disaster is one of government and people working together in a coordinated way via a coherent disaster management system.

Foundation Factors : Before the major requirements for coping with disaster can be established, it is essential that certain basic or foundation factors should be effectively covered. These include:

- An understanding of the significance of disaster, especially at key levels throughout the government structure
- A clear assessment of the disaster threat
- An effective disaster management policy

Their overall importance is reemphasized here because they are fundamental to the requirements of organization, planning, resource utilization, and training.

Organization : Some people have difficulty in understanding what exactly comprises a disaster management organization or system. It may be useful, therefore, to state some things that such an organization does not do.

- It does not duplicate normal government organization.
- It does not act independently of government.
- It does not control other government departments.
- It does not act outside the charter or terms of reference given to it by government, except perhaps in cases of extreme urgency.

Q.7 What are the coping strategies /adjustment (or) adaptation strategies?

Ans.

- It has been stated that 'coping' is the manner in which people act within existing resources and the range of expectations of a situation to achieve various ends. For them, this involves no more than managing resources in unusual, abnormal, and adverse situations.

- Coping strategies refer to a set of measures taken by the communities for obtaining resources in time of adversity and disaster. They are based on their experience, social structures, resources and their capacities to combine them.
- Coping strategies are often complex and involve a number of sequenced mechanisms we will refer to in the text as "coping mechanisms". They can include preparation, mitigation, and response or rehabilitation measures.
- Coping strategies are often transmitted from generation to generation within communities and households. They depend on the assumption that reoccurring disasters "will follow a familiar pattern and that people's earlier actions will be a reasonable guide for similar events."
- However, coping strategies are not static and linear. Under the change of their internal and external environment, communities and households have developed progressively different livelihood patterns and subsequently the community coping methods evolve over periods of time to suit the local socioeconomic, cultural and political environment best. "Strong external influence may act, often inadvertently, to break up internal coping mechanisms and their effectiveness".
- Over time strategies which formerly served people well come under a variety of pressures, which reduce their range and efficacy (reduced family ties, population pressure, change in agricultural modes of production, negative influences of the market, etc.).
- Eventually indigenous coping mechanisms may be undermined or weakened, increasing vulnerability. New or emerging hazards may be unfamiliar to communities.

Q.8 Explain advantages and disadvantages of media role during disaster.

Ans. Advantages : In certain circumstances, the news media provide an important disaster management public

service, especially in broadcasting alerts, warnings, and advisories. They can also play a helpful role in supplying needed information to decision makers. Among media's potential public services are:

- (i) Supplies information and directions to the affected public.
- (ii) Disseminates information on preparedness measures for future similar disasters.
- (iii) Stimulates volunteerism and donations, including blood donations.
- (iv) Discloses needs for improvement in governmental response.
- (v) Sometimes withholds potentially counterproductive information.

Disadvantages : The news media can also play a counter-productive role:

"The media take a particular interest in the typically subjectivist category of disasters and crises that, without too much reference to tangible referents, feature craze, panic, and collective stress". When media is not better informed, they make misinterpretation about the information's. Some functions of an ignorant press are given below :

- (i) People always panic
- (ii) Disasters incapacitate entire communities
- (iii) Looting and lawlessness is a high probability
- (iv) All kinds of goods and services are needed

Thus, prompting unneeded and unwelcome donations. Obviously, public officials at all levels of government have this responsibility to inform the media with appropriate information.

National and Local Media

- **National media generally**
- (i) Maintain interest during crisis and immediate aftermath.
- (ii) Provide general information with less attention to detail.
- (iii) Ask tougher questions of authorities than local media.

(iv) Believe in stereotyped disaster behaviour mythologies.

(v) Attempt to control or manage the news.

- **Local media generally**

- (i) Focus on the local effects of the disaster or incident.
- (ii) Concentrate on the details.
- (iii) Have better relations with local authorities than outside media.

PART-C

Q.9 Explain the role of mass media during disaster in detail.

Ans. Role of Mass Media During Disaster : Media's role can and should be part of each of the phases related to natural disasters. In the first phase, proper training for media organizations and media professionals on how to report on natural disaster are needed.

Media - print, voice or visual is an organized means of reaching a large number of people, quickly, effectively and efficiently. The suggestive, informative and analytical role of the media must form a key component of disaster education. It is the most potent way of educating the community on disaster prevention, mitigation and rehabilitation. These tasks can be carried out on the basis of the dual role of media related with imparting information and analyzing disasters discerningly.

The effects of disasters need to be examined not only in technical mind scientific terms, but also in humanitarian, social and economic terms. The media can play an important part in this direction by media, we generally imply the important channels of mass communication. This includes television, radio, newspapers, magazines, audio and video cassettes as well as movies. Special emphasis is laid on the role of electronic media and information technology as it is felt that this sector needs to be integrated with not only the disaster response but the overall disaster management strategy. Role of the print media is also important, as this continues

to be the medium of mass media in many parts of country, which are still unreachable by the electronic media. The print media have a major role to play in the pre-disaster prevention, mitigation and preparedness activities through appropriate community awareness generation.

Media need to be proactive in nature rather than reactive. They need to disseminate the right information at the appropriate time. In Bangladesh, the reach of radio and television to the masses, in providing information is getting organized. However, there is a need to include professionals in these channels to enable easy comprehension and response to the information. For instance, the involvement of professional meteorologists or training of media experts in providing weather-related information would definitely make an impact on how meteorological information is presented.

Media can be extremely effective in the following areas:

- 1. Educational :** Before a disaster, educating people about the hazard, prevention and self-help during the disaster. During rehabilitation, media can be extremely helpful in providing, accurate and unbiased coverage, post disaster impacts and needs.
- 2. Guiding :** Guiding people in preparing resource disaster calendar, resource mapping and preparation of community contingency plan.
- 3. Critical :** By critically evaluating, the emergency plan and benefit to be transferred to the people. This may include review and improvement of any existing plan.
- 4. Suggestive :** Media can suggest long term suggestions in the form of structured measure like enactment of certain legislation, adoption of code of conduct etc.

Measures to be taken by Media in Disaster Management : Media plays an all-round roll in pre disaster, during disaster and post disaster stage. The media not only is powerful, it has an inner reach to the lowermost tier and the top most tier as may be most useful for best Governance and management in the case disaster. However, media for such disaster situations needs to be institutionalized and made purposeful, accurate, efficient and effective.

Area where Media can Play Effective Role in Disaster Management

1. Early warning to the people : The preparedness of the community before the disaster, relief work during the disaster and the rehabilitation after the disaster are all equally important. The role of media in all the three situations are very crucial in today's world. The early information by electronic media like television and radio about the likely disasters can save many human being and livestock. The loss to property can also be minimized to considerable extent. The media can create awareness among community about various types of disasters. It can also play a role in preparing the community by training them and making them aware about do's and don'ts during disasters.

2. Watch dog on the disaster machinery : The response time of the relief machinery is generally very late after any disaster. The rehabilitation work after the catastrophe is normally not carried out expeditiously. The media can play the role of a watch dog especially after the disaster when rehabilitation work is going on. The pressure of media in a democratic set up is tremendous and it should be used in a responsible and constructive manner for the benefit of the society. Resources such as search and rescue team equipment, relief material and money are essentially required during disaster and subsequent rehabilitation. The responsibility lies with the Govt. to make available all the resources but some time the system is little lethargic and respond little late. In those circumstances, media can play a vital role by being a watch dog and keeping the disaster machinery active.

3. In preventing rumors and panic management : During a disaster, with the breakdown of communications, rumor can have debilitating effect on the relief work. During this time, media can play a role of monitoring such rumours by relaying correct information about the measures being taken and monitoring them. In addition, the media can also help by providing an early warning to the people likely to be affected, or about the Do's and Don'ts during a disaster.

Media can also help in establishing contacts, identifying the needy spots and focusing attention on them.

In addition, media can help by assisting the authorities, voluntary organizations and volunteers in reaching informing and assuring the affected ones of the assistance and measures taken for their relief.

4. In controlling law and order situation : Media can keep a watch on antisocial elements who try to take advantage of such situations. They can report such matter and highlight such situations. They can also assist the law and order machinery in restoring peace and harmony in the affected community.

5. In Resource mobilization : Media had played very effective role in raising resources for disaster victims in the past. The role of media during SIDR. They were able to convince people for larger participation by highlighting the contributions, providing tax-reliefs and quick a deficient mechanism of donations.

Caution and Restrain necessary for media people : The media should be very careful during reporting of disasters. It should not, create excitement and an atmosphere which lead to panic especially in today's time when there is cut-throat competition between various television channels and newspapers. It is desired that a balance approach is taken to report a situation. The people should be provided true and correct picture of disaster, its impact, the relief arrangements and coping mechanisms. They should avoid issuing warning signal unless it has been issued, by the government.

Great expectations from media by the people during disaster : People who are affected by a disaster as well as the relief providers expect widespread support from the media. They expect the media to play a constructive role by being 'partners' instead of critics. They should give correct assessment of the situation and refrain from providing subjective interpretations leading to modify and exaggerate the news.

Special training for media person for coverage of disasters : Media persons who are assigned the job of covering a disaster must be trained about the sensitivity of such coverage. They should be fully aware about nature and type of disaster so that they are able to cover in an educative and informative manner. Media people must be trained not to expose themselves to the risks

involved in covering a disaster. They should be taught how to be friendly and be part of the system in helping people in distress. Large-scale death and devastation can have unsettling effect on the reporter as well as the viewers. They should be trained how to overcome from trauma and distress of such situation. Media people are also expected to be sympathetic to the people, who under shock and pain because of the disaster and not to use them as a 'showpiece'.

Conclusion : The media play a unique role in disaster mitigation. Although the aims of the media and those of disaster mitigation organizations are not synonymous, without compromising the independence and integrity of either, much can be done to communicate to the public the information that will help many save their own lives. Their exists huge opportunity for the media and hazard specialists to work together to support mutual interests and, more important, to serve the world community by tangibly reducing the risks of natural and manmade hazards. If the roles and responsibilities are followed and obeyed regularly mass media can play a vital role in managing disaster.

Q.10 What is survival kit? How it can be used during disaster?

Ans. Survival Kit : A survival kit is a package of basic tools and supplies prepared as an aid to survival in an emergency. Civil and military aircraft, lifeboats, and spacecraft are equipped with survival kits.

Survival kits, in a variety of sizes, contain supplies and tools to provide a survivor with basic shelter against the elements, help him or her to keep warm, meet basic health and first aid needs, provide food and water, signal to rescuers, and assist in finding the way back to help. Supplies in a survival kit normally contain a knife (often a Swiss army knife or a multi-tool), matches, tinder, first aid kit, bandana, fish hooks, sewing kit, and a flashlight.

Civilians such as forestry workers, surveyors, or bush pilots, who work in remote locations or in regions with extreme climate conditions may also be equipped with survival kits. Disaster supplies are also kept on hand by those who live in areas prone to earthquakes or other

natural disasters. For the average citizen to practice disaster preparedness, some towns will have survival stores to keep survival supplies in stock.

The American Red Cross recommends an emergency preparedness kit that is easy to carry and use in the event of an emergency or disaster.

Health and First Aid : First aid kits will often include a combination of the following:

- Bandages such as sterile combine dressing and gauze pads
- Adhesive tape, and gauze tape or disinfectant pads
- A 30-day supply of personal prescription medication
- Antibiotic cream/Rubbing alcohol
- Burn cream
- Aspirin
- Sunscreen (where appropriate, above 30 SPF)
- 100% UV protective sunglasses ("UV 400") (protects eyes from harmful UV radiation. Polarized glasses are not necessarily UV protective, but aid with glare only)
- Surgical suture (for sewing up major wounds)

Food and water : Most survival kits include sustenance for short periods of time, to be used and replenished before contents spoil.

- Water in sealed containers for dry areas, or water purification tablets or household bleach in areas where water is available but may be contaminated
- Canteen full of water, and a filter if needed
- Heavy duty aluminum foil to create a distillation tube to remove salt from salt water during boiling condensation. Must have another receptacle to collect condensation
- Canned food, Meals Ready-to-Eat (MRE), high-energy foods such as chocolate or emergency food bars, or dry food items such as dried fruits, cereals, nuts or roasted grams
- Fishing line and gear (fish hooks, lures, and split shot leads)

- Snare wire
- Gillnetting (for emergency fishing)
- Spear tip (for spearing fish and other small animals)

Life Boat Survival Kit : Lifeboat survival kits are stowed in inflatable or rigid lifeboats or life rafts; the contents of these kits are mandated by coast guard or maritime regulations. These kits provide basic survival tools and supplies to enable passengers to survive until they are rescued. In addition to relying on lifeboat survival kits, many mariners will assemble a "ditch bag" or "abandon ship bag" containing additional survival supplies. Lifeboat survival kit items typically include:

Safety equipment

- Life jackets
- First aid kit
- Fire extinguisher
- Bucket

Communications and navigation

- Compass
- Distress beacons or (EPIRBs) to alert the Cospas-Sarsat rescue consortium, an international satellite-based search and rescue distress alert agency and identify the registered beacon owner's specific information from their registration file
- Red flare, rocket parachute flare, and/or smoke signal flare
- Laser pointer for signaling aircraft (red is color of distress, but green color is higher power and will be seen farther), with lithium cells, in double waterproof plastic pouch (pointers of high power are a theoretical hazard to eyes of low-flying pilots at night)
- Radar reflector (to help rescuers locate the raft)
- Lighter
- Lantern and fuel, the fuel doubles as firestarter
- Radio transceiver, standard VHF marine when operating near inland shore, 121.5 MHz AM VHF guard channel capable aircraft band transceiver to contact rescuers and high overflying commercial

and military aircraft visible by contrails, an optional amateur radio if a licensed radio amateur, (see Ham Radio) or an AM/FM/Weather/Shortwave radio receiver to receive precise time for celestial navigation as well as weather information

- GPS navigation device

Other tools and boating items

- Waterproof flashlight
- Heaving line
- Ladder
- Bailer
- Bilge pump
- Boat hook
- Sea anchor (also called a "sea drogue")

Natural disasters : The US government's Homeland Security website provides a list of in-home emergency kit items. The list focuses on the basics of survival: fresh water, food, clean air and materials to maintain body warmth. These basic survival items comprised into a kit are known as a Bug-out bag. The recommended basic emergency kit items include:

- Water, at least one gallon of water per person for each day for drinking and sanitation (should be rotated every 3 months)
- Food, non-perishable food for at least three days which is not required to be cooked or refrigerated
- Emergency food bars, preferably products with 2,400 or 3,600 calories and contain no coconut or tropical oils to which many people may have an allergic reaction, in addition to non-perishable food which does not require cooking or refrigeration
- Battery- or hand-powered radio with the weather band
- LED type flashlight (battery- or hand-powered)
- Extra batteries for anything needing them, lithium type is preferred for shelf life
- First aid kit
- Copies of any medical prescriptions
- Whistle to signal

- Dust mask, plastic sheeting and duct tape to shelter in place
- Moist towelettes, garbage bags and plastic ties for personal sanitation
- Wrench or pliers to turn off water valves
- Can opener for canned food
- Local maps
- Spare keys for household and motor vehicles
- Sturdy, comfortable shoes and lightweight rain gear
- Contact and meeting place information for the household

Earthquake : Below is list of commonly recommended items for an emergency earthquake kit:

- Food and water to last at least three to five days
- Water purification tablets/portable water filter
- Heavy-duty gloves
- A first aid kit
- A minimum of \$100 in cash, at least half of which should be in small denominations
- Family photos and descriptions (to aid emergency personnel in finding missing people)
- Copies of personal identification and important papers such as insurance documents, driver's license, etc.
- A flashlight (LED type for greatest efficiency) and radio
- Extra batteries (lithium type for longest shelf life)
- Goggles and dust mask
- A personal commode with sanitary bags
- Water: one gallon per person, per day

Hurricane : For hurricanes, National Oceanic and Atmospheric Administration (NOAA) recommends that the 'disaster bag' include:

- A flashlight with spare batteries
- A battery-operated portable radio (and spare batteries)
- A battery-operated NOAA weather radio (and spare batteries)

- A "Self-Powered Radio" and a "Self-Powered Flashlight". One, "Eton" model has the Weather Band and it is "self-powered". Some of these will keep your cell phone charged
- First aid kit and manual
- Prescription medicines (be sure to refill them once they expire)
- Cash and a credit card
- A cell phone with a fully charged spare battery
- Spare keys
- High energy non-perishable food
- One warm blanket or sleeping bag per person;
- Special items for infant, elderly or disabled family members
- Change of clothing

Bug-out bags / Survival Backpacks : The term "survival kit" may also refer to the larger, portable survival kits prepared by survivalists, called "bug-out bags" (BOBs), "Personal Emergency Relocation Kits" (PERKs) or "get out of Dodge" (GOOD) kits, which are packed into backpacks, or even duffel bags. These kits are designed specifically to be more easily carried by the individual in case alternate forms of transportation are unavailable or impossible to use.

These bags contain supplies such as food, water purification equipment, clothing, medical equipment, communications gear, and tools.



PLANNING FOR DISASTER MANAGEMENT

5

IMPORTANT QUESTIONS

PART-A

Q.1 *What is the role of State Relief Commissioner in disaster management?*

Ans. Role of State Relief Commissioner : The State Relief Commissioner through the office of the Department of Disaster Management plays a direct & active role in the Disaster Management programme of the State. For a disaster that impacts more than one district in the State, the State Relief Commissioner leads the Disaster Management measures using appropriate action plan.

The State Relief Commissioner either directly or through District Magistrates, co-ordinates and monitors the disaster management measures using all the resources available with the State Government. In this phase the State Relief Commissioner would:

- (i) Recommend to the State government when disaster needs to be declared.
- (ii) Supervise and undertake Preparedness, Prevention and Mitigation measures, if necessary, where disaster is declared.
- (iii) Monitor such works in respective districts.

Relief Commissioner to satisfy himself about the preparation. The State Relief Commissioner should satisfy himself that adequate preparations are being uniformly made in all districts in which distress is anticipated.

Q.2 *What is the role of Zilla Parishad in disaster management at district level?*

Ans. Role of Zilla Parishad : Under present conditions, Government has accepted full responsibility for fighting different types of disasters and at the district level, responsibility for administration of Relief solely rests with the District Magistrate. Zilla Parishad here plays a pivotal role in every kind of crisis management operation. The services of different district level functionaries of different line departments can be utilised in the management of disasters.

Q.3 *Write the functions of the district disaster management authority.*

Ans. Powers and functions of the District Disaster Management authority : As provided under Section 30 of the Disaster Management Act, 2005, the District Disaster Management Authority shall 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 State Authority.

Q.4 *What is hazard analysis?*

Ans. Hazard analysis: List of hazards with probability (frequency and magnitude) : It would consist of the type

of hazards that the district is prone to, history of hazards, impact analysis of the worst case scenario, the area, people and infrastructure that are exposed to these hazards. It should provide information about the exposure levels of various villages and cities that fall in multi-hazard zones.

Q.5 What is included in a disaster risk reduction plan?

Ans.

- Identification of hazards, vulnerabilities and risk to be managed
- Disaster risk reduction and management approaches / strategies
- Agency roles, responsibilities and lines of authority
- Coordination in pre-disaster and post-disaster phases
- Budgetary resources

Q.6 Why make a DRR plan?

Ans.

- Guide national government to allocate 5% of the local government budget to DRR
- Help the community access funding from national government
- Strengthen local government's technical capacity in disaster management
- Identify infrastructure priorities and action plans in anticipation of severe hazard events
- Train local actors in preparing for disasters, to promote safe and resilient communities

PART-B

Q.7 Explain disaster management planning with its components in brief.

Ans. Challenges : The world continues to experience a wide variety of natural and human induced disasters.

These are adversely impacting our heritage as well. These disasters include earthquakes, tsunamis, floods, volcanoes, fires, and wildfires.

Approach : Disaster management involves planning what to do before, during and after a disaster or emergency occurs. Through further understanding these hazards, and assessing a structure's behaviour to them, we can better prepare for disasters.

A risk-informed, performance-based approach exists offering opportunities to better understand objectives, identify credible hazards and develop alternatives that allow stakeholders (owners, government, etc.) to make risk-informed decisions as to how best protect heritage and meet disaster mitigation objectives.

This approach provides tremendous value including:

- Preserving our heritage
- Embrace local heritage, resources, and methodologies
- Limit damage and aesthetic impact
- Cost-effective solutions
- Maintain functionality of sites
- Enhance life safety

Planning for disasters in advance significantly reduces damage to tangible and intangible heritage, including historic sites, structures and their collections.

Services and Deliverables

Services

- Establish Objectives
- Hazard Assessments
- Risk Assessments
- Disaster Prevention Planning
- Disaster Mitigation Planning
- Emergency Access Assessments
- Emergency Egress Assessments
- Emergency Drills
- Emergency Response Equipment Planning
- Disaster Preparedness Planning

- Disaster Response Planning
- Disaster Recovery Planning
- Capacity Building

Deliverables

- Hazard and Risk Assessments
- Disaster Prevention and Mitigation Plans
- Disaster Preparedness Plans
- Disaster Response Plans
- Disaster Recovery Plans
- Emergency Evacuation Plans
- Emergency Access Plans
- Emergency Management Plans
- Training Programs

Q.8 Write about institutional arrangements for disaster management.

Ans. Institutional Arrangements for DM : This section would describe the organizational structure that exists at the District, Block, Gram Panchayat, Municipality and community levels for disaster management. It would include information about composition of the above institutions and their functions as per the National Disaster Management Act, 2005 and in the National Disaster Management Policy. However, DDMA may also identify functions of other institutions which they consider important such as Disaster Management Teams, Crisis Management Group/Incident Command System, Emergency Operation Centers (EOCs) and their operation, Site Operation Centres, Platforms such as inter-agency groups that would facilitate partnerships with NGOs, private sector, Community based Organisations (CBOs), other institutions (academic) and elected representatives. Major industrial /service / infrastructure establishments and fair capability plans should be listed.

- D.M. organizational structure at the national level
- D.M. organizational structure at the state level including Incident Response System(IRS) in the State

- D.M. organizational structure at the district level :
 - District Crisis Management Group(CMG)
 - District Disaster Management Committee and Task Forces
 - Incident Response System in the District
 - EOC setup and facilities available in the district
 - Alternate EOC if available and its location
- Public and private emergency service facilities available in the district
- Forecasting and warning agencies

Q.9 What is Preparedness Measures?

Ans. Preparedness Measures : Preparedness analysis in terms of network of communication systems, public distribution systems, storage facilities, transportation facilities, medical facilities, emergency reserves (essential resources, food, medicines, water etc.), fire stations, cyclone shelters with their capacity, availability of NGOs and other volunteers, availability of plans, teams to undertake various functions etc. so as to enable quick response is one important area of analysis as strengthening these would result in effective response.

- Identification of stakeholders involved in disaster response
- Formation of Teams for :
 - Early Warning
 - Search and rescue
 - Evacuation
 - Damage and Loss Assessment
- Activation of Incident Response System in the district
- Protocol for seeking help from other agencies such as Govt. of India, State Government, Public Sector Undertaking (PSUs), Other State Governments, National Disaster Response Force (NDRF), State Disaster Response Force (SDRF), Army, Navy and Air Force, Central Para Military Forces

- Mechanisms for checking and certification of logistics, equipments and stores
- Operational check-up of Warning Systems
- Operational check-up for Emergency Operation Centre
- Seasonal inspection of facilities and critical infrastructure
- Command and coordination – identification of quick response teams
- NGOs and other stakeholders coordination – identify their strengths and allocation of responsibilities in area/sector/duty/activities – Activate NGO coordination cell
- Seasonal preparedness for seasonal disasters like flood and cyclone
- Community Preparedness
 - Community warning system
 - Community awareness, education
 - Community's responsibility
- Standard Operating Procedures (SOPs)
 - Protocol and arrangements for VIP visits
 - Procurement (Tents, blankets, tarpaulins, equipment etc., SOP for Rate contracts)
 - Logistics
- Knowledge Management, networking and sharing
 - Uploading of information on resources on India Disaster Resource Network (IDRN) / State Disaster Resource Network(SDRN)
 - Documentation of lessons learnt and best practices after each event
- Media management / information dissemination
 - Training and interaction strategies with Media/ pre-event awareness for the Media.
 - Identification and training to the Official Spokesperson

In addition to the above, this also include the nature and kind of preparedness required for response,

starting from early warning. This would cover among other things, the community based preparedness efforts required.

- Awareness generation strategy
- Resource Mobilization
- Resource Inventory of Man and Material (IDRN/ SDRN)
- Early warning Mechanism including last mile connectivity
- Kits- Family Relief Kits, First Aid etc.

Q.10 What is the procedure for monitoring and maintenance of DDMP?

Ans. Procedure and methodology for monitoring, evaluation, updation and maintenance of DDMP

- Authority for maintaining and reviewing the DDMP
- Proper monitoring and evaluation of the DDMP
- Post-disaster evaluation mechanism for DDMP
- Schedule for updation of DDMP : Regular updation process for the DDMP, reflecting sections that need updation at various intervals
- Uploading of updated plans at DDMA/ SDMA websites
- Conducting of mock drills at district and sub district levels, at least annually, is important for the district as per approved Mock drill calendar. It would ensure that all parties understand their roles and responsibilities clearly. It would also help to test the efficacy of the plans prepared. Based on feedback from such simulation exercise, the plan will have to be revised and capacity build to fill the gaps. While indicating the mock drill plan of action it is essential to list down :
 - The responsible parties for organizing district drills,
 - Schedule for organizing drills and
 - Resources for organizing drills.

- Monitoring and gap evaluation
 - Checking whether all the personnel involved in execution of DDMP are trained and updated on the latest skills necessary in line with the updated plans
 - Check that the on-site /off-site emergency plan of major chemical, industrial and nuclear installations are received at District Collector's Office.

Q.11 What is standard operating procedures and checklist in disaster management?

Ans. Standard Operating Procedures (SOPs) and checklist : SOPs and checklists could be prepared for various stakeholders effective response. These can be made based on the functioning of Emergency Support Function (ESF) groups or Incident Response System (IRS). Depending on the hazard profile and level of exposure the district should decide in a participatory way the number of ESF covering all the above. The SOPs would briefly describe the following:

- Definition of disaster situations;
- Action on receipt of warning and warning dissemination;
- Process to access financial and technical resources (departments and stakeholders) for emergency response;
- Roles and responsibilities of the department or/and stakeholders in emergency response;
- Information management and dissemination strategy;
- Media management strategy during emergency response;
- Request for state government assistance;
- Relief and Rehabilitation Norms (Standards) Emergency Response/ Support Functions:
 - Evacuation
 - Search and Rescue
 - Cordoning the area

- Traffic control
- Law and order and safety measures
- Dead body disposal
- Carcass disposal
- (Add more if necessary)
- Humanitarian Relief and Assistance:
 - Food
 - Drinking water
 - Medicines
 - Trauma care
 - Clothing
 - Other essential needs
 - Shelter management
 - Providing helpline
 - Repairs and restoration of basic amenities (e.g. water, power, transport etc.)
 - Management of VIP visits
 - Maintenance of emergency reserves including by private agencies
 - (Add more if necessary)

Q.12 Explain approaches for disaster risk reduction in detail.

Ans. The framework for disaster risk reduction comprises of a four-pronged approach as follows:

1. Elimination or prevention of the hazard: The source of the risk is removed through planning and action. For example, if the hazard is terror, theft or vandalism, the risk may be reduced by increasing security and monitoring of the site or precinct and controlling access. Natural hazards, such as earthquakes, heavy rainfall, volcanoes etc. cannot be prevented in this manner, especially with respect to immovable cultural heritage property. In extremely rare scenarios, relocation of the cultural property is considered, though it must be remembered that in most scenarios the context of a cultural heritage site contributes towards its overall heritage value.

2. Reducing vulnerability: Even though many hazards cannot be prevented, vulnerabilities identified that emerge within the structure itself, in its immediate context or at the scale of the city and precinct can be addressed. For instance, retrofitting of ageing-built fabric may significantly reduce its vulnerability to hazards such as earthquakes and landslides.

3. Reducing exposure: Various measures to reduce the exposure of a site can be undertaken as a risk reduction measure. These may be based on principles of containment, isolation, etc., where the extent of damage can be minimized through structural and non-structural means.

4. Increasing capacity: The impact of the hazard can also be mitigated through implementing clear strategies for the management of visitors, communicating risks to the public in a clear and effective manner and so on, which increases the capacity of the site to respond to a disaster. Further details on this aspect can also be found.

A thorough risk assessment exercise that prioritizes risks is essential to develop sound strategies for risk reduction and/or mitigation. Some of the key areas for actions are described in the next sections, looking at multiple scales, ranging from the settlement and precinct, site and surroundings and the individual structure. With respect to disaster risk reduction for cultural heritage sites and precincts, certain aspects need to be considered:

- 1. Preserving and retaining cultural heritage values** as identified by the stakeholders. Interventions that would lead to a loss of these values should be weighed carefully against the potential benefits before being executed.
- 2. Retaining authenticity** of the site or precinct is an important consideration. While one of the primary concerns of disaster risk reduction is to minimize physical losses to property, standard interventions, such as structural retro-fitting may reduce the authenticity of the site and should be carried out with caution. An approach of minimum and appropriate intervention should be followed as far as possible, that weighs the advantages of the proposal in risk reduction with the possible impact to heritage values and authenticity.

3. Using traditional technologies and skill and indigenous knowledge systems should be prioritized as they contribute to the continuity and value of cultural heritage.

4. A degree of acceptable risk should be established for the cultural heritage site or precinct and such a threshold should inform risk reduction interventions.

PART-C

Q.13 Explain national disaster management planning in detail.

Ans. The National Disaster Management Plan (NDMP) aims to make India disaster resilient and significantly reduce the loss of lives and assets. The plan is based on the four priority themes of the "Sendai Framework," namely: understanding disaster risk, improving disaster risk governance, investing in disaster reduction (through structural and non-structural measures) and disaster preparedness, early warning and building back better in the aftermath of a disaster.

1. Vision : 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.

2. Objectives : Along with the mandate given in the DM Act 2005 and the NPDM 2009, the national plan has incorporated the national commitment towards the Sendai Framework. Accordingly, the broad objectives of the NDMP are:

- Improve the understanding of disaster risk, hazards, and vulnerabilities.
- Strengthen disaster risk governance at all levels from local to centre.
- Invest in disaster risk reduction for resilience through structural, non-structural and financial measures, as well as comprehensive capacity development.

- (iv) Enhance disaster preparedness for effective response.
- (v) Promote “Build Back Better” in recovery, rehabilitation and reconstruction.
- (vi) Prevent disasters and achieve substantial reduction of disaster risk and losses in lives, livelihoods, health, and assets (economic, physical, social, cultural and environmental).
- (vii) Increase resilience and prevent the emergence of new disaster risks and reduce the existing risks.
- (viii) Promote the implementation of integrated and inclusive economic, structural, legal, social, health, cultural, educational, environmental, technological, political and institutional measures to prevent and reduce hazard exposure and vulnerabilities to disaster.
- (ix) Empower both local authorities and communities as partners to reduce and manage disaster risks.
- (x) Strengthen scientific and technical capabilities in all aspects of disaster management.
- (xi) Capacity development at all levels to effectively respond to multiple hazards and for community-based disaster management.
- (xii) Provide clarity on roles and responsibilities of various Ministries and Departments involved in different aspects of disaster management.
- (xiii) Promote the culture of disaster risk prevention and mitigation at all levels.
- (xiv) Facilitate the mainstreaming of disaster management concerns into the developmental planning and processes.

3. Salient Features of the Plan

- (i) The plan covers all phases of disaster management: prevention, mitigation, response and recovery.
- (ii) For each hazard, the approach used in this national plan incorporates the four priorities enunciated in the Sendai Framework into the planning framework for Disaster Risk Reduction under the five Thematic Areas for Actions:

- Understanding Risk
 - Inter-Agency Coordination
 - Investing in DRR – Structural Measures
 - Investing in DRR – Non-Structural Measures
 - Capacity Development
- (iii) The Response part of the Plan has identified eighteen broad activities which have been arranged into a matrix to be served as a ready reckoner:
- Early Warning, Maps, Satellite inputs, Information Dissemination
 - Evacuation of People and Animals
 - Search and Rescue of People and Animals
 - Medical Care
 - Drinking Water/ Dewatering Pumps/ Sanitation Facilities/ Public Health
 - Food & Essential Supplies
 - Communication
 - Housing and Temporary Shelters
 - Power
 - Fuel
 - Transportation
 - Relief Logistics and Supply Chain Management
 - Disposal of Animal Carcasses
 - Fodder for livestock in scarcity-hit areas
 - Rehabilitation and Ensuring Safety of Livestock and other Animals, Veterinary Care
 - Data Collection and Management
 - Relief Employment
 - Media Relations
- (iv) The Plan has also incorporated a Chapter on Strengthening Disaster Risk Governance. The generalized responsibility matrix given in this section summarizes the themes for strengthening Disaster Risk Governance and specifies agencies at the Centre and State with their respective roles. The matrix has six thematic areas in which Central and State Governments have to take actions to strengthen disaster risk governance:

- Mainstream and integrate DRR and Institutional Strengthening
 - Capacity Development
 - Promote Participatory Approaches
 - Work with Elected Representatives
 - Grievance Redress Mechanism
 - Promote Quality Standards, Certifications, and Awards for Disaster Risk Management
- (v) It provides for horizontal and vertical integration among all the agencies and departments of the Government. The plan 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. The plan has a regional approach, which will be beneficial not only for disaster management but also for development planning.
- (vi) It is designed in such a way that it can be implemented in a scalable manner in all phases of disaster management. It also 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 generalized framework for recovery and offers flexibility to assess a situation and build back better.
- (vii) To prepare communities to cope with disasters, it emphasizes on a greater need for Information, Education and Communication activities.

Q.14 Discuss the organizational structure for disaster management in detail.

Ans. General : With the change of time, the age-old concept of Relief has been widened into the broader spectrum of Disaster Management. To implement the holistic approach of Disaster Management in our State, its organizational set up should be strengthened from the State level down to the Gram Sansad level. After strengthening the Panchayat Raj Institutions, the role of Zilla Parishad, Panchayat Samity and Gram Panchayats

have become very much important in the planning and implementation of Disaster management policy.

Relief Organization : Suitable organization has been evolved in this State at all appropriate level to draw up coordinated plans for setting up Disaster Management operations. The unit of Disaster Management organization in an area should be formed into Block, each under a Block Development Officer (BDO). A Disaster Management Officer appointed by the Director of Disaster Management, is placed under the BDO. In the Sub Division, a Sub Divisional Disaster Management Officer (SDDMO) is placed under the Sub Divisional Officer (SDO) and a District Disaster Management Officer (DDMO) is placed under the District Magistrate. In the Directorate of Disaster Management W.B, Disaster Management Officers and Senior Disaster Management Officers are placed under Director of Disaster Management. The Disaster Management organization of this State is running under the Department of Disaster Management, Govt of W.B. The Secretary, Disaster Management Department, is the State Relief Commissioner. The Directorate of Disaster Management, headed by a Director, assists the Secretary of Disaster Management for execution of all Disaster Management Operations at the State level.

Role of State Relief Commissioner : Refer to Q.1.

Role of District Magistrate : The District Magistrate plays a coordinating role at the district level to ensure that the various government functionaries in the district effectively carry out the Disaster Management activities in this phase working in close co-operation with Government Departments and local bodies. The role of the District Magistrate in this phase includes:

- (i) Ensuring that preparedness, mitigation and prevention-activities are carried out in accordance with the appropriate guidelines,
- (ii) Ensuring that relevant officials in the district possess the knowledge to deal with disaster management issues,
- (iii) Developing an appropriate Disaster Management strategy for the district, taking into account the

unique circumstances of the district and prevailing gaps in institutional capacity and resources of the district,

- (iv) Facilitating community training, awareness programmes and the installation of emergency facilities with the support of local administration, NGOs and the private sector,
- (v) Establishing adequate inter-department co-ordination issues related to disaster management,
- (vi) Reviewing emergency plans and guidelines,
- (vii) Involving the community in the planning & development process,
- (viii) Ensuring that local authorities in the district are involved in developing their own mitigation strategies,
- (ix) Ensuring appropriate linkage between Disaster Management activities and planning activities,
- (x) Revising/ Re-assessing contingency plans related to disaster management,
- (xi) Ensuring that proper communication systems are in place,
- (xii) Ensuring that equipments connected with Search and Rescue, especially firefighting equipments are well maintained and ready to use,
- (xiii) Contingency plans maximize the involvement of members of the community and NGOs.

Role of Zilla Parishad : Refer to Q.2.

District Disaster Management Officer : As the representative of the Disaster Management Department, District Disaster Management Officer will assist the District Magistrate in every kind of Disaster Management operations, in the implementation of the policies and principles of the Department and the rules of the disaster management code within their jurisdiction.

Sub Divisional Officer : The Sub Divisional Officer will supervise Disaster Management operations within his jurisdiction. The Sub Divisional Officer will be in charge of disaster management in the sub division concerned. He will see that relief is being efficiently and economically administered, orders are properly carried out, provisions

for medical relief, hospitals and dispensaries are adequate, special precautions are taken to guard the drinking water supply from contamination and pollution, to guard against breaking out epidemics in the disaster affected areas, that the provisions of the disaster management codes and orders of the State government are being fulfilled and that the provisions for the future is being duly made and reports properly submitted.

Sub Divisional Disaster Management Officer : As the representative of the Disaster Management Department, Sub Divisional Disaster Management Officer will assist Sub Divisional Officer in every kind of Disaster Management operation. He will function as the Secretary in the municipality level disaster management committees. He will assist S.D.O. in the implementation of the policies and principles of the Disaster Management Department and the rules of the Disaster Management code within the respective jurisdiction.

Block Development Officer : As the head of the Block administration, Block Development Officer plays a very significant role in the implementation of Disaster Management operations like Preparedness, Prevention and Mitigation. AS the main functionary of the Block administration, he will act in the following sectors:

- (i) Monitoring of functioning of all kinds of Disaster Management operations in his area and sending report to the Sub Divisional Officer and other higher authorities,
- (ii) To monitor the functioning of all committees related to Disaster Management at the Panchayat Samity and Gram Panchayat level,
- (iii) To visit every part of his area and to see that the social assistance measures are promptly, properly and effectively given to disaster victims whenever required and make periodical routine examination/ assessment of the socio-economic status of his area,
- (iv) To make assessment of fund required for infrastructural reconstruction after any disaster,
- (v) Will maintain all the accounts of the Disaster Management operations that have to be started during any natural calamity,

- (vi) He will prepare Block Disaster Management Plan every year and also revise it from year to year,
- (vii) He will undertake preparedness, mitigation and rehabilitation measures every year,
- (viii) He will keep the Block level India Disaster Resource Network updated every year,
- (ix) After every calamity, he will prepare and send preliminary report in CAII form to the Sub Divisional Officer at once.

Block Disaster Management Officer : As the representative of the Department of Disaster Management at the Block level, Block Disaster Management Officers play an important role in the evaluation, assessment and management of block level disaster management operations. The services of Block Disaster Management Officers are placed at the disposal of respective Panchayat Samities.

They will discharge their responsibility with regard to the Panchayat Samity in addition to their normal duties for execution or implementation of schemes already assigned to the Gram Panchayats and Panchayat Samities by the Department of Disaster Management.

The main duties of the Block Disaster Management Officer in the Block level Disaster Management operation are mentioned below:

- (i) To assist the Block Development Officer in every kind of decision-making in connection with Disaster management operations,
- (ii) Helping in sending periodical reports and returns in the implementation of various programmes related to disaster management to the appropriate authority,
- (iii) To organize Gram Sansad, Gram Panchayat and Panchayat Samity level Disaster Management related meeting,
- (iv) To check the priority lists prepared for distribution of Relief Assistance (both normal and special) and cause any enquiry in this regard if any discrepancy arises or if found inadequate,
- (v) To remain present at least once a month at the time and place of distribution of Relief Assistance and

also to check whether the muster rolls are being properly maintained,

- (vi) To inform Block Development Officer regarding the socio-economic condition of different priority stricken areas within the jurisdiction and cause Block Development Officer regarding combating any kind of disaster in these areas well in advance,
- (vii) To cause enquiries into application for Economic Rehabilitation Grants, Special Relief Assistance and distribution Relief materials,
- (viii) To help in proper maintenance of accounts in respect of Relief matters and also in clearing outstanding Audit objections in the Block offices and the Sub Division offices, Specific assistance as sought for by the Chief Accounts Officer and the Director of Disaster Management should be given,
- (ix) To make detailed estimate of loss and damage during and after any disaster and prepare the reports,
- (x) To monitor the working and distribution of Relief articles by N.G.Os in their area and to furnish regular reports,
- (xi) To help in implementation of Rehabilitation programme for Repatriates from Burma, living in registered co-operative societies, monitoring and follow-up actions connected therewith,
- (xii) To keep contact with the Pradhan of the Gram Panchayats (GP) and advise them in the preparation of Gram Panchayat Disaster Management Plan,
- (xiii) To obtain utilization certificate from Pradhan of GPs in respect of Relief assistance distributed through Pradhan from the Block,
- (xiv) To keep constant contacts with members of the Gram Panchayats, Panchayat Samity, extension officers of all Line Departments, Non-Governmental Organizations/ CBO.

District Disaster Management Authority : District Disaster Management Authority has been constituted vide provision of the Disaster Management Act, 2005 with the following members :

- (i) Collector of the District Chairperson
- (ii) Sabhadhipati of Zilla Parishad Co-Chairperson (Provided that in the tribal area, as referred to in the Sixth Schedule to the Constitution, the Chief Executive member of the district council of autonomous district, shall be the co-chairperson, ex officio)
- (iii) Chief Executive Officer of the District Authority, ex officio
- (iv) Superintendent of Police, ex officio
- (v) Chief Medical Officer of Health, ex officio
- (vi) Not exceeding two other district level officers, to be appointed by the State Government

Power and function of the State Disaster Management Authority : The State Authority shall have the responsibility for laying down the policies and plans for disaster management in the State as provided in Section 18 of the Disaster Management Act, 2005.

Powers and functions of the District Disaster Management authority : Refer to Q.3.

Powers and functions of the Sub-divisional level advisory committee : This Committee shall formulate general principles in regard to execution of the policies and plans as laid down by the SDMA and co-ordinate relief activities of the different agencies within the Sub-Division and shall adopt resolutions of an advisory nature on all matters as coming within its purview, and forward the same to the different organs for implementation within the framework of respective constitutions, rules, laws and byelaws.

Q.15 What is disaster risk reduction? Discuss disaster risk reduction strategies. Also discuss components of disaster risk reduction.

Ans. Disaster Risk Reduction : Disaster Risk Reduction is: 'Actions taken to reduce the risk of disasters and the adverse impacts of natural hazards, through systematic efforts to analyze and manage the causes of disasters, including through avoidance of hazards, reduced social and economic vulnerability to hazards, and improved preparedness for adverse events.'

The conceptual framework of elements considered with the possibilities to minimize vulnerabilities and disaster risks throughout a society, to avoid (prevention) or to limit (mitigation and preparedness) the adverse impacts of hazards, within the broad context of sustainable development.

Steps for Implementing DRR Strategy

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

What is included in a disaster risk reduction plan :
Refer to Q.5.

Why make a DRR plan : Refer to Q.6.

Components of Disaster Risk Reduction

1. Mitigation - Measures to be taken before and after an event
2. Preparedness - Measures to be taken before and after an event
3. Response - Measures to be taken during and immediately after an event
4. Recovery - Post disaster measures

1. Mitigation : Mitigation is the effort to reduce loss of life and property by lessening the impact of disasters. It is permanent reduction of the risk of a disaster. Mitigation lessens the likelihood and severity of disaster by implementing sustained actions, such as improved construction practice, to reduce or eliminate long-term risk to people and property. Mitigation of hazard impacts reduces the possibility of disaster and reduces the need for assistance.

Mitigation includes recognizing that disasters will occur; attempts are made to reduce the harmful effects of a disaster, and to limit their impact on human suffering and economic assets.

Types of Mitigation

1. Primary Mitigation: Primary mitigation refers to increasing the resistance to the hazard and reducing vulnerability.
2. Secondary Mitigation: Secondary mitigation refers to reducing the effects of the hazard (preparedness).

Various Approaches / Strategies of Disaster

- (a) **Risk Identification** : The first step in disaster mitigation is to identify areas that are at risk to hazard. Once the priority zones have been identified, comprehensive and integrated risk reduction programs should be initiated.
- (b) **Land-Use Planning** : Land-use planning includes the mapping of disaster-prone area which should contain number of livestock per unit area, crop density, population density, road network, location of shelter etc.
- (c) **Structural and Non-Structural** : Mitigation measures may involve construction (e.g. dykes and flood protection walls, and also ecosystem-based approaches to flood and erosion control, such as planting mangrove forests) and non-material measures (e.g. land-use restrictions in flood risk areas).
- (d) **Disaster relief and Rehabilitation** : Supply emergency humanitarian aid to victims for survival and relocate the peoples whose residence have been destroyed very badly, inappropriate for living.
- (e) **Disaster Management Training and Education** : Trained up group of personnel need to be formed in local, national and regional context to mitigate and reduce disaster risk and damages.
- (f) **Role of Media in Disaster Risk Reduction** : Media is the effective means to circulate the news and bulletins about hazard warning and mitigation processes.
- (g) **Institutional Capacity Building** : Several institutional bodies are engaged with disaster mitigation processes such as local community, organization, local and national government, NGOs, international organization etc. Ability and capacity of those institutions should be as high as they are capable to mitigate the disaster.

international organization etc. Ability and capacity of those institutions should be as high as they are capable to mitigate the disaster.

2. Disaster Preparedness : Preparedness refers the measures that ensure the organized mobilization of personnel, funds, equipment and supplies within a safe environment for effective relief. Preparedness lessens the severity of disasters by preparing people for disaster, developing plans to ensure an effective response and recovery and training people to implement plans after a disaster occurs. Preparedness Includes:

1. Forecasting and Warning for Different Hazards
2. Emergency Preparedness
 - (a) Organized personnel for monitoring, alert and evacuation
 - (b) Medical team - Search and rescue team
 - (c) Availability of food reserve
 - (d) Emergency monetary fund and seed reserve
 - (e) Distribution of disaster supplies and equipment
3. Education, Training and Public Awareness

Weather Forecast and Early Warning

Forecast : Weather forecasting is the application of science and technology to predict the state of the atmosphere for a given location. Weather forecasts are made by collecting quantitative data about the current state of the atmosphere at a given place and using scientific understanding of atmospheric processes to project how the atmosphere will change.

Tools : Various types of tools like Barometer, Radiosonde, Satellite (Geostationary and Polar Orbit), Radar, and other equipments.

Early Warning System : Early warning is a major element of disaster risk reduction. It prevents loss of life and reduces the economic and material impact of disasters. early warning systems can be used to detect a wide range of events, such as vehicular collisions, missile launches, disease outbreaks, and so forth. To be effective, early warning systems need to actively involve the communities at risk, facilitate public education and awareness of risks, effectively disseminate alerts, and warnings and ensure there is constant state of preparedness.

Tasks Related to Early Warning

1. Communication
2. Indigenous Knowledge
3. Media
4. Instruction Types of Early

Weather and Forecasting: Based on Duration

1. Short Range: 48 – 72 Hours (e.g. Cyclone, Hurricane, Bombing, Flood etc.)
2. Medium Range: 3 Days to 3 Weeks (e.g. Cold and Heat Wave, Floods etc.)
3. Long Range: Over a Season (El-Nino, La-Nino etc.)

Types of Early Weather and Forecasting: Based on Purposes

1. Aviation
2. Shipping
3. Local
4. Agricultural Base

Level of Preparedness

1. Family
2. Community - Volunteering activities - Protesting environmental degradation - Awareness building - Emergency steps
3. National : Developing principles and laws, executing rules, funding etc.
4. International / Regional: Seminar, Conference, Exchange of Technology and knowledge.

3. Response : Disaster response is the implementing phase of the disaster preparedness step. The focus in the response phase is on meeting the basic needs of the people until more permanent and sustainable solutions can be found.

To be ready for response with capability to provide rapid and efficient medical, rescue and emergency supplies, and equipment to those in need, following steps of task should be implemented:

1. Mobilization
2. Assessment
3. Requirement Analysis
4. Rescue and Evacuation

5. Emergency Assistance (e.g. medical care, shelter, distribution of food, water and supplies)

4. Recovery : Disaster recovery (DR) involves a set of policies and procedures to enable the recovery or continuation of vital technology infrastructure and systems following a natural or human induced disaster.

In other words, recovery is implementation of actions to promote sustainable redevelopment following a disaster, including new building code standards and land-use planning controls.

Recovery consists of:

1. Rehabilitation
2. Reconstruction (During reconstruction it is absolutely necessary to consider mitigation measures including relocation, land use zoning etc.)
- Rebuilding of house and public buildings
- Financing for rebuilding - Repair of roads, bridge, water system etc.
3. Psychological counseling
4. Long-term assistance to rebuild the community

Q.16 Case Study of disaster management in flash floods in Leh.

Ans. Disaster Management in Flash Floods in Leh (Ladakh) :

Introduction : In the midnight of August 6, 2010, Leh in Ladakh region of North India received a heavy downpour. The cloud burst occurred all of a sudden that caught everyone unawares. Within a short span of about 2 h, it recorded a rainfall of 14 inches. There were flash floods, and the Indus River and its tributaries and waterways were overflowing. As many as 234 people were killed, 800 were injured, and many went missing, perhaps washed away with the gorging rivers and waterways. There was vast destruction all around. Over 1000 houses collapsed. Men, women, and children were buried under the debris. The local communication networks and transport services were severely affected. The main telephone exchange and mobile network system (BSNL), which was the lifeline in the far-flung parts of the region, was completely destroyed. Leh airport was flooded and the runway was covered

Disaster Management

with debris, making it non-functional. Road transport was badly disrupted as roads were washed away and blocked with debris at many places. The civil medical and health facilities were also severely affected, as the lone district civil hospital was flooded and filled with debris.

Materials and Methods : The present case study is based on the authors' own experience of managing a natural disaster caused by the flash floods. The paper presents a firsthand description of a disaster and its prompt management. The data was collected from the records of the district civil administration, the civil hospital, and the Army Hospital, Leh. The approach used was both quantitative as well as qualitative. It included data collection from the primary sources of the district collectorate, interviews with the district civil administration and army officials who organized rescue operations, restoration of communication, and transport, mass casualty management, and informal discussions with local residents.

Disaster Management Strategies : Three core disaster management strategies were adopted to manage the crisis. These strategies included: i) Response, rescue, and relief operations, ii) Mass casualty management, and iii) Rehabilitation.

Response, Rescue, and Relief Operations : The initial response was carried out immediately by the Government of India. The rescue and relief work was led by the Indian Army, along with the State Government of Jammu and Kashmir, Central Reserve Police Force (CRPF), and Indo-Tibetan Border Police (ITBP). The Indian Army activated the disaster management system immediately, which is always kept in full preparedness as per the standard army protocols and procedures.

There were just two hospitals in the area: the government civil hospital (SNM Hospital) and Army Hospital. During the flash floods, the government civil hospital was flooded and rendered dysfunctional. Although the National Disaster Management Act(1) was in place, with the government civil hospital being under strain, the applicability of the act was hampered. The Army Hospital quickly responded through rescue and relief operations and mass casualty management. By dawn, massive search operations were started with the help of civil authorities and local people. The patients admitted in the civil hospital

were evacuated to the Army Hospital, Leh in army helicopters.

The runway of Leh airport was cleared up within a few hours after the disaster so that speedy inflow of supplies could be carried out along with the evacuation of the casualties requiring tertiary level healthcare to the Army Command Hospital in Chandigarh. The work to make the roads operational was started soon after the disaster. The army engineers had started rebuilding the collapsed bridges by the second day. Though the main mobile network was dysfunctional, the other mobile network (Airtel) still worked with limited connectivity in the far-flung areas of the mountains. The army communication system was the main and the only channel of communication for managing and coordinating the rescue and relief operations.

Mass Casualty Management : All casualties were taken to the Army Hospital, Leh. Severely injured people were evacuated from distant locations by helicopters, directly landing on the helipad of the Army Hospital. In order to reinforce the medical staff, nurses were flown in from the Super Specialty Army Hospital (Research and Referral), New Delhi, to handle the flow of casualties by the third day following the disaster. National Disaster Cell kept medical teams ready in Chandigarh in case they were required. The mortuary of the government civil hospital was still functional where all the dead bodies were taken, while the injured were handled by Army Hospital, Leh.

Army Hospital, Leh converted its auditorium into a crisis expansion ward. The injured started coming in around 0200 hrs on August 6, 2010. They were given first aid and were provided with dry clothes. A majority of the patients had multiple injuries. Those who sustained fractures were evacuated to Army Command Hospital, Chandigarh, by the Army's helicopters, after first aid. Healthcare staff from the government civil hospital joined the Army Hospital, Leh to assist them. In the meanwhile, medical equipment and drugs were transferred from the flooded and damaged government civil hospital to one of the nearby buildings where they could receive the casualties. By the third day following the disaster, the operation theatre of the government civil hospital was made functional. Table 1 gives the details of the patients admitted at the Army Hospital.

Table 1 : Admissions in the Army Hospital, Leh

Items	Army personal		Paramilitary	Civilian	Total
	Self	Dependents			
No. of casualty reported	11	7	2	529	549
No. of patients treated	11	7	2	529	549
No. of admissions	11	7	2	108*	128
No. of major surgeries	0	0	0	16	16
No. of minor surgeries	0	0	0	138	138

Note : *indicate 4 pregnant women who delivered

The analysis of the data showed that majority of the people who lost their lives were mainly local residents (49.6%). Among the dead, there were 10.3% foreign nationals as well [Table 2]. The age-wise analysis of the deaths showed that the majority of deaths were reported in the age group 26–50 years, accounting for 44.4% of deaths, followed by 11–25 year group with 22.2% deaths.

Table 2 : Number of deaths according to status of residence

States of residence	Frequency	Percent
Foreign nationals	24	10.3
Local residents	116	49.6
Non locals/tourists	76	32.5
Unidentified	18	7.7
Total	234	100.0

The gender analysis showed that 61.5% were males among the dead, and 38.5% were females. A further analysis showed that more females died in <10 years and ≥ 50 years age group, being 62.5% and 57.1%, respectively [Table 3].

Table 3 : Age and sex distribution of deaths

Age(years)	Gender		Total		No.	Percent		
	Female		Male					
	No.	Percent	No.	Percent				
<10	20	62.5	12	37.5	32	13.7		
11-25f	19	36.5	33	63.5	52	22.2		
26-50	29	27.9	75	72.1	104	44.4		
51+	16	57.1	12	42.9	28	11.9		
Age not ascertained	6	33.3	12	66.7	18	7.7		
Total	90	38.5	144	61.5	234	100.0		

Victims who survived the disaster were admitted to the Army Hospital, Leh. Over 90% of them suffered traumatic injuries, with nearly half of them being major traumatic injuries. About 3% suffered from cold injuries and 6.7% as medical emergencies [Table 4].

Table 4 : Distribution according to nature of casualty among the hospitalized victims

Nature of casualty	Frequency	Percentage
Traumatic injuries		
Major	45	43.3
Minor	49	47.1
Total	94	90.4
Cold injuries	03	2.9
Medical emergency	07	6.7
Total	104*	100.0

Note : *Does not include 4 pregnant women who were admitted after floods

Rehabilitation

Shelter and relief : Due to flash floods, several houses were destroyed. The families were transferred to tents provided by the Indian Army and government and non-government agencies. The need for permanent shelter for these people emerged as a major task. The Prime Minister of India announced Rs. 100,000 as an ex-gratia to the next of kin of each of those killed, and relief to the injured. Another Rs. 100,000 each would be paid to the next of kin of the deceased from the Chief Minister's Relief Fund of the State Government.

Disaster Management

Supply of essential items : The Army maintains an inventory of essential medicines and supplies in readiness as a part of routine emergency preparedness. The essential non-food items were airlifted to the affected areas. These included blankets, tents, gum boots, and clothes. Gloves and masks were provided for the persons who were working to clear the debris from the roads and near the affected buildings.

Water, sanitation, and hygiene : Public Health is seriously threatened in disasters, especially due to lack of water supply and sanitation. People having lost their homes and living in temporary shelters (tents) puts a great strain on water and sanitation facilities. The pumping station was washed away, thus disrupting water supply in the Leh Township. A large number of toilets became non-functional as they were filled with silt, as houses were built at the foothills of the Himalayan Mountains. Temporary arrangements of deep trench latrines were made while the army engineers made field flush latrines for use by the troops.

Water was stagnant and there was the risk of contamination by mud or dead bodies buried in the debris, thus making the quality of drinking water questionable. Therefore, water purification units were installed and established. The National Disaster Response Force (NDRF) airlifted a water storage system (Emergency Rescue Unit), which could provide 11,000 L of pure water. Further, super-chlorination was done at all the water points in the army establishments. To deal with fly menace in the entire area, anti-fly measures were taken up actively and intensely.

Food and nutrition : There was an impending high risk of food shortage and crisis of hunger and malnutrition. The majority of food supply came from the plains and low-lying areas in North India through the major transport routes Leh–Srinagar and Leh–Manali national highways. These routes are non-functional for most part of the winter. The local agricultural and vegetable cultivation has always been scanty due to extreme cold weather. The food supplies took a further setback due to the unpredicted heavy downpour. Food storage facilities were also flooded and washed away. Government agencies, nongovernmental organizations, and the Indian Army immediately established

food supply and distribution system in the affected areas from their food stores and airlifting food supplies from other parts of the country.

Health : There was a high risk of water-borne diseases following the disaster. Many human bodies were washed away and suspected to have contaminated water bodies. There was an increased fly menace. There was an urgent need to prevent disease transmission due to contaminated drinking water sources and flies. There was also a need to rehabilitate people who suffered from crush injuries sustained during the disaster. The public health facilities, especially, the primary health centers and sub-health centers, were not adequately equipped and were poorly connected by roads to the main city of Leh. Due to difficult accessibility, it took many hours to move casualties from the far-flung areas, worsening the crisis and rescue and relief operations. The population would have a higher risk of mental health problems like post-traumatic stress disorder, deprivation, and depression. Therefore, relief and rehabilitation would include increased awareness of the symptoms of post-traumatic stress disorder and its alleviation through education on developing coping mechanisms.

Economic impact : Although it would be too early to estimate the impact on economy, the economy of the region would be severely affected due to the disaster. The scanty local vegetable and grain cultivation was destroyed by the heavy rains. Many houses were destroyed where people had invested all their savings. Tourism was the main source of income for the local people in the region. The summer season is the peak tourist season in Ladakh and that is when the natural disaster took place. A large number of people came from within India and other countries for trekking in the region. Because of the disaster, tourism was adversely affected. The disaster would have a long-term economic impact as it would take a long time to rebuild the infrastructure and also to build the confidence of the tourists.

The floods put an immense pressure and an economic burden on the local people and would also influence their health-seeking behavior and health expenditure.

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Political context : The disaster became a security threat. The area has a high strategic importance, being at the line of control with China and Pakistan. The Indian Army is present in the region to defend the country's borders. The civil administration is with the Leh Autonomous Hill Development Council (LAHDC) under the state government of Jammu and Kashmir.

Conclusions : It is impossible to anticipate natural disasters such as flash floods. However, disaster preparedness plans and protocols in the civil administration and public health systems could be very helpful in rescue and relief and in reducing casualties and adverse impact on the human life and socio-economic conditions. However, the health systems in India lack such disaster preparedness plans and training. In the present case, presence of the Indian Army that has standard disaster management plans and protocols for planning, training, and regular drills of the army personnel, logistics and supply, transport, and communication made it possible to immediately mount search, rescue, and relief operations and mass casualty management. Not only the disaster management plans were in readiness, but continuous and regular training and drills of the army personnel in rescue and relief operations, and logistics and communication, could effectively facilitate the disaster management operations.

Effective communication was crucial for effective coordination of rescue and relief operations. The Army's communication system served as an alternative communication channel as the public communication and mobile network was destroyed, and that enabled effective coordination of the disaster operations.

Emergency medical services and healthcare within few hours of the disaster was critical to minimize deaths and disabilities. Preparedness of the Army personnel, especially the medical corps, readiness of inventory of essential medicines and medical supplies, logistics and supply chain, and evacuation of patients as a part of disaster management protocols effectively launched the search, rescue, and relief operations and mass casualty reduction. Continuous and regular training and drills of army personnel, health professionals, and the community in emergency rescue and relief operations are important

measures. Emergency drill is a usual practice in the army, which maintains the competence levels of the army personnel. Similar training and drill in civil administration and public health systems in emergency protocols for rescue, relief, mass casualty management, and communication would prove very useful in effective disaster management to save lives and restore health of the people.

Lessons learnt and recommendations : Natural disasters not only cause a large-scale displacement of population and loss of life, but also result in loss of property and agricultural crops leading to severe economic burden. In various studies, several shortcomings have been observed in disaster response, such as, delayed response, absence of early warning systems, lack of resources for mass evacuation, inadequate coordination among government departments, lack of standard operating procedures for rescue and relief, and lack of storage of essential medicines and supplies.

The disaster management operations by the Indian Army in the natural disaster offered several lessons to learn. The key lessons were:

- Response time is a critical attribute in effective disaster management. There was no delay in disaster response by the Indian Army. The rescue and relief operations could be started within 1 h of disaster. This was made possible as the Army had disaster and emergency preparedness plans and protocols in place; stocks of relief supplies and medicines as per standard lists were available; and periodic training and drill of the army personnel and medical corps was undertaken as a routine. The disaster response could be immediately activated.
- There is an important lesson to be learned by the civil administration and the public health system to have disaster preparedness plans in readiness with material and designated rescue officers and workers.
- Prompt activation of disaster management plan with proper command and coordination structure is critical. The Indian Army could effectively manage the disaster as it had standard disaster preparedness

Disaster Management

plans and training, and activated the system without any time lag. These included standard protocols for search, rescue, and evacuation and relief and rehabilitation. There are standard protocols for mass casualty management, inventory of essential medicines and medical supplies, and training of the army personnel.

- Hospitals have always been an important link in the chain of disaster response and are assuming greater importance as advanced pre-hospital care capabilities lead to improved survival-to-hospital rate. Role of hospitals in disaster preparedness, especially in mass casualty management, is important. Army Hospital, Leh emergency preparedness played a major role in casualty management and saving human lives while the civil district hospital had become dysfunctional due to damage caused by floods. The hospital was fully equipped with essential medicines and supplies, rescue and evacuation equipments, and command and communication systems.
- Standard protocols and disaster preparedness plans need to be prepared for the civil administration and the health systems with focus on Quick Response Teams inclusive of healthcare professionals, rescue personnel, fire-fighting squads, police detachments, ambulances, emergency care drugs, and equipments. These teams should be trained in a manner so that they can be activated and deployed within an hour following the disaster. "TRIAGE" has to be the basic working principle for such teams.
- Effective communication system is of paramount importance in coordination of rescue and relief operations. In the present case study, although the main network with the widest connectivity was extensively damaged and severely disrupted, the army's communication system along with the other private mobile network tided over the crisis. It took over 10 days for reactivation of the main mobile network through satellite communication system. Thus, it is crucial to establish the alternative communication system to handle such emergencies efficiently and effectively.

- Disaster management is a multidisciplinary activity involving a number of departments/agencies spanning across all sectors of development. The National Disaster Management Authority of India, set up under National Disaster Management Act 2005, has developed disaster preparedness and emergency protocols. It would be imperative for the civil administration at the state and district levels in India to develop their disaster management plans using these protocols and guidelines.
- Health system's readiness plays important role in prompt and effective mass casualty management. Being a mountainous region, the Ladakh district has difficult access to healthcare, with only nine Primary Health Centers and 31 Health Sub-Centers. There is a need for strengthening health systems with and capacity building. More than that, primary healthcare needs to be augmented to provide emergency healthcare so that more and more lives can be saved.
- Training is an integral part of capacity building, as trained personnel respond much better to different disasters and appreciate the need for preventive measures. Training of healthcare professionals in disaster management holds the key in successful activation and implementation of any disaster management plan. The Army has always had standard drills in all its establishments at regular intervals, which are periodically revised and updated. The civil administration and public health systems should regularly organize and conduct training of civil authorities and health professionals in order to be ready for action.
- Building confidence of the public to avoid panic situation is critical. Community involvement and awareness generation, particularly that of the vulnerable segments of population and women, needs to be emphasized as necessary for sustainable disaster risk reduction. Increased public awareness is necessary to ensure an organized and calm approach to disaster management. Periodic mock drills and exercise in disaster management protocols in the general population can be very useful.

Q.17 Case study of disaster management in flash flood in Uttarakhand.

Ans. A Case Study of Uttarakhand : At the peak of the monsoon season the northern state of Uttarakhand was face to face with floods caused due to the cloud burst that hit three of the four famous Char Dham pilgrimage sites, "2013 North India floods" leaving tens and thousands of inhabitants as well as pilgrims stranded or swept away due to the floods, and not to mention the damage cause to life, property and business. The famous Char Dham pilgrimage is now discontinued for three years for repair and restoration. The National Institute of Disaster Management (NIDM), in one of its first reports on the Uttarakhand floods, has blamed "climatic conditions combined with haphazard human intervention" in the hills for the disaster.

Besides the natural disaster various other factors have contributed to the downfall of this famous religious/tourist site. Uttarakhand's huge potential in tourism lead to the state in tapping its potential towards becoming a major tourist and pilgrim destination, also has a hand in this disaster. The uncontrolled rise of tourism inflow into the state of Uttarakhand, took a toll on the ecology of the state. With Uttarakhand's proximity to the national capital, the weekend revelers soon found Uttarakhand to be the destination to beat the heat. Plus, the religious tourists found it much easier to travel to-not-so accessible Badrinath, Kedarnath, Gangotri and other shrines, all this lead to an unsustainable rise in the number of people traveling to Uttarakhand.

As stated by Jacob (2013) during a live television interview on CNN-IBN that, "the number of 'pilgrims' has been steadily increasing, with people from the plains interested in a quick guided tour of the hills in a vehicle, the local authorities have ignored the carrying capacity and cumulative impact of dams and illegal construction on the fragile Himalayas". This steady rise in tourist inflow resulted in other detrimental issues such as heavy traffic and roadblocks, with tourists routinely complaining about the bad roads and how it affected their travel time, the government resorted to widen the roads so as to

accommodate the tourist's inflow. Considering the fragility of these mountains, Himalayas being the youngest of the mountain ranges in the world with very poor soil stability the roads would routinely cave in or get washed away during monsoons.

The rising tourism industry lured the land sharks and they erected multi-storied hotels, flouting all environmental norms. Thousands of such resorts and hotels have mushroomed in this eco-sensitive zone in the last few years. Some of these hotels were built on banks of several small and big rivers just to give the tourist a bird's eye view of the pristine river flowing through the valley. The number of hotels has also seen a similar rise in the recent past. For example, Kedarnath Valley has hundreds of such hotels that were vulnerable to these natural calamities. So, when flash floods struck the valley, many of these hotels got swept away and so did the people staying in them. As addressed by Jacob, that "rampant illegal construction of buildings by locals had also contributed to the problems and made a bad situation worse. On top of it all, traffic in the hills has increased hugely, with the number of vehicles registered in the hills going up sharply. Remember the hills are delicate and unstable, so it takes little to set off landslides. More infrastructure has in fact worsened the situation since much of it is poorly made and constructed by people who have no idea of building in the hills".

All the above factors has had a crucial role to play in the disaster, but as the report provisioned by the Comptroller and Auditor General (CAG) showed that not only was the disaster aggravated due to rise tourism but also blame lands in the faults of the State Disaster Management Authority which was formed in 2007, but never was a meeting convened nor were there any rules, regulations, policies or guidelines framed, "the state disaster management plan was under preparation and actionable programmes were not prepared for various disasters," the report says. Going to show that the state was unprepared to face a sudden crisis, furthermore as Varma stated, Uttarakhand government, the CAG said that although the Geological Survey of India had identified 101 villages as 'vulnerable' in June 2008, the state government did not take any measures for their rehabilitation till date".

Besides this there are also allegations against the government based on the construction of several dams along the river, which is as good as handing out an invitation to disasters, as Jacob reflects on the same, "illegal construction - of buildings and dams, the government has sanctioned an absurd number of hydro electric power projects that actually overlap with each other". All this only goes to show the state and in turn the nation's lack of competency, lack of planning and absences of political accountability is evidently seen through this extensive damage.

To highlight the main factors that aggravated the disaster are as follows: the unregulated tourist inflow; the absence of an early warning mechanism as the CAG report mentions "The communication system was inadequate"; a lack of trained medical staff at hospitals; the climatic conditions the India Meteorological Department had issued advance warnings predicting extreme weather conditions in Uttarakhand before the flash-floods though no appropriate action was taken and finally the fact that the state had no action plan in case a disaster struck.

"Plan ahead", states that "Disasters are not learning processes. The authorities will have to do all they can to ensure against such recurrences the starting point is for the State Disaster Management Authority to put place a disaster management plan". Thus, unforeseen disasters calls for having an effective disaster management plan in place and for the State Disaster Management Authority to prepare actionable programmes to deal with disasters. One such action plan is as suggested below, will help in restoring the destinations success.

Steps in Disaster Management : One of the many means of avoiding extensive damage caused by disasters is by being well prepared to face them. So as to ready the state of Uttarakhand with ways of combating unexpected disasters, an effective disaster management plan is to be implemented. The following are some of the steps that can be taken toward framing a disaster management plan.

The Pre-Disaster Stage : This stage focuses on minimizing the damage to life, property and environment is that before the disaster strikes and at the prohibition stage, various schemes are drafted for controlling the losses to lives and property to minimize the effects of disaster. There are several techniques to embark upon

this stage where the disaster has not occurred, wherein there is a call for being better prepared and to have an effective of warning mechanism prior to the disaster.

Preparedness : It refers to the readiness, on the governmental, social and personal levels, to effectively face the disaster that has already visited and it includes practical disaster-layouts. Here, the local residents along with the state officials need to be sensitized regarding the measures to be taken when faced by a crisis, such as landslides, floods, earthquakes etc. So in case of such emergencies they can take necessary action.

The Warning of Disaster : It is very crucial that immediately after receiving slightest hint of a disaster, the information about its advent reaches the entire danger-prone area. In the case of Uttarakhand it was seen that the State Disaster Management Authority did not have a scheme so as to curtail the disaster nor were the warnings issued by the meteorology department taken seriously.

Response and Relief Measures : This includes a wide range of activities including the erection of control booths, action according to the action-plan drafted, the broadcasting of danger notice. Post the disaster various relief measures were initiated by the authorities in forms of rescue missions by the Indian Armed Forces, so as to rescue victims and provide rehabilitation and in monetary terms to reconstruct the destination.

The Post – Disaster Stage : While restoring the state to normalcy, it is also equally necessary to ensure that if, unfortunately, the disaster revisits, the extent of damage is lesser. Restoration includes assistance, rehabilitation and reconstruction. "In addition to this, many protective steps will be taken to prevent if same calamity recurs in any case. It is decided to keep a track of the pilgrims – Indian as well as foreigners. Moreover, this time efforts will be made to handle things thoroughly and systematically" returns.

Revival / Resurrection : In revival, the focus is on the erection of facilities of greater competence than those built in pre-disaster stage. Erection of new buildings, taking ultra care of durability while erecting various essential facilities – are some illustrations of revival activities. During this stage care is to be taken to see to it that building do not encroach nature and that they are built in a sustainable manner. The government has curtailed the Char Dham yatra for three years for the purpose of repair and

restoration as quoted by B.D. Singh, chief executive officer of the Badrinath - Kedarnath Temple Committee told IANS, that the chances of reviving the pilgrimage "for the next few years" was grim, "what we are seeing is very painful and unbelievable," he said "We don't expect the Char Dham Yatra to resume in the next three years." A survivor claims that there is nothing left in Kedarnath except for the temple, which now will take these three years to restore, as from the building to the roads were washed away in the flood (IAN, 2013). Thus this stage will require this ample time to plan appropriately for the revival of this holy destination.

Development : The reconstruction of the affected region and bringing back people's lives to normalcy is a pretty long process – especially because of the existence of severe financial constraints. The government is taking initiative to raise fund from both the public and private fronts. To facilitate the above various funds and relief funds are raised throughout the country to mention a few the donations sent to Doctors For You, Uttarakhand Daivee Aapada Peedith Sahayata Samiti, Uttarakhand relief fund, individuals contributions and relief funds such as the Chief Ministers relief fund, Prime Ministers relief fund etc. all have come to aid the state of Uttarakhand. Besides this the chance of the Char Dham Yatra to resume excluding Kedarnath is also expected by the end of 30th September, 2013 so as to help the locals who survived solely on tourism returns.

An apt means of ensuring that the destination thrives in spite of being in a crisis is through the adoption of an effective means to restore the destination post the disaster. The following approach showcases a step by step means in destination restoration. This can be an example of how Uttarakhand can be restored to its former glory.

A Systematic Approach - Improves Destination Restoration Success : To assist planners in conducting cost-effective monitoring for destination restoration, techniques can be developed consisting of four components, following which is the brief explanation regarding the four components: planning, construction and implementation, assessment of performance and management of the system.

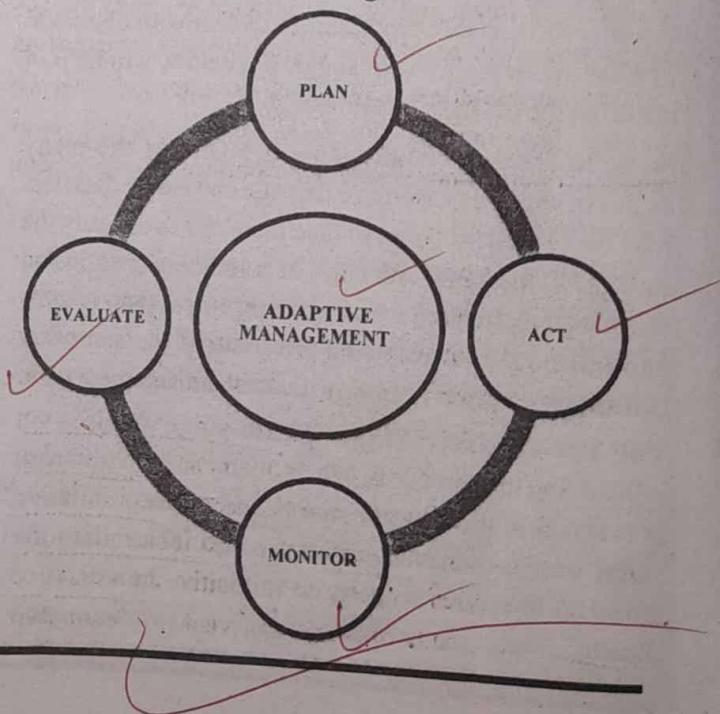
Planning : The key element in planning the restoration project would require: conceptual modeling, site assessments, and cost estimation. A conceptual model

details the structural aspects of the system that must be developed to meet the goals. Whereas as site assessment is essential where the site lacks the characteristics necessary to reach performance goals, the restoration project will likely fail. Thus in the case of Kedarnath an assessment of the destination must be made prior to any constructions made. Also cost estimation is to be made to the end of the planning stage. Restoration managers must account for land acquisition, engineering design, and construction, among other factors.

Construction and Implementation : Projects that require less physical restructuring of the site are more likely to develop successfully without human intervention. Projects requiring more engineering to massively rework the site often have a higher degree of uncertainty. These factors are to address while restoring the disaster hit regions of Uttarakhand.

Assessment of Performance : Post-implementation monitoring should focus on a parameter indicative of the original goal. There are numerous low-cost ways to effectively monitor a restoration project. Within the span of the three years there is a need for continuous assessment to see to it that the destination is being restored as per the action plan and no deviations occur.

Management of the System : Restoration management plans should be modified according to the principles of adaptive management, which is nothing but decision making in times of uncertainty, where policies and practices are altered according to learning from outcomes.



Thereby restoration policy can be understood well, depending on the application of alterations so as to accommodate changes if necessary.

Marketing Management of Destination in Crisis : Marketing management is another important criteria, while dealing with a destination in crisis and certain criteria's needs to be noted such as: identifying the event/problem as either a crisis or a hazard the next step is to establish a crisis management team and define roles, thirdly to promote the destination during and after the crisis, this must be done with utmost care so as not to negatively affect the sentiment to the people and to send out a positive reassuring message to the audience and lastly to monitor recovery and analyze the crisis experience. These measures should ensure a strong base for drafting a better marketing management system. Regular liaison between national, local and regional tourism authorities is vital during a crisis.

Maintaining an effective website : Many destination authorities now realize that an effective website is one of the most cost-effective marketing tools they have. It is an especially useful marketing aid during and after a crisis. E-Marketing campaigns are highly trackable and measurable, and can be targeted and customized. Travelers can use the same social media platforms to express themselves and communicate with each other. The media are heavily reliant on websites with visuals as a source of news and feature articles on tourism. The website serves as an integrated marketing medium featuring information on sites, operators, special deals and events. The qualities of a good website are at ease of access for the comprehensive and up-to-date provision of information.

During a crisis and the recovery phase, the website is rapidly replacing the traditional press release as a means of updating all concerned parties. During a crisis and in a post-crisis recovery phase, the most brilliant marketing campaigns and the most comprehensive websites are no substitute for firsthand independent testimonials from opinion leaders. Influential travel writers, travel-orientated television shows, radio programs and influential travel industry identities who report a positive impression of eyewitness accounts of those who visit the destination,

especially during the restoration phase, are important elements in recovery stimulation. Uttarakhand government portal has regular updates on the region along with the official website of Disaster Mitigation and Management Centre of Uttarakhand, has regular updates on the progress of the rescue mission and relief offered.

Best Practice of Destination Management : A destination should practice effective management within itself so as to deal with unprecedented events such as flash floods, earthquakes and other such disasters. Various developed and developing countries have adopted destination management through Destination Management Organizations (DMOs), which is one such take on destination management. It caters not only to management, but also several other aspects as mentioned by Vargese (2013) briefing on the general meaning and functions of DMOs being a, "non-governmental technical body voluntary in nature; supported by the Host Government. DMO is a body to initiate a standardized procedure to market a destination by attracting right quantum of tourist, to synergize activities on tourist destinations. DMOs are also perceived as marketing organizations designed to bring buyers in contact with marketers (providers of tourism products and services). DMOs can flourish with Destination marketing as a proactive function. Visitor centered approach to the economic and cultural development of a destination will balance and integrate the interests of visitors, service providers and the community". These destination management organizations are duty bound to deal with the crisis that the modern day destination has to face, as it directly or indirectly affects the destination image and in turn affects the marketing of that destination as Borzyszkowski & Marczak asserts the credibility of DMOs in destination crisis "it seems to be particularly essential the occurrence of various phenomena that are related to a crisis forces destinations to undertake specific actions aimed at a minimization of the effects of a crisis. Those organizations that are responsible for the development of tourism in a destination during the occurrence of crisis situations possess numerous possibilities to interact with the market and consequently to limit the effects of a crisis". Thus the role of a Destination Management Organization is essential in any destination especially to cater to its every

need and rise to assist the destination even in the plight of a disaster.

Conclusion : The highlight is on the tourism disasters vulnerability of the tourist trade to unforeseen events which also signifies the principles of disaster management, the content also elaborates on how to pro-actively deal with the potential for future crisis related to tourism, steps in disaster management would give a brief overview about the various stages involved in disaster management. Further discussion in this paper leads to a systematic approach – which improves destination restoration techniques and also describes about the reasons for the collapse of tourism destination areas and enumerating on

the aspects of an ideal area development, with relation to Uttarakhand.

In terms the losses faced by the tourism industry, due to the disaster are extensive as said by an official to Madhav that, "speaking on the possible losses, the season accounted for 30 per cent of the tourism sector's annual earnings. Due to the calamity, they were witnessing 99 per cent cancellations from the affected travelers and from pre-bookings." Thus when the Char Dham yatra has been cancelled for three year the possible losses can be imagined. So through the implementation of destination management and the several disaster management techniques, such losses can be avoided and the credibility of a destination restored.

