

**SPECIMEN COPY FOR  
REVIEW &  
RECOMMENDATION**

# **Disaster Management and Mitigation Measures**

**(Institute Level Optional Course - I) (ILO 7017)**

**Semester VII – (Common to all Branch)  
(Mumbai University)**

**Strictly as per the Choice Based Credit and Grading System  
(Revise 2016) of Mumbai University w.e.f. academic year 2019-2020**

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# **Syllabus**

## **Objectives :**

1. To understand physics and various types of disaster occurring around the world
2. To identify extent and damaging capacity of a disaster
3. To study and understand the means of losses and methods to overcome/minimize it.
4. To understand role of individual and various organization during and after disaster
5. To understand application of GIS in the field of disaster management
6. To understand the emergency government response structures before, during and after disaster

## **Outcomes : Learner will be able to ...**

1. Get to know natural as well as manmade disaster and their extent and possible effects on the economy.
2. Plan of national importance structures based upon the previous history.
3. Get acquainted with government policies, acts and various organizational structure associated with an emergency.
4. Get to know the simple do's and don'ts in such extreme events and act accordingly.

<b>Module</b>	<b>Detailed Contents</b>	<b>Hrs</b>
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	<b>Disaster Management, Policy and Administration</b>	

<b>3.2 Policy and administration :</b>	Importance and principles of disaster management policies, command and co-ordination of in disaster management, rescue operations-how to start with and how to proceed in due course of time, study of flowchart showing the entire process.	
<b>Institutional Framework for Disaster Management in India</b>		
<b>4.1</b>	Importance of public awareness, Preparation and execution of emergency management program. Scope and responsibilities of National Institute of Disaster Management (NIDM) and National disaster management authority (NDMA) in India. Methods and measures to avoid disasters, Management of casualties, set up of emergency facilities, importance of effective communication amongst different agencies in such situations.	06
<b>4.2</b> Use of Internet and softwares for effective disaster management. Applications of GIS, Remote sensing and GPS in this regard.		
<b>Financing Relief Measures</b>		
<b>5.1</b>	Ways to raise finance for relief expenditure, role of government agencies and NGO's in this process, Legal aspects related to finance raising as well as overall management of disasters. Various NGO's and the works they have carried out in the past on the occurrence of various disasters, Ways to approach these teams.	0911
<b>5.2</b>	International relief aid agencies and their role in extreme events.	
<b>Preventive and Mitigation Measures</b>		
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<b>6.3</b>	Non Structural Mitigation: Community based disaster preparedness, risk transfer and risk financing, capacity development and training, awareness and education, contingency plans.	
<b>6.4</b>	Do's and don'ts in case of disasters and effective implementation of relief aids.	



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Structural Mitigation : Community based disaster preparedness, risk transfer and risk financing, capacity development and training, awareness and education, contingency plans.

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# Introduction

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**Disaster, hazard, global and Indian scenario, general perspective, importance of study in Direct and indirect effects of disasters, long term effects of disasters. Introduction to**  
**ing and climate change.**

## Introduction to Disasters

### Definition of Disasters

The term Disaster can be defined as "Any occurrence that causes damage, ecological loss and human life deterioration of health and the health services on a scale sufficient to extraordinary response from outside the affected community or a region." OR  
 can also be defined as, "It is a serious disruption of the functioning of a community or a

isters involve, a wide spread, human, material, economic or (and) environmental impacts exceed. The ability of the affected community or society to cope up by using its own es.

### Definition of Hazard

The Hazard can be defined as, "It is a dangerous phenomenon substance human activity on which may cause the loss of life. Injury or any other health impacts property losses or loss of lively hoods and services, social and Economic disruption or Environmental

hards are the conditions that have potential to harm the community or the Environment. hard is a situation which poses the level of threat to human life property or Environment. hard is any source of the potential damage harm or adverse health effects on humans under condition at the work.

## 1.2 The Disaster Scenario at the Global Level

- The disasters at the global level are situations which are observed may be in a country or a community but the effects are spread at the world level e.g. flood situation in a small country in Africa. The drought in the countries of monsoon Asia involves the whole of the world.
- According to the world Disaster Report of 2005, there is an increase trend. Worldwide in the number of disasters and their economic impacts.
- This report also suggests that though the numbers of people getting killed in a disaster have decreased, but the total number of people who get affected by such situation has increased.
- E.g. If we compare the people getting killed due to floods about 50 years back with the latest data the numbers has been reduced but the economical and ecological losses along the bank of a river having floods have increased.
- This is due to the industrialization and urbanisation along the banks of the rivers.
- This is mainly observed in the countries where the economy is agro based and also in the countries where rivers are mainly used for inland navigations.

## 1.3 The Disaster Scenario at the National Level in India

- Though at the world level and also at the national level in India. We have made a tremendous progress in various fields in technology still there is one area where we have not been able to surpass the supremacy of the nature.
  - The nature always have proved to be very powerful than the entire human race. In spite of all the technological and scientific achievements, still we have failed to predict the weather for casting conditions.
  - This year i.e. in 2019 the Indian Metrological Department has predicted to have 95% of the south-west Monsoon Rainfall there is no surety of the arival of S.W. monsoons at a given schedule.
  - It may come early or late. It may yield more or less. If less it develops droughts like one we had in 2016 and if more that creates wet-famines and flood situation mainly in the northern states of India. i.e. Assam, Bihar, Uttarakhand etc.
  - Following are some of the notable disasters in India which have caused the det loss on life economic properties and also the ecological losses.
    1. Floods in Kashmir year 2014.
    2. The Flash Floods in Uttarakhand year 2013.
    3. The Tsunamies in the Bay of Bengal year 2004.
    4. The Earthquake at Bhui (Gujarat) year 2001.
    5. A super cyclone at Odisha year 1999.
- In the month of April 2019, one cyclone named as 'Fany', attacked odisha and west Bengal.
6. The Earth Earthquake at Latur [Maharashtra] year 1993.



7. The Earthquake at Koyananagar [Maharashtra] year 1967.
  - With these disasters if we look in the past some disasters have taken a high toll of human life. The notable disasters long part one.
    - (a) Cyclone in Andhra Pradesh in the year 1839 took the toll of 3.2 lakhs people's death.
    - (b) Cyclone at Calcutta (Kolkata) (West Bengal) in the Year 1737 killed about 3 lakhs people.
    - (c) The Famines in Bengal in the years 1770 about 30 million people died and 4 million died in the year 1943 in Bengal (than there was nothing like West Bengal).
  - So disasters dry to wet are very common in India. To control these loss of life properties animals and ecological losses.
  - We need to hence a proper planning and its proper execution.

## 1.4 General Perspective of Disasters

- (A) A disaster is calamity which causes physical damages to the buildings roads, dams and other structures. It also affects the human and other living beings. It causes economic and ecological losses. These physical loss are quantifiable but the environmental and ecological losses cannot be quantified and remain for a very long time.
- (B) There is another perspective of the disasters. They can cause serious mental health consequences. This can take the form of 'Post Traumatic Stress Disaster (PTSD)' and a variety other mental disorders. Other psychological effects of disasters are :
- (i) Emotional effects
  - (ii) Cognitive effects
  - (iii) Physical effects
  - (iv) Interpersonal effects

### (C) Socio-Cultural Perspective

- The level of knowledge about the risk of the disaster and the reaction of the people facing the disaster like floods earthquakes, cyclones, landslides etc. depends upon the socio-cultural background of the people In general people having better educational background have better knowledge about causes and effects of the disasters.
- So they can react logically and can help the other people to clam down and to have a positive response to the disaster. This helps to reduce the losses.

### (D) Economic Perspective

- Due to the disaster the whole of the economic system of the affected region is affected.
- E.g. the droughts cause losses of farming, Cyclones clause the losses of fishing industries,
- The landslides affect the transport activities etc.
- So in general the disasters have the negative effects on Assets, Production, Consumption Employment of the region / state which is under the effects of the said disaster.



### (E) The Political Perspective

- In a country like India having states which have different geographical locations to cause different disasters which put a political pressure on the control Government because they have to make the budgetary provision every year to support the states facing various disasters e.g. when the states like Bihar, Assam, Uttarakhand suffer from floods the states in south India like Maharashtra, Andhra Pradesh suffer from sevior droughts.
- The situation becomes more serious when the state Governments of different states have different ruling parties than the party ruling the Central Government e.g. 2014 to 2019 and 2019 onwards.
- We have N.D.A. Government at the centre and Congress Trunmul Congress D.M.K., leftist etc. rule different state as the state governments.

## 1.5 Importance Study of Disasters In Human Life

- It is necessary for all of us about the natural disasters like Earthquakes landslides floods or droughts because if we know the causes of these disasters.
- We can prepare for it in the future to reduces the total losses e.g. if we known that this years it is expected to have less or late rainfall which may cause droughts.
- We can save the water by going for rainwater harvesting after the late or less rainfall occurs to save us in the next dry summers or if we know that the cutting of forests in the upper region of the river causes the floods in the downstream areas.
- We can control the forest cutting and go for the tree plantation which not world control the floods but also would help to control the losses of soil along the upper stream region by controlling the forest cutting.
- We can reduce the another disaster at the world level i.e. Global warming.

## 1.6 Direct and Indirect Effects of Disasters

### (A) The Direct Effects of the Disasters

- (i) It causes the loss of lives of human beings and also the other living beings e.g. The cyclones on the east coast of India every year take a huge toll of deaths. Main the states which suffer from this disaster are Tamilnadu, Andhra-Pradesh, Odesha and West Bangal.
- (ii) It causes a huge economic losses e.g. the droughts very common in India cause a great loss of agricultural activities and also the losses of dairy farming.
- (iii) It causes loss natural vegetation mainly due to the floods.

### (B) The Indirect Effects of the Disasters

- (i) They create a threat to the ecosystem e.g. the forest fire disturbers the forest ecological system. It is a long run effect.



- (ii) They also create the problem soil erosion along the backs of a river due to the floods. The top fertile soil gets eroded and the fertility of soil is reduced. This causes the reduction in the agricultural produce to cause the problem of under nourishment of the farmers.
- (iii) The droughts cause the forced migration of the farmers and the land less labourers to the urban areas to get jobs. (Which are not easily available)
- (iv) These disasters such as floods, droughts, earthquakes make the forced migrations towards the urban areas to develop the slums. Which in turn create the social and political economic unrest in the urban areas.

## 1.7 The Long Term Effects of Disasters

- Each one of the natural disaster has some immediate and long term effect e.g. In case of almost all the economic losses and losses of lives of thousands of human beings are the immediate effects like in cases of cyclones floods, landslides earthquakes etc.
- These effects are immediately seen and are needed to be corrected by the local authorities the State Governments and also the Central Governments.
- The long term effects mainly are the ecological losses e.g. the losses of ecosystems losses of ecological habitats. This results into the permanent losses of some of the plant and animal species.
- The most of the long term effects are the chain which required to be cut and corrected e.g. the global warming is the result of forest cutting. The forest cutting causes the loss of the top soil. The top soils are transported to the dams and the storage capacity of the dams is reduced due to sedimentation. Due to reduction in the storage capacity of the reservoir, the command area and the catchment area suffer from the man made floods. These floods cause the losses of the human and animal life and also the causes the economic losses. So, growth of forest to reduce the global warming to reduce the floods, to reduce economic and ecological losses in the long run.

## 1.8 The Global Warming and the Climatic Changes

### (A) Causes of Global warming

- The global warming is a phenomenon of the climatic changes. It is the positive change in the heat received by the surface of earth i.e. there is a continuous increase in the temperature at the world level. This has modified the world climate zones like Equatorial zone, Tropical zone, Temperate zone and Artic zone.
- Following are causes of the global warming :

#### (i) Deforestation

Due to fast and unplanned urbanization. The natural vegetation i.e. the forests are being cut ruthlessly. The normal percentage of carbon dioxide [CO<sub>2</sub>] in the lowest layer of the atmosphere used to be about 0.03%. This was used to be consumed by the natural vegetation and they used to produce Oxygen (O<sub>2</sub>). Now, as we have started the deforestation on a large scale the



consumption of CO<sub>2</sub> has been reduced. As per the latest reports at present the percentage of CO<sub>2</sub> has increased up 0.04 %. CO<sub>2</sub> is a green house gas which hold the outgoing heat. So the lower layer of the atmosphere i.e. Troposphere is getting heated to cause global warming.

## (ii) Industrializations

Due to huge unplanned industrialization mainly of the chemical industries petrochemical industries, chemical fertilizer industries and pesticide industries huge amount of carbon particulates are sent out in the open sky. They remain in the atmosphere for a long time causing the air pollution in the industrial areas. They also hold the heat released from the earth causing the global warmings.

## (iii) The use of Fossil Fuel

The massive used the fossil fuel i.e. coal, oil and Natural Gas are the another sources of global warming. The burning of these conventional power resources causes the huge production of CO<sub>2</sub> and also of the carbon particulates which is the common cause of the present global warming.

## (iv) The Intensive Farming

In the intensive farming the main fertilizer used is green manure e.g. the cow dung as it is easily available and clear also. The decomposition of this green manure develops another green house gas i.e. the Methane Gas. So, the use of green manure in the intensive farming to increase the yields of the crops, is another cause of the global warming.

## (v) The Solid Waste Disposal

The disposal methods like landfill or incineration cause the development of green house gases like CO<sub>2</sub> and Methane gas to cause the global warming.

## (vi) The Mining Activities

In almost all mines to produce the raw material like ores the blasting methods are used. This sends tons of small particles in the atmosphere to have the green house effect to cause global warming.

## (vii) The over consumption

In fact this is the major cause of the global warming. As, the over consumption of the natural resources causes, over exploitation of these natural resources. This causes the loss of the balance of the carbon cycle, Oxygen cycle or the material cycles, resulting finally into the major worldwide disaster of global warming.

# (B) The Effects of Global Warming

## i) The Effects on the Biodiversity

The rise in temperature has affected the ecosystems. Due to the modifications in the climatic conditions the plant and also the animal biodiversity is getting lost as some of the plants and animals cannot withstand the rise in temperature and they die.

## Sea level Change

In rise in temperature mainly in the artic region the ice is melting. The huge Ice-berg are moving towards the tropical and equatorial regions where they melt and the sea level rises. E.g. Greenland in the Arctic Region has already lost about 10 % of its ice. In Antarctica the Ice is split and it may be carries upto the equator to cause the rise in the sea level. This will put 10 % to 20 % of flat coastal regions under water within a period of about 100 years from the present. Maldiv Islands are flat with very little elevation from the sea level. So, due to Global warming, Maldives could be the first inhabited country to be put under water. So, it is not Global warming but it is also a Global warming to the developed world.

## Climatic Changes

In the Global warming the seasons are changing i.e. we may receive rainfall in the month of October and December or May not receive it in the regular monsoon months sometimes we receive a cold wave or a warm wave. This year in 2019, we in Maharashtra has observed the hot weather to increase the temperature above 40° C in the central party of Maharashtra in the month of April and May and we still are not sure about the expected S.W. monsoon rainfall. This affects the human life physically and also economically.

## Prevention of Global Warming

### Renewable Energies

To control the Global warming and the climatic change. We must stop using the conventional resources i.e. the fossil fuel, coal, oil and natural gas. If we start using the Non-conventional renewable energy resources such as Solar Energy, Wind Energy, Geothermal Energy, Tidal Energy or Bio-Energy. The rate of Global warming can be put under control. We can use clean and Green Energy.

### Conservation in the Efficiencies of Energy and Water Resources

To make the proper use of these resources by reducing the wastages, the rate of over consumption could be put under control this would help to conserve these resources e.g. use of public transport can save the electricity; by recycling the industrial water after the proper treatment we can save the water resource. This would save our Green planet.

### Sustainable Transport

The public transport system is developed properly i.e. the use of Metro's or Locals running on electric power will not only reduce the use of private vehicles, which emit maximum CO<sub>2</sub> and CO, but would save world from Air pollution and also from the traffic Jams in the rush hours in mega cities in the world.

### Sustainable Infrastructure

Conventional methods of heating and cooling if Green technology is used i.e. use of solar power will help to control the emission of CO<sub>2</sub> and other greenhouse gases.

**(v) Sustainable Agriculture**

By using the high technology for watering crops will be save the water and also save the energy required for pumping the irrigation water i.e. the lift irrigation e.g. Drip Irrigation helps to reduce the water losses through evaporation and also through the over watering, which causes the water logging conditions to save the soil.

**(vi) A Forestation Methods**

If the deforestation is the basic cause of Global warming the forestation i.e. the re-plantation of the trees would help the process of controlling the climatic changes and controlling the Global warming. Some scientists believe that the Global warming is a natural process and after every 25000 years the Global warming would be followed by Global cooling i.e. Ice-age. If we can't stop it, let us not help it to increase the speed of the climatic changes global warming or the sea-level changes as it is dangerous to all the living beings.

**Review Questions**

**Q. 1 Define the following terms.**

A) Disaster

B) Hazard

**Q. 2 Describe the disaster scenario at the global level with suitable examples.**

**Q. 3 State the notable disasters in India and describe the National scenario of disasters in India.**

**Q. 4 With suitable examples the various perspectives of disasters.**

**Q. 5 Write in brief about the following.**

A) Socio- Cultural Perspective of Disaster

B) Political Perspective of Disaster

C) Importance of the study of disasters in Human life

**Q. 6 Describe the direct and indirect effects of disasters.**

**Q. 7 Write a note on, "The Long Term Effects of disasters".**

**Q. 8 What causes global warming ?**

**Q. 9 Describe the effects of global warming.**

**Q. 10 State and describe the measures to prevent the global warming.**



# Natural Disaster and Manmade Disasters

## Module II

### Syllabus :

- 2.1 **Natural Disaster** : Meaning and nature of natural disaster, Flood, Flash flood, drought, cloud burst, Earthquake, Landslides, Avalanches, Volcanic eruptions, Mudflow, Cyclone, Storm, Storm Surge, climate change, global warming, sea level rise, ozone depletion.
- 2.2 **Manmade Disasters** : Chemical, Industrial, Nuclear and Fire Hazards. Role of growing population and subsequent industrialization, urbanization and changing lifestyle of human beings in frequent occurrences of manmade disasters.

## 2.1 Classification of Disasters

### 2.1.1 Introduction

- In the previous chapter we have defined the term disaster as "It is a dangerous phenomenon that causes economic and ecological losses and creates health problems."
- The disasters have immediate and long term effects. So it is necessary to control them to reduce the huge losses living and non-living resources.
- For doing so we must know the types of disasters and their causes to control them, if not all like volcanic Eruptions, Earthquakes, Tsunamis cyclones etc. but at least we can control the losses.
- So it is necessary to classify the disasters.

### 2.1.2 Classification of Disasters

On the basis of the causes of the disasters. We can classify them as the Natural Disasters and the manmade disasters.

## 2.2 Natural Disasters

### 2.2.1 Introduction

**Definition :** *The disasters which are made by nature are called as the Natural Disasters.*

- Let us know the types of Natural disasters we are facing for the last many centuring i.e. in the pre historic and in the historic period.
- That time people use to look at these disasters as the curse of God and use to accept it.



- Now we know that there is nothing like curse and by studying the symptoms we can reduce the losses i.e. we cannot control cyclones but we can save the life of the people living on the cyclone prone areas.

### 2.2.2 The Nature of Natural Disaster

- The Natural Disaster is an event resulting from the Natural Process of the earth e.g. due to climatic variations at a Global or local level the cyclones are developed or due to sudden movements in the sub surface it may cause earthquakes and if the movements are very strong it may cause the Volcanic Eruptions.
- So it is just a natural phenomenon which cannot be controlled but it is necessary to study them to know the prone areas so we can avoid them for the construction of huge structures like dams.
- This would help us to reduces the losses in future.

### 2.2.3 The Classification of Natural Disasters

- On the basis of the basic natural cause we can classify the natural disasters as follows

#### (A) The Geological Disasters

- The landslides and Avalanches
- Earthquakes
- Volcanic Eruption

#### (B) The Hydrological Disasters

- The floods
- The Tsunamies
- The mun flood

#### (C) The Meteorological Disasters

- Cyclones
- Heat wave
- Cold wave
- Droughts
- The cloud burst
- Storm Surge
- Ozone Depletion
- Climatic change
- Global warming

- Let us know about each of these natural Disaster in brief.

## Geological Disasters

### Aquakes

*The sub layers of the earth's structure are in liquid state know as Lava or Magma.*

Sub substance always have vertical and horizontal movements.

Causes the quaking of the earth surface. The earthquakes are very common in the areas where the crust of the earth is thin e.g. in India J and K, Assam, Bihar are the states where the frequency of earthquakes is more than in the southern states like Andhra Pradesh, Tamilnadu, etc.

At world level the most Earthquake prone country is Indonesia and next to it is Afghanistan.

High magnitude earthquakes cause huge losses of human lives and the economic properties.

We can't stop earthquakes but we reduce the losses by avoiding such areas for the construction of huge dams which may cause further damages due to floods if they break due to the earthquakes.

### Landslides and Avalanches

*In the hilly areas if the surface rock is porous the rainwater percolates and make the rocks loose and heavy so due to the gravitational force these rocks slide down. They are called landslides.*

Causes a settlement at the foot of the hill due to such landslides it causes loss of lives, loss of lands and agricultural fields.

Causes observed in the high altitude regions like Himalayas. These areas have the Ice-caps and the temperature is always below 0°C they remain in the solid state.

Causes Ice layers become very thick and heavy mainly on the slopes it slides down. Causes danger to the people those who go for the mountaineering in Himalayas or for the pilgrimage like to Amarnath or Man Sarovar.

Causes settlement at the foot hills of Himalayas also suffer from such Avalanches like the one in the tropical regions.

### Volcanic Eruptions

Causes discussed the inner zone of the earth has the molten Lava.

Causes vertical movements become very strong, they break the solid earth surface i.e. the ground裂开 and the liquid hot lava came out.

Causes it just comes out and get spread in the downward direction due to the gravity.



- The major areas which are prone to the volcanic eruptions are :
  - (i) The west coast of North and South America. It is known as the Ring of Fire.
  - (ii) The Western Europe
  - (iii) Eastern and central Asia
- Like earthquakes the volcanic eruptions cannot be controlled but if these volcano prone areas are avoided for any type of settlements or for any economic activities the losses can be put under control.

## 2.2.5 The Hydrological Disasters

### The Floods

**Definition :** *The Floods can be defined as "It is the over flow of water from a stream or a river."*

- The floods get spread over the both of the banks of the river and create danger to the human and domestic animals.
- They also cause a great economic and ecological loss of the settlement located along their bank.
- After the floods are over they create unhealthy conditions. The floods are very common in North India.
- River Brahmaputra kosi and Damodar are known to create dangers to most of large cities located along their streams mainly on the plains. Where the floods cover very large areas to be affected economically and ecologically.

### The causes of Floods

- Mainly the Himalayas rivers get flooded twice in a year.
- 1. In summer the snow melts in their source regions to cause rise in the flow volume of the water which results into huge floods in the down stream areas.
- 2. In the rainy season due to the S.W. monsoon rains they get Flooded. Generally the floods are natural disasters but they are manmade also. Due to deforestation in the source regions the top soil is made loose it is carried to the downstream areas and it gets deposited on the bed of the river to make it shallow. The shallow 'V' shaped valley cannot hold the stream water within the banks, so it gets spread on both the banks to cause floods.

### Types of Floods

#### (a) The Flash Floods

- These are floods observed locally. They are very sudden and hence they cause a huge loss of human life and of the other living beings.
- They also cause the economic and ecological losses.
- They are caused by heavy rain fall in the upward region of the river.
- They may be the effect of very severe thunder storm.

Following are the major floods in India which caused a huge loss of lives and damaged the economy and ecology of the affected regions.

- (i) The floods in Uttarakhand in the year 2013.
- (ii) The Brahmaputra Flash floods in the year 2012. These floods killed more than 100 people in Assam and it hit the Kaziranga National Park and killed more than 500 wild animals.
- (iii) The flood in Ladakh (J and K) in year 2010.

The floods damaged about 71 towns and villages along the river banks and killed more than 250 persons.

Together with the above the floods in Karnataka in 2009 in Bihar in 2008 in Gujarat and in Maharashtra state in 2005 etc. have proved to be great Natural disaster in India creating huge economic and ecological losses.

### **The Mudflow**

The Mudflows are also called as the Mudslides.

**Definition:** It can be defined as "It is a flood related mudslide."

### **Causes of Mudslides**

It occurs when a large amount of water causes a rapid erosion of top soil on a steep slope.

That makes the water mixed mud to slide down in the downstream plains to cause danger to the human settlements and the agricultural fields.

### **Effects of Mud flows**

They are capable of destroying settlements washout the roads, bridges knock off the huge trees with thick depositions of mud and rocks.

They are commonly observed in the foot hill areas of the Northern Indian states such as J and K, Himachal Pradesh, Uttarakhand and in Sikkim very frequently causing a great natural disaster.

## **5 The Meteorological Disasters**

The following are the major Meteorological disasters.

- (a) Droughts
- (b) Cloud burst
- (c) Cyclones
- (d) Storms
- (e) Storm Surge

Let us known about the above climatic disasters.

### **Droughts**

there a huge gap in the rainy season. It causes droughts in India, droughts cause the huge losses of agricultural products and also affect the domestic animals.

In the years 2015, 2016 in India such drought conditions were observed. In country there is a long drought prone belt extending from Rajasthan it moves via central M.P. central Maharashtra, central Karnataka upto the central parts of Andhra Pradesh.

We have no control over the S.W. monsoon rainfall so, if it comes late or get off early the effects are the droughts.

They don't kill the human beings but make great economic losses.

### **Cloud Burst**

It occurs when the monsoon cloud drifts northwards from the Bay of Bengal or from the Arabian sea and settles down on a plain to cause a heavy down pour.

It may cause a heavy and sudden rainfall of about 7 to 8 cm per hour in a given small river basin. To create a flood or mudflow situation.

The known cloud burst in India.

- i) In Uttarakhand in 2013. This cloudburst created the flash flood situation to cause the deaths of about 5,700 lives.
- ii) The cloud burst in Himachal Pradesh in 2015. This observed at Manali located at the foot hills of Manali.
- iii) The cloud bursts in Kashmir valley in 2015. Eight cloud bursts within a period of three weeks time were observed mainly in Kap Worn and Budgam areas.

### **Cyclones**

**Definition :** The circular movement the wind in a small localised area for short period of time is known as cyclones.

In India generally in the months of October and November these cyclones are observed on the east coast of India mainly in the coastal plains of Tamilnadu, Andhra Pradesh and Odisha.

They cause huge losses of human lives and also of the properties.

The latest cyclone affected on the east coast of Odisha on 30<sup>th</sup> April 2019 and moved towards West Bengal. The name of this cyclone was "Fani."

In the month of June 1998 one such cyclone hit Gujarat Coast near Jamnagar. The wind velocity of the cyclonic wind was about 160 km/hour.

This caused a great loss to the coastal areas of Gujarat as the cyclone was followed by a huge high tide the height of the high tide was more than 5 mt. above average sea level.

This cyclone took a toll of 1200 human deaths and the economic losses were estimated up to Rs.



#### (d) The Storms

**Definition:** The storms are like cyclones having circular movements but are developed on the lands generally in India.

- They are observed in the pre-monsoon seasons in North India.
- They are also called as dust-storms.
- Locally named as Andhi in Punjab loo in Uttara Pradesh and Kalbaisakhi in West Bengal.
- Due to such high velocity dust storm on 3<sup>rd</sup> May 2018 in North India about 125 people lost their lives and about 200 got seriously injured.
- On 17<sup>th</sup> April of this year i.e. 2019 more than 50 people lost their lives due to dust-storm in Gujarat.
- Sometimes these pre-monsoon storms in South India bring sudden rainfall and hail storms which make a huge losses of the crops mainly of cotton and of the fruit crops.
- It is mainly observed in Marathwada region of Maharashtra state and also in central Karanataka.

#### (e) The Storm Surge

**Definition:** "The rising of the sea level in the form of waves due to the strong winds and due to change in the atmosphere pressure" is called as the Storm Surge.

- A storm surge or storm flood or A Tidal Surge or a storm tide is a coastal flood.
- It is like a Tsunami like phenomenon which rises the water level of the sea to affect the low lying areas near the coast.

#### (f) The global warming and the climatic changes

Please Refer section 1.8

#### (g) The Ozone Depletion

**Definition:** The ozone [O<sub>3</sub>] is a layer associated with the layer of the atmosphere called as stratosphere also called as ozonosphere which is about 45 km above the sea level from the earth. It is also called as the shield Region of the earth.

- As this layer absorbs most of the toxic ultra violet rays coming from the sun and protect all the living beings.

#### The depletion of the ozone layer

- We are losing this natural protection against UV. as the ozone is getting depleted to due the free radical catalysts i.e. Nitric oxides (NO), Nitrous oxide (N<sub>2</sub>O), Hydroxyl [OH], Atmomic chlorine (Cl) and ammonic Bromine (Br).
- In the recent times due to the development of cooling industries & huge amount of chlorofluorocarbons [FCs] the process of ozone depletion has been speeded up.

#### The Effects of Ozone Depletion

- Following effects have been observed.



- (i) It may cause skin cancer.
  - (ii) It affects the eyes (eye damages).
  - (iii) It also affects the plant and animals.
  - (iv) It affect the Immune system.
  - (v) It affects the skin and speeds up the aging of skin.
  - (vi) It may cause chest pains, throat infections, Lungs infections etc.
  - (vii) It also affect the marine ecosystem.
- So, the ozone depletion is slow killer and hence it is not taken very seriously by the common man. But we must try to safeguard this natural filter to control the immediate and long term effects and keep the earth safe.

## 2.3 The Manmade Disasters

### 2.3.1 Introduction

- The manmade disasters are also called as the Artificial disasters or the Anthropogenic disasters.
- All the human beings try to make use of the physical world i.e. the physical and natural resources to fulfil their ever growing demands like food, shelter, clothing and defence.
- These are the basic needs of all the living beings and for survival they are required to be completed, but when these needs get converted into greeds it creates a pressure on the natural resources e.g. we need more land to grow more not for consumption but for marketing.
- We need more land so the land under forest is cut and cleared.
- The deforestation leads to global warming in the long run. The other effects of forest cutting are we affect the forest ecosystem and the habitat of the wild life. As the plants are uprooted the top soil on the sloping regions, becomes loose and gets eroded, so we lose the valuable fertile soil.
- This soil gets deposited in the downstreams to make the river beds shallow to cause floods the manmade floods.
- The over use of the water mainly for the irrigation to get higher yields make the soils saline and water logging conditions make the soils useless for the future use.
- Due to industrialization and unplanned urbanisation the huge Be rages and solid waste is generated in the urban areas to cause unhealthy conditions e.g. dumping the solid waste without proper treatment creates serious health hazards due to Air water and soil pollutions.
- So together with the natural unavoidable disasters. We have to face these manmade disasters which can be put under controlled if not totally stopped.
- The modern life style needs more energy, more, infrastructural developments.
- This cannot be changed.
- We can't go back to the level of the life of the stone age people.



- The urbanisation the industrialization cannot be stopped but if we know the bad effects of the present unplanned use of the natural resources.
- We can at least control the situation and reduce the speed of manmade disasters.
- The economic development cannot be stopped but we must try to go for the sustainable development to control the economic and ecological losses through the manmade disasters.
- Let us try to know the types, causes and effects the manmade disasters. So we can try to put them under control if not total avoided.

### 2.3.2 Industrial Disasters or Hazards

#### (A) The Definition of Industrial Hazard

**Definition :** The Industrial Hazards are mainly due to accidents. So we can define these hazards as, "It is danger originating from technological or due to the dangerous procedures infrastructural failures, which may cause life of the workers or loss of the property and may lead to the environmental degradation."

#### (B) The types of Technological disasters

- Accident Release : The accidents during the industrial production transportation, storage and handling of the Hazardous chemical substances.

#### (C) The Explosion

- The accidents due to the unexpected explosion during the production process or during the transportation or after the material is stored.
- The losses depends upon the intensity of such explosions, it could be chemical explosion, Nuclear explosion, mine explosion etc.
- The effects depends upon the basic cause of the explosion its intensity and also the frequency.

#### (D) The Industrial Pollutions

- Due to unproper production process or due to unproper method of disposal of the industrial waste water and solid waste cause various types of pollution like Air, water and soil pollution.
- They cause various immediate effects on the health of the workers and also the long term effects like causing the problem to the human immunity or also on their Reproduction systems.

Following are some of the effects of these Industrial pollutions.

- The Acid Rains
- The water mainly ground water gets polluted
- The soil in the industrial dumping grounds gets polluted.
- The natural vegetation also get polluted around the industrial areas.
- If the non-treated or half treated industrial waste water gets mixed with the surface streams, the surface water gets polluted which affects the aquatic life.

In the few decades back between Pune and Mumbai a huge chemical industrial complex was developed near Khopoli in Raigad district.

This complex created a huge environmental problem to the surrounding areas.

It has a small river called as Patal Ganga.

Due to the direct flow of the industrial waste water into this river the whole of the river became polluted and caused various types of health problems.

Now they have shifted the chemical industrial complex to Roha a small industrial settlement on Mumbai-Goa, National highway in Raigad district.

Early by shifting the chemical industry the problem will not be solved unless the attempts are made to modify the production process, which cause the damages to the human life and also to the environment.

## The Notable Industrial Disasters

### The Bhopal Gas tragedy, 1984

It is also referred as the Bhopal Disaster. It was a gas leak incident. It is considered as one of the worst industrial disaster at the world level. The total toll deaths was 2259 and final figure of the deaths was confirmed by the M.P. state government was 3,787 deaths and 5,58,125 serious injuries causing permanent disability.

### The Chasnala Mining Disaster

This occurred on 27 December 1975 at Dhanbad, Bihar. It caused the deaths of 372 miners. This explosion at Chasnala was so severe that, the coal mine collapsed and millions of gallons of water from a nearly reservoir rushed into the pits @ of seven million gallons per minute. Those who were not killed during the early blast in the mine got trapped under the debris or drowned in the huge water that rushed into the mines.

## The Nuclear and Radiological Disaster

Exposure to radiation which crosses the permissible limits may lead to a Nuclear or Radiological Disaster causing emergency.

At the world level three major nuclear power plant accidents have been recorded at the world level.

Daiichi Nuclear Disaster 2011.

Chernobyl Disaster 1986

Male Island Accident 1979.

## **Types of Nuclear Disasters**

Nuclear power plants generate Electricity by heating the fluid via a Nuclear reaction to run the generator.

A nuclear damage accident is caused by the loss of sufficient cooling for the nuclear fuel within the reactor core.

## **Effects of Nuclear Disaster**

When there is a nuclear damage accident along with the damage caused by the fires and explosion these accidents release the radioactive materials. They cause Radiation sickness.

Radiation damages the DNA, it also damages the bone marrow and the brain cells. Such high doses lead to deaths.

## **Major Accidents in India**

### **Kalpakkam Accident, 1987**

The atomic power station is located in Tamilnadu.

An accident occurred while refuelling process was going on for the fast breeder test reactor.

It damaged the core of the reactor.

After this accident the plant was kept closed for two years and there was a monetary loss of about 300 million dollars.

### **Kudankulam Accidents, 1989 and 1992**

This accident was the result of the leakage of radioactive iodine.

It took one year for repairing and it cost 78 million dollars.

The 1992 accident was the result of the malfunctioning of reactor tube.

The plant was kept the production closed for a period of one year and monetary loss of about 350 million dollars.

Some of the other notable accidents in the Reactors are as below.

### **Rajasthan Atomic Power Station at Kota (1995)**

### **Kalpakkam Tamilnadu (2002)**

### **Majapuri Accident (Near New Delhi in 2010)**

## **Manmade Fire Hazards**

Manmade disasters are the results of human carelessness callousness or may be because of lack of foresight and lack of the proper planning.

These manmade disasters caused the deaths of a large number of innocent people and also the loss of economy and property.



### The Major Manmade Fire Hazard, In India

- In the urban areas the most notable cause of fire is short circuits of Electricity.
- It has been observed that generally such fires are observed in the public functions where the huge number of people suffer from such fires.
- Following are the major mishaps caused by fire in the past in India.

#### (A) Fire in Delhi

- On 13<sup>th</sup> June 1997 in Upahaar Cinema at Green Park in Delhi the fire took place during the screening of the Hindi movie Border.
- It killed 59 persons on site they died due to suffocation and 103 persons were seriously injured in the resulting stampede.
- Lack of fire extinguishers and the due to the lack of periodic maintenance of the electric wiring caused this fire hazard.

#### (B) AMRI Fire Disaster in Kolkata

- On 9<sup>th</sup> December 2011, this fire disaster took place at the AMRI, Hospital at Dhakuria in South Kolkata.
- An electric short circuit in basement of the hospital building resulted in inflammable substances catching fire which spread through the hospital at a very rapid rate.
- It became a more serious accident because it happened in the early hours of the day at 3 a.m. So most of patients and also the medical staff was sleeping. The central AC system carried the smoke all over the building.
- The death toll due to this fire hazard was 95 this included the patients and the medical staff of the hospital.

#### (C) The stephen court fire Tragedy, Kolkata

- On 23<sup>rd</sup> March 2010 due to the fire in this historical building 42 people got killed.
- We should call this as manmade disaster because in that building being old, had no proper fire escapes the exit from the roof also was blocked with a gate which was locked.
- So the people on the higher floors got trapped.
- The building being old with no proper and regular maintenance make the conditions worst.

#### (D) Kumbakonam school fire Tamilnadu

- On 16<sup>th</sup> July 2004 at Kumbakonam in Thanjavur district of Tamilnadu. This fire broke and took the lives of 94 young school going children.
- This again can be considered as the manmade hazard as that school had a lack of open space the classrooms were very closely constructed the exit gate was very small.
- The roof of the building was made up of Thatch there was no proper ventilation.
- All these together added the danger of the fire and took a very high rate of casualty.



- That school 900 student were present when the accident took place. That school had no disaster management plans.
- So, if we look at the above mentioned fire hazards. We will note that the main cause in all cases is unpreparedness for such hazards and carelessness.
- In case of the fire accident in the rural areas are results of the carelessness of the local people and also the tourists who go for the week end visits the nearly forest areas.
- The carelessness of these people, who go for camp fire or cook.
- The food on site cause the forest fires which not only put the forest plants on fire but also affect the forest ecosystem and kill the habitat of the wild life.
- So causes the economic and the ecological losses.
- This can be prevented both in the urban areas and in the forest areas if we can follow the following steps.
  - A. The maximum occupancy limit of a building should not be crossed.
  - B. The occupants of the building should be aware of the regulations in case of fire.
  - C. In case of the temporary structures built for the public functions a fire brigade and the ambulance should be on the stand by for any emergencies.
  - D. The building must have the proper and regular maintenance of the Electric connections.
- In case of the manmade forest fires every visitor should take care of the fire either made for camp fire activities or for cooking is totally taken care of i.e. we must put out the fire before we leave the camping sites.
- This would help to save the nature and also the valuable forest wood having economic values.

## 2.4 The Role of Growing Population Subsequent Industrialization and Urbanisation on the Hazard for Nation

### 2.4.1 Introduction

- Among all the fast growth of population at the world level e.g. in the year 1900 the world population was about 1.6 billion and has reached at the level of more than 6 billion in the year 2000.
- The latest population figure in 2019 is about 7.7 billion. Among these huge population figures the urban population percentage also is growth at the fast rate e.g. in the year 1985 the urban population was nearly 1.1% of the total world population.
- It has reached upto 7.8% in this year i.e. in 2019.
- The industrialization at the world level also has increased.
- It started in 19<sup>th</sup> century in Europe and America and reached India and in other Asian countries in 20<sup>th</sup> century.



- Industrialization has made an impact on the case of the natural resources through the changing the general land use pattern i.e. by cutting the forests to convert the forest land for industrial use or for the establishment of human settlement.
- This has also made the change in the normal life style of the human beings i.e. from the normal rural eco-friendly life style into the ruthless, urban population acting against the natural environment.
- This has become the major cause of the fast development of natural as well as manmade disasters.
- Let us know about the relationship among these manmade changes in the natural environment and their effects to cause these disasters.

#### 2.4.2 The Growing Population and Disasters

- Before we start discussing the cause and effects of population growth and the disasters we must not down that we are not discussing the rise in the number of earthquakes or the cyclones but the impact and the social economical and ecological losses.
- A large violent Tornado for instance passing through on open field would cause little danger On the other hands a weaker Tornado can pose a significant risk to the human beings and to the economic losses in the areas having high density of population.
- The floods were very common even from the Pre-historic periods and their occurrences also must have been same but the economic losses were less because people use to settle on the banks of the river were lesser in number.
- They use to make their lively hood from the natural environment without making any unnatural change, so the losses of life and the economic losses were least.
- At present we due to fast growth of population have dammed the rivers constructed huge tunnels through the hills cut the natural forest area to be used for settlements.
- This has caused the manmade floods and manmade landslides. The intensity has increased, the frequency has increased and death fall also have increased.
- So the disasters are results of fast growth of population i.e. population is putting over pressure on the natural resource to cause these dangerous conditions make the disasters more frequent and more sever.

#### 2.4.3 The Urbanisation and Disasters

- It has been proved that the rapid growth of urbanisation has increased world's susceptibility to natural disasters.
- It is said that about 78000 people get killed every year in the natural disasters at the world level and about 200 million person's about 3% of the human would population suffer the physical and (or) the economic losses due the natural disasters.
- It is estimated that by 2050 out of the total population of the world about 75% would be living in the towns and urban cities.



- This would increase the number huge mega cities on the coastal plains.
- This would increase the density of population of the coastal settlements one Tsunami in future may cause danger to these settlements.
- Due to population pressure we have started constructed big towns even in the earthquake prone areas. So it's not the earthquakes which have increased but we only have moved to the prone areas to cause more natural disasters.
- The natural resources are put under pressure due to over use of them, the rivers have the natural capacity to purify them under the natural course of time, but we have reduced this chances of natural purification by misuse and over use of the surface water e.g. the Government of India, spends millions of rupees to control the pollution of river Ganga but the results are not very great as the rate of protection of the water are lesser than the rate of pollution of the river.
- In most of the cases the urban settlements are put in dangerous conditions due to the huge development of solid waste.
- In fact there is no space available to dump the huge heaps of solid waste in and around most of the urban settlements which has caused danger to the health conditions not only to the human beings but also to all of the living beings.
- Most of the accidents in the urban areas like fires are the results of the unplanned construction of building keeping no space for the fire fighting vehicles to control such fires.

#### **2.4.4 The Industrialization Changing Life Style and Disasters**

- In a country like India the industrialization leads to urbanisations and urban settlements bring industrialization.
- The industrial development is surely required for the economic development of any country but unplanned industrialization leads to the conditions which cause the disasters.
- The gas leakages blasting in the industries the water and Air pollution due to the faulty production processes in the chemical industries etc. are all to manmade situations to cause the industrial disasters and hazards.
- Recently the industrial disasters have increased due to the accidents in the Nuclear Reactors at the world level.
- So finally we can conclude that due to changes in the life style of the human beings have caused this almost uncontrollable conditions.
- It is said that at a rate we are exploiting the earth this green water and living planet would be converted into a hot dry and dead planet.
- If this is to be stopped we are required to re-think about the unplanned life, we are living and about the greedy over use of the natural resources.
- The only solution to control the manmade disasters to make our life easy and happy. We must go for the sustainable and eco-friendly development and accept the simple thought of "Live and let live" policy.



### Review Questions

**Q. 1** Classify the Natural Disaster and explain the geological disasters with examples.

**Q. 2** Write notes on the following :

A) Hydrological Disasters

B) Cloud Burst

C) Ozone Depletion – causes and effects

**Q. 3** Define and explain the Industrial disasters, with suitable examples.

**Q. 4** Define "Nuclear Disaster" and describe the effects of Nuclear Disasters in India.

**Q. 5** Describe in details the major manmade fire hazards in India.

**Q. 6** Bring out the relationship between "Growth of Population Disasters".

**Q. 7** Write in details about the urbanization and disasters.

**Q. 8** What is the relationship between change in the life-style and disasters.

The floods were very severe due to sea level rise and coastal flooding. There has been some loss in the economic loss due to the heavy rain causing flood on the coast of the river were broken in number.

change, in the losses of life and the economic losses were from

through the increase in the number of people living in the coastal areas. In the year 2004, there was a massive cyclone which hit the state of Andhra Pradesh, causing a lot of damage to the economy and the lives of the people.

In the disaster are results of fast growth of population i.e., overpopulation has created pressure on the environment and

increased pressure on the environment and



# Disaster Management, Policy and Administration

## Module III

### Syllabus :

- 3.1 **Disaster management** : Meaning, concept, importance, objective of disaster management policy, disaster risks in India, Paradigm shift in disaster management.
- 3.2 **Policy and administration** : Importance and principles of disaster management policies, command and co-ordination of in disaster management, rescue operations how to start with and how to proceed in due course of time, study of flowchart showing the entire process.

### 3.1 Disaster Management

#### 3.1.1 Introduction

**Definition:** The disaster management can be defined as, "It is an organisation and the management of resources and responsibilities for dealing with all the humanitarian aspects of emergencies in particular, the preparedness, response and recovery, in order to reduce the impact of any disaster."

- In other words, the disaster management takes all such measures to see that a normal hazard would not reach the serious stage of disaster. e.g. suppose there is fire on the first floor of a huge building, if immediate steps are taken to call the fire fighters, the fire can be stopped before it gets spread and reach a stage which is out of control.
- The immediate and the proper action against any hazard can save the human lives and the loss of economic properties and the long term ecological losses.

#### 3.1.2 The Concept of Disaster Management

- The disaster management is a functioning authority which helps to control the disaster, and reduce the general losses.
- It includes sum total of all the activities i.e. programmes and measures which can be taken up before, during and after the disaster with a given purpose of avoiding and reducing the impact and recovering from its losses.

**Definition :** Kelly (1996), defined the disaster management as, "It is the range of activities designed to maintain the control over the disaster and the emergency situations and to provide a framework for helping those who are at risk to avoid or to recover from the impact of the disaster."



- The disaster management means, to manage the resources and to manage the responsibilities.
- This is carried to reduce the seriousness of the emergencies.
- The work of the disaster management starts before the disaster, within the disaster and after the disaster also.

### 3.1.3 The Aspects of Disaster Management

- The major Aspects are as follows

- A. Disaster Prevention
- B. Disaster Preparedness
- C. Disaster Response
- D. Disaster Mitigation
- E. Rehabilitation of the people
- F. Reconstruction of structures and infrastructures

### 3.1.4 Importance of Disaster Management

- It is a continuous phenomenon of mitigating the impact of the disaster.
- It calls for the collective and co-ordinative efforts. There are a number of activities required to be undertaken in the event of any disaster.
- They include co-ordination, command and control, rapid assessment of the damage, restoration of power Tele-communication and surface transport, Deployment of search and rescue team, the medical and Para-medical team the arrangement of the drinking water and food material, setting of the temporary shelters, sanitation and hygiene identification and the last but not the least is to maintain the law and order.
- So, with all these functions to be carried, one after another proves the importance of the Disaster Management.

### 3.1.5 The Objectives of the Disaster Management

- Following are the main objectives of the disaster management.
  - (A) To Reduce the potential losses from the disaster.
  - (B) To assure prompt and appropriate assistance to the victims when required.
  - (C) To achieve rapid and durable recovery.

### 3.1.6 The Disaster Risks in India

- The natural and manmade disaster are commonly observed in all the countries in the world but in India the losses are more due to these disasters.
- This is mainly because of the following reasons.



### (A) The Size of the Country

- In size, India stands 7<sup>th</sup> in the world. All the 6 countries having larger in size are economically developed and are well-aware about the causes and effects of the disasters.
- In case of India, still about 50% rural less educated, less aware population about the causes and effects of the results are more serious like floods droughts and earthquakes. Luckily except one in Andaman Islands, India does not suffer from the volcanic eruptions. One that we have named as, "Heriet" which is located on Barrain Islands in the group of Islands of Andaman just gives out smoke so, it does not cause a major disaster.

### (B) Huge Population

- Till 2018, the population of India was about 1.3 billion. It is the 2<sup>nd</sup> largest populated country in the world. So if and when a hazard occurs the total number of people at risk are always more in number, if compared to the western countries.

### (C) The Varling Relief

- India has all the relief features like mountain, plateaus and plains so, earthquakes, landslides and the cyclones on the coastal plains in the South India are the common hazards.

### (D) The Variation In Climate

- India has a variation in the climate i.e. the northern states suffer from the cold waves in December while the southern states suffer from the hot waves in summer.
- When the rivers in the North and East India are over flooded the rivers in the south are total dry. In both the cases, the hazards are observed.
- Indian economy mainly depends upon the regular functions of the South-West monsoons and its associated Rainy season.
- It has been observed and due to the rainfall variations, after almost every five years India suffers from the Droughts. It is a very serious hazard in India.
- It not only creates economic dangers and losses but also the ecological losses.

### (E) Unplanned Urbanisation and Industrialization

- Most of manmade disasters like fire explosions, road accidents are the results of unplanned and very fast urban and industrial growth.
- The above disasters can be put under control, if we have the proper regional planning.
- If not the natural, but at least the manmade hazards can be put under control and the natural disasters like earthquakes and droughts, the losses can be put under control.

## **3.2 The Paradigm Shift In Disaster Management**

### **3.2.1 Introduction**

The meaning of the term Paradigm can be expressed as a Model Pattern or a Set Pattern.

## 2.2 The Need of the Paradigm Shift in Disaster Management

The concept of disaster management was introduced by Samuel Henry Prince in the year 1917. Since then for the last 100 years. The concept of disaster management has undergone several ideas. From 1917 till today the original definitions also have been modified.

In 2012, IPCC Defined the disasters as, "The severe alterations in the normal functioning of a community or a society, due to the hazardous physical events interacting with vulnerable social conditions, leading to widespread adverse human material, economic and environmental effects which need immediate emergency response to satisfy the critical human needs and that may require.

## 2.3 The Need of the Paradigm Shift in Disaster Management Approach in India

India till the recent past, was reactive and used to respond the disasters and it used to provide relief from the hazards.

The recurrent occurrences of the different types of disasters compelled the government of India to take the cognizance of the objectives of the international Decade for the Natural Disaster Reduction i.e. 1990 to 2000.

The Yokohama strategy for the safer world (1994) and the plan of Action for safer world (At Istanbul, 1996) and also the set up a High Power Committee on disaster management i.e. H.P.C. in the year 1999 to recommend the strategies.

To prepare the disaster management plan. This High power committee submitted its recommendations in the month of October 2001 which included a Draft of the Disaster Management Act.

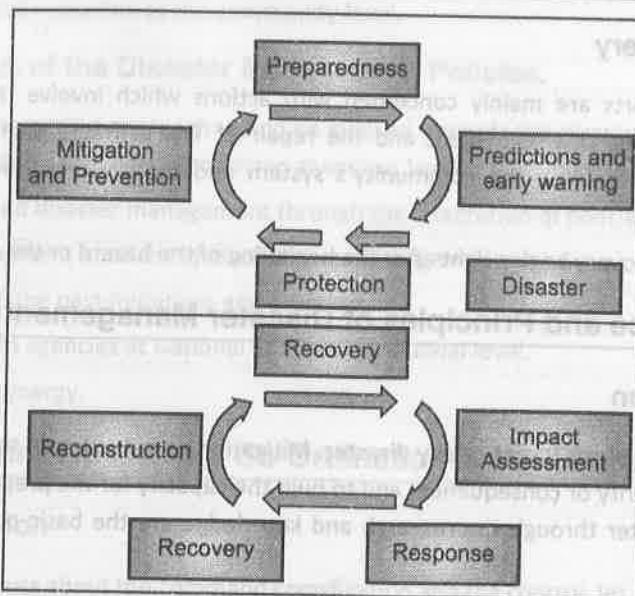
A National Response Plan and also the Establishment of National Disaster Management Authority on the basis of the recommendations the disaster management function was transferred from the Ministry of Agriculture to the Ministry of Home Affairs.

The Tsunami in Indian ocean (for India in Bay of Bengal) in the year 2004 heightened the level of awareness of the Central Government of India. The need of integrating disaster risk reduction into National Development Planning and the need for aligning and coordinating, with UN agencies, to respond the threat of the disasters with all these the Government of India has brought about a paradigm shift in its relief centric to responsive and the preparedness approach to the disaster management.

This new approach proceeds from the conviction that "The Development cannot be sustainable unless the disaster mitigation is built into the development process."

So, now the focus is more on Disaster Risk Assessment Preparedness and Mitigation.

The Tsunami in Indian ocean forced the idea that "The disasters can be managed through the



**Fig. 3.2.1 : The cycle of Disaster, Risk and Crisis Management**

### 3.3 The Policy and Administration

#### 3.3.1 Introduction

- The disaster management is recognised as a National level and as a Local level priority. It is also taken as a continuous and sustainable policy to fight at all the levels against any types of disaster.
- during all the three phases of disaster management i.e. Preparedness Response and the Recovery.
- Lets check these three phases.

#### 3.3.2 The Preparedness and Mitigation

- The public awareness programmes should be carried out through the effective media interaction the consultation, education and any type of informal means to sensitize the public and the disasters.
- The Non Government agencies (N.G.Os) should also take part in the public awareness programmes.

#### 3.3.3 The Response

- The response action plan must be immediately formulated. The search and rescue teams must be immediately mobilized.
- The Government should prepare its own standard norms of the relief packages.
- All the persons who affected by the disaster should have the right to receive the relief packages and the materials.



### 3.3.4 The Recovery

- The recovery efforts are mainly concerned with actions which involve the rebuilding of the destroyed properties, re-employment and the repair of fractured system. The prime goal of the recovery stage is to bring the community's system and the socio-economic activities to the normal.
- The process of recovery begins right after the beginning of the hazard or the disaster.

## 3.4 Importance and Principles of Disaster Management Policies

### 3.4.1 Introduction

- Prevention of danger or threat or any disaster. Mitigation or reduction of the risk in the disaster. To reduce its severity or consequences and to build the capacity for the preparedness to deal with any type of disaster through the research and knowledge are the basic policies of the disaster management.

### 3.4.2 The Importance of Disaster Management Policies

- In case of any type of disaster natural or manmade huge losses of human lives and of the properties are observed. All types of disasters have immediate and long term effects that affect the economy of the country. In some cases, the long term effects threaten the stability of the country also comes in danger. These are the political effects through the forced migration the social and cultural effects also are observed e.g. In 1947 – 48 in India, due to the partition, millions of people in Punjab and Sindh and in Bengal were forced to migrate due to manmade political disaster.
- Some of the disasters like Volcanoes, Earthquakes, Tsunamis can not be avoided but if the organizations either the government or social, are prepared for the next step to be taken after the disaster. The losses can be reduced. While in cases of the disasters such as droughts and floods. These organization can create awareness among the people and about the causes and effects to reduce. The losses e.g. In the drought-prone areas of India, like, Marathwada in Maharashtra, Northern Gujarat, Eastern Karnataka, Western Andhra Pradesh, the Drought Prone Area Development Plans (DRDP) have been prepared, to reduce the economic losses of these regions.

### 3.4.3 The Disaster Management Policies and Principles

- Following are the disaster management policies :
  - A) To strengthen the Institutional capacity at the multi-thematic and multi-sectorial level.
  - B) To streamline the sufficient and efficient funding.
  - C) To enhance the awareness of risk and risk reduction measures.
  - D) To mitigate the effects of the disaster through preparedness.

To ensure the risk reduction at the community level.

#### 4.4 Approach of the Disaster Management Policies.

A holistic and integrated approach would be evolved towards the disaster management with the emphasis of building strategic partnership at various levels.

Community based disaster management through the integration of policies, plans and execution.

Capacity development at all the level of disaster management.

Consolidation of the past-initiatives and practices.

Cooperation with agencies at National and at International level.

Multi-sectorial synergy.

### 5 The Command and the Co-Ordination in the Disaster Management

#### 5.1 Introduction

Before we discuss about the command coordination and the control, let us know these terms.

##### Command and Control in the disaster management

The command and control are the key words of the emergency management. They are very important to promote the unity of commands among the local state and the central authorities.

##### Coordination and Control

The coordination system is a multilevel system i.e. from the top level to the bottom level Central Government level to the affected local level.

The control task of the co-ordinator is to coordinate the interaction actions of the subsystems at the lower level. The next step is to develop the distribution system with minimum complexity and to develop the control synthesis for the coordinated systems.

#### 5.2 The Incident Common System [ICS]

This ICS, accommodates all the risks and hazards.

ICS is simple, flexible still powerful.

ICS can easily expanded contracted as required.

ICS provides better communication and cooperation among the agencies.

### 6 The Rescue Operation in Disaster Management

#### 6.1 Introduction

The world has continued to experience the natural and also the manmade disasters.



- The risk of catastrophes as well as climatic changes, mainly the Global warming, which are the results of fast growth of world population and the over exploitation of natural resources have increased the intensity and also the frequency of such disasters.
- It has created the economic as well as the ecological problems together with danger to all the living beings.

### 3.6.2 Stages of Rescue Management

- It is necessary to study the causes of disasters find out to reduce the losses and finally reset the people to bring them to the normal life.
- So we need to have continuous effects before within and after the disasters.
- The Disaster Management is cyclic action.
- IT is a multi stage process.
- It consists of four essential phases which are sub divided for the detailing of the phase (Refer fig. 3.6.1)

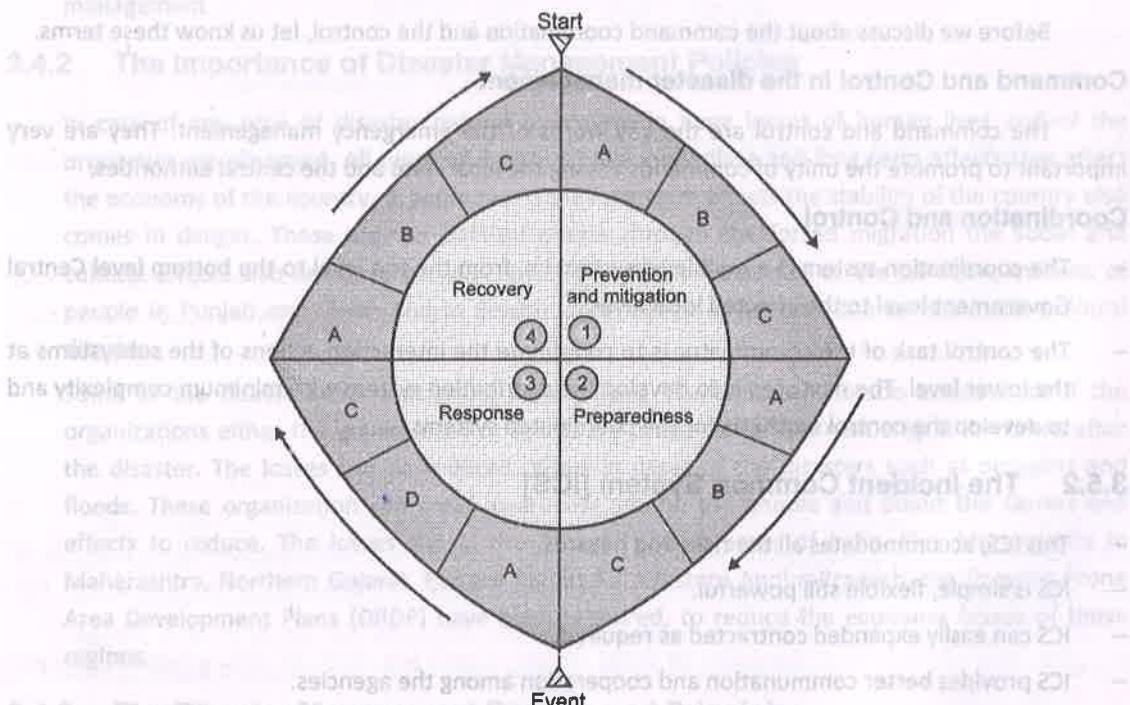


Fig. 3.6.1

#### 1. [Before Stage]

##### The Prevention and Mitigation

- A. Establish objectives
- B. Risk Assessment



- C. Risk prevention and Mitigation
2. [Before Stage]

#### The Preparedness

- A. Emergency Access and Evacuation
- B. Emergency Team and Drill
- C. Emergency Response Equipments

3. [During Stage]

#### Response

- A. Rescue, Relief and Salvage
- B. Immediate Damage Assessment
- C. Immediate Protection of Damage Heritage

4. [After Stage]

#### Recovery

- A. Detailed Damage Assessment
- B. Treatments [Restoration, Retrofitting and Repair]
- C. Recovery and Re-habitation

— Let us assess these stages / steps in the disaster management process in detail.

### 3.6.3 The Prevention Step

- This first step is focused on taking precautionary measures before any disaster or hazard takes place.
- This helps to reduce the damage.

This step includes the following

1. Identification of Danger
2. Assessment of life and property threat (To reduce the potential causalities)
3. Improvement of the Environmental policies.
4. To increase the awareness of the people through proper education.

### 3.6.4 The Preparation step

- This step is centred arranging a plan to approach the event after it crops up. The step is focused on increasing Resilience. It is carried through arranging and planning efficient measures to face the disaster.
- All these activities in this step are confined to reduce the damage due to the disaster. For the preparedness, following actions are arranged.
  - (i) The planning [For Emergency Access and Evacuation Routes]
  - (ii) The Training [For Emergency teams practice drills]
  - (iii) The supply [The provision of the Emergency Response Equipments]

### **The Pre-dispatch Phase**

In this the pre planning and the resource identification is carried. The type of hazard to be faced is also understood in this phase.

### **The Responding Phase**

In this phase the crew is sent to the area suffering from the hazard and it is also accessed about the resources required to rescue the persons in danger.

### **The Evaluation**

In this phase, the information is collected about the nature of hazard the type of emergency, the requirement of resources.

This information helps to know the urgency of the operation and the acceptable level of risk.

The recovery operations should be implemented when the risk to the responders is reduced to the lowest level.

### **The Pre-Entry**

In this phase, the area under the hazard is made as safe and possible. This phase has the following steps

- (i) Isolation : To stop unauthorized entry
- (ii) Evacuation : To clear the area
- (iii) Lock out/ Tag out : To enclosed the area for easy functions of the rescue team.

### **The operation**

It consists of the actual application of personnel and equipment to perform the Rescue and Recovery operations.

In this phase each personal should be informed about the type of work he is expected to carried out to avoid "The useless Traffic Jam."

### **The Removal**

This is a phase, where in the rescue operation is carried out i.e. it is the effective removal of the victims from the hot zone.

For the safe removal of the victims medical staff and Para indicate staff should be deployed.

### **The Termination**

This is the final stage of the rescue operation where in the personals and the equipment is safely removed from the site.

If all the steps are observed properly the losses can be reduced and the process of Rehabilitation can be started immediately.

We may not be able to stop the natural disasters but atleast we can minimise the physical, ecological, economic and social losses. In disaster management planning, it must be thought about minimising the manmade disasters by making the people aware about the causes of such



# Institutional Framework for Disaster Mgmt. In India

## Module IV

### Illabus :

Importance of public awareness, Preparation and execution of emergency management program. Scope and responsibilities of National Institute of Disaster management (NIDM) and National disaster management authority (NDMA) in India. Methods and measures to avoid disasters, Management of casualties, set up of emergency facilities, importance of effective communication amongst different agencies in such situations.

Use of Internet and software's for effective disaster management. Applications of GIS, Remote sensing and GPS in this regard.

## Importance of Public Awareness in Disaster Management

### .1 Introduction

At the world level in 2005 for the reduction of risk an Action Plan was introduced by "Hypo Frame work of Action" and was signed by 168 countries.

The main objective of this plan was "To make the use of knowledge innovation and education to built a culture of safety at all levels.

It has been observed that mean Hazard awareness does not lead to the people to adopt the risk reduction measures. People take the action only when,

- (A) They know about the specific action to be taken to reduce the risk.
- (B) They are totally convinced that such actions are effective.
- (C) They believe in their own ability to carry out the given task.

### .2 The Methods to Create Public Awareness

Before we start making the people aware about the disasters any incoming hazards the following facts must be considered.

- (A) It is necessary to stimulate to seek the information.
- (B) We must involve the public leaders or the social authorities in such programmes because people always need the validation, before they accept and act.
- (C) The people always believe in what they know and what they could observe so it is necessary



- (D) Learning understanding and acting are gradual processes so, we must allow a required time to them to accept the need of actions to taken before, within and after a disaster.

#### 4.1.3 The Approaches to Create Public Awareness

- To create the public awareness it is necessary to give correct and positive answers to the following commonly asked question by the public.

1. Why ?
2. Who ?
3. What for ?
4. What ?
5. With whom ?
6. When ?
7. Where ?
8. How long ?
9. With what tools ?
10. Why me ?

- If the people get satisfied with the answers, they would surely participate in such public awareness programmes. Four steps have been identified to create awareness among the people.
  - (A) Campaign
  - (B) Participatory learning
  - (C) Informal Education
  - (D) Formal school based efforts
- With all these methodological effects 50% people do not change as they have no spare time for such social tasks. 20% people have spare time but are not interested in any new tasks.
- 20% people have spare time and interest also but are not physically fit to carry out the given task.
- So, finally 10% of the people from a given society have spare time interest in social work and are physically fit to carry out these task.
- We should concentrate on these 10% people and get the task done to reduce the losses and to create safe environment.

## The Preparation and Execution of the Emergency Management

### 1 Introduction

**Definition:** The Emergency Management can be defined as "It is a management of the resources and responsibilities for dealing with all humanitarian aspects of any type of emergency."

The Emergency Management has four major aspects such as,

The Preparedness

The Response

The Mitigation

The Recovery

The Emergency Management is a related term but it should not be equated to the Disaster Management.

The basic aim of the emergency Management is to reduce the harmful effects of all types of hazards and disasters.

In other words these are the immediate measures taken to prevent a state which may turn into a disaster.

### 2 The Important steps in Emergency Preparation for any Disaster

It may be a fire, flood, landslide or an earthquake or any other emergency these is need develop an emergency response plan.

While creating such plan, five steps are necessary to be taken by the facility and security managers to reduce the losses and to save the sufferers. They are as stated below.

#### To know the Risk

One must list the potential emergencies and rank them according to the importance and the likelihood. It is required to know about, "What to do?" and "What resources are to be invested?" e.g. There is no need to invest a huge amount for a cyclone, if the region is discussion is not near a coast or there is no need to invest any big amount on earthquakes, if the area is not prone to earthquakes.

The risk assessment should be based on an all hazards approach for those hazards which may affect the region. A risk matrix would help to indentify the areas where in such investment is necessary e.g. In India if the matrix is to be prepared regionally to know the type of emergency is likely to attack a better preparation can be made in a proper direction e.g. In states of Assam and Bihar. The floods is the common emergency while in Himachal Pradesh, Uttarakhand landslides are very common J and K is a state where the earthquakes are commonly observed while in the drought prone belt extending from Rajasthan to Karanataka via M.P., Maharashtra and Andhra



- Once we know the type of hazard are can prepare for it.
- The matrix would help to know the severity of the hazard which is likely to cause the emergency in the said region or a state or a district to be planned to reduce the danger of the emergency.  
[Refer Fig. 4.2.1]

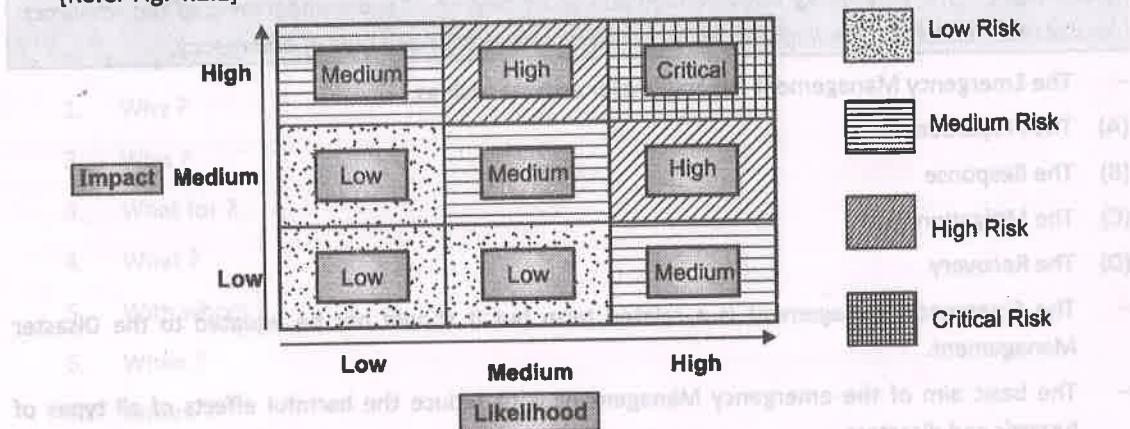


Fig. 4.2.1 : The Risk Matrix

#### (B) To Built a Team

- To prepare a proper emergency response plan, it is a must to develop team of the experts of the subject matter from different departments.
- This helps to determine the span of the plan. This plan needs to have the following four phases of the emergency management.

##### (i) The Mitigation

To Prevent emergencies and to minimize the effects of any emergency.

##### (ii) The preparedness

To prepare the people for the expected emergency.

##### (iii) The Response

To plan and to act in the situation to create safety.

##### (iv) To Recover

To act to bring the society to the normal operation.

#### (C) To make the Important Information Accessible Quickly

- The emergency plan should be prepared in such a way that the users should know the type of emergency and the steps to be taken immediately.
- The information should be written in easy language and it should be accessible easily to the actual users.

Depending upon the size of the organization, the responsibility of writing the plan its regular updating and the operation control is handed over to the safety department, security department or to the local authorities.

### **To update the Alert and Response Procedures**

The plans are made to ensure that every person knows about what is to be done ? in a given period of time.

So the plans to be followed, must be specific and should be to the point.

For giving the specific information e mails are used.

The language used for the notification must be clear and should be easy to understand.

It must be seen that the information is updated.

The after action report also should be prepared. This would help to plan any such hazard in future.

### **To Test the Plan**

After the plan is prepared, the next question would be "will it work ?" Is the job of the security manager to test the plan on a small scale and judge, where the plan is perfect or needs improvements.

The lectures and response sessions are designed to educate the persons, who need the training on " What the risks are?" and "What to do in an emergency?" For the better and fast results, it is necessary to have a good interaction between the lecturer and the audience.

If the hazards are to be put under control, all the steps of training must be followed.

## **3 The Scope and Responsibilities of National Institute of Disaster Management [NIDM]**

### **3.1 Introduction**

The disasters or hazards are the common dangers to the societies spread over the world.

The danger may be either manmade or natural, all the living beings have to suffer. In the past, disaster management everywhere in the world was nearly the response to the occurrence of such hazards.

Recently, the Disaster Management has become more efficient and the aims and objectives have become more positive i.e. not to deal with the disasters after their occurrence but before, within and after also the efforts are made to reduce the losses and to re-establish the society which has suffered due to the occurrence of such disasters.

### **3.2 Disaster Management in India**



- An organisation named as "The National Disaster Management Authority (N.D.M.A)", was formulated.
- It was headed by the Prime Minister of India. At the state level, the State Disaster Management Authorities (S.D.M.As) headed by the respective Chief Ministers of the states were also formulated.
- For each district in all states, "The District Disaster Management Authorities (D.D.M.As) was also developed to work at the micro-level.

#### **4.3.3 The objectives of Disaster Management In India**

- At present the efforts are made to control the disasters and reduce the economic and ecological losses.
- It is done by keeping the following objectives :
  - (A) The mitigation of any disaster i.e. to reduce the severity and the consequences.
  - (B) To develop the research and knowledge management.
  - (C) To prepare the public to deal with any type of disaster.
  - (D) To assess the severity and magnitude of the disaster.

#### **4.3.4 The Scope of National Institute of Disaster Management [N.I.D.M.]**

- The N.I.D.M. together with other research institutes has capacity development as one of its major responsibilities, together with training research documentation and to develop an Information Base at the National level.
- The N.I.D.M. will strive to emerge as 'a centre of Excellence' in the field of disaster management in India.

#### **4.3.5 The Responsibilities of N.I.D.M.**

- As per the disaster management Act, 2005, this Institute has got the statutory organisation status.
- This Act holds this Institute responsible for the followings :
  - For, planning and promoting the Training and Research in the field of Disaster Management.
  - For, Documentation and Development of national level information base related to Disaster Management Policies.
  - For, Prevention and Mitigation Measures.

#### **4.3.6 The Functions of N.I.D.M.**

- N.I.D.M. has been mandated by Government of India through the National Disaster Management Authority (N.D.M.A.) which is the apex body for the disaster management to a deemed university and Institute of Excellence on higher learning and capacity building U.G.C. has formulated a model curriculum for strengthening the disaster management in higher education and research.



### 4.3.7 The structure of N.I.D.M.

- N.I.D.M. has formulated structure to deal with the following.
  - (A) The policy planning has the Interdisciplinary Issues.
  - (B) The Hydro-meteorological, climatic changes and the Environmental Related Issues.
  - (C) The Geological disasters and the Engineering related issues.
  - (D) The Emergency Response and the Administration Related Issues.
- Together with the above, the Institute also work on,
  - (i) The call on the Environment and Climatic change.
  - (ii) Indo-German co-operation programmed on the Environmental knowledge for the Disaster Risk management.

## 4.4 The National Disaster Management Authority (N.D.M.A.) in India

### 4.4.1 Introduction

- After the Gujarat earthquake at Bhuj in August 1999, a High Power Committee [H.P.C.] was setup for making the National disasters management plans and also to suggest,
- The Effective mitigation mechanism.

#### The Vision of N.D.M.A.

- "To build a safer and disaster resilient India by a holistic pro-active technology driven and sustainable development strategy that involves all stake holders and fasters a culture of Prevention, pre-paredness and Mitigation.

### 4.4.2 The Methods and Measures to Avoid Disaster

- The methods and the measures to be taken to avoid disaster would be modified as per the causes the severity and effects of the disaster e.g. the steps required to avoid or to control flood disaster would be different than the steps required to be followed to avoid or control the severity of droughts.
- However the following steps would provide a general guideline to fight against any disaster the details required for a case of a particular disaster can be formulated by using these steps as a base.
  - (A) Prepare to be prepared the Disaster Prevention is the first and the foremost step in the preparation.
  - (B) Be informed
  - (C) Keep the required supplies ready
  - (D) Keep the personal protective equipment ready



- (E) Develop a fast communication system in the affected area.
- (F) The last but not the least steps is to have double check of all the steps.
- Well these steps may not be able to avoid the disaster but they sure would help to reduce the intensity of the disaster and also would help to reduce the losses.
- E.g. all the states facing the east coast of India suffer almost every year from the cyclones developed over the Bay of Bengal.
- This year in the month of April a cyclone called Fani attacked Odisha and West Bengal.
- These cyclones can not be avoided or prevented or controlled but if proper warning is given to the people in the cyclone prone areas we can reduce the toll of deaths of the people and also the domestic animals.
- We may not avoid the disaster but can avoid the after shock of such natural disasters.

## 4.5 Mass Casualty Management

### 4.5.1 Introduction

**Definition :** A Mass Casualty Incident [M.C.I] can be defined as, "It is an event that overwhelms the local healthcare system. Where the number of casualties exceeds the local resources and capabilities in a very short period of time."

- To face the problem to provide immediate medical help, it is necessary for each hospital to institute a surge plan in preparation for anticipated, progressive, insidious i.e. notice event and also sudden onset i.e. "No Notice event" disasters occurring within the community.

### 4.5.2 Identification of the Type of M.C.I.

- These categories include,
- (A) Planned i.e. sporting event
- (B) Conventional i.e. Transport incidents, burns, severe weather event, (too hot or cold weather)
- (C) Chemical Biological or Radiological incidents i.e. confined to chemical industries.
- (D) The Catastrophic Health Events i.e. major explosion cyclonic attack, pandemic diseases like Influenza, Chicken Gunia etc.
- (E) The accidents related to the act of Terrorism

The key to get success in controlling such medical emergency is to follow '5 s' i.e.

1. 's' Scene safe assessment
2. 's' Scene size-up
3. 's' Send information
4. 's' Scene set-up
5. 's' START



### 4.5.3 The Plan of M.C.I.

**Definition :** To reduce the toll of deaths in an accident following procedure is followed. It is called as "METHANE."

M : Major Incident Declaration

E : Exact Location

T : Type of incident

H : Hazard [both present and potential]

A : Access [The best route to access the site]

N : Number [Number of casualties]

E : Emergency services

- The success of the M.C.I. mainly depends upon the quick and correct actions taken after an accident is reported to the hospital authorities. The critical actions can be summarised within an Acronym such as "THREAT."

T : Threat Suppression

H : Hemorrhage control

R.E. : Rapid Extrication to safety

A : Assessment by medical providers

T : Transport to Definitive care

- Finally we can conclude about the functioning about the M.C.I. that Early START would yield into better success.

Here, S.T.A.R.T means :

S : Simple

T : Triage

A : And

R : Rapid

T : Treatment

## 4.6 Importance of Effective Communication Amongst Different Agencies In such Situations

### 4.6.1 Introduction

- In case of any type of disaster fast communication during and immediately after the disaster is an important component of response and the recovery.



- The quick communication helps to connect the affected persons families and the communities with the first responders the support systems and also with the rest of the members of the families.

#### 4.6.2 The Role of Communication in Disaster

- The communication has to play the multiple roles in any type of disaster.
- The communication must be developed in all directions i.e. between and among the agencies organisations the first responders, the support personnel, the Government and the media.
- For the unannounced immediate disasters, there must be the communication of the event itself. As all types of hazards and disasters and the disaster response start locally.
- In case of large scale events such communications can quickly be overwhelming and exceed the ability to generate the immediate response.
- The communication by dispatchers to the public safely Response units, Agencies, personnel.
- It can be made in a prioritized fashion.
- Each one of these concerned agencies has to make the further communication using their own staff.
- A general warning is required to be issued to the general public e.g. flood situation, land slides on the Railway lines or on the major roads must be communicated to the general public to reduce the traffic jams or to avoid the further accidents in the particular area of a big city.
- In case of the release of hazardous materials like toxic gases or oils, it is necessary to evacuate the area.
- This can be communicated by using local T.V. station and (or) Local Radio stations to the general public at a very fast speed.
- In case of disasters which occur with significant warning time like storms, cyclones, Tsunamis, etc.
- The advisors should communicate "Who?", "When?" And "How" the residents should prepare 'who' would need to evacuate? "Who, are at the risk of the floods? And finally 'where' these would be affected people should take the shelter?
- Another level of communication which occurs within the Incident Command Centres (ICCs) managing. **The response to the Emergency Operations Centre (EOC).** In such cases the communication might be done by face to face meetings, radio announcements.
- Generally, in metropolitan areas there will usually be a command centre set up by the local authorities and for a major event may be by the state Government.
- By making the use of any type of method or media, the public must be communicated about the following,
  - (A) How to get Relief?
  - (B) How to get medical care?
  - (C) How and where to get food and fresh water?



- (D) How get to the temporary shelter?
- In the recovery phase there are additional Recovery Support Functions.
- This is also needed to be communicated to the local volunteer recovery organisation and the victims of the hazard.
- So, the role of communication in any type of disaster is very important to rescue, to recover and to reset the affected public.

## 4.7 The use of Internet for the Effective Disaster Management

### 4.7.1 Introduction

- The cricer hazards or disasters can strike at any movement and anywhere in the world in under developing or developed countries.
- These can bring catastrophes such as Earthquakes, Tsunamis or Terror Attacks.
- It may affect few hundred to more than a million people; may be in a remote hilly or a forest area to a thickly populated urban settlement or an industrial complex.
- Under such situations it is necessary to have a fast and an accurate communication to inform the general public and also to the working groups at various levels.
- Such information is needed to be communicated, Before, during and also after the emergency situation.
- The High Technology of Internet and the social media play an important role in the Information Management.

### 4.7.2 The Internet of Thing [ I.O.T.] and The Disaster Management

- Together with the traditional use for Industry or Research I.O.T has the potential use to serve a critical and life saving role in an event of a natural or a manmade disaster.
- Today we live in he world of the mobile the cloud in analytical and social age which has created the new opportunities to transform the traditional emergency and the disaster operations and engage with the common public and also the stake holders losses or at least to reduce the losses.

#### A : To Prepare

- The I.O.T. has the potential to stream line the preparation efforts.
- The use of sensor technology to address real time stock and supplies replacement spare planning and the Automated Indent Processing.

#### B : To Generate Response

- I.O.T. can facilitate the Response Planning and Action through, "The use of the sensors to monitor the movements of the key persons in the process of Disaster Management".



## C : To Recover

- I.O.T. is very useful for the recovery efforts and the activities through, "By creating a virtual logistics network which allows the hub-operators to monitor traffic towards.
- By aligning these technologies towards the strategic charter the agencies can attain a new level of speed responsive. Quality and the agility.
- The I.O.T. offers disruptive potential in prevention, preparation, response and also in the Recovery phases of disaster management.

### 4.7.3 The Application of I.O.T. in Disaster Management

- Some of the important transformation applications include the following.

## A : To Prevent

- I.O.T. can be a game changer in the prevention of disasters through the following.
  - (i) Monitoring can be facilitated by using the real time sensor based data e.g.
- The sensors to detect forest fire, cyclones, Earthquakes, cloud burst etc.
- Such data would enable to give early warning to prevent the and within a hub in real time and also to facilitate the communication among all the involved parties.

### 4.7.4 The Benefits of I.O.T in Disaster Management

1. It can help to get the clear picture of the operation
2. It can make the use of current and also the historic data for the fast and better informed decisions.
3. It help to create a single information hub.
4. It creates an information backbone to all the concerned parties like government NGOs in fracture operates and the community to plan to work to respond and to Re-establish.
5. I.O.T. is a tool which provides fast accurate information and helps to get fast action for fast recovery from the disasters.

## 4.8 The use of Software's for the Effective Disaster Management

### 4.8.1 Introduction

- An Emergency Management Software is a software which is used by local state level and Central Government level emergency managements to deal with a wide range of disasters which include the natural or manmade disasters or hazards.
- E.g. the Training software like the simulators and generally used to prepare the first responders the word processors can keep the form templates handy for printing and analytical software can



- All these systems are interrelated so the results of an after Incident Analysis can be used to programme the training software to be used to prepare for a similar situation in the future.
- The crisis Information Management software (C.I.M.S.) is a software supports the management of crisis information and the corresponding response by the public safety agencies.

#### **4.8.2 The Type of Software's used for Disaster Management**

- The common features of the software include Geographic Information System (G.I.S.) [About G.I.S. we will discuss separately], weather and the plume modelling, resource management command control and communication (c-3) functions.
- The National Preparedness Directorate and Incident Management Systems (Integration Division) [NPD-IMSI] identify the criteria for this programme to evaluate against.
- These criteria are derived from the National Incident Management system.

**Example :**

- (i) Emergency support functions [ESFs] as per National Response Framework [NRF] definition.
- (ii) Incident Command function (ICF) as per, National Incident Management System [NIMS]
- (iii) Resource Management i.e. Preparedness Response Recovery and Reimbursement.
- (iv) All hazard philosophy as per the National Incident Management System. [N.I.M.S]
- (v) The specific hazards identified as per, the National Fire Protection Association (N.F.P.A.) 1600 : Standard on Disaster Emergency Management and business continuity programme.
- (vi) Command and management Incident Command System (I.C.S) as per the National Incident Management System. [N.I.M.S.]
- (vii) F.E.M.A. currently uses WebEOC as its emergency management software.

#### **4.8.3 The Application of G.I.S. in Disaster Management Programme**

- GIS is a tool which allows the user to create interactive queries analyze the spatial information, edit data, maps and present the results of all these operations.
- GIS provides environment for effective and efficient storage and manipulation of all the spatial and non spatial data for the scientific management and for Policy Oriented Information.
- The specific application of G.I.S. is made for
  - (A) The Risk Assessment
  - (B) The Hazard mapping to locate earthquakes, floods, landslides, cyclones etc.
  - (C) These location maps are used for the disaster warning system.

**The GIS application Is also useful In the following activities.**

- (A) To create Hazard Inventory Maps
- (B) To locate a particular critical facility
- (C) To create and to manage associate related Data Base.



- (D) To provide frame work for planner to view the spatial data by the way of computer based maps.
- GIS can be useful to the shelter operators to capture the specific personal details of the person being housed at a shelter.
  - So in short we can say that the GIS based data provides the better environment for the future planning.

#### 4.8.4 The Application of Remote sensing in Disaster Management

- The remote sensing is a science used to acquire the information about the earth by using the satellites or other equipments.
- The information generated by the remote sensing techniques is useful for the disaster management.
- These satellites offers accurate frequent and almost instantaneous data over a large area anywhere in the world.
- When any type of disaster strikes remote sensing is the only way to view the actual location and the type of disaster.
- The steps of remote sensing are as follows.
  1. Energy source or Illumination
  2. Radiation and the Atmosphere
  3. Interaction with Target
  4. Recording of Energy by the sensors.
  5. Transmission, Reception and Processing
  6. Interpretation and Analysis finally
  7. Application of the information

#### 4.8.5 The Application of G.P.S. in Disaster Management

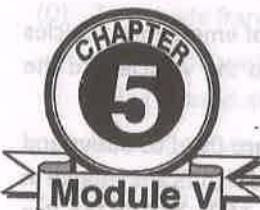
- The Global positioning system (GPS) is very useful during the disaster as it operates.
  1. In any Weather
  2. Any where
  3. At any time
  4. It provides the accurate position [In case of any disaster it is most important as G.P.S. provides pin pointing location]
- The main function of G.P.S. is to provide the location of the receiver. The level of precision of GPS makes it very useful to reach the location at any earliest time e.g. In case of land slides or forest fire the reporter can give the pin pointing location to the persons who can provide the immediate relief to the persons in the situation.
- The GPS is very useful during the response and the recovery phase of the disaster management.
- The GPS can also be used during early phases like the Preparedness phase and the Mitigation phase.



- Another important application of G.P.S. in Disaster management is tracking of emergency vehicles or the required supplies. In this application the GPS receiver is attached to the vehicle and the location over laid onto a map.
- The GPS can be used for monitoring the height of the wave. The GPS units are fixed to buoys and the height of the units can be determined upto centimetres any sudden and significant change in the wave's intensity or frequency trigger an Alarm may be for Cyclones, Tsunamis or the Sea Surge.
- The GPS can be used for measuring the deformation of the land due to the volcanic activities.
- So, GPS provides the accurate location of any hazard or disaster and helps the rescue team to reach the location in time to reduce the further losses of the living beings and minimize the death tolls indirectly.

### Review Questions

- Q. 1** Describe the importance and the methods to create public awareness in Disaster Management.
- Q. 2** State and describe various steps to create public awareness.
- Q. 3** Mention and explain the steps in emergency preparation for any Disaster.
- Q. 4** Write notes on the following :
  - A) Disaster Management in India.
  - B) The objectives of Disaster Management in India.
  - C) N.I.D.M structure.
  - D) Responsibilities of N.I.D.M
  - E) Structure of N.I.D.M
- Q. 5** Describe with examples the methods and measures to avoid disasters.
- Q. 6** Define the term, 'Mass Casualty Incident' (M.C.I) and describe its types.
- Q. 7** What is 'METHANE'?
- Q. 8** What is S.T.A.R.T.?
- Q. 9** Write notes on the following :
  - A) Role of communication in Disaster.
  - B) Use of Internet in Disaster Management.
  - C) Types of software's used in Disaster Management.
  - D) Application of G.I.S. in Disaster Management Programme.



# Financing Relief Measures

## Syllabus :

- 5.1 Ways to raise finance for relief expenditure, role of government agencies and NGO's in this process, Legal aspects related to finance raising as well as overall management of disasters. Various NGO's and the works they have carried out in the past on the occurrence of various disasters, Ways to approach these teams.
- 5.2 International relief aid agencies and their role in extreme events.

## 5.1 Ways to Raise Finance For Relief Expenditure

### 5.1.1 Introduction

- When a natural disaster like flood, cyclone, Earthquake or landslide hits any settlement or settlements the impact is devastating.
- The immediate needs are critical and also life threatening many persons lack the access to the essentials such as food, drinking water, shelter and also the healthcare.
- In the developing countries such disasters kill less people but the after situation i.e. without food, water, shelter and healthcare more people die.
- So, it is almost important to provide the required material immediately to reduce the further losses.
- This is just the beginning to provide relief to the affected people.
- These are the immediate needs to be fulfilled. But it is necessary to plan for long term needs of the affected families and communities i.e. the persons, who have lost everything need houses replantation of agriculture, redevelopment of infrastructure (Roads, Electricity, drinking water storage, medical facilities, educational facilities, markets etc.)
- So, for the immediate relief and for the long term relief planning huge funds are required.
- Though it is the prime responsibility of the local authority State Government and the Central Government, it is necessary for the people living outside the affected areas, to come forward and generate the relief funds to help the people in danger of the disaster, the social organisations i.e. Non-Government organisations (NGO's) also should extend their co-operation in such national calamities. Let us see the type of relief which is provided by the central and state governments in the natural / man made disasters.



### 5.1.2 The Role of Government Agencies in Disaster Relief Funding

- The financial assistance, to meet the rescue and relief expenditure during any disaster event is controlled by the guidelines notified by,
- The State Disaster Response Fund. (S.D.R.F)
- The National Disaster Response Fund (N.D.R.F)
- These funds have been created under the legal framework of 48 (1) (a) and section 46 of the Disaster Management Act, 2005.

### 5.1.3 The Disasters Covered Under S.D.R.F/N.D.R.F. the Legal Aspects

- The disasters, hazards or calamities such as Cyclones, Draughts, Floods, Earthquakes Landslides, Hot or cold wave, Tsunamis etc. are considered to be of severe nature by the Central Government of India and the concerned State Government.
- In case of the above mentioned notified natural disaster. The State Government has to submit and detailed report (memorandum), giving sector wise details of the Damages and the expected requirement of funds for the Immediate Relief operations.
- On the basis of the request made by the State Government due to not having adequate balance in its S.D.R.F. the Ministry of Home Affairs or the Ministry of Agriculture (in case of droughts and floods) assess this need for the additional assistance required from N.D.R.F. under the existing guidelines and the approved items of expenditure.

### 5.1.4 The Procedure Adopted for the Assessment of the Requests made the State Government for Additional Financial Support

- The memorandum of the State Government is examined to assess the likely requirement of the fund as per the items and norms of expenditure under S.D.R.F. / N.D.R.F.
- If the primary examination reveals that the state is in need of assistance, the central team is deputed to make the on the spot assessment.
- This report of the central team will be examined by the Sub-Committee of the National Executive Committee (S.C. – N.E.C.), which is constituted under section 8 of DM Act 2005.
- The SC-NEC will assess the extent of assistance and expenditure which can be funded by N.D.R.F. as per the norms of N.D.R.F. / S.D.R.F. and would make the recommendations.
- Based on these recommendations of SC-NEC a high level committee approves the quantum of the immediate relief to be released from N.D.R.F. by the concerned State Government (S.D.R.F.)

### 5.1.5 The Work of NGO's in Disaster Management In India

**Definition:** Together with the international organisations like Red Cross World Health Organisation there are a lot of N.G.O.s working in the field of Disaster Management one of the known organisation in this field is called as "The Rapid response".



- It is a registered Non-Profit Organisation which is formed to provide response and preparedness services to the vulnerable communities in both crises and also in Non-crises situations.

### The Mission

- “To provide immediate effective and sustainable support for the victims of the Natural disaster.”

### The Activities

#### (A) Disaster Response

- Food, Drinking water and medical requirement are provided with following steps :
  - Rescue and Medical Assistance
  - Relief provision the daily required items.
  - Rehabilitation

#### (B) Disaster Preparedness

- This is the step taken before the disaster (in the disaster prone areas) to make the people aware about the danger its cause and effect and also about the measure to be taken to reduce the social economic and environmental losses.
- This is done successfully by taking the following steps :
  - The community managed disaster Risk Reduction Programmers.
  - The comprehensive school safety programmes for children.
  - SMS based Disaster Preparedness and Early Warning System.
  - Through the Promotion of Mangroves for the Coastal Defence. These mangroves help to reduce the velocity and intensity of waves during the cyclones and helps to reduce the losses.
  - The Formation of disaster resilient villages.

### 5.1.6 The NGOs for Disaster Management in Mumbai

- Following NGOs are working Mumbai to provide relief to people who need help for a safe and better life.
  - Bgs Foundation
  - America India Foundation
  - Mansoori Manav Vikar Foundation
  - Yuva Ekta Samajik sanstha
  - Doctors For You
  - Utkarsh Manav Sevai Sanstha
  - Atulya Charitable Trust
  - The Family charitable Trust
  - Ardea Foundation

The young educated and environmental friendly Engineers like you should come forward either to form such N.G.Os or join such N.G.Os, to extend your co-operation to the people suffering from one or the other natural or manmade hazard.

This can be done by providing financial help for the disaster Relief Funds or (and) by providing the physical help to the rescue team engaged in disaster management activities at the local or State or National level.

## Legal Aspects in Fund and Raising in Disaster Management

### 1 Introduction

A National Disaster Response Fund is constituted as the mandated in the Act. This fund would be applied by The National Executive Committee (NEC) to meet the expenses for the emergency response relief and for rehabilitation in accordance with the guide lines laid down by Central Government of India in consultation with the National Disaster Management Authority (NDMA). The proposal of merger of National Calamity Contingency Funds (NCCF) with National Disaster Response Funds (NDRF) would be as recommended by the Finance Commission from time to time.

Similarly as mandated by the Act, The National Disaster Mitigation Fund (NDMF) is created mainly for the purpose of mitigation. This NDMF will be applied by The NDMA and it would be recommended by the Finance Commission, from time to time.

### 2 Techno- Financial Regime

The assistance provided by the state and central governments for the purpose of Rescue, Relief, Rehabilitation and Reconstruction needs can not compensate for the huge losses on account of disasters new financial tools like catastrophic Risk financing, Risk Insurance. The catastrophic bonds, Micro-finance and Insurance etc. will be promoted with innovative fiscal incentives, to cover such massive issues of the individuals the community and the corporate sectors e.g. This year the Floods in various district of Maharashtra like Kolhapur, Snagali, Nasik and Mumbai have created a huge problems to the local authorizes.

In this regards The Environment Relief Fund under Public Liability Insurance Act 1991 enacted to provide relief to the people who have suffered either due to the Natural Calamity like floods earthquakes forest fire or Droughts some financial practices like Disaster Risk Insurance Microfinance, Micro-Insurance warranty of newly constructed houses and structures and linking safe construction with home loan will be considered for adoption. So the main purpose of providing the legal frame work for the fund raising is to provided to funds to be right persons and to maintain the accountability of such funds, either provided by the government or by the private sectors.



## 5.3 International Relief Aid Agencies and their Role In Extreme Events

### 5.3.1 Introduction

- Following information is about the organisations working at the International level.
- They all are known for their work to provide relief to the communities suffering under a natural calamity.
- They work irrespective of cast, colour, creed or a country.
- They provide relief to the humanity, so their work is worth understanding.

### 5.3.2 The Need of Disaster Relief

- According to the reports prepared by the "The Centre for Research on the Epidemiology of Disaster" (RED) in the year 2017-18 at the world level about 350 natural disasters were recorded.
- 103 countries were affected by these disasters. Surprisingly if compared with the previous decades in the 2<sup>nd</sup> decade of the 21<sup>st</sup> century the number has been reduced.
- Among all the disasters caused by floods are maximum and their frequency also has increased.
- Flood disasters are followed by the Earthquakes and the cyclones. Due to their sudden occurrence and higher distinctiveness, they need a massive co-ordinated reaction within a short period of time.
- These organisations mentioned below, sometimes work together to generate immediate relief to the community or country suffering due to any type of natural disasters.
- Their work is next to the local state and the central Governments of the concerned countries.
- As mentioned above, "The numbers of the natural disasters have been reduced."
- In fact it's not the crude number of the disasters but the death tolls or the economic and ecological loss have been reduced due to the high technology of G.I.S. and G.P.S. the early warning can be given to the people living in that region, which is expected to be attacked by the natural calamities like floods and Cyclones, Tsunamis etc.
- These organisations generate the relief work, before within and after the attack of such natural disasters.

### 5.3.3 The N.G.Os Working at the International Level to Provide Relief against the Natural Disasters

#### 1. Doctors without Border

- A medicine sans Frontiers is an International Humanitarian medical Non-Government organisation (N.G.O.) of French origin known for its conflict zones and in the countries affected by the Endemic Diseases.
- H.Q. : At Geneva



- Country : Switzerland

## 2. The Direct Relief International

- It's a Humanitarian Aid organisation working in 70 countries with a mission to improve the health and lives of the people who have been affected by poverty a major cause of health disaster.

- H.Q. : Santa Barbara California country G.S.A.

## 3. International Red Cross

- This organisation based in U.S.A. and spread all over the world helps the people affected by a small house fire to any multi-state Natural Disaster.

- American Red cross, provide, clean water, food, shelter and medical help to the people wherever they are and whatever may be the cause of the natural disaster.

- They also help the people affected by the wars.

- They have about 17 million volunteers engaged in this relief work.

- H.Q. Geneva

- Country : Switzerland

## 4. Brethren Disaster Ministries

- One of the prime field of work of this organisation is to Repair or Result the damage houses for the disaster survivors who cannot recover on their own.

- It is the service provided by the churches all over the world.

- H.Q. Carolina

- Country : U.S.A.

## 5. All Hands organisation

- It is one of the leading disaster relief organisation working at the world level for the last 10 years.

- This organisation has 35000 volunteers and have donated 175000 days to help more than 5,00,000 people in various countries, suffering due to one type of natural calamity or other.

- All 'Hands and Hearts' is U.S.A. based non-profit organisation.

- It was founded in the year 2005 and till 2019 they have spread their organisation in more than 150 countries, spread over all the continents to provide immediate relief to the disaster affected people.

## 6. Plan India

- It is a member organisation of plan International Federation.

- It is a child Development organisation committed to creating a long lasting impact in lives of the vulnerable and excluded children and their families.



## 7. International Relief Team

- It is a top rated, non-profit humanitarian organisation.
- It is dedicated to all eviating human suffering, at the world level.
- It is in U.S.A. Their aim is to provide disaster response and to built the healthy communities.

## 8. World Health Organisation (WHO)

- W.H.O has 194 member countries. It was established on 7<sup>th</sup> April 1948. Being on health protecting organisation, it has played a leading role in the Eradication of small pox, cholera and Malaria mainly in the 3<sup>rd</sup> world countries.
- Its current priorities include HIV/AIDS and Ebola.

H.Q.: Geneva

Country : Switzerland

## 9. Humanitarian Coalition

- This organisation strives to maximise Canadian Fundraising efforts in support of the members assistance programmes, for the survivors of the International Humanitarian Disasters.
- The members of the organisation work to generate the awareness among the public and to help the sufferers affected by any natural disaster and help to resettle them after the disaster.
- Finally

## 10. The Engineers Without Borders (E.W.B)

- Now, it is a worldwide organisation helping the people who are project affected to re-set them, by providing them the basis need of shelters.
- The first E.W.B. was founded in 1980 in France and in U.S.A. it was founded at the university of Colorado Boulder in the year 2001.

## 11. Engineers without Border in India

- E.W.B. in India was established at Chennai (Tamilnadu) in the year 2016.
- The main aim of this organisation is render help to the disaster affected people as already mentioned the states of India, bordering the east coast, i.e. West Bengal, Odisha, Andhra Pradesh and Tamilnadu every year suffer from the cyclonic attacks in the months of September and October.
- They cyclones make huge economic losses mainly of the agricultural fields and of the houses. So E.W.B. has set the goal to support these cyclone affected people by re-building their houses and to provide the infrastructural structures.
- A natural disaster is a national calamity so every single person should come forward to generate help to the disaster affected people and also help to create awareness among the natural calamities, which would make them prepared to fight against the natural disaster.
- This also would help to reduce the economic and ecological losses.



- So, though we cannot stop the Natural disaster atleast we can reduce the severity of the disasters and also can minimise the losses.
- It is our prime aim to control the man-made disasters which are the results of the carelessness and uncontrolled life style.

## 5.4 The Worst Natural Disasters at the World Level in the Last Decade

### 5.4.1 Introduction

- We already have discussed about the natural and man-made disasters. Here, the worst disasters at the world level, in last decade have been noted to explain the importance and the need of the N.G.Os to fight against these disasters and make the poor sections of the society safe.
- Out of the total disasters about 80% of the disasters are the results of climatic change i.e. due to global warming, the ice-caps and the frozen zone is melting, causing, floods and also rise in the sea level change in the climate has made the weather conditions most unpredictable floods or droughts are the major climate calamities, causing physical, economic, social and environmental losses at the world level some of the worst calamities at the world level have been noted below which include the earthquakes Landslides also.

#### (A) The Earthquake at Bhuj (Gujarat) 26<sup>th</sup> May 2001

It occurred in an intra plate area, causing the death toll of 20,000 persons in India.

#### (B) The Guinsqugon landslide, Philippines 17<sup>th</sup> February 2006

- The tragedy of this landslide is that the authorities and local people were aware about the danger of landslide and have started evacuating the danger zone, but they were stopped by the heavy rainfall only to be buried under the slide.
- This indicates the need of joined planning on hazards and also explains the need of coordination in rescue operation teams.

#### (C) The Bam Earthquake, Iran 26<sup>th</sup> December 2003

- It was a direct hit on the ancient city Bam within a period of a few minutes about 27,000 persons lost their lives.
- It was not only an economic loss, but was the loss of the cultural heritage of the country.

#### (D) The Cyclone the 'Nargis' Myanmar, 2<sup>nd</sup> May 2008

It was a great natural climatic calamity which gave a big blow to the country together the economic losses in the coastal settlements, it took the total death toll of 1,38,000 persons.

#### (E) The Earthquake and Tsunami, In Indian Ocean 26<sup>th</sup> December 2004

- It is a known fact that if the magnitude of an earthquake is more than 8 and the focus and epicentre are located on the bed of an ocean, they yield the great waves to be called as the Tsunamis [it is a Japanese name to the great coast waves.]

As far as this natural calamity had a huge death toll of 1,65,000 persons in Indonesia and the total deaths at the world level reached up to 2,50,000 persons.

The above mentioned disasters should serve to remind us that we have a long way to go to reduce the disaster losses.

And it also explains that the disasters can occur anywhere in the world at any time so we have to prepare the relief plan and keep it ready for  $24 \times 7$  days.

We need more N.G.Os, who may not stop such disasters, but can help to reduce the losses and can help to provide the basic needs to the disaster affected people.

### Review Questions

1. Describe various methods to raise funds for the Relief Expenditure.
2. Explain the role of Government Agencies in Relief fund raising for Disasters Management.
3. Describe the procedure followed for the assessment of additional finance support requested by the state government for Disaster Management.
4. Write short notes on the following :
  - A) The work of N 90's in Disaster Management in India.
  - B) N.D.M.A
  - C) Techno-financial Regime
5. Describe the legal aspects in fund raising in Disaster Management.
6. Explain the need to raise the Disaster Relief.
7. Write in brief :
  - A) Doctors Without Border
  - B) International Red Cross
  - C) All Hands Organization
  - D) W.H.O
  - E) Engineers Without Border (E.W.B)
  - F) Engineers Without Border in India





# Preventive and Mitigation Measures

abus :

Pre-disaster, during disaster and post-disaster measures in some events in general

Structural mapping : Risk mapping, assessment and analysis, sea walls and embankments, Bio shield, shelters, early warning and communication.

Non Structural Mitigation : Community based disaster preparedness, risk transfer and risk financing, capacity development and training, awareness and education, contingency plans.

Do's and don'ts in case of disasters and effective implementation of relief aids.

## The Pre-Disaster ; During Disaster and Post-Disaster Measures

### 1 Introduction

In fact the pre-disaster measures would vary on the basis of the type of disaster.

The pre-disaster activities include prevention mitigation and preparedness.

Naturally these activities will have to be set up per the type of disaster or hazard or calamity.

Let us see the measures required to be taken in the pre-disaster stage.

### 2 Measures for Cyclones Pre; During and In Post

In a country like India located in the tropical climatic region and have the typical peninsular location i.e. three sides sea openings the tropical cyclones have become a common climatic calamity the severity may vary but they are observed mainly on the east coast of India and they cause danger to the sea facing states, such as west Bengal, Odisha, Andhra Pradesh and Tamilnadu.

We cannot control the cyclones their frequency or intensity but if we are prepared for such calamity. We can reduce the social Economical and Ecological losses and also can reduce the death tolls.

Following steps should be taken by the level government.

1. Pre-warning of such cyclone must be given to the people living in that cyclone prone areas.
2. These people must be moved to the suffer places to reduce the losses of human lives.



3. The process of Evacuation must be arranged very smoothly and to should be seen that they do not become Panicy, which would make the situation very difficult to manage.
4. The food, drinking water, clothing's shelter and safety should be provided to the people who have been shifted to the temporary shelters.
5. After the cyclone is over it is necessary to clean and clear the area and the infrastructure should be redeveloped.
6. The medical facilities must be provided to the people who required it.
7. Finally as early as possible the Low and order should be developed in the cyclone affected areas to provide safely to the community.

### 6.1.3 Pre, During and Post Measurement for Floods

- In India mainly in North India, the foods are the common disasters mainly in Himachal Pradesh, Uttarakhand Bihar and Assam states.
- Due to these floods every year a huge economic losses and human losses and ecological losses are observed.
- In Assam when river Brahmaputra get flooded almost 50%. Assam is put under water in 2018, the flood water entered in Kaziranga National Park and took a big death toll of the wild- life same is the case of Bihar which gets flooded every year by the floods of river Kosi.
- Like cyclones, floods cannot be totally controlled but if the necessary measures are taken before during and after the losses can be reduced.

#### A) Measures to be taken before the Floods (At an Individual / Family level)

- Build and emergency kit and make a safe family communication plan.
- Avoid to built your house in a low lying areas hear the bank of the river.
- If your are living in an area having high flood risk elevate the electric panels, water storage tanks.
- If possible and feasible construct a protective wall along the building or a single house.

#### B) The Measures to be takes During the Floods

- Listen to the T.V. or Radio to get the latest information and the instructions given by the local authorities.
- If there is any possibility of flash flood must leave your house immediately and more to the high ground area may be to a hills which is nearby.
- Don't getting instructions for evacuation by the local authorities.
- The flash floods can create serious condition in the low lying areas drains natural channels canals etc.
- If there are heavy rains due to cloud burst you must make more to the safer grounds.
- Before evacuation following steps must be taken :
  - (i) Secure your house, if the time permits bring up the valuables to an upper floor.



- (ii) Turn off the electric switches and water valves.

### C) Measures to be taken after the floods

- Avoid the moving water.
- Stay away from the damaged structures.
- Do not try to cross a road or a low lying bridge which is still under the flow of water.
- Return to your house when the local authorities indicate it is safe.
- Avoid the areas still having standing water do not cross bridge which was under by any type of vehicle.
- Never drink the water which has been contaminated by sewage.
- Finally as the floods can cause physical hazards and emotional stress you must look after yourselves and the members of the family mainly the young and old family members.
- And make your house clean from the mud and other suspend of material before you start living your normal life.

#### 6.1.4 Pre, During and Post Measures for Earthquakes

- A) As far as the earthquakes are concerned the pre measures are the long term plans like in the earthquake prone areas the multistory buildings and large reservoirs / Dams railway bridges, railway tunnels should not be constructed to avoid huge economic and human losses.
- B) The During stage of the earthquake lasts for a few seconds only but to reduce the toll of deaths

##### Following steps should be followed.

- (i) Hold on to any sturdy furniture until the shaking stops.
- (ii) If your driving a car in it pull over and stop the vehicle.
- (iii) Avoid the power lines.
- (iv) Avoid the basements area of toll buildings.
- (v) If you are away from your house, communicate with your members of your family and keep in contact with them and ask them to move to the suffer places. The most safe place would be the open grounds.

- C) After the earthquake is a long phase and you get enough time to re-settle.

##### Following instructions would help to have fast re-settling.

- (i) Check your selves and other members of your family for any minor or major injuries.
- (ii) Check water gas and electric connections before you open them.
- (iii) Stay away from the beaches.
- (iv) Make all the required structural repairs before you start using it.
- (vi) So, the pre during and after measures in case of any natural disaster are almost same i.e. keep safe do not panic and finally accept the disaster and re-set your life.



## 6.2 Structural Mapping / Risk Mapping

### 6.2.1 Introduction

- The Risk Mapping Assessment and Planning (Risk Map) is the Federal Emergency Management Agency (FEMA). It's a programme that provides food information and tool to the community which they can use to develop the mitigation plans and to help the persons in the disaster or hazard.
- Through the accurate mapping products the risk assessment tools planning and the in time support the Risk MAP can strengthen the local ability to make informed decisions to reduced the risk.

### 6.2.2 The Risk MAP Vision

- Through the collaboration with the state and local authorities the Risk MAP delivers the quality Data.
- This helps to develop the public awareness. This awareness leads to the action which reduces the risk to the life and the properties.
- The Risk MAP focuses on products and services beyond the Traditional Flood Insurance Rate MAP (FIRM).
- It helps to put the flood risk data and the assessment tools to use effectively communicating the Risk to the public and helps to enhance their mitigation plans and actions (Refer the Fig. 6.2.1).

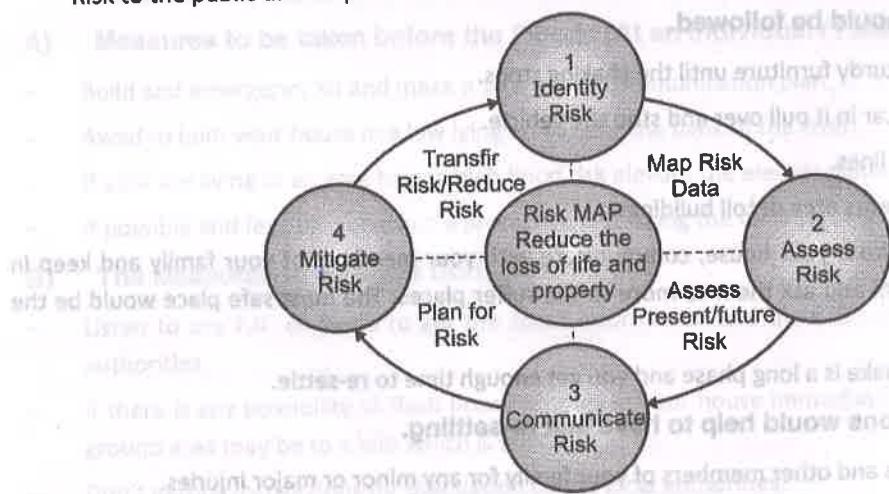


Fig. 6.2.1 : Steps of Risk MAP

### 6.2.3 The Risk MAP Solution

The FEMA has developed a Risk MAP solution to reach the vision of the Risk MAP

The solution identifies the new strategies and the products designed to achieve the goals and objectives which have been laid out in the vision.

These strategies and the products address the project prioritization Elevation, Data Acquisition

A watershed study Approach

Engineering and Mapping

Risk Assessment

Mitigation planning support and Finally

The Risk communication

## **The Risk Assessment and Analysis**

### **1 Introduction**

The Federal Emergency Management Agency [FEMA] manages several Risk analysis programmes which assess the impact of the natural hazards or disasters to reduce the Risk.

These programmes support to strengthen nationwide preparedness and mitigation against any natural disaster.

### **2 Advantages of FEMA's Mitigation Programmes**

It helps to create safer communities by reducing the loss of life and properties.

It helps to enable the people to recover at a fast rate from any type of disaster.

It helps to reduce the financial burden on the state and the local authorities.

### **3 FEMA's Mission to Reduce the Risk in any Disaster**

#### **Risk Analysis**

It applies Engineering and practices in conjunction with advanced technology tools to Identify the disaster to Assess the vulnerability and to develop the strategies to manage the risk in the said hazard or disaster.

#### **Risk Reduction**

It helps to reduce the risk to life and properties. It is carried out through the land use controls, building practices cost effective mitigation grants and the other tools.

These activities address the risk in both i.e. in the existing built environment and also in the future development programmes which occur in both the pre and post disaster environment.

The above mentioned strategies have been used very successfully in U.S.A. and have achieved to reduce the losses through the natural disasters. As already mentioned the floods and the cyclones are the major natural disasters in India which cannot be controlled but with the help of such Risk APS. We can reduce the losses of life and properties.

Following are some of the engineering structures which can reduce the danger of the natural disasters such as flood in the plains and the floods due to sea-waves in the coastal areas.

### **Sea walls**

#### **Need of Sea walls**

is a structure which separates the coastal land and sea water areas.

is designed to prevent the erosion and other damages due to sea wave actions and mainly to control the storm surge like flooding due to cyclones. e.g. in the last week of April a cyclone named 'Fani' attacked the low-lying coast areas of Odisha and West Bengal.

The sea walls are huge and massive structures designed to resist the full force of the sea waves mainly during storms and cyclones which are very common in India.

Cyclone named 'Vayu' is expected to attack the coastal areas of Gujarat on 12<sup>th</sup> June 2019.

#### **The Construction of Sea-walls**

These walls are the structures made up of concrete steel rock boulders or of wood.

They control the negative effects of the waves and tides on the land also help to control the process of desertification i.e. the marching the sand dunes in the deep interior parts of the level which is under the use for cultivation.

These walls also help to reduce the danger of salivation of the coast soils.

#### **The Types of Sea-walls**

The main objective of the sea-walls is to redirect the sea waves back to sea and save the coastal environment both economic and environmental. For this purpose two types of sea-walls are constructed.

- i) The vertical walls
- ii) The Riprap walls

Different designs of man-made Tsunami barriers includes Reef or plantation of trees on the sea walls or on the submerged sea walls.

It was started in the Tsunami affected areas of Tamilnadu after 2004 and it has been observed that such constructions like sea walls do help to reduce the impact of such high waves up to 83%.



- (ii) The slope of the area
- (iii) The type of coast
- (iv) The average height the tide and wave

### A word of Caution

- These sea-walls have to stand against the hydraulic pressure and also the chemical weathering on the sea ward side.
- So it is necessary to have regular and timely maintenance of these walls and embankments to reduce the sudden danger of the breaking of the walls at the time of a cyclone.

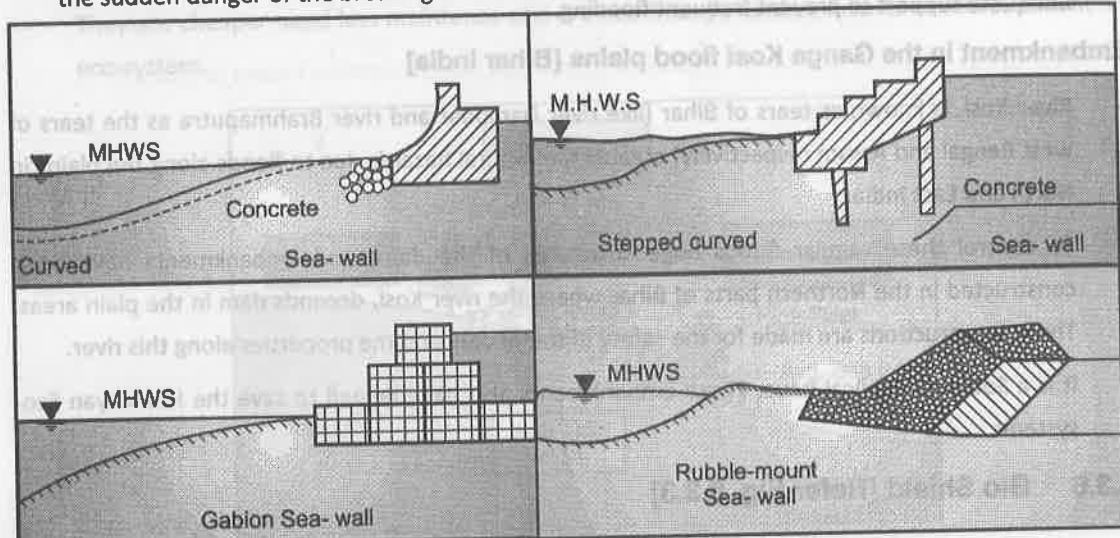


Fig. 6.3.1 : Types of Sea-walls

### 6.3.5 Embankments [Refer Fig. 6.3.2]

**Definition :** Embankment can be defined as, "It is an artificial bank raised above the ground level to redirect or flooding of the river lake or sea". (like sea-walls)

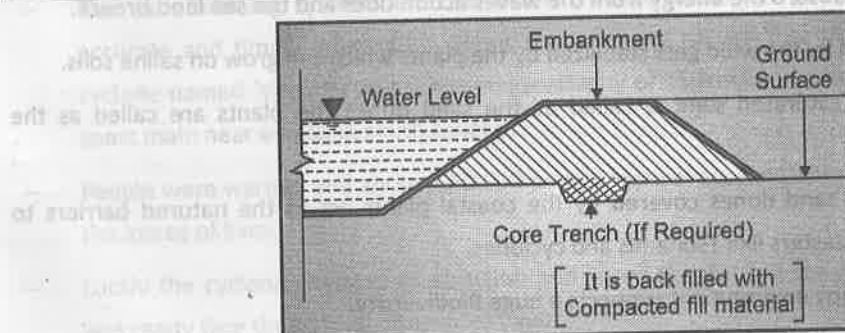


Fig. 6.3.2



### The purpose of an Embankment

- An embankment refers to a volume of earthen material which is placed and compacted with the purpose of avoiding the floods in the low-lying areas along the banks a river.

### Construction Material for Embankment

- They are general constructed from the material obtained from a cutting the embankments need to constructed by using non-aerated water proofed and compact material which can provide adequate support to prevent frequent flooding.

### Embankment in the Ganga Kosi flood plains [Bihar India]

- River Kosi, is known as tears of Bihar [like river Damodar and river Brahmaputra as the tears of west Bengal and Assam respectively] creates the natural hazards due to floods along the plains in North and East India.
- To control these regular floods huge structures of the dams and embankments have been constructed in the Northern parts of Bihar where the river Kosi, decends dam in the plain areas. These constructions are made for the safety of the people and the properties along this river.
- It is a Socio-eco-polical issue. These embankments also have helped to save the Himalayan Ecosystems.

### 6.3.6 Bio Shield [Refer Fig. 6.3.3]

- We already have noted that the natural hazards can neither be prevented nor be predicted but still with proper planning they can be mitigated by rising preventive structures on the sea shores.
- Among all the vegetation cover can be one of the best natural methods to reduce the danger of very high waves tides or Tsunamis. They are called as Bio shields as the materials used are the coastal plants.
- These coastal plants absorb the energy from the waves action tides and the sea land breeze.
- The sand transported by the wind gets stabilized by the plants which can grow on saline soils.
- These high levelled saturated sand is called as the sand dunes the plants are called as the mangroves.
- These coastal stable sand dunes covered by the coastal plants act as the natured barriers to control the natural disasters like Tsunamis and cyclones.
- The dump, saline, sandy environment supports a huge Biodiversity.
- In 2004 some areas on the east coast got the natural protection against the Tsunamis through these Bio-shields.



- This encourages a long term Eco-friendly Action plan with an integrated approach in Restoration and conservation of the coastal marine eco-system which helps to promote sustained livelihood and also the effective coastal protection against the marine cycle of erosion through the coastal physical and chemical weathering.
- These Bio shields offer a much cheaper and also a long lasting means for the mitigation of coastal disasters.
- If they are compared with the artificial structures such as sea-walls.
- They are cheaper need less maintenance and are eco-friendly as they help to conserve the marine eco-system.

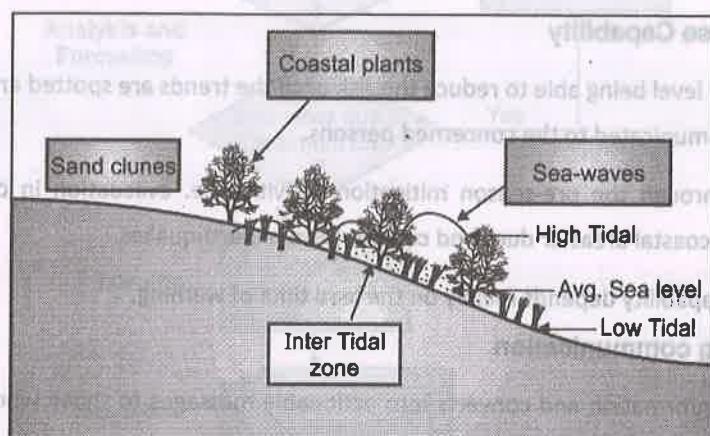


Fig. 6.3.3 : Coastal Bio-Shield

## 6.4 The Early Warning and Communication in Disaster Management

### 6.4.1 Introduction

- The early warning systems are the means through which the people concerned get relevant accurate and timely information about the incoming natural disaster e.g. on 12<sup>th</sup> June 2019 a cyclone named 'Vayu' having the average velocity of 150km/hour was expected to reach Gujarat coast main near veraval in south Gujarat.
- People were warned and about 2,50,000 people were evacuated from the coastal areas to reduce the losses of lives.
- Luckily the cyclone changed its direction and saved Gujarat but the state was well informed and was ready face the natural disaster of Vayu.



#### 6.4.2 The Basic Elements of Early Warning System

- These are four basic elements of an early warning system.
- To get better success it is necessary to have the effective functions of each of these elements.

##### (A) The Risk Knowledge

- It gives the baseline knowledge about the Risk i.e. the hazard or the disaster e.g. cyclones floods.

##### (B) The Monitoring

- It is a logical follow-on activity to keep-up to date information about the hazard or disaster.

##### (C) The Response Capability

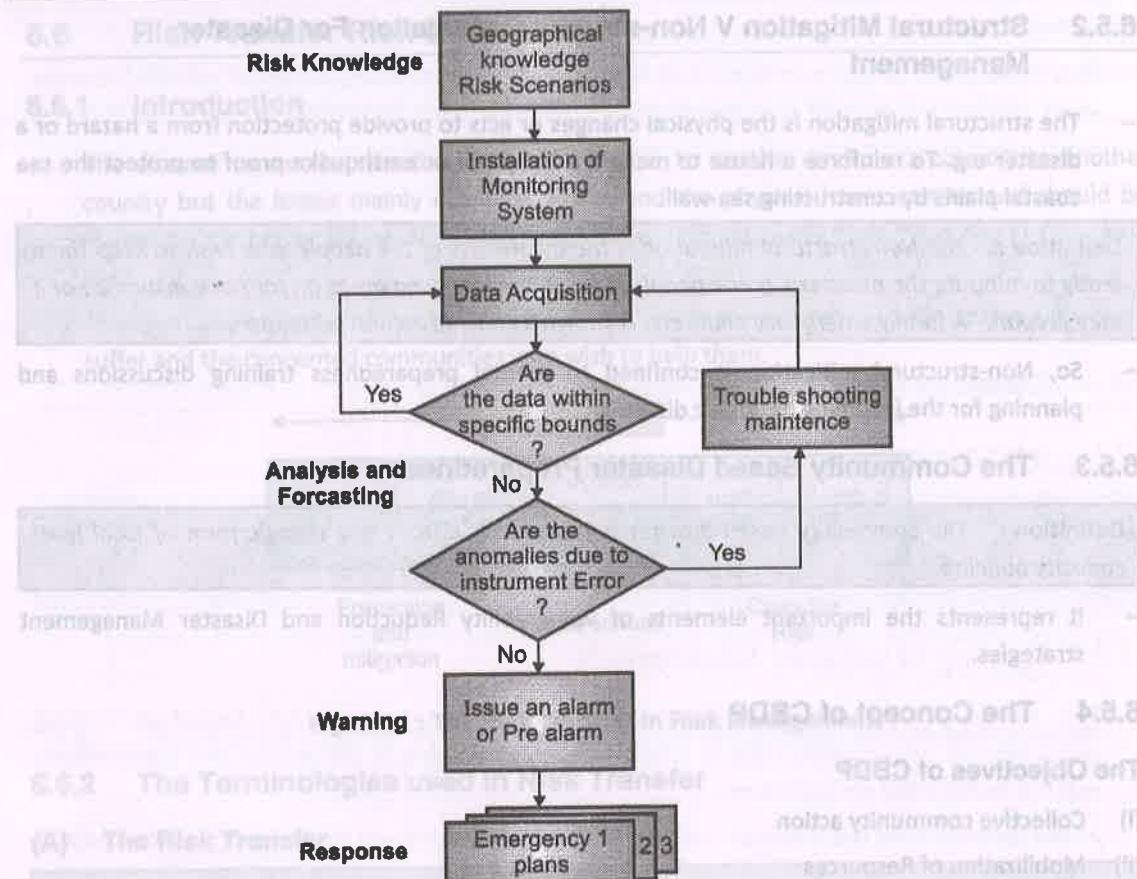
- It insist on each level being able to reduce the risk once the trends are spotted and announced i.e. informed / communicated to the concerned persons.
- This may be through the pre-season mitigation activities i.e. evacuation in case of floods or cyclones in the coastal areas or duck and cover in case of earthquakes.
- The response capability depends mainly on the lead time of warning.

##### (D) The warning communication

- It collects the information and converts into actionable messages to those who can understand the messages and are ready prepared to act accordingly.

#### 6.4.3 The Importance of Early Warning System

- The early warning system can be set up to avoid to control or to reduce the impact of the incoming hazard or the disaster e.g.
  1. **Floods** : If the flash floods are informed in time to the concerned people the lives can be saved.
  2. **Storms** : If a cyclone is predicated and informed people can protect themselves.
  3. **Hot/cold wave** : If this sudden change in the atmospheric temperature people can avoid to be in the open areas to avoid the drastic effects of the extreme weather conditions.
- It is not possible in cases of all the natural hazards like earthquakes or landslides or avalanches but if the people are informed about such calamities in advance and also informed about the means are methods to protect their lives, it can reduce the losses of life.



**Fig. 6.4.1 : A flow chart of emergency management in a natural disaster**

— So, in this four steps have been identified such as,

- Risk knowledge
- Analysis and Forecasting
- Warning
- Response

## 6.5 Non-Structural Mitigation

### 6.5.1 Introduction

**Definition :** The non-structural mitigation can be defined as "It is a set of Mitigation and /or adaptation measures that do not make the use of traditional structural measures used as flood defence measures."

They help to reduce the damage without influencing the current of the flood event.



### 6.5.2 Structural Mitigation V Non-structural Mitigation For Disaster Management

- The structural mitigation is the physical changes or acts to provide protection from a hazard or a disaster e.g. To reinforce a house to make it wind proof or earthquake proof to protect the sea coastal plains by constructing sea-wall.

**Definition :** The Non-structural mitigation is the awareness of the people who wish to keep them ready to mitigate the disaster e.g. the people living in the low-lying areas go for flood insurance or if they prepare "A family emergency plan" etc. is known as non-structural mitigation.

- So, Non-structural mitigation is confined to mental preparedness training discussions and planning for the incoming hazard or disaster.

### 6.5.3 The Community Based Disaster Preparedness

**Definition :** The community based disaster preparedness [CBDP] is a specific form of local level capacity building.

- It represents the important elements of vulnerability Reduction and Disaster Management strategies.

### 6.5.4 The Concept of CBDP

#### The Objectives of CBDP

- Collective community action
- Mobilization of Resources

#### The Aims of CBDP

- The community should be made well aware of the risk they are living with
- Improve the local knowledge and resources to make them strong to face the impact of the disaster.
- The local people should be make self-protective and not nearly the passive target.
- Prepare the local people to fight against the disaster to have the sustainable effect.

#### Importance of CBDP

- It is at the community level where the disaster effects are felt. So the physical social and economic risk can be properly assessed and managed.
- No body but the people who have to suffer are more interested in improving the conditions to get better protection from the disaster.
- No body but the locals can understand the constraints and the opportunities available in-situ.
- The first and quickest response to a disaster would always come from the community members.
- As the community is involved in the whole process they only know what do they head first in case of the disaster.



## 6.6 Risk Transfer Risk Financing

### 6.6.1 Introduction

- The disaster cannot be transformed from a region to another or from a country to another country but the losses mainly economic losses and the physical losses can be and should be shared by the better off people within the country or from the outside countries at the world level.
- The mechanism that promote the risk transfer can bridge the gap between the communities who suffer and the concerned communities who wish to help them.

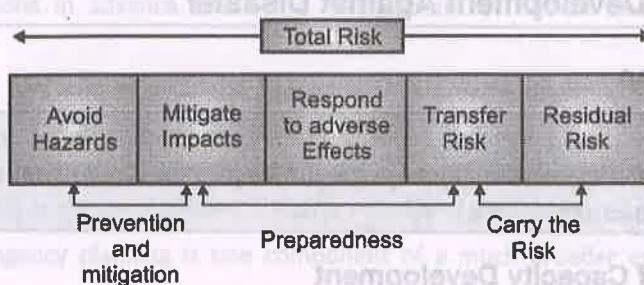


Fig. 6.6.1 : The Risk Transfer In Risk Management

### 6.6.2 The Terminologies used In Risk Transfer

#### (A) The Risk Transfer

**Definition :** It is a process of formally or informally shifting the financial consequences of risk from one party to another.

E.g. the Insurance is the well known form of risk transfer.

#### (B) Risk / Resource Pooling

- It is an important disaster transfer mechanism under this system public sectors NGOs. Insurance companies or Different countries come together to form a pool to provide protection against any disaster like floods or earthquakes.
- The risk pooling provides the financial and the technical support to the regions or a country who need support against the natural disaster.

#### (C) Risk Retention

- It involves the retaining the responsibility for the disaster risk through a planned acceptance of losses if the disaster is materialized.
- It is carried by the central government and (or) the state government by making the Budgetary Provision to arrange the financial add to the under the disaster.



#### (D) Residual Risk

It is the amount of risk that remains in unmanaged form i.e. it is the level of risk that remains even after all the disaster management measures have been put in e.g. the settlements in the flood prone or the cyclone prone or the earthquake prone areas etc.

#### (E) The Basic Risk

It is the difference between the amount paid and the actual cost of the losses e.g. in case of insurance policies it depends upon the terms of coverage i.e. the insurance against the natural calamities like floods or fire.

### 6.7 Capacity Development Against Disaster

#### 6.7.1 Introduction

**Definition :** Capacity development or capacity building is an ongoing process that equips the official stakeholders and the community to perform their functions in a better manner during any natural calamity or a disaster.

#### 6.7.2 Training of Capacity Development

- This training includes the elements of human resource development i.e. Individual training, organizational development such as improving the functioning of the groups and organisations and the institutional development.
- At the National level the National Institute of Disaster Management (NIDM) is a capacity building Arm. Every state has its own Disaster Management cells in the state Administrative Training Institutes to perform the function of capacity building for Effective and Efficient Disaster Management (for the details refer chapter No.4 for the functions of NIDM)

#### 6.7.3 Creating Awareness through the Education in Disaster Risk Research [D.R.R]

- The education in D.R.R. is at the centre of a sustainable capacity development system.
- It is a fact that well educated population is necessary for a productive prosperous and resilient country.
- The Progress in disaster risk reduction practice is strong themed by informed cross disciplinary applied risk education and the tertiary levels.
- If the awareness is generated at the school levels and also at the higher educational levels about the Risk management before within and after the disaster it would help to develop the capacity to fight against these natural calamities in future.
- Together with the formal education at school and at college level the informal education about the disaster or risk management should be provided e.g. fire fighting training programmes for the adults in the society.



- If the proper training is given to the general public it would be easy to reduce the economic, social and environmental losses through any natural disaster i.e. we cannot prevent the disaster but minimise the losses and can prepare the society to face such hazards or disasters.

### 6.7.4 Contingency Planning

- The contingency plans are also referred as Response plans. It is a critical activity for the organisations and communities to prepare themselves to respond well to the disaster event and its potential impacts.
- To develop a contingency plan the following steps are involved.
- A) Making decisions in advance about the management of human financial and the material resources.
- B) Co-ordination and communications procedures to ensure timely and effective provision of assistance and humanitarian aid to those most in need when a disaster occurs.
- The time invested in the contingency and Response planning pays dividends in reduction of the damage and losses of lives and more effective delivery of the Response and Recovery services.
- So, the contingency planning is one component of a much broader emergency preparedness process.

## 6.8 Do's and Don'ts in case of Disaster an Effective Implementation of Relief Aids

### 6.8.1 Introduction

- These Do's and Don'ts in a disaster (before and after) vary according to the type of disaster.
- As the causes and effects are different the reactions, response, preparedness also vary.
- So let check the Do's and Don'ts for different disasters.

### 6.8.2 Do's And Don'ts in Floods

#### (Don'ts)

##### (A) Before Floods

- i) Don't litter, waste plastic bags, plastic bottles in stream or a river.
- ii) Be at home if a high tide and the heavy rains occur at the sometime (It is for the people in the low coastal areas).
- iii) Evacuate the low lying areas and shift to the higher and safer grounds.
- iv) Put all the valuables at a higher place in the house before you evacuate it.

#### (Do's)

##### (B) In the Flood situation

- i) Follow the instruction given by the local authorities and move to the safer areas.



- (ii) Switch off the water tabs and electrical supply.
- (iii) Don't touch the open wires.
- (iv) Don't spread rumors about the flood situation.

### 6.8.3 Do's and Don'ts in Earthquakes

#### During Earthquakes

- (i) Take a cover under a strong furniture if at home or at office.
- (ii) Don't leave the place until the shaking stops.
- (iii) Stay away from the glass or and weak structures.
- (iv) If your out of your house try to be on an open ground.
- (v) Don't stop under any tree.
- (vi) If driving a vehicle stop it immediately and leave it and stand near the vehicle.

### 6.8.4 Do's and Don'ts in Tsunami

#### (Before and During Tsunami)

- (i) Don't go and stay near the shoreline.
- (ii) Get immediately to any higher ground away from the cost.
- (iii) If the sea waves are rising two high than the normal leave your house if it is near the coast.
- (iv) Follow the emergency instructions.
- (v) Don't wait for the instructions for the evacuation.
- (vi) Close all the windows and door of your house before you leave it.
- (vii) Switch off the water taps and the electric supply.
- (viii) Don't come back to your house unless informed.

### 6.8.5 Do's and Don'ts in Cyclones

#### (A) Before the Cyclone

- (i) Check the house secure the loose tiles, repair doors and windows.
- (ii) Remove the dead branches of the trees near your house.
- (iii) Remove the loose materials like tins, garbage cars, tin sheets in the back yard of the house.  
These loose solid matters may be lifted up and may cause danger to the living being.
- (iv) Demolish the condemned structures.

#### (B) During Cyclone

- (i) Act according to the instruction given by the authorities.
- (ii) Ignore the rumours.
- (iii) Get away from the low-lying areas near the beaches.



- (iv) Leave the house immediately if and when asked by the authorities.
- (v) Before evacuating the house keep the valuables at a higher level and close the windows and lock the doors.
- (vi) Carry dry food cans, drinking water and the medicines.

### (C) After the Cyclone

- (i) Remain in the shelter until informed to return to your house.
- (ii) Get inoculated immediately against diseases.
- (iii) Check the house properly before you allow the kids and aged to walk in.
- (iv) Clean the debris of the house premises immediately.
- (v) Don't drink the open water to avoid the further health problems.
- (vi) Report the correct losses to the authorities.
- (vii) Help the NGO's to get back the normal life as fast as possible.

## 6.8.6 Do's and Don'ts in landslides

### (A) During landslide

- (i) Stay inside the house and any protected area.
- (ii) Avoid the road having steep land cuttings.
- (iii) Try to get out of the path of the landslide.
- (iv) Run away from the landslide.
- (v) If the rocks and debris are approaching the road at the foot hills leave the open ground and take a shelter of a higher ground or a building.
- (vi) If you have no time to run away is flat on the ground and cover your head. Curl into tight ball and protect your head from the falling rocks.

### (B) After Landslide

- (i) Stay away from the slide area.
  - (ii) Check for the injured and trapped persons and provide them the first aid (if you are trained).
  - (iii) Check for the damaged utility lines and Report to the authorities.
  - (iv) Check the building foundation chimney for damage.
  - (v) Get the latest information about the landslide which may cause a flash floods due to blocking of the river near your settlement.
- So, if the persons or the society is well prepared for any natural disaster if well informed and if they act accordingly the losses can be minimised in any type of hazard or disaster.

**Review Questions**

- Q. 1** Describe in details about the measures required to be taken in Pre, During and Post periods of cyclone.
- Q. 2** Explain with examples the Pre, During and Post Flood Disasters in India.
- Q. 3** Write notes on the following :
- Measures During Earthquake
  - Post Earthquake Relief Work
  - The Risk MAP Vision
- Q. 4** Describe the work of FEMA to reduce the risk in Disaster.
- Q. 5** Write in brief :
- need of seawalls
  - The types of sea walls
- Q. 6** Define the term 'Embankment' and describe purpose of Embankment support your answer with suitable diagram.
- Q. 7** Describe the concept and need of bio shield in the coastal areas.
- Q. 8** Explain the basic elements of early warning system in Disaster Management.
- Q. 9** Draw and explain the flow chart of emergency management in a natural disaster.
- Q. 10** What are non-structural mitigation?
- Q. 11** Explain the objectives of CBDP.
- Q. 12** Write notes :
- Importance of CBDP
  - Risk Transfer