CDM - 01 FOUNDATION COURSE IN DISASTER MANAGEMENT

Disasters, which are often sudden and intense, result in destruction, injury and death disrupting the normal life as well as the process of development. This highlights the importance of disaster management and the need to learn about it. The Foundation Course in Disaster Management, among othe, aspects, is intended to familiarise the learners with the meaning, factors, significance, causes and effects of disasters. Besides providing the Regional and Seasonal profile of natural disasters in India, the Course also presents a global view of disasters. In keeping with the peculiarities of various disasters, the Course deals with the vulnerability, impact and effects, nature of damage, predictability, forecasting aspects of disasters such as Earthquake, Flood and Drainage, Cyclone, Drought and Famine, Landslide and Snow Avalanche, Fire and Forest Fire, Industrial and Technological disasters, and Epidemics. In order to create and sustain awareness of disasters the community and to upgrade the information, knowledge and skills of the Governmental and Non-governmental Organisations' personnel dealing with disaster mitigation and management, the Course lays emphasis on disaster preparedness. Here we shall be dealing specifically with the essentials of disaster preparedness viz. Planning, communication, leadership and co-ordination, and warehousing and stock piling. To strengthen the resilience and self-confidence of local communities and to enable them to develop Community Action Plans to deal with pre and post disaster situations, the Course focuses on human behaviour and response, techniques for effective community participation and beliefs and myths regarding disasters. Further, it aims to present relevant information pertaining to disasters and the effective dissemination of the same. It is a known fact that various agencies play different and significant roles in dealing with disaster situations. Therefore, we shall describe the roles of District Administration, Military and Para-military forces, Ministries and Departments at the Centre and State levels, Non-governmental Organisations, International Agencies and Media.

UNIT 1 DISASTER : MEANING, FACTORS AND SIGNIFICANCE

Structure

1.0 OBJECTIVES

After studying this unit, you should be able to:

- discuss the meaning, definitions and types of disasters,
- describe the nature of disasters,
- highlight the aggravating factors of disasters, and
- explain the significance and repercussions,

1 1 INTRODUCTION

A disaster is the result of an immediate situation or the result of a long set process which disrupts normal human life in its established social, traditional and economic system. This is due to the destruction of environment which is caused by extraordinary natural destructive phenomena or human-induced hazards resulting in human hardship and suffering beyond recovery unless external aid is brought in.

1.2 MEANING OF DISASTERS

The terms 'Disaster' owes its origin to the French word `Desastre' which is the combination of the article - 'des' and 'astre' meaning 'star'. In earlier days a disaster was considered to be due to some unfavourable star. Nowadays, the term Disaster' is commonly used to denote any odd event, be natural or man made, which brings about immense misery to a region. So that it becomes difficult to cope with the situation through local resources.

1.2.1 Definitions

The dictionary meanings of Disaster are as follows:

1) Disaster is a sudden or great misfortune, calamity. (Concise Oxford Dictionary)

2) Disaster is a sudden calamitous event producing great material damage, loss and distress. (Webster's Dictionary)

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Disaster is assessed on the basis of the following features:

1) Disruption to normal pattern of life. Such disruption is usually severe and may also be sudden, unexpected and widespread.

2) Human effects such as loss of life, livelihood and property, injury, liardship and adverse effects on health.

3) Effects on Social Structure such as destruction of or damage to infrastructure, buildings, communications and other essential services.

4) Community needs such as shelter, food, clothing, medical assistance and social care.

The severity of a disaster situation is usually recltoned in terms of loss of life or property or both.

A formal definition of disaster may be "an event, concentrated in time and space, wliicli threatens a society or a relatively self-sufficient sub-division of a society with major unwanted consequences as a result of tlie collapse of precautions which had hitherto been culturally accepted as adequate" (Turner, 1997).

1.2.2 Distinction Between Hazard and Disaster

Hazard and disaster are closely related. A liazard is a natural event while tlie disaster is its consequence. A liazard is a perceived natural event whicli threatens both life and property. A disaster is tlie culmination of such liazard.

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

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

1.2.3 Distinction Between Natural and Man Made Disasters

Disasters are classified under various groups when studied according to origin or from functional angle. Although both types of disasters (natural or man niade) result in damage to life and property, their distinction can be identified by classifying into major groups:

1. **Natural** Disasters

   i) Wind related - Storm, Cyclone, Tornado, Storm surge, Tidal waves,

   ii) Water related - Flood, Cloudburst, Flash flood, Excessive rains. Drought.

   iii) Earth related - Earthquake, Tsunamis, Avalanches, Landslides, Volcanic eruptions.

2. **Man Made Disasters**

i) Accidents: Road, Rail, Air, Sea, Building collapse.

ii) Industrial Mishaps: Gas leak, Explosion, Sabotage, Safety.

iii) Fire: Building, Coal, Oil.

iv) Forest Fire (In tropical counters, forest fires are often manmade)

v) Contamination/Poisoning: Food, Water, Illiatliquor, Epidemics.

vi) Terrorist activities.

vii) Ecological: Pollution (Air, Water, Noise), Soil degration, Loss of Biodiversity, Global Warming, Sea level rise, Toxic Wastes, Nuclear accidents.

viii) Warfare: Conventional, Chemical, Nuclear.

1.3 NATURE OF DISASTERS

As disasters have profound and often long lasting effects on the people and their safety, if is essential to acquire fullest possible knowledge about their occurrence, impacts and precautions including remedial measures. However, study of Disasters has many facets. While their mechanism requires the study of the scientific aspects of their genesis and life cycle, this impacts on the environment and society also need a multi-disciplinary approach involving the social and medical services. Hence, scholars for studying disasters have adopted the following six approaches.

1) Geographical Approach

In this, social science methods are widely used and emphasis is given to the spatio-temporal distribution of hazard, impacts and vulnerability. Geographers have also given particular thought to.the question of how choices are made between different types of adjustment to natural hazards.

2) Anthropological Approach

This approach has focused on the role of disasters in guiding the socio-economic evolution of populations in dispersing them and in causing the destruction of civilizations. A strong concern has led anthropologists to search for the threshold points beyond which local communities can no longer provide the basic requirements for survival of their members.

3) Sociological Approach

In this approach, vulnerability and impacts are considered in terms of patterns of human behaviour and the effects of disasters on community. In addition, psychologists have studied disaster in relation to factors such as a psychologically determined defensive reaction pattern.

4) Developmental Studies Approach

It considers problems of providing aid and relief, migration management, health care and the avoidance of starvation. Over 80 per cent of disasters occur in developing countries, and it is clear that the prevailing poverty increases human vulnerability to natural hazards.

5) Disaster Medicine and Epidemiology

It focuses on the management of mass casualties, the treatment of severe physical trauma and the epidemiological surveillance of communicable diseases' whose incidence rates may increase during the disruption of public health measures following a disaster.

6) Technical Approach

The natural and physical scientists emphasise upon this approach. Emphasis is given to geological, geomorphological and geophysical approaches to disasters.

Check Your Progress 1

Note: i) Use the space given below for your answers,
ii) . Check your answers with those given at the end of tlie unit.

1) What do you mean by hazard and disaster?

2) Discuss briefly the major types of tlie natural disasters.

3) Briefly describe any four approaches regarding nature of disasters.

1.4 AGGRAVATING FACTORS OF DISASTERS

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

Poverty

All disaster studies show that the wealthy among the population arc less affected and arc able to recover quickly. However, poverty generally makes people more

vulnerable to all the impacts of disasters. It is only due to poverty that poor people are forced to live in more vulnerable areas such as tlie flood plains of rivers. Usually droughts claim poor peasant farmers as victinis and rarely the wealthy; and famines are the result of a lack of purchasing power to buy food rather than an absence of food. Many people are forced to move from tlieir homes to other parts of their countries or even across borders to survive. Such crisis induced migration poses considerable challenge both in terms of immediate assistance and long term planning for development.

Population Growth

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

Rapid Urbanisation

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

Many of the landslides or flood disasters are closely linked to rapicl and unchecked urbanisation whicli forces low-income families to settle on tlie slopes of steep hillsides or banks of rivers.

Transitions in Cultural Practices

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

Environmental Degradation

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

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

Lack of Awareness and Information

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

War and Civil Strife

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

1.5 SIGNIFICANCE AND REPERCUSSIONS

Disaster has significance and repercussions in global, national and local terms. It retards the development process not only in the affected area/region but extends to the neighbouring regions or countries as well.

In global terms, disasters have serious repercussions for the future. The world *is* already facing a range of environmental and subsistence crises. The political, economic and social stability of the world depends on bridging the socioeconomic gap between developing and developed nations.

In national terms, the impact of disasters usually results in major setbacks to the economy and the developmental process. It produce the direct loss of existing national assets in various forms. Also, it diverts national resources and effort, away from ongoing subsistence and development activities, in order to achieve satisfactory recovery.

In local terms, the requirements of the community need realistic assessment taking into consideration the expected occurrence of the types of vulnerability. Enabling resources to strengthen tlie local coping mechanisms have to be made available.

Check Your Progress 2

Note: i) Use the space given below for your answers.
ii) Check your answers with those given at tlie end of the unit.

1) Discuss briefly tlie aggravating factors of disasters.

2) How poverty is contributing to increasing the disaster problems?

3) Discuss some important areas of the significance and repercussion of disaster

1.6 LET US SUM UP

In this Unit, we discussed the meaning and types of the disasters and the distinction between natural and man-made disasters. The nature of disasters and the difference approaches adopted to study Disasters have been explained. The Unit also highlighted the aggravating factors of disasters. The significance and repercussions of Disasters at global, national and local levels have been indicated.

1.7 KEY WORDS

Anthropological: Related to study of human beings with regard to the evolution of human society, customs and rituals.

Avalanche: rapid and sudden sliding of large mass of a mixture of snow and ice with rock material.

Biodiversity: The existence of a wide variety of plants and animals.

Cyclone: A severe storm originating on the high sea and moving to the coastal areas, characterized by very strong winds. torrential rain and floods.

Damage assessment: post disaster estimation of physical damage.

Disaster assistance: Provision of measures to prevent and reduce the impact of, and reverse, the effects of disasters; phase include relief, rehabilitation, reconstruction and preparedness, and prevention and mitigation,

Epidemiology: Science of epidemics

Landslide: rapid movement of soil and rock downhill.

Trauma: Psychological shock of a disastrous event.

Vulnerability: Extent to which a country, area, community or structure. is likely to be damaged by a Disaster

1.8 REFERENCES AND FURTHER READINGS

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1.9 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

1) Your answer should include tlie following points:

- A hazard is a natural event while the clisaster is its consequence.
- A hazard becomes a disaster when it hits an area affecting tlie normal life system and the community needs external assistance to cope with the situation.

2) Your answer should include tlie following points:

- Wind related disasters.
- Water related disasters.

  Earth related disasters.

3) Your answer should include tlie following points:

- The Geographical approach
- The Anthropological approach
- The Sociological approach
- The Developmental approach

Check Your Progress 2

1) Your answer should include tlie following points:

- Poverty
- Population growth
- Rapid urbanisation
- Transition in cultural practices
- Environmental degradation
- Lack of awareness and information
- War and civil strife

2) Your answer should include the following points:,

- Wealthy population is able to recover quickly from a disaster situation.
- Due to poverty people are forced to live in areas that are prone to disasters.
- Famines are the result of a lack of purchasing power to buy food.
- Migration.

3) Your answer should include the following points:

- In global terms, disasters lead to the widening of the socioeconomic gap between developed and developing nations.
- On the national level, disasters result in major setbacks to the national economy and the developmental process.
- On the local level, the requirements of the community need realistic assessment and provision on the basis of the expected disasters and the local vulnerability.

UNIT 2 UNDERSTANDING DISASTERS: CAUSES AND EFFECTS

Structure

2.0 OBJECTIVES

After studying this Unit, you should be able to:

- describe the various elements of disasters.
- explain the causes of disasters; and
- discuss the effects of disasters.

2.1 INTRODUCTION

It is clear from the first Unit of this Block that disasters affect the development process adversity. For disaster management, it is essential to identify the causes of disasters and to know the effects. This Unit will identify and analyse the causes and discuss the effects of disasters.

2.2 TOWARDS UNDERSTANDING OF DISASTERS

Some disasters are of limited interest due to their restricted area extent, e.g., avalanches, snowstornis and tornadoes. As these hazards affect relatively few people and the countries in which they occur largely have sufficient resources and systems in place to respond without external assistance, the international interest is less.

There are several types of disaster for which there is a widespread concern. These can be classified as i) Rapid onset disasters, ii) Rapid/slow onset disasters, and iii) Slow onset disasters.

Table 1 shows the different types of disasters in India by nature of onset and cause based classification.

Table 1

Types of disasters in India by nature of onset and cause based classification

NATURE OF ONSET	TYPE OF DISASTER	CAUSES		STATES IN WHICH PREVALENT
		NATURAL	HUMAN	
Rapid	Cyclone			AP, TN, ORISSA, WB
	Storm surges			AP, ORISSA, WB
	Floods			ASSAM, BIHAR, GLIJARAT, ORISSA, TFUPURA, UP, WB, HARYANA, PUNJAB, AP, HP, J&K, KARNATKA, MAHARASHTRA, MEGHALAYA, RAJASTHAN, MIZORAM
	Earthquake			ALL INDIA
	Industrial			ALL INDIA
	Fire			ALL INDIA
	Landslides			HP, J&K, ASSAM, UTTARANCMAL
Rapid/Slow	Migration and Urbanization			ALL INDIA
	War			BORDER AREAS
	Epidemics			ALL INDIA
	Civil unrest			ALL INDIA
Slow	Drought			AP, GUJARAT, ICARNATAKA. MAHARASHTRA, RAJASTHAN. ASSAM, ORRISA, MI
	Environ-mental			RAJASTHAN, HP, UP, MP

Above mentioned types of disasters can be classified into tlie Geological, Environmental, Epidemics and Industrial accidents

2.2.1 Geological Disasters

I) Earthquake

It is a sudden movement shift of tlie Earth's crust below or at tlie surface that results in ground vibration and the potential collapse of buildings and possible destruction of life and property if tlie quake is of sufficient magnitude. Earthquakes are considered to be one of tlie most disastrous phenomena and its occurrence is usually sudden with little or no warning. It is not yet possible to 'predict earthquakes.

2) Tsunamis

Tsunamis are popularly called tidal waves. Tsunami is a Japanese word meaning "harbour wave". These are the waves, which often affect distant shores, originate from undersea or coastal seismic activity, landslides and volcanic eruption. Whatever may be the cause, sea water is displaced into a violent motion and swells up, ultimately breaking over land even at very long distances with great destructive power.

3) Volcanic eruption

Volcano is like a vent or chimney to the earth's surface from a reservoir of molten rock, called magma, deep in the crust of the earth. A study shows that approximately 600 volcanoes are active or have erupted. On an average, about 50 volcanoes erupt every year. At present, about 10% of the world's population live on or near potentially dangerous volcanoes.

Usable short term forecasts, within hours or days may be made through volcano monitoring techniques including seismic monitoring, ground deformation studies and observation and recording of geoelectrical, and geochemical changes. Structures with roof designs which do not resist ash accumulation are vulnerable even at large distance from a volcano.

4) Landslides

Landslides generally occur as secondary effects of heavy rain storms, earthquakes arid volcanic eruptions.

It occurs as a result of changes, either sudden or gradual, in the composition and structure of rocks or hydrology or vegetation on a slope.

It covers a wide variety of land forms and processes involving the movement of soil under the influence of gravity.

2.2.2 Climatic Disasters

Climatic disaster include the following types:

1)' Cyclone

It is a tropical storm in which the winds can reach speeds of over 120 kph. The cyclone blows in a large spiral around a relatively calm centre or eye. Every year, these, violent storms with torrential rain and very strong winds bring widespread devastation to coastlines and islands lying in their paths. Cyclones pose a major threat to lives and property in many parts of the world. While such storms are called cyclones in India and neighborhood, they have different nomenclature in other parts of the world, e.g., hurricanes in the Americas and typhoons in Japan and the Philippines.

2) Flood

It can arise from abnormally heavy precipitation, dam failures, rapid snow melts, river blockages or even burst water mains. It is usually sudden in onset.

Types of floods are as follows:

i) Flash floods

ii) River floods and

iii) Coastal floods due to tsunami, tidal wave or storm surge in the wake of a cyclone.

Major floods result in physical damage, deaths and injuries, problems in drinking water supply and food shortages, and displacement of population.

3) Drought

Droughts have disastrous and long term inpacts on the economy and can affect a large segment of the society which may last for months and in some cases several years. Generally, drought situation may be defined as a temporary reduction in water or moisture availability significantly below the normal or expected amount for a specific period. Drought is a slow onset phenomenon.

There are three types of droughts, *viz.*,

i) Meteorological drought when rainfall is appreciably below normal.

ii) Hydrological drought when the water scarcity result in reduction in the available water in inland water bodies.

iii) Agricultural drought when the scarcity results in partial or total loss of crops and effects agricultural activity adversely.

2.2.3 Environmental Disasters

Environmental disasters are the result of:

1) Environmental pollution

There are five aspects of the environmental pollution hazard:

(i) air and water pollution

(ii) ozone depletion and

(iii) global warming

(iv) sea level rise

(v) forest fires

People in developing countries are much more vulnerable to the effects of environmental degradation because they often directly depend on the land.

2) Deforestation

It can be explained as the removal of vegetation in a region that is predominantly tree covered. Deforestation may contribute to disasters caused by flooding, landslides and drought. The spread of agriculture, firewood collection, and unregulated timber harvesting are the main reasons for deforestation. Trees inhale carbon dioxide and give out oxygen. Depreciation contributes to increase of carbon dioxide on the atmosphere.

3) Desertification

Broadly speaking desertification can be defined as the decline in biological productivity or production potential due to a long term process of degradation or change in climate. Desertification worsens the condition of the poor, brings malnutrition and disease, and destabilizes the soico-economic base of a country.

4) Pest Infestation

A pest may be defined as any animal or plant causing harm or damage to people, their animals, crops etc. The primary pests are insects, diseases and weeds.

2.2.4 Epidemics

An epidemic is the occurrence of a disease, known or suspected to be of infectious or parasitic origin. An epidemic usually evolves rapidly into an emergency situation. Epidemics may be hazard in themselves, but may also occur in the aftermath of disasters. Epidemics such as, cholera, typhoid and hepatitis pose considerable threat to the people.

2.2.5 Industrial and Technological Accidents

Chemical and industrial emergencies may arise due to disaster/explosion in a plant handling or producing toxic substances, accidents in storage facilities, acciclents during transportation of chemicals, misuse of chemicals, improper waste management, failure of plant safety design or plant components, technological system failure, fire, earthquakes, landslides and human error. People are becoming victims of these types of accidents (chemical and industrial) that release hazardous substances into the environment.

Check Your Progress 1

Note: i) Use the space given below for your answers.
ii) Check your answers with those given at the end of the unit.

1) Discuss the main types of disasters with special reference to Geological Disasters.

2) Briefly explain the types of climatic disasters.

3) Discuss briefly the various types of Environmental disasters.

2.3 CAUSES OF DISASTERS

Each type of disaster has its own cause. Here is a brief description of natural phenomena which may lead to disasters.

1. Earthquakes may arise either due to tlie release of energy from strained rocks inside the Earth, or tectronic movements or volcanic activity. The sudden release of accumulated energy or stresses inside the earth or sudden movement of massive land areas on the earth's surface cause tremors, commonly called earthquakes.
2. Tsunami could be the after effect of undersea earthquake due to which the abrupt movement of ocean floor generates waves which travel at high speed in the ocean. As approach land, their speed decreases while their height increases. It can be highly destructive to coastal areas.
3 Tropical cyclones, typhoons or hurricanes are the names given to tlie same phenomenon in the different parts of the world. They are weather systems with strong winds that circulate anti-clockwise around a low pressure area in the northern hemisphere and clockwise in the southern hemisphere. Tropical cyclones form in certain tropical areas over the open seas where the sea surface temperature is around 26°C.
4. Floods are excessive accumulations or flow of water which results from heavy rainfall, snow melt or high tides and other causes such as dam burst, embankment failure etc. They include flash floods which are rapidly rising and falling river and overland flows resulting from the rapid run off of rainfall from upland areas; river floods in which river water spills over adjoining areas, tidal flooding usually saline from the backflow of sea waters into coastal rivers at high tides, and storm surge floods associated with the landfall of tropical cyclones.
5. Drought or scarcity of water to satisfy the normal needs of agriculture, livestock or human population is generally associated with semi-arid or desert climates, but drought can also occur in areas that normally enjoy adequate rainfall and moisture levels.
6. Volcanic eruptions are vents in the crust of the earth through which the molten rock is extruded as lava or ejected as ash, sometimes accompanied by steam or hot gases.
7. Landslide can be caused by heavy rainfall, earthquakes or undercutting of the base of slopes by rivers. They are common in mountaneous areas where they frequently destroy the infrastructure, agriculture and buildings.

2.4 EFFECTS OF DISASTERS

Disasters vary in terms of their severity, disruptive potential, frequency, predictability and duration. In turn, remedial needs differ according to tlie nature of tlie disaster and the magnitude of the resultant destruction. The effects of disaster depends upon the types of disasters.

1. Disasters may be categorised as sudden or calaclysmic, with immediate destruction. Natural phenomena like earthquake, floods, wind storms, tidal waves, volcanic eruptions, landslides and avalanches can suddenly destroy important parts of the housing stock, physical and social infrastructure, production facilities and crops. Disasters may disrupt the productive base of the economy by impunging on its capital stock. Its timely repair and replacement, of course, diverts the national savings which otherwise might have been allocated to the infrastructure and productive capital stock.

2. Some disasters may be slow in materialising and showing their effects. These may be categorised as continuing disasters. As time passes, tlie situation may further deteriorale. For instance, continuing disasters include prolonged droughts and crop failure., While in cataclysmic disasters the affected area is relatively small, it may be very large in a continuing disaster situation. For example, droughts may compound long standing problems of deforestation, encroaching desertification and soil erosion over vast stretches of land for many years. Agriculture may suffer severe setback and large groups of affected population may have to migrate. In turn, it may cause pressure on urban centres, creating new demands and infrastructure.

3. Man made disasters like wars, civil strife, population explosion, environmental degradation and major industrial accidents. The direct destruction caused by war and civil strife is similar to that of a sudden natural disaster. A period of war and civil strife results in diversion. of resources, affecting infrastructure as well as production facilities.

4. Disasters disrupt economic activities. Physical damage after catalysmic disasters temporarily halts developmental activities. Continuing disasters require changes to the infrastructure. In either case, repair and response take time and require additional resources. These resources may not be immediately available without dislocating ongoing developmerit activities in priority sectors.

5. The impact of disasters on the physically weak and socioeconomically disadvantaged sectors of the society is tremendous, e.g., on susbistence farmers, small shopkeepers, casual labourers and marginal fishermen. Their capital stock or savings may be completely wiped out by disasters, pushing them into the poverty group. Migration to urban centres in search of work as a result of disasters, in turn tends to increase the urban plight and the demand for remedial action. They may even halt or slow the chances of the poor coming out of the poverty net. Tlie physically weak, such as children, pregnant and lactating mothers, the aged and infirm bear the brunt of the adverse impacts of disasters.

Check Your Progress 2

Note: i) Use the space given below for your answers.
ii) Check your answers with those given at the end of the Unit.

1) Explain briefly a few disasters that are caused due to heavy rain or lack of rain.

2) Discuss the causes of an earthquake.

3) Describe the effects of disasters.

2.5 LET US SUM UP

This Unit has described the different categories of disasters viz. geological disasters, climatic disasters, environmental disasters, epidemics and the industrial accidents.

Further, the various causes of disasters have also been discussed. The earthquakes may arise due to the release of energy from the strained rocks inside the earth, or tectonic movements. Tsunamis could be due to the abrupt movement of ocean floor and tropical cyclones are caused by the circulation of strong winds anti-clockwise around a low pressure area in the northern hemisphere and clockwise in the southern hemisphere. Similarly, floods occur due to many reasons like the heavy flow of water, high tides, embankment failure etc. Droughts occur mostly in areas that do not enjoy adequate rainfall and moisture levels. Landslides can be caused by heavy rainfall, earthquakes or undercutting of the base of slopes by rivers.

The effects of disasters are felt especially on the socio-economic front. Disasters can cause loss of life, loss of property and the disruption of social and economic activity. Agricu7lture may also receive a major setback due to disasters like

2.6 KEYWORDS

Drought: situation created generally insufficient levels of rain resulting in water shortage that affect the economic and physical well being of a community.

Earthquake: Sudden movement of the Earth's crust below or at the surface that results in ground vibrations and the resultant collapse of buildings and possible destruction of life and property if the quake is of sufficient magnitude.

Rapid onset disasters: These type of disasters are very fast moving and are consequently very difficult to predict or prevent. They strike quickly and briefly, e.g., earthquakes and flash .floods.

Slow onset disasters: These type of disasters are more lengthy in duration, e.g., droughts. They are easier to foresee and provide time to take preventive measures.

Tectonic: Earth's crust is divided into various "plates" which have their own directions of movement. These are known as tectonic plates. Tectonic movement, . Such movement of plates often results in earthquakes.

Tsunami: Japanese term for sea waves generated by undersea earthquakes.

2.7 REFERENCES AND FURTHER READINGS

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2.8 ANSWERS TO CHECK YOUR PROGRESS EXERCICES

Check Your Progress 1

1) The main types of disasters are as follows:

- Geological disasters
- Climatic disasters
- Environmental disasters
- Epidemics
- Industrial Accidents

Geological disasters are:

- Earthquakes
- Tsunamis
- Volcanic eruptions
- Landslides

2) Your answer should include tlie following points:

- Tropical cyclones
- Floods
- Droughts

3) Your answer should include tlie following points:

- Environmental pollution
- Deforestation
- Desertification
- Pest Infestation

Check Your Progress 2

1) Your answer should include tlie following points:

- Floods
- Drought
- Landslides

2) Your answer should include the following points:

- Earthquakes may arise either due to the release of energy from strained rocks inside tlie earth or volcanic activity or tectonic activity.
- The sudden release of accumulated energy or stresses inside the earth or sudden movement of massive land areas on tlie earth's surface cause earthquake.

3) Your answer should include tlie following points:

- Disasters may disrupt the productive base of the affected economy through damaging or destroying. The existing infrastructure and halting the development process.

  It may cause pressure on urban centres, creating new demands and infrastructures.

  Diversion of resources, deteriorating infrastructure as well as production facilities.

- Disrupt economic activities.

  Disasters may halt or slow the chances of the poor coming out of the poverty net.

UNIT 3 DISASTERS: A GLOBAL VIEW

Structure

3.0 OBJECTIVES

After studying this Unit, you should be able to: ,

- discuss disasters in the global context
- briefly describe the disasters in a regional context
- identify the efforts world over to mitigate disasters.

3.1 INTRODUCTION

Disasters have always been mankind's constant companion. Generations of people have had to withstand disaster. They suffered from the consequences and recovered from them, and life continued. But somehow, over the ages, the scenario has changed quite a bit. Of course, there has not been much reduction in the traditional disaster threat. Natural disasters lilte earthquakes, cyclones, volcanic eruptions, tsunamis, wildfires, floods, landslides and droughts continue to strike. So do their basic man-made counterparts, such as major accidents. While we have learned to cope with these problems to a certain extent, we have neither eliminated nor contained them. So, whilst their effects may have been modified, they continue to inflict unacceptable pressure on a world population which is already finding it difficult to make ends meet. The largest sufferers are the least developed nations and economically weaker sections of the society.

Increasing population has forced people to live in disaster-prone areas which previously, would not have been regarded as habitable. This fact tends to apply particularly in developing countries. For example, human settlement has been allowed to develop in the flood-prone areas of major river systems, also on low-atoll islands which are subject to inundation from the sea.

New disaster threats have also developed in the modern world. Increased social violence has drastically affected many nations and communities. Instances of hijacking, terrorism, civil unrest and conflict with conventional arms have become commonplace. Instances of cross-border terrorism in parts of India continuing for many years and the organized simultaneous multi-target terrorist attacks in USA on September 11th, 2001 are the most despicable instances of willful manmade disasters. These inflict heavy burdens on governments and societies, more so in developing countries whose existence is already precarious because s f poor economic and social conditions.

New threats have also come from what are generally termed as hazardous materials or substances. The gas leak tragedy of Bhopal in 1984 ranks paramount in this category, with its estimated toll of 2,500 killed and 1,00,000 seriously affected in health. Hazardous materials are shifted around the transport systems of the world in increasing quantities and sometimes they are dumped in

areas which are vital to the world's future. These materials constitute a disaster threat which is potentially worse than to those posed by many of the natural phenomena.

The threat from atomic and nuclear sources poses another modern problem for disaster management. The explosion in 1986 at the Chernobyl nuclear power plant in in the then Soviet Union highlighted the extent and severity of this problem. Apart from those killed and affected by radiation sickness, some 1,35,000 people had to be evacuated from the area.

Whilst the threat from nuclear accidents is disturbing enough, the disaster management problems arising from possible nuclear war are almost beyond comprehension. The possibility is high that even if a country is not directly involved in nuclear conflicts, it could well suffer from the radioactive side-effects.

Therefore, it can be said that the new disaster threats contain some unwelcome and unacceptable characteristics, in that they may have extremely far-ranging effects and, at the same time, be difficult to counter.

3.2 DISASTERS: GLOBAL AND REGIONAL CONTEXT

3.2.1 Global Context

It has often been pointed out that most of the world's worst disasters tend to occur between the Tropic of Cancer and the Tropic of Capricorn i.e., in the tropical areas. Coincidentally, this is the area which contains the poorer countries of the world. A major significance of this is, of course, that such countries find themselves facing repeated setbacks to progress. Indeed, some countries seem destined to remain in the category of developing nations primarily because of the severity and magnitude of their disasters. Seen in this light, therefore, disaster can be a strong aggravating factor in the differences between wealthy nations and poor nations.

On the other hand, the simple fact is that the more nations develop and the more assets they build up, the more they stand to lose. It follows that any action that can be taken to reduce disaster-related loss must be seen as logical and desirable in cost-benefit terms. This applies to all countries, rich or poor, and it underlines the need for all countries to try to develop and maintain an effective disaster maintenance capability appropriate to their needs. It also underlines the necessity for cooperative and coordinated international action in order to strengthen all aspects of disaster management, wherever this is possible.

Unless disaster can be mitigated and managed to the optimum extent possible, it will continue to have a debilitating effect in the future. The world is already facing a range of environmental and subsistence crises. Disaster mitigation should be regarded as an important tool in successfully coping with these crises. Also, the political, economic and social stability of the world depends significantly on bridging the gap between developing and developed nations. The mitigation and containment of disaster effects on the developing nations, now and in the future, is an important step towards bridging this gap.

In the global context, it is significant to note that among the major disasters, the floods account for the largest number of deaths, persons affected and damage inflicted. In fact, nearly 30% of all deaths, damage and affected population can be traced to flood disasters. On the other hand, droughts do not result in too many deaths and most of the persons also escape the serious effects by migrating but the damage is nevertheless significant, that is, around 20% of all the disaster. related damages.

The study of the global statistics of disasters over the last few decades reveals that there is a significant and steady rise in the impacts of disasters (deaths, damage, persons affected). This appears for two reasons, viz., (i) increased incidence of man-made disasters' due to industrialisation and ecological degradation; and (ii) increased technological capability to detect and monitor 'natural disasters.

3.2.2 Regional Context

The South Asian region faces various kinds of natural hazards. The countries in this region are densely populated and are low-income economies making sustained efforts for economic growth. Recurrent natural disasters offer setbacks to their efforts at development and aggravate poverty conditions in the region.

The South Asian countries have diverse agroclimatic regions, each subject to particular natural disasters. Long coastal regions are prone to cyclones, arid and semi-arid regions to persistent droughts, the Himalayan mountain terrain and parts of the continental crust to earthquakes and landslicles and the near-perennial rivers of the region to periodic floods.

The coastal regions of India, Bangladesh, Myammar and Sri Lanka are severely affected by cyclones arising in the Bay of Bengal. In tlie recent past, Bangladesh and India particularly have been ravaged by severe cyclones that have killed lakhs of people and damaged/destroyed property worth thousands of crores of rupees. The super cyclone that hit Orissa in 1999 resulted in unprecedented destruction and loss of lives. Earlier in 1970, the then East Pakistan (New Bangladesh) was hit by a very severe cyclone.

Floods are almost an annual feature of the region ancl cause heavy losses. The major rivers of the region like the Ganga, the Brahmaputra and the Indus are all prone to flooding either due to heavy rains or clue to fast melting of snow in the Himalayas. Floods occur with unfailing regularity in Pakistan, India, Sri Lanka, Bangladesh and Nepal, while there are occassional flash floods in Bhutan. In India, more than 40 million hectares of land is flood prone.

Seismic disturbances are common all over the region. Nepal alone has experienced 23 major earthquakes between 1890 ancl 1975. Earthquakes of lesser magnitude also strike every year. Pakistan too has a long history of earthquakes. In 1935, an earthquake at Quetta killed 35,000 people. Around 56% of India's total area is susceptible to seismic disturbances. India suffered from two major earthquakes recently in Maharashtra (1993) and in Gujarat (2001) that have taken a massive toll of human lives ancl property. Bangladesh is also susceptible to occassional seismic disturbances though the magnitude of the disturbances here is of a considerably lower scale than the rest of the region.

The inherently variable nature of tropical rain such as the monsoon is responsible for the frequent occurrence of droughts. In fact, it is not uncommon for one part of a large country like India to be experiencing droughts while a different part of the same country is reeling under the impact of floods. Two-thirds of India comes under arid and semiarid regions and dry subhumid conditions. These areas are all prone to droughts. The Western parts of the country suffered from major drought in 1987. The Pakistani states of Sind and Punjab are the country's drought-prone areas. Sri Lanka's northern and eastern parts also suffer from droughts occasionally.

Landslides are an increasingly common occurrence in the hilly areas of the region. Landslides cause extensive damage to roads, bridges, human dwellings, agricultural lands, orchards, forests, resulting in loss of property as well as life. Economic degradation of hill areas has also been increasing due to greater frequency of occurrence of landslides. In India alone, the cost of restoration works and associated economic losses due to landslicles has been estimated .conservatively at Rs.200 crores per annum. It should be noted that India faces the largest number of disasters among the countries of South and Southeast Asia.

Check Your Progress 1

Note: i) Use the space given below for your answers.
ii). Check your answers with those given at the end of the Unit.

I) Name a few severe disasters that occurred in India or elsewhere in the world.

2) Discuss disasters in the Global context.

3) Briefly describe tlie disasters in the regional context of South Asia.

3.3 EFFORTS TO MITIGATE DISASTERS WORLDWIDE

Natural Disasters are no longer reckoned as the "Wrath of God". Modern science and technology have helped us to understand the mechanisms that result in such catastrophic events and also in devising means to minimise their ill effects. In tlie era of advanced satellite and other remote sensing techniques, the magnitude of damages wrecked by natural calamities can be reduced considerably by building a "Culture of Prevention" through awareness, knowledge and appropriate use of such technologies. We may not be able to eliminate the occurrence of such disasters but certainly, action can be taken to reduce their impact. Such actions are termed as mitigatory.

The most significant global effort made in recent times to mitigate tlie effects of disasters was the launching of tlie IDNDR programme by the United Nations.

International Decade for Natural Disaster Reduction (IDNDR)

Recognising the rapidly rising world-wide toll on human arid economic losses due to natural disasters, the UN General Assembly in. 1989 made a decision to launch a far reaching global programme to save human. lives and reduce the impact of natural disasters. With this aim in mind, the decade 1990-2000 was declared International Decade for Natural Disaster Reduction (IDNDR).

The objective of IDNDR was to reduce through concerted international action, especially in the developing countries, the loss of life, property damage and social and economic disruption caused by natural disasters such as earthquakes, windstorms, tsunamis, floods, landslides, volcanic erruptions, wildfires, drought and desertification and other calamities of natural origin.

By the year 2000, as per the plan of the IDNDR, it was intended that all countries should have:

1. comprehensive national assessments of risks from natural hazards, and these assessments taken into account in development plans ;
2. mitigation plans at national and/or local levels, involving long term prevention and preparedness and community awareness, and ;
3. Ready access to the global, regional, national and local warning systems and broad dissemination of the same.

The major conference of the IDNDR programme held in Yokohama (Japan) in May 1994, evolved a plan of action for disaster reduction called the Yokohama Strategy. It gave guidelines for Natural Disaster Prevention, Preparedness and Mitigation.
The Plan of Action was to be based on points like development of a global culture of preveiition as an essential component of an integrated approach to disaster reduction, adoption of a policy of self-reliance in each vulnerable country and community comprising capacity building as well as allocation and efficient use of resources, community participation in the disaster reduction process, and improved risk assessment, broader monitoring and timely communication of forecasts and warnings. Furthermore, the strategy called upon all countries to express political commitment to reduce their vulnerability through appropriate means. It also recommended that donor countries should upgrade the priority on disaster prevention, mitigation and preparedness in their assistance programmes and budgets.

International strategy for Disaster Reduction appreciating tlie good work done under the aegis of IDNDR and the need to continue the effort on tlie global level, the International Strategy for Disaster Reduction (ISDK) has been adopted as tlie successor to IDNDR. The ISDR has been programmed to take advantage of the network and experience gained under IDNDR. While the main achievement of IDVDR was to create awareness among the people and policymakers worldwide, ISDR is aimed at upgrading this awareness into realistic action plans. For implementing the ISDR, the main focus will be on:

- Continuing the efforts lo increase awareness,
- Obtaining commitment from public authorities,
- Creating disaster resistant communities, and
- Reducing socioeconomic losses.

Monitoring and Hazard Assessment of Seismic Disturbances

Though earthquakes are as yet unpredictable hazards, monitoring of seismic disturbance helps to delineate hazard zones and also help in preparation of risk maps. Risk maps are then used to plan construction works and implement mitigation measures.

Several countries including India, which are threatened by earthquake hazard, operate national and local networks for earthquake monitoring and surveillance. The first global network, known as World Wide Network of Seismic Stations (WWNSS) was established in the early sixties. Later on, a few of these were converted to Seismic Research Observatories (SRO). Now a modern global network called Incorporated Research Institutes for Seismicity (IRIS) has been established by USGS throughout the world.

Checlc Your Progress 2

Note: i) Use the space given below for your answers.
ii) Check your answers with those given at the end of the Unit.

I) Discuss briefly the efforts to mitigate disasters worldwide.

2) Explain the terms IDNDR and ISDR.

3) Briefly describe the importance of monitoring and hazard assessment of seismic disturbances.

3.4 LET US SUM UP

No country in the world is free from disasters. They have been occurring since time immemorial and mankind continues to be at their mercy. With advances in science and technology, newer man-made threats have been aclded to the traditional natural hazards. In the South Asian Region, however, it is the natural

disasters that continue to be the most dominating factor. The developmental progress of these nations is also hampered by the continuous onslaught of disasters. However, never before has there been such awareness about the importance of disaster mitigation practices. International programmes are aiding the mitigation efforts worldwide in order to help people cope with disasters as best as possible under the given circumstances. In this Unit, the discussion has been focused, primarily on the global and regional aspects.

3.5 KEY WORDS

Assessment: Survey of a disaster area to make estimates of damages and recommendations for necessary relief action.

Rislc Analysis: Systematic procedure to assess the likelihood of an event ,occurring and its socio-economic impact.

Rislc Mapping: Maps that identify types or severity of hazards, and their likely impacts in areas that may be affected by disasters.

Seismic Rislc Map: Chart that depicts areas likely to experience an earthquakes of various magnitudes.

3.6 REFERENCES AND FURTHER READINGS

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3.7 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

1) Your answer should include the following points:

- Earthquake in Gujarat in 2001.
- Super Cyclone in Orissa in 1999.
- The tragedy of Bhopal in 1984.
- The explosion in 1986 at tlie Chernobyl nuclear power plant in the then Soviet Union.
- The cyclone that hit the then East Pakistan (Now Bangladesh) in 1970.

2) Your answer should include tlie following points:

- Most of the world's worst disasters tend to occur between the Tropic of Cancer and the Tropic of Capricorn.
- Any action that can be taken to reduce disaster-related loss must be seen as logical and desirable in cost benefit terms.
- Among the disasters, floods account for the largest number of deaths, persons affected and damage inflicted.

3) Your answer should include the following points:

- Coastal regions are prone to cylones, arid and semi-arid regions to persistent droughts, tlie Himalyan mountain terrain and parts of the continental crust to earthquakes and landslides and tlie near perennial rivers of the region to periodic floods.

Check Your Progress 2

1) Your answer should include tlie following points:

- Modern science and technology have helped in designing means to minimise the effects of disaster.
- The most significant is the launching of the IDNDR programme by the United Nations.
- IDNDR has now been succeeded by tlie programme called tlie International Strategy for Disaster Reduction (ISDR).

2) Your answer should include the following points:

- IDNDK is International Decade for Natural Disaster Reduction (1990-2000) which was launched by UN General Assembly in 1989 reduce tlie impacts of natural disasters.
- ISDR is Inter-national Strategy for Disaster Reduction and it has been designed as the successor to IDNDR in order to consolidate the progress made during IDNDR.

3) Your answer should include the following points:

- Monitoring of seismic disturbances helps to delineate hazard zones and also help in preparation of risk maps.
- Risk maps are often used to plan construction works and implement mitigation measures.

UNIT 4 DISASTER PROFILE OF INDIA: REGIONAL AND SEASONAL

Structure

4.0 OBJECTIVES

After studying this Unit, you should be able to:

- describe the types of natural disasters occuring in India;
- explain their regional and seasonal distributions; and
- highlight tlie more vulnerable areas of tlie country.

4.1 INTRODUCTION

A natural disaster is an event of nature which causes sudden disruption to tlie normal life of a society and causes damage to property and lives, to such an extent, that normal social and econoniic mechanisms, available to tlie society are inadequate to restore normalcy. There is no way of preventing them. Earthquakes, cyclonic storms, snow-stortiis, heavy rains, droughts, landslides, etc. have occurred in tlie past and will continue to occur in future. In this Unit, the discussion will provide an overview of tlie type of disasters occuring in India.

4.2 DISASTERS IN INDIA : REGIONAL PROFILE

The Indian subcontinent is highly vulnerable to a number of natural disasters. Droughts, Floods, Cyclones and Earthquakes are major natural disasters in the country, though Landslides, Avalanche and Bush fire also occur in most of the states of Himalayan region. Out of 35 total States/Union Territories, almost all are prone to disasters of one type or tlie other. The areas oribe ti different disaster., phenomena in India are shown in Figure 1

Due to unique and widely varying geographical and geological conditions of the country, virtually all types of natural disasters take place with various intensities and in different regions.

4.2.1 Flood

Floods occur when large volume of water from heavy rainfall and/or river spill is not able to drain off quickly through normal channels. As explained in an earlier Unit, floods are the most frequent and most widespread natural disaster resulting in death, destruction, degradation and displacement. Whether sudden onset or slow development, floods take long to subside and they leave prolonged ill-effects.

India is the second most flood affected country where flood is a common natural disaster especially during the later part of the monsoon period. Severe floods occur almost every year in one part of the country or the other causing loss of life, large scale damage to property and untold misery to millions of people. Floods are estimated to affect 6.7 million hectares of land annually. The statistics of 10 years (1979-89) indicates that on an average in India about 30 million population are affected by flood every year

The effects of flood on the affected population are manifested in the form of inundation marooning, drowning, loss of habitat roads, communications, destruction of crops, industrial shutdown, loss of wages, diarrohea diseases, respiratory infections etc. and most of the affected population is among the poorer sections.

In India the most affected states due to floods are Bihar, Assam, Uttar Pradesh, the states in the northeast, Orrisa & West Bengal. They are also serious in states like Andhra Pradesh, Gujarat, Haryana, Punjab, Rajasthan & Tamil Nadu

Causes of Floods

Flooding is mainly caused by :

1) Inadequate capacity within the banks of the river to contain high flows,
2) River bank erosion and silting of river beds,
3) Land slides leading to obstruction of flow and change in the river course,
4) Synchronization of floods in the main and tributary rivers,
5) Retardation of flow due to tidal and backwater effects,
6) Poor natural drainage,
7) Cyclones and storm surge,
8) Cloud burst and flash floods.

Flood Problem : Regional Distribution

The nature of flood problem varies from one river system to another (Figure 2). For a proper appreciation of the problem, the country can be divided into the following broad regions:

1) Brahmaputra Region;
2) Ganga Region;
3) North-West Region; &
4) Central India and Deccan Region

A brief description of these flood prone river regions is given below:

Brahmaputra River Region

The predominant problem in this region is the flooding caused by spilling of rivers over their banlts, drainage congestion and tendency of some of the rivers to change their courses. In recent years, the erosion along the banlts of the Brahmaputra has assumed serious proportions.

Considering the individual states in tlie region, tlie flood problem is acute in Assam where inundation is caused by over-bank spillage along tlie Brahmaputra, the Barrack and their tributaries such as. the rivers Tista, Torsa, Jaldhaka and subansiri which are in floods every year and inundate large areas. These rivers also carry considerable amount of silt and have a tendency to change their courses. Tlie lakes get filled up during the monsoon and spread over larger marginal areas. In Tripura, there are problems of spilling and erosion by rivers.

Ganga River Region

The flood problem is mostly confined to the areas on the northern i.e. the left bank of the Ganga river. The damage is caused mostly by the northern tributaries of the Ganga which spill over tlieir banks and often change their courses. Even though tlie main Ganga is a mighty river carrying huge discharges of 57,000 to 85,000 cusecs, the inundation and erosion problems are confined to relatively few places in the States of Uttar Pradesli, Bihar and West Bengal.'

In Uttar Pradesli, the flooding is frequent in tlie eastern districts, mainly due to spilling of the Rapti, tlie Sharada, tlie Gliagra and tlie Gandak. The erosion is experienced in some places on the left bank of Ganga, on the right bank of the Ghagra and on the right bank of the Gandak.

In Bihar, the floods are largely confined to the rivers of North Bihar and are more or less, an annual feature. The rivers such as the Burhi Gandak, the Baghmati and the Kamla Balan and other smaller rivers of tlie Adhwara Group, the Kosi in the lower reaches and the Mahananda at the eastern end spill over tlieir banks causing considerable damage to crops, housing and roads leading to dislocation of traffic.

In South and Central West Bengal, the Mahananda, tlie Bhagirathi, the Ajoy, tlie Damodar cause flooding due to the inadequate capacity of river channels. There is also the problem of erosion of the banks of some of the rivers and on the left and right banks of Ganga both upstream and downstream of the Farakka barrage.

Northwest Rivers Region

Compared to the Ganga and the Brahmaputra river regions, the flood problem is relatively small in this region. The major problem is that of inadequate surface drainage which causes inundation and waterlogging over vast areas.
At present, the problem in tlie States of Haryana and Punjab are mostly of drainage and waterlogging. Floods in parts of Rajasthan were rare in tlie the past. The Ghaggar river used to disappear in the sand dunes of Rajasthan after flowing through Punjab and Haryana, In recent years it lias become active in the Rajasthan territory also, occasionally submerging large areas.

Tlie floods occur periodically in the Jhelum and its tributaries in Kashmir Valley causing a rise in the level of the Wullar lake thereby submerging marginal areas of the lake and banlts. Similarly, the Chenab and its tributaries like Tawi are often in spate endangering several densely populated areas like Jammu and Aklinoor.

Central Inclia and Deccan Region

This region covers all the southern states namely Andhra Pradesh, Karnataka, Tamil Nadu and Kerala and the states of Orissa, Maharashtra, Gujarat and parts of Madhya Pradesh. The region does not have very serious flood problem because the major rivers have largely well defined stable courses and are able to carry flood discharges safely except in the deltaic areas especially in some of the rivers of Orissa State.

Tlie flood problem in Andhra Pradesli is confined to spilling by tlie smaller rivers and the submergence of marginal areas along tlie Kolleru Lake. In addition, there is a drainage problem in the deltaic tracts of the coastal districts.

The Tapi and tlie Narmada are occasionally in high floods affecting areas in the lower reaches in Gujarat.

In Orissa, damage due to Hoods is caused by Mahanadi, Brahmani and Baitarni whicli liave a common delta where tlie flood waters intermingle and when in spate simultaneously cause considerable havoc. The problem is accentuated when the flood sychronises with high tides. The silt deposited constantly by rivers, often results in rivers overflowing their banks or breaking through new channels causing heavy damage. The lower reaches along the Subarnarekha are affected by floods and drainage congestion.

Godavari and Krishna rivers on the east coast have acute drainage problem and face floods particularly in the wake of heavy rains From cyclonic storms. Tlie small rivers of Kerala wlien in spate, cause considerable damage.

4.2.2 Drought

Drought is widespread in India. It is primarily a deficiency in rainfall but over exploitation of ground water aggravates the situation. Large evaporation resulting from poor water retention capacity of soil adds to the problem. It is also the result of poor water management strategy, deforestation and indiscriminate industrial exploitation of water resources. Drought is a creeping phenomenon, which makes an accurate prediction of its onset a difficult task. A drought may take place in a season or in a run of years and its impact on society may linger For many years. Its impact depends largely on society's vulnerability to drought at that particular time. Human or social factors often aggravate the effects of drought.

Drought is quite a perennial feature in India especially in Gujarat, Rajasthan, and parts of Madhya Pradesh, Maharashtra, Karnataka, Andhra Pradesh and Tamil Nadu Certain areas in Orissa also suffer Droughts perennially. Due to the highly variable occurrence of monsoon rains, there are usually areas of deficient rains even in good monsoon years.

Factors Promoting Drought in India

The Factors promoting drought are the delay or less rains due to whicli there is water scarcity. Depletion of forest, overgrazing soil erosion, extension of cultivation to marginal lands and lowering of water level etc. directly contribute to-and aggravate the ill effects of drought.

When the monsoon rainfall deficit for the country as a whole is 10% below normal or worse, and 20% or more area of the country, suffers from rain deficit, it is reckoned as a "drought year" for the country as a whole. In the scientifically recorded history of India the following are recognized as the drought years on the national scale:

1877, 1891, 1899, 1901, 1904, 1905, 1907, 1911, 1913, 1915, 1907, 1911, 1913, 1915, 1918, 1920, 1925, 1939, 1941, 1951, 1965, 1966, 1968, 1972, 1974, 1979, 1982, 1985, 1987.

Among these the two exceptionally bad years were 1977 and 1899. In 1977, the monsoon rainfall deferency was 29% below normal and 67% area of the country suffered from rain deferency. In 1899 while the monsoon rains were 26% below normal, as much of 83% of the area of the country suffered drought conditions.

4.2.3 Cyclone

India has a very long coastline of 5700 kms, a major portion of which is exposed to tropical cyclones arising in the Bay of Bengal and Arabian Sea (Fig. 1. C). Once taking birth over the sea areas, the cyclones move either western and or northwestward.

Cyclones are characterized by very strong winds, torrential rains and associated floods which cause extensive damage to human lives and property in the coastal areas. The damage is much more if cyclone strikes the coast at the time of high tide resulting in very substantial storm surge inundating the coast. The combination of torrential rains and exceptionally strong winds makes cyclones very destructive and the storm singe bringing in saline seawater in huge quantities compounds the problem.

The Indian coastal regions are among the six major cyclone-prone regions of the world. In India cyclones occur usually between April and May, and between October and December. These are called the Pre-monsoon and post-monsoon seasons.

The eastern coastline is more prone to cyclones as it is hit by about 80% of total cyclones generated in the region. Sometimes, a cyclone hitting the east coast, travels over the peninsula with reduced strength and emerges in the Arabian Sea to become a cyclone once again.

4.2.4 Earthquake

Earthquakes are considered to be one of the most dangerous and destructive natural hazards. The impact of this phenomenon is sudden with little or no warning, making it just impossible to predict it. Therefore, the best strategy is to make preparations against damages and collapses of building and other man-made structures, About 50-60% of total area of the country is vulnerable to seismic activity of varying damage potential (Fig.1.D).

Most of the vulnerable areas are generally located in Himalayan and sub-Himalayan regions, extending from Kashmir to Arunachal Pradesh, Kutch and in Andaman and Nicobar Islands. Some of the more damaging earthquakes (India) are listed below.

Table-2

More Damaging Earthquakes in India

Year	Region	*Magnitude on Richter Scale*	Deaths
1897	Assam	8.7	1600
1905	Himachal Pradesh	8.0	2000
1930	Meghalaya	7.1	N.A.
1934	North Bihar	8.4	11000
1935	Baluchistan (then India)	7.5	25000
1941	Andaman Islands	8.1	N.A.
1950	Assam	8.6	1500
1956	Gujarat	7.0	N.A.
1988	Assam	7.2	N.A.
1988	N.Bihar	6.7	1300
1993	Marathwada	6.4	10000
1999	Uttranchal	6.8	N.A.
2001	Gujarat	6.9	18250

4.2.5 Landslide

Among the natural hazards that strike the mountainous areas almost perennially, landslides occupy a position of major concern. The Himalayan range constitutes a young and therefore, a fragile mountain system. It is not a continuous landmass but comprises series of curvilinear parallel folds extending in length to about 2400 km. Its width is around 340 km. The Himalayas in general are fragile in nature due to tectonically displaced and folded as well as crumpled rock formation and due to periodic earth tremors in this belt.

The Himalayas abound in seismic thrusts and faults which have profound effect on slope stability. In order to save the Himalayas from the increasing negative impact of slope instability there is a need to have an integrated approach of various branches of ^sciences like geology, geomorphology, geotechnical engineering, meteorology, hydrology, remote sensing for finding a viable solution to mitigate the landslide hazards. This has become especially important for keeping open. The road network in the Himalayan region.

Causes of Landslides

A slope may yield a wide variety of mass movements. Slope failures are normally due to sheer stresses which increase with the inclination and height of the slope and occur when sheer stress exceeds the sheer strength. When the forces of equilibrium alter marginally the landslide is slow and if the disturbing forces undergo significant change, the movement of mass is fast. The rock fall and debris flow in Himalayas are caused due to heavy precipitation and saturation during rainy season and consequent development of hydrostatic pressure in highly jointed, fractured and weathered rock mass. Extensive erosion by the meandering rivers also causes progressive failure of the overlying materials.

Check Your Progress 1

Note: i) Use the space given below for your answers.
ii) Check your answers with those given at the end of the unit.

1) Describe briefly the disaster phenomenon in the Indian subcontinent.

2) Discuss the flood problem in India with special reference to regional distribution.

3) What do you mean by Drought? Discuss briefly the factors promoting drought in India.

4.3 DISASTERS IN INDIA : SEASONAL PROFILE

Seasonal variation in disasters is observed mostly in cases of floods and cyclones.

Floods

According to the India Meteorological Department, the south west monsoon season is considered to be from Olst of June to 30th of September. About 80% of the annual rainfall occurs during the southwest monsoon. Floods in India are mainly caused by heavy rainstorms during this season. Consequently, southwest monsoon season is, generally, regarded as the flood season in India. The average rainfall of India is 110 cm. Floods can arise from abnormally heavy precipitation, dam failures, rapid snow melts and river blockages.

Floods also occur in coastal areas when a cyclone hits the coast and brings with it very huge quantities of saline sea water. Hence cyclone related strom surge floods occur in the cyclone season.

Cyclones

Cyclones are the most destructive kind of storms that strike the coastal belt of India with varying degree of fury. Their frequency in the Bay of Bengal is roughly fourfold higher than that in the Arabian Sea. Most of the cyclones occur in the months of April, May, October and November, i.e., in the pre-monsoon and post-monsoon months.

Droughts

As already mentioned droughts occur when there is delay or shortfall in the monsoon rains. The situation aggravates if the monsoon season continues to behave erratically and give insufficient rains. Therefore, the maximum impact of the drought is fell in the sutnmer and the subsequent months.

Check Your Progress 2

Note: i) Use the space given below for your answers.
ii) Check your answers with those given at the end of the unit.

I) Which are the prominent seasons for floods?

2) Discuss the occurrences of cyclones in India.

3) What are the causes of droughts?

4.4 LET US SUM UP

Because of its large size and the special characteristics of geography and geology, India has considerable variety and frequency of disasters. It is particularly vulnerable to floods and cyclones causing maximum damage in terms of life and property followed by earthquakes, droughts and landslides.

There is a set pattern of regional and seasonal occurrence of these disasters particularly the floods and cyclones.

4.5 KEY WORDS

Flash Flood : Sudden and extreme volume of water that comes on rapidly over a relatively small area causing inundation; can result in very heavy loss of life and destruction of property.

Slope Instability: When slopes are having unstable rock structure or loose soil, slope become unstable and cause soil erosion and landslides. It depends on character of rocks, soil type and vegetation on the slope.

Synchronization: (of flood in main and tributary rivers). The control of flow of water in the main river and its tributaries by mechanical means.

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4.7 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

1) Your answer should include the following points:
   - Flood
   - Drought
   - Cyclone
   - Earthquake
   - Landslide

2) Your answer should include the following points:
   - Floods occur when large volume of water from heavy rainfall and/or river is not able to drain off quickly through normal channels.
   - Floods take long to subside and they leave prolonged ill effects.
   - For a proper understanding of the problem, the country can be divided into the following broad regions:

i) Brahmaputra River Region;
ii) Ganga River Region;
iii) North-West Rivers Region;
iv) Central India and Deccan Rivers Region.

3) Your answer should include the following points:

- Drought is primarily a deficiency in rainfall over a certain period of time.
- It results because of the change in environmental patterns resulting in poor water retention capacity of soil. It is also the result of poor wafer management strategy, deforestation and indiscriminate industrial exploitation of water resources.
- Factors promoting drought in India are as follows:
  - Delay or less rains which causes scarcity of water.
  - Depletion of forest, soil erosion, extension of cultivation to marginal lands, Lowering of water table.

Check Your Progress 2

1) Your answer should include the following points:

- Most floods ocean during the monsoon (June to September)
- Storm Singe, which is cyclone related, occurs in cyclone seasons, i.e. pre-monsoon (April to May) or post-monsoon (October to November) seasons

2) Your answer should include the following points:

- Coastal belt of India is affected by cyclones
- Bay of Bengal and Arabian Sea are the source of cyclones
- Occurrences are mainly in the months of April, May, October and. November

3) Your answer should include the following points:

- Delay/Shortfall in the monsoon rains.
- Erratic or insufficient rains

Over exploitation of ground water sources

UNIT 5 EARTHQUAKE

Structure

5.0 OBJECTIVES

After studying this Unit, you should be able to:

- describe an Earthquake;
- discuss the general characteristics of earthquakes;
- briefly describe the Instrumental and Non-Instrumental precusors;
- understand the vulnerability of different regions of the country through seismic zoning;
- analyse the impact and effects of an earthquake; and
- discuss the nature of damage.

5.1 INTRODUCTION

Earthquakes are considered to be one of the most dangerous and destructive natural hazards. The commencement of this phenomenon is usually sudden with little or no warning. It is not yet possible to predict earthquakes and to make preparation against damages and collapse of buildings and other man-made structures. In effect, earthquake consists of a sudden shaking (vibrations) of ground caused by disturbances in the earth's crust. An earthquake generates a set of horizontal and vertical vibrations of the ground which result in destruction of structures.

Earthquakes may be defined as a natural phenomenon Which tends to create panic due to tlie trembling vibrations or sudden undulation of a portion of earth's crust caused by splitting of a mass of rock (Tectonic) or by volcanic or other disturbances.

This Unit provides a general discussion about earthquakes. We will first explain the general cliaracteristics of earthquakes. Besides this precursors: (instrumental and non-instrumental) and vulnerability of the different regions of the country will be discussed to analyse the impacts and effects of earthquake. Lastly nature of damage caused by earthquakes will be described.

5.2 GENERAL CHARACTERISTICS

Earthquakes occur sudden by with little or no warning, However, following a major earthquake, the after-shocks may sometimes indicate the likelihood of a further earthquake. On some occasions, an earthquake may be preceded by a less

intense tremors or foreshocks. The basic characteristics of an earthquake are the following:

It is not yet possible to predict magnitude, time and place of occurence of an earthquake.

- The onset is usually sudden.
- Earthquake prone areas are generally well identified and well known on the basis of geological features and past occurrences of earthquakes.
- Major effects arise mainly from ground movement and fracture or slippage of rocks underground. The obvious effects include damage (usually very severe) to buildings and infrastructures alongwith considerable casualties.
- About 200 large magnitude earthquake (M>6.0) occur in a decade.
- The world's earthquake problem seems to be increasing with the increased population, high rise buildings and crowded cities.

The exact spot underneath the surface of the earth at which an earthquake originates is known as "focus" while the point lying on the ground surface vertically above the focus is defined as "epicenter" of the earthquake. The seismic shoclts originating at a depth of about 50 km or less below the surface are termed as shallow focus earthquakes; otherwise these are known as deep focus earthquakes.

The energy released at the focus, due to the elastic rebound of rocks, creates the earthquake and is a measure of the power of the earthquake.

The power (energy) of an earthquake is reckoned in terms of its "magnitude" which is measured on an open-ended Richter. But it is not a linear scale and not even a logarithmic scale. This will be clearly understood from the following Table 5.1 which gives the equivalence of earthquake magnitude (on Richter Scale) and the equivalent energy release by tlie explosion of a certain mass of TNT which is the well known measure of explosive power in any blast. The Richter scale derives its name from the scientist who proposed it.

Table 5.1

Magnitude of Earthquake (on Richter Scale)	Approximate Equivalent TNT mass in terms of explosive power	
1.0	170 gm	
3.0	180 kg	(180 x 10^3 gm)
6.0 (like Latur, 1993)	5700 tonne	(570 x 10^7 gm)
8.5 (Like Assam 1897 & 1950)	28700000 tonne	(287 x 10^{11} gm)

From the above, it should be clear that tlie energy released by an earthquake increases enormously as the magnitude on Richter Scale rises. Another way to appreciate the enormous destruction potential of an 8.5 magnitude earthquake is' to know that the energy released is approximately equal to 10,000 Hiroshima type Atom Bombs. It may be noted from Table 5.1 that each infeger increase of magnitude on Richter Scale represents about 33 times increase in the energy released.

The primary waves (or P-waves) from the focus are transmitted due to longitudinal vibrations set up within the earth. These waves have the velocity of

the order of several kilometers pel second and cause the preliminary tremors on the surface of tlie earth. These waves create an effect of horizontal pull and push and are also called pull and push waves.

The secondary (or S-waves) o n the other hand are transmitted due to transverse vibrations. These are known as surface or slow waves. Even though the amplitude and size are small compared to other waves, these are the most destructive since they create vertical up and down movements *in* the ground surface as against horizontal oscillation due to longitudinal waves.

While the "magnitude" of an earthquake defines the energy released by the event the "intensity" of the earthquake will depend on the particular place where it is measured. Obviously the intensity will decrease as the distance from the epicenter increases.

5.3 INSTRUMENTAL AND NON-INSTRUMENTAL

Wc have already stated it is not yet possible to predict earthquakes. However, sometimes there are some indication that would indicate that perhaps an earthquake would occur. Such indications are called "precursors". These could bc either instrumental, i.e., those that are measured by instruments or non-instrumental, i.e., those which can only bc perceived and not measured. Needless to say, the non-instrumental precursors are more subjective.

Some of the generally recognized precursors are listed below:

Table *5.2*

Instrumental Precursors	Non-Instrumental **Precursors**
Fore-shocks & after shocks	Sudden rise or fall of water level in wells and lakes.
Statistical pattern of shocks.	Mud and sand shows up in surface waters.
Uplift or subsidence of ground.	Changes in flows of natural springs,
Changes in gravity.	Increase in salinity of wales.
Faults. displacements in Earth's Crust	Advance and retreat of seas.
Tilt and strain of underground rock formations.	Unusual behaviour of animals.
Changes in electric resistance of rocks.	
Changes in earth's magnetic field.	
Emission of Radon gas from the ground.	
Unusual sounds from inside earth.	

Evaluation of Precursors

The above Table shows that precursors have been useful some time or the other, although none by itself is expected to help the prediction of earthquakes. The problem is how to know which precursor should take precedence at any given

time and place. More often than not, false or untenable conclusions seem to hold the sway, and the pros and cons do not lead to any agreement regarding the usefulness of these precursors for prediction of earthquakes.

Some studies have been made to assess which of these precursors are readily activated before or during various earthquakes. However, it has not yet been possible to draw operationally usable criteria for predicting earthquakes on the basis of precursors (instrumental and lion-instrumental). More observation and studies are required.

Check Your Progress 1

Note: i) Use tlie space given below for your answers.
ii) Check your answer with that given at the end of the Unit.

1) What do you understand by an Earthquake?

2) Discuss tlie general characteristics of an Earthquake.

3) List some of tlie Instrumental and non-Instrumental Precursors.

5.4 VULNERABILITY

Disasters result from vulnerable societies being exposed to a hazard. There can be physical vulnerability, social vulnerability and economic vulnerability released to an earthquake disaster.

Physical vulnerability relates to old and non-engineered buildings, infrastructure. The vulnerability of builclings is dependent on their designs, shape, materials used, construction techniques, maintenance and proximity of buildings. The weightage attached to each factor will vary according to the characteristics of the particular earthquake.

Infrastructure may be considered in three broad groups: transport systems (roads, railways, bridges, airports, port facilities); utilities (water, sewerage and electricity telecommunications) and flood protection structures such as dams and embankments

Vulnerability analysis is especially concerned with the risk faced by critical facilities (sometimes termed "life-lines") which are vital to tlie functioning of societies in disaster situations especially such as incase of earthquakes. These facilities include hospitals, dispensaries and emergency services. Special consideration is given also to protect heritage buildings of great cultural and historical importance.

Social Vulnerability

Records of past earthquake disasters suggest that the following groups of people are particularly at risk and require special attention:

- Single parent families;
- Women, particularly when pregnant or lactating;
- Mentally and pliysically handicapped people;
- Children; and
- The elderly and the infirm

Poor people are less concerned with infrequent hazards. If there are groups whose livelihoods are at risk, living or working in densely populated areas, with low perceptions of risk and without institutional support, the cumulative effect would be high social vulnerability.

Economic Vulnerability

It measures the risk of hazards causing losses to economic assets and processes. It focusses on evaluating the direct loss potential (i.e., damage or destruction of physical and social infrastructure and its repair or replacement cost, as well as crop damage and losses to the means of production); indirect loss potential (i.e., the impact on cost of production, employment, vital services and income-earning activities); and secondary effects (epidemics, inflation, income disparities and isolation of outlying areas). With the insights provided by economic vulnerability analysis, it is possible to estimate direct and indirect losses and to design ways and means to mitigate them in relation to the estimated costs of relief/recovery actions and mitigation measures required.

5.5 IMPACT AND EFFECTS

In general terms, typical impacts and effects of earthquake disasters tend to be :

- Loss of Life.
- Injury
- Damage to and destruction of property including crops.

- Disruption of production.
- Disruption of lifestyle.
- Loss of livelihood.
- Disruption to essential services.
- Damage to national infrastructure and disruption to administrative and organizational systems.
- Sociological and psychological after-effects.

The following problem areas need particular attention in case of Earthquake disasters:

- Severe and extensive damage, creating tlie need for urgent counter measures, especially search and rescue, and medical assistance.
- Difficulty of access and movement.
- Widespread loss of o r damage to infrastructure, essential services and life support systems.
- Recovery requirements (e.g., restoration and rebuilding) may be very extensive and costly.
- Occurrence of earthquakes in areas where such events are rather rare may cause problems due to lack of public awareness.

5.6 NATURE OF DAMAGE

Damage due to earthquakes depends on various factors listed below:

a) **Nature of Earthquakes:** It includes various parameters like magnitude, intensity, duration and ground acceleration due to earthquake. Higher tlie value of these parameters, higher will be tlie resultant damage.

b) **Geological and Soil Conditions:** Geology and Soil conditions play a very important role in the amount of damage due to any earthquake. In hilly areas damages are severe due to various aftereffects of earthquakes such as landslides, blockage of connecting roads, diversion of river flows and damage to dams. The intensity of earthquake is directly relatecl to the type of supporting soil layers. The structures built on the solid rock and firm soil generally perform better. There are cases in which tlie intense vibrations from the earthqualce "liquified" the soil and buildings tilted on to the ground because tlie foundation became loose.

c) **Quality of Construction:** Construction quality is very important for safety of buildings. Building designs must be such as to ensure that the building has the adequate strength, and will remain as one unit while subjected to vibrations and significant cleformation, otherwise it will suffer great damage. The great loss of life and property due to poor construction practices can be seen in major earthquakes.

d) **Sociological Factors:** Various sociological factors such as density of population, time of occurrences, community preparedness are very important for limiting the resultant damage.

A short list of the more damaging earthquakes that occured in India since the very great earthquake of 1897 in Assam has already been given in Unit 4.

The nature of the damage that can occur as a result of any earthquake may well be imagined. Everything based upon tlie stability of the earth is rudely disturbed. If the tilt or displacement of tlie ground disrupts the equilibrium, structures fall. Gravity spares nobody. Therefore, the maximum damage is noticed in the case of tall buildings. If these are not designed to withstand any substantial ground movement, they will fall. Tall buildings and roofs are tlie first casualties. In the wake of their collapse, most damage to life is done to those who are inside tlie house. Many will be hit by falling debris or get trapped inside tlie collapsed building. Persons trapped under the debris, shouting pathetically for help, constitute a truly gruesome sight. Sometimes steel beams have to be cut before the victims can be rescued.

Essential services such as water - mains, drainage systems, and electrical transmission lines are seriously damaged. Broken water - mains cause flooding of the area and leave no water for drinking or for fire-fighting. The sparking of high tension overliead electric cables cause fires, setting ablaze whatever combustible material is in the vicinity. Leaks from cooking gas cylinders or supply lines also cause fires.

Disrupted drainage lines spread noxious fluids and give rise to diseases and epidemics.

Geological faults in tlie Earth's crust become activated and accentuate displacement of tlie ground, producing gaping fissures in which human beings and animals are known to have been engulfed. Telephone and telegraph poles fall down and the services go out of order. Communications are seriously hampered or altogetlier stopped. Railway lines are twisted out of shape and rail communication to and from the affected area is broken off. In some cases tlie only access to tlie affected area is by helicopter.

Large dams in tlie vicinity may be affected, and in some cases may even burst and cause severe floods. On the coast, huge waves called tsunamis lash the shore and bring down houses and other structures and dislocate fishing and navigation.

Creation of new islands is a rare phenomenon but does occurs due to some earthquakes, which originate below tlie sea bed. The new islands were composed of loose sand and clay mostly and are eroded due to sen waves and tides.

Check Your Progress 2

Note: i) Use tlie space given below for your answers.
ii) Check your answer with that given at the end of the Unit.

1) Briefly discuss the types of vulnerability due to earthquakes.

?

2) What are the impacts and effects of an Earthquake? Discuss

3) On what factors does the nature of damage depend in an Earthquake?

5.7 LET US SUM UP

This Unit discussed tlie phenomenon of earthquake and defined tlie relevant terms. It throws light on the general characteristics and precursors. It also highlighted tlie vulnerability situation, impact and effects of an eartliquake. Lastly, nature of damage due to earthquake has been described.

5.8 KEYWORDS

Epicenter : The point on tlie Earth's surface directly above the focus of an earthquake.

Magnitude : A measure of earthquake's power that describes the amount of energy released.

Non-engineered : A structure tliat has been constructed without proper engineering design and supervision.

TNT : Trinitrotoluene (an explosive material).

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5.10 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

1) Your answer should include tlie following points:

- Earthquakes are considered to be one of the most dangerous and destructive natural hazards.
- This phenomenon is usually sudden with little or no warning.
- It consists of a shaking of ground caused by disturbances in tlie earth crust.
- It is not possible to predict earthquakes and to make preparation against damages and collapse of buildings and other man-made structures.

2) Your answer should include the following points:

- It is not yet possible to predict the magnitude, time and place of occurrence.
- The onset is usually sudden.
- Earthquake prone areas are generally well identified on the basis of geological fetures and past occurrences of earthquake.
- Major effects arise mainly from ground movement and fracture or slippage of rocks underground.
- The obvious impacts include damage to buildings and infrastructure alongwith considerable casualties.

3) Your answer should include the following points:

Instrumental Precursors

occurrence of foreshocks and aftershocks

- Statistical pattern of shocks.
- Uplift or subsidence of ground.
- Changes in gravity.

Non-instrumental Precursors

- Sudden rise or fall of water level in wells and lakes.
- Mud and sand shows up in surface waters.
- Changes in flows of natural springs. .
- Unusual behavior of animals.

Check Your Progress 2

1) Your answer should include the following points:

- Physical vulnerability
- Social vulnerability
- Economic vulnerability

2) Your answer should include the following points:

- Loss of life, livelihood, economic loss and injury.
- Damage to and destruction of property.
- Damage to and destruction of crops.
- Disruption of production, life style and essential services.
- Sociological and psychological after-effects.

3) Your answer should include the following points:

- Magnitude of an Earthquake.
- Geological and soil conditions.
- Quality of construction.
- Sociological factors.

UNIT 6 FLOOD AND DRAINAGE

Structure

6.0 OBJECTIVES

After reading this unit, you should be able to :

- explain what disasters caused by floods & drainage congestion are like;
- discuss causes, predictability and vulnerability
- describe the adverse effects; and
- highlight preparedness measures and mitigation possibilities.

6.1 INTRODUCTION

Floods liave ravaged portions of India from times immemorial. Though floods are one of the very few well recorded natural phenomena, the catastrophic damages caused by them attracted focussed attention in recent decades. With increasing population pressure and accelerated economic development, the adverse effects of floods are being increasingly felt now. Floods cause great distress whenever they damage crops and property and endanger lives. The term Flood is generally defined as a relatively high flow or stage in a river and the inundation of low land which might result therefrom. In a broader sense the term flood is also used to convey all outflow due to jamming or blocking of rivers by landslides and inadequate drainage to carry away surface water speedily. Coastal floodings are also covered.

In essential terms, flood denotes imbalance between the inflow and outflow of water. I-Ience, areas are stated to be flooded when water due to rainfall and/or riverspill is unable to drain off within a quick span of time. Strictly, this type of situation is a drainage congestion problem. Most often drainage forms a part of floods and the term flood is often used to describe either type of situations.

In India vast stretches of land are submerged under water and other adverse effects are caused, such as destruction or damage to houses, property, bridges roads and other means of communications, lives lost etc. year after year. Dense population, weak infrastructure and rapid urbanization aggravate the problem.

6.2 CAUSAL PHENOMENA AND CHARACTERISTICS

Flood are natural phenomena characteristic of all rivers. As is known, the rainfall in India is largely dependant on the monsoons and cyclonic depressions, Most of the rainfall is received during the southwest monsoon season (June to

September) during which heavy spells of rain are often experienced in the catchment of rivers over periods of a few days at a time. It could therefore be said that high rainfall coupled with inadequate channel capacity leads to flooding. Choking of river beds by natural causes or artificial obstructions aggravate the problem.

Flood damages are the combined result of the natural, phenomenon of floods coupled with the human activity in the flood plains. The fertile river silt has promoted large-scale settlements and cultivation of lands near the riverbanks and adjacent areas or even in the river bed region. While these activities are increasing on one hand, on the other the river continue to experience varying magnitudes and intensities of floods which cause damages, sometimes in disastrous proportions. In a way flood damage is the price paid for the human occupation and exploitation of the flood plain of the river. Even single events could result in a heavy toll of death as also property loss.

As mentioned, the basic cause of flooding is the high rainfall. Apart from that, the size of the catchment also usually governs the character of the flooding. On large rivers with big catchments basins, such as the Ganga or the Brahmaputra, the riverflow in the lower reaches is relatively slow to change; in contrast to this, flash floods, most commonly associated with small catchments lead to very high build up very quickly. They leave very little time between the start of the flood and the peak discharge. Coastal floods are associated with tropical cyclones, storms surges and tidal conditions.

The general cliaracteristics of floods are as discussed so far but it must be noted that floodings are the complex results of interaction of a number of connected phenomena and that the flooding characteristic of each river is different from the other. They cannot be easily classified even in types or groups. But in every case, the people and the activities in the flood plains are adversely affecte3d.

If there would have been no occupation of the riverfront or economic activities nearby, high floods might come as also subside without mankind being affected or bothered much. We, however, are concerned with flood losses. Flood losses may be defined as the destruction or impairment, partial or complete, of the value of goods and services or of health, resulting from the action of flood waters and the silt and debris they carry.

India is one of the highly floodprone countries of the world. Flood damage statistics, compiled from reports from the State Governments indicate that on an average (based on data for 1953-1990) about eight million hectares of land are affected by floods in India, involving about thirty three million people. In a high flood year, the figures will be many times more. Our neighbour Bangladesh also suffers seriously from floods. The floods of 1988 which caused high losses in India also caused serious flood problems there, affecting 45 million people and crop damage on two million hectares of land.

6.3 VULNERABILITY

From the earliest days, mankind has learnt to live with nature. As people settled in environs with fertile soils and by the side of waterfronts, for raising food or on' strategic considerations such as trade, commerce, communication or defence, they also realised that these regions that sustained them are also disasterprone. They soon learnt lessons and started taking precautions so as to reduce their risks. The evidence noted in the form of houses built on stilts on the banks of major rivers are of this nature. In course of time the population pressures increased and the vigilance of the people also slackened. Thus mankind's vulnerability started increasing. (The concept of vulnerability has been explained in Unit 5, Section 5.4).

The vulnerability to flooding is influenced by many factors. The principal factors can be classified to fall under three groups.

1) climatological, i.e. intensity and frequency of rainfall.
2) hydrological and environmental conditions, i.e. how much water can be absorbed, evaponvhed or drained off.
3) local geomorphology of the flood plain, i.e. how much would the flood waters spread sideways.

In addition, coastal flooding also depends on the coastal configuration and tidal conditions.

In simple terms it can be stated that the factors contributing to vulnerability from floods are : ,

a) nature of settlements on floodplains
b) reduction of water absorbing capacity (or moderating capacity) of land
c) lack of awareness of flood hazard
d) risky infrastructure elements: nonresistant construction
e) livestock, crops and other stocks that are unprotected
f) boating and fishing activities and infrastructures, and
g) unprepared administration and population

Check Your Progress 1

Note: (i) Use the space given below for your answers.
(ii) Check your answers with those given at the end of the unit.

1. Explain the meaning of flood and drainage.

2. Discuss the factors which influences type and degree of floods.

3. List out tlie factors contributing to vulnerability from floods.

6.4 PREDICTABILITY, FORECASTING AND WARNING

Experience lias shown that loss of lives and property can be reduced significantly by giving reliable advance information about the oncoming floods. Tlie people could be moved to safer places in an organised manner as soon as tlic warning is received. Cattle and valuable property could be transferred to places of safety. Fortunately advances in science and technology liave made it possible to predict floocls. Forecasting tlie likely future stages of, or flow of incoming flood and its sequence at selected points along tlie river can be very effective in reducing flood damages. Reasonably reliable flood forecasting and warning coupled with effective follow up measures constitutes tlie most important measure of flood management.

The Central Water Commission is tlie nodal agency of the Government of India for flood forecasting and tliey liave been involved in scientific flood forecasting on most interstate rivers regularly. There are over 150 Flood Forecast Stations all over tlie country managed by the Central Water Commission (C.W.C.). In addition,, tlie various State Governments liave their own flood forecast stations to meet their respective particular needs.

The flood forecasts are communicated Io the concerned user authorities, at administrative and engineering levels, who liave to deal witli flood management. On receipt of tlie forecasts these agencies disseminate tlie warning to tlie officials concerned for taking steps like strengthening the flood protection measures and to those -concerned witli informing the public at risk and evacuating them/organising relief measures, if necessary.

Generally the State Governments set up control rooms at tlic State and local levels which receive the forecasts and disseminate the warnings to all concerned as also monitor tlie situation till the emergency passes off and situation becomes normal.

Tlie State authorities study the situation at different locations and indicate tlie danger levels in respect of all rivers witli which they are concerned. As some advance notice is needed and to maintain vigilance even before tlie danger level is reached by tlie river at that location, an alert is issued when the river level is one metre below the danger level. This is called tlie warning level. The warning and danger levels are required to be periodically reexamined and revised as necessary. The district administration liave usually well laid rules and instructions about the various steps to be taken when the warning is received. Different means of communication channels and equipments are utilised to disseminate the warnings quickly.

Tlie management of flood forecasting and warning services requires skilled and responsible personnel. Tlie forecasting procedure involves trained hydrological and meteorological specialists while the warning and its wide dissemination are handled by tlie district administration.

In river systems which extend beyond the political boundaries of India, there often comes the need to receive useful data to indicate field conditions there so that flood forecasts become useful and reliable. In yet other cases there is a need to sharc sucli forecasts as also hydrometlogical data on shared river systems for mutual benefit and to be cooperative. India has sucli coopcrativc arrangements, existing or under contemplation, with tlie neighbouring nations as are mutually agreeable. Meteorological data exchange on a regional basis is also an existing practice.

Various approaches to deal with floods are available. As each situation is different, different adjustments or combinations thereof are chosen. Basically, however, these approaches fall under the following three groups:-

I) modify the tloods i.e. don fallow water to accumulate

2) modify the susceptibility of the people to flood damages

3) modify tlie loss burden inflicted by floods

Modification of floods would involve such measures as weather modification, catchment and landuse modification, physical control works such as reservoirs, embankments etc. Modification of the susceptibility of the people to floods would involve steps like flood forecasting and warning, flood proofing, and floodplain management. Modifying tlie loss burden would involve steps like emergency evacuation, flood fighting, public health aspects as also flood insurance, and disaster relief.

Structural measures such as storage reservoirs merely for flood relief could be very uneconomical, whereas multipurpose scheme for many other benefits in addition to flood control are economically viable. However, in such cases, there is tlie likely problem of clashing priorities and conflicting requirements. Similarly embankment schemes are not unmixed blessings. Maintenance of these costly structures also involves difficulties and constraints such as inadequate provision of funds. These have led to a greater emphasis being laid on non-structural measures sucli as flood forecasting and flood plain management which are tlie basic elements of flood preparedness.

6.5 PREPAREDNESS

Disaster preparedness could be defined as the detailed planning for the prompt and efficient response immediately as soon as the anticipated event materialises. This effort has to be very comprehensive inclusive of public education and awareness campaign ahead, provisions for the issuance of timely warnings, development of orderly evacuation plans, and preparations for providing the evacuees with food, clothing and shelter on emergency basis. The moment the disaster strikes will also mark the start of the emergency response period. The immediate onsite responses are spontaneous actions of local residents but their effectiveness could be improved by advance training. The speed and efficiency of the community reaction to save lives and mitigate suffering and losses is determined by adequate planning, training and rehearsals.

In the context of floods, it is well known that floods damage human settlements, necessitate evacuation to safer areas, damage crops and disrupt farming, wash away infrastructure items like irrigation, communication etc. and make land unusable. Disaster preparedness should also deal with all these aspects and other connected matters.

The vary basic step in vulnerability reduction will be to identify such high risk areas, prepare risk maps showing the likely risks at different probability levels of floodings and make this knowledge available widely.

The National Flood Commission (1980) set up by tlie Government of India made a comprehensive study of the flood management scene in India and made many valuable recommendations or flood management including flood disaster and cyclone disaster mitigation steps needed. The Government of India and the various State Govts. are also engaged in identifying and implementing the many steps needed to be taken in different parts of India to take care of local conditions. These steps include those on flood disaster preparedness.

6.6 MITIGATION WITH SPECIAL REFERENCE TO FLOOD PLAIN ZONING

Advance warning and evacuation, shifting away of valuable moveable properties and such measures cannot do much to prevent property damage or crippling economic impacts associated with flood disasters. This is a sphere where mitigation measures can be of great help. All actions taken to reduce the risks to lives and property and disruption from a natural hazard either by modifying the hazard or reducing the vulnerability are called mitigation measures.

Modification of tlie hazard in flood related disasters is possible through some structural measures like construction of storage reservoirs, particularly with provision of flood reserve. However there are many nonstructural measures which offer great scope for mitigation. Adoption of a suitable flood plain zoning and regulation mechanism is one such effective measure.

The concept of flood plain zoning and regulation is based on the recognition that the floodplain is an integral part of tlie river system, even though the river uses it only occasionally to pass down flood flows. Whenever the floodplain is free from water, it is beneficially used as a part of the land system Tor agriculture of other economic activities. The purpose of the land regulation is to enable a land use which takes advantage of the benefits offered by the floodplain while simultaneously reducing the damage potential likely during the inevitable periods of flooding thereof. Flood plain management would cover land use regulation, statutes, zoning ordinance and Government purchase of property and relocation.

In 1957 the Central Flood Control Board accept, in principle, the enactment of legislation for demarcating flood zones and preventing indiscriminate development of flood plains, occupation or cultivation of lands of rivers and drainage channels. As a view was taken that the matter lay within the competence of the State Govts. a model bill could be circulated by the Central Govt. Accordingly the union Govt. circulated a draft bill in 1975. The National Flood Commission pursued tlie issue with the States. Their Report (1980) recommended that flood plain management measures should be undertaken wherever the necessary legislation existed and suitable legislation enacted in other States.

The guidelines circulated by the Central Water Commission on flood plain zoning envisages the following:-

i) Demarcation of areas liable to floods on large scale maps

ii) demarcation of areas likely to be inundated for different flood frequencies (say 1 in 25, 1 in 50 and 1 in 100 years)

iii) delineation of the type of use to which the different zones as demarcated in flood plains could be put to.

Different priorities for different types of uses are envisaged. Important buildings used as defence installations, public utilities like hospitals, commercial centres, should be located above the level corresponding to 1 in 100 years flood. Next in order of priority Govt. offices, public libraries, residence etc could be built above

the 1 in 25 year flood level, with the stipulation tliat they be built on stilts or higher levels. Parks, playgrounds parking places could be allowed even in areas liable to frequent floods. There are other types of precautions like stipulating that buildings in areas liable to flood should be double/multi storeyed.

The National Water Policy adopted in 1987 deals with all aspects of water including flood management. It has recommended that "an extensive network of flood forecasting station sliould be established for timely warning to tlie settlements along with regulation of settlements and economic activity in flood zones, to minimise tlie loss of life and property on account of floods. While physical flood protection works like embankments and dykes will continue to be necessary, the emphasis should be on non-structural measures for minimisation of losses, such as flood plain zoning so as to reduce the recurring expenditure on flood relief'.

In short, flood plain regulation or zoning aims at dissemination of information on the locations, extent of area and the likely intensity and frequency of flooding at different probabilities, so as to regulate indiscriminate and unplanned development in the floodplains to reduce loss.

6.7 ADVERSE EFFECTS OF FLOODS

All over the world, and throughout history, natural disasters have imposed human suffering and extracted heavy toll of losses. Recent instances have revealed tliat it is not merely the developing countries that have so suffered. The loss in some of the highly developed Nations' is mind boggling notwithstanding the high standards of construction and extensive protection measures that they had undertaken.

Apart from the casualties, injuries and disablement, many sections of the population get affected by the floods. Cropped area gets submerged, eroded and strewn with sand leading to loss of crop production and consequential disruptions. Many houses are destroyed completely; others are damaged. Damage and loss to public and private utilities and industrial disruptions occur. Breakdown of economic activities occurs with corresponding loss of wealth.

Apart from these adverse socioeconomic impacts on tlie affected community, floods also bring about significant geomorphological changes in river channels, flood plains and coastal areas. Often, floods change land forms though tlie processes of erosion shifting arid sedimentation.

Check Your Progress 2

Note: (i) Use the space given below for your answers.
(ii) Check your answers with those given at the end of the unit.

1. Explain mitigation measures.

2. Discuss the guidelines circulated by Central Water Commission of floods/plains zoning.

3. Briefly discuss adverse effects,of flood.

6.8 LET US SUM UP

Natural disasters have very often exacted a heavy toll of death, destruction and human suffering. Among the types of natural disasters, floods occupy a prominent position. While floods and flooding have always been experienced from the earliest days, the damage and economic disruption due to floodings have been on an upswing which trend is alarming. We seem to be paying too high a price for our unwise and indiscriminate use of land in the flood plains. This is even more regrettable when we realise that it is possible to reduce the loss significantly by means of wise regulation and recourse to some mitigative measures such as flood plain zoning.

India is one of the most flood prone countries of the world. India's own past experience has shown that our flood losses could be minimised by a set of desirable disaster mitigation steps. India has been a pioneer in flood forecasting. There are sound policy initiatives evolved through much experience and experimentation. However the progress in executing such desirable measures needs to be accelerated.

6.9 KEYWORDS

Catchment : The area from which a lake or a river receives water flow.

Coastal flooding : Flooding caused near the sea face or in the delta region nearby the high winds, tides, waves from highwinds/surges etc.

Discharge : Volume of water poured out.

Drainage congestion : Flooding by impeded flow where the river bed is higher than the surrounding land, due to obstructions to flow or embankments without adequate drainage provisions etc.

Floodplain : The area of land encroached by the flood water

1 in 100 years flood : The type of flood that is likely to occur once in about 100 years.

Urbanization : Growth of big cities; shift of population from rural areas to big city areas,

6.10 EPERENCES AND FURTHER READINGS

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6.11 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

1) Your answers should include the following points :

- The term flood is generally defined as a relatively high flow in a river and the inundation of low land which might result there from.
- Areas are stated to be flooded when water due to rainfall and/or river spill is unable to drain off within a quick span of time. This type of situation is a drainage congestion problem.
- In essential terms, floods are due to imbalance between inflow and outflow of where Drainage is very important for maintaining good outflow.

2) Your answers should include the following points:

The principal factors can be classified under three groups.

- climatological,
- hydrological and environmental conditions,
- local geomorphology of the flood plain.

3) Your answers should include the following points :

- nature of settlement on floodplain,
- reduction of water absorbing capacity (or moderating capacity) of land,
- lack of awareness of flood hazard
- risky infrastructure elements : nonresistant construction,
- livestock, crops and other stocks that are unprotected,
- boating and fishing activities and infrastructures,
- unprepared administration and population.

Check Your Progress 2

1) Your answers should include the following points :

- Structural measures such as construction of reservoirs and embankments but these are very costly.
- Non-structural measures such as .flood forecasting, and flood plain zoning are very effective.

2) You! answers should include tlie following points :

- The guidelines circulated by the Central Water Commission of flood plain zoning envisages the following :-
  - i) demarcation of areas liable to floods on large scale maps,
  - ii) demarcation of areas likely to be inundated for different flood frequencies (say 1 in 50 and 1 in 100 years), and
  - iii) delineation of the type of use to which the different land zones as demarcated in flood plains could be put to.

3) Your answers should include tlie following points :

- Apart from the casualties, injuries and disablement, many sections of the population get affected by tlie floods.
- Cropped area gets submerged, eroded and or strewn with sand leading to lose of crop production and consequential disruptions.
- Many houses are destroyed completely, others are damaged
- Damage and loss to public and private utilities and industrial disruptions occurs.
- Breakdown of economic activities occurs with corresponding loss of wealth.
- Geomorphological changes such as tlie rivers changing course or land forms changing due to erosion, shifting or sedimentation caused by floods.

UNIT 07 CYCLONE

Structure

7.0 OBJECTIVES

After studing this Unit, you should be able to :

- discuss the characteristics of cyclone as a natural disaster,
- highlight the effects of cyclone,
- identify the components of cyclone forecasting and warning system, and
- describe the preparedness and risk reduction measures.

7.1 INTRODUCTION

Cyclones are one of the most disastrous natural hazards in the costal areas of the tropics and are responsible for deaths and destruction more than any other natural calamities. Cyclones bring with them extremely violent winds, heavy rain causing floods and storm surge causing coastal inundation.

Cyclones form over the warm ocean waters (sea surface temperature of the order of 26^0 C or 27^0C) little away from the equator within the belt of 30^0 N and 30^0 S. In our area, cyclones form in the Bay of Bengal and the Arabian Sea. As they move westward or northwestward, those forming in the Bay of Bengal come to the Indian territory while those forming in the Arabian Sea generally go away from India but sometimes they turn around to hit Gujarat.

7.2 CHARACTERISTICS

Tropical cyclones are large, rotating, atmospheric phenomena extending horizontally from 150-1000 km and vertically from surface to 12-14 km. These are intense low-pressure areas with a spiral shape. Fierce winds spiraling anti-clockwise in the northern hemisphere blow around the cyclone centre. Cyclones generally move 300-500 km in 24 hours over the ocean.

Cyclones develop from areas of low atmospheric pressure and go through the stages of depression and deep depression before attaining the category of cyclone. They can intensify further to attain categories of severe cyclonic storm, very severe cyclonic storm and ultimately super cyclone when the winds in the storm are of the ferocious speed of 220 kmph or more. Each category is recognised on the basis of wind speed as indicated below:

Table 7.1

	Categories	Maximum Wind Speed in the Storm
1.	Low Pressure Area (L)	<30 kmph
2.	Depression (D)	30 to 50 kmph
3.	Deep Depression (DD)	50 - 60 kmph
4.	Cyclonic Storm (CS)	60 - 90 kmph
5.	Severe Cyclonic Storm (SCS)	90 - 120 kmph
6.	Very Severe Cyclonic Storm (VSCS)	120 – 220 kmph
7.	Super Cyclonic Storm	>220 kmph

A well developed cyclone consists of a central region of light winds known as its "Eye". The eye has an average Diameter of about 20 to 30 km, but it can be 40 to 50 km in large cyclones. The eye is an almost cloud-free zone and it is surrounded by a ring of clouds with very strong winds and heavy rain. This area is known as zone of maximum wind. Surrounding this region, winds spiral in the counterclockwise direction in the northern hemisphere, extend outwards to large distances, with speeds gradually decreasing towards the outer boundary of the cyclone.

On an average, about 5-6 cyclones form in the Bay of Bengal and the Arabian Sea every year, out of which 2 or 3 may be severe. More cyclones form in the Bay of Bengal than in the Arabian Sea. The ratio is 4:1. Tropical cyclones in these seas generally form between 5^0 N and 20^0 N. There are two distinct seasons of cyclones in our area. One is from April to June (Pre-monsoon) and the other is from October to mid-December (Post-monsoon). May, June, October and November are known for severe cyclonic storms.

Almost the entire east coast is vulnerable to cyclones with varying frequency and intensity. In the west coast, the north west coast (coast north of Mumbai) is more vulnerable as compared to southwest coast (South of Mumbai).

Check your Progress 1

Note: (i) Use the space given below for your answers.
(ii) Check your answer with those given at the end of the unit.

1) What is a tropical cyclone?

2) While developing from an area of low atmospheric pressure, a cyclone goes through different stages of growth before attaining the category of super cyclone. List these stages of development.

3) What are the months in which cyclones occur in India?

7.3 FORECASTING AND WARNING SYSTEMS

Cyclone forecasts are provided through six cyclone warning centres located at Calcutta, Bhubaneswar, Visakhapatnam, Chennai, Mumbai and Ahmedabad. These centres have their distinct area wise responsiblities covering both the east and west coasts of India and the oceanic areas of tlie Bay of Bengal and tlie Arabian Sea, including Andanian & Nicobar and Lakshadweep. Cyclone warnings are issued to tlie All lndia Radio (AIR) and tlie Doordarslian for broadcast/telecast in different languages. Cyclone warnings are also given to control room and Crisis Management Group in the Ministry of Agriculture, Government of India, who are finally responsible for coordinating various activities of Centre and State Governments and other agencies in respect of cyclone warnings. Forecasts and warnings are simultaneously communicated to tlie States and the Districts likely to be attached. Ports, airports and other user agencies also receive the forecasts and warnings at the same time.

Cyclones are tracked with tlie help of INSAT, powerful cyclone detection radars and conventional meteorological observations including weather reports from ships. At present cyclone detection radars are installed at (i) Calcutta, (ii) Paradip, (iii) Visakhapatnam, (iv) Machilipatnam, (v) Chennai, (vi) Karaikal on the east coast; and (vii) Goa, (viii) Cocliin, (ix) Mumbai and (x) Bhuj along the west coast, Present cyclone surveillance system in lndia is such that no cyclone in tlie region will go undetected at any time of its life cycle.

.The important components of cyclone warnings are tlie forecast of future path and intensity of a cyclone and the associated hazardous weather. For tlie preparation of future position (path) of tropical cyclones and for estimation of storm surges, modern computer based techniques are used in addition to conventional methods. Intensity forecasts are made by using satellite techniques.

Cyclone warnings are provided in four stages. In its first stage, "Pre-Cyclone Watch" is maintained regularly during the cyclone seams and is intended to

provide an early warning if conditions mature for a cyclonic disturbance to take birth on the seas. In the second state, a "Cyclone Alert" is issued 48 hours before the anticipated time of commencement of adverse weather along the coast. In the 3rd stage, a "Cyclone Warning" is issued 24 hours before the cyclone's anticipated landfall and is updated frequently. Warnings for the ports and fisheries start much earlier. Ports are warned day and night through a specially designed port warning system. Informatory messages on cyclones are issued to All India Radio and Doordarshan much earlier, as soon as a tropical cyclone is detected in the Bay of Bengal or in the Arabian Sea. Lastly, the 4th stage of warning comprises the "post-landfall scenario" which commences about 12 hours before anticipated landfall and continues so long as cyclone-force winds (60 kmph or more) are effected in the affected areas overland.

Cyclone warnings are disseminated through the following means:

- Telegrams with highest priority,
- Telecast through Doordarshan,
- Broadcast through AIR,
- Bulletins to the press,
- Broadcast through Department of Telecommunications, Coastal Radio Stations for ships in the high seas and coastal areas,
- INSAT based Disaster Warning System, and
- Point to point direct channels to the Central and State Government functionaries and other user agencies.

In addition to above, cyclone warnings are disseminated through teleprinters, telex, facsimile and telephones wherever such facilities exist with the recipients.

The warning bulletins are issued normally at hourly intervals, but more frequently when needed. Likely areas threatened by cyclone, heavy rainfall, magnitude of destructive winds and probable inundation of coastal areas by storm surges are some of the elements included in the bulletins. On receipt of warnings, the Government officials and other authorities take appropriate measures to safeguard lives if necessary by evacuating people from vulnerable areas to safer places.

Landline telegram, telex and telephones are often aniong the first casualty during a cyclone situation because the overhead lines and underground cables are affected by strong winds and heavy rain during cyclone. To overcome this difficulty, a satellite based dependable and unique communication system known as Disaster Warning System (DWS) has been developed in India. Through this system, rapid and direct dissemination of cyclone warnings in local languages is made via INSAT satellite to designated addresses in the vulnerable areas. At present, Disaster Warning System is working along coastal areas where about 250 DWS sets have been installed in places such as blocks, taluq offices and police stations. Disaster warning sets are also located in the H. Q. of Coastal States and Districts. The system has been successfully utilized in cyclone situations and found to be very useful. About 100 more DWS sets are to be installed in the coastal areas.

7.4 PREPAREDNESS

The preparedness means measures which enable government agencies, private organizations, communities, and individuals to respond rapidly and effectively to disaster situations. The preparedness measures include the formulation of viable disaster mitigation plans.

The preparedness actions have to be planned ahead of disaster. It would consist of a plan of action to be implemented on the receipt of the Cyclone Alert message from Cyclone Warning Centre. A cyclone alert is issued generally 48 hours before tlie possibility of tlie area being affected by cyclonic weather such as strong winds, heavy rain and storm surges. The Action Plan would indicate how evacuation of people would be effected and the places where they could be evacuated to. The identification of strong buildings which would withstand the fury of the storm is an important segment of preparedness action plan. The safe storage of non-perishable food and other essential needs, adequate collection of stocks of drinking water and medicines, has to be made. Most of the maritime states have prepared Cyclone Disaster Preparedness handbooks or manuals, where action plans of various organizations have been indicated in the case of cyclone threat. It is desirable that as an essential component of preparedness, the action points indicated in the manuals are rehearsed at the beginning of each cyclone season and updated in the light of experience gathered.

To deal with cyclone situation a contingency plan has been evolved by the Ministry of Agriculture, who is the nodal agency at the Centre to co-ordinate the activities of various Central departments and the affected State/States to cope up with tlie natural disaster in general.

Training programmes for the disaster management officials and Non-Government Organisations (NGOs) are arranged by tlie disaster management faculties of several management and public administration institutions in India. The Certificate Course in Disaster Management conducted bi-annually by tlie Indira Gandhi national Open University (IGNOU) is available to all in more and abroad in a distance learning mode. IGNOU is also planning to introduce Post Graduate Diploma Course in Disaster Management.

7.5 RISK REDUCTION MEASURES

The prevention of tropical cyclone formation is not within the realm of possibility. However, tlie loss of human lives and destruction of properties can be minimised by adopting prescribed short and long term measures for risk reduction. While cyclone warning system is the most important constituent of short term risk reduction measures against cyclone disaster, the risk assessment of tropical cyclone falls under long term measures.

As prevention of formation of tropical cyclone is not in tlie realm of possibility, definite structural and non-structural preventive measures of long term nature can be undertaken to mitigate the suffering of cyclone affected people. Structural measures like construction of cyclone shelters, embankments, dykes, reservoirs and coastal afforestation are some of the long-term risk reduction measures for cyclone disasters. Creation of proper awareness, training and education of people in the vulnerable communities, introduction of insurance are some of the useful non-structural measures..

7.6 EFFECTS

Severe tropical cyclones are responsible for large number of causalities and considerable damage to property and agricultural crop. The destruction is confined to the coastal districts and tlie maximum destruction being within 100 km from the centre of the cyclone and on the right side of the storm track. Principal dangers from a cyclones are : (i) very strong winds, (ii) torrential rain, and (iii) high storm tides. Most casualties are caused by coastal inundation by

storm surge. Maximum penetration of storm surges varies from 10 to 20 km inland from the coast. Heavy rainfall and floods come next in order of devastation. They are often responsible for much loss of life and damage to property. Death and destruction directly due to winds are relatively less. The collapse of buildings, falling trees, flying debris, electrocution, aircraft and ship accidents and disease from contaminated food and water in the post-cyclone period also contribute to loss of life and destruction of property.

Floods generated by cyclone rainfall are more destructive than winds. Rainfall of the order of 20 to 30 cm per day is common.

As mentioned, the worst danger emanates from the storm surge. In the storm centre, the ocean surface is drawn upward by 30 cms or so above normal due to the reduced atmospheric pressure in the centre. As the storm crosses the continental shelf and moves coastward, the mean water level increases. This abnormal rise in sea level caused by cyclone is known as storm surge. The surge is generated due to interaction of air, sea and land. The cyclone provides the driving force in the form of very high horizontal atmospheric pressure gradient and very strong surface winds. As a result, the sea level rises and continues to rise as cyclone moves over increasingly shallower water as it approaches coast, and reaches a maximum on the coast near the point of landfall (Point of crossing coast). Surge is maximum in the right forward sector of the cyclone and about 50-100 Km from the centre coinciding with the zone of maximum wind. Winds in this sector is from ocean to land.

Due to improvement in cyclone warning system and adequate and timely steps taken by the government and other agencies, it appears to be some stabilization (in spite of large population growth especially in coastal areas) on the loss of human lives, although loss of properties shows an appreciable increasing trend. The increase in the loss of properties is due to increased but unplanned human activities. E-engineered and non-engineered canstructions along the coast also contribute to the damage suffered by property. In support of the above statements we present some data on recent cyclones in the table 7.2 below. It may be seen that although the May 1979 and May 1990 cyclones, which occurred in the same coastal area of Andhra Pradesh and had the peak wind speeds of the same order, yet the loss of human lives in the case of the 1990 cyclone was of the same order comparison to that of 1977 cyclone but the economic losses were many times more in the 1990 cyclone.

Table 7.2

Cyclone	Peak Wind Speed	Human Loss Lives	Loss of Property (Millions Rupees)	Month & Year
Chirala	260	8547	3500	November 1977
Machilipatnam	210	700	11700	May 1979
Sriharikota	210	604	4000	November 1984
Machilipatnam	235	967	22480	May 1990
Paradip	260	9887	--	October 1999

Check your progress 2

Note: (i) Use the space given below for your answers.
(ii) Check your answers with those at the end of the unit.

1) What are the characteristics of the "eye" of a cyclone?

2), What are "Cyclone Alert" and "Cyclone Warning"?

3) Write a few lines on Disaster Warning system?

7.7 LET US SUM-UP

In this Unit, we have discussed the highly disastrous phenomenon of cyclone. The characteristic features of cyclone and their occurrence in the Indian seas have been described. The well-developed and operationally-proven forecasting and warning system has been discussed. Special mention has been made of the INSAT based Disaster Warning System for cyclone warning. Preparedness plans and Risk Reduction measures have been enumerated. Finally, the destructive effects of cyclones have been described.

7.8 KEY WORDS

INSAT : Indian National Satellite (Geostationary)

Inundation : Flooding.

Landfall : Time of cyclone hitting the coast. Also the place where cyclone hits the coast.

Continental Shelf : Generally sloping ground (under sea water) in a coastal region; the continental shelf is generally taken to extend in the sea upto a depth of 183 metres (600 feet).

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7.10 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check your Progress 1

1) Your answer should include the following points:
   - Cyclone is a large, rotating atmospheric phenomenon. It may extend 150 to 1000 kms in width and 12-14 kms in height.
   - It has fierce winds and gives torrential rains.
   - It occurs over seas and comes to coastal areas where it creates devastation.

2) Your answer should include the following points:

   The stages of development of a cyclone are as follows:
   - Low Pressure area (L)
   - Depression (D)
   - Deep Depression (DD)
   - Cyclonic Storm (CS)
   - Severe Cyclonic Storm (SCS)
   - Very Severe Cyclonic Storm (VSCS)

     Super Cyclone (SC)

3) Your answer should include the following points:

   April, May and June (Pre-monsoon season)
   - October, November and December (Post-monsoon season)

Check your Progress 2

1) Your answer should include the following points:
   - Eye is the calm, cloud free, centre of cyclone.
   - Its size varies from 20 to 50 kms in diameter.
   - It is surrounded by a ring of clouds with heavy rain and very strong winds.

2) Your answer should include the following points;

- Cyclone Alert is the advance warning issued 48 hours before the anticipated commencement of adverse weather on coast.
- Cyclone Warning is issued 24 hours before the anticipated landfall of cyclone and is updated frequently.

3) Your answer should include the following points:

- Disaster Warning System (DWS) is operated via INSAT Satellite.
- Through it, warnings are sent in local language from Cyclone Warning Centres to designated recipients in the vulnerable region.
- It is very reliable because the normal communication channels breakdown during cyclone but DWS, being a satellite operated service, works.

UNIT 8 DROUGHT AND FAMINE

Structure

8.0 OBJECTIVES

After studying this Unit, you should be able to :

- discuss the meaning and charactel-istics of drought and famine,
- explain the factors affecting vulnerability to drouglit,
- highlight the drought preparedness and mitigation measures,
- describe the typical effects of drought.

8.1 INTRODUCTION

Drought can be defined as lack or shortage of water for an unusually long period. It can occur at any place causing anything from inconvenience to deaths through famine.

When the rains fail, the effect can be disastrous; no drinking water, crops die, people starve. In industrial communities, droughts can cause water scarcity and closing down of various economic activitics. In this Unit, the focus of discussion will be drought, its characteristics, predictability, forecasting and warning System. An attempt will be made to describe vulnerability, mitigation and typical effects of drought situation.

8.2 DISTINCTION BETWEEN DROUGHT AND FAMINE

Drought results in shortfall in agricultural production and hence, may cause food shortages. However due to reduced purchasing power of the, poorer sections of the society and if timely help is not available from the community or government, the situation can lead to famine.

Reduced production of food is only one of several problems; secondary effects include reduced rural employment; which results in loss of income and reduction of purchasing power for buying food. Drought causes crop 'failure, but mismanagement of the drought mitigation measures can cause famines.

Droughts

There are three different types of droughts namely meteorological, hydrological and agricultural,

Meteorological drought, describes a situation where there is a reduction in rainfall for a specified period (day, month, season or year) below a specified amount - usually defined as some proportion of the long term average for specified time period. Its definition involves only precipitation statistics.

Hydrological **drought** involves a reduction in water resources (stream flows, lake levels, ground water, underground acquifers) below a specified level for a given period of time. Its definition involves data on water availability and off take rates in relation to the normal requirements of the system (domestic, industrial, agricultural) being supplied. In case of rivers fed by snowmelt, irrigated areas downstream may experience reduced water availability as a result of reduced snowmelt caused by below normal temperatures during the summer months. Areas drawing water from underground acquifers through wells and borewells may experience hydrological drought as a result of geological changes which cut off parts of the acquifer. Overutilization of the acquifer may also result in its exhaustion.

Agricultural drought is the impact of meteorological and/or hydrological droughts on crop yields. Crops have particular temperature, moisture and nutrient requirements during their growth cycle in order to achieve optimum production. If moisture availability falls below the required amount during the growth cycle, crop growth will be impaired and yields reduced. Howcvcr, droughts have different impacts on different crops, e.g., sesame often thrives in dry (season) years. Because of the complexity of the relationships involved, agricultural drought is difficult to measure. A fall in yields may be due to insufficient moisture but it may also stem from, or have been aggravated by, such factors as the unavailability of fertilizers, lack of weeding, the presence of pests and crop diseases or the lack of labour at critical periods in the growth cycle. Also these factors can interact with each other and complicate the conditions.

Famines are caused by either or both of the following reasons:

a) decline in the availability of food

b) reduction in people's access to, or their ability to acquire food.

It was generally believed that the only cause of famine is a decline in food availability due to a reduction in production resulting from adverse weather, disease/pest infestation or through a cutting off of sources of supply. I-Iowever, over the last century there has been a growing realisation that famines can also occur in areas where overall food availability has not declined, but as a result of a reduction in the ability of certain disadvantaged or economically weak groups within the population to acquire food, for instance as a result of a loss in their income or a sudden rise in the price of food.

Decline in food availability may be caused by a range of "natural" and human-induced-factors.

Natural factors are :

- agricultural drought
- floods
- unseasonal cold spells/frosts
- crop disease
- pest infestation

Human induced factors are :

- conflict preventing farmers from planting, weeding, harvesting and selling or possibly, involving the physical destruction of standing crops.
- external economic shocks, e.g., sudden increases in the price of agricultural inputs (power, fertilizers, pesticides, good seeds) or appreciable fall in the sale price of agriculture produce.
- Unchecked hoarding
- Disruption in movement of food grains from one part of the country to the other either due to natural hazards or dislocation due to'civil strife.
- internal macro economic conditions, e.g., poor agricultural pricing policies discouraging farmers from growing food crops (as against cash crops).

8.3 CHARACTERISTICS OF DROUGHT

A drought is characterized by scarcity of water. As an agricultural drought affects most as compared to a meteorological or hydrological drought, it is the agricultural drought which is of common concern. Infact when the word drought is used, it commonly connotes agricultural drought.

Main characteristics of drought (agricultural drought) are:

- It builds over a period of time (may be even a year or two) with increased scarcity of water "generally due to insufficient or erratic monsoon rains.
- It does not have a well-defined start. It is a creeping phenomenon.
- Generally it does not have a sharp ending although sometimes a prolonged spell of drought can come to a sudden end through a fairly long spell of specially heavy rainfall as in case of depression or cyclone.
- Drought can be localized covering a district or a group of districts. On the other hand, it can be widespread covering a few states.
- Area affected by a drought usually takes an elliptic shape instead of a circular coverage.
- Although drought can occur anywhere if there is prolonged scarcity of water, the regions most prone to droughts in India are :
  - Gujarat
  - West Rajasthan
  - Marathwada
  - Telangana
  - Rayalseema
  - Madhya Pradesh
  - Some parts of Orissa (Kalahandi and adjoining districts)
  - Some parts of Karnataka, Tamil Nadu, Haryana, Bihar and U.P.
- Drought is more troublesome when it occurs over the rainfed areas of the country.

8.4 PREDICTABILITY, FORECASTING AND WARNING

Predictability

As drought is very much linked with the performance of the monsoon, the predictability of drought is also linked to the monsoon. But monsoon, by its inherent nature is highly variable in time and space which means that rainfall is neither uniform nor evenly distributed. For good agriculture, well distributed and evenly spaced spells of monsoon rain are required. But in actual circumstances, it is rarely so. However, the good feature is that monsoon rains arrive towards the end of May or early June even if there is a delay of few days and the monsoon never fails the entire country. Thus, widespread drought is not a very frequent occurrence in India. This inherent characteristic of the monsoon rains (which provide about 80% of the annual rainfall in India) emphasizes that the predictability of droughts in India - either on local scale of district or a group of districts or on larger scale of a state or group of states - is achievable on a working basis of monitoring the rainfall - especially the monsoon rainfall - over the target region and taking into account the antecendant rainfall history of last one or two monsoon seasons.

Forecasting

We have already referred to the intimate link between the performance of monsoon and the incidence of drought. Therefore, it should be obvious that forecasting of drought is almost wholly linked to the ability to forecast monsoon, i.e., to forecast its timely onset and the season's rainfall.

It is within the capability of science to indicate broadly the date of onset of monsoon over Kerala and to give a forecast of the overall rainfall for the country as a whole during the monsoon season which lasts from June to September. It is also possible to issue day to day forecasts of the progress of monsson over different parts of the country. Therefore, the occurrence of rain over all parts of the country is closely monitored and analysed keeping in view the rainfall history of the previous years. Thus, it is possible to idicate the likelihood of drought over an area and to monitor its subsequent condition.

However, it has to be kept in mind that as already stated, drought does not have a sharp starting point. It builds over a period of time when apart from the availability of rains, factors such as water use and availability of additional water resources (from rivers, tubewells) has to be taken into account.

Warning

Of the main natural disasters, droughts are unique in terms of length of time between the first indications from, for example, rainfall monitoring that a drought is developing and the point at which it begins to impact significantly upon the population of the affected area. The requirement of the length of such "warning time" varies significantly between societies.

Early warning system indicators are :

- Meteorological
- Agricultural
- Remote sensing

However, the Agriculture and Revenue Departments of the States remain watchful during tlie dry weather seasons and the situation is monitored regularly especially for those areas which are known to be drought prone due to local climatic conditions, scarcity of ground water and absence of irrigation facilities.

As drought is forecast and monitored, on the basis of the availability of water (mainly through monsoon and from underground sources to some extent), meteorological forecast and warning systems and satellite monitoring of underground water sources and tlie condition of growing crops constitute the basis of drought monitoring and warning system.

Check Your Progress 1

Note: i) Use the space given below for your answers.
ii) Check your answer with that given at the end of the Unit.

1) Briefly describe the distinction between drought and famine.

2) Discuss the characteristic features of a drought.

3) Discuss briefly tlie predictability of droughts in India.

8.5 VULNERABILITY

Factors contributing to vulnerability to droughts are the following:

- monsoon rains are deficient,
- lion-irrigated agricultural lands,

- source of water for irrigation dries up,
- low moisture retention in soil,
- deficiency of moisture at critical stage of crop growth,
- farmers can't adapt to drought or do not get alternative seeds, and
- lack of alternate sources of income for those rendered jobless due to drought.

Vulnerability, from economic angle reduces the demand within the economy generally, increases defaults on loans in rural sector and reduce govt. revenues. Drought affects national budget as it costs heavily to govt. for organizing relief measures.

Droughts result in reduced income of farmers and agricultural labourers, reduced spending locally on agricultural inputs and equipment and non-agricultural items and services like price of livestock as farmers are forced to sell because of increases in the cost of fodder and agricultural inputs.

inability of more vulnerable sections within the population to afford increased food prices results in the following:

- switch to cheaper and sometimes less preferred food.
- reduction in overall food intake leading to malnutrition and starvation.
- borrowing to maintain food intake.
- Poor hygiene, disease.
- selling assets to raise funds.
- engaging in alternative income earning activities locally.
- migrating in search of employment opportunities.
- migration to where relief food is being distributed.

Drying-up of water sources leads to reduction in water quality, the need to travel further to collect water and possibly migration to better water sources. Increase in competition for access to dwindling water sources may lead to increase in incidences of local disputes/conflict.

Drought also leads to substantial reduction in industrial production especially in tlie industries requiring considerable amount of water such as plastic, paper, textile and petroleum industries. Lack of hydroelectric power generation and poor health of workers also affect industrial production and increase tlie economic vulnerability.

Education is another sector vlunerable to drought. It leads to loss of education, due to fall in school attendances by children lacking energy and/or money for fees, plus the need for them to assist other family members in water collection and income generating activities. Social costs of migration are also very heavy on account of break-up of communities and families.

8.6 MITIGATION

The commonly adopted mitigation strategies are as follows:-

- Check dams to store water.
- Watershed management.
- Water-rationing.

- Cattle management.
- Proper selection of crop for drought affected areas.

  Leveling, soil conservation techniques.
- Reducing deforestation and firewood cutting in the affected area.
- Checking of migration and providing alternate employment for people in government sponsored relief schemes or village cooperatives and non-governmental programmes.
- Education and training to the people.
- Participation in community programmes, e.g., pani-panchayat in Maharashtra, Sukhomajri experiment in Punjab, and Anna Hazare's work in Rale gaon Sidhi Village in District Ahmednagar of Maharashtra.

a) **Improvement in Agriculture** through modifying cropping patterns and introducing drought-resistant varities of crops.

b) **Management of Rangeland** with improvement of grazing lands, improved grazing patterns, introduction of feed and protection of shrubs and trees.

c) **Development of Water resource system** with improved irrigation, development of improved storage facilities, protection of surface water from evaporation, and introduction of drip irrigation system.

d) **Animal Husbandary** activities can help in mitigation with the use of improved and scientific methods, increasing outputs without destroying the echo-system.

The first step in drought mitigation is to identify areas that are at risk. In this situation, historical records can be analysed. After the identification of vulnerable areas, priority zones sliould be established. Then comprehensive and integrated development programmes should be initiated.

8.7 TYPICAL EFFECTS OF DROUGHT

Effects of Drought

PRIMARY	SECONDARY (Short & Long term)
• Loss of Crops, Loss of agricultural production • Loss of Livestock and other animals • Loss of water for drinking and hygienic use • Loss of hyproductive power generation • Loss of industrial production	• Famine • Spread of disease and death • Loss of Livelihood • Changes in Settlement patterns and in social and living patterns • Major ecological changes including; - Increased desertification - Decreased scrub growth, and - Increased wind erosion of soils

Primary effects of drought mainly result from lack of water. However, the secondary effects of drought follow and result from the primary effects. In such circumstances, people begin to migrate in searcli of better grazing lands for their herds or to the cities to seek alternate source of income, If the dwindling supplies of food are not replaced, famine can occur, further accelerating the migration. The migration may in itself contribute to the spreading of the scope of the disaster, specially if grazing animals are moved with their masters. Long-term drought

results in permanent changes in settlement patterns and in social and living patterns. Among the ecological changes the desertification cycle is of the most concern. The whole process gradually spreads, bringing more and rnnore land under desert conditions.

Check Your Progress 2

Note: i) Use the space given below for your answers.
ii) Check your answer with that given at the end of the Unit.

1) List the situation that create or'aggravate droughts.

2) Briefly discuss the mitigation strategies or actions that can lessen the drought impacts,.

3) Drought impacts can be highly varied and widespread and are potentially one of the most destructive hazards. Discuss.

8.8 LET US SUM UP

This Unit has given an idea about the phenomenon of drought and its characteristics. The link between drought and famine has been discussed. It brought out the importance of predictability, forecasting and warning of droughts. If highlighted the problems of vulnerability and drew attention to the need for systematic mitigation strategies. Lastly, it gives clear understanding on the typical effects of droughts.

8.9 KEY WORDS

Animal Husbandry : breeding and care of domestic animals.

Desertification Technically, it occurs when the soil reaches a certain level of dryness and tlie land gradually takes on the characteristics of a desert.

Mitigation measures which can minimize the effects of hazards when they do occur. Mitigation measures may be of either "structural" or "non-structural" nature.

Rangeland grassland maintained for cattle grazing.

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8.11 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

1) Your answer should include the following points:

- Drought results in shortfall in agricultural production and hence may cause food shortages.
- Due to the reduced purchasing power of tlie poorer sections of the society and if timely help is not available from the community or governments, the situation can lead to famines.
- Drought causes crop failure, but mismanagement of the drought mitigation can cause famines.

2) Your answer should include tlie following points:

- It builds over a period of time with increased scarcity of water generally due to insufficient or erratic monsoon rains.
- It is a creeping phenomenon.
- Drought can be localized covering a district or a group of districts, or be widespread cover-up a state or a group of states.
- Area affected by a drought usually taltes an elliptic shape instead of a circular coverage.

3) Your answer should include tlie following points:

- As drought is very much linked with the performance of the monsoon, the predictability of drought is also linked to the monsoon.
- But monsoon, by its inherent nature is highly variable in time and space which means that rainfall is neither uniform nor evenly distributed.

For good agriculture, well distributed and evenly spaced spells of monsoon rain are required. But in actual circumstances, it is rarely so.

- The encouraging feature is that even if there is a delay of few days and the monsoon never fails tlie entire country.
- The seasonal forecast of mansoon rainfall helps in the predictability of droughts.

Check Your Progress 2

1) Your answer should include the following points:
   - monsoon rains arc deficient.
   - lion-irrigated agricultural lands.
   - source of water for irrigation dries up.
   - low moisture retention in soil.
   - deficiency of moisture at critical stage of crop growth.
   - fanners can't adapt to drought or do not get alternative seed.
   - lack of alternate sources of income for those rendered jobless due to drought.

2) Your answer should include the following points:

   The commonly adoptecl mitigation strategies are as follows:
   - construction of check dams to store water.
   - watershed management and water rationing.
   - cattle management and proper selection of crop for drought affected areas.
   - leveling, soil conservation techniques.
   - Reducing deforestation and firewood cutting in the affected area.
   - Education and training of the people.

3) Your answer should include the following points:
   - The effects of drought can be divided into primary and secondary.

     primary effects of drought mainly results in loss of crops, livestock and other animals, water for drinking and hygienic use, loss of hydroelectric power generation and loss of moustrial production.
   - Secondary effects of drought follow and result from the primary effects. More prominent secondary effects are: poor health, disease and loss of liveliliood.

     In such circumstances, people begin to migrate in search of better grazing lands for their herds or to the cities to seek alternate source of income.

     If the dwindling supplies of food are not replaced, famine can occur, further accelerating the migration, which coned lead to social conflict.

UNIT 9 LANDSLIDE AND SNOW AVALANCHE

Structure

9.0 OBJECTIVES

'After studying this unit, you will be able to:

- discuss the phenomena of landslide and snow avalanche,
- their characteristics, causes and effects,
  explain tlie preparedness and risk reduction measures.

9.1 INTRODUCTION

In this unit, we shall discuss landslides and snow avalanches which are hazards peculiar to mountain areas. Occurring in remote parts of difficult mountain terrain which is not easy to access, these particular hazards affect communities which are often isolated and without much outside support. These communities also have the handicap of being economically and educationally disadvantaged. These facts highlight the importance of studying landslides and snow avalanches and leaving about the preparedness aspects.

9.2 LANDSLIDES AND SNOW AVALANCHES: THE PHENOMENA

Webster's Third New International Dictionary (1971) defines these phenomena as follows:

Landslide: Rapid downward movement, under tlie influence of gravity, of a mass of rock, earth, or artificial fill on a slope. Also, the mass that moves or has moved downwards.

Snow Avalanche: Large mass of snow, ice, earth, rock, or other material in swift motion down a mountain side or over a precipice.

The Encyclopaedia Brittanica - Micropaedia (1985) gives fairly detailed descriptions of the two phenomena as follows:

Landslide: Also called landslip; Downward mass movement of earth or rock on unstable slopes including many forms resulting from differences in rock structure, coherence of material involved, degree of slope, amount of included water, extent of natural or artificial undercutting at the base of the slope. relative

rate of movement and relative quantity of material involved. Many terms cover these variations : creep. earthflow, mudflow, solifluction and clebris avalanche are related forms in which mass movement is by flowage.

If shearing movement occurs on a surface on consolidated rock, the dislocated mass is a debris slide. Cliffs may become so steep through undercutting by rivers, glaciers or waves that masses of rocks will fall freely and constitute a rock-all type of landslide.

Snow Avalanche: Large mass of snow or rock debi is that moves rapidly down a mountain slope sweeping and grinding everything in its path. An avalanche begins when a mass of material overcomes frictional resistance of the sloping surface. often after its foundation is loosened by rains or is rapidly melted by a warm and dry wind. Vibrations caused by loud noises such as artillery fire, thunder or blasting can start the mass in motion.

Some snow avalanches develop during heavy snowstorms and slide while snow is still falling but more often they occur after the snow has accumulated at the given site.

The Wet avalanche is perhaps the most dangerous because of its large weight, heavy texture and the tendency to solidify as soon as it slops moving. The dry type is also very dangerous because its entraining of great amounts of air makes it act like a fluid; this kind of avalanche may flow up the opposite side of a narrow valley. Avalanches carry a considerable amount of rock debris along with snow and therefore are significant geological agents; in addition to transporting unsorted materials to the bottoms of slopes, they may, if repeated, cause an important amount of erosion.

From tlie above definitions and descriptions, it will be seen that landslides and snow avalanches arc phenomena of mountain regions and both involve the swift and sudden movement of large masses of material falling or slipping down a hilly slope. While landslide involves rock, soil and mud; snow avalanche primarily involves snow. While landslide may occur even in smaller hills or rocky terrains, snow avalanches occur in high mountains with abundance of snow. Landslides involve loosened or weakened rocks and mud whereas snow avalanche brings down accumulated or overhanging snow mass although it may collect rock and other debris on its way. Both the phenomena can be triggered by their own weights or by vibrations and also due to loud noises. Earthquakes or even minor tremors are known to have triggered landslide5 and snow avalanches.

Incidence of landslides are common in the various hilly regions of India but these are more in the Himalayas, in the Western Ghats (including Kerala), and in the Nilgiris. There are occasional reports of landslides in the Vindhyachals and the Eastern Ghats as well. Landslides are more frequent during or after heavy rains.

In India, snow avalanches occur in the I-limnlayan ranges and more so in the mountain regions of Kashmir, Himachal Pradesh and the hills of West U.P. This is because the dense forest and vegetation cover in the eastern and northeastern Himalayas act as binding force and inhibit the slippage of snow mass.

9.3 CHARACTERISTICS AND CAUSES

Characteristics

Landslides: These can be classified in two categories according to the type of movement and the type of material. The movement can be either slow or fast. Obviously, the more rapidly moving landslides pose grater hazards to life and property in their path. Fast speeds also leave little time for warning or escape. It

is a total disaster if a fast landslide occurs at night and passes through or hits a village or hamlet. Apart from tlie speed, tlie movement of a landslide can also be classified as a flow or fall or topple. A flow is mostly like a thick viscous mixture of mud and broken rocks. Water is really not necessary for a landslide flow but this type of landslides generally occurs during or after licavy rains. In landlside fall, masses of rock and other material fall down from cliffs or come down hurtling along tlie slopes and bouncing through tlie air. A topple type landslide involves an overturning movement which, if not blocked by bigger and stable rocks, results in a landslide.

In a landslide, tlie moving material can be broken up further as the landslide progresses or it may remain intact if it is strong enough. The landslide, in which the moving material is strong and remains more or less intact, is called a slump.

Snow Avalanche: These may be classified as "dry snow type" or "wet snow type" and each of these types can be further subdivided into "direct action" or "delayed action" avalanches. Thus, we may have four categories of snow avalanches, viz., (i) Dry snow direct action avalanche, (ii) Dry snow delayed action avalanche, (iii) Wet snow direct action avalanche, and (iv) Wet snow delayed action avalanche.

Dry snow avalanches involve fresh (dry) snow sliding over a surface of old snow which has congealed and become fixed and stable. Wet snow avalanches occur when rainfall or warm weather follows immediately after a spell of heavy snowfall. In such a case, tlie snow avalanclic consists primarily of melting snow mixed with water but lakes along with it any other material enroute. Wet snow avalanches also occur during spring season when licavy accumulations of snow become loose with the start of the melting process with the advent of warm spring season.

Avalanches that occur during or just after a snowfall take the falling snow along without giving it a chance to stabilize itself at tlie location of the snowfall. Such snow avalanches (whether dry or wet type) are called Direct Action avalanches. On the other hand, those cases where snow would have accumulated over a period of time before an avalanche (dry or wet) starts. arc called Delayed Action avalanches.

A snow avalanclic comprises three "zones". viz., (i) Starting Zone, (ii) Runout Zone. and (iii) Track. The Starting Zone is also called Release Area or Formation Zone or Origin Zone or Accumulation Zone, or Rupture Zone or Fracture Zone or Catchment Basin. It is tlie area where the snow avalanche begins. Depending on the shape of the slope or cliff and the preferred areas of snowfall depending on tlie orientation of tlie mountains. there are areas with likelihood of start of snow avalanches. These are called snow avalanche "sites".

The Runout Zone is also called Deposition Zone. It is the lowest end or the Destination Area of a snow avalanche where the avalanche will sun out, i.e., the snow mass carried by tlie snow avalanche will ultimately come to a stop. This stoppage may come about either because the terrain has beconie flat inhibiting further movement or because an obstacle stops tlie moving mass. The middle past or path between the Starting Zone ancl the Runout Zone is called the Avalanche Track. It is also known as Slide Path or Avalanche Path.

Each snow avalanche seems to possess unique characteristics depending on factors such as topography of the mountain, climate, and weather conditions such as snowfall, rainfall, ancl speed and direction of the prevailing wind. Sometimes, snow mass can even come down flying from a cliff through air and fall over an unsuspecting community resulting in serious disaster.

Causes

Landslides: As landslides involve movement of mass of rock, mud etc., down a slope, factors that promote such movement of mass provide the causes for landslides. Such causes can arise from a number of happenings. For example:

(a) Increase in the mass of weak rocks, clay arid other debris likely to slide;

(b) Loosening or breaking of rocks and soil by wetting due to rain, weathering, erosion. deforestation, earthquake, tremors and similar other events;

(c) Increase in the tilt or slope due to seismic disturbances or construction activities, mining, quarrying etc.

It is evident from tlie above that tlie causes for landslides are both natural and manmade.

While the above mentioned causes are basically responsible for landslides, it is quite often that a triggering mechanism starts the disaster. Conditions favourable for a landslide continue to build up and a final small cause triggers a landslide. This small cause or trigger can occur in many ways. It could be tlie seepage of water inside rock crevices; a vibration from blasting, earthquake, or even thunder; erosion from water streams; deforestation; weakening dud to digging and quarrying. It could even be the continued loading due to snow accumulation or collection of large amount of rain water.

Snow Avalanche: These are generated due to tlie structural failure of snow heap lying on mountain slopes. Such structural failure may occur due to:

(a) external stresses caused by (i) large accumulation of snow from heavy snowfall creating excessive loading, (ii) movement of persons, animals and (iii) sound waves from any loud noise like a sharp whistle, gunfire, thunder;

(b) metamorphic activities, i.e., physical happenings within the snow mass which would create weak layers inside it; and

(c) excessive melting of upper layer of the snow mass resulting in seeping of meltwater under tlie snow mass and lubricating the bottom surface of the snow mass to enable it to slip and create a snow avalanche.

In general, snow avalanches occur when extreme winter conditions (sub-zero temperatures) prevail for long duration and heavy snowfall occurs over smooth, glaciated slopes which are devoid of vegetation cover. Sometimes, strong winds blow and drift accumulated snow from avalanche-free areas to avalanche-prone slopes thus causing a snow avalanche.

Check Your Progress 1

Note: i) Use the space given below for your answers.
ii) Check your answers with those given at the end of the unit.

1) What are the regions and seasons in India prone to landslides and snow avalanches?

2) What ate the different types of landslides and snow avalanches?

3) List the main causes of landslides and snow avalanches.

9.4 VULNERABILITY

The following are highly vulnerable to landslides and snow avalanches:

(a) Deforested mountains especially in areas of heavy rainfall or snow fall;

(b) Settlements (villages or hamlets) that are built on hill tops, steep slopes, softer soil;

(c) Settlements built at the base of hills, steep slopes, mountain valleys;

(cl) Buildings with weak foundations; and

(e) Roads and communication lines in mountain areas.

9.5 RISK REDUCTION MEASURES

In order to consider risk reduction measures, we should first have an idea of likely risks arising from landslides and snow avalanches. These are as follows:

i) Geographical risks:

   a) Spread and deposition of debris

   b) Blocking of Streams

ii) Engineering risks:

   a) Buildings

   b) Roads

   c) Bridges

   d) Communications

iii) Medical risks:

a) Death

b) Injury

c) Shock

iv) Socio-economic risks:

a) Loss of family

b) Loss of homes

c) Loss of crops

d) Loss of employment

The above mentioned risks can bc reduced by adopting risk reduction measures which can be divided in two categories, viz., (a) Risk Control Measures and (b) Risk Assistance Measures;

Risk Control Measures

i) Hazards mapping

ii) Preparation of Hazard Zonation Maps

iii) Community education arid awareness

iv) Land-use regulations

v) Advance planning

vi) Relocation of vulnerable settlements

vii) Strengthening of weak structures

viii) Creating adequate drainage to avoid accumulation of water and snow

Rislc Assistance Measures

i) Monitoring and Warning

ii) Search and Rescue

iii) Medical assistance

iv) Damage assessment

v) Economic assistance for rehabilitation and reconstruction

9.6 PREPAREDNESS

The key to preparedness lies in understanding and appreciating the risk reduction measures listed in the previous section of this Unit and adopting these lo the maximum extent that the circumstances permit. Here the physical and financial assistance from government and non-government sources is of considerable importance.

Therefore, the preparedness actions to deal with the disasters of landslides and snow avalanches are as follows:

i) Community Education and Awareness

ii) Preparation of Hazard Zonation Maps

iii) Relocating highly vulnerable settlements

iv) Strengthening of weak structures

v) Removal of likely blocltages

vi) Creating adequate drainage

vii) Monitoring and Warning

viii) Community cooperation and vigilance

9.7 EFFECTS AND IMPACTS

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

(a) These clisasters occur in remote mountain areas with difficult terrain and adverse weather conditions.

(b) The communities (villages and hamlets) are small entities with weak housing, make-shift structures and poor resources.

(c) Landslides and snow avalanches give almost no notice in most cases and enormous amounts of rock, soil or snow come crashing with fantastic speed on the often unprepared communities.

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

i) Direct Effects - Physical Damage

Anything on tlie top of a landslide or in its path or at its bottom will suffer severe damage. The same is the case with a snow avalanche when anything in its path or falling areas will suffer severe damage. In case ol'a snow avalanche of "Slab type" where massive slabs of hardened snow come hurl ling down, tlie hit is very hard and devastating whereas the "loose snow" type of snow avalanche may engulf and cover larger area.

Blockages of roads, mountain passes and streams and damage to electric and communication lines are among the direct effects of landslides and snow avalanches apart from injuries and fatalities to human and cattle lives. Blockage of streams and later release of the itnpounded water create flash floods with disastrous effects. Falling of large volumes of debris from landslicles or snow avalanches in mountain lakes can generate flash floods. Snow avalanches create additional suffering due to extremely low temperatures and the associated freezing effects. Even if there are survivors among tlie victims, they may suffer hypothermia and frost-bite before help arrives.

ii) Indirect Effects and long-term Impacts

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

Check Your Progress 2

Note: i) Use the space given below for your answers.
ii) Check your answers with those given at the end of the unit.

1) What are the main risk reduction measures for landslides and snow avalanches?

2) What are the essential elements of Preparedness lo meet the hazards posed by landslides and snow avalanches?

3) What arc the direct and indirect effects and impacts of landslides and snow avalanches?

9.8 LET US SUM UP

This Unit has dealt with Landslides and Snow Avalanches. These two hazards have been defined and their characteristics have been described. The causes that generate landslides and snow avalanches have been identified. After describing the vulnerability, risk reduction measures are discussed for these hazards. Essential elements of preparedness have been enumerated and the direct and indirect effects and impacts of landslides arid snow avalanches liave been described.

9.9 KEYWORDS

Precipice — Very steep face of a rock, cliff or mountain.

Coherence of material — Sticking together of material.

Shearing movement	Distorting or breaking movement; shifting of different layers (of rock or snow) laterally over each other.
Degree of slope	Steepness of slope expressed usually as angle from tlie horizontal.
Solifluction	Flow of surface deposits of soil, clay, rock, snow over tlie still forzen slope beneath made possible by water released from thawing or melting of snow.
Flowage	Flow, flowing
Zonation	Identifying zones
Frost-bite	Injury to any part of body due to exposure to sub-zero temperatures in extremely cold weather.
Hypothermia	Abnormal lowering of body temperature due to external cold.

9.10 REFERENCES AND FURTHER READING

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9.11 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

1) Your answer should include the following points:

- Landslides occur in various mountain regions of India but are more in the Himalayas, the Western Ghats and the Nilgiris.
- Landslides are more common during rainy season.
- Snow Avalanches occur in Himalayas only because these are snowfall there,
- Snow avalanches are more common during winters and springs.

2) Your answer should include the following points:

- Types of landslides : Flow, Fall or Topple Types

  Types of snow avalanches : Dry snow direct action type, Dry snow delayed action type, Wet snow direct action type, and Wet snow delayed action type.

3) Your answer should include the following paints:

- Causes of landslides :

  i) Increase in mass of rocks, soil etc.;

  ii) Loosening or breaking of rocks, soil;

  iii) Increase in tilt or slope.

- Causes of snow avalanche :
  - i) Large accumulation of snow;
  - ii) Vibrations due to Movement of persons or animals, strong winds or Loud noise;
  - iii) Melting of upper layers of snow and seeping of the melt water under the snow mass.

Check Your Progress 2

I) Your answer should include the following points:

- Risk Control Measures :
  - i) Hazard mapping
  - ii) Hazard Zonation Maps
  - iii) Community Education & Awareness
  - iv) Land-use regulations
  - v) Relocation of vulnerable villages
  - vi) Strengthening of weak structures
  - vii) Creating adequate drainage.
- Risk Assistance Measures :
  - i) Monitoring & Warning
  - ii) Search & Rescue
  - iii) Medical Aid
  - iv) Damage Assessment
  - v) Rehabilitation & Reconstruction

2) Your answer should include the following points:

- Community Education and Awareness.
- Preparation of I-lazard Zonation Maps.
- Relocating highly vulnerable settlements.
- Strengthening of weak structures and taking engineering actions such as removal of blockages, and creating adequate drainage.

3) Your answer should include the following points:

- Direct Effects - Physical damage,

  injuries, deaths, loss of homes.
- Indirect effects and long-term impacts

  Loss of productivity in a scenario which is already poor.

UNIT 10 FIRE AND FOREST FIRE

Structure

10.0 OBJECTIVES

After studying this Unit, you should be able to:

- discuss the serious nature of the hazards associated with Fire and Forest Fire,
- understand the difference between fires in coal, oil, buildings and forests,
- identify tlie causes of fires and forest fires and our vulnerability to these,
- describe the effects and impacts of fire and forest fire, and
- explain the precautions against fires and forest fires.

10.1 INTRODUCTION

Fire and Forest Fire constitute typical disaster phenomena the origins of which can be either natural or manmade. In their ferocity and destructive potential, these are notoriously dangerous. In this Unit, we will discuss about Fire and Forest Fire which may be caused by natural processes sometimes but most of tlie time, these occur (and spread) due to human negligence. In either event, fires spread rapidly and cause excessive dalnage to life and property, if not controlled in time.

10.2 FIRE: MAJOR KINDS

10.2.1 Coal

Coal is an important source of energy and India has large deposits especially in Bihar and West Bengal from where coal is regularly mined in large quantities. Raniganj-Jharia-Dhanbad is a prominent coal belt. Coal mining is a hazardous operation. Although all efforts are made to observe tlie mining safety rules prescribed by the Director of Mine Safety of Government of India. fire accidents do occur.

Moreover, soft coal, under extremely hot conditions as prevail inside deep mines, sometimes leads to spontaneous self-ignition. Once ignited, coal burns uncontrollably. In many cases, the gases accumulated in the mines can cause explosion. If coal miners are trapped in a burning coal.mine and the exit gets blocked, it becomes a major disaster resulting in the death of the trappccl miners.

In the coal fields, there are underground tracts in coal mines where fires have been burning for many years. Enormous quantities of coal are getting destroyed by these fires.

In addition to the destruction and hazard of burning, coal fires produce considerable amount of combustion products in the form of gases and soot, all of which pollute tlie atmosphere.

10.2.2 Oil

Inflammable liquids such as oil. petrol, spirit, liquor, tar, paints, many chemicals, and even ghee, pose serious fire hazard. All such fires can be called "oil fires". These start as soon as an inflammable liquid comes in contact with a naked flame or smouldering ember or a sparlt or a very hot object. Oil fires can also occur in the absence of a naked flame, sparlt etc. This happens because many chemicals release heat due to the process of oxidation when they come into contact with air which always contains oxygen. If adequate ventialtion is not maintained by circulating the air so that heat and fumes get dissipated, a stage comes when the temperature rises enough to cause fire in the inflammable liquid chemical. Sometimes there can be an explosion.

As tlie fire in a liquid medium such as oil, burns on the surface, it spreads quickly as tlie oil spreads or gels sprinkled on other substances.

10.2.3 Building

Fires in buildings, residential or commercial, are by far the most common occurrences among fire disasters. Once started, fires in buildings become uncontrollable due to tlie considerable amount of combustible and inflammable material such as wood, cloth, paper, plastics, chemicals, cooking gas, kerosene oil, used or stored in tlie buildings. Fires in multi-storeyed buildings and closely located liouses turn into major disasters as the fire spreads quickly and leads to considerable loss of property and even deaths which occur due to burning or suffocation.

Electrical equipment in buildings, especially in urban houses ancl in multi-storeyed buildings, are serious fire hazards if riot checked and maintained well. In such cases, it is not only tlie fire which causes the disaster but there is the added danger of electrocution also.

10.3 FOREST FIRE

Forest areas are particularly susceptible to fires which are mostly manmade although sometimes these could be the result of lightning strike during severe thunderstorms. Forest fires. lead to heavy destruction of forest resources and disturb tlie wild life as well. Forest fires add to the deforestation process as it takes many years for tlie forest to grow again. In many cases, tlie forest land gets spoilt or taken over by vested interests for other activities.

The nature and amount of vegetation cover and other combustible material such as deacl wood, dry leaves, determine the nature and extent of forest fires. High atmospheric temperatures, dryness (low humidity), the strength of the prevailing wind and tlie slope of the ground arc important factors in die spread of forest fire.

The most common type of forest fire is a "surface fire". It involves lighter material such as dry leaves lying on the ground, bushes and small hardwood trees. Surface fire is generally slow moving and flames can rise almost one to two metres high. As the surface fire intensifies by burning more material, heavier bushes and medium size trees start burning and the flames may rise as high as five metres or more. On further intensification, forest fire flames may reach the tops of even the tall trees creating "crown fire". These crown fires, burning upto the heights of tops of tall trees, are the most dangerous forest fires. Many a times, burning trees explode due to intense heat. This is a sure indication that the forest fire is reaching the crowning stage which involves extreme danger.

Large and intense forest fires can create strong air convection currents which blow hot embers up in the air and carry them to long distances of even a kilometre or two. These embers can ignite new areas of forest fires or create fire in village areas adjacent to forests.

Check Your Progress 1

Note: i) Use the space given below for your answers.
ii) Check your answers with those given at the end of the unit.

I) What are the hazards posed by fires in coal mines?

2) How does an oil fire occur and spread?

3) What types of buildings are more prone to fire disasters?

4) What are tlie materials in buildings that create fire hazards? disasters?

10.4 CAUSES AND VULNERABILITY

Fires are caused when a source of fire like open fire, naked flame, lighted cigarette or "beedee", smouldering ember, electric spark, lightning, or any other source of ignition comes into contact with combustible or inflammable material. High atmospheric temperatures and dryness (low humidity) offer favourable circumstances for a lire to start. Once started, fire is sustained by the continuous supply of oxygen from the air.

Therefore, tlie first factor that determines the vulnerability of a material or building or location to fire hazard is its proximity to a source of fire or ignition. The second, but equally iniportant, factor is the inflammability or combustibility of tlie material or building or location, i.e., liow quickly it will catch fire and start burning. This depends on the contents as well as the way these are built, stocked and arranged. By this very nature, the fixtures, fittings and furnishings in a building are fire prone. Household goods like clothes; books, paper, kerosene oil, cooking gas, are either combustible or inflammable. Oils, paints, chemicals, add considerably to the vulnerability.

Crowded places, such as large hotels, cinema halls, hospitals, schools, circus, religious congregations,. large fairs, political rallies, are particularly vulnerable because of very large collection of men, women,.children and babies, loose or temporary electrical wiring, overloaded electrical equipment, highly combustible material like tents, shamianas, thatched roof, plastic seats, and above all a shortage of adequate number of exits. People also become vulnerable to fire hazards on occasions such as Diwali when a very large number of candles or earthen lamps are lit creating innumerable naked flames and when almost every family indulges in fireworks even in crowded localities.

As already mentioned, air plays the sustaining role once a fire gets started. This is also evident from the popular idiom "To fan the fire". Hence the prevailing wind conditions influence the speeding and spreading of a fire or a forest fire. The areas, downwind from a raging fire, become highly vulnerable to spread of fire.

10.5 PRECAUTIONS

The following are the important precautions against fire:

i) To keep the source of fire or source of ignition well separated from combustible and inflammable material.

ii) To keep tlie source of fire or source of ignition under watch and control.

iii) Not to allow combustible or inflammable material to pile up unnecessarily and to stock tlie same as per procedure recommended for safe storage of such combustible or inflammable material.

iv) To adopt safe practices in factories, coal mines, in oil stores, in chemical plants and even in household kitchens.

v) To incorporate fire reducing and fire fighting techniques and equipment while planning a house or building or an oil storage facility or a coal mining operation. Use of fire resistant or tire retardant material in construction is a good precaution. Even thatched roofs can be treated by such material to reduce fire hazards.

vi) Construction should be as per prescribed rules.

vii) To provide enough ventilation for air circulation so that artificial hot spots are not created.

viii) To provide fire sensors and smoke detectors in multistoried buildings or important buildings such as bank vaults, archives, computer installations, libraries, museums, control rooms, airports, warehouses, shopping malls, and factories..

is) To provide adequate water storage and other fire-fighting material and equipment.

x) To train volunteer fire fighting teams to manage till such time that professional fire fighters arrive on the scene.

xi) In case of forest fires, the volunteer teams are essential not only for fire fighting but also to keep watch on the start of forest fires and to sound an alert.

xii) To arrange fire fighting drills frequently.

xiii) To keep all electrical equipment earthed properly and to ensure its proper maintenance, including regular and strict inspection.

xiv) To keep industrial activity (especially that which involves a fire hazard of any sort) away from residential areas.

10.6 EFFECTS AND IMPACTS

The effects of a fire event, wherever it occurs, are disastrous and its impacts are long term and truly debilitating. India being a large country, complete data are not available; but it has been estimated that loss due to fires in our country is more than Rs.1500 crore annually. Apart from this enormous loss of property, tlie human death, disability and misery is colossal and irreparable. It has been estimated that the deaths due to fire events are in the neighbourhood of 15000 to 20000 every year for the country. These figures appear unbelievable but are reasonably correct estimates. In Delhi alone, there are about 400 reported 'fire events every year involving death and disability of a few hundred persons and a loss of around 200 crores. Forest fires destroy every large areas depleting natural resources and taking a heavy toll of life especially the wild life. Forest fires destroy the valuable bio-diversity.

Check Your Progress 2

Note: i) Use the space given below for your answers.
ii) Check your answers with those given at the end of the unit.

1) What precautions would you recommend against fire hazards?

2) Can there be any precautions for thatched roofs in villages?

3) What are the impacts of fire disasters?

10.7 LET US SUM UP

Fires and Forest Fires are dreadful disasters which should be prevented as much as possible. Apart from fires in forests, those in coal mines, oil storages and buildings take heavy toll of life and property. While the basic cause of start of Fire is due to a source of fire coming in contact with combustible or inflammable material, the further course of events depends very much on the nature of the burning material. , Therefore, fires in coal, oil, buildings and forests have characteristic features of their own. The prevailing environmental conditions such as atmospheric temperature, humidity and wind influence the speed and spread of fires. The effects and impacts of fire disasters are extensive and intensive resulting in loss of precious lives and property and long term human misery.

While it might not be possible to eliminate fire hazards totally it is possible to diminish the probability of occurrence and spread and thus to reduce the resultant loss by assessing the vulnerability of a particular situation or location and by observing adequate precautions which have been listed in this Unit.

10.8 KEY WORDS

Combustible	Capable of burning easily.
Inflammable	Capable of catching fire quickly and burning intensely.
Destruction Potential	Hidden capability of destruction.
Self-ignition	Catching fire by itself due to self-generated heat.
Wild Life	Living creatures in a forest.
Crown (of a **tree)**	Top portions of tall trees
Air **Convection** Currents	Air, when it gets hot, rises up and cooler air from sides takes its place. Thus, convection currents develop in case of forest fire.
Fire sensors	Small electronic devices that get activated and sound an alarm as soon as they perceive unusual heat.
Smoke detectors	Small electronic devices that get activatecl and sound an alarm as soon as they perceive smoke particles.
Vulnerability	Sensitivity or susceptibility of a building or a community to a risk such as fire or forest fire.
Bio-diversity	Large variety of plant and animal life (especially in forests).

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10.10 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress **1**

1) Your answer should include the following points:

- Burning fires destroy enormous amount of coal thus destroying an important energy source.
- Coal fires generate gases and soot which pollute the atmosphere.
- If coal miners are trapped in the fire, it becomes a major disaster involving loss of lives.

2) Your answer should include the following points:

- Oil fire occurs when inflammable oil comes into contact with a source of fire.

- Oil fires can also occur by self-ignition under conditions of heat and no ventilation in case of inflammable oils.
- Oil fires spread quickly as the burning oil spreads out quickly or gets sprinkled on other substances.

3) Your answer should include the following points:
   - Multistoreyed buildings
   - Closely located houses

4) Your answer should include the following points:
   - Highly combustible material such as wood and plastic fittings and furnishings.
   - kerosene oil, cooking gas cylinders and any chemicals or paint.
   - Electrical equipment.

Check Your Progress 2

1) Your answer should include the following points:
   - At least ten (if not all the fourteen) precautions listed in Section 10.5 (Precautions) of this unit

2) Your answer should include the following points:
   - Thatched roofs in villages can be sprayed with fire resistant and fire retardant solutions.

3) Your answer should include the following points:

   Impacts are disastrous and long term
   - Considerable loss of life and property
   - Fire disfigures and disables the people
   - Forest fires destroy valuable natural resources including trees, plants and wildlife - thus destroying the bio-diversity.

UNIT 11 INDUSTRIAL AND TECHNOLOGICAL DISASTER

Structure

11. OBJECTIVES

After studying this unit, you should be able to :

- explain the meaning and concept of Industrial and Technological Disasters, together with their Types,
- appreciate their characteristics and causes,
- describe typical effects,
- understand safety precautions.

111 INTRODUCTION

You have got detailed overview of "Disasters" in general in Block I, Units 1 to 4. You have realised that there are two broad categories, namely, Natural disasters and Man Made Disasters. The variety of Man Made Disasters is very vast indeed. Accidents on Road, Rail, in Air and over water form a major group. Equally large in number are the occurences of fire of all types, Building collapse, Stampede, and ecological. Yet the most significant range emanates from industrial and Teclinological Disasters. Table 11.1 lists natural and manmade disasters.

Table 11.1

I)	**NATURAL DISASTERS** **(SOMETIMES PREDICTABLE BUT NOT AVOIDABLE]** I. IIUAVY RAINS. 2. FLOODS, 3. DROUGHTS, 4. EARTHQUAKE, 5. VOLCANO ERRUITION. 6. AVALANCHE, 7. LANDSLIKE, 8. EPIDEMIC, 9. CYCLONE, 10. HEAT WAVE. COLD WAVE, 11. FOREST FIRE
II)	**MANMADE DISASTERS [AVOIDABLE BUT NOT PREDICTABLE]** **A. UN-INTENTIONAL OR INADVERTANT:** (a) POOR MAIN'TENANCE, (b) LOW QUALITY WORK, (c) HUMAN ERROR, **B. WILFUL AND INTENTIONAL:** I. SABOTAGE, **2.** MISCHIEF, 3. REVENGE, 4. RIOTS, 5. MOB FURY, 6. ENEMY ATTACK. **C. INDUSTRIAL AND TECHNOLOGICAL -** (MOSTLY SYSTEM/PROCESS MALFUNCTION) I. NUCLEAR RADIATION, 2. GAS LEAK, 3. EXPLOSION. 4. FIRE.

Rapid advancement in technology has given rise to a multitude of small, medium and large industries. Compared to the earlier small scale non-hazardous industries, today's scenario encompasses a vast group of mega-scale chemical and petrochemical industries using inflammable products e.g., Naptha as well as Natural Gas. Thus, there are chemical, pharmaceuticals, petrochemicals, paint and such other hazardous industries including large Fertiliser Complexes. Power Plants using natural gas and atomic energy form a distinct category with high degree of risk.

11.2 MEANING & CONCEPT

"On Site" And "Off Site". It will be appropriate, at this point, to introduce two very vital terms, applicable to Industrial Disasters. An On Site accident is, primarily restricted to only the premises at tlie industrial unit. It can be combatted by tlie industry's own resources and it does not attack any area outside the premises of the unit. An Off Site Scenario, however, is of far greater concern. In that there is invariably a spread tlie originally On Site Disaster, outside tlie industry's premises and/or its combat needs resources from outside since industry's own either do not exist or are inadequate. A more detailed relationship between On Site and Off Site situations is given in Table 11.2

Table 11.2

CONCEPT OF "ON SITE" & "OFF SITE"
WHAT CONSTITUTES "ON SITE"?
• IT IS CENCESSARILY SMALL OR MINOR.
• ITS CONTROL AND COMBAT IS WELL WITHIN THE CAPACITY OF THE INDUSTRIAL UNIT
• EXTERNAL HELP NOT REQUIRED.
• IT DOES AFFECT OR COULD SPREAD TO AREAS, OUTSIDE ITS PREMISES.
• REPORTING TO AUTHORITIES OPTIONAL.
ESSENTIAL FEATURES OF "OFF SITE" EVENT
OCCURRENCE. MAY BE INITIALLY SMALL,, MAY ESCALATE 1O LARGE SIZE ("ON SITE" TO "OFF SITE")
• BEYOND THE CONTROL OF THE INDUSTIIIAL.. UNIT, WHERE IT STANDCD.
• EXTERNAL AID NEEDS TO BE RUSHED.
• INFORMATION TO AND GUIDANCE FROM AUTHORITIES REQUIRED.
• DEPENDING ON WIND DIRECTION AND VOLUME OF DISASTER SOURCE. POPULATION AND AREA OUTSIDE THE PREMISES INVARIIIABLY AFFECTED

Check Your Progress 1

Note: (i) Use the space given below for your answers.
(ii) Check your answers with those given at the end.

1) What are the two major categories of disasters of clisasters and what are their principle distinguishing features?

2) Bring out the difference between "On Site" and Off Site" situations.

1.3 TYPES

Let us first distinguish between Industrial and Technological Disasters. In fact, there is no demarcation between them. In a broader sense, an accident or a disaster in an industrial unit can be termed as Industrial, while all others can be called as Technological, e.g., war, Nuclear accidents, train and an accidents, and the like. Such events, when occurred engulf a large surrounding area in its aftermath. The concept of On Site and Off Site is easily discernible in these two categories.

Range of Chemical Disasters: A very large number of hazardous chemicals are in use in Chemical & Petrochemical industries - in solid, liquid and gaseous forms. They can cause the Following types of accidents:

a) Fire

b) ***Toxic Gas Leak***

c) BLEV- (Boiling Liquid Expansion Vapour Explosion) - This is highly dangerous, giving no notice to sudden explosion.

d) ***Explosion***

e) ***Cascading or Domino Effect*** - Original primary accident at one type of chemical reacting with adjacent chemicals and thus, giving rise to enormously complex catastrophe.

Table 11.3: list the characteristics of some of the highly hazardous chemicals

IMFLAMMABLE AND TOXIC CHEMICALS
INFLAMMABLE RANGE
1 METHYL ALCOHOL - HIGHLY VOLATILE
BENZENE
XYLENE - META. -ORTHO & - PARA
ACRYLONITRILE (ACN)
ETHYLENE DI-CHLORIDE
ETHYLENE OXIDE
VINYL CHLORIDE
AMMONIA
CHLORINE CONTACT WITH WATER
TOXIC RANGE
I. XYLENES, 2. BUTADIENNC. 3. ACIZYLONITRILE. 4. ETHYLENE DI-CHLORIDE,
5 VINYL CHLORIDE. 6. ETHYLENE OXIDE. 7. AMMONIA, 8. CHLORINE.
9. BENZENE, 10. METHYL ALCOHAL.
LPG – BLEVE [BOILING LIQUID EXPANSION VAPOUK EXPLOSION]
SOME PECULIAR FEATURES
AMMONIA - EXPLOSIVE IN CONTACT WITH "Ag & Hg"
ETHYLENEOXIDE- EXPLODES EVEN IN ABSENCE OF "AIR & 02"
ETHYLENE DI-CHLORIDE- HIGHLY CORROSIVE TO METALS EC STEEL.
ACRYCONITRILE- VOILENTPOLYMERISATION WITH ALKALIES.

haracteristics

Conventional Accidents: General technological Accidents not involving the hazardous chemicals are no less serious; only their aftermath is, relatively, of a lower intensity. Compressed Air, Superheated Steam can rupture the pipes leading to explosion or fire. Boiler Burst or bursting of any pressure vessel; electrical short circuits, structure collapse, drowning in tanks, etc. can constitute tlie accidents in an Engineering or non-chemical industry. They are usually "On Site" and manageable by the industry, itself.

11.4 CHARACTERISTICS AND CAUSAL PHENOMENON

The discussion so far would have conveyed tlie concept of industrial and technological disasters. We can say that while most of the industrial disasters are of technological nature, only those technological disasters that occur within the premises of an industrial establishment can be termed industrial disasters as well.

Casual Phenomena

Barring remote possibilities of "system malfunction" and unknown causes, most of the industrial as technological disasters are a result of inadvertent human error or mischief or sabotage. The probability of human error always prevails, whatever safety precautions are taken. In the recent decade, however, cases of large-scale disasters through arson, sabotage or terrorism are on tlie increase. The terrorist attack on tlie World Trade Centre in New York on the September 11, 2001 is the most devastating instance of a cruel and willful man-made disaster with worldwide impact.

Check Your Progress 2

Note: i) Use the space given below for your answers.
ii) Check your answers with those given at the end.

1) Enumerate some of the peculiar characteristic of hazardous substances.

2) Which are the main categories of manmade accidents?

11.5 WARNING

The Accidents/Disasters under present discussion occur without any warning/notice or pre-intimation. The only thing that can possibly be done, in the event of catastroplie is to warn surrounding population - or those who are likely to be affected in the own wind direction to move away to safety. Electricity operated Sirens or Air Horns are generally used to issue warning to people of impending threat. Once the number and location of sirens is determined, it is imperative to test them at frequent intervals with adequate education to the public. People for whose benefit tlie siren is sounded must be trained to do exactly what they are supposed to do, on hearing the siren.

Police and authorised officials are major instruments to warn people under threat conditions. In such events police vehicles with loudspealters are used. In the case of a Toxic Leak to ensure that police personnel themselves do not fall victim, they are given gas masks and the message is played on an Amplifier system in pre-recorded form. Earlier and clearer the Warning, maximum number of personnel arc rendered safer. With today's high technology, all sirens of an area can bc centrally operated.

11.6 SAFETY PRECAUTIONS

There is always a set of Laws, Rules, Regulations, "Do's & Don'ts" for every activity of. Rules for road traffic, handling electricity, doniestic cooking gas, ctc. exist. Accidents still keep on happening due to negligence or system failure.

Appropriate safety precautions and preventive measures are necessary to reduce the risk. This becomes all the more essential because with the passing of years, every industry is subjected to tlie following natural Depreciative Factors :

a) Ageing of Machinery & Process,

b) Growing Complancency arising mostly out of automation in modern Industry,

c) Needless Discontent in tlie employees leading their minds astray,

d) Less Integrity and Sincerity.

Hence, it is necessary to take appropriate preventive action on these aspects as an integral part of the programme to ensure adequate safety precautions.

Although it does not seem possible to rille out industrial or technological disasters totally, it is absolutely essential for everyone associated with hazardous industry - from within and without - to train one's mind for endeavouring utmost safety through lectures, talks, demonstrations, regular drills, civil defence (against enemy air attack), strict enforcement of safely rules without any compromise and tight security (against Sabotage).

11.7 TYPICAL EFFECTS

The following are the typical effects of industrial and technological disasters:

1. Injuries and death,
2. Destruction of buildings and other property,
3. Stoppage of production,
4. Costly and time-consuming repairs and replacement,

5. Loss of income to the industry and loss of wages to worlters,
6. Loss to insurance companies,
7. Expensive compensations,
8. Adverse publicity, and
9. Loss of morale.

Check Your Progress 3

Note: i) Use tlie space given below for your answers.
ii) Check your answers with those given at the end.

1) What is tlie need of giving "Wnrning"?

2) What are the Major ways of achieving "Safety"?

11.8 LET US SUM UP

Among all tlie disasters which we are exposed to - the industrial and technological ones, are caused largely through system failure or inadvertent human error or through wilful mischief or sabotage. Whatever be the cause, the aftermath in each case is sudden and disastrous.

Manmade disasters are not predictable because they happen suddenly, without any notice - but are mostly avoidable through vigrous and strict safety precautions, i.e., through preventive measures like Training, Supervision. Security and Vigilance.

Any original low-key accident, if allowed to go unnoticed - or detection of which is very late - generally leads to massive disaster, given conducive conditions like adverse wind direction, large volume of stocks and inefficient functioning of system in general and lack of resources, in particular. Inefficient communication becomes very damaging.

There are two types of industrial Disasters - On Site and Off Site. In the case of former, the occurrence is of low key and is within tlie capabilities of the source of disaster and generally does not attack premises outside. The Off Site scenario

is highly complex where tlie original On Site accident goes out of control of tlie source, it attacks population and property of the outside premises and is required to be handled by outside authorities so designated. Large number of resources and volunteers are required to be called upon for assistance in the areas of Police, Medical, Fire Fighting, Evacuation, etc.

1.9 KEY WORDS

Hazardous Industry: An industry using raw materials or processes which could lead to disastrous accidents.

Technological Disasters: The accidents which occur in industry using modern technology and generally lead to great loss/damage to property, death/injury to own employees and/or outside population. These disasters also can occur on Road, Rails, Ships, Pipelines in situations where modern technological machines or processes are in use or are being transported.

On Site: These two words apply to any occurrence and action plan to handle it, within and by the source of accidents1disaster.

Off Site: Any occurrence - which may be caused by any On Site incidence - which attack population1 premises/ area outside any individual industry/source of disaster.

Toxic Leak: Uncontrolled leakage and eventual spread of a hazardous gas, which can be annoying or injurious or fatal. Some of the gases - like tlie Methyl I I so Cynate in Bhopal Gas Tragedy can leave far reaching disabilities among survivors.

BLEVE (Boiling Liquid Expansion Vapour Explosion: A long, un-noticed leakage of a boiling liquid or an inflammable gas and its eventual spread in atmosphere leads to "instantaneous" explosion giving no notice for "safety" in the affected area.

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11.11 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

1) Your answer should include the following points:

- There are two broad categories of Disasters namely, natural Disasters and Man-made Disaster, Natural disasters are sometimes Predictable but Not Avoidable, whereas the Man-made ones are Avoidable but Not Predictable.

2) Your answers should include the following points:

- The term "On Site" is applied to a situation when the source of disaster, lies within an industrial premises, can be handled without external help as per prepared action plan and its aftermath does not spread "outside" to affect population and property not under its own control.
- An Off Site situation is, invariably, an escalation of original On Site occurrence and engulfs population/area not under control of the industrial unit. Its handling is on a very large scale through various agencies.

Check Your Progress 2

1) Your answers should include the following points:

- Each chemical shows a variant behaviour pattern under different conditions of pressure and temperature. Some are inflammable, toxic and explosives, all the time. Some are toxic and inflammable. Some become toxic after they start burning. With some, their pressure rises excessively with the rise of ambient temperature. For some, contact with water is harmful. Some are highly corrosive.

2) Your answers should include the following points:

- Accidents/Disasters caused through human hand/mind are many with common aftermath. They are inadvertent errors through negligence, complacency and error of judgement or intentional damage through mischief/sabotage, acts of terrorism or mob Fury war like situations.

Check Your Progress 3

1) Your answers should include the following points:

- Any timely and proper warning gives some notice to people of either an impending threat like enemy air attack or information of an accident. This gives people time to take immediate safety. It also, tells the volunteers and trained personnel to report to "duty stations" for their contribution to 'relief, rescue and rehabilitation".

2) Your answers should include the following points:

- Major ways of achieving safety is own critical analysis, correct awareness of surrounding with knowledge of probability of disaster, Training to prevent occurrence and disciplined abiding by given set of rules and regulations.

UNIT 12 EPIDEMICS

Structure

12.0 OBJECTIVES

After studying this Unit, you should be able to:

- define epidemics
- explain an epidemic situation and describe the types of epidemics
- list tlie cause and characteristics of an epidemic
- outline the safety measures for control and management of epidemics

12.1 INTRODUCTION

Epidemics of water and food borne diseases are common and occur from time to time. Measles and influenza are other diseases that generally show marked seasonal and annual variations in incidence. Even non-communicable diseases like cancer, goiter, blindness, heart diseases, and mental sickness are also acquiring epidemic proportions.

Epidemics often occur in the community. They liappcn in different ways but during disasters there are greater chances of their occurrence. It requires to follow a reasonably systematic approach in order to manage them. It is necessary to follow an orderly sequence for effective management and control of an epidemic. I lowevcr, the approach has to be disease specific and procedures may vary according to local circumstances about tlie disease, previous levels of occurrence, and population at risk. It becomes essential to find tlie cause of tlie epidemic and plan to institute measures to control by attacking the source, interrupting transmission and protecting susceptible population. In this Unit, you would learn what constitutes an epidemic, types of epidemics, their causes and tlie safety measures required during epidemics.

12.2 MEANING & TYPES

Let us consider what constitutes an epidemic. Epidemic is a derivation of two Greek words epic (upon/among) and demos (people). It is the 'unusual' occurrence in a community or region of a disease specific health related events "clearly in excess" of the "expected occurrence". Thus, any clisease, which occurs in numbers more than the expected occurrence, constitutes an epidemic. It includes heart diseases, or even psychosomatic *disorders*. I-Iealth affecting lifestyle like smoking, drug addiction and health related events like accidents also fall into tlie category of epidemics. But during disasters we are more concerned about the epidemics of communicable diseases.

Having learnt that epidemic is the occurrence of a particular disease in unexpected numbers, you must be thinking that how to define the 'expected occurrence'. There is no designated standard number for the expected occurrence of a disease. It varies from place to place, and region to region. A few hundred cases of a particular disease at one place can be called as the expected occurrence of the disease in that area, if this disease is common there. On the contrary where the disease is non-existent. the expected occurrence shall be zero and in this case even a single case of that disease will be termed as epidemic. So the basis of defining an epidemic is the defining of usual prevalence of the disease in that area and this usual prevalence is called *endemicity*.

Let us take the example of small pox. Twentyfive years ago, small pox was quite common in our country. It was thus an endemic diseasc. Now it has been eradicated not only from the country but the world for that matter. It is no more an endemic diseasc. The expected occurrence of small pox is zero. A single case of smallpox will, therefore, be clearly in excess of the expected occurrence and hence would be now considered as an epidemic of smallpox. So a disease, which was endemic once, may cease to be so and a single case may be taken as an epidemic.

How disease occurs?

In order to understand the occurrence of diseases in more than the expected number and why there are greater chances of spread of an epidemic during a disaster we need to understand how diseases occur.

Diseases occur as a result of interaction between an agent, a host and the environment. Under normal conditions, there is a stage of equilibrium among these but in unfavourable conditions this equilibrium gets disturbed and diseases occur in human body.

Let us understand the terms host and environment before we learn about causes and characteristics of an epidemic.

Agent A disease 'agent' is defined as a substance living or non-living the excessive presence or relative lack of which may initiate the disease process in man. Example of living agents are : bacteria, viruses. fungi and protozoan whereas nonliving agents are nutrients, chemical substances and physical forces such as heat, cold and pressure.

Host Host is the organism in which diseases occur and for us man is considered as host for all practical purposes. A number of host factors such as age, sex, nutritional status and socio-economic factors are responsible for occurrence of diseases. In epidemiological terms, man is also defined as tlie 'soil' and disease agent as 'seed'.

Environment : Environment is a set of conditions under which human beings live and can be defined as "all that which is external to individual human host living or non-living and with which he is in constant interaction". This includes all of man's external surroundings such as, air, water and sanitation.

Types of Epidemics

As already mentioned. epidemics generally follow a pattern depending on the geographical and environmental conditions. the distribution and characteristics of the host population. and their socio-cultural behaviour. If there is no intervention or change in these conditons, those epidemics tend to repeat themselves. Therefore, knowledge about various types of epidemics arid tlie conditions under which they occur can be of help in managing them.

The various types of epidemics that normally occur arc described given below:

i) Common Source Epidemics

These epidemics originate from a single source of infection or the disease producing agent, There arc two types of common source epidemics:

a) Point source or single exposure epidemics

In this type of epidemic tlie disease agent responsible for spread of diseases is exposed to susceptible population at one point of time and only once. A very good example of this type of epidemic is occurrence of food poisoning due to consumption of contaminated food in a feast. In this type of epidemic there is a sudden rise of cases which decline equally fast.

b) Continuous or multiple exposure epidemics

In this type of epidemic, the source of infection is continuous and such epidemics will not cease to exist unless the source is removed. A well with contaminated water becomes a regular source of infection to the people using it and the epidemic may continue until tlie water is treated and made safe. Similarly a cook who is a disease carrier may hcep on infecting tlie diners in the restaurant till lie is trcatecl and made non-infectious.

ii) Propagated Epidemics

A propagated epidemic is generally of infectious origin and results from person to person transmission of disease agents. The epidemic shows a gradual rise arid tapers clown slowly over a period of time. Transmission continues until there are no susceptible individuals. Such epidemics are more likely where large number of susceptible individuals gather as in fairs and festivals.

iii) Seasonal Epidemics

Certain diseases such as influenza and pneumonia are more common during winter season where as diarrohoea diseases are more during summer and rainy seasons. The epidemics which occur in particular season are known as sesonal epidemics.

iv) Cyclical Epidemics

Sonic epidemics tend to occur in cycles wliicli may repeat over a period of time which may be days, weeks, months or years. An example of this type of epidemic is measles epidemic which tends to occur in a cycle of 2-3 years.

(v) Epidemic of Non-communicable Diseases

With the advances in science and technology, the changing life styles have led to a living pattern which is sedentary and affluent with little physical activity. This has resulted in a marked rise in diseases like hypertension, heart diseases, diabetes and mental diseases. The non-communicable diseases have acquired epidemic proportions in recent times.

Check Your Progress Exercise 1

Note: i) Use the space below for your answer.
ii) Check your answer with those given at the end of the Unit.

1) Fill in the blanks.

a) Occurrence of a disease in numbers more than expected is called .....

b) Usual occurrence of a diseases in a community throughout is called .....

c) Diseases occur as a result of interaction between .....and .....

2) Tick the most suitable or correct answer.

i) Epidemic is defined as occurrence of a disease.

a) In large number

b) In small number

c) In unusually large number

ii) Which of the following diseases can cause epidemic

a) Communicable

b) Non-communicable

c) Both of the above

iii) A disease agent which is responsible for causing a disease is

a) micro-organism such as bacteria and viruses

b) chemical substance and physical forces

c) all of the above

12.3 CHARACTERISTICS AND CAUSES

Characteristics:

By now you know what is an epidemic and its various types. All epidemics have the following common features:

i) An unexpected number of cases of particular disease occur at a particular point of time affecting large segment of population.

ii) Generally confined to a definite population or geographical area and hence geographic patterns provide us important sources of clues about the causes of diseases.

iii) Usually have a common source of infection. For containment of epidemics, it is important to identify the source of infection so that the appropriate measures can be adopted to eliminate the common source of infection in order to prevent further spread of epiclemic.

iv) Epidemics generally tend to follow a pattern and repeat periodically when the conditions are favourable again.

v) The way an epidemic presents itself in tlie community depends upon tlie distribution and characteristics of people living in that area, their social pattern, their cultural behaviour and tlie various environmental factors.

Causes:

Earlier you learnt that tlie agent, host and environment are in constant interaction and that a disease is caused by disturbance of equilibrium between agent, liost and environment. The disease assumes epidemiological proportions when tlie environmental conditions arc favourable for tlie clisease agent and unfavourable conditions exist for man. You must have observed disasters like wars, famine, floods and earthquakes arc followed by epidemics of infectious diseases. Why does this happen? It happens because after the disaster, tlie favourable conditions for occurrence of an epidemic sets in. There is no specific or a particular cause which is responsible for occurrence of epidemic but various factors complementing and supplementing each other are responsible for occurrence of epidemics. The following factors favour occurrence of epidemics after disasters.

i) Temporary Population Settlements

Rehabilitation operations tliat follow a disaster arc usually set up in crowded temporary camps or settlements. Provision of safe drinking water, sanitation and other basic services often lack at these places. This results in a rise in the incidence of infectious diseases like dysentery, measles, whooping cough, tuberculosis, scabbies and other skin diseases.

ii) Pre-existent Diseases in the Population

The diseases already occurring in the area are most likely to emerge as epidemics when tlie area is struck by a disaster, An epidemic of non-existent disease in tliat area is unlikely to be seen after such disasters.

iii) Ecological Changes

During natural disaster like tloods and cyclones, ecological changes occur. It causes increase in the breeding sites for mosquitoes. This results in an increase in tlie cases of malaria. Open defecating and decay and decomposition of organic material increases insect breeding and thereby increases tlie transmission of diseases like conjunctivitis, diarrhoea, dysentery, enterovirus infections, and parasitic diseases.

iv) Resistance Potential of the I-Iost

The nutritional and immunisation status of tlie host population determines to a large extent its susceptibility to communicable clisease. Children with poor nutrition are more likely to get infected with communicable disease and tlie incidence of measles, whooping cough, diptheria and tuberculosis is likely to be higher if they are not immunised earlier.

v) Damage to Public Utility and Interruption of Public Health Services

Public utility services like water supply and sewage if damaged may cause large scale contamination and subsequent introduction of diseases in the population. Interruption of ongoing health programmes in the area may also lead to resurgence of diseases.

Check Your Progress Exercise 2

Note: i) Use the space below for your answer.
ii) Check your answer with those given at the end of the Unit.

1) Which of the following is true or false:

a) Epidemics have usually common source of infection.

b) After the natural disasters the conditions are favourable for occurrence of an epidemic.

c) Occurrence of a disease in large number throughout the year in a community is called epidemic.

d) For every epidemic there is a definite cause.

e) Ecological changes during natural disasters can initiate are epidemic of communicable diseases.

2) Fill in the blanks

a) Epidemics are usually confined to a defined .....

b) During disasters, ... diseases are likely to present as epidemics

c) Children with pour nutrition are more likely to get infected with ..... such us ..... if they are not immunized earlier.

12.4 VULNERABILITY

It is a common experience that some individuals have health problems or diseases more frequently than the others and that all individuals in a community do not have equal chance of acquiring a disease; some have more and some have less. Depending upon the probability of occurrence of diseases the population can be grouped into low risk, moderate risk and high risk groups. The same is also applicable during disasters and epidemics.

The infants, poorly nourished children and elderly people are more vulnerable to acquire infectious diseases during epidemics and disasters. Similarly. women in the reproductive age group, specially pregnant and lactating women, are more prone to get diseases. Persons living in rural areas and slums and those living in overcrowded situations are more vulnerable as compared to those living in cleaner houses in urban areas. Poor environmental sanitation, inaccessibility to safe drinking water and industrial pollution also contribute towards vulnerability to diseases. Various socio-cultural factors, such as, hygiene, literacy, income, social habits, customs, and lifestyles determine the vulnerability of population to disease. The susceptible individuals who are more prone to acquire the infections, constitute vulnerable groups in the communities.

12.5 SAFETY MEASURES

Epidemics affect large number of persons in a community when favourable conditions are present for the spread of an epidemic. If one understands the basic principles of **epidemiology,** these epidemics can be prevented by adopting certain safety measures.

Let us see what those precautions or safety measures are:

i) Predictability

By having a knowledge about the frequency and distribution of health problems, clues are obtained which promote understanding of diseases

leading to .timely and appropriate intervention for prevention. Early warning on the basis of the available data helps in reducing the severity of an epidemic. By improving the sanitary conditions, the spread of disease can be slowed or even halted. Proper cleanliness measures, proper disposal of solid waste and liquid waste will help in decreasing the breeding of flies and mosquitoes.

ii) Improvement of Immunity of Host

By improving the nutritional status and by mass vaccination programmes, the resistance of the individuals can be increased thereby checking the spread of an epidemic.

iii) Community Health Education

Community Health Education can help to halt epidemics by alerting individuals to the signs and symptoms of diseases and stressing the importance of reporting the cases to medical authorities. It is important to teach the methods that can be used to stop the spread of communicable diseases.

iv) Training

Training at different levels in emergency preparedness and response to epidcn-rics can prove to be an effective safety measure. This should begin at the school and community levels. Non-government organization can play a very useful role in the effort.

12.6 EFFECTS

Direct Effects of Epidemics

Epidemics usually affect large number of individuals and can lead to complications including disabilities and death.
There is always a possibility of existence of sufficient number of disease carriers who may favour the resurgence and spread of disease.

On seeing the sufferings and deaths especially within close relatives psychological effects are also common during epidemics.

Indirect Effects of Edpidemics

i) Social and political disruption due to tension and law and order problems.

ii) Economic loss arising from lack of strength of cultivate.

iii) Scarcity of clean food and water leading to malnutrition and starvation.

iv) Worsening of already poor sanitary conditions resulting in aggravation of epidemics.

Epidemic situations also worsen the already overburdened health services, as the scarce available resources have to be diverted for controlling and management of epidemics.

Check Your Progress Exercise 3

Note: i) Use the space below for your answer.
ii) Check your answer with those given at the end of the Unit.

1) List the factors which make individuals more vulnerable to infectious diseases.

2) List three safety measures for dealing with epidemics.

12.7 LET US SUM UP

In this Unit, you have learnt that a disease is caused by interaction of agent, host and environment. You also learnt what is an epidemic and what are tlie various types of epidemics. Subsequently, causes and characteristics of epidemics were described. Factors responsible for vulnerability of individuals to diseases and epidemics were explained. Finally you learnt about the various safety measures which can be adopted to avoid epidemics and tlie adverse effects which an epidemic will cause.

12.8 KEY.WORDS

Communicable disease	:	A disease capable of passing on from one person to another thus spreading fast in tlie affected community
Endemicity	:	A condition or illness that is common among tlie people there.
Epidemiology	:	The study of the occurrence of diseases in human populations; tlie science ofepidemics.
Psychosomatic		Physical disorder or illness caused or influenced by tlie persons emotional conditions.

12.9 REFERENCES AND FURTHER READINGS

Text Book of Preventive & Social Medicine, K. Park, M/s. Banarsidas Bhanot, Jabalpur.

Epidemiology : Principles & Methods, Macmohan B. and T.F. Pugh, Little Brown. Boston.

An Introduction to Epidemiology, Anderson M. Macmillan, London.

Manual of Epidemiology for District Health Management, WHO, Geneva.

12.10 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

1) Your answers should include the following points:

epidemic

endemicity

agent, a host environment

2) i) a

ii) c

iii) c

Check Your Progress Exercise 2

1) Your answer should include tlie following points

a) true

b) true

c) false

d) true

e) true

2) a) Population

b) Communicable

c) Communicable, diseases, tuberculosis

Check Your Progress Exercise 3

1) Your answer should include the following points

Poorly nourished children, elderly people, women in the reproductive age group, pregnant and lactating women, people living in rural areas and slums and those living in overcrowded communities are vulnerable to epidemics.

Poor environmental sanitation, inaccessibility to safe drinking water and industrial pollution also contribute towards vulnerability to infectious deseases.

2) Your answer should include following points

- Predictability

Improvement of immunity of host

Community Health Education

UNIT 13 PLANNING

Structure

13.0 OBJECTIVES

After studying this Unit, you should be able to :

- describe the meaning and concept of planning in the context of disaster preparedness;
- differentiate between short-tern~and long-term planning; and
- discuss the role of a planner in the process of preparing for disasters.

13.1 INTRODUCTION

The word 'planning' generally covers two entirely different approaches in the context of disasters. One is that of land-use or physical planning. It involves the regulation of the development process in urban and rural areas by means such as imposing limits on building heights and the use of land, the amount of land that can be built upon, etc. In urban areas that are declared to be 'development areas', laws and development regulations are accepted and are generally recognized as being helpful. However, outside the urban areas and especially in the rural flood plains, zoning and planning law proves difficult to enforce. If it does exist, it is mostly in the form of positive direction, rather than precise law, setting out 'what ought to be'. In such cases, planning is very careful because it raises awareness and sets certain standards.

The other form of planning relates to advocacy planning. It relates to policies and proposals. In this approach, the planning team acts as catalytic agents, presenting choices to various organizations like local self-government, Non-Governmental Organizations (NGOs), and community based organizations, while seeking support for that approach which seems to bring most benefits to a wide range of beneficiaries at a cost that is affordable.

Planning is advantageous because it results in clear allocation of responsibilities and consequently improves coordination between agencies. Accordingly, the planning process should never be regarded as one in which some specialist or team acts in isolation. The planning process essentially needs to be action-oriented, to involve a wide range of people and organizations and to produce an end result which has the agreement and support of all those involved in the common objective of dealing with the disasters in their areas of responsibility.

13.2 PLANNING IN THE CONTEXT OF DISASTER PREPAREDNESS: MEANING AND CONCEPT

The purpose of planning is to anticipate future situations and requirements and to make provision for the same. This will ensure the application of effective and co-ordinated counter-measures. This is a useful definition of planning for disaster management officials because it indicates the wide nature of an requirements for counter-disaster planning. In other words, Planning is not confined merely to preparedness for and response to specific disaster events. It should cater, as far as possible, for all stages of the disaster cycle from advance preparation to relief and rehabilitation. Therefore, requirements for planning involve a considerable range ofactivitics dictating a flexibility of approach.

National Development

Many countries including India gear national development to a series of time-period plans; for example, Five Year Plans. This kind of a system provides considerable flexibility for adjustment to unscheduled or unexpected events, like disaster situations. Thus, many nations include disaster planning aspects in their overall planning cycles. This approach of incorporating disaster mitigation planning into the developmental planning process has been found to be cost-effective and result oriented.

These days, management of the environment rates high in national considerations. Since many disaster events are enviornmentally related, there is a strong case for linking disaster to environment, as far as national planning is concerned. Consequently, a key planning point is that wherever appropriate, disaster planning is linked to the development and environment considerations in the national plan.

Prevention

The possible range of prevention measures is quite large because of the nature of different disasters. At one end of the prevention range, the construction of flood control structures could involve extensive effort and very large amounts of money. At the other end of the prevention range, controlled burning in forest areas, prior to a high risk season, in order or prevent big fires from starting comes closer to mitigation, or even preparedness.

Planning for these different contingencies, therefore tends to fail into different categories. For example, a complex and costly flood prevention system could reasonably be expectccl to come within the category of national development, while the case of controlled burning would be more likely to fall within a specific annual disaster management programme, which could also be usefully included in a disaster preparedness/response programme.

Mitigation

If the term mitigation, or prevention/mitigation is taken as mainly including structural and non-structural measures designed to reduce the effects of disaster when they occur, it would seem appropriate for such measures to be applied as a series of programmes or regulations, rather than as plans. For instance, aspects such as building codes, land use regulations and safety codes for transport systems would fit more appropriately into a programme or regulation category. However, as with measures of prevention, it would also be reasonable to include appropriate references in disaster preparedness/response plans. For example, the fact that wind-resistant factors had been built into domestic houses would have some bearing on disaster response managment decisions relating to possible evacuation or temporary movement to safe havens.

Preparedness/Response

The combined categories of preparedness and response generally constitute the most widely used basis for counter-disaster plans especially those which might be called Action Plans. This is because so much of the effectiveness of response depends on good preparedness. In some cases, the preparedness/response plan may be called a national or state disaster response plan, as distinct from a separate plan designed to deal with recovery.

Recovery

There are various planning options that can be used for recovery. Sometimes, a separate plan is utilized, so that two main plans exist, a disaster response plan and a disaster recovery plan. However, in some cases the agencies prefer to take a more flexible approach and deal with recovery through arrangements which, depending on circumstances, are specific to each disaster event.

The planning process usually involves consideration of a wide range of disaster-related matters in order to decide what is eventually included in the plan. However, not all aspects will be related to all levels of plans. Neither will all aspects assume equal importance in different plans.

Planning guidance cuts across the projects of private developers and the functions of government agencies. Planning related activities command popular support when they are seen to be implementing a good public information policy to be directed towards achieving public good and people's access to amenities and services. A high level of public consultation and transparency will ensure public support. This will ensure that the plans which reduce vulnerability to natural disasters command public confidence and support.

13.3 SHORT-TERM AND LONG-TERM PLANNING

Mitigation is defined as "measures aimed at reducing the impact of a natural or man-made disaster on a nation or community". The basic assumption is that, whilst it may be possible to prevent some disaster effects, other effects will persist. The concept of mitigation recognizes this and maintains that the application of certain measures can moderate or reduce disaster effects.

An effective approach to reducing risks and achieving disaster mitigation has long-term and short-term goals. Long-term goals are either an integral part of the national/regional/local disaster management plan or are set after a major disaster with a view that, should a similar disaster strike again, the population will be well-prepared and able to cope with it. Long-term planning, therefore, involves measures for prevention, mitigation and rehabilitation.

Prevention measures are those that are aimed at impeding the occurrence of a disaster even though it may not be possible to avoid the event that creates the hazard. Construction of a dam or embankment to control floods arising from heavy rains is an example of a preventive measure. Another example is the controlled burning - off in a bushfire-prone area.

The nature of disaster prevention is such that the measures involved, usually need to be implemented from senior levels of government. For example, the population of a single community or area is unlikely to be able to institute a major flood-prevention project. 'Sometimes, Legislation is also resorted to, to implement measures of prevention, like in case of mandatory building codes.

Many factors which apply .to prevention also apply to mitigation. Mitigation can be introduced within the three diverse contexts of reconstruction, new investment and the existing environment. Each presents different opportunities to introduce safety measures. Mitigation measures are complex and interdependent, and they involve widespread responsibility. They are most effective if safety measures are spread through a wide diversity of integrated activities.

Simple examples of mitigation **measures are** :

1) adoption of land-use planning and development controls to restrict the activities in high risk areas;

2) economic diversification to allow losses in one sector to be offset by increased output in other sectors;

3) changing crop cycles so that crops mature and are harvested before the onset of the disaster season; and

4) retrofitting houses to withstand cyclones and earthquakes (reconstruction and rehabilitation).

Long-term planning proposals generally face a lot of opposition, at least in the initial stages. These may be a long-standing acceptance of disaster risks by governments and communities, who may feel that traditional measures, taken over many years, are adequate. Also, Long-ten11 measures tend to be ruled out, perhaps without a detailed analysis of cost-benefit and other factors. Higher priorities given to other national programmes sometimes totally preclude the consideration of disaster preventive measures. Considerations affecting disaster prevention and mitigation may be given limited priority in national develpment plans. So disaster-related measures do not receive adequate or appropriate attention in national planning.

During its initial period of implementation, a mitigation or prevention-related strategy needs recognition and leadership from a high governmental and city management level, if it is to be sustained through a network of implementing agencies. A long-term programme also includes periodic reviews and renewals of policy statements, professionals engaged in mitigation work and public education programmes. In a long-term plan, a major objective is to involve all sectors of society in some degree in contributing to the formulation of appropriate mitigation measures, and in the execution of work where possible. Some sectors will be involvecl in policy formulation at the national level, others at the level of urban neighbourhood and local communities known to be at high risk.

Long-term planning, therefore, involves multiple agencies, each agency doing some specific work related to reducing risk in their area of concern. Such goals are incorporated into the agency's current priority list.Short-term planning, on the other hand, consists of measures to deal with disaster situations immediately at hand. These measures may be initiated either immediately after a disaster strikes (reactionary) or precluding a disaster situation (proactive).

Reactionary measures are those taken immediately after a disaster strikes, for example, after an earthquake. In this case, the planning process is triggered off once the occurrence of the tragedy is known. Immediate measures initiated in such cases are:

i) provision of temporary shelters for the affected,

ii) ensuring adequate supply of safe water food and medicines,

iii) provision of sanitary facilities, and

iv) maintenance of law and order

For this purpose, a single agency is formed, though many other bodies may also bc involved in tlie relief work. The central agency does the work of determining priorities, coordinating tlie relief and rescue operations, directing the supplies, etc. The agency works either according to an existing government plan or through an emergency plan formulated for the occasion.

The Short-term post-disaster planning process continues till such a time as some semblance of normalcy is restored in tlie area - normally till the services are functional. After that, the long-term rehabilitation and reconstruction work starts.

Proactive short-term planning is initiated when there is a warning issued that a disaster is about to strike. For example, modern technology has made it possible to track tlie path of cyclones so that warnings can be issued well in advance to the residents of the area wliere they are likely to strike. Once the warning has been issued, tlie pro-active planning mechanism swings into action and efforts are launched to evacuate people out of harm's way. They are transferred to temporary storm shelters where tliey stay till the danger is past. Evacuation is also done when there is a danger of floocls. Periodic inspection and monitoring, e.g., checking of embankments for breaches prior to the onset of monsoons and drills for officials in simulated emergency situations are all a part of tlie short-term planning strategy.

Disasters can be met with effectively only if a judicious combination of long-term and short-term planning is adopted. While the results of short-term planning are more apparent and raster, tlie ultimate reduction in damages from disasters is achieved only through long-term planning.

Check Your Progress 1

Note: i) Use the space given below for your answers.
ii) Check your answers with those given at the end of the unit.

1) Differentiate between short-term and long-tern1 planning.

2) Give simple examples of mitigation measures.

13.4 ROLE OF PLANNER

It is very important for the planner, throughout the planning process to keep certain critical points in consideration. Being a person trained in a wide range of abilities ranging from administrative procedures to developmental perspectives, he or she occupies a unique position as being able to perceive, from various standpoints, conflicting issues that might arise from time to time. Such a skill comes in most handy to settle the contentions of differing professionals and for varied interest groups..

The planner has to take on the responsibility of keeping the approved aim of the plan in clear focus. Needless to say, the plan has to be evolvecl in response to the user needs and should have the maximum support base in the community. The plan should also have formal approval of Government or any authority designated on its behalf.

The planning process is a co-operative process. There should always be full consultation with all concerned, particularly to ensure that mutual agreement is reached on responsibilities designated within the plan. This consultative process is best carried out, from a practical as well as psychological viewpoint, by the planners going to see the key individuals and agencies concerned, and not vice-versa.

For best success, the planner has to ensure transparency at every stage and periodic progress reports should be made public indicating the physical and financial targets and achievements.

The planning process, arid the plan itself, should include provision for legal authorization, thus malting the plan a lawful instrument of the government. It is generally recommended that this should happen whether or not disaster legislation exists.

Obviously, the responsibility carried by disaster management planners is an onerous one. If the planners get the plan wrong, then the repercussions can be very severe and widespread, possibly involving the loss of many lives. On the other hand, accurate and meticulous planning not only produces an effective plan, it also provides the focus for successful overall disaster management.

13.5 LET US SUM UP

Planning is one of the most efficient tools available to deal with disasters. Planning can be applied in the physical aspects like land-use and infrastructure as well as in its advocacy form, which involves policies and proposals. Proper planning ensures that damages from disasters are considerably reduced in the long term. It also prepares people and officials to cope better in disaster situations. In the process of the preparation of a disaster-preparedness plan, the planner plays the crucial role of coordinating with the administrative authorities as well as among the different interest groups involved. On him lies the responsibility of keeping the ultimate aim and format in mind and guiding the draft-plan preparation process accorciingly. A judicious combination of long-term and short-term planning measures is the best possible manner in which to achieve the mitigation of disasters. Long-term and short-term planning techniques should ideally take into account cost-benefit considerations.

13.6 KEY WORDS

Advocacy : Promoting the cause (of disaster planning)

Physical Planning : Making arrangements for real goods and services required for completion of a project.

National Development Plan : Planning for economic development of the country. It may be short, medium or long-term.

Retrofitting : To equip or modify a house or a building to make it safer

13.7 REFERENCES AND FURTHER READINGS

Carter, W.N.(1991) *Disaster Management : A Disaster Manager's Handbook*, Asian Development Bank, Manila.

13.8 ANSWERS TO CHECK YOUR PROGRESS . EXERCISES

Check Your Progress 1

1) Your answer should include the following points:

- Short-term planning consists of measures which deal with the disaster situation immediately at hand. Such measures may be initiated either immediately after a disaster or earlier to prevent/reduce its impact.
- Long-term planning involves measures that can be implemented over a period of a Sew years arid need large expenditure. Therefore these need periodic reviews and renewals.

2) Your answer should include the following points:

- Adoption of land-use planning and development control to restrict the activities in high risk areas.
- Economic diversification to allow losses in one sector to be offset by increased output in other sectors,
- Changing crop cycles.
- Retrofitting houses.

UNIT 14 COMMUNICATION

Structure

14.0 OBJECTIVES

After studying this unit, you should be able to:

- explain the distinction between the Conceptual and Physical Aspects of communication;
- identify the significance and role of communication in Disaster Preparedness and Mitigation; and
- describe the principal techniques, ways and means of communication for effective end results.

4 .1 INTRODUCTION

Among various aspects of Disaster Management, "communication" is one of the most critical requirement. The word "communicate" implies conveying of thoughts, ideas, warnings, instructions, orders, command, knowledge and information. In the context of disaster management, fail-safe communication is vital during a wide range of actions, from the significant phase of "preparedness" to impart knowledge and information (mass education and public awareness), warning of impending threat of disaster, calling various resources and intimation to authorities and conducting disaster management in general.

14.2 COMMUNICATION: MEANING AND CONCEPT

The word "Communication" holds a very significant place in all walks of human life, A person is an element of society, nation and the world and cannot live his or her in isolation. He or she has to interact with his or her fellow human beings.

There are two distinct facets of communication. One is the physical one where we use a variety of means using ever progressing technology. Due to modern technology and use of Satellites we broadcast television programmes all over the world. Satellite phones and internet have added new dimensions to global and almost instantaneous communication. Thus there is no lacking of any type of Hi-Tech means to communicate. Media (print and electronic) serve as credible and influential agents of communication.

The other aspect which is far more important is the conceptual one. It is necessary to ensure that recipient of communication understands the contents of the message being conveyed and that he responds to it in the desired manner. This apparently simple requirement carries behind it Herculean efforts of thorough knowledge, clarity and conciseness. The originator must realise the

capacity and capability of the receiver to appreciate the message and to react correctly. Thus, content and clarity have to be the essential features of the message being communicated. The content has to be specific, to the point, brief and couched in simple, understandable and clear language with no ambiguity. Thus in its modern concept "communication" transcends its traditional meaning of transmission of message but includes the quality of the message itself especially tlie content, conciseness and comprehensibility.

14.3 SIGNIFICANCE OF COMMUNICATION IN DISASTER PREPAREDNESS AND MITIGATION

Whenever we talk of "Disaster" we invariably imply tlie following distinct phases:

(a) Preventive and preparedness measures for ensuring minimum adverse effects,

(b) Follow up actions in the event of occurrence of a Disaster, to handle tlie "Aftermath" arid make all efforts to mitigate - i.e., to minimise/to reduce eventual losses/damage to Life and Property.

Unless we have "Communication" at its best in all the required forms we will not be in a position to deal with the above phases lo our entire satisfaction. In the aftermath of a disaster, time counts and efficient communication at all levels decides tlie success of all efforts. It is therefore essential to critically examine tlie role - and need - of communication. The discussion that follows will critically examine the same in tlie above mentioned phases.

Communication during the phase of Preventive Measures: An in-depth study of all probable causes of disasters likely to occur in the area is to be made, identifying all likely sources of disaster.

Preparedness: This is the most important phase. The state of Preparedness is to be reached to maximum efficiency to be effective. In this phase, all resources - their types and strength - are worked out, identified and are placed "on call" whenever situation so warrants. This phase requires high degree of dedication and cooperation of all resources. Resources imply police, firemen, medical personnel, transporters, volunteers and above all a sound communication system.

Immediately after A Disaster Occurs: Communication, in all its forms, plays a most vital role in this phase. The prime requirement of this phase is to convey facls without creating any panic. Also, time element is of utmost importance. Even a minor delay caused due to incomplete or incorrect communications will add to the problem. The intimation of the occurrence of a disaster is to be given, in the laid down priority, to government officials, affected population and news media of all types. This becomes effective only when there are "Check Lists" at all levels and personnel are trained to act strictly yet timely according to their respective check lists. In the absence of check lists, chaos will prevail disrupting the smooth responses at required levels.

Aftermath: Once the laid down actions get under way, the situation is brought to normal, i.e., the cause of disaster is "contained" or has passed away. While this is going on, regular progress of events is intimated to people through proper "media". The next action by concerned authorities, after normal life is restored, should be to carry ruthless audit of all events, critically analyse faults, weaknesses, lapses, and shortcomings together with impediments, if any is experienced, and introduce measures to overcome/remove them.

It is implied in the above that only correct and efficient communication can (a) prevent occurrence of a disaster or reduce its impact. (b) reduce vital delays in aftermath and (c) in general decide the success of disaster management efforts.

14.4 TECHNIQUES OF COMMUNICATION

Efficient communication needs hardware and software systems of considerable sophistication. It is obvious, therefore, that their use needs skills and techniques of high order. In the various phases of Disaster Management, where every minute and every effort are precious, it is the efficient and flawless communication which ensures the success of the operation.

Following are the broad areas where skilled communication is required:

(a) Mass Education And Public Awareness.

(b) Training of industrial personnel

(c) Appraisal of Government Authorities

(d) Information to Media

(e) Use of Wireless set, and amateur radio (Ham)

(f) Use of Telephones, Cell phones and satellite phones

(g) Use of INTERNET including e-mail

A concerted effort is required to train every originator and each recipient in order to make the communication effective, so as to achieve the intended objectives.

14.5 MODES OF COMMUNICATION

With progressive Hi-Tech means a number of sophisticated equipment are being developed. A broad range of the means of communication is given at Annexure A, The point to note in this list is that hardly any existing mode will ever be obsolete despite inclusion of more modern methods.

Media (electronic and print) are very helpful in disaster management related communications. They serve as very useful conduit between the people and the disaster management personnel.

14.6 WAYS TO ENSURE EFFECTIVE COMMLTNICATION

Plan the Total **Requirements of** Today and Tomorrow. At the outset, determine numbers - after duly identifying them - of total "subscribers" including industries other sources of Disaster, Resources, Government Authorities and make out the phase wise programme of the required means from the list at Annexure 'A'. Also provide for the futuristic increased requirements.

Disaster Management Directory. For day to day interactions, telephone is going to be the major means. Therefore, a group wise Telephone Directory is also necessary..

Skilled Personnel. Having obtained costly communication equipment, skilled personnel need to be inducted to handle it. Every instrument has to be kept in daily use by scheduled "checking". The equipment needs to be maintained and always kept in serviceable condition.

Vigorous and Regular Training. It must be an integral activity so as to maintain and improve the skill level. For example use of wireless set Iias a specific pattern, not familiar to even educated. This has to bc attended to. Also, duty personnel must be taught tlie use of telephone in an economical yet clear manner.

Sub-Control Rooms/Alternate Control Centres. In the event of main Control Room being ineffective for any reason, there must be another one to assume charge without interruption in the operations.

14.7 LET US SUM UP

We have seen that "Communication" is the most vital requirement for effective and efficient Disaster Management. Since time is of great significance, tlie delays in intimation and responses at all levels can only be minimised by skilled communication through multitier, sophisticated equipment and trained persons.

Basic requirements of communications are:

(a) Thorough Knowledge of Situations

(b) Clarity

(c) Conciseness

(d) Thorough Assimilation of Message Received and Correct Response.

Taking into confidence people likely to be affected, in general, and news-media, in particular, and giving them tlie correct and timely knowledge and information is vital, in order to obviate panic, chaos, rumours and confusion.

The skill levels of all "Originators" and "Receivers" of messages need to be kept high by regular training and constant practice.

Check Your Progress 1

Noie: i) Use tlie space given below for your answers.
ii) Check your answers with those given at tlie end of the unit.

1) Distinguish clearly between tlie Physical and Conceptual aspects of Communication.

2) What are the basic requirements for making an effective communication?

Check Your Progress 2

Note: i) Use tlie space given below for your answers.
ii) Check your answers with those given at tlie end of the unit.

1) Which are the "electronic" modes of communication?

2) Which are various wings of "Media"?

14.8 KEY WORDS

Comprehensibility : Quality of being understood clearly by the recipient of the message

Originator and Receiver of Communication : A person/control centre which originates orders/instructions/information is originator whereas the party at the other end which "responds" is Receiver.

On Call : In a state of readiness

Preventive Measures : All actions including training, supervision, exercises taken to prevent or minimize the probability of occurrence of disaster situations.

Transcends : Goes beyond

Audit of Events : To analyse what went wrong after normalcy is restored.

Disaster Management Directory : A useful compendium of full details of all agencies who contribute to the entire scenario of Disaster Management in any way/capacity in the specific area

14.9 REFERENCES AND FURTHER READINGS

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14.10 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

1) Your answer should include tlie following points:

- Physical aspect implies various modes of communication e.g., telephones, wireless sets, sirens, TV & radio, newspapers.
- Conceptual aspect, which is more vital, is to ensure that the intended message/knowledge/ information/order/instruction is so conveyed that it is understood clearly by tlie "Receiver" for the intended/expected action.

2) Your answer should include tlie following points:

- Clarity, Conciseness, Credibility
- Completeness with due consideration to above.

Check Your Progress 2

1) Your answer should include the following points:

- Electronic modes include-Radio, Television, Wireless Set, Amateur Radio (HAM), Cellular phones, Satellite phones, and INTERNET.

2) Your answer should include tlie following points:

- The word media includes agencies like newspapers, television and radio that serve as tlie carriers of information to the people at large and also give publicity to their views and responses.
- Media are usually recognized in two types viz., print media (newspapers and periodicals) and electronic media (television and radio).

"ANNEXURE - A"

MEANS OF COMMUNICATION (DEPENDING ON SITUATION AND AVAILABILITY)

1. WIRELESSSETS:
   (a) STATIC
   (b) MOBILE (VEHICLE-MOUNTED)
   (c) AMATEUR RADIO (HAM)
   (d) HAND-SET (WALKIE-TALKIE)

2. I-IOT LINES
   "NO DELAY" POINT-TO-POINT COMMUNICATION (BOTH WAYS)

3. ONE WAY COMMUNICATION FROM MAIN CONTROL ROOM TO EACH SUB- CONTROL ROOM FOR SIMULTANEOUS WARNING.

4. TELEPHONES INCLUDING CELLULAR PHONES AND SATELLITE PHONES: TELEPHONE CONFERENCING FACILITIES

5. INTERNET INCULDING E-MAIL

6. SIRENS AND BELLS OR GONGS.

7. DESPATCH RIDERS WITI-I MOTORCYCLES.

8. MESSENGERS WITH BICYCLES.

9. PAGING SYSTEM - FOR KEY PEIESONNEL AND TRAINED DOCTORS.

10. AIR HORNS.

11. LOUDSPEAICERS MOUNTED ON JEEPS/VANS OR MOTOR BOATS.

12. DOORDARSHAN.

13. AKASI-IVANI.

14. SLIDES IN CINEMA THEATRE

UNIT 15 LEADERSHIP AND COORDINATION

Structure

15.0 OBJECTIVES

After studying this unit, you should be able to:

- explain the concept and significance of leadership in disaster situation;
- discuss various leadership styles under conditions of crisis;
- explain the concept and significance of coordination;
- discuss the principles and techniques of coorclination; and
- describe the role of a leader and coordinator in a crisis situation.

15.1 INTRODUCTION

Leadership has a prominent and powerful role in society and influences all aspects of life in normal as well as crisis situations. Leaclers can emerge from within a group and can also bc formally appointed or elected. There are many qualities that a leader should have such as intelligence, quick comprehension, decisiveness, courage, strength, confidence, education, knowledge, personality, charisma and above all integrity. There may be a long list of leadership traits but the following five attributes have strong correlation with the leadership. There are: I. Dominance (Personality) 2. Intelligence 3. Self-confidence 4. High energy level and 5. Task related knowledge (political or organizational).

15.2 LEADERSHIP IN DISASTER SITUATIONS: CONCEPT AND SIGNIFICANCE

Leadership is defined as ability to influence or motivate a group or community towards achievement of certain goals. In normal circumstances, leadership is entirely different as all decisions are taken after enough thinking, after a process of consideration and reconsideration as well as with the thoughtful advice of experts in the area. There is a framework of legislation to provide formalized support and confirmation. On the other hand in crisis situations or under unstable and disruptive conditions or in disasters, tasks of leaders usually becomes difficult. The leadership from local level, district level, state level and up to national level is affected by a number of factors such as the following:

Many of the designated local leaders are themselves affected by the disaster. They could get isolated due to sudden breakdown of communications or become ineffective under traumatic condition due to the suddenness and severity of the situation. . .

During disaster, many of tlie relatives and friends of the leaders could be affected. Their attention could get diverted to them instead of taking decision or action for relief and recovery of the community.

Lack of information and disruption of communication become serious factors hampering decision making.

Loss or delayed availability of human resources, equipment, transport and other relief commodities delays action and creates a sense of helplessness.

In the resulting confusion, community feels insecure and could lose confidence in the leadership. There may be many other factors depending on tlie type of disaster and tlie affected people. In a crisis situation requiring relief and rehabilitation of disaster affected people, administration and political leadership could have different goals.

A) District administration

In a district, tlie district magistrate or district collector is chairman of the disaster relief committee. The officers' main aim is to mount effective rescue operations for the affected people, provide immediate relief in terms of food, medicine, drinking water, clothes and temporary shelter. It depends on tlie leadership qualities of an administrator, how he or she gets the job done. There could be two approaches: (i) "Boss-Approach" in which one passes orders and expects that the subordinates will act according to the orders, (ii) "Team-Approach" in which full cooperation of all concerned officers and people is taken. In this case tlie leader will take all concerned officers into confidence, involve them in the decision making, monitor their work and guide them from time to time for effective relief operations. In disaster situation, the latter approach will be more effective and give better results.

B) Local leadership

Local Icaders would like to make their prescncc felt. They may or may not be having any experience of disaster management. In many cases, their intervention may sometime hinder the process of relief but may give political advantage to tlie local leaders. Secondly, they may openly criticize the disaster management officials with or without justification.

C) State and national level leadership

State and national level leadership will try to provide funds and mobilize effective relief within the available resources but this leadership initiative from top will be based on an overall appreciation of the disaster situation. For the state and national level leadership to be effective, they should have accurate arid up to date information from the disaster area through tlie district leadership and leave detailed implementation to the local established administrative system.

15.3 LEADERSHIP STYLES

Before dealing with the leadership styles, it is important to know the attributes and desirable qualities of a leader. Leadership qualities can not be learnt from a book; for 'example, 'courage' cannot be learnt from anywhere except perhaps from worthy role models. Secondly, no leader can be an allrounder or ideal in all aspects. There are some good qualities that every person has in some measure, such as sense of humour, endurance, cheerfulness, dedication, enthusiasm, courage, quick decision, identification of problem, etc. But combinations of a large number of these desirable qualities in a person can make him or her a better

leader. Some of the more desirable qualities of leadership in disaster management are briefly discussed below:

1) Personal qualities and self-confidence

As mentioned above, every person has some leadership qualities. One should identify them and try to develop and upgrade them to the best capability. Self-confidence is an important characteristic of a leader which can be developed by increasing his own professional competence and inter-personal abilities.

2) Professional competence

This competence means knowing what to do and how to do it. This can be developed by acquiring a high standard of knowledge, skill and ability appropriate to the task and circumstances. Higher the professional competence, more is the respect and trust that the leader would receive.

3) Sound judgement and appropriate decision making

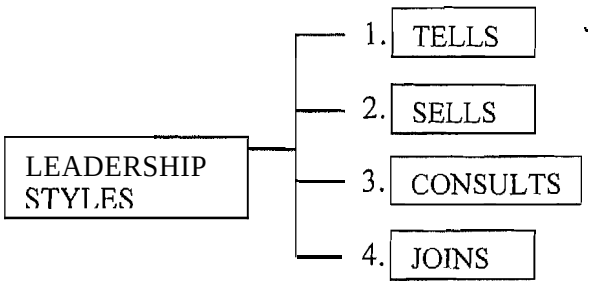
There are very much related to the professional competence and experience of a person. A leader with these two qualities will emerge successful with his team of co-worlters in any disaster situation.

4) Ability to cominunicate

Clear and concise communication with people working with the leader is very much essential for proper functioning. In fact, this is an essential ingredient in developing good interpersonal relations that generate goodwill and loyalty to the leader leading to a high level of discipline in the team.

5) Appropriate style of leadership

Always different tasks require different styles of leadership. It is important for a successful leader to understand the dimensions and requirements of the given task and adjust the leadership style to achieve the desired results. The leadership styles appropriate to disaster management work are of four types as follows:



1. Tells-

The leader orders the team and waits for results and action while keeping an eye on the progress. He does not expect his subordinates to ask questions or give suggestions. This style is adopted when the matter is urgent and there is no time to lose.

2. Sells-

Convinces the team about the decision taken by analysing the positive and negative points. It is like selling ideas to the team members. Obviously, this exercise takes some time.

3. Consults-

Leader consults the team and allows them to participate in the decision making with the view to making small adjustments but the main thrust of the decisions of the leader are more or less final. This style is somewhat less time consuming than the 'Sells" style.

4. Joins-

The leader discusses thoroughly the problem and the likely course of action. Every member of the team is involved in the discussion and finally the consensus decision prevails. This style consumes most time but later work is smooth.

Sometimes a multi-style or mixed-style approach is more useful in disaster situation. There are various different tasks such as distribution of foocl, medicines, temporary shelter, and rescue work. If each of such tasks is assigned to a diffeent person instead of all tasks to one, there can be better results. In other words, delegation of authority and work is also an important aspect of leadership style. Of course, the leader has to continue to monitor and coordinate with his colleagues.

Another useful factor in the clevelopment of disaster management is the strong and positive link between leadership and training. A high standard of training can upgrade the professionalism in the leadership. This is the reason that the Government of India (through its nodal ministries and departments) and the various institutes of public administration (through their faculties of disaster management are giving more emphasis on 'Human Resource Development' in the area of disaster management. They want to provide training to various levels of government officers, NGOs and to the community leaders so that they have more knowledge, skill and confidence to tackle the likely disaster situations.

Check Your Progress 1

Note: i) Use the space given below for your answers.
ii) Check your answers with those given at the end of the unit.

1) Define Leadership.

2) What are the qualities of a good leader in disaster situation?

3) List the different leadership styles for a disaster manager.

15.4 CO-ORDINATION: CONCEPT AND SIGNIFICANCE

Coordination

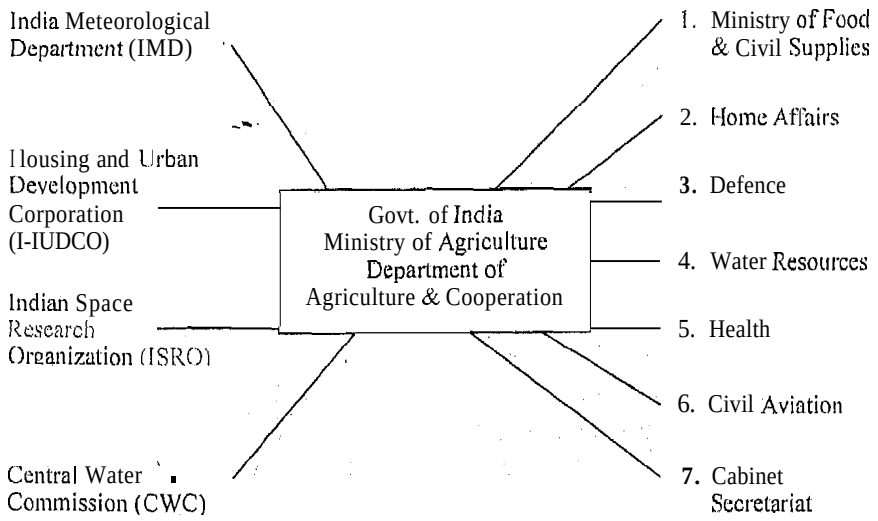
Coordination can be defined as combined efforts of various related organisations and agencies to achieve tlie goal/target of a task and is therefore very essential. In fact, there is always scope for improvement in coordination between various agencies/organisations working for relief and rehabilitation. There are three main bodies involved in disaster management:

NGO= Non-Government Organisation
CBO= Community Based Organisation

At all stages of disaster management, viz., preparedness, mitigation efforts as well as relief or response, there is need of proper coordination. Thus, the role of coordinator/leader in disaster situation becomes very significant.

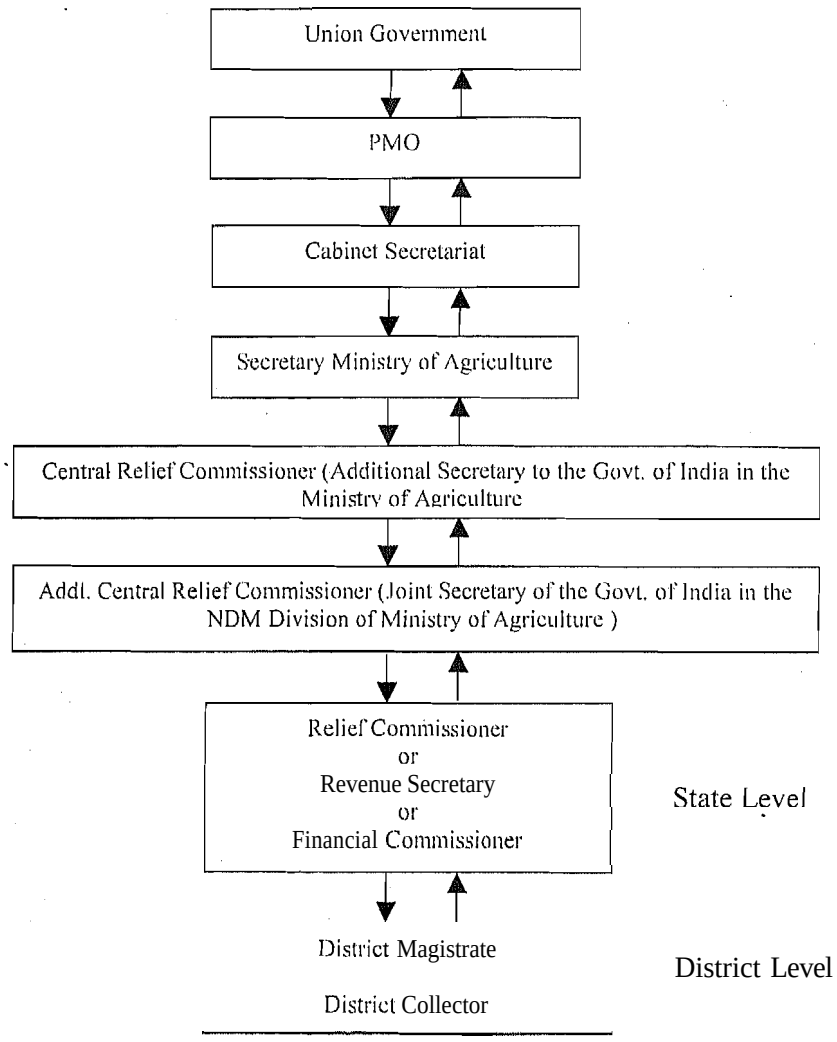
In Government of India, the Ministry of Agriculture was the nodal ministry for disaster management. The Natural Disaster Management Division dealing with Natural disaster was earlier with the Ministry of Agriculture, Government of India but now it is under the Ministry of Home Affairs, Government of India. However, drought as a natural disaster is still being managed by the Ministry of Agriculture, Government of India.

There are many other ministries and specialist departments and organisations involved in the disaster preparedness and response operations.



Similarly, the State governments have their agencies involved in disaster management work. The Central Government is in regular contact with State Governments. In the Central Government, the Central Relief Commissioner is the focal point and the Finance/Revenue Secretary or the Slate Relief Commissioner is the focal point in the States. They work in close contact with each other.

The following diagram explains the coordination arrangements between Central, State and District Administration for Disaster Management.



15.5 PRINCIPLES AND TECHNIQUES OF COORDINATION

In Disaster Management, all the concerned organisations, agencies, and the public have common goals as discussed below.

Pre-Disaster Situation- for disaster prevention. mitigation and preparedness to minimize loss of life and property from natural disasters.

Disaster Situation- to provide effective relief, rehabilitation of affected people and recovery of the community. There are no set principles or rigid techniques for coordination in disaster situation because each disaster situation is unique in its own way. But, coordination is more effective if we follow the basic principles of coordination given below:

1) Clear Role Allocation

There sliould be clarity in roles of different participant organisations. They should know their authority and limitations. There should not be duplication of roles.

2) Networking

All concerned organisations should have proper networking. This will provide them better understanding of strengths and weaknesses of each other and will also ensure proper coordination of efforts besides avoiding duplication.

A proper networking of NGOs will give them the idea about the capacity and capabilities of each other. This knowledge is very essential for coordination among NGOs.

3) Practising coordination during exercises.

4) Knowledge of professional competence of individual organisation

5) Knowledge of available resources including financial resources

6) Transparency in the action of various organisations involved in management.

15.6 ROLE OF LEADER AND CO-ORDINATOR

A good leader or coordinator can make the task simple and more effective. He can serve the affected people within limited resources and be cost-effective. Role of a leader starts from pre-disaster situation. He has a very important role during and after tlie disaster. Roles of leader/coordinator are almost same and are given below:

Identification of safe places or protected areas, when disaster impact occurs. He should be able to convince tlie community that they should reach these safer places at the time of pre-warning. Normally, people do not want to leave their houses and belongings even after several warning and even police intervention. But a good leader can persuade them to move to safe places. In cyclones and floods, such evacuation of people can save a lots of human lives and cattles.

Leaders take decision concerning post-impact priorities for rescue, temporary evacuation, shelter, immediate needs of the community crucial to tlie lines and livelihood of the affected people.

Leaders implement self-help measures and induce spirit of cooperation.

They take decisions to organize external assistance which can significantly defer or alleviate potential hardship for those who have lost their home and means of livelihood.

Involving people and community in the decision making, implementation of plans and their participation at every step of relief or rehabilitation process by keeping complete transparency.

Check Your Progress 2

Note: i) Use the space given below for your answers.
ii) Check your answers with those given at the end of the unit.

1) Name the nodal ministry and other important concerned ministries and agencies of Governments of India involved in disaster management.

2) Who is the focal point for disaster management in the Ministry of Agriculture?

3) List the important roles of a leader in disaster management.

15.7 LET US SUM UP

Leadership is the ability to influence or motivate people towards achievement of goals. There are five important traits of leadership such as personality, intelligence, self-confidence, high energy level and task relatecl knowledge. Leadership in normal circumstances and during crisis differs greatly. This unit has discussed the concept ancl significance of leadership ancl described the various leadership styles. The importance of coordination has been emphasized and the role of a leader and coordinator has been explained.

15.8 KEY WORDS

Charisma : Ability to attract, influence ancl inspire people

Integrity : Quality of probity, honesty and high moral principles

PMO : Prime Minister's Office

15.9 REFERENCES AND FURTHER READINGS

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15.10 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

1) Your answer should include the following points:

- Leadership is defined as the ability to influence or motivate a group or community towards achievement of certain goals such as disaster management. Leadership plays a prominent and powerful role in society and influences all aspects of life in normal as well as crisis situations.

2) Your answer should include the following points:

Personal qualities and self-confidence;

- Professional competence;
- Sound judgement and appropriate decision making;
- Ability to communicate; and
- Appropriate style of leadership.

3) Your answer should include the following points:

i) Tells;

ii) Sells;

iii) Consults; and

iv) Joins

Check Your Progress 2

1) Your answer should include the following:

Ministry of Agriculture, Food and Civil Supplies; Home Affairs; Defence; Water Resources; Health; Civil Aviation; Tndia Meteorological Department and Central Water Commission.

2) Your answer should include the following:

Central Relief Commissioner, assisted by the Additional Central Relief Commissioner.

3) Your answer should include the following points:

- A good leader can be very cost-effective by managing the work within limited resources through proper coordination.

- A good leader plays an important role in convincing the affected people to act according to the warning and advice, for example, where prompt evacuation has been advised by the concerned authorities.
- A good leader induces the spirit of cooperation among the community and is thus able to implement self-help projects very well.

UNIT 16 WAREHOUSING AND STOCKPILING

Structure

16.0 OBJECTIVES

After studying this unit, you should be able to:

- explain the need for warehousing and stockpiling of essential commodities as past of preparedness for disaster;
- describe the inventorisation of commodities based on established need; and
- discuss the network and distribution mechanism of stocked goods.

6 . 1 INTRODUCTION

At the national level, the central government, maintains buffer stoclts of essential items to cater to fluctuating demand pattern. In case of food items, the inventory is maintained by the Food Corporation of India of the Ministry of Food and Civil Supplies, with their warehouses located all over the country. In overall working and distribution system, the government may vary its own procurement based on the level of buffer stocks. Essential items such as medicines are also maintained through a system of Medical Stores at national and regional level. This is maintained by the Ministry of Health & Family Welfare.

While Medical Stores cater directly to emergencies, the food stocks service the public distribution system and also take into consideration, the seasonal demand shifts and international trade.

At the district level, as part of the contingency action plan, stores are identified and stocks maintained of essential items in addition to medicines and food for use during emergencies.

The level of stocks and the various techniques for distribution may vary from item to item and time to time according to exigencies. Needless to say, this depends very much on the population of the district and the vulnerability of the clistrict to any particular types of disaster.

16.2 IMPORTANCE OF WAREHOUSING AND STOCKPILING

Disasters occur suddenly, sometimes without warning, and in a very short span of time. The government through the district administration has to provide maximum succour to the affected community.

Usually a wliole range of items is required. Besides essential food and medicines, other items for search and evacuation, temporary shelter, communication systems, energy fuel needs to be mobilized by different Government departments.

Mobilization of such large range and quantity of items in times of emergency can be done only if there are enough stoclts available within a short accessible distance. A well organized stockpiling system for easy availability and easy access becomes the basic requirement of a dependable contingency plan.

16.3 LOCATION OF WAREHOUSES

Location of warehouses is very important and is dependent on the degree of vulnerability of certain areas and on Facility of transportation. The location should be at a comparatively safer place. Maintaining stoclts of items required in contingency also depends on availability and it may not be viable for tlie State Government to be able to station such warehousing in tlie required quantities at ideal locations. The problem gets further complicated due to tlie limited life of certain items such as food and medicines. They need to be replenished after a fixed time failing which they would become useless and harmful.

Without compromising on the accessibility of stores yet maintaining a balance with the high cost of maintenance, tlie following criteria are adopted:

Vulnerability of the Area

Certain regions are much more vulnerable than others. This can be assessed from tlie frequency of disasters that have taken place in the past or from regional studies. For example, the coastal districts of the States in southern zone are exposed to tlie threat of cyclones every year. It is natural that stores be located in areas that woulcl need them.

Types of Goods

Goods, which liave a limited time span and may be rendered useless if left unutilized, could be stored in fewer places. Such places could be strategically located at selected points. Food items and medicines fall under this category.

Distributing Agencies

In the event of a disaster, it is the responsibility of various agencies, under whose care tlie various items are put, to mobilize necessary infrastructure for distribution. Location of the warehouses should serve to make tlie functions of distributing agencies more efficient.

On tlie wliole, a well-developed and clearly identified system of interlinked wareliouses within accessible distances will considerably improve tlie effectiveness of the contingency plans.

Check Your Progress 1

Note: i) Use the space given below for your answers.
ii) Check your answers with those given at tlie end of tlie unit.

1) Briefly discuss the importance of stockpiling.

2) Discuss the criteria kept in consideration for selecting location of warehouses.

16.4 COMMODITIES AND TOOLS

A list of the commodities and tools required for different types of disaster situations forms part of the district contingency plan. Normally, there are two types of warehousing - at the district level which stocks all rescue and evacuation equipment/tools and at regional level (groups of districts) for items such as food and medicines. Respective departments may also be required to maintain their own stores.

Typically, in a cyclone or flood contingency plan, special 'cyclone store' or "flood store" is required to be set up stocking the following items:

1) Hoolcs for clearing debris, ladders.
2) Rubber Tires and Tubes for using as float in water; also boats.
3) Tents, tarpaulin, galvanized corrugated sheets, asbestos sheets, bamboo and other material for providing temporary shelter.
4) Kerosene, lanterns, candles, matchboxes, lighters and battery operated lights along with cells/batteries.
5) Large cooking vessels for use in relief camps; Food serving utensils.
6) Identity slips (in plastic pouches) to be issued to the refugees in relief camps.
7) Copies of Maps.
8) Ropes, Wires, Chains, Lights fittings with wire, lead wires, spades, and crowbars.
9) Spare road-marker stores, steel pole, bamboos and slotted stripes of metal (to be laid on broken or muddy road surface for better traction. Double handled 'saws (for cutting fallen trees), concrete cutter, shovels and Hose Pipes, Few diesel pumps and generator sets.
10) First-Aid Kits, duty sign boards, jerry cans, empty oil drums, gunny bags and gunny bags and sand bags. Polythene bags for dropping supplies, Buckets, Wireless sets and satellite phones.
11) Equipment For filling or boiling water.

A separate store for medicines (attached to district level hospital) would need to maintain stock of essential life saving medicine, drugs for preventing infections, vaccines and First Aid equipments.

Similarly, the Public Health Department would need to maintain stores in each district containing the following items:

a) Disinfectants such as phenyl, naphthalene balls, bleaching powder, chlorine liquid, water purifying tablets equipment for checking quality of water and for checlting quantity of free chlorine and supplying safe potable water.

b) Mobile water tankers, canvas water tanks, drums and jerry cans for transporting drinking water.

c) Vaccines

d) Insecticides

e) Temporary or portable lavatories

The animal husbandry department is required to stock essential drugs and vaccines for livestock cattle.

Likewise, separate lists of store items are prepared for each type of disaster situation and stocks maintained by the respective agency.

16.5 IDENTIFICATION OF AREAS AND SUFFERERS

The amount of stock maintained at the stores in the district or at regional level (groups of districts) is dependent on the resident population and the requirements due to different types of likely disasters.

The basis of calculating medical supplies is based on the statistics of number of people affected due to floods each year averaged for a 10-year period. It has been estimated that as far as health impact of flood is concerned, approximately 2% of the affected population would need medical attention. Stocks are thus kept accordingly.

A similar kind of study is carried out for other disaster situations and total requirement worked out. In cases where one district is prone to more than one type of disaster, the range (types) of medicines in the stock is increased proportionately.

16.6 TECHNIQUES FOR DISTRIBUTION

Distribution of Relief Material is well organized and predetermined by rehearsal through drill, prior to disaster. Many state government departments mobilize the items they are responsible for based on the requirement placed by the district disaster committees.

Food and Essential items for the affected population are directly distributed through temporary kitchens set up in relief camps. Alternatively, they may be air droppecl to people who are not otherwise accessible.

Teams of doctors move in mobile vans to the affected areas if movement is still feasible. They could also form part of the defence team, which has its own transportation arrangements.

A lot of material from regional stores is moved in by rail. Earlier the practice of moving was by wagon loads. This kind of piecemeal traffic movement resulted in ordinate delays. Now a days in cases of emergency, food etc., is moved by special relieftrain thus optimizing on total movement and distribution time.

An important factor to be kept in consideration during distribution is that the same community should be given the relief material over and over again so long as they need it. At the same time, one has to be cautious against free riding, i.e., those that do not deserve the relief but take undue advantage of the occasion. Such incidents happen when either there is no way of identifying the actual victims or if the distributing agencies are not coordinating amongst them.

Such anomalies may be taken care of, by issuing identity slips to the victims and making a person or institution incharge of coordinating the overall distribution.

Check Your Progress 2

Note: i) Use the space given below for your answers.
ii) Check your answers with those given at the end of the unit.

1) List our the items to be stocked in a "cyclone store"?

_____

_____

_____

_____

_____

_____

2) Describe technique for distribution.

_____

_____

_____

_____

_____

_____

16.7 LET US SUM UP

Warehousing of essential items for distribution as relief material, and tools/equipment as means for evacuation and rescue are critical to any disaster management exercise.

Needless to say, the quantity and range of stock has to be kept on the basis of' thorough calculations on anticipated requirement with sufficient margin for fluctuation. Lastly, the stock should be able to reach the victims in the shortest possible time.

16.8 KEY WORDS

Buffer Stocks — Stock of essential items like food and such commodities required at the time of contingencies like disaster.

Exigencies — Urgent need or demand or necessity

Shelf life — Length of time for which food/medicines/other commodities can be stored before deterioration.

1169 REFERNECES AND FURTHER READINGS

Govt. of India's Report,"*The drought of 1987, Response and Management*", Department of Agriculture & Cooperation, Ministry of Agriculture, Government of India, New Delhi.

Health Sector Contingency Plan for Management of Crisis Situations in India; Emergency Medical Relief, Directorate General of Health Services, Ministry of Health & Family Welfare, Government of India, New Dellii.

Cyclone Contingency Plan of Action; Revenue Department, Government of Andhra Pradesh, Hyderabad.

16.10 ANSWER TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

1) Your answer should include the following points:
   - In disaster situations, the affected people need help of various types such as food, medicines, shelter, fuel, and tools. These can be made available only if stocks are stockpiled at easily accessible warehouses beforehand by government agencies and made available for distribution during emergencies.

2) Your answer should include points like vulnerability of the area; types of goods and distributing agencies

Check Your Progress 2

1) Your answer should include the following points:
   a) Boats, rubber tires and tubes
   b) Tents, tarpaulin, bamboo
   c) Lanterns, kerosene, torches with cells
   d) Cooking and serving utensils
   e) Candles, match box
   f) Maps and identity slips
   g) Ropes, wires, spades, crowbars, gunny bags
   h) First aid kits
   i) Mobile water tankers
   j) Water purifying kits
   k) Vaccines
   l) Disinfectants and insecticides

2) Your answer should include the following:
   a) Essential items including food and water are distributed at the relief camps or are airdropped if the people are marooned or otherwise inaccessible.
   b) Medicines and healthcare are distributed by teams of doctors in mobile vans if such movement is practicable. Otherwise doctors join the special defence teams.
   c) Need-based and equitable distribution of essential items is ensured on the basis of identity slips (packed in plastic covers) issued to the attached people.

UNIT 17 HUMAN BEHAVIOUR AND RESPONSE: INDIVIDUAL, COMMUNITY, INSTITUTIONAL

Structure

17.0 OBJECTIVES

After studying this Unit, you should be able to understand and describe:

- tlie concept of human behaviour and response in disaster situations;
- the factors inhibiting positive human behaviour during disasters;
- the measures that should be taken by various organisations for ensuring .positive human behaviour response;
- the psyche of providers and sufferers during disasters; and
- the interaction patterns between individuals, community and institutions in disaster situations.

17.1 INTRODUCTION

There is an old saying that "No two individuals in this world are alike". It is interesting to notice how widely a mother differs from her daughter and father from his son in individual behaviour. But what is the human behaviour which separates the personalities of one person from another. In a laymans` language, it is the way different individuals react when facing a situation. One person might be mild in his reaction; while the other might be very aggressive. One might find it difficult to separate normal behaviour from abnormal. In fact, it may even be difficult to say what constitutes a normal behaviour when faced with an unexpected situation. According to Ullmann and Krasver (1975), abnormal is simply a label given to behaviour that deviates from social expectations; whereas other psychologists explain it in terms of maladaptive behaviour.

We can classify normal and abnormal human behaviour as indicated in Fig. 17.1 It is very important to know about human behaviour in detail as we will be coming across lot of abnormality disorders and psycho-physiological problems occurring due to excessive stress during disasters. In this Unit, we shall discuss

how people behave in stress situation (at the time of natural or man-made disasters), individually, in groups and as a large affected community.

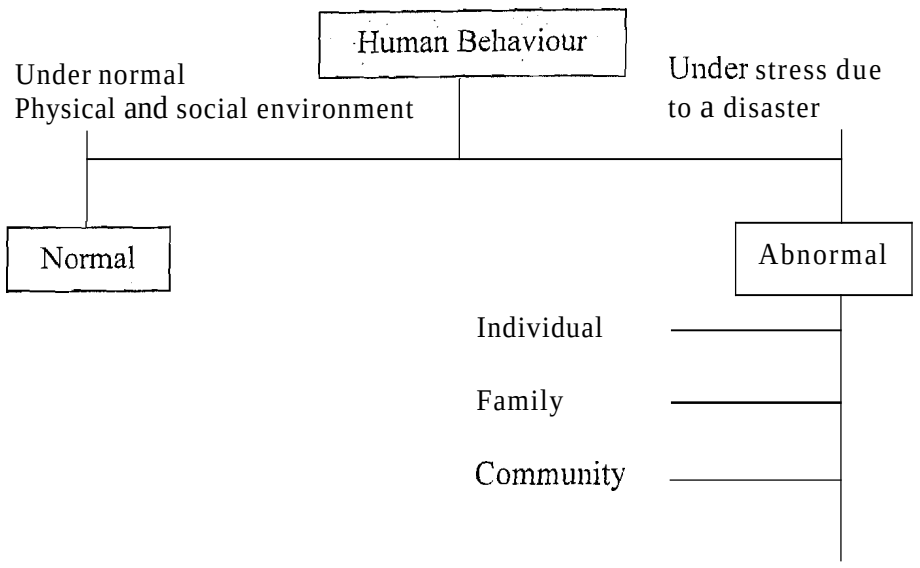

Fig. *17.1:* Normal and Abnormal Human *Behaviour*

17.2 HUMAN BERAVIOUR AND RESPONSE: THE CONCEPT

With a few exceptions people exposed to earthquakes, tornadoes, explosions or other terrifying experiences show psychological "shock" reactions .The symptoms may vary greatly depending on the individual and also on the nature and severity of the terrifying disaster. For instance when two trains collide leaving many people dead and many more injured, the tragedy also leaves a large number of people with feelings of fear, guilt, anxiety and many of them might need "talk sessions" by psychiatrists.

A "disaster syndrome" appears to characterize the reactions of many victims of such disasters.

The disaster syndrome:- A victim's initial response following a disaster typically involves three stages, viz.,

1) Shock stage: in which the victims are stunned, dazed and apathetic.
2) The suggestible stage: in which the victim tends to be passive, but open to suggestions and willing to take directions from rescue workers and others.
3) The recovery stage in which the individual may be tense and apprehensive and may show generalized anxiety but gradually regains psychological equilibrium often showing a need to repetitively tell about the catastrophic event .

It has been seen that in disaster situations the response of an individual varies from heroism to post-traumatic stress disorder depending on one's personality.

The suffering people should be given supportive psychological treatment. Proper rest usually can alleviate symptoms that lead to Post- traumatic stress disorder.

In general, the more stable and better integrated a personality and the more favourable an individuals' life situation, the more quickly he or she will recover from a severe stress reaction.

A case of Maharashtra Earthquake

In the Latur Earthquake of Maharashtra on 30th Sept. 1993, people were celebrating 'Ganesh Puja', the biggest festival of Maharashtra. The whole atmosphere on the previous night was jubilant. People were visiting each others houses and celebrating the festival with joy. No body was expecting that the same night, there will be an earthquake and they will lose some of their dear ones. The first reaction of the people to the disaster was a big 'shock'. After some time, they started thinking of their family members, and got busy in search and rescue. If the family member died in the disaster, they collected his/her dead body and cremated it. This was the time, when anxiety was maximum. After few days, recovery stage started. They got some help from Government and NGOs and started making temporary shelters. Some times the recovery takes a long time. If there is no proper treatment or therapy, people develop symptoms leading to more and more stress and affect mental health. Some of the NGOs in this region started religious discourses and 'Bhajan' and 'Kirtan' so that people consider the inevitability of the tragedy and resume normal life again. There were many cases of post-traumatic stress disorders among the affected individuals.

Check Your Progress 1

Note: i) Use the space given below for your answers.
ii) Check your answers with those given at the end of the Unit

1) What are the stages of human behaviour in disaster situation?

2) How can we treat a person having mental stress because of a disaster?

17.3 FACTORS INHIBITING POSITIVE HUMAN BEHAVIOUR IN DISASTER SITUATIONS

There are various factors which prevent the rescue team workers to relate positively with the affected persons. For instance it has been seen that in places where these disasters occur frequently, the people living in those areas develop a

kind of shock absorbing capacity. To put it in simple words these people are mentally prepared for its occurrence and hence they are able to relate to the rescue workers more positively whereas when there is a totally unexpected calatnity, it leaves tlie sufferers in a state of shock.

Furthermore, the kind of loss suffered also affects the behaviour of the sufferers. Economic loss and death of close persons are the two losses which have a major adverse effect on their behaviour since the surviving victims are so disturbed and under so much of stress and pain that at that stage they do not care for any kind of help from people.

Another factor which we can consider lierc is the time period of the disaster. For instance, there have been droughts in Orissa, Rajasthan and Gujarat and since the time period of these is long the people react in slightly more practical and stabilized manner than those who suffer great losses within a matter of few seconds (the earthquake at Gujarat in January 2001). The former is called a continuing disaster whereas the latter is known as sudden or cataclysmic disaster with immediate destruction being evident e.g. earthquake or cyclone.

Moreover the impact of disaster on the economically wealcer groups is often particularly great e.g. on Jhuggi dwellers, marginal farmers, small shop-keepers, fishermen. Their meager capital stock or saving may be completely wiped out by disaster thereby pushing them into the poverty or starvation stage. Thus the economic status of the sufferer also plays a major role in his or her response to the disaster situation. The same is true for the physically weak, the sick, the disabled, the aged, pregnant women, nursing mothers, children and infants whose response to disastrous situations is highly traumatic bordering on abnormally panicky.

Sometimes, the Disaster situation may be so bad that even the relief workers' mental state is affected adversely in such situations. They don't expect to see this much of deaths or loss and damages because of a particular disaster and develop abnormal symptoms. The ground situation arising from the terrorist attack on the World Trade enter in New Yorlc on the 11th September 2001 is the prime example of this type. The people who have to collect dead and dismembered bodies in such area sometimes start behaving abnormally as it was a completely unexpected situation for them.

17.4 MEASURES FOR ENSURING POSITIVE HUMEN BEHAVIOUR RESPONSE

For any rescue team to work in a disaster affected area, it is a must that the survivors and other people living there should be co-operative and are able to communicate with them in an effective manner. Although it turns out to be quite a tough job for the rescue worlcers as the victims are usually under much stress and mental depression. Yet there are certain measures which can be adopted to ensure a positive behaviour response. To start with, in areas which have a high probability of occurence of disaster, the residents should be made aware of the likelihood of a disaster and the stops needed to cope. This mentally prepares them to cope with such a situation for example people of Japan (having a high frequency of earthquakes) are given live demonstration of how to behave when an earthquake takes place. As a result, at the time of its occurrence, even a child knows that it is safe to stand at the corners of the house. Thus there should be more and more public awareness of the precaution through media and classes in school. People should be taught how to help the rescue team so that they can help them in turn. The advantage of cooperating fully with the rescue workers should be impressed on people.

Moreover, it is seen that measures like mock exercises, drill, practices of the rescue workers and giving the people adequate information proves helpful in getting a positive response froni the public. The various organisations should work towards having appropriate training programmes for the rescue worlters, NGO's, government officials etc. which will benefit tlie people.

Further if post-disaster review can be carried out reasonably soon after completion of the emergency phase, the information acquired can be utilized for recovery programme purposes. There sliould be an effort to involve the affected community in the work such as community kitchen, in rehabilitation and reconstruction. This will help them to return to their normal mental status sooner.

17.5 PSYCHE OF PROVIDER AND SUFFERER

In a Disaster situation, the psyche or tlie mental thinking of the providers as well as the sufferers is very important. Firstly let us discuss the meaning of provider. By provider, we mean a person who comes to help out the people affected in disaster. They can be voluntary organisations, government officials or any one. During disasters, the psychology of the provider as well as the sufferer plays a very important part in efficient disaster management.

It is seen that during post disaster period the provider or the team helping tlie people should not feel that they arc doing some charity or obligation. On the contrary, it is a part of their sacred social duty to the community irrespective of the fact whether they are getting paid to do this work. Thus they should change their own attitude towards the work and do their required job as efficiently and promptly as they can and not take it as a burden . Tlie rescue team should try to concentrate more on helping the people rather than showing off .

The rescue workers, should preferably be trained local people and they should have a feeling that they are going to help the affected people of the community who are their own brothers and sisters .

Similarly, the sufferer or tlie victim sliould approach their problems more optimistically instead of giving up completely. They should remain composed and cooperate with the providers to the fullest in the interest of the affected community. The sufferers should not demand priority on the strength of their social or economic status. It has been observed that the victims expect the NGO's and government agencies to compensate for all the losses incurred by them which is usually not possible. They should develop an attitude to get back to their normal course of life and job as speedily as practicable.

Tlie past experiences of Uttarkashi earthquake (1991) and the Latur earthquake (1993) are that community has become more and more dependent on external help. Their expectations from relief agencies are very high. This is the reason that even after several years after the disaster the community has not fully recovered. This trend should be reversed. The relief is to provide temporary and timely assistance to the victims. It sliould not be conipared with 'tlie compensation. The NGOs and local voluntary agencies should work hard to change the attitude of the people and make them self-reliant and independent in the long run. The experience in Gujarat earthquake (2001) was comparatively better because the affected communities, although suffering much more damage and deaths, should considerable resilience.

17.6 INTERACTION BETWEEN INDIVIDUAL, COMMUNITY AND INSTITUTIONS

Disaster is such an unwanted happening which never informs in advance before coming. Therefore the various agencies institutions and communities should be well prepared in advance so that they can handle the situation more efficiently. For that, there should be disaster preparedness training courses, and disaster response workshops which should include members of government agencies, non-government organisations, and other persons who have a responsibility, stake and interest in disaster response operations.

The training may be at three levels, viz., individual, institutional and community levels as indicated below:

1) Individual Training

a) Skills training (e.g. in categories such as rescue, first aid)

2) Institutional Training

a) Seminars & workshops (e.g. Annual Preparedness Seminars)

b) Training Modules (e.g. in general disaster management response operations)

3) Community Level Training .

a) Awareness upgradation

b) Simulation exercise (indoor)

c) Mock exercises (outdoor)

d) Unit (single agency, full scale)

e) Combined.

Such Training programmes will also enhance the interaction between the community and organisations.

Further it should be noted that there should not be one way communication. Whatever information the NGO's or other officials have from their past experiences should be given to the people exchanging information openly:-

The policies of the government regarding the grants compensation and rescue of the sufferers should be made known to the people in that area .

There should be regular contacts within the responsible authorities for establishing telecommunications service, including the repairs of normal systems and the installation of temporary radio network, where needed.

Check Your Progress 2

Note: i) Use the space given below for your answers.
ii) Check your answers with those given at the end of the unit.

1) Write any two factors inhibiting normal and positive human beliaviour in disaster situation?

2) What measures can be applied for ensuring positive human behaviour response?

3) What should be the normal psyche of the relief workers (or providers) at the disaster time?

17.7 LET US SUM UP

In this Unit, we have discussed the human behaviour and response in disaster situations. The normal and abnormal beliaviour patterns have been distinguished. Factors that prevent the people from giving a positive response and rational behaviour have been indicated. Disaster situations affect tlie providers i.e. rescue worlters also. Therefore the psyche of providers and victims in disaster situations have been discussed. The importance of interaction between individuals, institutions and community has been emphasized and the role of training has been stressed.

17.8 KEY WORDS

Psyche	:	The mind, mental thinking
Maladaptive Behaviour	:	Abnormal behaviour- anything away or deviant from normal behaviour which itself varies from place to place

Disaster Syndrome	:	Characterizes the symptoms or certain signs of the victims of these disasters
Resilience	:	Ability to recover quickly from disaster
Drill practices	:	Rehearsal for the rescue workers
Psycho-physiological problems	:	Body problems arising from mental stress
Trauma	:	Severe psychological or physiological stresses.
Psychiatrist	:	Doctor who treats mental disorders

17.9 REFERENCES AND FURTHER READINGS

Ullmann, L.P. and Krasver (1975) *Approach* to *abnormal* behaviour (2nd edition) Englewood, Prentice-Hall.

17.10 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

1) Your answer should include the following points:

- Shock Stage;
- Suggestible State; and
- Recovery State

2) Your answer should include the following points:

- The people suffering should be given supportive psychological treatment and proper rest. These can alleviate symptoms that lead to post-traumatic stress disorder.

Check Your Progress 2

1) Your answer should include the following points:

- Shock absorbing capacity
- Economic loss
- Death of a close person
- Time period of the disaster

2) Your answer should include the following points:

- In disaster prone areas, the people should be made aware of the likelihood of occurrence of disasters and the steps needed to cope with these.
- The advantages of cooperating fully with the rescue workers should be impressed on the people.
- Practice drills and mock exercises specific to the likely disasters should be conducted regularly.
- To the extent possible, the affected people should be involved in the post disaster rescue, rehabilitation and recovery.

3) Your answer should include the following points:

- The normal psyche of relief workers should be that they are doing the work as their sacred social duty to help their suffering brethren. They should concentrate on doing the work without showing off.

UNIT 18 COMMUNITY PARTICIPATION AND AWARENESS

Structure

18.0 OBJECTIVES

After reading the Unit, you should be able to :

- explain the concept and importance of community participation and community awareness in the context of a disaster;
- describe ways and means of creating community awareness; and
- discuss the techniques for effective community participation in disaster management.

18.1 INTRODUCTION

In the last two decades, the term community participation is being used in all development processes in the country. Donors like World Bank, Asian Development Bank, UN Agencies as well as NGOs are increasingly demanding that the development programmes should have involvement/participation of recipient communities. This holds true for programmes related to disaster management as well. For effective participation by communities, proper awareness is a prerequisite. This Unit deals with the important aspects of community participation and awareness in the context of disaster management.

18.2 COMMUNITY AWARENESS AND PARTICIPATION IN DISASTER SITUATION

Community Awareness and Participation

Community Awareness: There will be more effective participation if the community is aware about its vulnerability and the risk involved in various types of disasters in that area or State. Awareness is one of the most important aspects of disaster preparedness. People can be made aware by formal and informal methods for different aspects of disasters. Government, NGOs, Media, Technical Institutions, etc., can create the desired awareness in the area of disaster mitigation and preparedness. An alert community will take active part in any disaster reduction/mitigation programme and will provide more inputs in terms of local knowledge and available resources. They will be ready to accept all initiatives taken by Government, NGOs, or other external agencies and participate in the programme in case they are also involved in decision making at all stages of the project.

Community Participation: There may be many definitions of community participation, but three concepts are commonly used in most of the development programmes. These are:

1) **Participation as Community Contribution:** Most of the time, this type of participation is found in development programmes. Communities provide free or partly free labour and other resources to the programmes ("Shramdaan" or "dhandaan") but no part in planning and decision making. Even if they are consulted through participatory approach or direct discussion, their suggestion are either not incorporated in the final programme or are modified according to the ideas of local administration or donor agency. In most of the reconstruction and rehabilitation projects, this gpproach is being followed very often. It is noted that this type of community participation is perceived by local people as cheap or free labour option by the project authorities.
2) **Participation as by the project Authorities:** This type of participation is to build up community leadership and organization. This could include formation of local committees, Task forces, Youth clubs, small cooperatives or associations to work in disaster preparedness, mitigation and relief.
   In India, Panchayats may be considered as effective community organizations. The Pancliayats are having elected members of all sections of the society. There is representation of women, and weaker section of the society which are highly vulnerable to any type of disaster.
3) **Participation as Community Decision Making:** In this type of community participation, community takes decision at all stages, from project formulation, funding to implementation. Technical staff and funding agencies are assigned only advisory or regulatory roles. This form of participation is a means of empowering local people to make their own decisions concerning their disaster preparedness, mitigation or relief and rehabilitation programmes. In other words, it is handling over control of programmes to the beneficiaries, which external agencies adopting a supporting as coinpared to a controlling role.

In disaster management, community participation has more significance as all the programmes, short term or long term are for the benefit of the community. Therefore, there is a need for continuous interaction between community, local administration and other agencies involved from the initiation of the programme/ project up to its implementation and monitoring. This interaction can be visualized as shown in Figure 1.

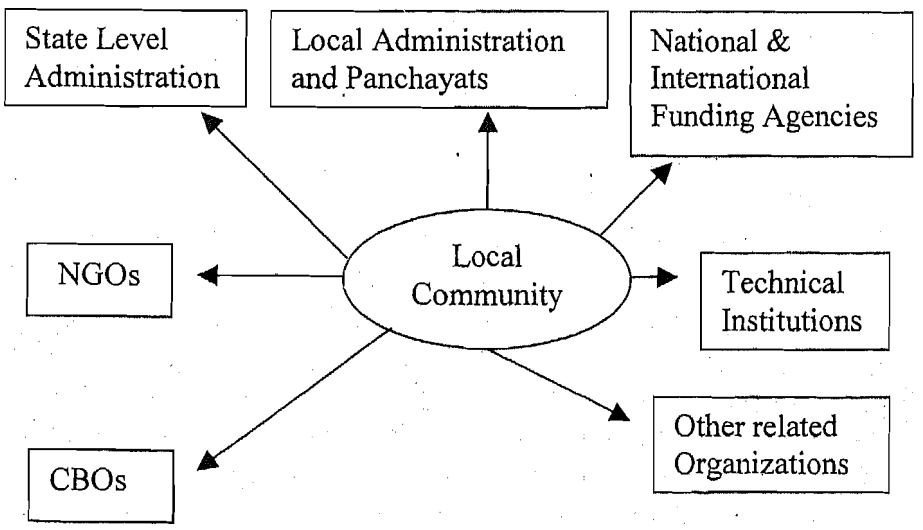

Figure 1: Interaction of Community with Various Organizations Involved in Disaster Management

The three forms of community participation listed above cannot be entirely exclusive. In most of the programmes, it is a mixture of all three forms. While community participation in decision making may be the underlying principle on which a programme is based, it is likely that community will contribute labour and resources, and further, that some form of community organization will be established, or existing organization strengthened.

Importance and Need of community Participation

A disaster management project is likely to fail if the goals and methods did not fit the needs and capacities of the intended beneficiaries,. There is a need for radical changes in the attitude of programme implementation authorities as well as funding agencies. Recently, World Bank and other donor agencies have moved towards procedures which allow target communities to be involved in programme planning, implementation, monitoring and evaluation in many human settlements projects and disaster management programmes,. This concept is shown in Figure 2.

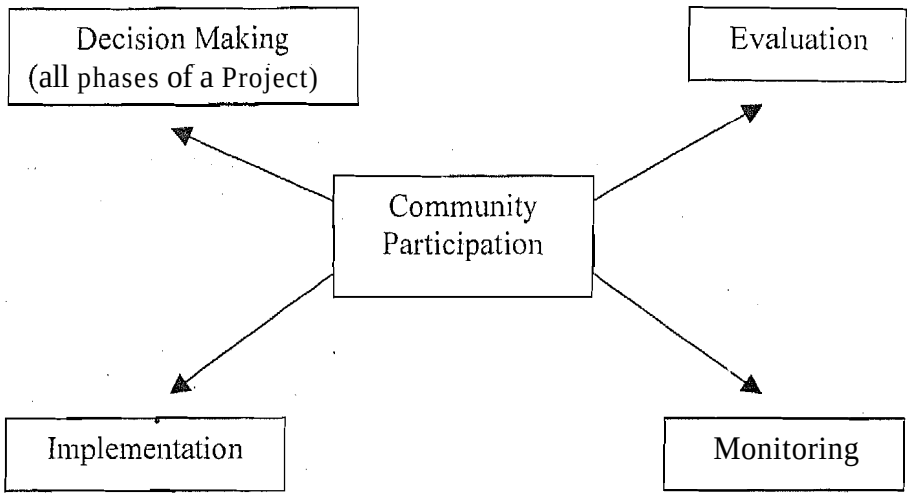

Figure 2: Community Participation Concept in Disaster Management

There are many practical benefits or advantages in having community participation in disaster reduction or rehabilitation programme. The more important benefits are discussed below:

1) Cost Recluction

If Community is involved in planning, implementation and monitoring, cost of project is reduced considerably. Otherwise, a big sum will have to go to outside agencies.

2) Efficiency

As project is of direct benefit to the community, participation of local people allows for more efficient use of programme resources.

3) No Misunderstanding with Administration

If people are working with administration, there is understanding and transparency and therefore less problems due to misunderstandings between implementation agencies (Government or Non-Government Organizations) and the community.

4) Socio-Cultural accptability

The community involvement will solve one of the important problems of most of the projects, i.e., socio-cultural Acceptability of these projects by the local people, as the implementation agency is from outside and not having knowledge of local social structure, culture, tradition and economy of the area.

5) Self-reliance and Self-dependence

Community participation provides peoplc with the opportunity to take control over their own lives and feel self-reliant. Otherwise for even small mitigation measures, community will be dependent on outside agency or on Government.

6) Coverage

More people will be benefited by the project, if there is community participation.

7) Sustainability

In community participation, people have a sense of involvement and ownership in the programme. The project will sustain for long as community will do the follow-up, maintenance and make all efforts for its sustainance.

Check Your Progress 1

Note: i) Use the space given below for your answers.
ii) Check your answers with those given at the end of the Unit

1) List the usual types of community participation.

2) Write down five most important advantages of community participation.

18.3 ENSURING COMMUNITY AWARENESS

Importance of Community Awareness

The main aim of community awareness programmes is to make the community more informed, alert, self-reliant and capable of participating in all activities and programmes of disaster management in close collaboration with government and non-governmental organisations. The awareness will not only promote community participation but also enable tlietn to understand the following :

I) What can be the impact of particular disaster and what an individual, a family or community can do to reduce its impact and save life and property.

2) Government's plan for disaster reduction and available assistance in time of disasters.

3) Government's limitations of resources and responsibilities.
4) Need to cooperate with government to overcome th4e crisis and recover the community as it is in their own interest.
5) Implementation of self-preparedness measures whenever required.
6) What community can do till any external help is available?

Type of Awareness required

The community should be provided all necessary information available with administration. The flow of information should continue even in the normal non-disaster periods. People should know that tlie community and government have common goals and are interdependent in coping with disasters. They must work together at every step to overcome tlie problems which arise and to restore things to normal.

Community should be aware of tlie relevant.details of tlie disaster management systems such as tlie following:

i) Designated shelters at the time of disaster. It may be school building or other safe place, where people can immediately reach in disaster situation.
ii) Rescue operation. evacuation procedure, tlie shelters.
iii) Special warning signals, if any.
iv) Role of community in providing relief and rehabilitation programmes.
v) Role of community in proper storage and distribution of relief supplies.
vi) Providing correct information to tlie authorities such as actual needs and priorities of the affected community.
vii) Providing correct information to the media.
viii) Checking rumours.
ix) Help most vulnerable section of tlie community (old or disabled people, Women and Children).
x) Provide information on past experiences.

Methods to Create Public **Awareness**

There are various means for creating public awareness. Some important methods are listed below:

1) Use of media and press
2) Short films/Folk songs
3) Posters/cartoons/charts/photographs/exhibitions
4) Organising training camps
5) Short street plays in fairs/religious functions/other celebrations and occasions of public gathering
6) Through schools/colleges
7) Special lectures by community leaders or well known persons of tlie area,
8) Group discussions among Mahila Mandals, Youth Clubs, Senior Citizens

Community awareness is the key to community participation. Well informed and well aware people will have more role-clarity in disaster reduction and

preparedness programmes. They will be able to contribute their best if they know the issues involved as well as various participants in the past disaster management instances and their own expected roles in tlie process. They will become more self-reliant in the long-run and less dependent on the government or any other external agency. The most important benefit of tlie community awareness is that they will be able to judge their strength and the weakness and to identify tlie areas in wliicli they really need outside assistance.

18.4 TECHNIQUES FOR EFFECTIVE COMMUNITY PARTICIPATION

Techniques of Community Participation tried by CASA

A good example of community participation was initiated by CASA (Church's Auxiliary for Social Action) after the 1977 cyclone in Andhra Pradesh, by creating awareness among the rural communities and building up a network of community based peoples' representative institutions in the project area. These bodies are operational, effective and visible in the villages. CASA organised the following in the affected villages:

1) Village Development Associations
2) Disaster Task Forces
3). Youth Groups

There is a positive impact of these village level organisations as people are able to take decisions on tlieir own. This has created confidence, a feeling of dignity, pride and self-reliance among the local people. The idea of disaster task forces at tlie community level has proved to be a good technique and is described below.

Disaster Task Force (DTF)

Local men and women constitute a disaster task force after a series of discussions, wliicli can work not only for disaster preparedness but in arranging emergency evacuation and relief within a village. Identification of the members of DTF is done by local people tliemselves. They are documenting all proceedings of meetings and selecting their own office bearers. They allocate responsibilities to tlie members and mobilise resources for emergencies.

The major responsibilities of members of DTF are:

I) Monitoring advance cyclone warnings on radio, television and telephone and inform local people verbally or thorough loud speakers.
2) Alert relief helicopters with red flags in marooned villages.
3) Collection of essential commodities like food, medicine, firewood, drinking water, etc., and stockpiling them.
4) Managing emergency kitchens.
5) Liaison with state government & NGOs, for post-disaster support and rehabilitation.

Extneding tlie concept, a few villages of District Machilipatnam mobilised varying amounts in cash from local households and established a **Disaster Relief Fund.** This fund is mobilised, monitored and managed by tlie local disaster task force. For example, in Lankapalli village, profits from the annual auction of a

fresh water fish tank totalling Rs. 1500/- was deposited in the fund, by DTF members. In other villages, a contribution ranging from Rs. 10 to Rs. 50 per household per year was collected and used for purchase of materials and food not available in case of emergencies.

CASA also organised training programme for the members of DTFs and community leaders. Such common programmes created inter-village networking which helped considerably in the dissemination of ideas regarding disaster preparedness through common meetings of neighbouring villages. Consequently, there exist DTFs in neighbouring villages as well laying a strong foundation for disaster preparedness promotion and related activities on a wider scale.

Community Participation in Specific Hazard Mitigation

Apart from role of community in post-disaster activities, they can play major role in pre-disaster activities such as disaster mitigation and preparedness. A few examples of community participation in specific disasters are given below:

1) **Floods**

i) Awareness of flood plains and construction of flood resistant houses by using water resistant material and strong foundations.

ii) Clearance of sediments.

iii) Construction of dylces and embankments.

iv) Afforestation in catchment areas.

v) Evacuation operations.

vi) Appropriate agricultural practices in flood plains.

2) **Landslides**

i) Identification of active landslide spots.

ii) Avoid commercial and residential constructions in hazard prone areas.

iii) Making strong foundations of structures.

iv) Contribution in slope stabilization through terracing and forestry.

v) Compaclion of ground locally.

vi) Making rockfall barriers.

3) **Drought**

i) Watershed management, construction of check dams, reservoirs, ponds, water tanks, wells to utilize every drop of water.

ii) Afforestration and catchment area treatment.

iii) Changing cropping patterns.

iv) Live-Stock (Cattle) Management.

v) Encouragement to non-agricultural vocations and small industries.

4) **Cyclones**

i) Construction of wind resistant houses (which can be rebuilt easily).

ii) Avoid loose material such as metal/aluminium sheets, which can blow away and cause damage or injury elsewhere.

iii) Construction of multi-purpose cyclone shelter

iv) Deploy battery operated communication systems, use of transistor radios.

5) Earthquakes

i) Construction of earthquake resistant buildings in highly seismic areas following the building codes.

ii) People in vulnerable areas should be provided with knowledge of first-aid and fire-fighting.

iii) Retrofitting of weak buildings.

iv) Storage of fire extinguishers, excavation tools at some known places.

v) Training of masons in the highly seismic areas, so that they can construct safer buildings.

Cheek Your Progress 2

Note: i) Use the space given below for your answers.
ii) Check your answers with those given at the end of the Unit

1) List out four important methods for creating public awareness.

3) Write down five points highlighting the role of community in mitigating floods.

18.5 LET US SUM UP

In disaster management, there is need of active community participation and awareness. Only Government efforts or NGOs help is not sufficient to reduce disaster impacts or mitigation and preparedness. Awareness is needed at all levels of the society. It can be created through media and press, exhibitions, training camps, schools, colleges, ad community discussions.

Community participation is needed as it is more cost-effective, efficient and provides self-reliance and confidence to tlic vulnerable community.

Community participation in specific disasters like floods, landslides, will be different. So community should be aware about the disaster possibility and risks involved and act accordingly Tor mitigation and preparedness.

The main aim of community awareness and participation is to have well informed, self-reliant, confident and well-prepared community which can independently take decisions, and use local lanowledge and resources in disaster situations. The community participation also includes community's cooperation with Government, non-governmental organizations or external funding agencies at every step of disaster mitigation, preparedness and recovery. When community is working with Governmenl or NGOs or external agency, there is total transparency and no room for misunderstanding.

18.6 KEY WORDS

Exclusive	Separate from each other
NGO	Non-Government Organization
Senior Citizens	Elderly persons (generally beyond the age of 65 years)
Sustainability	Maintainabi lity
Target Community	Community aimed at

18.7 REFENCES AND FURTHER REAIDNGS

Aysan, Yasemin; Clyton, A. ; Cory, A; Davis; I and Sanderson, D. (1995), 'Developing Building for Safety Programmes', Intermediate Technology Publications, London.

Kumar, Jayant (1995), 'Community Based Disaster Management - A Case Study From Coastal Andhra Pradesh' (Mimeograph).

Oakley, Peter et.al. (1991) 'Projects with People', International Labour Organisation, Geneva.

18.8 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

1) Your answer should include the following points:
   - Participation as community contribution
   - Participation as by the project Authorities
   - Participation as community decision making.

2) Your answer should include any five of the following:
   - Cost Reduction; Efficiency; Self-reliance; Socio-Cultural Acceptability; Sustainability; Widc coverage and good understanding with the administration.

Check Your Progress 2

1) Your answer should include the following points:
   - Use of media and press; Short Films; Organising Training camps; Posters/Cartoons, Group Discussions.

2) Your answer should include the following points:
   - Awareness of flood plains, Clearance of sediments, Construction of embankments Afforestation in catchment areas; Evacuation operations.

UNIT 19 PUBLIC AWARENESS PROGRAMMES

Structure

19.0 OBJECTIVES

After reading this Unit, you should be able to-

- explain tlie importance of Public Awareness Programmes in Disaster Management;
- Describe the techniques which can bc used in tlie Public Awareness Programmes; and
- discuss tlie importance of training in creating public awareness.

19.1 INTRODUCTION

From times immemorial, human beings have faced disasters. The International Federation of Red Cross and Red Crecent societies has estimates that every year on the average, natural disasters kill over 150,000 people and disrupt lives of 129 million people all over the world. In India there is not State which is free from natural disasters. There are four types of disasters, common in the country i.e. Floods, Droughts, Earthquakes and Cyclones. Landslides and Bushfire are also common in the Himalayan Statcs. There are two approaches towards the mitigation of these natural disasters. First is "Structural Approach" in which the main emphasis is on the planning and construction of structural measures which niay resist the forces unleashed by the natural phenomenon such as Earthquakes or Floods. Construction of embankments regulators, drains or by-pass channels in flood-prone areas are examples of structural approach.

The second mitigation approach is know as "Non-Structural approach". In this approach, emphasis is laid on disaster related legislation (Legal Framework), Incentives or providing grants and subsidies to tlie people to include mitigation measures in their construction activities. Training and Education are tlie other important aspects of this approach. For effective implementation of any programme,, public involvement is very necessary, and this can come through awareness only. Thus, public awareness is the most important non-structural tool to deal with disasters.

As part of the Public Awareness Programme for disaster mitigation, the local people should be made aware of the following:

a) Types of disasters likely to occur in the area and the time and frequency of their likely occurrence.

b) The vulnerability of tlie area to these disasters.

c) The types of risks and elements at risk due to the disasters.

d) According to the vulnerability and risk involved, what type of mitigation measures should be adopted

e) Based on vulnerability and risk assessment, a local preparedness plan should be prepared in consultation with tlie people.

f) They should know the available resources and the help likely to be available at the time of disaster from governmental and non-governmental sources.

g) The importance and need of community participation should be impressed on the people.

19.2 BELIEFS AND MYTHS REGARDING DISASTERS

There are various myths and beliefs regarding natural disasters. Over the ages, these disasters have generally been taken as nature's anger and accepted by people as their fate or destiny. Every region and every culture have many examples of belief and myths related to the origin and occurrence of disasters. Now with the increasing awareness, people have started realising the actual causes and appreciate the scientific reasons for natural disasters.

The first and foremost awareness in disaster management is to remove the irrational beliefs by providing basic knowledge to the people regarding the different natural calamities. The causes of tlie disasters and tlieir mitigation measures should be explained to them in tlieir own language. This should be the first and foremost component of any public awareness programme.

Who can help in removing existing myths and and irrational beliefs

Taking the children into confidence at the school stage turns out to be the most effective tool for removing irrational beliefs. Starting from primary education up to higher education, scientific knowledge should be imparted regarding natural disasters, tlieir impacts, losses due to various disasters and areas most vulnerable for a particular disaster. Non-Governmental Organisations (NGOs) and Community Based Organisations (CBOs) can also play very important role in creating and upgrading awareness among masses, regarding area specific disasters and measures to be taken to get prepared for such events. Some of tlie local clubs like Rotary club, Lion's club may also take up disaster awareness programmes. These clubs have enough resources and some times they adopt villages for some specific social work. In disaster prone areas these clubs can create awareness for construction of cyclone shellers or earthquake resistant buildings using appropriate building materials. They can prepare charts of **Do's** and **Dont's** for those areas and local people may by made aware accordingly. Similarly, education regarding causes of other likely disasters and preventive measures may be imparted to vulnerable communities.

Now in India, we have a very effective tool or a delivery system viz., 'Panchayats' for creating correct awareness among people and provide them area-specific education. Panchayat members are the elected representatives of the people in villages. There is 30% participation of women. If, Panchayat members are sensitized properly, they can help in creating public awareness in masses. People will understand them better as they are from them and will communicate in the local language and idiom.

In brief, for getting people's cooperation and effective participation, Government, Non-Government Organisations, schools, social clubs, Panchayats, all should work together. They should remove the superstitions and myths

regarding disasters from people's mind and provide them with the right: kind of information, knowledge of disaster mitigation and preparedness.

The objective of creating public awareness is to promote a well informed, alert and self-reliant community possessing scientific attitude and who can help and cooperate with aid agencies (government or non-government) in disaster management

Check Your Progress 1

Note: i) Use the space given below for your answers.
ii) Check your answers with those given at the end of the unit.

1) What type of awareness should be created among the people in disaster management?

2) Who can help in removing existing myths and irrational beliefs?

19.3 PUBLIC AWARENESS PROGRAMMES

There are three main approaches for creating proper public awareness programmes-

1) Face to Face Interaction

Face to face interaction is most effective in generating a worthwhile public awareness programme. In India, the rural people are more vulnerable to natural disasters. These people have low literacy rate but they can be educated for disaster mitigation by calling a public meeting or organising street plays or inviting them to a group discussion. They can clear their doubts at one to one interaction sessions. This kind of awareness can be provided by the local government functionaries, NGOs or Panchayat members. Schools can also play important role in this type of interaction.

These discussion sessions should be designed/prepared thoughtfully to meet the local requirement, They should be in simple local language and their impact

should be monitored. These programmes should be a continuous activity. Face to face interaction is possible through the following ways-

- Illustrated Lectures
- Meetings
- 'Nukkad-Nataks'- Street plays
- Group discussions and Debates
- Social gatherings or in community functions.

  Door to Door campaign
- Panchayat meetings

2) Electronic Media

In India, the use of electronic media is becoming a very important means of creating mass awareness. In providing disaster warnings also, this tool has given positive results. T.V. and Radio are reaching the remote corners of the vast land that is India. Transistor radios have made the facility available even where there is not electricity. There are two advantages of the use of electronic media-

i) The awareness programme may be broadcast and telecast repeatedly so that it can have maximum coverage in the target area.

ii) The message registers on the masses.

The continuous use of electronic media in disaster awareness and education will also maintain the awareness level of the target community. It should be taken as a regular programme on electronic media as is done for family planning, literacy or other similar mass awareness programmes.

For radio and T.V., special programmes/serials can be prepared on various natural disasters to educate people regarding-

- What basic preparations can be made in the pre-disaster period?
- What to look for early warnings.
- What they should do at the time of disaster?
- What type of help Government is likely to provide at the time of disaster?
- The role of community in disaster prevention, preparedness and response/relief?
- The community should understand that natural hazards can not be prevented but disasters can.
- Disasters are not discriminative. They affect individuals, families and community irrespective of age or status. They affect -government infrastructure and services and paralyse the life support systems.
- The Community and government are interdependent in disaster management. They should cooperate with each other to minimise human sufferings due to natural disasters. The community should work with Government machinery to restore the basic facility and bring normal life quickly back after the disaster. They should also appreciate the limitations of government and available resources.
- The concept of self-reliance and self-help in the disaster management should be highlighted.

- Good case studies of community participation and role of community in disaster mitigation should be shown.
- Media can show the negative impacts of dependency and expectancy of the people in relief and recovery. The positive features of self-reliant, well-prepared community being able to face any difficult situation successfully should be highlighted.
- Use of traditional knowledge in disaster preparedness may be highlighted through media.
- National and State resources for disaster prevention, preparedness and relief can be described so that there may be more transparency between government programmes and the community/people involved in disaster management.

3) Print **Media/Publicity** Materials

This is the important method to create public awareness among the literate people. The print media usually educates the people as well as the concerned officers. Press can also highlight the strength and weakness of any public awareness programme launched by government or the people. The print media can also assess the effectiveness of a programme.

Awareness material can be prepared in printed form, which can provide-

i) basic needs or requirements of the community for disaster prevention as well as in relief work.

ii) information about programmes assisted by government, NGO or international donors/agency in the area of disaster management.

iii) about the safe places at the time of early warning.

iv) clear instructions about do's and dont's in a particular disaster situation.

v) the type of actions, that should be taken by the community to prevent disasters. eg. Various risk zones and necessary preventive techniques in construction of building in those areaslplaces.

vi) other disaster related education in suitable form such as.

- notices
- posters
- cartoons
- photographs
- exhibitions
- films, documentaries.

vii) There are many other ways to communicate disaster awareness related information such as printing short message or slogan on

- Leaflets
- Tickets (Bus tickets, Cinema tickets)
- Shopping bags
- Banners
- Other methods of displays at Public functions or on sport events, country faits etc.

19.4 TRAINING OF TRAINERS FOR CREATING PUBLIC AWARENESS

The creation of public awareness requires proper training on how to provide disaster related education to the people. There should be specific training module for specific target group. The following people should be trained to provide the knowledge to the people in the vulnerable community. Such trained persons will be the trainers for the public.

i) Government Officials involved in the process of disaster management.

ii) NGOs and CBOs.

iii) School teachers and volunteers from clubs, .youth forums and Mahila Mandals.

iv) Local Leaders.

As stated earlier, disaster management is a multidisciplinary subject, and wide range of functions and skills. Some of the important components are-

- Planning
- Organisation
- Management of day to day activities
- Identifying counter disaster actions and their implementation.
- Management of rescue, relief, first-aid, and communications.
- Other crisis management actions.

For skill development in these areas, special training modules, compatible with the national and local preparedness or contingency plan, should developed. The responsibility of providing training to these trainers should also be well identified.

Broadly, there are four basic areas in which training is required to create public awareness of disaster management. These are as follows:

i) Disaster management	a general module
ii) Skill training	for emergency operations, rescue (swimming, climbing, first aid, resuscitation, fire fighting), welfare, communication etc.
iii) Coordination	all related functions.
iv) Specialised training	Construction programmes and other technical knowledge for specific disasters.

It should be noted that the broad objectives of training are to teach people to carryout specific tasks based upon accepted methodology.

Check Your Progress 2

Note: i) Use the space given below for your answers.
ii) Check your answers with those given at the end of the unit.

1) Name the three important ways to create public awareness?

2) List the ways by which face to face interaction is possible.

19.5 LET US SUM UP

This Unit has brought out the importance of Public Awareness which is one of the most effective non-structural disaster mitigation measures. The local people should be aware of the vulnerability of that area for the likely disasters. They should also know the elements at risk and expected loss due to these disasters. People should also know the existing contingency. or preparedness plan for specific disaster as well as availability of resources through government and non-government organisations.

The Unit has discussed the need to dispel the prevailing beliefs and myths regards disasters and to have a realistic appreciation of the nature cause and impact or disasters. This public awareness can be best brought through schools, clubs, electronic and print media. Face-to-face interaction are most effective in the context of a large segment of the population being illiterate. The unit has also discussed the training aspects for creating public awareness.

19.6 KEY WORDS

Counter disaster actions	:	Anti-disaster actions
Myths	:	Imaginary stories based on popular traditional beliefs
Legislation/Legal Frame Work	:	Laws and Acts
Electronic Media	:	Television and radio
Print Media	:	Newspapers, Magazines and other printed material
Resuscitation	:	Artificial respiration, Reviving a drowned or choked person by restoring the breathing process.

19.7 REFERENCES AND FURTHER READINGS

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Reed, Sheila B. (1992), *'Introduction lo hazards'*, UNDRO Publication.

19.8 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Checlc Your Progress 1

1) Your answer should include the following points:

- Types of disasters likely to occur in the area and their probable time and frequency.
- Types of risks due to these disasters and thc vulnerability of the area to these.
- Type of mitigation measures needed keeping in view the risks and vulnerability.
- Resources available locally and from outside.

2) Your answer should include the following points:.

- School and collage teachers through students
- Non-government organizations (NGOs)
- Community Based organizations (CBOs)
- Pancliayat

Checlc Your Progress 2

1) Your answer should include: Face-to-Face interaction; Electronic Media and Print Media/Publicity Material.

2) Your answer should include tlie following:

- Lectures; Meetings; Group Discussions; Street plays; Door to door campaign; Pancliayat Meetings.

UNIT 20 INFORMATION ORGANISATION AND DISSEMINATION

Structure

20.0 OBJECTIVES

After reading tlie Unit, you should be able to

- know tlie meaning and importance of information especially in tlie context of disaster management,
- understand tlie different types of information,
- learn tlie various methods of collecting and organizing relevant information,
- appreciate tlie importance of effective dissemination of information, and
- discuss how to get feedback from different sources for improving information collection and dissemination.

20.1 INTRODUCTION

Proper information is essential for nay rational or planned activity. Therefore, all organizations (big or small) and even individuals need to get information and handle it. The effort is required to be sustained over period of time, and includes the activities of collecting information, sorting it out, storing it, directing it to appropriate places and utilizing it at "appropriate time in various tasks before tlie individual or tlie organisation. In this process, there are three important aspects, i.e., information, data and organisation. It means that every information may not be useful for the organisation. Different types of data are required to develop an information system, according to tlie needs of the organisation. The present is an era which is largely dominated by information technology which is the most influential and widespread technology in modern times. Every sector of life, (viz., industry, governmental, business, education, social work, public administration as well as disaster management) make use of information and they should develop own information systems according to the special needs of that sector. In this unit, we shall discuss tlie various aspects of information organization and dissemination with particular reference to disaster management.

20.2 INFORMATION CONCEPT: MEANING, TYPES AND IMPORTANCE

Meaning and importance of information

Any data, encryption, description, photograph, sketcli or map about a person, place, thing event or subject constitutes the information about it. But haphazard

information does not malce anybody wise. Only when the information is properly collected, arranged verified, analysed and presented in an understandable form that it turns into reliable knowledge which then becomes a powerful tool in the hands of an individual or organization for planning and operational purposes. That is why it is said that systematic data is information, analysed information is Icnowledge and knowledge is power. Hence the importance of information is self-evident.

Types of information

Different types of information are traditionally stored in different institutions and organisations, text documents in libraries and archives, administrative information in tlie records of organisations, scientific data in laboratories and statistics in statistical offices. Many institutions may have more than one type of information. Each organisation or institution has its own ways of processing and administering the information types that it deals with. Recent advances in information technology have made possible the combined processing and communication of different types of information by multimedia or integrated systems. So first of all we should know various types of information and the way they contribute to various activities, especially those related to disaster management.

There are three broad types of information:

1) Descriptive information

Most of the organisations, of any size in structure and functioning, liave a set of rules. This may involve salaries of tlie people working, their various functions, accounting record books, inventories of stores and warehouses, individual performance records, etc.

The organisations involved in disaster management may have many descriptive information to keep in their computers or files such as:

- Case studies of earlier disaster events.
- Manpower involved in various activities.
  (Preparedness, Relief, Rehabilitation).
- Stockpiles/warehouse Records.
- Record of Emergency kits (Medicines, Tents, etc.)
- Any other descriptive matter such as organisations involved, resources utilized etc.

2) Probabilistic Information

These are the information on the basis of which description of the situation can be inferred or guessed. Such information can be of two varieties.

i) **Predictive Nature** - can be used for forecast. eg. The amount of rainfall data in the catchment area will provide information, which will predict the amount of water flow (flow rate) in the river.

ii) **Inferred Information** - This is the information which attempts to describe the situation by means of inference from a limited set of observations or measurements. This is tlie case, where a statistical sample is used to project a general pattern or a larger pattern. The heat or cold wave situation over a large area inferred on tlie basis of temperature observations of one or two places is an example of this type.

3) Qualitative Information

There may be the following types of Qualitative Information:

i) **Explanatory Information –** which explains or elaborates the brief or coded information.

ii) **Qualifying and Qualitative information** - which provides additional descriptive information of a formal system.

iii) **Patterns and Norms** - this information will determine the norms i.e., how things should be done and the values according to which evaluations or judgement will be made.

iv) **Judgemental Information** - approving or disapproving the approach/methodology plan.

Importance of Information in disaster management

The safety and welfare of people and their belongings are at stake in disaster management. The importance of information in disaster management lies in the fact that information plays a very significant role in every sphere of disaster situation. This is depicted in figure 1.

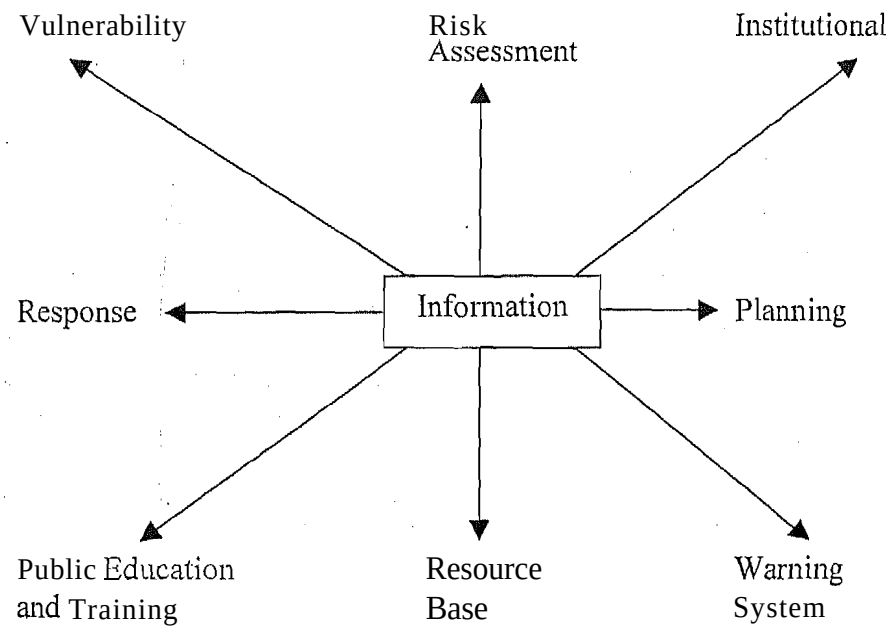


Figure 1: Importance of Information in activities related to Disaster Management

The importance of information is quite fruitful in the pre and post disaster situations as also at the time of tlie occurrence ofdisasters.

1) Pre-disaster situation

i) Early Warning

ii) Planning for Preparedness

iii) Mitigation options available for a specific disaster

iv) Vulnerability and risk assessment

2) Disaster situation

i) Real time Warning

ii) Taking administrative decisions

iii) Provide appropriate and timely relief

iv) Resources available with various organizations

v) In monitoring and evaluation of relief efforts made by the Government and NGOs

3) Post-Disaster situation

i) Rehabilitation for the affected community according to their

a) Social needs

b) Cultural needs

c) Economic background

The most important requirement in respect of information is that it should be

- Concise
- Accurate
- Complete
- Relevant

Check Your Progress 1

Note: i) **Use** the space given below for your answers.
ii) Check your answers with those given at the end of the unit.

1) What do you understand by information?

2) How many types of information you know about?

20.3 METHODS OF COLLECTING RELEVANT INFORMATION

Information can be available from a number of sources, but before accepting it, the receiver must verify the reliability, accuracy and completeness of it.

The following are some of the effective ways of collecting information:

1) Libraries
   a) Research Reports
   b) Annual Reports
   c) Pamphlets
   d) Journals
   e) Reference Books
2) INTERNET
3) Interviews Questionnaires, Surveys, Network Observations
4) Observations
   a) from site
   b) from field network
   c) from remote sensing tools such as radars and satellites
5) Mass Media
   a) Newspapers and Periodicals
   b) Radio
   c) Television
6) Meetings
   a) Seminars
   b) Conferences
   c) Workshops

Information collected from research reports, annual reports, pamphlets, journals and reference books is usually very accurate and focused. One can get a proper account of tlie subject from them.

Interviews can be taken if the number cf people is less. Experts and experienced people in tlie field are interviewed to gather information. However, if the number of people .is large, then the questionnaire or survey method can be used to collect relevant information. The questionnaires must be prepared carefully in order to get useful inputs from maximum people. But, though this method is very effective, it only reaches a certain number of people-the literate people.

The mass media of communication like newspapers, Journals, radio, television and Internet have brought about an information explosion. Television and radio provide information to people in different walks of life. In today's world these are undoubtedly tlie biggest source of all types of information.

The field observations provide the scientific information necessary to study the disastrous event and to forecast its behaviour.

Last but far from least is the information collection through meetings, seminars, conference and workshops. People who participate in such meetings get an opportunity to know the latest techniques and tlie ongoing research and development in the relevant fields. When the experts and others get together to exchange their views, they actually share each other's knowledge and experience.

20.4 ORGANISPNG INFORMATION

From the earlier section, it is clear that there are various ways of information collection. The next step is to organise information in a proper manner. A suggested format in which information about a cyclone disaster event may be organized is given below to serve as a typical example. It may be mentioned that maintaining a proper sequence is essential for useful organization of disaster related information:

1) Introduction (about the place, socio-cultural aspects)
2) Disaster history of the place (frequency of cyclones, previous history, damages caused)
3) About tlie disaster, viz., Cyclone (wind speed, area covered, other characteristics)
4) Damage caused by tlie disaster (Cyclone)
   a) Death (Human/Livestock/Poultry/Others)
   b) Damage to Crops
   c) Damage to Horticulture
   d) Damage to Houses
   e) Damage to Industries
   f) Damage to Infrastructure
   g) Damage to Artisans/Fishermen/Weavers/Other Communities
   h) Damage to Other Sectors
   i) Total number of persons affected
5) Response (Relief Provided to the sufferers)
   a) by Government Agencies
   b) by Non-Governmental Organisations
   c) by International Agencies
6) Rehabilitation: Short & Long-term measures taken for
   a) Socio-cultural, and
   b) Economic Rehabilitation
7) Lessons learned
8) Long-term Approach for Mitigation

This is just one example. The total information, if organised in a proper form is much more useful to field workers, control room, authorities researchers, trainers and the public.

20.5 EFFECTIVE DISSEMINATION OF INFORMAQTION

In disaster situations, information should reach the authorities and people as early as possible and there should be effective means of dissemination of these information. The disseminated information should be authentic and accurate. The fastest available communication method should be used. The information should not lie unattended at tlie receiving end. It should be quickly converted into action. Most importantly, the information should be updated at frequent intervals. If the danger has passed, a de-warning information should be disseminated quickly.

Before dissemination of information, care should be taken to exclude any misinformation or disinformation that might liave crept in advertently otherwise. But this verification process should be so arranged that it does not delay the dissemination of information which needs to be quick in order to be timely and useful.

20.6 FEEDBACK FOR IMPROVING INFORMATION COLLECTION AND DISSEMINATION

It is absolutely essential to have feedback information from the field from tlie people and the disaster management personnel. Feedback information is required on every aspect such as nature of tlie disaster, effect on tlie people and property, timely reception of warnings, usefulness of warnings, rescue and rehabilitation activities etc. There are several ways of getting the feedback. A survey may be conducted immediately after tlie disaster, which will provide tlie correct feedback and people's perceptions. Past experience has shown that only Government machinery is not enough to deal with disasters and people's participation is required. Regular feedback is essential for reviewing and upgrading tlie entire disaster management process.

Check Your Progress 1

Note: i) Use the space given below for your answers.
ii) Check your answers with those given at the end of the unit.

1) List at least five ways of collecting information.

2) What do you understand by "Effective Dissemination of Information"?

20.7 LET US SUM UP

Information is the base from which we derive knowledge and formulate action plăns for disaster management or carry out operational work during disaster situations. Information plays a key role in dealing with disasters at every slate viz., pre-disaster; during disaster and post-disaster stages. Herein 'lies tlie importance of information in tlie context of disaster management.

There are different ways of collecting information but it is very essential to organise the information properly. Only then, information can be utilized quickly and 'effectively. In this aspect, feedback from the field (from affected people, from the rescue and rehabilitation personnel, media etc.) is very necessary to update the information so that the action plans can be updated. Effective and quick dissemination of information is equally important.

20.8 KEY WORDS

Data	Large amount of information
Real-time	In actual time i.e., during disaster
Dissemination	Distribution or Communication of information
Encryption	Data in coded form
Misinformation	Incorrect information (usually unintentional)
Disinformation	Wrong or misleading information (usually deliberate)

20.9 REFERENCES AND FLTRTHER READINGS

Avgerou C & Cornford Tony, (1993), *Developing Information Systems - Concepts, Issues and Practice,* MacMillan Press Ltd.

Bhatnagr, S. C & Bjorn - Anderson, N. (1990), *Information Technology* in *Developing Countries,* North-Holland, Amsterdam.

Banerjee, U. K (1992): *Information Technology for Common Man,* Computer Society of India and Concept Publishing Company, New Delhi.

20.10 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

1) Your answer should include the following points:
   - Information consists of any data, encryptions, description, photograph, drawing or map about some person, place, thing event or subject. In order to be useful information should not bc haphazard but it should be properly collected, verified, analyzed and stored properly.

2) Your answer should include the following points:
   - Descriptive Information; Probabilistic Information; Qualitative Information.

Check Your Progress 2

1) Your answer should include the following points:
   - Libraries; Interviews; Questionnaires, Surveys, Network observations; Mass media, Meetings, INTERNET.

2) Your answer should include the following points:
   - Information should reach the recipient quickly though the fastest available communication system.
   - Information should not lie unattended or unutilized at the receiving end.
   - Information should be updated frequently.

- De-warning information should be disseminated if the danger from disaster has been averted or has passed away.
- Misinformation and disinformation should be carefully but quickly excluded from information dissemination.

UNIT 21 DISTRICT ADMINISTRATION

Structure

21.0 OBJECTIVES

After reading this unit, you should be able:

- to understand tlie working mechanism of tlie District Administration and other field level agencies in tackling disaster situations; and
- to understand strategies for relief and rehabilitation measures at field level.

21.1 INTRODUCTION

The District Administration is the focal point for field level organizations and implementation of all government contingency plans related to disaster management. Considerable powers have therefore been vested in tlie District Collector to carry out operations effectively in the shortest possible time.

The District Administration is required to prepare in advance a contingency district disaster management plan depending on tlie type of disasters likely in the district. Contingency Plans are required to keep into account the type of preparedness and the relief material required to be mobilized. Tlie concerned departments need to work together in a coordinated manner and provide an efficient feedback and monitoring system to tlie District Collector.

21.2 ROLE OF RELEVANT DISTRICT ADMINISTRATIVE AGENCIES.

India is a Parliamentary Democracy with a federal structure. Both the Union Government and the State Governments are run by elected representatives. The framework within which the government is run is laid down in a written Constitution. The country has a well establislied administrative set up both in the States and in the Central Government. The country's day-to-day administration centres around tlie District Collector (also known as the District Magistrate or Deputy Commissioner in some States) who heads the administrative organization in a District. Tlie country is divided into Districts of varying sizes each headed by a District Collector. In some States a number of Districts are grouped togetlier to form Divisions headed by Divisional Commissioners. The head of the State's administrative set-up is the Chief Secretary. The State Headquarters has, in addition, a number of Secretaries heading the various Departments handling specific subjects under the overall supervisions and co-ordination of the Cliief Secretary. At the level of the State Government, natural disasters are usually tlie

responsibility of the Revenue Department or the Relief Department where the State Relief Commissioner, usually a senior officer of Secretary's rank, is the nodal officer. While important policy decisions are taken at the State Headquarters by the Cabinet of the State headed by the Chief Minister, day-to-day decisions involving policy matters, or exercise of financial powers which have not been delegated to the Divisional Commissioners or Collectors, are taken or exercised by the Secretary in the Department. The actual day-to-day work of administering relief or implementing contingency plans for disaster mitigation at tlie field level is the responsibility of tlie District Collector. The Collector exercises coordinating and supervisory powers over functionaries of all the Departments at tlie district level. During actual operations for disaster mitigation or relief, the powers of tlie Collector are considerably enhanced, generally, by standing instructions or orders on the subject, or by specific Governments orders, if so required. Sometimes, the administrative culture of tlie state concerned permits, although informally, the collector to exercise higher powers in emergency situations and the decisions are later ratified by the competent authority.

The Collector or Deputy Commissioner is the focal points at the district/field level for directing, supervising and monitoring relief measures for disasters and for preparation of the district level plans.

Contingency plans: At the district level, the disaster relief plans are prepared which provide for specific tasks and agencies for their implementation in respect of areas in relation to different types of disasters. While the District disaster relief plans exist, all the districts are now preparing district disaster management plans that include tlie preparedness aspects as well.

A contingency plan for the district for different disasters is drawn up by the Collector Deputy Commissioner and approved by the State Government. The Collector/Deputy Commissioner also coordinates and secures the input from the local defence forces unit in the preparation of the contingency plans. These contingency plans lay down specific action points, and identify key personnel and contact points in relation to all aspects.

21.3 INTERACTION WITH OTHER AGENCIES

Interaction with other government and non-governmental bodies is done at the district level by various district level mechanisms which are:

District Relief Committee: The relief measures are reviewed by the district level relief committee consisting of official and lion-official members including the local legislators and tlie members of parliament.

District Control Room: In the wake of natural disasters, a Control Room is set up in the district to function as the district emergency management centre for regular monitoring and coordination of the rescue and relief operations on a continuing basis. It works round the clock and has very good communication facilities.

Coordination: The Collector maintains close liaison with the Central Government authorities available in the districts, such as, the Army, Air Force and Navy, Ministry of Water Resources, Health etc. who supplement the efforts of the district administration in the rescue and relief operations.

The Collector/Deputy Commissioner coordinates voluntary efforts by mobilizing the non-government organizations capable of working in such situations and also oversees proper distribution of the aid and relief material received from outside the District.

Check Your Progress 1

Note: i) Use the space given below for your answers.
ii) Check your answers with those given at the end of tlie unit.

1) Briefly discuss the role of relevant District Administrative agencies in disaster management.

2) Explain briefly the function of District Control Room.

21.4 COMMUNICATION NETWORK

The normal mode of telecommunications is overland telephone and fax, but in times of stress and if there is a breakdown of tlie overland system, radio communication is resorted to. The wireless network is generally run and maintained by the police organization. Cellular phones also come handy if it is available locally and its network has not been disturbed by the disaster. Satellite phones are very helpful but these are not yet available at all district headquarters but there are specially brought and pressed into service if the situation so demands.

The radio amateur network (the HAM operators), wherever available, also plays an important role in providing voluntary communication facilities when normal channels of communication break down as happens in disaster situations.

Internet/e-mail also serves well as a communication channel so long as the supporting telephone network is working.

21.5 ROLE OF SUB-DISTRICT ADMINISTRATION

A District'is sub-divided into sub-divisions and further into Tehsils or Talukas. The head of a sub-division is called the Sub-Division Officer (SDO) while the head of a Tehsil is generally known as the Tehsildar (Talukdar or Mamlatdar in some States). Contact with the individual villages is through the village Officer or Patwari who has one or more villages in his charge. When a disaster is apprehended, the entire machinery of the District, including officers of technical and other Departments, swings into action and maintains almost continuous contact with each village in the disaster threatened area, The entire hierarchy

right from the Central Governmental to the District level, and the sub-Divisional/Tehsil level becomes alert to the situation.

21.6 RELEIF MEASURES

As pointed out earlier, each district is required to prepare in advance contingency plans for each of tlie likely disasters in the district. The relief measures listed out in the contingency plans are as follows.

Establishment of Control: As the first part of the relief strategy, the district administration is required to establish control over the. situation by notifying and mobilizing necessary agencies and organizations required to intervening.-A Control Room is simultaneously energized.

Military Assistance: If the district administration feels that the situation is beyond its control, then immediate military assistance may be sought to carry out the relief operations. The District Collector is the designated authority to make this assessment and to seek military's help.

Medical: Specialized Medical Care may be required to save tlie injured population. Besides, preventive medicine may have to be administered to prevent diseases from breaking out.

Epidemics: In tlie relief camps set up for the affected population, there is likelihood of epidemics from a number of sources. The strategy should be to subdue such sources of infection and immunize the population against them.

Rescue and Salvage: A major effort is needed to rescue the trapped persons and to salvage destroyed structures and property. Essential services like communications, roads, bridges, electricity would liave to be repaired and restored to enable rescue and relief work and for normalization of activities.

Corpse Disposal: Disposal of dead bodies is to be done as part of clean up operation to bring some sense of safety in tlie surviving population and also prevent spread of epidemics.

Deployment of Resources: Considerable amount of human, and economics resources are required to be mobilized in a short time.

Outside Relief: During disaster situations, as considerable relief flows in from outside, there is an immediate need to coordinate the relief flow so that the maximum coverage is achieved, there is no wastage, and there is no duplication of work in the same area.

Special Relief: Along with compensation relief, essential items may have to be distributed to the affected population to provide for temporary sustenance.

Information: As information flow and review is essential part of the relief exercise, constant monitoring is required to assess the extent of damage and resultant requirements which form the basis of further relief to the affected area.. Dissemination of correct information is essential for media coverage and it also. helps to quell rumours.

21.7 REHABILITATION

At the District Level, while the immediate rehabilitation is carried out by the District Administration themselves, the long term exercises are taken up by the state level and central agencies. (Of late Voluntary Agencies have also begun working in, partnership with the government). For example, shelter provision is

usually taken care of by tlie State Housing Boards and Development Authorities. In all rehabilitation efforts the district administration becomes the coordinating body.

Typically, the rehabilitation works comprise tlie following components:

Housing

For Housing rehabilitation, the existing settlement may need to be completely reconstructed at new site for which land acquisition may have to be done.

Housing rehabilitation may also be carried out by way of improvement of existing damaged houses by carrying out damage repair.

As part of the long-term mitigation strategy, the existing structures may be strengthened as proofing against future disasters.

Infrastructure

Infrastructure such as roads, communications, water supply, sewerage and public buildings such as schools and health centres may be required to be rebuilt in the new relocated sites or existing ones may be repaired. Historical monuments, religious places may also have to be repaired as part of the rehabilitation programme.

Economic Rehabilitation

Economic Rehabilitation is essential for normalization of activities. Various new opportunities may be created in addition to getting the destroyed stocks replenished for restoration of livelihood.

Farm Implements, livestock, seeds etc. may be distributed as initial capital to restart economic activities in the rural areas.

Employment may also be generated by way of carrying out rehabilitation works.

Social Rehabilitation

To help it to recover, the community's social systems have to be restored. Restoration of such systems could ensure sustenance of essential services within the community.

Social Rehabilitation may include new components such as community training and funding so that they are able to lead a better quality of life.

Check Your Progress 2

Note: i) Use tlie space given below for your answers.
ii) Check your answers with those given at the end of the unit.

1) Brieily analyse the role of Sub-District Administration in managing disasters.

2) Write a note on relief measures.

21.8 LET US SUM UP

The basic responsibility of Disaster Management lies with the State Government. However, tlie actual operations are carried out by the District Administration. The District Administration thus becomes the focal points of all disaster related activities. Districts are required to prepare Contingency Action Plans for each type of disaster likely in tlie district. The Contingency Action Plan outlines the various measures required as preparedness to face disasters and tlie relief measures to be carried out in case a disaster occurs. Relief activities are coordinated by the district administration through the district relief committee.

In case, tlie impact of disaster is high and long term rehabilitation works also need to be carried out, the decisions are taken at the State level with tlie District Administration becoming tlie field level coordinating body.

21.9 KEY WORDS

Federal Structure	:	System of government in which the States are coordinated by a central government but the states also have the powers and laws within their territory.
Key Personnel		Persons who carry out important tasks in implementing a plan.
Contact Points		Persons or officials who are to be contacted in tlie concerned organizations in case of emergency.

21.10 REFERENCES AND FURTHER READINGS

Contingency Action Plan for Natural Calamities, Ministry of Agriculture, Department of Agriculture and Cooperation, Government of India.

Maharashtra Emergency Earthquake Rehabilitation *Programme*, Programme Management Unit, Earthquake Relief and Rehabilitation Cell, Government of Maharashtra, Mumbai

21.11 ANSWERS TO CHECK YOUR PROGRESS EXERICES

Check Your Progress 1

1) Your answer should include the following points:

In India, the district administration is headed by District Collector who is also called Deputy Commissioner or District Magistrate in some States.

The District Collector is responsible for coordinating and supervising the preparedness, rescue and relief work relating to'disaster management.

- For disaster management work, the district administration takes guidance and directions from the State Relief Commissioner and the Chief Secretary of the State.

2) Your answer should include the following points:

- When a disaster seems imminent or has actually occurred, the district administration sets up a Control Room.
- The District Control Room functions as the district emergency management centre and works round the clock with good communication arrangements. It is responsible for regular monitoring and coordination of rescue and relief operation on a continuing basis.

Check Your Progress 2

1) Your answer should include the following points:

- A district is divided into sub-divisions and tehsils.
- Contact with villages is through Patwari. In times of disaster the entire hierarchy becomes active up to village level.

2) Your answer should include the following points:

- Control Room

  Rescueand Salvage
- Corpse Disposal
- Medical
- Outside Relief
- Military Assistance
- Information

UNIT 22 MILITARY AND PARA-MILITARY FORCES

Structure

22.0 OBJECTIVES

After reading this Unit, you should be able to:

- define the role and functions of Armed Forces, both in Peace Time and during Emergencies and Enemy Encounters;
- describe the primary role of Para Military Forces and their involvement in National Emergencies and major events; and
- discuss their interaction with each other and contribution during Disaster situations.

22.1 INTRODUCTION

Basically, it is the duty of the civil administration to be prepared for and to manage disasters (natural or manmade) when they occur. There is a structured organisation in which the district administration under the charge of the District Collector plays the vital role. The Police, which is a civilian service, assists in disaster management in the efforts related to law and order, evacuation, search, rescue, wireless communication, disposal of dead, and general security. Non-governmental organisations and community based organisations render help according to their capability and capacity. In most situations, this combined civilian effort is able to manage. However, when the disaster and its effects are of such severity and suddenness that is beyond the combined capacity of civilian agencies, the military and para military forces have to be summoned and they always rise to the occasion.

22.2 ROLE OF ARMED FORCES

The military forces or defence forces or armed forces play a very important role during disaster situation and also in the post-disaster scenario. Their main assets are: discipline, training, professionalism, specialized equipment, resources and above all a minimum response time. Generally, they are called upon to manage the following tasks:

- Evacuation
- Maintenance of essential services
- Distributing of essential supplies in remove and marooned areas.
- Transport of relief material
- Medical aid
- Management of relief camps

22.3 ROLE OF PARA-MILITARY FORCES

In the earlier days, Military i.e., the Armed Forces used to take care of the outside enemies and conventional police used to look after internal security and law and order. With the growth of population and new activities resulting in the need for specialized security services to valuable sectors such as the borders, the industry, vital installations etc., it became necessary to create a variety of paramilitary forces under the Govt. of India. More prominent of these paramilitary forces are:

a) Border Security Force (BSF)
b) Central Reserve Police Force (CRPF)
c) Central Industrial Security Force (CISF)
d) Indo Tibet Border Police (ITBP)
e) Railway Protection Force (RPF)
f) Assam Rifles
g) National Security Guard (NSG)
h) Coast Guard
i) Rapid Action Force (RAF)
j) Territorial Army

Important point to note is that the Police Force is under control of the respective State Administration while all the para-military Forces including the "Civil Defence Organisation" are under the control of Government of India and these are deployed to assist the local police whenever necessary.

Apart from their primary role as their name implies-e.g. BSF guards the borders, CISF takes care of Central Public Sector undertakings including their security and fire fighting, all the Para-Military Forces are deployed in the troubled areas or during major national event like General/State Elections.

The Coast Guard is a special duty force for guarding the coasts and to deal with undesirable activities such as smuggling on the coasts.

22.4 SPECIAL ROLES OF AIRFORCE, ARMY AND NAVY

Armed Forces and para-military forces play important roles in disaster situations as described below:

Special Role of air Force. During emergencies for heavy troop movement be it Army Personnel or para-military forces - the Transport wing of Air Force is called in, in a big way, The helicopters of Air Force are used for survey and dropping of food packets together with rescuing of stranded people, especially in flood situations. Air Force also has the responsibility of VIP/VVIP movement.

Special Role of Army. The local Army commander, anywhere in the country has orders from Ministry of Defence, to assist the civil authorities during any contingency. For this, however, only the District collector has the authority to requisition the aid of military and that too in extreme emergencies, on a written request. In riot-affected cities, places, Army Flag March - only parading is arranged in order to deter anti-social elements indulging in further trouble and to pacify common population by boosting their morale for peace and assurance of their safety and security.

Special Role of Navy: The Navy has a special role in the event of a disaster on the sea or on coasts or in ports. Cyclones, storm surge or oil spill are the most prominent among the disastrous events that could occur in these locations. In discharge of their duties, the Navy is assisted by the Coast Guards.

Check Your Progress 1

Note: i) Use the space given below for your answers.
ii) Check your answers with those given at the end of the unit.

1) When are the military forces asked to help in disaster management and by whom?

2) What are tlie major para-military forces of our country and what are their primary functions?

3) How can the Defence Forces be useful in Disaster Management ?

22.5 LET US SUM UP

The Army, Navy apd Air Force constitute the Armed Forces. They have been given tlie main, defence, task of guarding our boundaries, our skies, our seas and thus the sovereignty and integrity of our nation.

With the vast boundaries, vast sea coast and growing external and internal problems and the situations created by natural and manmade disasters, a number of Para-Military Forces have been created like BSF, CISF, CRPF, Coast Guards, NSG, Assam Rifles, and Home Guards.

All the Military Forces have the mandate to aid civil authorities during disaster Management. The para-military forces, too, area sizeable extra help which can be requisitioned for combating large-scale disasters and their aftermath.

The discipline, training, equipment, resources and the quick response time make, the military and paramilitary forces very useful in disaster management.

22.6 KEY WORDS

Military — The nation's Armed Forces. This is a term with which the common man is familiar and includes all the wings.

Para-Military Forces : — The forces of a military nature created for specific taslcs.

22.7 REFERENCES AND FURTHER READINGS

National Centre for Disaster Management, 2001, Manual on *Natural* Disaster Management in India, Ministry of Agriculture, Government of India

22.8 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

1) Your answer should include the following points:

- Military Forces are asked to assist the civil administration in disaster management when due to the severity of the situation, the civil administration finds it difficult to deal with the situation.
- The District Collector' is the designated officer authorized to ask for the help of military forces in disaster management.

2) Your answer should include the following points:

BSF (Border Security Force) CISF (Central Industrial Security Force) CRPF (Central Reserve Police Force) NSG (National Security Guard), Coast Guard. Their primary functions as their respective name implies, are:

- To prevent enemy is filtration into, the country across the border and prevent any nefarious activities at the border, from within, To guard the installations of Central Public Sector undertaking together with Fire Fighting Role. To provide protection to our seafaring vessels and fishing travellers and thwart any enemy mischief over our waters, etc.
- In addition, they may be called upon to assist in disaster situations as the need arises.

3) Your answer should include the following points:

The Defence Forces have the attributes of discipline, training, special equipment, resources and a very quick response lime. These qualities are necessary in disaster management. Defence Forces are especially useful for the following items of work:

- Evacuation
- Maintenance of essential services in remote and marooned areas
- Distribution of essential supplies in remote and marooned areas
- Transport of relief material
- Medical aid
- Management of relief camps

UNIT 23 MINISTRIES AND DEPARTMENTS AT CENTRE AND STATE LEVELS

Structure

23.0 OBJECTIVES

After studying this unit, you should be able to:

- describe government's approach in dealing with disasters.
- discuss the centre and state coordination and allocation of responsibilities for action in disaster situations.

23.1 INTRODUCTION

Disasters due to the scale and extent they affect tlie population are a national calamity and it becomes imperative that action to mitigate their adverse effects be initiated quickly at the national level.

It has been observed that over the past few decades the frequency of disasters and their devastating effects have increased manifold. Apart from other causes the burgeoning' population, growing infrastructure arid the increased industrial activity have contributed largely to this situation. Among the important reasons for the increased vulnerability is the lack of coordinated efforts to manage a disaster situations. Precious time is lost in tlie authorities getting their act together to intervene. A well organised predetermined structure becomes a prerequisite for a prompt and comprehensive action to face disasters. Considerable progress has been made in the recent past in government organization and division of responsibilities in this regard.

23.2 EXISTING PREPAREDNESS AND RELIEF MEASURES

i) National Level

At the national level, depending on the type of disaster, a nodal ministry is responsible for tlie task of coordinating all activities of the state and district administration and the other support departments/Ministry. This is shown in the table below. The organisational pattern of the Natural Disaster Management Division of tlie Ministry of Agriculture, Govt. of India is depicted in the following figure. The nodal ministries form part of the National Crisis Management Committee. Part of their tasks is to prepare detailed Contingency Plans for each type of disasters falling in areas of their responsibility.

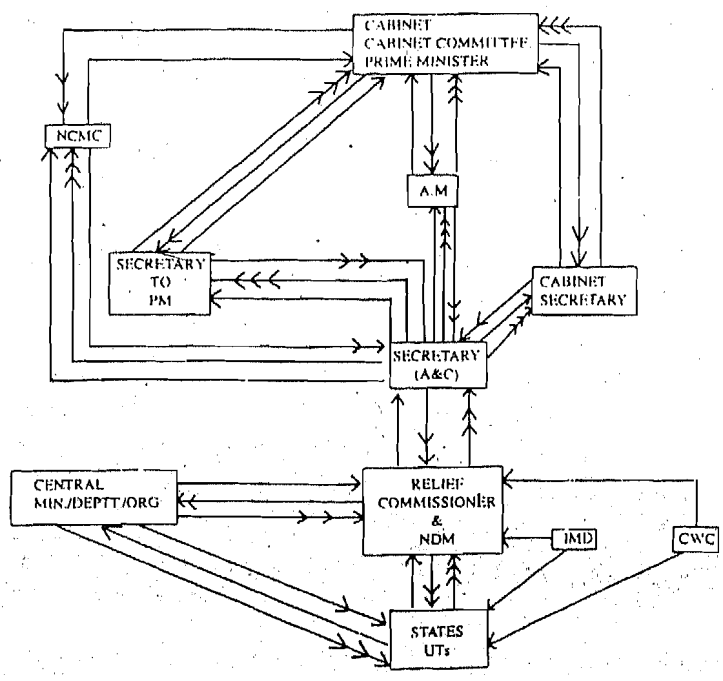
Type of disaster/Crisis & the Nodal Central Ministry

Type of Disaster/Crisis	Nodal Ministry
Air Accident	Ministry of Civil Aviation
Civil Strife	Ministry of Home Affairs
Major breakdown of any of the Essential Services posing widespread orotracted problems	Concerned Ministries
Railway Accidents	Ministry of Railway
Chemical Disasters	Ministry of Environment
Biological Disaster	Ministry of Health
Nuclear Accident inside or outside the country which poses health or other hazards to people in India	Department of Atomic Energy
Natural Disasters	Ministry of Agriculture*

Basically the responsibility for undertaking rescue, relief and rehabilitation measures in the event of natural disasters is that of the concerned State Government. The role of the Central Government is supportive in terms of providing financial and other resources. The department of Agriculture and Cooperation (DAC) of tlie Ministry of Agriculture* is tlie nodal department in the Government at Central level that deals with the subject of Natural Disaster. Management. In the DAC, tlie Central Relief Commissioner functions as tlie nodal officer to coordinate relief operations for all natural disasters.

The Central Relief Commissioner receives information relating to forecast/warning of natural disasters from the India Meteorological Department (IMD) or from the Central Water Commission (CWC) on a continuing basis and keeps the Secretary (Agriculture & Cooperation) and through him the Agriculture Minister and the Cabinet Secretary and the Secretary to Prime Minister and through them, tlie Prime Minister, the Cabinet and the Cabinet Committee informed. The "National Crises Management Committee (NCMC)" is kept informed through the Cabinet Secretary. He also disseminates the information to different Central Government ministries/Departments and the State Governments for appropriate follow-up action.

Figure I; Organisational Pattern of the Natural Disaster Management Division of the Department of Agriculture & cooperation in the Ministry of Agriculture, Government of India.



* The Natural Disaster Management Division dealing with Natural disasters was earlier with the Ministry of Agriculture, Government of India but now it is under the Ministry of Home Affairs, Government of India. However, drought as a natural disaster is still being managed by the Ministry of Agriculture, Government of India.

LEGEND

INFORMATION ——————————

INSTRUCTION/DIRECTION ——————————

FEED BACK ——————————

IMD	Indian Meteorological Department
CWC	Central Water Commission
NCMC	National Crisis Management Committee
A.M.	Agriculture Minister
P.M.	Prime Minister
A & C	Agriculture & Coopel-ation
N.D.M.	Natural Disaster Management

While the Ministry of Agriculture is the nodal ministry managing disaster situations, it is supported by other ministries as well-an important contribution is made by the Ministry of Health & Family Welfare through the Emergency Medical Relief Division of the Directorate General of Health Services. In a typical Disaster situation, the Medical Relief Division gets in touch with the Central Control Room in D.A.C and obtains feedback on the extent of disaster situation on a particular day population affected; and health profile lilte number of patients, type of patients etc.

Based on the results available, the concerned medical agencies are put into action.

ii) State Relief Organization And Response

In the federal set-up of India, the responsibility to formulate the Government's response to a disaster situation is essentially that of the concerned State government. However, the Central Government, with its resources (physical and financial) does provide the needed help and assistance to buttress relief efforts in the wake of major disasters. The dimensions of the response at the level of National Government are determined in accordance with the existing policy of financing the relief expenditure and keeping in view the factors like:

i) the gravity of the situation,

ii) the scale of the relief operations necessary, and

iii) the requirements of Central assistance for augmenting the financial resources at the disposal of the State Government.

Most of the States have Relief Commissioners who are in charge of tlie relief measures in the wake of natural disasters in their respective States. In the absence of the Relief Commissioner, the Chief Secretary or an Officer nominated by him is in overall charge of the Relief operations in the concerned State.

23.3 COORDINATION AT VARIOUS LEVELS

Coordination at the Central and the State Levels is achieved by way of various committees which have participation from all departments that are involved in' Disaster Management. The more important among these committees are as follow:

Cabinet Committee

The Cabinet may set up a committee for effective implementation of Relief measures in tlic wake of a particular natural calamity. The Secretary in tlie Ministry of Agriculture acts as the secretary of this committee. In the absence of such a committee, all the matters related to the relief are reported to the Cabinet Secretary.

National Crisis **Management** Committee (NCMC)

Under tlic chairmanship of the Cabinet Secretary, the NCMC has been constituted in tlie cabinet secretariat. It is a Standing High Power Committee which comes into action immediately in cnse of an anticipated or actual disaster. The other members of this committee include tlie Secretary of Prime Minister, Secretaries of Ministry of Home Affairs, Defence Research and Development Organisation, and Departments of Science and Technology and Agriculture and Cooperation along with Director Intelligence Bureau, Director General of Meteorology and an officer or the Cabinet Secretariat. Tlie NCMC gives direction to the Crisis Management Group as deemed necessary.

Top level officers from other ministries/Departments participate according to the needs of the situation.

Crisis **Management Group** (CMG)

A group under the chairmanship of tlie Central Relief Commissioner comprising the senior officers from the various ministries and other concerned departments reviews every year contingency plans formulated by tlie Central Ministries/Departments. It also reviews tlie measures required for dealing with a natural disaster and coordinates tlie activities of the Central Ministries and tlie State Governments in relation to disaster pscparedness and relief and obtains information from tlie nodal officers on measures relating to tlie above. The Joint Secretary (National Disaster Management) & Additional Central Relief Commissioner is the convenor of CMG. Tlie CMG have to meet at least twice a Year. When a disaster is anticipated or has occurred, CMG meets as frequently as tlie situation demands.

At tlie State level, the State Relief Commissioner (or Secretary, Department of Revenue) supervises and controls relief operations through Collectors or Deputy Commissioners, who are the main functionaries to coordinate the relief operation at district level. Tlie State Governments are autonomous in organizing relief operations in tlie event of natural disasters and in developing the long-term rehabilitation measures. Tlie State Governments efforts are supplemented by Central Government based on the recommendations of the Finance Commissions who make recommendations for five year periods.

States Crisis Management **Group**

There is a State Crisis Management Group (SCMG) under the Chairmanship of Chief Secretary/Relief Commissioner of the State. The Group comprises Senior Officers from the State Departments of Revenue/Relief, Home, Civil Supplies, Power, Irrigation, Water Supply, Panchayat (local self Government), Agriculture, Forests, Rural Development, Health Planning, Public Works and Finance.

The SCMG is required to take into consideration tlie infrastructure and guidance received, from time to time, from Government of India and formulate action plans for dealing with different natural disasters.

It is also the duty of the Relief Commissioner of the State to establish an emergency operations centre or Control Room as soon as a disaster situation develops. Besides having all updated information on forecasting and warning of disaster, the centre is also the contact point for the various concerned agencies.

Check Your Progress **1**

Note: i) Use the space given below for your answers:
ii) Check your answers with those given at the end of the unit.

1) Mention the concerned Nodal Ministry of tlie Government of India for dealing with the following disasters: a. Chemical Disasters; b. Biological Disaster; c. Natural Disasters.

2) The Chairman of the National Crisis Management Committee is:

a. Prime Minister
b. Union Agriculture Minister
c. Cabinet Secretary
d. Chief Justice of Supreme Court.

23.4 RELIEF ASSISTANCE (FINANCIAL ARRANGEMENTS)

Natural Disaster are huge economic burdens on developing economies such as in India. Given its large size, huge population and weak infrastructure and also because of its peculiar geography, India is visited by quite a few disasters (natural and manmade) every year. Consequently, every year huge amount of resources are mobilized for rescue, relief and rehabilitation worlts following natural disasters.

Schemes for financing expenditure on relief in tlie wake of natural disasters are governed by the recommendations of tile successive Finance Commissions appointed by Government of India every five years. Under the existing scheme, each State has a corpus of funds called Calamity Relief Fund (CRF),

administered by a State Level Committee, headed by the Chief Secretary of the State Government. The size of the CRF is determined having regard to the vulnerability of tlie Sate to different natural calamities and the magnitude of expenditure normally incurred by the State on relief operations.

The Calamity Relief Fund was first introduced by the Ninth finance commission set up by the Government of India which made recommendations for tlie five year period 1990-95. Tlie scheme is designed to enable tlie States to manage and provide for calamity relief on tlieir own by drawing upon tlie resources available with a fund constituted for that purpose separately for each State. The prescribed annual contribution to each State CRF are required to be made by the Centre and tlie concerned State in tlie proportion of 3:1 the scheme further provides for an accumulating balance with the proviso that if there is any unutilized amount left at tlie end of five years, if would be available for augmenting the plan resources of tlie State. On the other hand. It is permissible under tlie scheme to draw upon a percentage of the next year's central assistance, if it becomes necessary to tide over tlie insufficiency of resources in tlie CRF in any particular year.

The latest (I l"') Finance Commission while making recommendations for the period (2000-05) lias continued CRF. Further, it has suggested the creation of National 'Calamity Contingency Fund (NCCF) with an initial contribution of Rs.500 crore by Government of India and further augmented through surcharge as central taxes. For example, a surcharge of 2% on income tax was levied after the disasterous Bhuj (Gujarat) earthquake of 26th January 2001. Tlie Eleventh Finance Commission also recommended the establishment of tlie National Centre for Calamity Management (NCCM) to monitor all types of major disastrous events at the central level.

Relief is also provided by the other concerned departments/ministries depending on requirements. Tlie Ministry of Health usually mobilizes medicine stocks to affected area through their medical stores located all over the country. Other types of relief may be provided by concerned departments in the form of quick restoration of essential services like roads, communication lines, distribution of rations. When the disaster is unusually severe, tlie armed forces may be called in to assist tlie civil authorities. Non-government organisations and philanthropic societies also extend relief assistance according to their specialization.

23.5 REHABILITATION

Rehabilitation measures are taken up if the magnitude of the disaster is high arid loss of life and property entails complete rehabilitation.

Rehabilitation measures are taken up by Government with the assistance from tlie international agencies, or large public sector agencies. Rehabilitation usually includes restoration of livelihood and shelter in existing places or in new locations depending on tlie situation. As such tlie rehabilitation works are long term interventions and may continue for several months/years.

Check Your Progress 2

Note: i) Use the space given below for your answers.

ii) Check your answers with those given at the end of tlie unit.

1) CRF Stands for

a) Central Reserve Fund
b) Central Relief Fund
c) Calamity Relief Fund
d) Crisis Relief Fund

2) What are the main recommendations of the Eleventh Finance Commission for the period 2000-05 in the area of disaster management?

23.6 LET US SUM UP

There is a well-defined governmental structure to tackle disasters or any other emergencies. Depending on the type of disaster, separate ministry has been assigned responsibility to mobilize resources at appropriate levels.

The Central Government usually is required to intervene only when the calamity is particularly grave and beyond the capacity of the State Government to liandle it.

Relief and Rehabilitation is carried out with funds available from the Central and the State Governments. Much of the relief and rehabilitation work is carried out by the government itself in partnership with international and national non-governmental organizations.

23.7 KEY WORDS

Burgeoning	Growing
Nodal Ministry	The Ministry mainly responsible
Calamity	Disaster of extreme proportions
Contingency	Something that might happen in future

23.8 REFERENCES AND FURTHER READINGS

Sinha, Anil and V.K.Sharma, 1999, *Culture of Prevention (Natural Disaster Management: India)*, Indian Institute of Public Administration, New Delhi, and Ministry of Agriculture Department of Agriculture and Cooperation, Govt, of India.

National Centre for Disaster Management, 2001, *Manual on Natural Disaster Management in India,* Indian Institute of Public Administration, New Delhi.

Health Sector Contingency Plan for Management of Crisis situations in India, Emergency Medical Relief, Directorate General of Health Services, Ministry of Health and Family Welfare, Government of India.

23.9 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

1) Your answer should include the following points:
   - Ministry of Environment
   - Ministry of Health
   - Ministry of Agriculture

2) The correct answer is (c) Cabinet Secretary

Check Your Progress 2

1) The correct answer is (c) Calamity Relief Fund

2) Your answer should include the following points:
   - The Eleventh Finance Commission has recommended the continuation of the Calamity Relief Fund (CRF) scheme which was started by the ninth Finance Commission (1990-95).
   - The Eleventh Finance Commission has recommended the establishment of the National Calamity Contingency Fund (NCCF)
   - It has also recommended the creation of the National Centre for Calamity Management (NCCM).

UNIT 24 NON-GOVERNMENTAL ORGANISATIONS

Structure

24.0 OBJECTIVES

After studying the unit, you should be able:

- describe the different type of NGOs and their important role in disaster management; and
- discuss the working mechanism of NGOs and their partnerships with other agencies.

24.1 INTRODUCTION

Disaster Management is a multi-disciplinary and multi-dimensional effort requiring massive, large-scale and often long-term intervention at short notice. In a vast and populous country like India, it is not feasible for only the governmental machinery to undertake disaster management programmes satisfactorily. Active and willing participation of the people is essential. Non-governmental organisations (NGOs) including the community based organisations (CBOs) play an important effective role as a bridge between the government and the people. The non-governmental sector, due to its linkages with the community base and its flexibility in procedural matters, has an advantage over governmental agencies in invoking the involvement of the people at community level.

24.2 TYPES OF NGOs, THEIR OBJECTIVES AND IMPORTANCE WITH REGARD TO DISASTERS

NGOs can be of different sizes, with different areas of operation and different fields of expertise. The Non Governmental Sector covers a whole range of activities, through its various types of Organisations. Some major types of NGOs are as given under:

1) **NGOS with dedicated field operations and resource backup**. These are large Organisations, such as the International Red Cross Society, that have specific areas in which they carry out field operations. They have access to large resource bases, and have the capability to extend material, financial, as well as technical support. In times of disaster, their roles are very laudable as they garner support and resources from all over the world and come to the rescue of the affected persons almost immediately.

2) **Development Technology related NGOs.** These are NGOs involved in developing and propagating development technologies, such as Sulabh International, which has renowned activities in the field of low sanitation. Tliese NGOs are active in times of peace, carrying out their developmental projects, and can be called in at times of emergency due to natural disaster for providing the affected community with immediate pliysical infrastructure that may be required. Even in non-disaster times their services are useful for retrofitting in areas of building technology, so as to minimize death and destruction in future disasters.

3) **Interest Groups.** These are also NGOs, formed with the objective of sharing interests and community service, such as the Rotary Club, However, such interest groups are very active, and have come forward to help disaster victims in times of need. Most of these groups have good financial resources. They can play a major role in resource mobilization for relief aid and rehabilitation purposes.

4) **Associations of local occupation groups.** Such associations are formed on tlie basis of common occupational backgrounds, and could include groups such as doctors' associations, traders' associations, Army wives associations etc. Such groups, as with interest groups, can play a major role in resource mobilization, and also in providing specialized services to the disaster victims.

5) **Local Residents' Associations.** These associations are formed by the local residents to look into the interests of those living a shared community life in tlie area which may be rural or urban or in big towns. As such, these associations are highly concerned about the welfare of the local community, and need no external motivation to take active part in disaster reduction. Thus, they can be a very useful tool for getting across the message of community participation at the ground level and to muster community's willing participation. They are very useful in coordinating disaster management efforts such as distribution of essential supplies or providing local volunteers.

6) **Religious and Charitable Bodies.** Religious bodies are one of tlie most important NGOs groups that come to the immediate rescue and relief of the disaster victims. These bodies have a large and dedicated following in the community. They also have control of the local places of worship, which are usually strong structures built on high and safe ground, and can serve as ideal shelters during disasters. Besides, they often have infrastructure to feed mass gatherings, which becomes very useful in times of disaster.

7) **Educational Institutions.** Educational institutions Such as schools and colleges are also NGOs that play a crucial role in disaster management. Their prime responsibility in this regard is to spread awareness on natural disasters and preventive action needed to minimize damage due to them, as well as on immediate relief and rescue methods. Besides, these institutions have large buildings which can be used as shelters for the victims in times of disaster.

8) **Media,** Most of the media, such as newspapers or tlie radio/TV channels that are not owned. by government come in the category of NGOs and they perform prime function bkfore, during and after disasters as discussed in detail in unit 26 of this Block.

Latur A Case Study

A severe earthquake of magnitude 6.4 on the Richter scale struck the Marathwada region of Maharashtra state in the early morning hours of 30th September, 1993, at 3.55 a.m. The exact location of the epicentre of the earthquake was near the village Killari, a prosperous settlement about forty kilometres south of Latur district headquarters and near tlie boundary of Latur-Osmanabad districts. The damage caused by the earthquake was enormous-killing about ten thousand persons and destroying about two hundred thousand dwelling units along with a huge loss of public and private property. The major cause of such a wide-spread damage was the poorly constructed houses with locally available stones.

Tlie damage was more because the Marthwada region lies in Zone I as per the earthquake zoning map of India, which is supposed to be the least prone to earthquakes, Hence, tlie earthquake was totally unexpected and caught the people as well as the autliorities unawares.

The response of voluntary groups which came forward immediately after the eartliquake was spontaneous and overwhelming. The immediate response group mainly comprised local religious bodies and charitable trusts. They responded immediately by undertaking mass feeding programs and free distribution of essential items such as clothes, utensils etc. Few such Organisations were Akhil Maharashtra Jain Sangh, Gurudwara Mandal, Seva Bhavi Sanstha and Gurudwara Siddha Peeth. Besides such groups, a number of local and international NGOs sent medical teams and supplies to the site.

The second category of Organisations that played a vital role were those involved in developmental activities in different parts of the country. Tliese Organisations came forward to help tlie government in long term rehabilitation and reconstruction programs. Tlie Organisations comprised religious and charitable agencies who in turn were provided with financial, infrastructure and research support by a number of private corporate houses, public sector Organisations and research & development agencies.

The rehabilitation and reconstruction program comprised physical development of villages, and socio-economic support to the affected community. As many as 23,000 new houses were to be constructed in 49 villages on entirely new sites. Tlie importance of NGOs in any development process became further apparent as tlie difference in the approaches adopted by the government agencies and that adopted by the lion-Governmental agencies became evident in the reconstruction programme. The first category of houses whose construction started within one month of tlie disaster displayed inherent weaknesses in design and quality of construction. For the second category of liouses, the construction of which started a little later, the quality of liouses was much superior and found wider acceptance in the community. These houses were constructed with help of non-governmental agencies who in turn relied considerably on local material and technology; they also incorporated views of the community while developing building plans.

24.3 FUNDAMENTAL MECHANISM

The essential function of the NGOs is to be the vital link between Government and the Community. With their reacli to the remote areas through CBOs, NGOs also perform the very important function of "gap fillers" at places where the reach of governmental organisations is somewhat tenuous. These functions are made possible in different mechanisms as the situation requires. For example, if tlie government requires to distribute relief material to the community, NGOs may be requisitioned for distribution and more importantly in identifying the

persons actually needing the relief. The various other functions that the NGOs may be expected to perform are briefly enumerated below:-

Stage	Activity
Pre-Disaster:	• Awareness and information Campaigns
	• Vulnerability analysis of communities
	• Training of local volunteers
	• Inventory of resources available in the community and nearby
	• Advocacy and planning
During Disaster:	• Immediate rescue and first-aid including psychological counselling
	• Supply of food, water, medicines and other immediate need inaterials
	• Ensuring sanitation and hygiene
	• Damage and death assessment
	• Help in disposal of the dead
Post-Disaster:	• Technical and material aid in reconstruction
	• Assistance in seeking financial aid
	• Monitoring

These roles are usually played under directions or divisions of functions as decided by the Government of the District Relief Committee. Thus while the local district office may be overall incharge of the disaster management operations, certain functions may be singularly or jointly handled by the NGOs sector. In case there are more than one NGOs being able to perform different types of functions, then their roles may either be put in a hierarchy or alternately each of them could be directly responsible for their own tasks and coordinate directly with the government agencies.

Areas of Contribution

NGOs can contribute effectively to the disaster management efforts in tlie following areas:

Communication with Community - NGOs have a closer and informal link with the coininunity and also have presence in the field, which puts them in a better position to assess, decide and implement relief operations at time of disaster.

Manpower - The manpower available with NGOs is voluntary, dedicated, disciplined, prompt and highly motivated as it comprises basically volunteers and socially conscientious who are involved at their own initiative.

Finances and Materials - NGOs have very flexible means of mobilizing resources and a number of them specialize in just resource mobilization to be able to fund the activities of other NGOs working in the field.

Professional and Technical Services - A number of specialized technical services can be made available to the community by NGOs, which would otherwise be too expensive and inaccessible to the common folk.

24.4 INTERACTION AND COORDINATION

For an effective functional mechanism of the various agencies both government and nongovernment, an effective but simple coordination scheme has to be in place, some of the basic requirements of which are as follows:

Communication and interaction with the Government: A regular cbmrnunication and information exchange with the concerned government officers of department is necessary at all levels. This ensures, adequate preparedness depending on forecasts made by the government departments, providing manpower help in distributing government sponsored relief and ensuring complete coverage of disaster relief. Government of Indian has taken the initiative to establish a mechanism called GoI-NGO Coordination Committee for providing an interactive forum between Government and the national and international NGOs active in the field of disaster management .

Communication apd Networking with other NGOs working in the area of Disaster Management: This makes it possible to be able to use each others strengths fully but more importantly, it helps in ensuring that there is no duplication of work in the same area and at the same time, there are no areas left out for action. While coordination at bilateral or multilateral level exists between many NGOs in India, a proposal is under consideration to establish a nationwide network of NGOs with the National 'Centre for Disaster Management in New Delhi acting as the Convenor. This nationwide network of NGOs working for disaster management is likely to be called "Voluntary Agencies for Sustainable Universal Development and Emergency Voluntary Action (VASUDEVA).

Communication and Interaction with the Donor Agencies: Donor Agencies would prefer that tlie resources available with them for disbursement are accounted for and distributed properly so as to bring clear benefits to the affected community. This has to be based on an assessment of realistic needs of tlie community. For this, NGOs, can provide the most appropriate and unbiased information.

Transparency: An effective and acceptable form of interaction with adequate coordination sustains only if there is transparency in the operations and account. Transparency ensures that the focus of the various bodies involved is towards the single objective of quickly providing maximum succour to the community.

Check Your Progress 1

Note: i) Use the space given below for your answers.
ii) Check your answers with those given at tlie end of the unit.

1) Mention any four major types of NGOs.

2) Describe the functions performed by NGOs during disaster

24.5 LET US SUM UP

NGOs participation forms a vital part of a Disaster Management strategy. This becomes clear form the multifarious functions the NGOs are able to perform before, during and after disaster scenarios. Characteristics unique to MGOs such as their short response time and close link with the community make them tlie most suitable agencies for specific activities of disaster management.

In order to fully benefit from the Non Governmental sector, there should be greater utilisation of tlie services of NGOs in disaster management. At the same time, the government's role vis-a-vis the NGOs role needs to be clearly identified so tliat such a mechanism can be made operational within a short span of a disaster occurrence. Caution should however be exercised that tlie government and the NGO sector do not try to compete or duplicate each other's efforts. In fact, they should complement each other.

24.6 KEY WORDS

Retrofitting : Put a new part or new equipment in machine or a building after it has been in use for sometime or is damaged.

Advocacy : Recommended a particular action or plan.

Psychological Counselling : Helping to boost the morale of those affected mentally by disaster.

Hierarchy : A system of organising people into different ranks or levels of importance, e.g. in government or company.

Transparency : Acting in a manner that is frank, factual, honest and open.

Succour : I-Ielp

Tenuous : Thin or insignificant

24.7 REFERENCES AND FURTHER READINGS

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24.8 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

1) Your answer should include the following points:

- Development Technology NGOs; Associations of Local Occupational Groups; NGOs with cledicated field operations; Religious and Charitable Bodies.

2) Your answer should include the following points:

- Immediate rescue and first-aid; supply of food, water, medicine and other immediate need material; ensuring sanitation and hygiene; and damage assessment.

UNIT 25 INTERNATIONAL AGENCIES

Structure

25.0 OBJECTIVES

After studying this unit you will be able to:

- discuss the role of International Agencies in Disaster Mitigation;
- describe the important International Agencies in Disaster Mitigation;
- explain tlie mechanism of financial assistance by international bodies; and
- understand Government's Policy for international assistance

25.1 INTRODUCTION

"Red Cross" is tlie first organized trans-national or international effort to provide relief to those affected by war— a manmade disaster. With the experience gained in attending to the Austrian and French victims of the Battle of Solferino in 1859, J.H.Dunant, a Swiss Philanthropist and Humanitarian, founded tlie International Committee of Red Cross in 1863 in Geneva when delegates from 14 countries adopted tlie Geneva Convention. Dunant received tlie Nobel Peace Prize in 1901 and the International Committee of Red Cross was honoured thrice witli the Nobel Peace Prize (1917, 1944 and 1963). It shared the 1963 Nobel with the League of Red Cross and Red Crescent Societies", also headquartered in Geneva. Both the organisations complement each other. While the International Committee deals mainly witli war like situations, the League provides relief after natural and manmade disasters and helps tlie development of national Red Cross Societies.

This background of international assistance since tlie 19th century has provided a great deal of experience and precedent on which other disaster assistance programmes developed. Thus today, there is a reasonably clear understanding, by both donors and recipients, of what is involved in disaster assistance generally. Also, the increasing interdependence of nations tends to give disaster assistance a respectable image and makes it an acceptable part of international relations. It is agreed chat all disaster assistance programmes have their difficulties. I-lowever, the fact remains that the overall concept of international disaster assistance is currently recognised by most nations as being valid, practicable and productive,

25.2 INTERNATIONAL AGENCIES INCLUDING UNITED NATIONS: ROLE AND IMPORTANCE IN DISASTER MITIGATION

The increasing population and infrastructural growth worldwide has resulted in worsening the effects of disastrous events (natural and manmade). The fast development of communications and the visual impact of television images has upgraded the awareness and sensitivity worldwide irrespective of the location where the disaster occurred. The world witnessed a few terrible disasters which took unprecedented toll of life and property and their effects are still being felt decacles after their occurrence. The Bangladesh Cyclone (1970), the Bhopal Gas Leak (1984) and the Chernobyl Nuclear Power Plant Disaster (1986) made the United Nations (UN) to take cognizance of the situation leading to the 1989 Resolution of the UN General Assembly that set forth an international framework of action at national and international levels and also provided an international structure with scientific, technical and financial support. The most important follow up was the launching of the International Decade for Natural Disaster Reduction (1990-2000) which is better known by its initials IDNDR. A mid-way review of IDNDR was taken by the UN Conference on Natural Disaster Reduction at Yokohoma (Japan) in 1994 when the Yokohoma Strategy was aclopted.

In line with the thinking within the UN, major international funding agencies increasingly recognise the benefits of funding disaster related projects.

However, a critical fact to be recognised here is that it must be the prerogative of a stricken or potential recipient country to decide whether or not it needs international disaster assistance.

International agencies provide assistance at various stages as follows

1) Pre-Disaster Assistance

Pre-disaster assistance from international sources takes on a variety of forms.

(i)Assistance in prevention/mitigation

a) Assistance in building a system of dams, aimed to prevent flooding.

b) Development of monitoring and warning systems.

(ii) Assistance in Preparedness

a) Provision of assistance in the formulation of plans at national and regional levels;

b) Provision of assistance in establishing and developing clisaster management structures or key points; for instance, the establishment of a national disaster management centre, office or section.

c) Provision of systems and facilities in the form of warning systems, communication systems, emergency operations centres; emergency broadcasting systems;

d) Stockpiling of emergency items, such as generators, chain saws, shovels, water purification plank, cooking equipment, shelter materials, medical equipment.

2) Assistance in Response Operations

As with pre-disaster circumstances, assistance in response operations can also take various forms, like;

a) Monitoring and warning of potential disaster impact.

b) Post impact survey for instance, aerial photographic or visual reconnaissance.

c) Provision of emergency assistance teams; for instance medical teams, other specialist teams.

d) Provision of emergency equipment and supplies; for instance communications, power generator, clothing, shelter materials, food transport and medical supplies.

e) Provision of specialist personnel; for instance, to install and operate water purification plant.

f) Temporary provision of major response capabilities for instance, helicopter capability for various emergency roles (including survey and assessment and food distribution, shipping capability for movement of heavy/bulky supplies, offroad vehicle capability.

3) Assistance in Recovery Programmes

The post-disaster recovery process usually consists of a series of distinct but inter-related prgorammes, for instance, covering infrastructure, medical and health system, education facilities, and so on. International assistance may therefore be directed towards a specific recovery programme, or comprise some form of contribution to overall recovery. Therefore, they may take the form of:

a) Financial grants or credits

b) Building Materials

c) Technical Equipment

d) Agriculture rehabilitation

e) Extended feeding programmes

f) Specialists or specialist teams

g) Food for work

4) Assistance in Future Development

In many cases, international assistance in post-disaster recovery may develop or merge into long-term development programmes, for instance, development of transport systems, building of dams and embankments.

re-disaster assistance and assistance in future development tend to be of a routine nature and can be processed in a routine manner. Assistance in response operations and recovery programmes usually has a high degree of urgency, which necessitates quick processing.

In some circumstances, problems can arise locally. For example, the affected community may become totally or over-dependent on aid. In such a case, original and traditional customs of combating disaster have been eroded. In these circumstances self-coping mechanisms of rehabilitation have to be strengthened.

Rapid injection of aid especially food items can upset a local economy. This particularly applies when local markets and rural production are interdependent. Such a situation adds considerably to the problem in immediate post-impact conditions.

Over supply of aid is another well known problem area which can particularly apply to severe and widely publicised disasters. The Maharashtra Earthquake (1993), the Andhra Cyclone (1996) and the Gujarat earthquake (2001) are good examples of over supply of aid by international agencies. It may result in aid of unsuitable varieties being showered on a stricken people with little or no regard for its usability or the amount of aid already received.

The work of international agencies depends very significantly on the understanding between the agencies and recipient nations, Most of the major problems in international assistance can be avoided if a Sew basic factors are recognised. Assistance agencies need to exercise a sensitive approach and practice.

When assistance is needed, the recipient nation is usually in some form of post-impact shock. In such a situation, the recipient may have difficulty in identifying assistance needs.

The desirable concept is one of a mutual relationship throughout tlie whole process of preparedness, response and recovery. In this way, when assistance needs to be applied, it is merely one phase of an ongoing dialogue, rather than a sudden shock response to an already traumatised recipient country.

Check Your Progress 1

Note: i) Use the space given below for your answers.
ii) Check your answers with those given at the end of tlie unit.

1) Describe different stages at which International Agencies provide assistance for disaster mitigation.

2) Mention any four forms of assistance in recovery programmes provided by International Agencies.

25.3 IMPORTANT INTERNATIONAL AGENCIES IN DISASTER MITIGATION

There are four major categories of International agencies active in disaster mitigation.

Category I: Core Agencies of the U.N.

Department of Humanitarian Affairs (UN-DHA), Office of Disaster Relief Coordinator, Geneva. The agency assists in disaster assessments and relief management. It also advises on hazard risk assessment, mitigation planning and implementation. It provided the secretariat for tlie International Decade for Natural Disaster Reduction ((IDNDR) and now houses the secretariat for its successor programme viz., the International Strategy for Disaster Reduction (ISDR).

FAO-Food and Agriculture Organisation

It offers technical advice on the reduction of vulnerability and monitors and advises in food production. It is headquartered in Rome.

United Nations Centre for Human Settlements (UNCHS), Nairobi

It advises on settlement planning that will reduce risk and on post-disaster reconstruction.

UNDP:

The United Nations Development Programme (UNDP) with headquarters in New York incorporates disaster mitigation in developmental planning and also provides financial aid for technical assistance for disaster management. It offers administrative support to resident coordinator and advises on flood loss prevention, mitigation and management through agencies such as UN Economic and Social Commission for Asia and the Pacific (UN-ESCAP, Bangkok). UNDP has sanctioned the project to the Ministry of Agriculture (Govt. of India) on "Strengthening Disaster Management capacity' for the country.

UNESCO:

The United Nations Educational, Scientific and Cultural Organisation (UNESCO) in Paris funds research in disaster mitigation and strengthening of heritage structures against flood and earthquake damage'. It is supportive of food management programmes and runs a publications programme.

Category II: United Nations Agencies with Support Roles in Disaster Mitigation

The United Nations Centre for Regional Development provides training and research in regional development and planning and related fields, for developing 'countries. Its projects focus primarily on research and training, but include advisory services and information dissemination components, Its operational units include the Regional Disaster Prevention Unit (RDPU).

The United Nations Environment Programme (UNEP) perceives and includes disaster mitigation in its environmental programming. It has a working relationship with the UN Centre for Human Settlements (UNCHS) (Habitat) and has its own publications programme.

The UNICEF (United Nations Children's Emergency Fund) attends to the well-being of women and children including that at the time of disaster. It collaborates with the World Health Organization (WHO) and World Food Programme (WFP) in social programmes. including improvement of water supply, sanitation and health. Besides running its own publications programmes, it is now entering, into disaster preparedness, planning and mitigation work in alliance with other agencies.

The UNIENET or United Nations International Emergency Network through a network of computers, places members of the worlcl-wicle disaster management community in direct communication with each other and provides them instantaneously with both background and operational disaster related information.

The UNHCR (United Nations High Commissioner for Refugees) assists refugees through cainps, financial grants and other assistance.

The WFP or World Food Programme provides targetccl food aid, sometimes linked to 'food for work' programme for construction of flood protection structures and coordinates pre and post disaster emergency food aid. It also runs its own publications programme.

Tlie WHO or World Health Organisation provides assistance in post-clisastcr rapid response. It promotes 'health cities' programmes ancl is supportive of disaster mitigation measures. It also has its own publications programme.

The WMO or World Meteorological Organisation provides technical guidance, training and coordination to the national weather services to upgrade their forecasting capabilities for the weather and climate related disasters.

Category III: Major Intel-national Agencies (outside tlie UN System)

Tlie Asian Development Banlc located in Manila finances projects in Asia and the Pacific. It is committed to ensuring disaster mitigation which is included in programming of its projects. It publishes mitigation handbooks. Publishing programme and advisory work is being clone as part of technical assistance.

The Asian Disaster Preparedness Centre in Bangkok provicles training and information services for countries in the Asia and the Pacific region to formulate policies and develop capabilities in all areas of disaster management.

The European Community Humanitarian Office is newly founded, but active in the development of disaster mitigation strategies. Its parent body, the Commission of European Communities organises funding of mitigation structures such as cyclone shelters in Bangladesh.

The International Institute for Environment and Development (IIED) of USA promotes and disseminates results of research on the development of tenements and squatter settlements in urban area, social factors which cause or aggravate natural disasters and interventions that can limit their impact on tlie poorest sectors of society. It provides technical assistance to national and international agencies.

Organisation for Economics Cooperation & Development (OECD) of Europe has issued guidelines, through its Development Assistance' Committee, to aid agencies on disaster mitigation.

The World Banlc (IBRD-International Bank for Reconstruction and Development) offers loans for structural adjustment and projects. It plays a

catalytic role in the development of mitigation strategies. It funds large-scale flood control and water management projects, as well as running its publication programme The Bank has recently funded the Maharashtra Earthquake rehabilitation programme in India by providing loan.

The International Federation of Red cross and Red crescent Societies (IFRS) assist programmes of the national Red-cross societies of various countries, In India, they assist and work with the Indian Red Cross Society. IFRS also publish a 'World Disaster Report' from its Geneva office.

Category IV: National Bodies Assisting Overseas

ODA - Overseas Development Administration (UK) operates a disaster response unit and undertakes advice ancl studies in disaster mitigation. It finances consultancy and construction work for post-disaster and pre-disaster preparedness. It also has its own publications programme.

OFDA - Office of Foreign Disaster Assistance (USA) liolds regional seminars on mitigation strategies. It also offers consultancy and issues publications.

NCDM/India - The National Centre for Disaster Management (NCDM) established by Government of India at tlie Indian Institute of Public Administration in New Dellii provides training; research and consultancy in different areas of disaster management in India and to countries in the South Asian region.

25.4 FINANCIAL AND LOGISTIC ASSISTANCE IN DISASTER SITUATIONS

Logistics have been described as the procurement and delivery of the right supplies in the right order in good condition at the right place at tlie right time. Obviously, logistics play a crucial role in clisaster mitigation.

International assistance usually boosts the availability of much-needed relief commodities provided liaison between the stricken country and international donors has ensured the preclusion of unnecessary relief items.

If, however, good liaison is not maintained, inappropriate and often unusable items may be received. This can be a serious liability, since the in-country supply system may become choked and valuable local resources may have to be deployed to sort usable commodities from non-usable one. It is, therefore, normally the responsibility of potential recipients to ensure that inappropriate supplies (e.g. unacceptable foodstuffs or clothes) are made known to donors.

International relief input usually places additional demands on tlie in-country logistic system. This may be a crucial sector if major ports, airfields roads and railways have had their capacity reduced by disaster effects. Extra demands may also be placed on fuel and food stocks by visiting aircraft and various relief teams.

Therefore, it is clear that international assistance activities, whilst: contributing many invaluable benefits also impose logistic complications. Any such complications need to the minimised through prior planning and preparedness arrangements.

In the interests' of both the stricken country and the international assistance agency, it is important that no undue delays are imposed on international inputs by delays from customs or other formalities.

International Financial aid in disaster situations is released via four main channels

1) The United Nations contribute funds for disaster situations which are released on request from tlie stricken country. This assistance is channeled through the appropriate UN agency such as, UNHCR or UNWFP or UNICEF or UNDP.

2) Developed nations usually have some funds set aside for disaster situations in the under-developed world. The amount they release is determined by a variety of factors like the magnitude of the tragedy, the relations between the two countries, etc.

3) International bodies like the European Union have also been assisting the disaster-affected countries.

4) Countries may have bi-lateral agreements among themselves that may include the clause that if either country is stricken by a disaster, the other will help with tlie required form of assistance - monetary or otherwise.

Major disasters impose a tremendous strain on a country's financial and other resources. In such a situation it is almost impossible for it to cope on its own without financial aid from international agencies. In such a scenario, when aid starts flowing from various quarters, it becomes very essential to keep track of the amounts coming in and to ensure that they are utilised in an appropriate manner.

25.5 INTERNACTION AND COORDINATION WITH GOVERNMENTAL AND NON-GOVERNMENTAL ORGANISAITONS; GOVERNMENT'S POLICY FOR INTERNATIONAL ASSISTANCE

All international agencies require clearance from the national government.

The international agencies operate at different levels. They usually have a branch head office in the national capital and some branches at state levels. The head office regulates the flow of funds; receives orders and instructions from the agency headquarters and passes them on to the branch offices. It also liaises with the national government and finalises operational details.

Non-Governmental Organisations usually work in close conjunction with the international agencies. The agencies normally work through NGOs. They finance the specific project and the NGOs do the ground work. This way, the country gets the financial aid of the international agency and tlie agency, in working through local organisation (s), gets a true picture of the events and is able to utilise its resources more effectively.

Alternatively, tlie agencies might fund and carry out a programme on its own after first getting clearance from the governmental. Sometimes, these agencies simply fund the government programmes in part or as a whole.

The policy of Government of India with regard to external assistance for relief in the walte of disasters is not to issue a formal appeal, either directly or through any national or international agency, to request relief assistance from abroad. However, any assistance donated on a voluntary basis is accepted and acknowledged as a token of international solidarity. If the assistance is in cash, it is to be sent to the Prime Minister's National Relief Fund. If it is in kind, it should preferably be routed through the Indian National Red Cross.

Check Your Progress 2

Note: i) Use the space given below for your answers.
ii) Check your answers with those given at tlie end of the unit.

1) List the core agencies of the U.N. working for disasters mitigation.

2) IBRD stands for:

a) International Bank for Rural Development
b) International Bureau for Reconstruction and Development
c) International Bank for Reconstruction and Development.
d) International Bank for Reconstruction Development.

3) Mention the salient features of Government's Policy for international assistance in the event of disaster.

25.6 LET US SUM UP

When a major disaster strikes, it becomes very difficult for the country to manage the rescue and relief work and consequent rehabilitation on its own. In such a situation, the assistance of international agencies is required, particularly in developing countries. With the increasing recognition of the importance of disaster related matters, more and more agencies are now providing aid in this field. There are four major types of international agencies active in disaster management. They interact with the national and state/governments and get an idea of the amount of money and type of material that are required immediately. Many of the international agencies work in close conjunction with the Non-Governmental Organisations (NGOs).

25.7 KEY WORDS

Self-coping	To be able to manage by itself
Infrastructural	Collective term for fixed installations including roads, communications, bridges, etc.
Reconnaissance	Process of surveying or inspection or gatliering information
Transnational	Across nations
Traumatised	Upset, shocked

25.8 REFERENCES AND FURTHER READINGS

Carter, W.N. (1991), *Disaster Management; A Disaster Manager's Handbook*, Asian Development Bank, Manila.

The Institution of Civil Engineers (1995), *Mega Cities; Reducing Vulnerability to Natural Disasters*, Thomas Telford, London.

25.9 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

1) Your answer should include the following points:
   - Pre-disaster stage
   - Response Operations stage
   - Recovery Programmes stage
   - Future Development stage

2) Your answer should include the following points:
   - Financial grants or credits; Building Materials; Technical Equipment; Agriculture Rehabilitation, Food for Work.

Check Your Progress 2

1) Your answer should include following points:
   - UN-DHA, UN-FAO, UNESCO, UNDP

2) Your answer should include the following points:

- International Bank for Reconstruction and Development.

3) Your answer should include the following points:

- Government of India's Policy is not to ask for external assistance
- If aid comes voluntarily, it is accepted as token of international solidarity
- Cash aid goes to PM's National Relief Fund and material aid should be routed through Indian Red Cross

UNIT 26 MEDIA

Structure

26.0 OBJECTIVES

After reading this unit, you will bc able to understand and discuss the following:

- What is Media?
  The importance and role of Meclia in a disaster situation;
- The types of Media and how to make the right kind of choice between different Media available; and
- How the facts are reported by Media during and after a disaster situation?

26.1 INTRODUCTION

Media is usually defined as impersonal means of communication by which written, visual or auditory or sometimes a combination of such messages are transmitted directly to the audiences". In simpler terms, the word media denotes the means of communication with large number of people spread over communities, cities or countries through written or printed word or sound and voice or visual images or a combination of these.

By the definition itself, we understand that media is an organised means of reaching large number of people, quickly, timely effectively arid efficiently. There are two main characteristics of media,

i) It can reach millions of people in short time; even instantaneously.

ii) Audio media transcends the limits of illiteracy and the visual media can be effective in a multilingual society as well.

iii) It is cost effective and generally user-friendly.

iv) Generally, media provide one way communication i.e. to the receiving people.

Television, radio, newspaper, magazines, audio and video as well as movies are examples of media. These are very useful in the multilingual traditional and largely illiterate society in India.

Types of Media : Media may be of various kind; but in disaster management,' following types of media are important:

i) **Print Media** - Print Media (newspapers etc.) have made tremendous progress in India since 1780, when the first Indian newspaper 'The Bengal Gazette' appeared. After Independence, the mass media assumed great significance. As per official records, more than 25000 different newspapers, magazines and bulletins are being published from various states in the country in various languages.

ii) **Broadcast Media** - They comprise radio and television. Messages are transmitted by these media through satellite and received by viewers and listeners at distant places of the country very quickly. Radio and T.V. reach more number of people than print media. In disaster warning and creating awareness. broadcast media are most effective especially a large multilingual country like India with low level of literacy. Broadcast media are sometimes termed as Electronic Media although the latter term would include audio video cassettes.

iii) **Display Media** - This comprises the following:

a) Hoardings or Billboards or illuminated signs which can bc displayed at busy public places like bus stands, railway stations, parks, etc.

b) Wall paintings and posters on common places including railway stations, airports providing specific awareness.

c) Small panels on lamp posts or inside or outside buses, railway compartments, taxis etc.

d) Banners

e) Window displays

f) Sky balloons in trade fairs

g) Small handbills, leaflets.

h) Exhibitions and Fairs where special pavilions may be arranged to deal with the theme of disaster management.

Check Your Progress 1

Note: i) Use the space given below for your answers.
ii) Check your answers with those given at the end of the unit.

1) Define Media and mention its two characteristics.

2) Name various types of Media generally used?

26.2 IMPORTANCE *AND* ROLE OF MEDIA

Media has a very important role in disaster management. In this context, it performs major functions mentioned below:

i) Surveillance of the environment, which means collection and distribution of information concerning events in the climate/environment. A number of climatic information is potentially related to the natural disasters, which can be communicated regularly and more frequently at the time of disaster.

The best example is cyclone, Media can play a very important role in dissemination of infor-mation such as formation of depression on the sea, its movement towards the coast, areas likely to be affected, etc.

ii) Disaster Awareness Education to the masses can be given by niedia. Today we have about 50% illiterate people in India but most of them do have access to radio or television.

iii) Long term preparedness and mitigation strategies can be explained effectively to tlie masses through various media.

iv) Media help in policy formulation by conducting public debate or surveys or polls.

Why Media Covers Disaster News?

This is because disasters are unusual, sudden events which cause enormous loss of lives and property. It brings many dramatic and traumatic stories. It depends on how the news is delivered by tlie journalists. Most of tlie time they try to find fault in provicling relief to the victims and highlighting the impact on affected community. Sometimes these news encourage international fundraising and create more public sympathy for the affected people. the amount, depth and period of coverage will depend on the scale and frequency of the disaster, the speed with which the information can be obtained, and the amount of interest in tlie public on tlie subject. The media have a strong impact on the perception of and reponse to disasters. Thus role of media in a disaster is multipurpose and can be broadly classfied in three categories:

a) Informative

b) Suggestive

c) Analytical

26.2.1 Informative Role

Media can play informative role in all the three situations:

j) Pre-clisaster

ii) At the time of disaster; and

iii) Post-disaster

In Pre-disaster situation, knowledge of disaster vulnerability of the community is very important. In monsoon season, rainfall predictions, water level in different rivers, water flow rate, possible breach of embankment etc. are the pieces of information extremely useful for the people living in the highly vulnerable areas. Media can highlight some of tlie important mitigation measures, which community should take up in the vulnerable zones of a natural disaster.

Similarly, some of tlie success stories of water-shed management in drought mitigation, can be useful in other drouglit affected areas of the country. Himalayan region is highly vulnerable to a number of natural disasters (viz. Earthquake, Landslides, Flash Floods, Avalanches etc.). A concept of Environmental protection, ecological balance and sustainable development in this region will certainly help in disaster reduction in tlie region. Awareness in this regard can be generated by media only through informative reporting.

At tlie time of disaster, accurate information should be the first aim of a journalist. It needs cooperation between local officials and media. Most of tlie time tlie local officials are unable or unwilling to give information, because of sensitivity or security reasons or tlie news is still unconfirmed. In such cases journalist should depend on reliable sources/agencies working in relief/or unbiased local community so that right information may reach the people and other national and international agencies. However, the media lias to ensure balanced reporting so as to avoid unnecessary panic and rumours.

In post-disaster situation, informative role of tlie media is to provide correct information about tlie continuing impacts of tlie disaster and the actual needs of tlie affected people so that tlie rehabilitation and reconstruction programmes can be tailored accordingly, The media helps to keep a check on various agencies which undertake rehabilitation programmes.

26.2.2 Suggestive Role

In a disaster situation, there could be many mitigation measures available, Sometimes it is difficult to find out tlie most suitable option for tlie specific disaster. For example, Flood is a very common natural disaster. There are many states which are prone to this disaster like Assam, U.P. Bihar, and West Bengal. In this context, media lias a significant role in providing suitable suggestions for political attention and public understanding for most acceptable options. Similarly, media lias a role in checking activities which might aggravate tlie adverse impacts ofdisasters.

In tlie process of rehabilitation and reconstruction, media can be used to muster expert opinion and solutions, e.g.

- models of houses
- suitable building material
- suitable topography for building new houses
- Do's and Don't in the construction work.

Similar suggestions can be provided in the retrofitting of weaker structures and houses in the earthquake vulnerable areas.

26.2.3 Analytical Role

The most critical role of media is analytical. This approach can be applied in analysis of

- disaster preparedness
- disaster mitigation
- disaster relief
- disaster rehabilitation

There are preparedness plans for each disaster, After the disaster, the effectiveness of plan and lessons learnt from the disaster should be analysed in a constructive way. It will certainly improve the plan for future use. Similarly, if there are different mitigation approaches used by Government and non-Governmental Organisations, the media can highlight both and strive to evolve a balance of approach. This type of success stories can be replicated in other parts of tlie country in similar situations.

The analytical role of media is specially helpful in rehabilitation and reconstruction work after landslide or earthquake disaster. The Latur earthquake rehabilitation of more than 50 villages is a good example of this kind. The media can give views of various role players about the success or failure of their prcigramme so that it can be a lesson for tlie authorities and the mistakes committed once are not repeated in similar circumstances.

26.3 FACTUAL AND ETHICAL REPORTING

Sincere journalists try to give accurate facts and figures. They try to get quick access to the disaster area and the affected people and follow all norms and ethics or faithful reporting without fear or favour. Others might be interested in "news" or "stories", and might concentrate on failures only. Such reportage might produce a saleable copy but most of the time it does not yield productive results.

Newspapers reporting of a disaster is very interesting. Suppose, tliere is an earthquake which has killed a few hundred or few thousand persons. It will be a front page news. Or a cyclone killing thousand persons will get front page coverage. On the second day, tlie news will be on tlie third or forth page, about the rehabilitation work and response from various sections of the society. If there is a VIP visit in the area, news may again come on the front page on the third/fourth day of disaster. After that generally there is no follow up. There are no expert analyses.

Media has great responsibility particularly in disaster situations. The ethical part is equally significant in reporting a disaster. In a riot situation or community violence, how to give correct news in a way that it does not hurt sentiments of any section of the society is very important.

Check Your Progress 2

Note: i) Use the space given below for your answers.
ii) Check your answers with those given at tlie end of the unit.

1) How media can be informative in disaster situation?

2) What are major functions that media perform in disaster management?

3) Explain the analytical role of media in any disaster situation?

26.4 LET US SUM UP

The term "Media" has been explained highlighting the characteristics. Types of media have been described and their major functions in the context of disaster management have been discussed. The importance and role of media at various stages of disaster management have been brought out. Finally, the need for factual and ethical reporting of disaster situations hase been emphasized.

26.5 KEY WORDS

Audience refers to the people who see or hear or read the messages in the media.

Auditory : pertaining to the sense of hearing.

Campaign : refers to a planned programme of communication using media during a specified period.

Surveillance : close watch

Circulation : number of copies of a newspapers or magazines sold per day or per month.

Coverage : number of persons from target audience that see, Iiear or read the message

Transcends rises above

VIP : Very Important Person

Million Ten lakh or a tliousand thousand

26.6 REFERENCES AND FURTHER READINGS

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World Disaster Report, 1993, International Federation of Red Cross and Crescent Societies, Geneva.

26.7 ANSWERS TO CHECK YOUR PROGRESS EXERCIES

Check Your Progress 1

1) Your answer should include the following points:

- Media are tlie means of communicating with a large number of people tlirough printed word, or voice or visual images or a combination of these.

Characteristics of media are:

d) Message can reach millions of people quickly.

e) Even illiterate people can benefit from radio and TV; and

f) Media provide only one way communication to tlie receiving people.

2) Your answer should include:

- Print Media, Broadcast Media; and Display Media,

Check Your Progress 2

1) Your answer should include the following points:

- By highlighting the successful mitigation measures and the earlier success stories of pre-disaster measures.
- By providing accurate and unbiased news coverage during disaster situations.
- By highlighting tlie continuing long term impacts in tlie post-disaster situation and the needs of tlie affected people,

2) Your answer should include the following points:

- Surveillance of the environment
- Disaster awareness education
- Informing the public about strategies for long term preparedness and mitigation against disasters.
- Help in policy formulation through public debates, surveys or polls.

3) Your answer should include the following points:

- Analytical role of media is very important because it enables through testing the effectiveness of a disaster management plan and makes it possible to undertake the necessary review and revision of the existing plans.
- The analytical role of media is equally applicable to all stages of a disaster management plan such as the preparedness, mitigation, rescue, relief and rehabilitation.
- The analysis by the media should be unbiased and constructive.