TRANSNET

Academy

Faculty of Leadership and Functional Development

Disaster Management

Learner Guide

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CONTENTS

PURPOSE OF THE UNIT STANDARD

To equip learners with knowledge and skills to enable them to describe the causes / progression of disaster vulnerability as well as the disaster management continuum diagram, Describe the causal factors of disasters, Recognize the phases of disasters, Identify the relationship between disasters and development, Describe the impact of disasters on development programs, Identify the most important hazards and how they affect society as well as Identifying the aims and elements of disaster management

LEARNING ASSUMED TO BE IN PLACE AND RECOGNITION OF PRIOR LEARNING

It is assumed that a learner will be competent in:

1. Communication at ABET Level 3 or equivalent.
2. Mathematical Literacy at ABET Level 3 or equivalent.

UNIT STANDARD RANGE

N/A

FACILITATOR'S ROLES AND RESPONSIBILITIES

The Facilitator is expected to (but not limited to):

1. Encourage collaboration and self-learning
2. Building a safe, structured environment that promotes communication, collaboration and creativity amongst the group
3. Stimulate discussions, ask questions to get the group thinking, and encourage peer-to-peer communication
4. Where necessary, assist with practical demonstrations

LEARNER'S ROLES AND RESPONSIBILITIES

The learner is expected to:

1. Bring their ID Documents
2. Sign the Attendance Register
3. Complete the Learner Registration Form
4. Complete the Programme Evaluation Form
5. Complete and submit all assessments.

LEARNING OUTCOMES

The qualifying learner will:

1. Describe the causes / progression of disaster vulnerability as well as the disaster management continuum diagram
2. Describe the causal factors of disasters
3. Recognize the phases of disasters
4. Identify the relationship between disasters and development
5. Describe the impact of disasters on development programs
6. Identify the most important hazards and how they affect society
7. Identify the aims and elements of disaster management

NOTES TO THE LEARNER

1. You are responsible for your own learning – make sure you manage your study, practical, workplace and portfolio time responsibly.
2. Learning activities are learner driven – make sure you use the Learner Guide and Portfolio Guide in the manner intended and are familiar with the Portfolio requirements.
3. The Facilitator is there to reasonably assist you during contact, practical and workplace time of this programme – make sure that you have his/her contact details.

COURSE PREREQUISITES

N/A

ASSESSMENT METHODS

Learners will be assessed in any of the following ways of assessment:	**1. Formative Assessment** In each Learner Guide, several activities are spaced within the content to assist you in understanding the material through application. Please make sure that you complete ALL activities in the Learner Guide, whether it was done during the contact session, or not! **2. Summative Assessment** You will be required to complete a Portfolio of Evidence for summative assessment purposes. A portfolio is a collection of different types of evidence relating to the work being assessed. It can include a variety of work samples.

TARGET AUDIENCE

Employees involved in disaster management activities

ICONS USED IN THIS LEARNING UNIT

Icons representing various kinds of information can be found throughout this learning unit. They serve as a "quick-look" reminder of their associated text

ICON	MEANING OF ICON
	**NOTE** This icon indicates important additional information
I 	**GLOSSARY/** **Abbreviation** This icon indicates an alphabetical list of terms/words with explanations.

TERMS AND DEFINITIONS

TERMS	DEFINITIONS
Hazard	A natural or human-made event that threatens to adversely affects human life, property or activity to the extent of causing a disaster.
Disaster	A disaster is an occurrence disrupting the normal conditions of existence and causing a level of suffering that exceeds the capacity of adjustment of the affected community.
Disaster risk management	Includes all measures which reduce disaster related losses of life, property or assets by either reducing the hazard or vulnerability of the elements at risk, disaster management aims to reduce, or avoid the potential losses from hazards, assure prompt and appropriate assistance to victims of disaster, and achieve rapid and effective recovery.
Emergency	a state in which normal procedures are suspended and extra-ordinary measures are taken in order to avert a disaster
Vulnerability	the predisposition to suffer damage due to external events
Risk	Risk is a "measure of the expected losses due to a hazard event occurring in a given area over a specific time period. Risk is a function of the probability of particular hazardous event and the losses it would cause
Susceptibility	exposure to danger
Resilience	adaptability, capacity to recover
PREPAREDNESS	the measures that ensure the organized mobilization of personnel, funds, equipment and supplies within a safe environment for effective relief
MITIGATION	permanent reduction of the risk of disaster
RESPONSE	the set of activities implemented after the impact of a disaster in order to assess the needs, reduce the suffering, limit the spread and the consequences of the disaster and open the way to rehabilitation
RECONSTRUCTION	The full resumption of socio-economic activities plus preventive measures.

PREFACE

Disasters take various forms ranging from natural disasters, such as tornados, to man-made disasters, such as workplace violence, and happen on a far too frequent basis. No matter what type of disaster befalls individuals, organizations or countries, the results are typically the same, i.e., substantial loss of life, assets, and productivity. In most cases, health professionals are among those who extensively participate in the management of disasters. Therefore, health professionals need to be familiar with disaster prevention and preparedness in order to prevent potential disasters from happening where possible, minimize risks where prevention is not possible, and appropriately react to keep the damage to a minimum.

Disaster prevention and preparedness is a newly designed course for health science students. The aim of the course is to equip students with knowledge and skills of developing feasible disaster prevention plans and preparedness before a disaster happens to minimize the risks and the resulting damages.

Nevertheless, the lack of relevant and contextualized teaching materials is a common phenomenon within Higher education institutions. This also holds true for this particular course. This endeavour is, therefore, to contribute towards the alleviation of this scarcity.

The lecture note consists of six chapters. Chapter one deals with the definitions, types, and causes of the disaster. Chapter two describes the factors leading to disasters, emphasising deforestation, drought, floods, fires, air pollution and global warming. Chapter three deals with the consequences of a disaster such as economic losses, social reactions and factors that intensify these reactions and the consequences of population displacement are discussed. Chapter four discusses disaster management; risk reduction measures: disaster preparedness, disaster response, disaster mitigation and disaster recovery are explained in the chapter. Chapter five entertains the most prevailing disasters in Ethiopia. Chapter six discusses the role of the primary health care unit team in the event of disaster, respectively.

The preparation of this material should be understood as a process of compiling and organizing items from different sources. We do not claim that the material is an original work and hence due gratitude is extended to the authors of books and other materials that served as a source for this formulation.

1 WHAT ARE DISASTERS

Learning objectives

At the end of the chapter, the students are expected to:

- Define disaster, hazard, vulnerability, and risk
- Describe the types and causes of disasters.
- Discuss the magnitude and distribution of disasters
- Explain different phases of disasters

1.1 INTRODUCTION:

Disasters and emergencies are fundamental reflections of normal life. They are consequences of the way society structure themselves, economically and socially; the way societies and states interact; and the way that relationships between the decision makers are sustained. The disaster emanates from the fact that certain communities or groups are forced to settle in areas susceptible to the impact of raging river or a volcanic eruption. The magnitude of each disaster, be in terms of deaths, property damage or costs for a given developing country increases with the increment of marginalization of the population. As the population increases, the best land in both rural and urban areas is taken up, and those seeking land for farming or housing are forced to accept inadequate land. These offer less productivity and a smaller measure of physical or economic safety.

Disasters have massive human and economic costs. They may cause many deaths, severe injuries, and food shortages. Most incidents of severe injuries and deaths occur during the time of impact, whereas disease outbreaks and food shortages often arise much later, depending on the nature and duration of the disaster. Anticipating the potential consequences of disasters can help determine the actions that need to be started before the disaster strikes to minimize its effects. This Chapter deals with definitions of disaster and other related terms like hazard, vulnerability, and prevention. Moreover, it also addresses types of disasters and discusses the trends of the occurrence of disasters to introduce readers to the basic concepts of the subject matter.

1.2 THE DISTINCTION BETWEEN HAZARD AND DISASTER

It is essential to make a distinction between hazard and disaster. The presence of a hazard by itself can neither cause risk nor disaster. There are different predisposing factors that make vulnerable the survivors.

The following are some of such underlying causes:

- Poverty: Virtually all disaster studies show that the wealthiest of the population survive the disaster, remain unaffected or are able to recover quickly.

- Population growth: Increasing number of people will compete for a limited amount of resources which can lead to conflict and conflict may result in crisis-induced migration.
- Rapid urbanization: competition for scarce resources is an inevitable consequence of rapid urbanization, leading to human-made disasters.
- Transitions in cultural practices: Societies are constantly changing and in a continuous state of transition. These transitions are often extremely disruptive and uneven, leaving gaps in social coping mechanisms and technology. Conflicts as well as transitional cultural practices can also lead to civil conflict (e.g. communal violence triggered by religious differences).
- Environmental degradation: Deforestation leads to rapid rain runoff, which contributes to flooding.
- Lack of awareness and information: Disasters can also happen because people vulnerable to them simply do not know how to get out of harm's way or to take protective measures.
- Wars and civil strife are among the principal man-made factors precipitating disaster.

Thus, disaster occurs only when hazards and vulnerability meet. But it is also to be noted that with greater capacity of the individual/ community and environment to face these disasters, the impact of a hazard reduces.

Therefore, we need to understand the three major components namely hazard, vulnerability and capacity with suitable examples to have a basic understanding of disaster management.

Disaster mainly occurs when vulnerability and hazard meet. The interaction and association of such phenomena are depicted in the following figure (Figure 1).

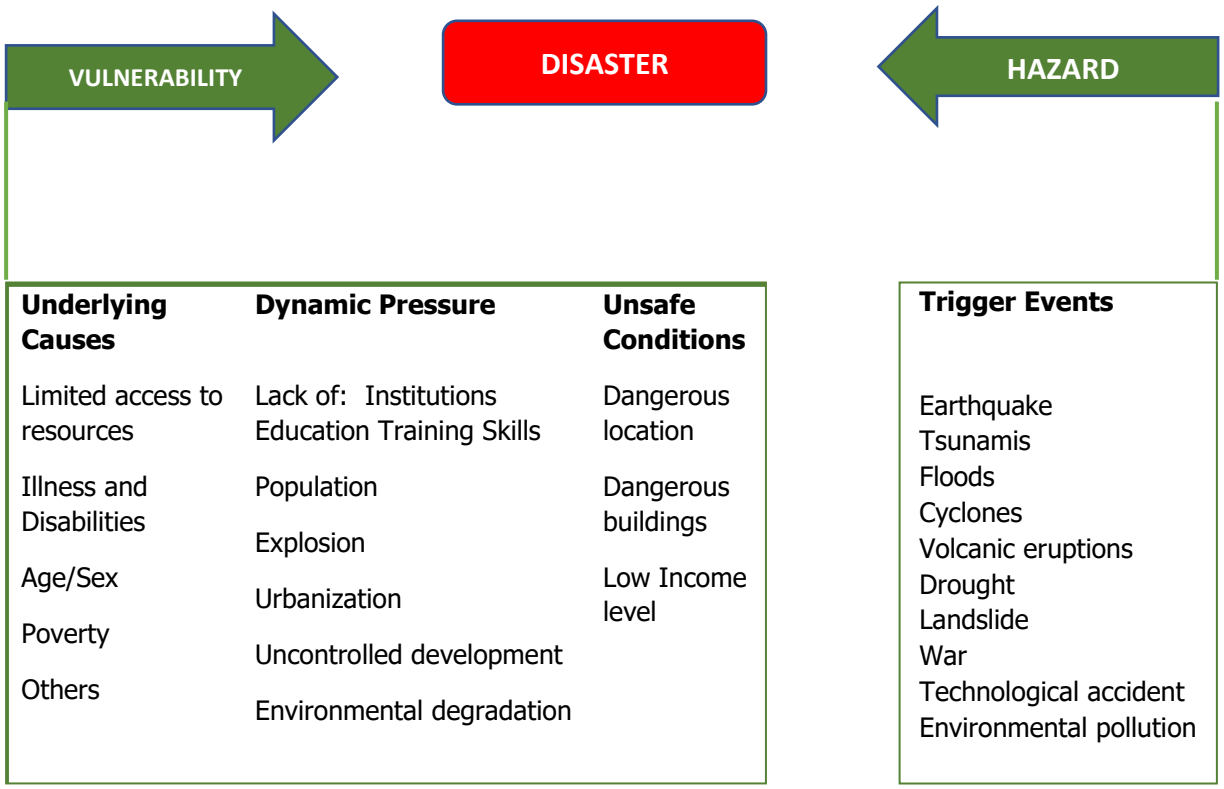


Figure1: Relationship of vulnerability, hazard, and disaster

1.3 WHAT IS VULNERABILITY?

The vulnerability may be defined as "The extent to which a community, structure, services or geographic area is likely to be damaged or disrupted by the impact of a particular hazard, on account of their nature, construction and proximity to hazardous terrains or a disaster-prone area."

Vulnerabilities can be categorized into physical and socioeconomic vulnerability.

1.3.1 Physical Vulnerability-

It includes notions of whom and what may be damaged or destroyed by a natural hazard such as earthquakes or floods. It is based on the physical condition of people and elements at risk, such as buildings, infrastructure etc; and their proximity, location, and nature of the hazard. It also relates to the technical capability of buildings and structures to resist the forces acting upon them during a hazardous event.

1.3.2 Socio-economic Vulnerability-

The degree to which a population is affected by a hazard will not merely lie in the physical components of vulnerability but also on the socioeconomic conditions. The socio-economic conditions of the people also determine the intensity of the impact. For example, people who are poor and living in the sea

coast do not have the money to construct strong concrete houses. They are generally at risk and lose their shelters whenever there is strong wind or cyclone. Because of their poverty, they too are not able to rebuild their houses.

1.4 WHAT IS CAPACITY?

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

Physical Capacity: People whose houses have been destroyed by the cyclone or crops have been destroyed by the flood can salvage things from their homes and from their farms. Some family members have skills, which enable them to find employment if they migrate, either temporarily or permanently.

Socio-economic Capacity: In most of disasters, people suffer their greatest losses in the physical and material realm. Rich people have the capacity to recover soon because of their wealth. In fact, they are seldom hit by disasters because they live in safe areas and their houses are built with stronger materials. However, even when everything is destroyed they have the capacity to cope up with it.

1.5 TYPES OF DISASTERS

Disasters are broadly divided into two types comprising natural and man-made (technological) disasters. There is also another basis by which disasters can be categorized which has been mentioned later in this section.

1.5.1 Natural disasters

Natural disasters occur as the result of the action of the natural forces and tend to be accepted as unfortunate, but inevitable. Natural disasters result from forces of climate and geology. Natural disasters are perhaps the most "unexpected" and costly overall in terms of loss of human lives and resources. In the last few years, natural disasters have claimed 100,000 lives costing above 140 billion US dollars.

During the 1980s, more than 700,000 people lost their lives as a direct result of severe weather, including floods and droughts. Natural disasters can be categorized as "acute" or "slow" in their onset. They should be predictable in certain instances since they cluster in geographical areas. Natural disasters with acute onsets include events such as earthquake, flood, hurricane, cyclone or typhoon, tornado, fire, tsunami or storm surge, avalanche, volcanic eruption, extreme cold or blizzard, and heat wave. Natural hazards with slow or gradual onset include drought, famine, desertification, deforestation, and pest infestation.

The 1990s and beyond proved to be even more calamitous, as global natural disaster trends rose with increasing rapidity (Figure 2). Among the different types of natural disasters, floods, tropical storms, droughts, and earthquakes are the most destructive, followed by landslides and storms.

Source: Emergency Disasters Data Base, EM-DAT. (http://www.em-dat.net/)

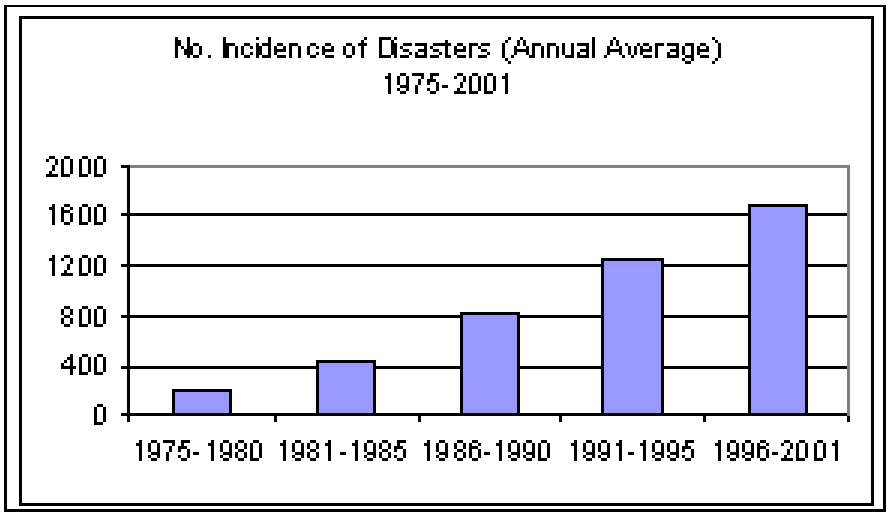


Figure 2: Global trends of natural disasters.

In 1992 alone, natural disasters cost the world economy more money than they spent on development aid. The November 2004 typhoons in the Philippines also claimed over 1,000 lives and devastated the livelihoods of many more. The recent Indian Ocean Tsunami was even more destructive and more than 150,000 lives were lost. As reported by the secretariat of the International Strategy for Disaster Reduction (ISDR), the last ten years have seen 478,100 people killed, more than 2.5 billion people affected and about US$ 690 billion in economic losses. Disasters triggered by hydro-meteorological hazards amounted to 97 per cent of the total people affected by disasters, and 60 per cent of the total economic losses (30). The damage and costs inflicted by natural disasters spread well beyond the immediate regions affected, to countries as a whole and often to the wider global community.

The incidence of hazards demonstrates considerable geographic variation. During the period 1994-2003, Asia was disproportionately affected by natural disasters (Figure 3). Approximately half of the 650 natural catastrophes recorded in 2004 were windstorms and severe weather events, while 80 were due to geological hazards (70 damaging earthquakes and 10 volcanic eruptions). As a result of increasingly effective preventive measures, while the number of disasters has more than tripled since the 1970s, the reported death toll has almost been reduced by half.

Source: Emergency Disasters Data Base, EM-DAT. (http://www.em-dat.net/)

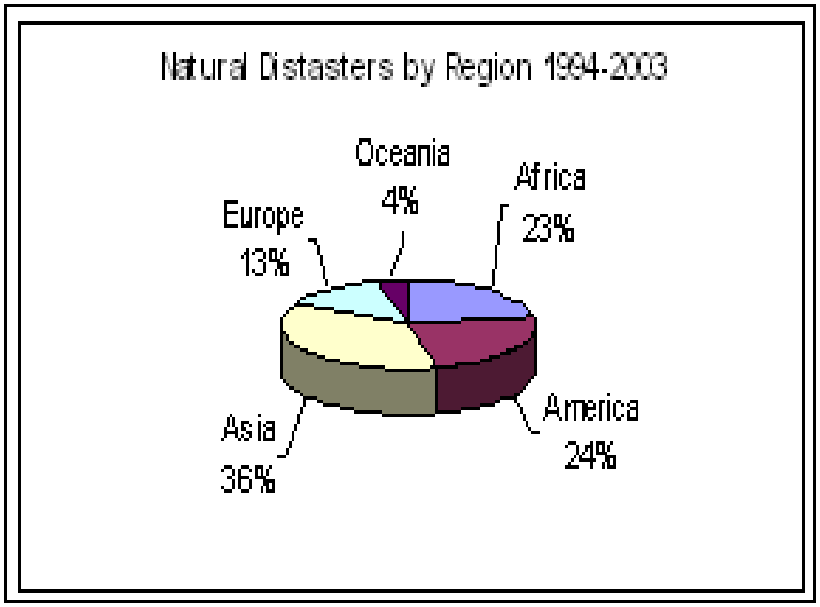


Figure 3: Distribution of natural disasters by Region

Around 75 per cent of the world's population lives in areas affected at least once by an earthquake, tropical cyclone, flood, or drought between 1980 and 2000. Billions of people in more than 100 countries are periodically exposed to at least one event of an earthquake, tropical cyclone, flood, or drought. As a result of disasters triggered by these natural hazards, more than 184 deaths per day are recorded in different parts of the world, 11 per cent of the people exposed to natural hazards live in countries classified as having low human development, and they account for more than 53 per cent of total recorded deaths7. For each hazard type, disaster risk is considerably lower in high-income countries than in medium- and low-income countries.

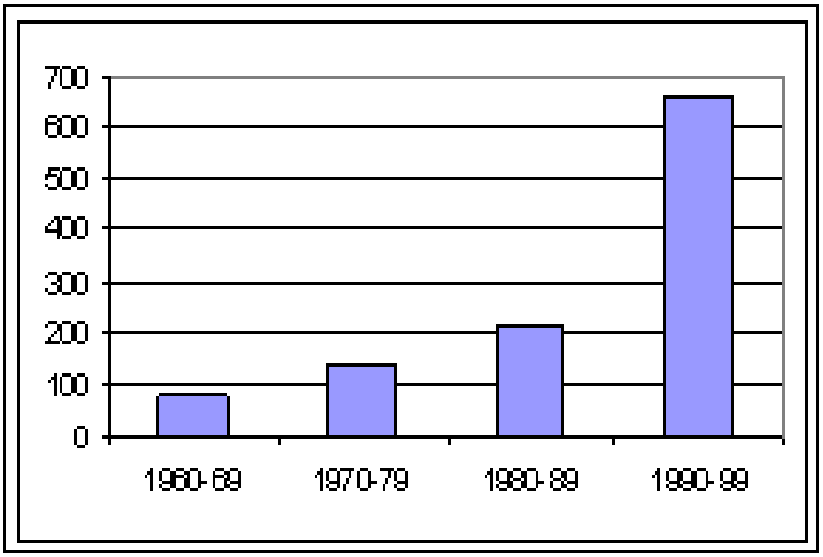


Figure 4: Economic losses due to natural disasters 1960-2000 (million US$)

Natural disasters can have significant economic and food security impacts, especially on the poorest households. In the last three decades, there has been a clear increase in the number of natural hazard

events, the size of affected populations and the extent of economic losses (Figure 4). Several million victims have suffered homelessness, disaster-induced ill health, severe economic losses, and personal tragedies.

Direct economic losses increased five times in the 1990s (Figure 4) and are mostly concentrated in developed countries. Underlying these economic figures is not only the destruction of productive assets and vital infrastructure and the loss of livelihood systems but also their implication to economic development and poverty aggravation. When disasters occur, poor households suffer greater relative losses in terms of physical and social assets, resulting in deepening their poverty further. Such losses of assets can trap households in chronic poverty and food insecurity.

An important development in disaster management approaches over the past decade has been the recognition of their cyclical nature. Although the response phase captures most of the attention, much of the hard work on disaster risk management is carried out before disasters occur, in the form of risk assessment, prevention, mitigation, and establishment of early warning systems. After the crisis has passed, the emphasis is on rehabilitation, reconstruction, and the commencement of a new cycle of assessment, incorporating lessons derived from the previous cycle.

1.5.2 Human (technological) causes

Technological or manmade disasters result from some human activities, such as explosions, fires, the release of toxic chemicals or radioactive materials, bridge or building collapse, crashes, dam or levee failure, nuclear reactor accidents, breaks in water, gas, or sewer lines, deforestation, war, etc. Technological disasters tend to involve many more casualties than natural disasters of the same magnitude of energy release.

Technological or man-made disasters are unpredictable, can spread across geographical areas, may be unpreventable and may have limited physical damage but long-term effect. They are also much more difficult for the community to deal with and for victims to accept. In technological disasters, there are issues of blame involved and the community spends much time discussing who was responsible and what mistakes were made. Increasingly, agencies involved in disasters and their management are concerned with the interactions between man and nature, which can be complex and can aggravate disasters.

Communities in which industrial sites are located or through which hazardous material pass via high way, rail, or pipelines are at risk for technological disasters. Injuries can occur to workers at the site, to responders bringing the incident under control and providing emergency medical care, and to residents in the community. Those with pre-existing medical conditions, such as lung or heart diseases, could be

at increased risk for negative health outcomes if exposed to toxic-related skin disorders, and lung damage can result from exposure to specific agents.

Ensuring that local industry implements basic safety procedures can significantly reduce negative health outcomes from the accidental release of toxins. Emergency preparedness – including the ability of pre-hospital and hospital systems to care for patients exposed to industrial agents, the training of medical personnel to work in contaminated environments, and the stockpiling of personal protective equipment for responders – is key for providing care following industrial accidents.

Another classification of disasters will be as follows:

1. ***Sudden-onset disasters*** include floods, earthquakes, tsunamis, or tidal waves, tropical storms, volcanic eruptions, and landslides. As their name implies, sudden-onset disasters occur swiftly and often without any warning. Floods are the most frequent type of natural disaster associated with sudden migration of large populations and food shortages. Other types of disasters generally occur more frequently in Asia, Latin America, and the Caribbean rather than in Africa. When these disasters occur, they frequently cause thousands of deaths and casualties. Earthquakes cause the greatest number of deaths and overwhelming infrastructural damage. Communities at risk of these types of disasters should recognize and respond to threats posed by local weather patterns and the shape and contours of the land.

2. ***Slow-onset disasters*** include droughts, famine, environmental degradation, deforestation (loss of trees and vegetation), pest infestation and desertification (conversion of arable lands to deserts). These disasters are usually the result of adverse weather conditions combined with poor land use. Traditionally, African communities, particularly the poor, have been at increased risk of these types of disasters because of poverty and social inequality, environmental degradation from poor land use and rapid population growth. Slow-onset disasters can be prevented because they happen over a long period of time and human decisions contribute to (or cause) problems. Early warning systems can be easily put in place to lessen or even prevent the disaster.

3. ***Industrial/technological disasters*** result from a society's industrial and technological activities that lead to pollution, spillage, explosions, and fires. They may occur because of poor planning and construction of manmade facilities (buildings, factories, etc.) or from neglect of safety procedures. Sudden-onset disasters such as earthquakes, floods, and terrorist acts may trigger secondary disasters such as fires or pollution. Industrial events have the potential to cause large-scale loss of life and infrastructural damage, especially in developing countries with unregulated industrialization, and inadequate safety standards and disaster response capacity. Wherever there is a man-made facility, there is the potential for an industrial or technological disaster to occur. Reducing the occurrence and effects of industrial disasters requires a multi- sectoral approach.

4. ***Complex emergencies*** are usually man-made, with multiple contributing factors. They often follow wars between states, internal conflict, and, increasingly, terrorist acts. Massive population displacements may occur due to lack of food, insecurity, and increasing death rates. Poverty and risk of conflict go hand in hand. Civilians that are not part of the conflicts end up bearing the majority of casualties because they are often targets of both sides of the conflict.

5. ***Epidemic diseases*** are those diseases that normally do not occur in stable communities but have the potential to spread under certain conditions. This can cause frequent and severe outbreaks. These diseases may be spread by contaminated water or food, person-to-person contact, or through animals or insect vectors. Examples of epidemic diseases that commonly threaten displaced populations include cholera, measles, dysentery, respiratory infections, malaria, and, increasingly, HIV. After a major disaster, the risk of epidemic diseases increases mainly as a result of overcrowding and unhygienic conditions

1.6 PHASES OF DISASTERS:

Disaster situations are dynamic, always changing and demanding a change in response. Disasters can be viewed as a series of phases on a time continuum. Even though the evolving situation may appear continuous, identifying and understanding these phases helps to describe related needs and to conceptualize appropriate disaster management activities. These phases are described below:

Pre-emergency phase:
the period before the disaster strikes may be used to assess how often a particular community is exposed to different risks (risk mapping) and how good is their preparedness. Protective actions can be undertaken based on the disaster warning and the available resources, e.g. identifying temporary shelters, stocking basic supplies, planning evacuation routes, monitoring trends, etc.

Impact and flight phase:
when a disaster strikes the hazard (fire, earthquake, floods, conflicts, etc) may trigger the displacement of a large number of people from their homes. How long this phase lasts depends on the type of disaster, the number of people affected and the distance they must travel to find sanctuary. Search and rescue and other assistance, e.g. providing transportation, shelter, and basic supplies to affected people may be carried out to reduce the loss of lives.

Acute phase:
this phase begins immediately after the impact of the disaster and is marked by intense, often reactive activities by many humanitarian agencies responding to media reports of very high death rate (may be

5-60 times the normal death rate). The priority is to keep the affected people alive. Security may be a major concern in complex emergency situations. Critical services such as providing food, water, sanitation, basic health care, and protection from violence and harassment are to be quickly organized. This phase ends when the crude death rate falls below 1/10,000 persons per day (the crude mortality rate for a stable population in Africa is about 0.5/10,000 individuals per day).

Post-emergency phase:

the population movement usually slows down. This enables critical services to be properly established and maintained. During this phase, the cause of displacement may be evolving. The displaced people wait for "something to happen" so that they can return home, integrate with the local community, or relocate elsewhere. As international support declines, the emphasis shifts to building local capacity of and promoting community participation. Tracing reproductive health care, mental health care and other services may be initiated, based on epidemiological information. It is difficult to set time limits on the post-disaster time phases or to accurately define the limits of each, even for one specific type of disaster. For example, the emergency phase of a hurricane or a flood may be only a few days, or as long as a week. A drought and a resulting famine can last for months or even a year or more.

Repatriation phase:

after the emergency situation is over, displaced people are expected to return to their place of origin either on their own or with the help of relief agencies. Repatriation may be either forced or voluntary.

Rehabilitation or reconstruction phase:

once the permanent solution is obtained, the focus shifts from relief to development. The aim is to help the affected community become self-reliant. The responsibility of providing assistance is handed over to the affected community, the local authorities, development agencies and other non-governmental organizations. Because humanitarian and development technicians have different approaches to providing assistance and the infrastructure for relief is inadequate for development, the programs are re-oriented and redesigned.

1.7 DISASTER MANAGEMENT CYCLE

Disaster Risk Management includes the sum total of all activities, programmes and measures which can be taken up before, during and after a disaster with the purpose to avoid a disaster, reduce its impact or recover from its losses. The three key stages of activities that are taken up within disaster risk management are as follows (See Figure 2):

Before a disaster (pre-disaster).

Pre-disaster activities those which are taken to reduce human and property losses caused by a potential hazard. For example, carrying out awareness campaigns, strengthening the existing weak

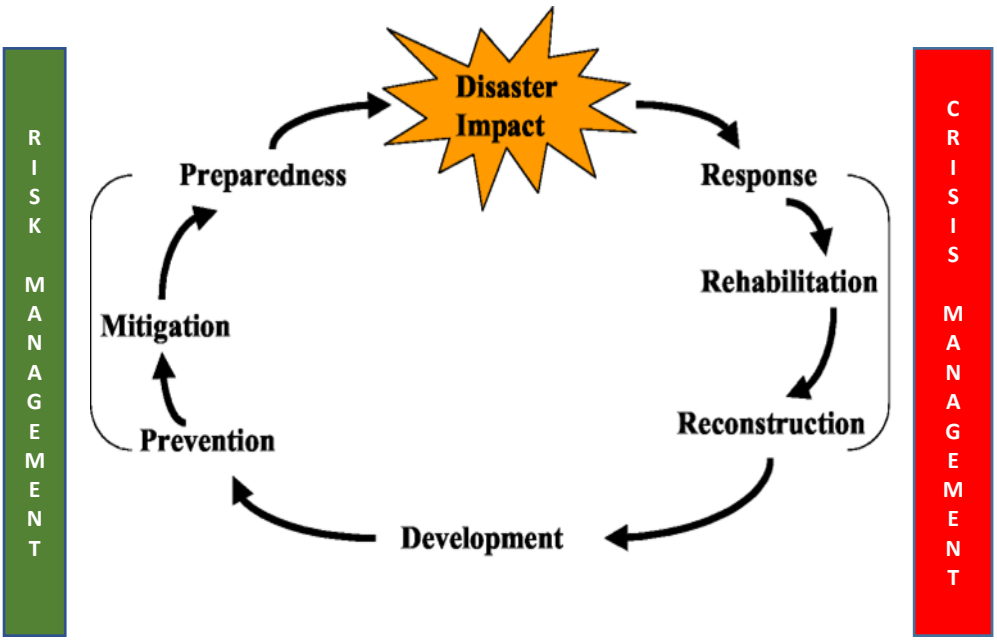
structures, preparation of the disaster management plans at household and community level, etc. Such risk reduction measures taken under this stage are termed as mitigation and preparedness activities.

During a disaster (disaster occurrence).

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

After a disaster (post-disaster).

There are initiatives taken in response to a disaster with a purpose to achieve early recovery and rehabilitation of affected communities, immediately after a disaster strikes. These are called as response and recovery activities.



Disaster risk management cycle diagram (DRMC)

The Disaster risk management cycle diagram (DRMC) highlights the range of initiatives which normally occur during both the Emergency response and Recovery stages of a disaster. Some of these cut across both stages (such things as coordination and the provision of ongoing assistance); whilst other activities are unique to each stage (e.g. Early Warning and Evacuation during Emergency Response; and Reconstruction and Economic and Social Recovery as part of Recovery).

The DRMC also highlights the role of the media, where there is a strong relationship between this and funding opportunities. This diagram works best for relatively sudden-onset disasters, such as floods, earthquakes, bushfires, tsunamis, cyclones etc, but is less reflective of slow-onset disasters,

such as drought, where there is no obviously recognizable single event which triggers the movement into the Emergency Response stage.

According to Warfield (2008) disaster management aims to reduce, or avoid the potential losses from hazards, assure prompt and appropriate assistance to victims of disaster, and achieve rapid and effective recovery.

The disaster management cycle illustrates the ongoing process by which governments, businesses, and civil society plan for and reduce the impact of disasters, react during and immediately following a disaster, and take steps to recover after a disaster has occurred. Appropriate actions at all points in the cycle lead to greater preparedness, better warnings, reduced vulnerability or the prevention of disasters during the next iteration of the cycle. The complete disaster management cycle includes the shaping of public policies and plans that either modify the causes of disasters or mitigate their effects on people, property, and infrastructure.

The mitigation and preparedness phases occur as disaster management improvements are made in anticipation of a disaster event. Developmental considerations play a key role in contributing to the mitigation and preparation of a community to effectively confront a disaster. As a disaster occurs, disaster management actors, in particular humanitarian organizations become involved in the immediate response and long-term recovery phases.

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

Exercise:

1. How do you define disaster?
2. List and describe phases of disasters.
3. What are the types of disaster? Describe them.
4. Why do trends of disasters increase over time?

2 FACTORS LEADING TO DISASTERS

Learning objectives:

At the end of the chapter the students are expected to:

- Describe causes and consequences of deforestation.
- Mention predisposing factors for droughts.
- Identify impacts of droughts.
- Describe the need for climatic change adaptation with respect to disasters.
- Describe impacts of floods and public health interventions to reduce health effects.
- Mention major causes of air pollutions.
- Describe causes and impacts of global warming.
- Mention the causes, impacts and public intervention of fires and explosions.

2.1 INTRODUCTION

There are numerous factors that trigger the occurrence of disasters ranging from natural to man made predisposing factors. It is beyond the scope of this lecture note to discuss all. Hence this chapter deals with some prominent factors that lead to disasters. This chapter is organized in such away that it imparts readers the magnitudes, impacts and, where possible, the management (prevention and control) of these disaster causing factors.

2.2 DEFORESTATION

Definition: Deforestation is the removal or damage of vegetation in a forest to the extent that it no longer supports its natural flora and fauna. It is most frequently caused by humans taking care of their immediate needs, while not being aware of the long-term effects of their actions.

Magnitude: The rapid rate of deforestation in the tropics is a key driving force in the yearly increase of flood disasters. According to the Food and Agriculture Organization and United Nations Environmental Program (FAO/UNEP) study in 1981, tropical forests are disappearing at the rate of 7.3 million hectares (18 million acres) per year:

- 4.2 million hectares (10.4 million acres) a year in Latin America
- 1.8 million hectares (4.4 million acres) a year in Asia
- 1.3 million hectares (3.2 million acres) a year in Africa.

Impacts

The greatest and most immediate danger of deforestation is that gradually diminishing forested areas contribute to or worsen other disasters. For example, by removing vegetation that retains water,

deforestation can lead to flooding, drought, and desertification. By removing vegetation that stabilizes the soil, desertification can lead to erosion, siltation, and an increased chance of landslides during earthquakes.

Impact on Agriculture and Ecology

Deforestation's impact on food supply follows this chain of events:

1. Deforestation
2. Erosion
3. Collapse of hillsides
4. Loss of topsoil and agricultural land.
5. Reduced productivity which leads to food insecurity.

Impact on Economy

What are the economic consequences of uncontrolled deforestation and forest-product scarcity?

- Rising dependence on imported forest products. Already most of the Third World countries are net importers of forest products, particularly paper.
- Foreign exchange shortages and high prices can hold a nation's wood and paper consumption well below the levels at which basic needs are satisfied.
- Acute scarcities of firewood and timber plague wide areas of Africa, Asia, and Latin America.
- Soaring firewood prices are also another inflation source. In parts of West Africa and Central America, urban families spend one-fourth of their income on wood or charcoal for cooking.

Deforestation and timber scarcity have an especially harmful impact on housing in poor countries. Even if Third World governments were to make a serious effort to meet the housing problem, adequate wood supplies would not be available in many cases. For example, in the late 1970s, the Indian state of Gujarat conceived of an ambitious plan to construct huts for landless laborers. The plan was derailed by the lack of raw materials. The program called for 25 million wood poles, but only 400,000 of those became available each year; and only four million bamboo stalks were produced a year, although 765 million were needed.

Management

But essential as they are, forestry measures alone will not be enough to solve the deforestation problem. Many of the underlying sources of deforestation originate outside the scope of forestry per se. In order to halt the destructive spread of cultivation, national development patterns must provide the destroyers

with alternative ways to feed themselves; in particular, crop yields and employment must be boosted on the lands best suited to farming. Sound forestry policies can contribute to these efforts, but broader decisions on investment priorities, land tenure, and the choice of technologies will be even more critical. Woodland depletion by firewood gatherers can be greatly mitigated by tree planting, but broader attention to rural energy needs, alternative energy sources, and national energy priorities is also necessary. Of course, human population growth underlies all the sources of deforestation. A vast amount of tree planting is essential over the coming decades, but its benefits will be undercut if the deeper roots of deforestation are not eradicated. Deforestation also unbalances the water supply by contributing to drought and flood.

2.3 DROUGHT AND FAMINE

Drought is defined as a water shortage caused by deficiency of rainfall and differs from other natural hazards in three ways:

Drought is lack or insufficiency of rain for an extended period that severely disturbs the hydrologic cycle in an area. Droughts involve water shortages, crop damage, stream flow reduction, and depletion of groundwater and soil moisture. They occur when evaporation and transpiration exceed precipitation for a considerable period. Drought is the most serious hazard to agriculture in nearly every part of the world. Efforts have been made to control it by seeding clouds to induce rainfall, but these experiments have had only limited success.

A famine is a phenomenon in which a large percentage of the populations of a region or country are so undernourished and that death by starvation becomes increasingly common. In spite of the much greater technological and economic resources of the modern world, famine still strikes many parts of the world, mostly in the developing nations. Famine is associated with naturally-occurring crop failure and pestilence and artificially with war and genocide

- Drought has long been recognized as one of the most insidious causes of human misery.
- It has today the unfortunate distinction of being the natural disaster that annually claims most victims.
- Its ability to cause widespread misery is actually increasing.

While generally associated with semiarid climates, drought can occur in areas that normally enjoy adequate rainfall and moisture levels. In the broadest sense, any lack of water for the normal needs of agriculture, livestock, industry, or human population may be termed a drought. The cause may be lack of supply, contamination of supply, inadequate storage or conveyance facilities, or abnormal demand. Drought is usually accompanied by hot, dry winds and may be followed by damaging floods.

Geographical Distribution

Droughts occur in all of the world's continents. In recent decades, the most severe and devastating to human populations have been in Africa, perhaps giving the impression that droughts are principally an African problem. In fact, devastating droughts have occurred in virtually all of the major semiarid regions of the world as well as in many zones that are normally temperate climates with significant annual rainfalls.

In addition to the droughts in the African Sahel, there have recently been major droughts in northeast Brazil, Chile, Ethiopia, the Philippines, the Bolivian altiplano, and India. Near-drought conditions in the grain-producing regions of the United States and the Soviet Union have also occurred, affecting greatly the international food supply and demand.

Trends in the occurrence of droughts indicate that they are becoming more frequent on the edges of desert lands and where agricultural, lumbering, and livestock grazing practices are changing.

Natural Preconditions for Drought Disasters

Drought differs from other natural disasters in its slowness of onset and its commonly lengthy duration. Before the rise of modern water- consuming cities, drought was an agricultural disaster. Now, with cities having expanded faster than water supplies can be made available, the specter of drought faces both the farmer and the urban dweller. Shifts in atmospheric circulation, which cause drought, may extend for time scales of a month, a season, several years or even a century. The following are conditions that lead to drought:

- Widespread and persistent atmospheric calm areas known as subsidence, which do not cause precipitation. These areas result from the present-day atmospheric circulation, which tends to create subsidence in the subtropical latitudes of both hemispheres.
- Localized subsidence induced by mountain barriers or other physiographic features. Most such areas lie in the lee of mountains across the westerly belts. They are hence in midlatitudes. The dryness is caused by the warming of westerly currents as they descend east of the summits. This allows them to hold moisture and carry it away.
- Absence of rainmaking disturbances causes dry weather even in areas of moist air. In general, rain is caused by the travel of organized disturbances across a region--i.e., systems that involve actual uplift of humid air. There is plenty of water in the air, but nothing to bring it down as rain.
- Absence of humid airstreams. The relationship between the water available for precipitation (precipitable water) and the precipitation that actually falls is by no means simple.

The above four predisposing factors are interdependent, but their relative effect depends on season and locality. One can broadly distinguish between:

1. Almost continuously dry climates, leading to desert surface conditions, in which there is no season of appreciable rainfall;
2. Semiarid or sub-humid climates with a short wet season in which humid airstreams or rainmaking disturbances penetrate;
3. The rare sub-humid areas in which rainfall is infrequent but not confined to a special season.

Human activities also contribute to the development of drought conditions. Overgrazing, poor cropping methods and improper soil conservation techniques often contribute to creating drought.

Recurrence Interval

Climatologists debate whether drought is a short-term aberration in the climate or the result of long-term climatic changes. Some argue that drought feeds upon itself; that as vegetation is stripped from the land; the surface dries out and reflects more of the sun's heat. This would alter the thermal dynamics of the atmosphere and suppress rainfall, which would, in turn, dry out more land.

Historically, droughts have tended to occur at regular intervals. Whether precisely predictable or not, the historical trends can give an indication as to when drought periods might be expected. For this reason, it is important that persons living in marginal or semiarid areas try to learn about the history of drought in that particular region and use this knowledge as a rule of thumb in predicting future drought periods.

Impact of Droughts on Built and Natural Environments Primary (Immediate) Effects

- Water supplies are overtaxed and finally dry up
- Loss of crops
- Loss of livestock and other animals, and
- Loss of water for hygienic use and drinking.

Secondary (Resulting) Effects of Drought

- Migration in search of better grazing lands
- Famine
- Permanent changes of settlement, social, and living patterns.
- Major ecological changes (scrub growth, flash flooding and increased wind erosion of soils)
- Desertification.

The Impact of Droughts on Development

If a drought is allowed to continue without response, the impact on development can be severe. Food shortages may become chronic. The country urban growth may be accelerated due to migration of people from rural areas. To respond to this, the government must borrow heavily and must divert money from other development schemes in order to meet these needs. All serve to undermine the potential for economic development.

If drought response is treated as only a relief operation, it may wipe out years of development work, especially in rural areas. Agricultural projects in particular are most likely to be affected by droughts. A balanced agricultural program that develops good water resources, addresses the problems of soil erosion, adopts realistic limits on the expansion of animal herds, or accompanies herd expansion with comprehensive range management will contribute to the mitigation of drought impact.

The same philosophy is used for reconstruction in the aftermath of a drought. Reconstruction should be viewed as an opportunity to accelerate development work. It is an ideal time to introduce improved animal husbandry techniques, rangeland management, water resource development schemes and erosion control measures.

Relief Operations for Famine and Food Emergencies

The primary purpose of relief operations during famine is to provide food to inhibit the occurrence of malnutrition. The nutrition component of relief operations in times of famine and food emergency may be divided into two broad groups of interrelated activities dealing with general food rations and selective feeding programs. Often the provision of food assistance to disaster victims is accompanied by public health programs, particularly immunization campaigns and primary health care services.

General food rations: involves the complex interaction of nutritional planning, agency appeal and procurement, donor pledging, international shipping, national logistics, warehousing, inventory, and distribution.

Selective feeding programs: The purposes of selective feeding programs are to provide complete protection to population groups with increased vulnerability to nutritional deficiencies and to recuperate those already suffering from malnutrition. Selective feeding programs for disaster victims are usually divided into two distinct operations. Supplementary feeding programs are designed to protect vulnerable groups against malnutrition and to rehabilitate those individuals currently suffering from moderate protein-energy malnutrition (PEM).

Intensive feeding programs (also called therapeutic feeding) are curative operations designed to reduce mortality among cases of severe PEM.

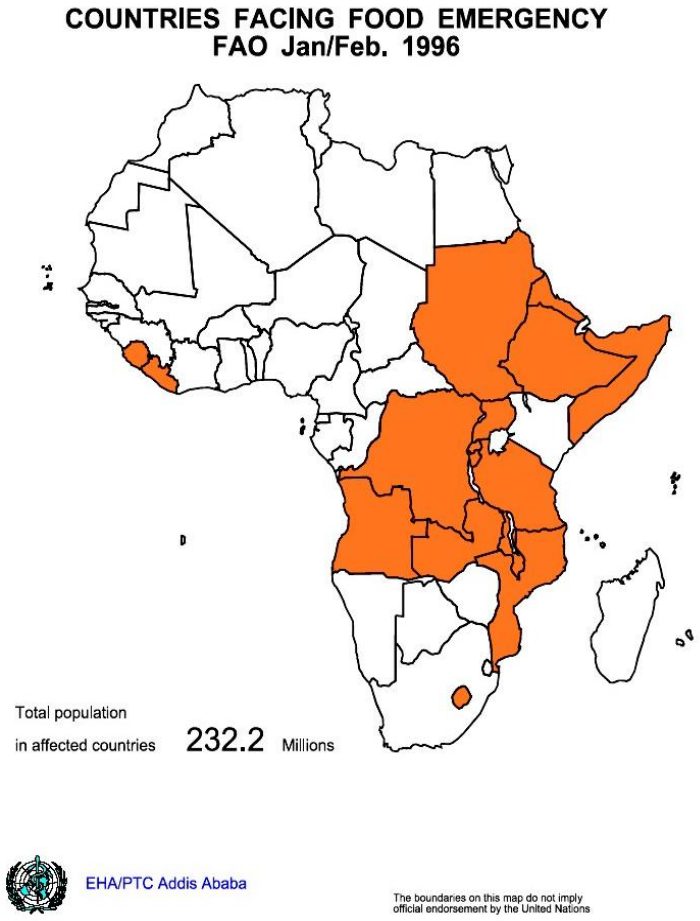


Figure 5 African Countries facing food emergency, 1996 Map

Public health interventions

- Monitor health and nutritional status by assessing using anthropometric measurements;
- Monitor death rate;
- Ensure safe water, sanitation, and disease control.
- Assess and ensure food safety and security, including availability, accessibility, and consumption pattern;

2.4 EPIDEMIC

Definition:

An epidemic is the occurrence of a number of cases of a disease in excess of the usual occurrence for a given place and time.

A threatened (or potential) epidemic is said to exist when the circumstances are such that the epidemic occurrence of a specific disease may reasonably be anticipated.

The spread of infectious disease depends upon preexisting levels of the disease, ecological changes resulting from disaster, population displacement, and changes in the density of population, disruption of public utilities, interruption of basic public health services, compromising sanitation and hygiene. The probability that epidemics of infectious diseases will occur is proportional to population density and displacement. An epidemic can occur in susceptible populations in the presence or impeding the introduction of a disease agent compounded by the presence of a mechanism that facilitates large-scale transmission (For example, Contamination of water supply or increment of vector population).

In general, many natural and/or man made disasters that affect or disrupt one or more parts of the public health infrastructure, including the sanitation systems, potable water supplies, nutrition stores, primary health care access (including routine immunization program), vector control programs, and established systematic surveillance mechanisms, can trigger infectious disease outbreaks.

Impact:

Displaced populations suffer high rate of disease due to stress of migration, crowding, and unsanitary conditions of relocation sites. Morbidity and mortality can result from diarrheal diseases, respiratory diseases, and malnutrition. Mortality exceeding a baseline of one death per 10,000 people per day is the index of concern.

The public health importance of an epidemic disease results from the number of persons at risk, risk of fatal cases or sequelae, speed of spread, disruption of social life and economic losses, possible contamination of water supply, food chains, local animal reservoirs and vectors, the risk of new epidemic situation and difficulty and cost associated with prevention and control.

Quick response is essential because epidemics, which result in human and economic losses and political difficulties, often rise rapidly. An epidemic or threatened epidemic can become an emergency when the following characteristics of the events are present. Not all of the characteristics need to be present and each must be assessed with regard to relative importance equally:

- Risk of introduction to and spread of the disease in the population;
- Large number of cases may reasonably be expected to occur ;
- Disease involved is of such severity as to lead to serious disability or death;

- Risk of social or economic disruption resulting from the presence of the disease;
- Authorities are unable to cope adequately with the situation due to insufficient technical or professional, organizational experiences, and necessary supplies or equipment (eg. Drugs, vaccines, laboratory diagnostic materials, vector control materials, etc.);
- Risk of international transmission.

Public health intervention:

Successful intervention requires rapid assessment to determine whether the breakdown points of infrastructure have occurred. Disaster managers, public health specialists, and health care providers should pay specific attention to the degree to which infection control measures have been affected during the acute disaster phase and should repair those defects and treat the cases that have been known.

2.5 PEST INFESTATION

Pest infestation can cause tremendous damage to crop production and thus undermine the food security of a particular area. Locust (desert and migratory) and grasshopper's infestations are the main threats in sub-Saharan Africa. Current pest monitoring and control programs together with the promotion of agricultural diversity have lessened, though by no means eradicated, the threats of food shortages due to infestation.

The spread of emergent diseases and invasive species has increased dramatically in recent years. At the same time, numerous developments - such as the rapidly increasing trans-boundary movements of goods and people, trade liberalization, increasing concerns about food safety and the environment - have heightened the need for international cooperation in controlling and managing trans-boundary pests and diseases.

Certain basic conditions affect the likelihood of trans-boundary pests and diseases establishing and spreading in regions or countries. These include: climate; geographical isolation; crops and livestock produced; production systems used; hosts and vectors widespread in or native to the country; and control methods used as part of routine agricultural management.

Recent food safety issues related to diseases such as bovine spongiform encephalopathy (BSE) and avian flu have become a serious concern for consumers, farmers, food processors, food retailers and governments alike. Furthermore, food contamination with non-authorized food additives, chemicals such as polycyclic aromatic hydrocarbons (PAHs) and acryl amide, microbiological pathogens (Salmonella, E. coli,) and mycotoxins, among others, have created worldwide concern regarding the safety of food supplies. To better address the existing and emerging challenges, FAO is recommending, as well as applying, a comprehensive approach, food chain approach, to food safety and quality issues that shares

the responsibility for providing safe food among all players in the food and agricultural sector, from food producers and processors to retailers and consumer households.

Management/ Public health intervention:

FAO recommends complementing regulation and control of end products, currently the main focus of many food safety programs, with preventive measures to control the introduction of hazards. This requires the adoption of good practices - in primary production, post- harvest, processing, and handling - that reduce the risk of microbiological and chemical contamination. In-plant controls of food processing operations should be based on:

- Good Hygienic Practices (GHP),
- Good Manufacturing Practices (GMP) and
- The Hazard Analysis Critical Control Point (HACCP) system, which identifies and then monitors the most vulnerable points in a food production system.

2.6 FLOODS

Magnitude: Global statistics show that floods are the most frequently recorded destructive events, accounting for about 30% of the world's disasters each year. The frequency of floods is increasing faster than any type of disaster. Much of this rise in incidence can be attributed to uncontrolled urbanization, deforestation, and more recently, the effect of El Niño. Floods may also accompany other natural disasters, such as sea surges during hurricanes and tsunamis following earthquake.

Impact

Flood effects can be local, impacting a neighborhood or community, or very large, affecting entire river basins and multiple communities. Except for flash floods, flooding causes few deaths. Widespread and long-lasting detrimental effects include mass homelessness, disruption of communications and health care systems, and heavy loss of business, livestock, crops, and grain, particularly in densely populated, low lying areas like that of the Awash Valley. The frequent repetition of flooding means a constant or even increasing drain on the economy for rural as well as urban populations.

Acute effect: The early health effects of floods include death through drowning and accidents such as falls, electrocution and the effect of landslides. People lose their homes and often also lose their source of food and water. If the drinking water supply and sanitation system is already inadequate, flooding poses a further major health threat. Sanitation is a major problem in all flooded areas, as demonstrated by recent floods in Mexico, Ghana Mozambique and in Ethiopia. Industrial waste, such as engine oil and refuse dumps, adds to the health risks of floods.

The severe flooding in China in 1998 killed more than 5,500 people and left at least 21 million homeless (Kriner, 1999).

Long term effect: In addition to the acute effects, the floodwaters provide an ideal breeding ground for mosquitoes and an increased risk of diseases such as dengue, malaria, and Rift Valley Fever. They also displace rodent populations, which may cause human outbreaks of leptospirosis and Hantavirus infection. The combined effects of open sewage and reduced opportunities for good personal hygiene also favour the spread of infections causing diarrhea, such as cholera and gastrointestinal viruses. Flooding in the horn of Africa in 1997, associated with ENSO, and caused an upsurge in cholera deaths due to the lethal combination of damage to sanitation and contamination of water supplies (WHO, 1998). During flooding in Bolivia and Peru in the mid 1980s, increases in diarrheal diseases and acute respiratory diseases were recorded (WHO, 1999). Prolonged heavy rainfall causes fewer deaths than floods, but the infection risk is just as high in areas of poor sanitation.

Flooding affects health indirectly through the widespread damage to the infrastructure of a community: its roads, buildings, equipment, drainage, sewerage, and water supply systems. For example, during flooding in Peru in 1997/98, nearly a tenth of the health facilities were damaged: in Ecuador during the same period 2% of the hospitals were put out of action by a combination of flooding, mud, damage to sewerage systems and contamination of the drinking water supply. The mental distress of flooding may persist long after the floods have receded, since people have lost their homes, their livelihood, and their confidence.

Risk of morbidity and mortality

Flood related mortality varies from country to country. Flash flooding such as from excessive rainfall or sudden release of water from a dam, is the cause of most flood-related deaths. Most flood-related death victims become trapped in their car and drown when attempting to drive through (or attempting to cross in the case of rural settings) rising of swiftly moving water. Other deaths have been caused by wading, bicycling, or other recreational activities in flooded areas.

Life-threatening characteristics of floods:

- Absence of warning of a flood (either 'official' warning or warning derived from cues e.g. heavy rain).
- High floodwater velocities (like in hilly or mountainous terrain or where stream disgorge on to plains from upland areas; in river valleys with steep gradients; in areas behind floods embankments or natural barriers which may breach or overtop, below dams which may break).

- Rapid speed of flood onset (like in areas when streams are 'flashy' i.e. rise and fall rapidly; these are usually urban areas or arid rural areas where soil surface becomes compacted and hard; or in areas where high floodwater velocities are expected).

- Deep floodwater: where floodwater is in excess of one meter depth (occurs in or close to river channels; in depression which may not be easy to identify by eye; behind overtopped flood embankments and in basements of buildings).
- Long duration floods (like where land is flat, flooding is extensive; river gradients are very low, channels are obstructed, and flood water become trapped behind natural or artificial barriers).
- Flood has more than one peak (not atypical on complex river systems where tributaries contribute to river flows, or where flooding is tidal).
- Debris load of floodwaters (usually greatest in high velocity floods; floodwater may contain trees, building debris etc which may either provide floating refuge, or threaten life).
- Characteristics of accompanying weather (especially windy, unusually cold, or hot weather).
- Flood may display combinations of characteristics!

Management/ Protective Measures Before a Flood, you should:

- Avoid building in a floodplain unless you elevate and reinforce your home.
- Elevate the furnace, water heater, and electric panel if susceptible to flooding.
- Install "check valves" in sewer traps to prevent flood water from backing up into the drains of your home.
- Construct barriers (levees, beams, floodwalls) to stop floodwater from entering the building.
- Seal walls in basements with waterproofing compounds to avoid seepage.
- Learning swimming skill is helpful.

During a Flood

If a flood is likely in your area, you should:

- Listen to the radio or television for information.
- Be aware that flash flooding can occur. If there is any possibility of a flash flood, move immediately to higher ground. Do not wait for instructions to move.
- Be aware of streams, drainage channels, canyons, and other areas known to flood suddenly. Flash floods can occur in these areas with or without such typical warnings as rain clouds or heavy rain.

If you must prepare to evacuate, you should do the following:

- Secure your home. If you have time, bring in outdoor furniture. Move essential items to an upper floor.

- Turn off utilities at the main switches or valves if instructed to do so. Disconnect electrical appliances. Do not touch electrical equipment if you are wet or standing in water.

- If you have to leave your home, remember these evacuation tips:
- Do not walk through moving water. Six inches of moving water can make you fall. If you have to walk in water, walk where the water is not moving. Use a stick to check the firmness of the ground in front of you.
- Do not drive into flooded areas. If flood-waters rise around your car, abandon the car, and move to higher ground if you can do so safely.

After a Flood:

The following are guidelines for the period following a flood:

- Listen for news reports to learn whether the community's water supply is safe to drink.
- Avoid floodwaters; water may be contaminated by oil, gasoline, or raw sewage. Water may also be electrically charged from underground or downed power lines.
- Avoid moving water.
- Be aware of areas where floodwaters have receded. Roads may have weakened and could collapse under the weight of a car.
- Stay away from downed power lines, and report them to the power authorities.
- Return home only when authorities indicate it is safe.
- Stay out of any building if it is surrounded by floodwaters.
- Use extreme caution when entering buildings; there may be hidden damage, particularly in foundations.
- Service damaged septic tanks, cesspools, pits, and leaching systems as soon as possible. Damaged sewage systems are serious health hazards.
- Clean and disinfect everything that got wet. Mud left from floodwater can contain sewage and chemicals.

Public Health Interventions

- Conduct needs assessment to determine the status of public health infrastructure, utilities (e.g. water, sewage, electricity), and health, medical, and pharmaceutical needs.
- Conduct surveillance of drinking water sources, injuries, increases in vector populations, and endemic, water-borne, and vector-borne diseases.
- Organize delivery of health care services and supplies, and continuity of care.
- Educate public regarding proper sanitation and hygiene.
- Educate public regarding proper clean up.

2.7 TSUNAMIS

Definition: A tsunami is a series of waves generated by an under sea disturbance such as an earthquake. From the area of the disturbance, the waves will travel outward in all directions, much like the ripples caused by throwing a rock into a pond. As the waves approach the shallow coastal waters, they appear normal and speed decreases. Then as the tsunami nears coastline, it may grow to a great height and smash into the shore, causing such destruction.

Tsunamis (pronounced soo-ná-mees), also known as seismic sea waves (mistakenly called "tidal waves"), are a series of enormous waves created by an underwater disturbance such as an earthquake, landslide, volcanic eruption, or meteorite. A tsunami can move hundreds of miles per hour in the open ocean and smash into land with waves as high as 100 feet or more.

Protective Measures

Guidelines for what you should do if a tsunami is likely in your area:

- Turn on your radio to learn if there is a tsunami warning
- Move inland to higher ground immediately and stay there.
- If there is noticeable recession in water away from the shoreline this is nature's tsunami warning and it should be heeded. You should move away immediately

Guidelines for the period following a tsunami:

- Stay away from flooded and damaged areas until officials say it is safe to return.
- Stay away from debris in the water; it may pose a safety hazard to boats and people.

2.8 EARTHQUAKES

Definition: Earthquakes are sudden slippages or movements in a portion of the earth's crust accompanied by a series of vibrations. Aftershocks of similar or lesser intensity can follow the main quake.

Earthquakes can occur at any time of the year. An earthquake is generally considered to be the most destructive and frightening of all forces of nature.

Magnitude:

The Richter scale, used as an indication of the force of an earthquake, measures the magnitude and intensity or energy released by the quake. This value is calculated based on data recordings from a single observation point for events anywhere on earth, but it does not address the possible damaging effects of the earthquake. According to global observations, an average of two earthquakes of a Richter magnitude 8 or slightly more occur every year. A one digit drop in magnitude equates with a tenfold increase in frequency. Therefore, earthquakes of magnitude 7 or more generally occur 20 times in a year, while those with a magnitude 6 or more occur approximately 200 times.

Specific active seismic zones have been identified around the globe. Millions of people live in these seismic zones and are exposed to threat of an earthquake daily. The damage caused by an earthquake can be extensive especially to incompatible building types and construction techniques. Also, an earthquake usually ignite fires, which can spread rapidly among damaged buildings if the water system has been disabled and fire services cannot access the site of the fire.

Impact

Earthquake losses, like those of other disasters, tend to cause more financial losses in industrialized countries and, as the developed countries have better early warning systems and life saving means, more injuries and deaths occur in undeveloped countries. Deaths and injuries from earthquakes vary according to the type of housing available, time of day of occurrence, and population density. Common injuries include cuts, broken bones, crush injuries, and dehydration from being trapped in rubble. Stress reactions are also common. Morbidity and mortality can occur during the actual quake, the delayed collapse of unsound structures, or clean-up activity.

Public health intervention

Public health officials can intervene both in advance of and after earthquakes to prevent post-earthquake injuries. The safety of homes and the work environment can be improved by building standards that require stricter codes and use of safer materials. Measures to prevent injuries include securing appliances, securing hanging items on walls or overhead, turning off utilities, storing hazardous materials in safe, well-ventilated areas, and checking homes for hazards such as windows and glass that might shatter.

Protective Measures Before an Earthquake:

- Repair defective electrical wiring, leaky gas cylinders, and inflexible utility connections.
- Place large or heavy objects on lower shelves. Fasten shelves, mirrors, and large picture frames to walls.
- Store bottled foods, glass, china clay, and other breakables on low shelves or in cabinets that fasten shut.
- Anchor overhead lighting fixtures.

- Be sure the residence is firmly anchored to its foundation.

Install flexible pipe fittings to avoid gas or water leaks. Flexible fittings are more

- Resistant to breakage.
- Locate safe spots in each room under a sturdy table or against an inside wall.
- Hold earthquake drills with your family members: Drop, cover, and hold on!

During an Earthquake: minimize your movements during an earthquake to a few steps to a nearby safe place. Stay indoors until the shaking has stopped and you are sure exiting is safe.

I. If you are indoor:

- Take cover under a sturdy desk, table, or bench or against an inside wall, and hold on. If there is not a table or desk near you, cover your face and head with your arms and crouch in an inside corner of the building.
- Stay away from glass, windows, outside doors and walls, and anything that could fall, such as lighting fixtures or furniture.
- Stay in bed - if you are there when the earthquake strikes - hold on and protect your head with a pillow, unless you are under a heavy light fixture that could fall. In that case, move to the nearest safe place.
- Use a doorway for shelter only if it is in close proximity to you and if you know it is a strongly supported, load bearing doorway.
- Stay inside until shaking stops and it is safe to go outside. Most injuries during earthquakes occur when people are hit by falling objects when entering into or exiting from buildings.
- Be aware that the electricity may go out or the sprinkler systems or fire alarms may turn on.
- DO NOT use elevators.

II. If you are Outdoors:

- Move away from buildings, streetlights, and utility wires.

III. If you are In a moving vehicle:

- Stop as quickly as safety permits and stay in the vehicle. Avoid stopping near or under buildings, trees, overpasses, and utility wires.
- Proceed cautiously once the earthquake has stopped, watching for road and bridge damage.

IV. If you are trapped under debris:

- Do not light a match. Do not move about or kick up dust.
- Cover your mouth with a handkerchief or clothing.

- Tap on a pipe or wall so rescuers can locate you. Use a whistle if one is available. Shout only as a last resort - shouting can cause you to inhale dangerous amounts of dust.

After an Earthquake: be prepared for aftershocks. These secondary shockwaves are usually less violent than the main quake, but can be strong enough to do additional damage to weakened structures.

- Open cabinets cautiously. Beware of objects that can fall off shelves.
- Stay away from damaged areas unless your assistance has been specifically requested by police, fire, or relief organizations.
- Be aware of possible tsunamis if you live in coastal areas.

Public health interventions:

- Encourage earthquake drills to practice emergency procedures;
- Recommend items for inclusion in an extensive first aid kit and survival kit for home and automobile, and encourage maintenance of those kits;
- Teach basic precautions regarding safe water and safe food;
- Ensure the provision of emergency medical care to those who seek immediate care in the first three to five days after an earthquake;
- Ensure continuity of care for those who have lost access to prescriptions, home care, and other medical necessities;
- Conduct surveillance for communicable disease and injuries, including location and severity of the injury, disposition of patients, and follow up contact information;
- Prepare media advisories with appropriate warning and advice for injury prevention;
- Establish environmental control;
- Facilitate use of surveillance forms by search and rescue teams to record types of buildings, addresses of site, type of collapse, amount of dust, fire or toxic hazards, location of victims, and nature and severity of injuries.

2.9 POLLUTIONS AND HEALTH CONSEQUENCES OF POLLUTIONS:

Definition:

Pollution: is undesirable state of the natural environment being contaminated with harmful substances as a consequence of human activities. Pollution is the contamination of the air, water, or earth by harmful or potentially harmful substances.

Over the past 100 years, the state of the terrestrial, freshwater and marine environments has declined in virtually all respects. Environmental degradation and resource depletion have escalated particularly over the past three decades due to the cumulative impacts of rapid growth in population, intensive

agriculture, urbanization, and industrialization. The priority list of environmental challenges includes land degradation, deforestation, declining biodiversity and marine resources, water scarcity, and deteriorating water and air quality.

A major reason for these adverse environmental trends in Africa is that most people and countries are poor. Their poverty is both a cause and a consequence of environmental degradation. However, the main cause of many environmental problems is the persistence of economic, agricultural, energy, industrial and other sectoral policies which largely neglect - and fail to avoid - harmful impacts on the environment and natural resource base.

2.9.1 Air pollution:

Air pollution is the presence in the air of substances put there by the acts of man in concentrations sufficient to interfere with health, comfort, or safety, or with full use and enjoyment of property.

The term is often used to identify undesirable substances produced by human activity. Air pollution usually designates the collection of substances that adversely affect human health, animals, and plants; deteriorates structures; interferes with commerce; or interferes with the enjoyment of life.

Primary Pollutants & their Health Effects:

Particulate Matter (PM):

Particulate matter consists of soot and dust particles that are smaller than the diameter of human hair. Particulate matter is all particles smaller than 10 microns in diameter are classified as PM10 or coarse-size particles. Fine-size particles, or PM2.5, are those particles less than or equal to 2.5 microns in diameter. Sources of PM include diesel exhaust, soil dust, tire wear, and soot. These particles penetrate deeply into the lungs and are captured by lung tissue. A major contributor to the PM pollution problem is exhaust from diesel vehicles, which produce 79% of the particulate emissions from mobile sources. Exposure to PM pollution has been associated with respiratory and cardiac problems, infections, asthma attacks, lung cancer and decreased life expectancy. The World Health Organization has estimated that 500,000 premature deaths each year may be associated with PM pollution. The American Lung Association believes that PM2.5 represents the most serious threat to our health. Segments of the population that are more susceptible to PM pollution include children, athletes, senior citizens, and people with pre-existing respiratory problems.

Ozone (O3)

Ozone forms when hydrocarbons combine with nitrogen oxides and chemically react in sunlight. Hydrocarbons and nitrogen oxides are primarily produced by motor vehicles and various industrial practices. Ozone is a highly reactive oxidizing agent that breaks- down organic materials. Ozone is the primary component of smog. A natural phenomenon called an "inversion layer" traps these gases and prevents them from dissipating into the atmosphere. Symptoms of ozone exposure are coughing, shortness of breath, wheezing, fatigue, throat dryness, chest pain, headache, and nausea. Ozone has been shown to cause inflammation of lung tissue and reduced lung capacity. Development of asthma, increased lung cancer mortality rates, and accelerated lung aging has all been linked to ozone exposure. Lung damage from long-term exposure to ozone can be permanent, while short-term exposure appears to be reversible. Ozone reduces the respiratory system's ability to fight infection and remove foreign particles such as particulate matter. Segments of the population that are more susceptible to ozone pollution include children, athletes, senior citizens, and people with pre-existing respiratory problems.

Hydrocarbons

Hydrocarbons are a class of reactive organic gases (ROG), which are formed solely of hydrogen and carbon. Hydrocarbons contribute to the formation of ozone and the resulting smog problem. Carcinogenic forms of hydrocarbons are considered hazardous air pollutants, or air toxics. The incomplete burning of any organic matter such as oil, wood, or rubber produces hydrocarbons. Combustion engine exhaust, oil refineries, and oil-fueled power plants are the primary sources of hydrocarbons. Another source of hydrocarbons is evaporation from petroleum fuels, solvents, dry cleaning solutions, and paint. The primary health effect of hydrocarbons results from the formation of ozone and its related health effects. High levels of hydrocarbons in the atmosphere can interfere with oxygen intake by reducing the amount of available oxygen through displacement.

Nitrogen Oxides (NOx): Nitrogen monoxide (NO) and nitrogen dioxide (NO2)

- The two forms of nitrogen oxide are found in the atmosphere.
- Contribute to the formation of ozone, production of particulate matter pollution, and acid deposition.
- Produced by factories, motor vehicles and power plants that burn fossil fuels
- NO2 irritates lung tissue, causes bronchitis and pneumonia, and reduces resistance to respiratory infections
- Frequent or long-term exposure to high levels of nitrogen oxides can increase the incidence of acute respiratory illness in children.

Carbon Monoxide (CO)

- CO is a colourless, odourless gas produced by burning organic matter such as oil, natural gas, fuel, wood, and charcoal.
- Displaces oxygen in red blood cells, which reduces the amount of oxygen that human cells need for respiration.
- Exposure to CO can result in fatigue, angina, reduced visual perception, reduced dexterity, and death.
- The elderly, young children and people with pre-existing respiratory conditions are particularly sensitive
- Extremely deadly in an enclosed space, such as a garage or bedroom.

Sulfur Dioxide (SO2)

- A colourless gas produced by motor vehicles, refineries, and power plants that burn fossil fuels.
- Reduces respiratory volume, and increases breathing resistance in those exposed, especially asthmatics.
- Increases nasal airway resistance.

2.9.2 Water pollution and contamination

Water is necessary for industries which are therefore often located near a river. Thus, natural disasters may not only affect the water resources and their management directly but floods and earthquakes may also destroy industries producing or using toxic materials or dangerous chemicals which might be released into floodwaters.

These harmful materials include organic wastes, sediments, minerals, nutrients, thermal pollutants, toxic chemicals, and other hazardous substances. Organic wastes are produced by animals and humans, and include such things as fecal matter, crop debris, yard clippings, food wastes, and rubber, plastic, wood, and disposable diapers.

Their origin is human industrial activity and they can be avoided through properly applied policies and good decision making. With increased urbanization, increase in population density and industrialization, the problem of pollution might also become more important. The polluted water may cause death or diseases by poisoning.

Worldwide, a considerable number of diseases are linked to the interrelated problems of water quality, water availability, sanitation, and hygiene.

Natural networks of rivers, lakes, and marshes, also play a role in the transmission of water-related and vector-borne diseases. If these undergo increased flooding, community water supplies could become

contaminated, leading to a greater incidence of faecal-oral diseases such as cholera, typhoid, hepatitis A and diarrhoea.

Developing countries are at the most risk with respect to waterborne and Water-washed diseases and urban communities are at greater risk than rural communities.

Any increase in heavy precipitation and consequently in runoff from agricultural lands, would also be likely to increase the contamination of water with chemicals such as pesticides.

2.10 GLOBAL WARMING

How might climate change?

The earth's climate is predicted to change because human activities are altering the chemical composition of the atmosphere through the buildup of greenhouse gases primarily carbon dioxide, methane, and nitrous oxide. The heat-trapping property of these gases is undisputed. Although uncertainty exists about exactly how earth's climate responds to these gases, global temperatures are rising.

Scientists use computer-based models to predict the effects on global climate of different levels of greenhouse gases in the atmosphere. According to the most recent projections of the Intergovernmental Panel on Climate Change (IPCC), the global mean temperature could increase by 1.4°C to 5.8°C between 1990 and 2100.

The climatic effects of such a temperature increase might include:

- More frequent extreme high maximum temperatures and less frequent extreme low minimum temperatures;
- An increase in the variability of climate, with changes to both the frequency and severity of extreme weather events;
- Alterations to the natural biological range of certain infectious diseases;
- Rising sea levels.

Effects of global warming

Global warming can be expected to produce changes in the frequency of intense rainfall. Higher sea-surface temperatures can be expected to increase the intensity of tropical cyclones and to expand the area over which they may develop. Rainfall intensity is likely to increase with increasing greenhouse gas concentrations and there may be an increasing concentration of rainfall on fewer rain days.

As climatic warming occurs, there will be notable changes in the hydrology of Arctic areas. River-ice regime might be altered and substantial effects on the hydrology can be expected that will affect flow, water levels, and storage. It is reasonable to think that an increase in the frequency and intensity of floods may be associated with an increase in the occurrence and severity of droughts in order to compensate for the first extreme and to re-establish the natural energy and water balance.

Exposure to ultraviolet (UV) radiation as the result of global warming

Overexposure to UV radiation in sunlight can result in painful sunburn. It can also lead to more serious health effects, including skin cancer, premature aging of the skin, and other skin disorders; cataracts and other eye damage; and immune system suppression.

Perhaps the most obvious impact of global warming will be the direct effects: a warmer planet will experience more extreme heat waves. As seen in Europe, the scorching weather may have claimed as many as 35,000 lives in 2003; heat waves often lead to an increase in the number of human deaths.

Technological adaptations such as the installation of effective air- conditioners and the construction of heat-minimizing houses will happen more quickly among the rich, so heat waves are likely to have a disproportionate effect in less-developed countries and in the poorer segments of rich societies.

Rising sea levels as the result of global warming

Global warming is predicted to lead to thermal expansion of sea water. Scientists predict that sea levels will rise as the global temperature rises, due to the melting of land-based ice in the Polar Regions and glaciers, and the thermal expansion of the oceans. According to the most recent projections, sea levels could rise between 9 and 88 centimetres by the year 2100. A rise of this magnitude would have disastrous consequences for people living on low-lying islands, such as the Maldives group in the Indian Ocean and many South Pacific islands. In parts of Egypt, Bangladesh, Indonesia, China, the Netherlands, Florida, and other low-lying coastal areas already suffering from poor drainage, agriculture is likely to become increasingly difficult to sustain.

Higher sea levels lead to coastal flooding and an increase in the frequency of extremely high water levels from storm surges. Related problems are the contamination of coastal freshwater supplies with encroaching seawater and the degradation of fishing and agricultural areas.

Infectious diseases as the result of global warming:

Many infectious diseases are dependent on vector organisms, which are sensitive to environmental factors and therefore will be affected by global warming. Biological modelling under various climate

scenarios suggests a widening of the potential transmission zone of some disease-causing pathogens and their vectors, such as mosquitoes.

Scientists speculate that if temperatures rise under global warming, the incidence of diseases caused by food poisoning and by the contamination of drinking (and swimming) water could increase dramatically.

Extreme events and disasters as the result of global warming:

Most computer models generated by scientists indicate that the future climate will be more variable than in the past and those droughts and floods will be more severe. Some of the health effects of weather-related disasters, in addition to the immediate death and injury to people and damage to property, include:

- Increases in psychological stress, depression, and feelings of isolation amongst people affected by natural disasters;
- Decreases in nutrition due to poorer agricultural yields caused, for example, by prolonged drought and problems of food distribution;
- Increases in disease transmission due to a breakdown in sewerage and garbage services.

Effects of Climate Variations and Climate Change

Climate variations is a term referring to year to year or inter-annual fluctuations in the annual cycle, including also anomalous cycles ranging from two to ten years in duration.
Climate variability persistent over a ten years period is referred to as climate change. Scientists are now increasingly able to link extreme weather events such as droughts and storms with climate variations and climate change. The Working Group II of the Intergovernmental Panel on Climate Change (IPCC, 1995) concluded that: there is evidence, from climate models and hydrological impact studies, which flood frequencies, are likely to increase with global warming.

Climate change may increase the risk of death, according to the World Health Organization report of 2006. Many important diseases that affect developing countries are sensitive to climate variations, according to the report, and even a proportionally small change in the global incidence of some diseases could result in significant public health impacts far into the future. The authors of Climate Change and Human Health: Risks and Responses quantified the relative risk of death in 2030 from diarrhoea, malaria, and cardiovascular disease related to heat and cold, malnutrition, and flooding in several developed and developing regions.

"Provision of clean water and sanitation not only cuts overall diarrhoea rates, but also decreases the importance of the bacterial pathogens that respond positively to temperature, and decreases risks of diarrhoea outbreaks following floods."

El Niño-Southern Oscillation (ENSO)

One of the most spectacular climate variation consequences is El- Niño.

The El Niño event, a warm water current along the coast of Peru and Chile, is part of a climatic phenomenon known as the El-Niño- Southern Oscillation (ENSO) which strongly affects tropical and mid-latitude countries. Impacts of ENSO are droughts over Southeast Asia, northeastern Brazil and Southern Africa, heavy rains in the tropical Pacific and the west coast of the Americas at tropical and mid-latitudes. The generation of ENSO is not yet fully understood. Its recurrence interval varies from two to seven years, with an average of four years.

Source: http://www.who.int/globalchange/en/

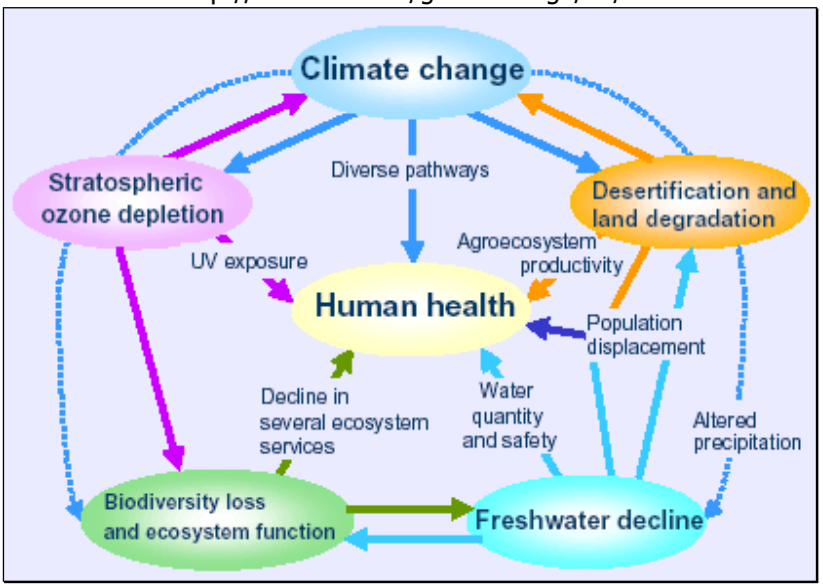


Figure 6: Effects of climate change on the ecosystem

2.11 OZONE DEPLETION:

The Connection between Ozone Depletion and UVB Radiation: Reductions in ozone levels will not result in the sun's output of UVB change; rather, less ozone means less protection, and will lead to higher levels of UVB reaching the Earth's surface hence more UVB reaches the Earth. Studies have shown that in the Antarctic, the amount of UVB measured at the surface can double during the annual ozone hole. Another study confirmed the relationship between reduced ozone and increased UVB levels in Canada during the past several years.

UVB is a kind of ultraviolet light from the sun (and sun lamps) that has adverse effects on lives. Particularly it is effective at damaging DNA. It is a cause of melanoma and other types of skin cancer. It has also been linked to damage to some materials, crops, and marine organisms. The ozone layer protects the Earth against most UVB coming from the sun. It is always important to protect oneself against UVB, even in the absence of ozone depletion, by wearing hats, sunglasses, and sunscreen.

Causes of Ozone Depletion

Ozone depletion occurs when the natural balance between the production and destruction of stratospheric ozone is tipped in favour of destruction. Although natural phenomena can cause temporary ozone loss, chlorine and bromine released from man-made compounds such as chlorofluorocarbons (CFCs) are now accepted as the main cause of this depletion.

It was first suggested by Drs. M. Molina and S. Rowland in 1974 that a man-made group of compounds known as the chlorofluorocarbons (CFCs) were likely to be the main source of ozone depletion. However, this idea was not seriously taken until the discovery of the ozone hole over Antarctica in 1985 by the British Antarctic Survey.

Chlorofluorocarbons are not "washed" back to Earth by rain or destroyed in reactions with other chemicals. They simply do not break down in the lower atmosphere and they can remain in the atmosphere for 20 to 120 years or more. As a consequence of their relative stability, CFCs are instead transported into the stratosphere where they are eventually broken down by ultraviolet (UV) rays from the Sun, releasing free chlorine. The chlorine becomes actively involved in the process of the destruction of ozone. The net result is that two molecules of ozone are replaced by three of molecular oxygen, leaving the chlorine free to repeat the process:

Ozone is converted to oxygen, leaving the chlorine atom free to repeat the process up to 100,000 times, resulting in a reduced level of ozone. Bromine compounds, or halons, can also destroy stratospheric ozone. Compounds containing chlorine and bromine from man-made compounds are known as industrial halocarbons. Emissions of CFCs have accounted for roughly 80% of total stratospheric ozone depletion.

The problem of ozone depletion is caused by high levels of chlorine and bromine compounds in the stratosphere. The origins of these compounds are chlorofluorocarbons (CFC), used as cooling substances in air-conditioners and refrigerators, or as aerosol propellants, and Bromo fluorocarbons (halons), used in fire extinguishers. As a result of the depletion of the ozone layer more UV radiation comes to Earth and causes damage to living organisms. UV radiation seems responsible for skin cancer in humans; it lowers the production of phytoplankton, and thus affects other aquatic organisms. It can also influence the growth of terrestrial plants.

The Effects of Ozone Depletion On Human Health

Laboratory and epidemiological studies demonstrate that UVB causes nonmelanoma skin cancer and plays a major role in malignant melanoma development. In addition, UVB has been linked to cataracts. All sunlight contains some UVB, even with normal ozone levels. It is always important to limit exposure to the sun. However, ozone depletion will increase the amount of UVB and the risk of health effects.

On Plants

Physiological and developmental processes of plants are affected by UVB radiation, even by the amount of UVB in present-day sunlight. Despite mechanisms to reduce or repair these effects and a limited ability to adapt to increased levels of UVB, plant growth can be directly affected by UVB radiation.

Indirect changes caused by UVB (such as changes in plant form, how nutrients are distributed within the plant, timing of developmental phases and secondary metabolism) may be equally, or sometimes more, important than damaging effects of UVB. These changes can have important implications for plant competitive balance, herbivory, plant diseases, and biogeochemical cycles.

On Marine Ecosystems

Phytoplankton forms the foundation of aquatic food webs. Phytoplankton productivity is limited to the euphotic zone, the upper layer of the water column in which there is sufficient sunlight to support net productivity. The position of the organisms in the euphotic zone is influenced by the action of wind and waves. In addition, many phytoplanktons are capable of active movements that enhance their productivity and, therefore, their survival. Exposure to solar UVB radiation has been shown to affect both orientation mechanisms and motility in phytoplankton, resulting in reduced survival rates for these organisms. Scientists have demonstrated a direct reduction in phytoplankton production due to ozone depletion-related increases in UVB. One study has indicated a 6-12% reduction in the marginal ice zone.

Solar UVB radiation has been found to cause damage to the early developmental stages of fish, shrimp, crabs, amphibians, and other animals. The most severe effects are decreased reproductive capacity and impaired larval development. Even at current levels, solar UVB radiation is a limiting factor, and small increases in UVB exposure could result in a significant reduction in the size of the population of animals that eat these smaller creatures.

On Biogeochemical Cycles

Increases in solar UV radiation could affect terrestrial and aquatic biogeochemical cycles, thus altering both sources and sinks of greenhouse and chemically important trace gases e.g., carbon dioxide (CO2), carbon monoxide (CO), carbonyl sulfide (COS) and possibly other gases, including ozone. These potential changes would contribute to biosphere-atmosphere feedback that attenuate or reinforce the atmospheric build-up of these gases.

UVB: a band of ultraviolet radiation with wavelengths from 280-320 nanometers produced by the Sun
UVC: a band of ultraviolet radiation with wavelengths shorter than 280 nanometers

2.12 TORNADO

Tornados are rapidly whirling, funnel-shaped air spirals that emerge from a violent thunderstorm and reach the ground. Tornados can have a wind velocity of up to 200 miles per hour and generate sufficient force to destroy even massive buildings. The extent of damage depends on updrafts within the tornado funnel, the tornado's atmospheric pressure (which is often lower than the surrounding barometric pressure), and the effects of flying debris.

Risk of Morbidity and Mortality

Injuries from tornados occur due to flying debris or people being thrown by the high winds (i.e., head injuries, soft tissue injuries, and secondary wound infection). Stress-related disorders are more common, as is a disease related to loss of utilities, potable water, or shelter.

Injury Prevention

In the event of a tornado, the residents should take shelter in a basement if possible, away from windows, while protecting their heads. People with special needs should have a "buddy" who has a copy of the list and who knows of the emergency box.

Public Health Interventions

- Work with emergency management on tornado shelter drills for vulnerable communities.
- Conduct needs assessment using maps that detail pre-existing neighborhoods, including landmarks, and aerial reconnaissance.
- Ensure the provision of medical care, shelter, food, and water.
- Establish environmental controls.
- Establish a surveillance system based at both clinical sites and shelters.

2.13 FIRES

There are two types of fire disasters. They are domestic and wildfires. Fires can be triggered or exacerbated by lightning, high winds, earthquakes, volcanoes, floods, and the deliberate setting of fire by human beings. Lightning is the most significant natural contributor to fires affecting the building environment. Buildings with rooftop storage tanks for flammable liquids are particularly susceptible.

To protect yourself, it is important to understand the basic characteristics of fire. Fire spreads quickly; there is no time to gather valuables or make a phone call. In just two minutes, a fire can become life-threatening. In five minutes, a residence can be engulfed in flames. Heat and smoke from fire can be more dangerous than the flames. Inhaling the super-hot air can sear your lungs. Fire produces poisonous gases that make you disoriented and drowsy. Instead of being awakened by a fire, you may fall into a deeper sleep. Asphyxiation is the leading cause of fire deaths, exceeding burns by a three-to-one ratio.

Management

Before a Fire (mostly for developed countries)
Smoke Alarms

- Install smoke alarms. Properly working smoke alarms decrease your chances of dying in a fire by half.
- Place smoke alarms on every level of your residence. Place them outside bedrooms on the ceiling or high on the wall (4 to 12 inches from ceiling), at the top of open stairways, or at the bottom of enclosed stairs and near (but not in) the kitchen.
- Test and clean smoke alarms once a month and replace batteries at least once a year. Replace smoke alarms once every 10 years.
- Have a record of the fire brigade's telephone in a safe and accessible to members of the family.
- Making aware of the people about care (prevention), and escape mechanisms.

Escaping the Fire

- Review escape routes with your family. Practice escaping from each room.
- Make sure windows are not nailed or painted shut. Make sure security gratings on windows have a fire safety opening feature so they can be easily opened from the inside.
- Consider escape ladders if your residence has more than one level, and ensure that burglar bars and other antitheft mechanisms that block outside window entry are easily opened from the inside.
- Teach family members to stay low to the floor (where the air is safer in a fire) when escaping from a fire.
- Clean out storage areas. Do not let trash, such as old newspapers, magazines, other materials, and equipment accumulation.

With regards to Flammable Items

- Never use gasoline, benzene, naphtha, or similar flammable liquids indoors.

- Store flammable liquids in approved containers in well- ventilated storage areas.
- Never smoke near flammable liquids.
- Discard all rags or materials that have been soaked in flammable liquids after you have used them. Safely discard them outdoors in a metal container.
- Insulate chimneys and place spark arresters on top. The chimney should be at least three feet higher than the roof. Remove branches hanging above and around the chimney.

With regards to Heating Sources

- Be careful when using alternative heating sources.
- Place heaters at least three feet away from flammable materials. Make sure the floor and nearby walls are properly insulated.
- Use only the type of fuel designated for your unit and follow manufacturer's instructions.
- Store ashes in a metal container outside and away from your residence.
- Keep open flames away from walls, furniture, drapery, and flammable items.
- Keep a screen in front of the fireplace.
- Have heating units inspected and cleaned annually by a certified specialist.

With regards to Matches and Smoking

- Keep matches and lighters up high, away from children, and, if possible, in a locked cabinet.
- Never smoke in bed or when drowsy or medicated. Provide smokers with deep, sturdy ashtrays.
- Douse cigarette and cigar butts with water before disposal.

With regards to Electrical Wiring

- Have the electrical wiring in your residence checked by an electrician.
- Inspect extension cords for frayed or exposed wires or loose plugs.
- Make sure outlets have cover plates and no exposed wiring.
- Make sure wiring does not run under rugs, over nails, or across high-traffic areas.
- Do not overload extension cords or outlets. If you need to plug in two or three appliances, get a UL-approved unit with built-in circuit breakers to prevent sparks and short circuits.
- Make sure insulation does not touch bare electrical wiring.

Other Precautions

- Sleep with your door closed.
- Install fire extinguishers in your residence and teach family members how to use them.
- Consider installing an automatic fire sprinkler system in your residence.

- Ask your local fire department to inspect your residence for fire safety and prevention.
- Make buildings accessible to water source

During a Fire:

If your clothes catch on fire, you should:

Stop, drop, and roll - until the fire is extinguished. Running only makes the fire burn faster.

To escape a fire, you should:

Check closed doors for heat before you open them. If you are escaping through a closed door, use the back of your hand to feel the top of the door, the doorknob, and the crack between the door and door frame before you open it. Never use the palm of your hand or fingers to test for heat - burning those areas could impair your ability to escape a fire (i.e., ladders and crawling).

Hot Door	Cool Door
Do not open. Escape through a window. If you cannot escape, hang a white or light- colored sheet outside the window, alerting fire fighters to your presence.	Open slowly and ensure fire and/or smoke is not blocking your escape route. If your escape route is blocked, shut the door immediately and use an alternate escape route, such as a window. If clear, leave immediately through the door and close it behind you. **Be prepared to crawl**. Smoke and heat rise. The air is clearer and cooler near the floor.

The air is clearer and cooler near the floor.

- Crawl low under any smoke to your exit - heavy smoke and poisonous gases collect first along the ceiling.
- Close doors behind you as you escape to delay the spread of the fire.
- Stay out once you are safely out. Do not reenter.

After a Fire

- If you are with burn victims, or are a burn victim yourself, cool and cover burns to reduce chance of further injury or infection.
- If you detect heat or smoke when entering a damaged building, evacuate immediately.

- If you are a tenant, contact the landlord.
- If you have a safe or strong box, do not try to open it. It can hold intense heat for several hours. If the door is opened before the box has cooled, the contents could burst into flames.
- If you must leave your home because a building inspector says the building is unsafe, ask someone you trust to watch the property during your absence.

Wildfires:

Wild land fires are classified into three categories:

- A surface fire: is the common type and burns along the floor of a forest, moving slowly and killing or damaging the trees;
- A ground fire: is usually started by lightning and burns on or below the forest floor;
- A crown fire: spreads rapidly by winds and moves quickly by jumping along the top of trees.

Wildland fires are usually signaled by dense smoke that fills the area for miles around.
If heavy rains follow a fire, other natural disasters can occur, including landslides, mudflows, and floods. Once ground cover has been burned away, little is left to hold soil in place on steep slopes and hillsides. If the wild land fire destroyed the ground cover, then erosion becomes one of several potential problems.

Protective Measures

Before a Wildfire
to prepare for wildfires, you should:

- Mark the entrance to your property with address signs that are clearly visible from the road.
- Keep lawns trimmed, leaves raked, and the roof and rain gutters free from debris such as dead limbs and leaves.
- Stack firewood at least 30 feet away from your residence.
- Store flammable materials, liquids, and solvents in metal containers outside your residence at least 30 feet away from structures and wooden fences.
- Create defensible space by thinning trees and brush within
- 30 feet around your residence. Beyond 30 feet, remove dead wood, debris, and low tree branches.
- Landscape your property with fire resistant plants and vegetation to prevent fire from spreading quickly. For example, hardwood trees are more fire-resistant than pine, evergreen, eucalyptus, or fir trees.
- Make sure water sources, such as hydrants, ponds, swimming pools, and wells, are accessible to the fire department.
- Use fire resistant, protective roofing and materials like stone, brick, and metal to protect your residence. Avoid using wood materials.

- Cover all exterior vents, attics, and eaves with metal mesh screens to prevent debris from collecting and to help keep sparks out.
- Install multi-pane windows, tempered safety glass, or fireproof shutters to protect large windows from radiant heat.
- Use fire-resistant draperies for added window protection.
- Have chimneys, wood stoves, and all home heating systems inspected and cleaned annually by a certified specialist.
- Insulate chimneys and place spark arresters on top. The chimney should be at least 3 feet above the roof.
- Remove branches hanging above and around the chimney.

Follow Local Burning Laws

- Before burning debris in a wooded area, make sure you notify local authorities, obtain a burning permit, and follow these guidelines:
- Use an approved incinerator with a safety lid or covering with holes no larger than 3/4 inch.
- Create at least a 10-foot clearing around the incinerator before burning debris.
- Have a fire extinguisher or garden hose on hand when burning debris.

During a Wildfire:

If a wildfire threatens your home and time permits, take the following precautions:

- Shut off gas at the meter. Only a qualified professional can safely turn the gas back on.
- Turn off propane tanks.
- Place combustible patio furniture inside.
- Connect garden hose to outside taps. Place lawn sprinklers on the roof and near above-ground fuel tanks. Wet the roof.
- Wet or remove shrubs within 15 feet of your residence.
- Gather fire tools such as a rake, axe, handsaw or chainsaw, bucket, and shovel.
- Back your car into the garage or park it in an open space facing the direction of escape.
- Shut doors and roll up windows. Leave the key in the ignition and the car doors unlocked. Close garage windows and doors, but leave them unlocked. Disconnect automatic garage door openers.
- Open fireplace damper. Close fireplace screens.
- Close windows, vents, doors, blinds or noncombustible window coverings, and heavy drapes. Remove flammable drapes and curtains.
- Move flammable furniture into the center of the residence away from windows and sliding-glass doors.

- Close all interior doors and windows to prevent drafts.
- Place valuables that will not be damaged by water in a pool or pond.

If advised to evacuate, do so immediately. Choose a route away from the fire hazard. Watch for changes in the speed and direction of the fire and smoke.

Risk of Morbidity and Mortality

Morbidity and mortality associated with wildfires include burns, inhalation injuries, respiratory complications, and stress-related cardiovascular events (exhaustion and myocardial infarction from fighting or fleeing the fire).

Public Health Interventions

More than four out of every five wildfires are started by people. Negligent human behavior, such as smoking in forested areas or improperly extinguishing campfires, are the causes of many forest fires. Another cause of forest fires is lightning. Prevention efforts include working with the fire service to educate people to:

- Build fires away from nearby trees or bushes,
- Be prepared to extinguish fire quickly and completely.
- Never leave a fire—even a burning cigarette—unattended.
- Encourage the development of a family wildfire evacuation plan if the area in your community is at risk for wildfire.

2.14 EXPLOSIONS

Explosions can inflict multi-system life-threatening injuries to many persons simultaneously. Contributing factors include the composition and amount of the materials involved the environment in which the event occurs, the method of delivery, such as a bomb, the distance between the victim and the blast, and the absence/presence of protective barriers or environmental hazards in the area of the blast.

To predict subsequent demand for medical care and resources needed, it is useful to remember that post-blast, half of the initial casualties will seek medical care over the first one-hour period. Those with minor injuries often arrive before the most severely injured because they go directly to the closest hospitals using whatever transportation is available. Further, where the explosion has resulted in a structural collapse, victims will be more severely injured and their rescue can occur over prolonged time periods.

Morbidity and Mortality

The most common injuries for survivors of explosions are penetrating and blunt trauma. Blast lung is the most common fatal injury among initial survivors. Explosions in confined spaces (mines, buildings, or large vehicles) and/or structural collapse are associated with the greatest morbidity and mortality. Blast injuries can occur to any body system: auditory, digestive, circulatory, central nervous system, extremities, renal, and respiratory. Up to 10 percent of all blast survivors have significant eye injuries. These injuries can occur with minimal discomfort initially and patients can come for care days, weeks, or even months after the event. Symptoms include eye pain or irritation, foreign body sensation, altered vision, periorbital swelling, or contusions. Clinical findings in the gastrointestinal tract may be absent until the onset of complications. Victims can also experience tinnitus, and/or temporary or permanent deafness from blasts.

Public Health Interventions

- Identify the medical institutions and personnel who can provide emergency care
- Ensure that the community preparedness plan includes structure for surge capacity. To estimate the "first wave" of casualties, double the number appearing for care in the first hour. Prepare written communications and instructions for victims who may experience temporary or permanent deafness.
- Work with the regional Emergency Management Organization, police, fire, etc to have a plan in place to identify potential toxic exposures and environmental hazards for which the health department will need to help protect responders in the field and the community.
- With the hospital community, establish a victim identification registry.

- With the mental health community, plan for the reception and intervention with family and friends.

Exercises:

1. What are impacts of deforestation?
2. Write ways in which drought differs from other natural disasters.
3. Describe main causes of drought.
4. Write public interventions of drought.
5. Mention major air pollutants and their health effects.
6. What are the roles of community in protecting deforestation?
7. Discuss the causes and effects of global warming.

3 CONSEQUENCES OF DISASTER

Learning objectives:

At the end of the chapter, the students are expected to:

- Describe the extent of life and economic losses as the consequences of disasters.
- Explain social reactions following disasters.
- Identify factors that may affect social reactions due to disasters.
- Describe the causes and consequences of population displacement.
- List the impacts of disasters with respect to food shortage and malnutrition.
- Describe common mental health problems following disasters.
- Describe common communicable diseases following disasters

3.1 INTRODUCTION

Human and economic losses due to natural disasters have continued to increase despite efforts undertaken by Governments and the international community to raise awareness of risk reduction needs, in particular fostered by the International Decade for Natural Disaster Reduction (IDNDR, 1990-1999). Global summaries for 2002 indicated the occurrence of over 500 disasters, with more than 10,000 people killed, 600 million people affected, US$ 55 billion in total damages and US$ 13 billion in insured losses. Developing countries are disproportionately affected, with their losses rising to about five times higher per unit of GDP than for rich countries, sometimes exceeding a year or more of hard-won and desperately needed economic development.

The underlying problems of growing vulnerability to natural and technological hazards are largely outcome of short-sighted development activities. Every day development decisions are being made at local, national, and international levels. Despite their importance, these developmental activities are more often factors that increase the vulnerability to hazard than reducing the risk. In other words, the

vulnerability of communities is growing due to human activities that lead to increased poverty, greater urban density, environmental degradation, and climate change. In addition to the aforementioned, the prominent consequences of disasters are summarized under the following headings:

3.2 SOCIAL REACTIONS

The nature of disasters may intensify reactions of persons impacted by the event. The scope of the event, personal loss or injuries, and traumatic stimuli, all serve to impact reactions. Though reactions to disasters may vary between individuals, there are common reactions that are normal reactions to the abnormal event. Sometimes these stress reactions appear immediately following the disaster; in some cases, they are delayed for a few hours, a few days, weeks, or even months. These stress reactions may be categorized as physiological, cognitive/intellectual, emotional, and behavioral symptoms and may include the following:

Physiological Symptoms

- Fatigue
- Shock symptoms
- Nausea
- Headaches
- Vomiting
- Profuse sweating
- Fine motor tremors
- Chills
- Teeth grinding
- Muscle aches
- Dizziness

Cognitive/Intellectual Symptoms

- Memory loss
- Concentration problems/distractibility
- Reduced attention span
- Decision making difficulties
- Calculation difficulties
- Confusing trivial with major issues

Emotional Symptoms

- Anxiety
- Feeling overwhelmed
- Grief
- Identification with victims
- Depression
- Anticipation of harm to self or others
- Irritability

Behavioral Symptoms

- Insomnia
- Crying easily
- Substance abuse
- Gallows humor
- Gait change
- Ritualistic behavior
- Hyper vigilance
- Unwillingness to leave scene

Although these may be normal reactions to the event, persons providing disaster mental health services should recognize when reactions are severe enough to refer an individual for services of a mental health professional.

3.3 FACTORS WHICH MAY AFFECT REACTIONS

- Lack of warning
- Scope of the event
- Abrupt contrast of scene
- Personal loss or injury
- Type of disaster
- Traumatic stimuli
- Nature of the destructive agent
- Human error
- Time of occurrence
- Lack of opportunity for effective action
- Degree of uncertainty
- Properties of the post-disaster and duration of threat
- Environment (temperature, humidity, pollution…)

Host Related Factors

Although specific factors intensify reactions, there are personal risk factors that people often possess prior to the disaster/emergency that make them more vulnerable to disaster-precipitated stress. People often have preexisting stress prior to the disaster/emergency. This stress makes them more vulnerable to the challenges that a disaster/emergency situation brings.

Health

- Disabled: physical, sight, hearing, speech
- Health and medical problems, receiving medication

Social

- Lack of support networks, divorced, widowed
- Cultural: language barriers, norms and fears about receiving help in dealing with the system

Demographic

- Age: younger and older have more difficulties
- Sex: women report more stress than men but little differences have been found in immune and endocrine responses

Past History

- Past disaster experience/traumatic events
- Past mental illness or emotional problems

3.4 PUBLIC HEALTH IMPACT OF DISASTER

3.4.1 Sexual violence

Rape is increasingly recognized as a feature of internal wars, but it could as well be experienced in many different types of conflicts. In some conflicts, rape has been used systematically as an attempt to

undermine the opposing groups. Rape, sexual violence, and exploitation may also be widespread in refugee camps, although the extent of its recognition is limited, widely varying estimates of the numbers of victims have been reported.

In addition to the long-lasting mental health disorders, rapes have resulted in the transmission of the human immunodeficiency virus (HIV). War and political conflict present high risk situations for the transmission of sexually transmitted infections (STI), including HIV. There are various ways in which war predisposes to STI and HIV transmission, such as:

- widespread population movement, causing increased crowding;
- separation of women from partners normally providing protection;
- abuses and sexual demands by military personnel and others in positions of power;
- Weakened social structures, there by reducing inhibitions on aggressive behavior and violence against women.

Aside from these additional exposures, access to barrier contraceptives, to treatment for STIs, to the prerequisites for maintaining personal hygiene, and to health promotion advice are all compromised in conflict situations.

Human right violations:
Violations of human rights law and international humanitarian law that targets individuals can take many forms such as torture of civilian, physical and psychological harms to individuals do not end with the cessation of hostilities, sex trafficking, child labour, denying basic needs, etc.

The impact of disaster will also include indirect causes, such as food scarcity, population displacement, destruction of health facilities, and disruption of routine curative and preventive services.

3.4.2 Population Displacement

Population displacement due to environmental degradation is not a recent phenomenon. Historically, people have had to move from their land because it had been degraded (through natural disasters, war, or over-exploitation) and could not sustain them. What is more recent is the potential for mass movements caused by population growth, resource depletion and the irreversible destruction of the environment. Environmental disasters such as floods, droughts and earthquakes are displacing more and more people every year. People and governments of many nations are altering the physical environment in a way that makes it more vulnerable to disruption. For example, rapid rates of population growth and high levels of consumption in affluent states have resulted in the overutilisation and degradation of the land. As deforestation, desertification, global warming, and other threats appear, a new category of displaced people is being recognized - the environmentally displaced.

Mass population movement is due primarily to war, famine, drought, or combination of these factors. Such migration predisposes large number to overcrowding, inadequate sanitation, malnutrition, and diseases for which they may not be immune. The highest morbidity and mortality rates occur in the mass displacements of populations in areas of limited resources during the acute phase of disaster.

Measles, diarrheal illness (eg. cholera) and acute upper respiratory infection have emerged as the most common causes of infectious diseases – related deaths among refuge and internally displaced populations in 1990s. For example, Somalia and Rwanda provide the most devastating large scale mortality rates from infectious diseases in mass population displacements. In such situations, the crude death is inevitably higher in the refugee population than the base crude death rate of the host population.

In general, the variety of possible situations displaced persons may be experienced, in varying degrees, are summarized as follows:

- Loss of means of livelihood;
- Communities becoming separated from any services previously provided;
- Loss of normal sources of food;
- Lack of shelter and household necessities;
- Lack of fuel for cooking;
- Lack of potable water;
- Communicable diseases and overcrowding;
- Additional burdens particularly for women heads of households;
- Possibly large numbers of unaccompanied children;
- Loss of land tenure;
- Possible communication and logistics problems;
- Insecurity due to tension and military activities.

3.4.3 Communicable diseases

In general, the risks of large scale epidemics are low immediately following acute natural disasters, particularly in the developed world.

- Infectious disease outbreaks usually occur in the post impact and recovery phases and not during the acute phase.
- The risks of epidemics increase; however, if drought, famine, and large displacements of people are involved.

These risks will be minimized if potable water; safe food; sanitation services including human and animal wastes removal; adequate personal hygiene; vector control; maintenance of routine immunization programs; sufficient space and ventilation in shelters and temporary housing; and the isolation of patients with communicable diseases are provided.

3.4.4 Climatic exposure

To a large extent, public health depends on safe drinking water, sufficient food, secure shelter, and good social conditions. A changing climate is likely to affect all of these conditions. Overall, however, the health effects of a rapidly changing climate are likely to be overwhelmingly negative, particularly in the poorest communities,

which have contributed least to greenhouse gas emissions. Marked and short-term fluctuations in weather can cause acute adverse health effects; including the following:

- Extremes of both heat and cold can cause potentially fatal illnesses, e.g. heat stress or hypothermia, as well as increasing death rates from heart and respiratory diseases.
- In cities, stagnant weather conditions can trap both warm air and air pollutants -- leading to smog episodes with significant health impacts.
- These effects can be significant. For example abnormally high temperatures in Europe in the summer of 2003 were associated with at least 27,000 more deaths than the equivalent period in previous years.

Other weather extremes, such as heavy rains, floods, and hurricanes, also have severe impacts on health. Approximately 600,000 deaths occurred world-wide as a result of weather-related natural disasters in the 1990s; and some 95% of these were in poor countries.

- In October 1999, a cyclone in Orissa, India, caused 10,000 deaths. The total number of people affected was estimated at 10-15 million;
- In December 1999, floods in and around Caracas, Venezuela, killed approximately 30,000 people, many in shanty towns on exposed slopes.

Measurement of health effects from climate change can only be very approximate. Nevertheless, a WHO quantitative assessment, taking into account only a subset of the possible health impacts, concluded that the effects of the climate change that has occurred since the mid-1970s may have caused over 150,000 deaths in 2000. It also concluded that these impacts are likely to increase in the future.

3.4.5 Food shortage and malnutrition

Famine and decreased per-capita food production in general can result from natural disasters (e.g. extensive flooding, prolonged drought, or gradual change in climate) or armed conflicts. In fact, in conflict areas food procurement and distribution have been used as a weapon of war. In Africa, drought permanently threatens 460 million people (see figure 5 below).

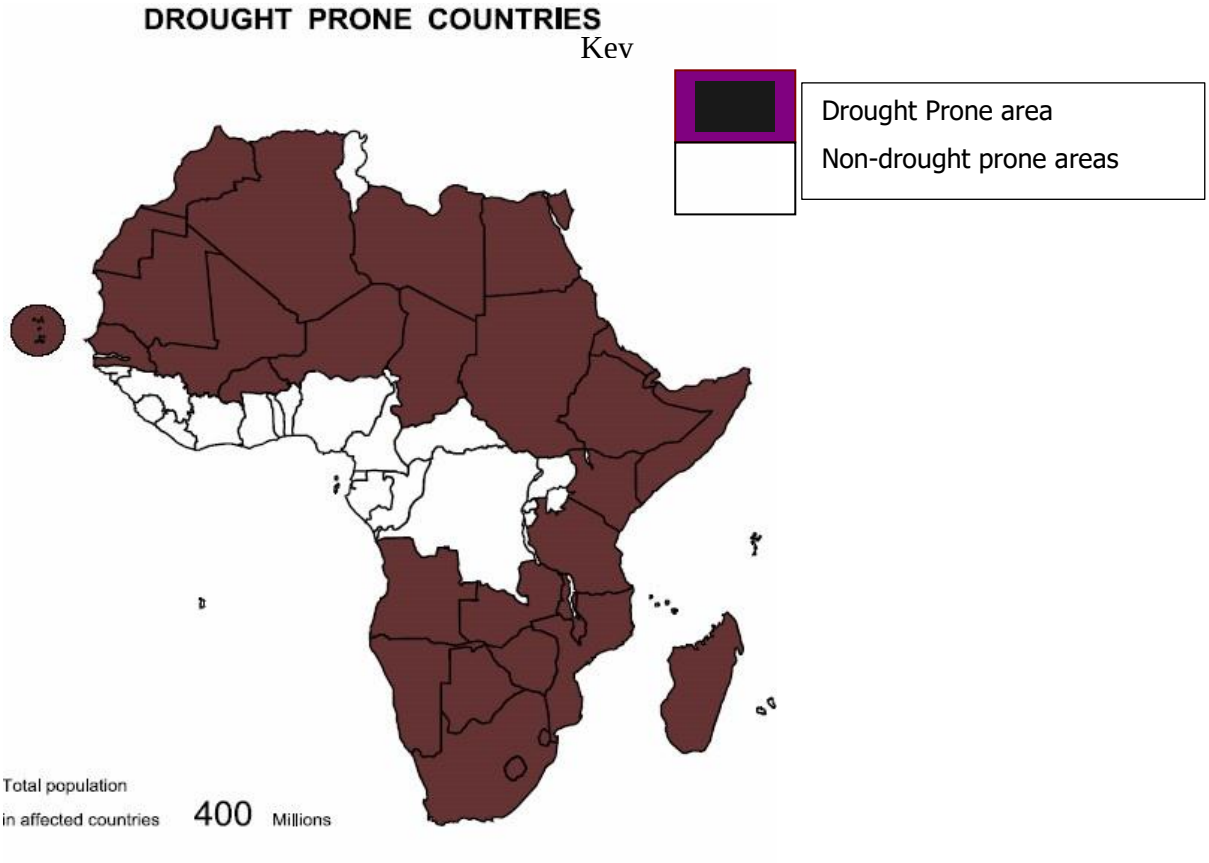


Figure 7 Drought Prone Countries in Africa

3.4.6 Mental Health:

Post-traumatic stress disorder:

Each disaster presents a slightly different profile of emotional trauma. However, some trends are predictable. All persons involved with a disaster will suffer to some degree from the emotional trauma. Human-created disasters seem to cause a more intense reaction than those of natural occurrence. The most consistent positive predictor of significant symptoms is the degree of direct involvement in the disaster.

Risk factors for post traumatic stress disorder development after disaster:

- intense exposure to death and injury;
- exposure of survivors to dead bodies;
- overwhelming life threatening danger;
- unexpected or first exposure to disaster;

- intense initial phase (prolonged stress);
- manmade disaster with no warning;
- high impact ratios;
- dependence on outside agencies;
- exposure to prolonged stress.

Time course of post traumatic stress disorder:

The development of post traumatic stress disorder (PTSD) may be delayed from one week to three years, and it is divided into three stages.

- Stage one is associated with an adrenergic surge that occurs acutely, but persons rarely dwell long term on the incident. It may last up to one month, and, if symptoms last
- more than six weeks, the patients are considered to have been entered stage two.
- Stage two is characterized by a sense of helplessness and a loss of self-control. Autonomic and somatic manifestations dominate. Moreover, it is accompanied by lifestyle and personality changes.
- Stage three is characterized by profound despondency and demoralization.

Prognosis:
Overall, the majority (70% to 90%) of the patients with PTSD will do well: 30% rapidly, 40 % manifest mild symptoms, 20% manifest moderate symptoms, 10% do not recover or get worse. Patients with a good prognosis are those with a rapid onset and a short duration of symptoms. These people usually have strong social net work, and usually they have participated in one form of formal process of trying to resolve the emotional content of an incident in order to prevent PTSD.

Children in disasters:

The actual degree of emotional trauma among children is usually underestimated after disaster. The most important reasons for this are:

- Most studies to date have had significant methodological flaws.
- Parents are either unaware or unwilling to admit any inability to protect their children from stress, and therefore they under report it.
- The extrapolation of emotional status from non-disaster events to disaster may also give false evaluation of the level of the symptoms in children.
- Most of the childhood emotional effects of disaster are age- related.

The impact of disaster on children should be thought of in terms of their developmental age and not their chronologic age. Preschoolers are still exercising some normal separation anxiety. Disaster will

increase the normal feelings. Increased arousal, sleep disturbances, clinging and fear of being alone all become manifest. School-age children tend to be less dependent on their parents. As such their response to the stress of a disaster may be less consistent. They may exhibit reckless behavior and may experience psychosomatic complaints. Adolescents, who are independent, often become involved in productive activities, such as rescue and recovery work. Some; however, may regress and may display withdrawn functioning under significant denial. Normal adolescent anxiety may be increased particularly if they identify with the victims.

Risk factors of an increased emotional trauma in children:

- high intensity event;
- injury to the child;
- loss of parent or significant person;
- fear of death, separation, and recurrence of the disaster;
- insecurity, lack of support;

The elderly in disasters:

The elderly are indeed at an increased risk for physical injury in some circumstances, but they are not necessarily at an increased risk for psycho emotional disorder. However, the impact of the loss of spouse, relative, or even a pet may be greater in the elderly. Another factor is the loss of self-reliance. In some cases the disruption of normal routines and living environment may result in confusion and aberrant behavior. However, the life experience of the elderly may be a valuable resource during the recovery phase of the disaster. They often have more realistic expectations of what their recovery needs are.

Treatment:
Mental health professionals, including psychiatrists, and psychologists, are regarded as the principal providers of care to the PTSD patients. Psychotherapy and behavioral therapy are generally thought necessary, and they have yielded good results, in addition, some patients may benefit from psychotropic medications.

Rescue workers in disaster:

The most common secondary victims of a disaster are those providing care to the victims. These include not only rescue and search personnel but also physicians, nurses, and other staff. The stress reactions seen in non-professionals involved in disaster response resemble the symptoms seen in primary victims. Many professional responders also report serious symptoms following disaster. Rescue workers will have more intense emotional trauma if they are involved in a failed rescue attempts (especially if children are involved). However, up to 90% of the professionals involved will have good coping skills.

The most serious reactions occur among rescue workers involved with body handling. These are due to in part the profound sensory stimulation experienced by these personnel. Inexperienced body handlers have significantly more symptoms than those with previous experience. Symptoms can also be correlated with number of bodies encountered by the rescue worker

Additional symptoms of PTSD in professional disaster worker are decreased by:

- ability to judge risk;
- leadership ability;
- efficiency;
- ability to work cooperatively.

Factors for decreasing PTSD symptoms in disaster workers are:

- prior disaster training;
- specific disaster education;
- maturity;
- experience with prior disasters;
- Leadership type (good leadership).

Coping methods for disaster recovery workers include:

- To avoid humanization of the bodies;
- not to look at the faces;
- not to learn the name of the victims;
- to concentrate on the tasks at hand;
- to concentrate on the benefit to the society.

In disaster people loose loved ones, relatives, and property. Above all, in psychological terms, they lose faith – not religious faith, but faith in the fact that life has a certain consistency and meaning.

3.4.7 Five experiences borne by survivors are:

The death imprint: it consists of indelible imaginary of the encounter with death, intruding whilst awake, or during sleep in the form of nightmares. It comprises considerations of experience - images of the impact such as the sight of bodies dismembered or crushed, the sounds of screaming, or the smell of burning flesh.

Survivor guilt: when the person questions why they survived when other did not, can be of two sorts:

- There is what might be called "existential guilt." Here, the person dwells in a very general way on their survival – 'why me?' or 'why did God choose me?' perhaps, 'why me when I am old and so many children died?'
- Guilt may be focused on actions or their absence – 'Did I do enough, could I have saved more people? Guilt may be especially intense when parents survive their children, or where there is competition for survival.

Psychic numbing: it is manoeuvre, presenting survivors from experiencing the reality of the catastrophic destruction and death about them, and the massive personal threat implied.

- It blocks the experience of too much unbearable pain at any time, and its first manifestations are present in the so called 'disaster syndrome,' where immediately following the impact, behaving remarkable calmly.
- They may seem to be in control and coping bravely in fact, they have not yet to react. They are behaving as though they are calm observers of someone else's experience.

Nurturance conflicts: refers to suspicion of offers from outsiders and in particular to the experience of distrust, the fear that such offers may be false.

- Survivors may become 'touchy and sensitive to the response of others.'
- Develop 'a form of severe victim-consciousness' which sometimes reaches the level of paranoia.

Quest for meaning: the survivors need to make a 'formulation' of their experience in the attempt to explain and gain mastery over it. Formulation is a key element of psychological processing and hence of much psychological treatment of trauma. The survivors' search to understand the experience of the disaster exists on a number of levels, which might be termed as 'hierarchy of formulation.' In terms of development of understanding over time, a psychological sequence might be:

Mutual assistance and disaster intervention programs may significantly limit the impact of disaster on the community. International assistance is difficult to manage and coordinate but may make a decisive difference in the outcome, especially in countries and areas with very limited resources.

3.5 DEVELOPMENT AND DISASTERS

For a long time, the cause-and-effect relationship between disasters and social and economic development was ignored. Development planners hoped that disasters would not occur and, if they did, were most effectively handled by relief from donor countries and relief organizations. Disasters were seen in the context of emergency response-not as a part of long term development programming. When a disaster did occur, the response was directed to emergency needs and cleaning up.

The growing body of knowledge on the relationships between disasters and development indicates four basic themes. The themes may be expanded as follows:

- Disasters set back development programming, destroying years of development initiatives.
- Rebuilding after a disaster provides significant opportunities to initiate development programs.
- Development programs can increase a particular area's susceptibility to disasters. A major increase in livestock development leads to overgrazing, which contributes to desertification and increased vulnerability to famine.
- Development programs can be designed to decrease susceptibility to disasters and their negative consequences. Housing projects constructed under building codes designed to withstand high winds result in less destruction during the next tropical storm.

3.5.1 Disruption of Development by Disasters:

Disasters can seriously disrupt development initiatives in several ways, including:

- Loss of resources
- Interruption of programs
- Impact on investment
- Impact on the non-formal sector
- Political destabilization

Loss of Resources: Development resources are lost when a disaster wipes out the products of investment. It shortens the life of development investments.

Interruption of Programs: Disasters interrupt ongoing programs and divert resources from originally planned uses.

Impact on Investment Climate: Investors need a climate of stability and certainty to be encouraged not to risk their money.

Impact on Non-Formal Sector: Disasters depress the non-formal economy through the direct costs of lost equipment and housing (which often also serves as business sites). The indirect costs of disasters include lost employment, and lost income. Sometimes the importation of relief items creates disincentives to producers.

Political Destabilization: The stress to a country caused by a disaster often results in the destabilization of the government. This may occur for several reasons. For example, mismanagement of the disaster relief and recovery, or the survivors may have had unmet expectations.

3.5.2 How Development May Cause Disasters

Development projects implemented without taking into account existing environmental hazards may increase vulnerability to natural disasters. For example, projects designed to increase employment opportunities, and thus income, usually attract additional population growth. Low-income people may then have to seek housing in areas previously avoided, on hillsides or in floodplains. The cost of relief assistance after a landslide or flood can easily outweigh the benefits to the economy of more jobs. Similarly, development projects may lead to negative political consequences that increase the vulnerability to civil conflict.

3.5.3 Development opportunities afforded by disasters

Disaster can serve as a catalyst for introducing mitigation activities. Disasters often create a political and economic atmosphere wherein extensive changes can be made more rapidly than under normal circumstances. For example, in the aftermath of a disaster, there may be major opportunities to execute land reform programs, to improve the overall housing stock, to create new jobs and job skills, and to expand and modernize the economic base of the community - opportunities that would not otherwise be possible.

Disasters can also highlight high-risk areas where action must be taken before another disaster strikes. The realization of vulnerability can motivate policy-makers and the public to participate in mitigation activities. Disasters may also serve to highlight the fact that the country is seriously under-developed. They can thus bring in funding and the attention of donor communities to apply to long-term development needs (Henderson, 1990).

Exercises:

1. The underlying problems of growing vulnerability to natural and technological hazards are largely an outcome of short-sighted development activities. A. true B. false.
2. Write common social reactions as the consequences of disasters.
3. Mention health consequences of population displacement.
4. Describe factors that increase the risks of communicable diseases during disasters.
5. What are public health interventions for disaster survivors who may encounter mental health problems?
6. Discuss public health impact of disasters.
7. Describe the relationship between disaster and development.

4 DISASTER MANAGEMENT

Learning Objectives:

At the end of this chapter students will be able to:

- Define disaster preparedness
- Discuss different risk reduction measures
- Define disaster response, disaster mitigation and disaster recovery
- Explain disaster mitigation strategies

4.1 INTRODUCTION

The scope of disaster management can include all disaster-related activities. These activities are categorized as disaster preparedness, disaster response, disaster recovery, post disaster epidemiological surveillance, environmental management, and disaster mitigation. The details of these activities are treated in the subsequent sections of this chapter.

Aims of disaster management are to:

- Reduce (avoid, if possible) the potential losses from hazards;
- Assure prompt and appropriate assistance to victims when necessary;
- Achieve rapid and durable recovery.

4.2 DISASTER PREPAREDNESS

Disaster preparedness is defined as a state of readiness to respond to a disaster, crisis, or any other type of emergency situation. More broadly it is stated as the leadership, training, readiness and exercise support, and technical and financial assistance to strengthen citizens, communities, state, local and tribal governments professional emergency workers as they prepare for disaster, mitigate the effects of disaster, respond to community needs after a disaster, and launch effective recovery efforts (www.fema.gov).

All measures and policies taken before an event occurs that allow for prevention, mitigation, and readiness constitutes disaster preparedness. Preparedness includes designing warning systems, planning for evacuation, and reallocation, storing food and water, building temporary shelters, devising management strategies, and holding disaster drills and exercises,. Contingency planning is also included in preparedness as well as planning for post-impact response and recovery.

The aim of disaster preparation is to be able to reduce the immediate mortality and morbidity with a better prepared, well equipped service. The preparation includes early warning systems for seasonal changes in climate, and risk of flood or drought, such as electronic information systems and satellites

that can provide information over large regions and continents. Separate systems are needed to cater for the agricultural sector, cities, and people in rural or remote communities. The public health infrastructure is particularly important for the immediate measures needed and for public information on reducing the health risks.

The most important challenge is to change from concentrating solely on post-disaster relief and to focus on pre-disaster preparedness. Thanks to disaster-preparedness schemes, particularly to an increasingly sophisticated early warning system, the comparative losses of life due to weather-related disasters are declining. All the evidence shows that, for every dollar spent on prevention and preparedness, about $100 or more is needed for relief efforts after the disaster has taken place.

Where such forecasting and warning systems are installed as part of disaster-management programs, evidence shows that more lives can be saved and damage is drastically reduced

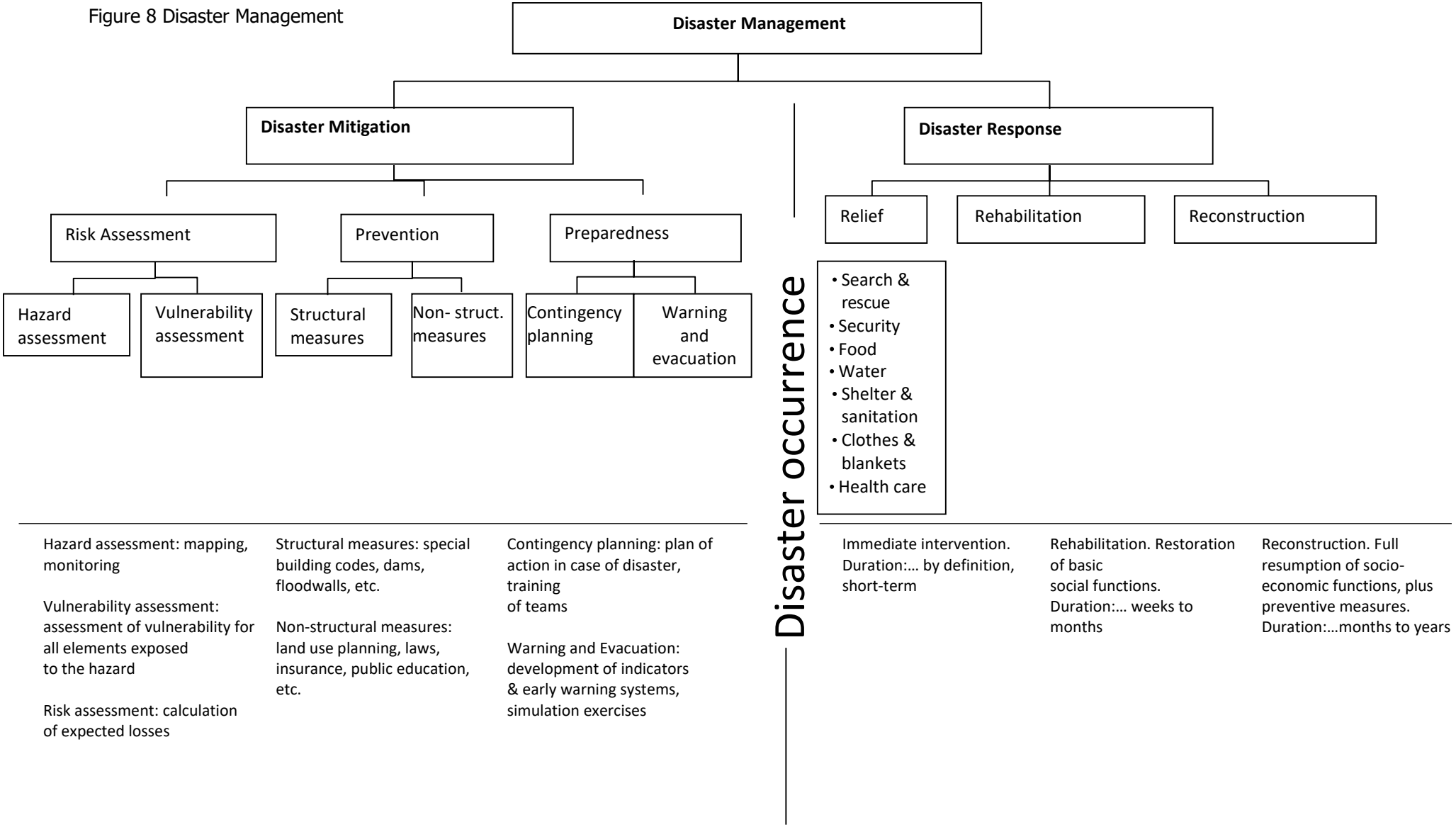
Being prepared also means having thorough disaster contingency plans comprising of:

- Covering emergency housing, repairs, replacement of essential equipment and protection of the most vulnerable people in the community: the sick, the very young and the old.
- Improvement of water supply and sanitation systems
- Logistics of the predicted need for health and social services need to be laid down in advance, including early warning systems to detect health effects.
- Planning for climate change: as global warming and its effects on water will increase the frequency of water related disasters.
- Public information and education: to ensure early warnings to communities at risk; and give information about how to conserve water and keep it safe from contamination.

Preparedness consists of three basic steps: preparing a plan, training to the plan, and exercising the plan. Preparedness deals with the functional aspects of emergency management such as the response to and recovery from a disaster, whereas mitigation attempts to lessen these effects through pre-disaster actions as simple as striving to create "disaster-resistant" communities.

Planning for various disasters:
Two strategies for disaster planning include the agent-specific and the all-hazards approaches. In agent-specific planning, communities only plan for threats most likely to occur in their region. Since many disasters pose similar problems and similar tasks, an all-hazards approach involves planning for the common problems and tasks that arise in the majority of disasters.

Figure 8 Disaster Management



The following are some of the means to plan for disastrous situations:

- Escape routes
- Family communications
- Utility shut-off and safety
- Insurance and vital records
- Special needs
- Safety Skills

Escape Routes

Identify and prepare escape routes such as alternative doors, windows, and path ways.

Family Communications

It is important to contact police departments, Red-Cross, radio/Television (media) stations to find family members. Also pick a friend or relative who lives out-of- woredas, zone, and region for household members to notify that they are safe.

Utility Shut-off and Safety

In the event of a disaster, you may be instructed to shut off the utility service at your home. Below is some general guidance for shutting off utility service:

Natural Gas: Natural gas leaks and explosions are responsible for a significant number of fires following disasters. It is vital that all household members (who have natural gas) know how to shut off natural gas.

Water: Water quickly becomes a precious resource following many disasters. It is vital that all household members (who have water pipe lie) learn how to shut off the water at the main house valve.

- Cracked lines may pollute the water supply to your house. It is wise to shut off your water until you hear from authorities that it is safe for drinking.

Electricity: Electrical sparks have the potential of igniting natural gas if it is leaking. It is wise to teach all responsible household members where and how to shut off the electricity.
Preparing to Shut Off Electricity

- Locate your electricity circuit box.
- Teach all responsible household members how to shut off the electricity to the entire house.

For Your Safety: always shut off all the individual circuits before shutting off the main circuit breaker.

Insurance and vital records:
Households should be encouraged to have insurance for property, health, and life. Such vital records, including insurance, bank… books need to be kept in safe place.

Planning for Special Needs
If you have special needs, find out about special assistance that may be available in your community.

- Create a network of neighbors, relatives, friends, and coworkers to aid you in an emergency. Discuss your needs and make sure everyone knows how to operate necessary equipment.

- Discuss your needs with your employer.
- If you are mobility impaired and live or work in a high-rise building, have an escape chair.
- If you live in an apartment building, ask the management to mark accessible exits clearly and to make arrangements to help you leave the building.
- Keep specialized items ready, including extra wheelchair batteries, oxygen, catheters, medication, food for service animals, and any other items you might need.
- Be sure to make provisions for medications that require refrigeration.
- Keep a list of the type and model numbers of the medical devices you require.

Additionally, under each specific disaster, the necessary preparedness to be made is discussed accordingly and readers are advised to refer to chapter two for more information regarding specific disaster.

4.3 DISASTER RESPONSE

The response is the immediate reaction to the disaster. It may occur as the disaster is anticipated, as well as soon after it begins. Examples include mass evacuation, sandbagging buildings, and other structures, securing emergency food and water, covering windows, providing emergency medical services, search and rescue, firefighting, and restoring public order to prevent looting.

Extrication, triage, stabilization, and transport

Extrication has evolved into a fire services function in most of the country. In addition to specialized technical and trench rescue teams, fire services have more experience with building collapse and secondary hazards (eg, floods, fires) than other organizations.

The concept of triage involves providing the most help for as many as possible. Medical personnel are accustomed to providing extensive, definitive care to every patient. When confronted by a number of patients simultaneously in a disaster situation, it is easy to become overwhelmed, even for an experienced disaster worker. Triage must occur at multiple levels, and patients must be reassessed during every step of the process.

Transport must be both organized and orchestrated.

Definitive scene management

While scene control and containment may be relatively simple in a local, static disaster, dynamic and paralytic disasters may take several days to contain and stabilize. As the length of time of the disaster increases, additional resources must be made available, as rescue crews reach exhaustion, supplies become spent, and additional hazards develop.

There is often theoretical debate over when the response function ends and recovery function begins. For the time being, the response function is classified as the immediate actions to save lives, protect properties, and meet basic human needs.

Activation

Notification and initial response: During this phase, organizations involved in disaster response and the potentially affected populations are notified.

Organization of command and scene assessment: The prearranged command and staff structure for responding to the disaster should be arranged and initial communications nets established.

Emergency Response Activities:

Emergency response activities are those carried out during the actual emergency or immediately prior to it. This may involve evacuation of threatened communities, emergency assistance during the disaster, and actions taken in the immediate aftermath during the time when the community is rather disorganized and basic services and infrastructure are not fully functioning. Because the emergency period is both dramatic and traumatic, most attention by the press and international community is focused here. Yet in most disasters (with the exception of droughts and civil strife), the emergency passes rather quickly and, in reality, only accounts for a very small percentage of the total picture.

Twelve tasks or problems are likely to occur in most disasters are summarized below:

- Interorganizational coordination is important.
- Sharing information among organizations,
- Resource management,
- When advance warnings are possible, evaluations from areas of danger can be the most effective life-saving strategy in a disaster.
- The public tends to underestimate risks and downplays warnings if messages are ambiguous or inconsistent.
- Search and rescue
- Using the mass media: to deliver warnings to the public and to educate the public
- Triage: is a method of assigning priority for treatment and transport for injured citizens.
- Casualty distribution: in most domestic disasters, several medical resources can handle the casualty distribution.
- Patient tracking: is complicated by the fact that most persons evacuating their homes do not seek lodging in public shelters where their presence will be registered.
- Caring for patients when the health care infrastructure has been damaged requires careful advance planning.
- The management of volunteers and donations: is a common problem in disasters. Procedures should be established to manage large number of resources.
- Plan for organized improvement in response to the disruption of shelter, utilities, communication systems, and transportation.

4.4 DECLARATION OF DISASTER:

The social disorganization surrounding a disaster and the number and types of responding organizations and groups create the need for a well-ordered mass response system. Consequently, a complex organizational environment has to be developed to respond in disaster situations. To mobilize these organizations, a declaration of disaster is initiated according to an increasing level of emergency (disaster).

Disaster shall be declared when convincing and complete socio- economic reports from regional councils and the National Early Warning System are provided. National level declaration for disaster will be made only by the National Disaster Prevention and Preparedness Committee (NDPPC). The commencement of relief measures shall automatically follow the declaration of disaster in the area. However, it is not always necessary to wait such formal declaration, or NDPPC's decisions on measures to be taken. Having regard to the policies of the Government, relief operation may commence with the available local resource before a formal declaration if the state of distress warrants immediate intervention. Subject to its enforcement by NDPPC and depending on the context of the disaster, the Relief and Rehabilitation Commission (RRC) may also authorize certain essential measures to be taken in such situations.

4.5 DISASTER RECOVERY (REHABILITATION AND RECONSTRUCTION):

The primary aim of recovery is to assist the affected community to regain a proper level of functioning following a disaster both initially and in the long term. It is "the coordinated process of supporting emergency-affected communities in reconstruction of the physical infrastructure and restoration of emotional, social, and physical well- being" (Emergency Management Australia, 2004). Recovery essentially concerns rehabilitation as well as developing the tools to mitigate against the future impact of a disaster, and should return the community to an improved state of post-disaster. This includes those activities that continue beyond the emergency period to restore lifelines. Examples include providing temporary shelters, restoring power, critical stress debriefing for emergency responders and victims, job assistance, small business loans, and debris clearance.

Recovery involves decisions and actions relative to rebuilding homes, replacing property, resuming employment, restoring business, and permanently repairing and rebuilding infrastructures. Since the recovery function has such long-lasting effects and usually high costs, the participants in the process are numerous. They include all levels of government, the business community, political leadership, community activists and individuals.

The recovery phase is frequently underemphasized in disaster plans, but it is crucial for the affected community. Recovery efforts should identify opportunities for community development, especially in terms of creating sustainable, safer, and more resilient communities.

The four elements of recovery are:

1. Community recovery (including psychological recovery);
2. Infrastructure recovery (services and lifelines);
3. Economy recovery (including financial and political considerations, and business continuity);
4. Environment recovery.

1. Community recovery:

- Have we considered the specific needs of our community? That is, the cultures, traditions, demographics, etc as identified.
- What mechanisms and resources will be required to aid in the psychological recovery of the community?
- What financial assistance is available to the community? For example, government payments and public appeals.
- What government and non-government agencies would you consider necessary to rebuild your community following a disaster?

- What is likely to be the medical and health requirements of the community?

2. Infrastructure recovery:
   - How will we ensure the restoration of essential services?
   - How will our community access essential services?
   - How will we ensure or facilitate the restoration of living conditions and housing security?
   - How will we rebuild our community infrastructure? This includes ports, airports, dry storage, roads, public transport, fuel, gas, water, electricity, telecommunications, garbage and sewerage, waterways, parks, flora, and fauna.
   - How will we communicate with our community and external agencies? This includes gathering, processing, and circulating information to and from the community. It also encompasses communication with disaster workers (staff and volunteers), media, local government management, suppliers, groups, and authorities including the local disaster management group.
   - Are our recovery plans adequately integrated and/or considerate of plans of other relevant services (such as health, energy, telecommunications, etc)?

3. Economic recovery:

   - What impact will disaster have on job security in our community? (that is, both for displaced community members and volunteers in the recovery process.)
   - What mechanisms and resources will be required to assist and ensure the economic recovery of the community?
   - Who needs to be involved in re-establishing economic validity in our community?

4. Environmental recovery:

   - What issues do we need to consider in preparing for and managing environmental damage caused by a disaster event?
   - Who needs to be involved in this process?

Principles of disaster recovery and reconstruction:

1. Three phases describe as to what happens to post-impact in the affected community:
2. Emergency phase: activities should focus on saving lives through search and rescue, first aid, emergency medical assistance and over all disaster assessment. Efforts immediately begin to repair critical facilities, to restore communications, and transportation networks, and in some cases, to evacuate residents from areas still vulnerable to further disaster.
3. Transition or recovery phase: during this phase, people return to work, repair damaged buildings and infrastructure, and initiate other actions that allow the community to return

to their normal as soon as possible. Victims begin emotional recovery and may experience depression and post-traumatic disorder.

4. Reconstruction phase: is characterized by physical reordering of communications, utilities, roads, and general environment. Residents repair or rebuild their housing and agricultural activities resume.

Community participation is essential for planning the rehabilitation phase because local people better understand their own needs and the problems that create these needs.

4.6 DISASTER MITIGATION

Mitigation is defined as a sustained action to reduce or eliminate risk to people and property from hazards (disasters) and their effects. The function of mitigation differs from other emergency management disciplines since it looks at long-term solutions to reduce risk as opposed to preparedness for hazards, the immediate response to hazards, or the short-term recovery from a hazard event.

Disaster mitigation includes those activities designed to prevent or reduce losses from disaster. It is usually considered the initial phase of emergency management, although it may be a component in the other phases. Examples include land-use planning, to limit or prevent development in floodplains, building codes to reduce losses from earthquakes and fires, dam, and levees to prevent flooding.

The mitigation efforts must include:

- Emergency housing, especially after floods, but also if drought has caused mass population movement in an attempt to find better water and food supplies.
- Provision of emergency supplies of safe drinking water.
- Emergency repairs to homes, drains and water supply and sanitation infrastructure.
- Early warning systems to identify health effects and to detect rise in mosquito borne diseases, such as malaria, and diarrheal diseases, such as cholera.

Both disaster preparedness and its mitigation require multisectoral cooperation and joint planning. Both need evaluation after a disaster to reduce the ill effects of later crises.
The goal of mitigation is to create economically secure, socially stable, better built, and more environmentally sound communities that are out of harm's ways. The following widely accepted tools are used to reduce risks:

- Hazard identification and mapping,
- Design and construction applications
- Land-use planning,

- Finical incentives,
- Insurance,
- Structural controls.

In certain cases, some of the devastating effects of disasters can be reduced before the actual event. For example, evacuations may be orchestrated before hurricanes or floods. Early warning allows residents to seek shelter from tornadoes.

Disaster Mitigation Strategies Risk Identification

To reduce the threat of droughts and to lessen their impact should they occur, a number of measures can be taken. The first step in disaster mitigation is to identify areas that are at risk to drought. Once the priority zones have been identified, comprehensive and integrated rural development programs should be initiated. Among the usual activities are:

- Agricultural improvements including modifying cropping patterns and introduction of drought-resistant varieties of crops;
- Rangeland management including improvement of grazing lands, and grazing patterns, introduction of feedlots, and protection of shrubs and trees.
- Water resource development including improved irrigation, and water storage facilities, protection of surface water from evaporation, introduction of drip irrigation systems, and water containment methods such as retention dams and subsurface dams.

Animal husbandry activities including maintaining smaller herds, eliminating unproductive animals, and upgrading the quality and productivity of stock through improved breeding practices.

Land-Use Planning

Another approach to reduce the impact of droughts on human settlements (including nomadic communities) is to employ land-use planning techniques.

Land-use controls similar to zoning regulations could be created and adopted by governing bodies. These controls can include:

- numbers of livestock per unit area;
- maximum population density;
- limits on amounts of water taken from public water supplies for agricultural or industrial use;
- authority to declare a state of emergency during which time animal herds are required to be depleted or transported to non-emergency areas, more stringent water usage allowances are imposed, etc.

Impediments to Mitigations

There are several factors, including denial of the risk, political will, cost, and lack of funding.

4.7 POST-DISASTER EPIDEMIOLOGICAL SURVEILLANCE:

The post-impact needs assessment provides information necessary to begin recovery. The first step is to assess community capacities and vulnerabilities, including physical environment (i.e. intact infrastructure, resources), social conditions (i.e. existing

organizations, support, networks), and population attitude towards and motivation to recover. Communication must be established between the people affected by the disaster and the responding jurisdictions and organizations. Needs are determined by visiting representative areas, by talking to selected groups in affected communities, and by conducting rapid health assessment surveys.

The principles of the undertaking are to:

- Maximize use of pre-existing surveillance data for "baseline" information, and to modify conditions
- Coordinate efforts after a disaster with the normal surveillance activities in the health sector.
- Avoid duplication of efforts
- Be familiar with the epidemiology of endemic diseases and with the national surveillance system.
- Coordinate the relief surveillance of communicable disease with activities of national health authorities.
- Strengthen the reporting systems.
- Strengthen the documentation system at the central level, in hospitals and clinics at the intermediate level.

Steps in Epidemiologic Surveillance that should be taken before and after a Rapid-Onset Disaster

1. Identification of the diseases and other conditions to be monitored, and selection of suitable indicators.
2. Delineation of the areas affected by the disaster.
3. Rapid statistical sampling of sites (ideally including unaffected localities for control purposes).
4. Rapid, gross detection of cases or presumptive cases based on the presence of a symptom or complaint.
5. Monitoring and reporting by local health services of the selected diseases or symptoms.
6. Interpretation of data at the national level by a health unit of the disaster-affected country that is experienced in data analysis and has direct access to relief authorities.

7. Investigation of any "unusual" occurrence of disease by local health workers, assisted when necessary by epidemiologists.

Requirements

For surveillance to be most effective, there are four requirements.

1. Establishment of priorities for investigating unusual occurrences of diseases, whether confirmed or rumoured.
2. The establishment of a mechanism for the dissemination of surveillance information to both encourages the taking of appropriate measures and discourages expenditure on inappropriate measures.
3. Training and involvement of local health workers at all levels of the health system.
4. Pre-disaster planning, including identification of real health risks in various disaster situations, assignment of responsibilities, and development of an assessment and surveillance plan.

The Collection, Interpretation and Utilization of Data

Participation of field health units in the surveillance system must be as complete as possible after a disaster. It is critical to motivating reporting units. The participation of units operating before the disaster should be continued, when possible, with an emphasis in reporting placed upon the diseases or symptom complexes targeted for surveillance. Health teams mobilized for the relief effort should be adequately briefed about the importance of surveillance. They should be given the case definitions to be used (according to IDSR) and be amply provided supplies of reporting forms.

Two operational aspects of data collection deserve emphasis. First is the importance of regularly sending "negative" reports whenever no patients with notifiable diseases are seen in a unit. A report form with a line of zeros provides valuable information. It also permits assessment of the number of units participating in the surveillance system. Failure to report, on the other hand, can either mean a lack of disease, or that a unit has dropped out of the surveillance effort. Speed of reporting is always critical in communicable disease surveillance and is especially vital following disaster. In general, weekly reporting from all units by telephone, telegraph or shortwave radio is preferable to reporting by mail. Immediate consultation about any unusual condition or suspected epidemic, at any time during the week, should be encouraged.
Innovative ways to facilitate rapid reporting during the period of severe disruption in transportation and communication should be sought by members of the epidemiology unit. Egs include:

- Daily or weekly radio reporting of selected diseases from the field;

- The distribution and retrieval of reporting forms by members of the drug and/or food distribution system;
- Gaining access to the national security force's communication network;
- Incorporating disease surveillance into a more general regular report required by the relief coordinator;
- Regular visit to field units by the epidemiologist-in-charge or a member of the surveillance team.

It is important that incoming notifications are evaluated immediately upon receipt by the epidemiology unit to provide prompt response to rumors or enquiries

The epidemiologists should also develop maps and graphs for visual appreciation of disease trends. This is frequently a more productive investment of the scarce time of staff members than is generating columns and figures. Maps with pins indicating the geographic clustering of cases are particularly useful for following the spread of a disease. Well charted graphs can more sensitively indicate disease trends than numbers.

Providing Feedback to the Field from the Central Level

Providing feedback is an important aspect of post-disaster surveillance. The weekly report provides more than feedback to field workers. The epidemiologist should ensure that the weekly report and adequate background information (personal visit or covering note) are circulated to the relief coordinator and other national authorities and local representatives of voluntary agencies. The overall relief coordinator should be responsible for distributing the report to members of the media and the community.

Presenting Epidemiologic Information to Decision Makers
It is critical to present information from surveillance and the field investigations to key decision makers. Epidemiologic information, implications, and an outline of alternatives of action must be summarized in non-technical terms understandable to lay people.

Surveillance During and After the Recovery Phase

With the increasing passage of time after a disaster, both decision makers and the public become progressively less concerned with the probability of epidemic disease. The phasing out of the intensified, disaster-related surveillance activities should take place after consultation with members of the national epidemiology group.

4.8 ENVIRONMENTAL HEALTH MANAGEMENT

The impacts of disasters, whether natural or man-made, not only have human dimensions, but environmental ones as well. Environmental conditions may exacerbate the impact of a disaster, and vice versa, disasters have an impact on the environment. Deforestation, forest management practices, agriculture systems etc. can exacerbate the negative environmental impacts of a storm or typhoon, leading to landslides, flooding, silting and ground/surface water contamination.

Emphasizing and reinforcing the centrality of environmental concerns in disaster management has become a critical priority, requiring the sound management of natural resources as a tool to prevent disasters or lessen their impacts on people, their homes, and livelihoods.

There is a clear need to reinforce the importance of environmental concerns in the entire disaster management cycle of prevention, preparedness, assessment, mitigation, and response and to integrate environmental concerns into planning for relief, rehabilitation, reconstruction, and development. This will also require the enhancement of capacities to undertake short and medium-term activities in disaster management based on long-term environmental considerations.

A comprehensive understanding of natural systems coupled with the application of management tools such as environmental evaluation and risk assessment can make a major contribution to the reduction of risks and mitigation of any impacts.

Specifically, we need to examine the need for a multi-stakeholder partnership that links local governments, private sector entities, and civil society organizations in order to facilitate more effective disaster prevention and mitigation.

Environment management is a critical strategy to prevent disasters and reduce risks/vulnerabilities of disaster-prone countries and communities. Disaster risks and vulnerability can be considerably reduced through effective and long-term environmental and natural resource management practices.

Exercises:

1. What do you understand by disaster preparedness and disaster prevention?
2. Write common tasks in disaster response.
3. Describe how the function of mitigation differs from the other emergency management disciplines.
4. Describe activities in relief operations.
5. Write the four requirements to make epidemiologic surveillance most effective.

