

LECTURE NOTES

For Health Science Students

Disaster Prevention and Preparedness



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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, organization or country, the results are typically the same, i.e., substantial loss of life, assets and productivity. In most caafall7(ong ca)5lnd

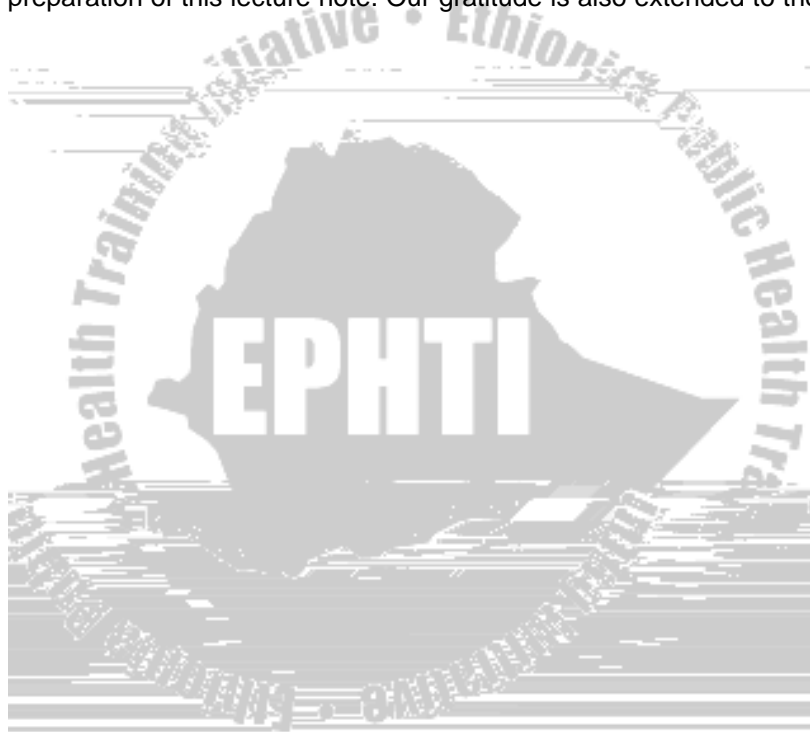


factors leading to disasters; with emphasis to deforestation, drought, floods, fires, air pollution and global warming. Chapter three deals with the consequences of disaster such as economic losses, social reactions and factors that intensify these reactions and consequences of population displacement 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. Chapters six discusses the role of 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 source for this formulation.

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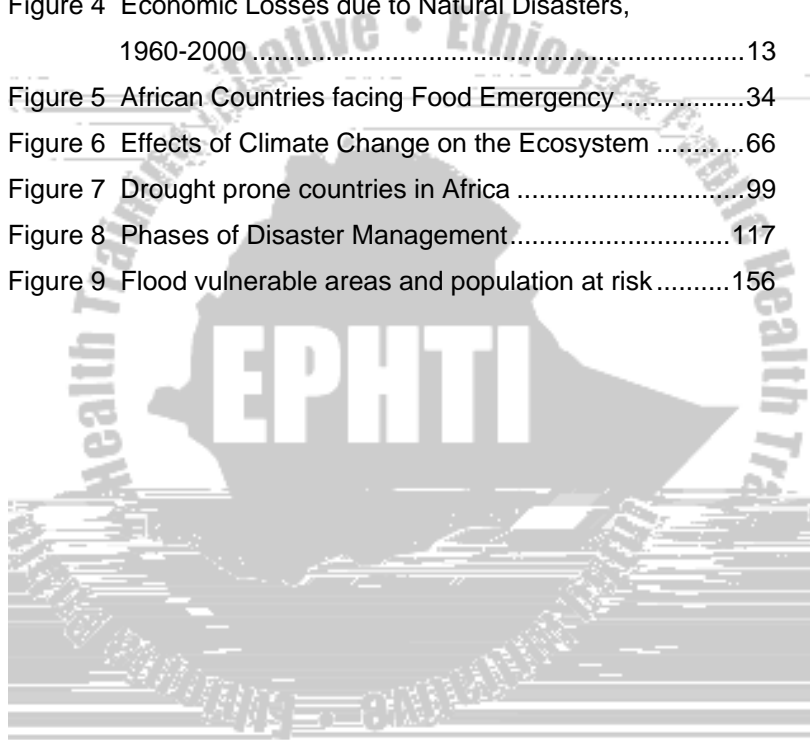
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CHAPTER ONE

WHAT IS DISASTER

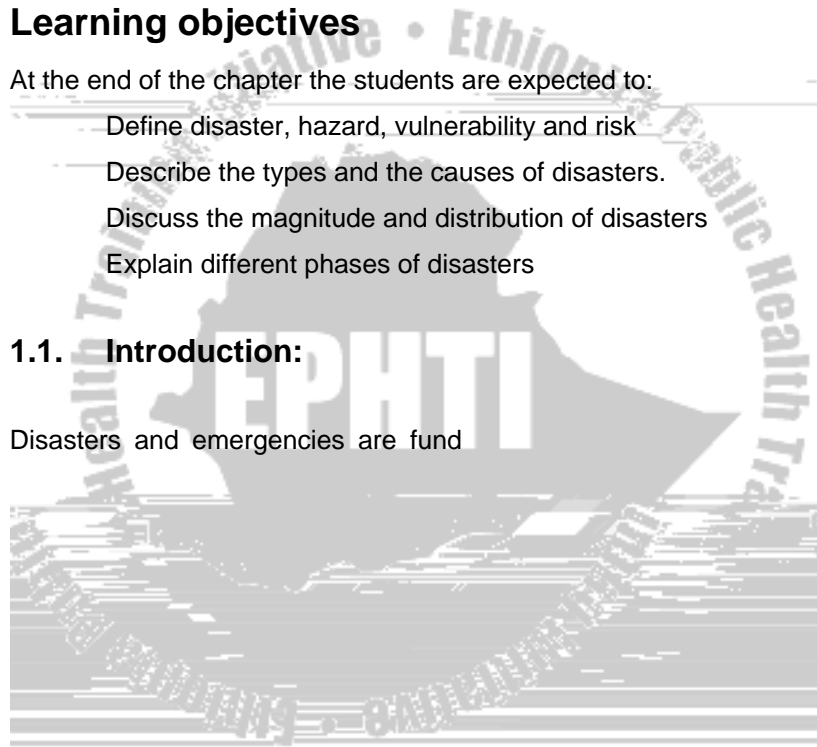
Learning objectives

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

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

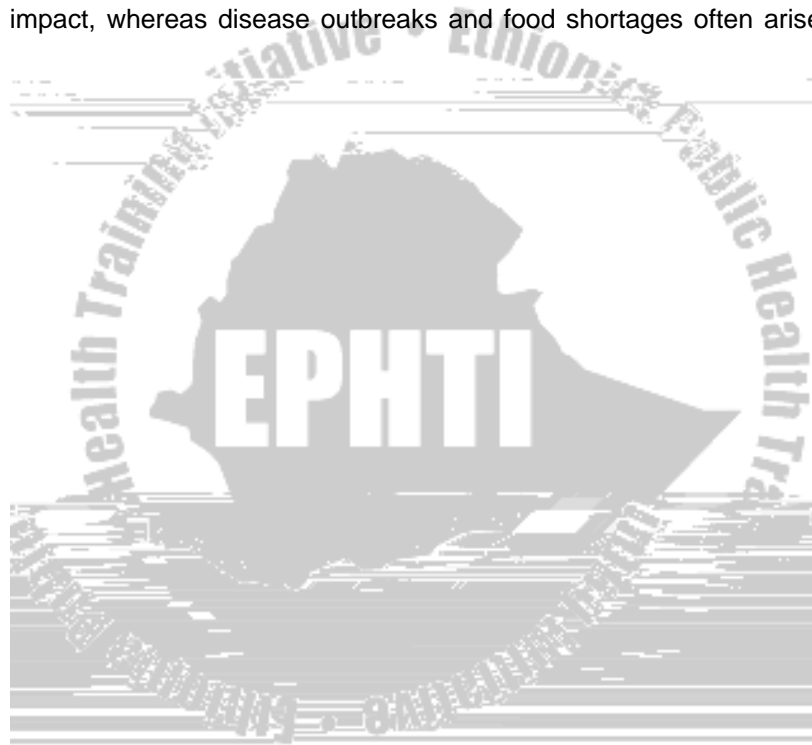
1.1. Introduction:

Disasters and emergencies are fund



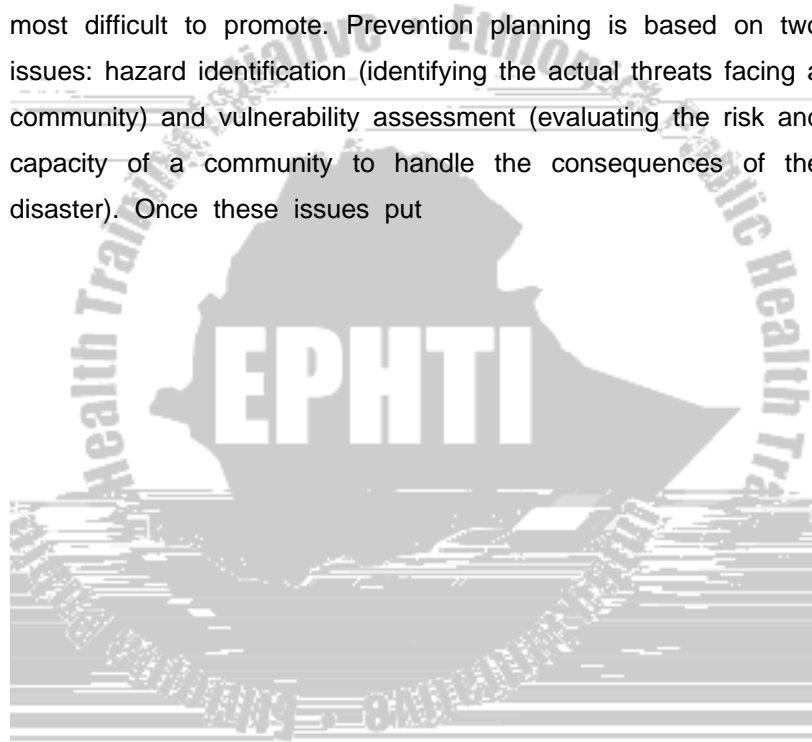
land. These offer less productivity and a smaller measure of physical or economic safety.

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





Prevention is defined as those activities taken to prevent a natural phenomenon or potential hazard from having harmful effects on either people or economic assets. Delayed actions drain the economy and the resources for emergency response within a region. For developing nations, prevention is perhaps the most critical components in managing disasters, however, it is clearly one of the most difficult to promote. Prevention planning is based on two issues: hazard identification (identifying the actual threats facing a community) and vulnerability assessment (evaluating the risk and capacity of a community to handle the consequences of the disaster). Once these issues put

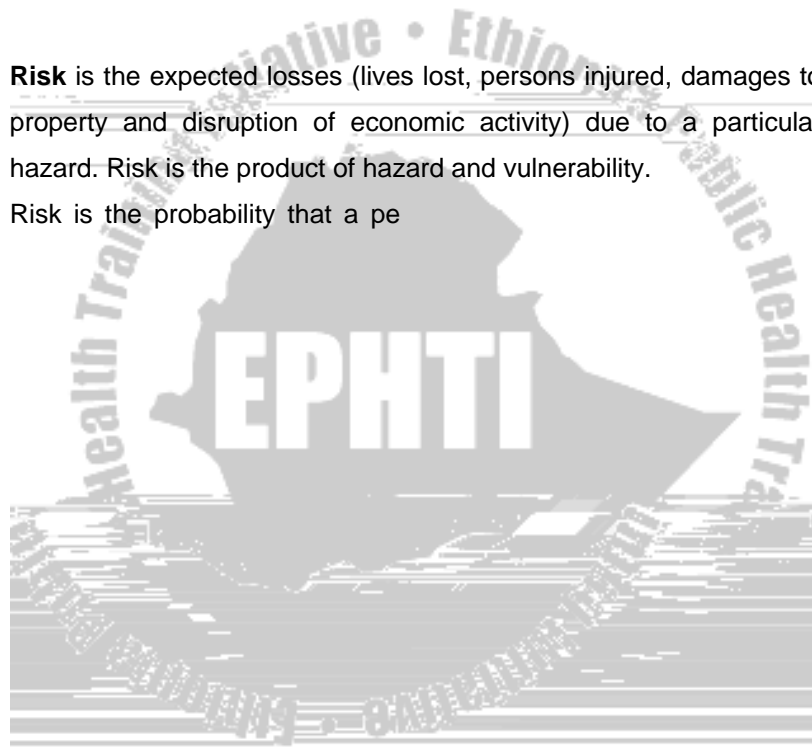


Resilience: is adaptability, capacity to recover.

Response: is 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, open the way to rehabilitation.

Risk is the expected losses (lives lost, persons injured, damages to property and disruption of economic activity) due to a particular hazard. Risk is the product of hazard and vulnerability.

Risk is the probability that a pe



It is the susceptibility of a population to specific type of event. Vulnerability is also associated with the degree of possible or potential loss from a risk that results from a hazard at a given intensity. The factors that influence intensity include demographics, the age, and resilience of the environment, technology, social differentiation and diversity as well as regional and global economics and politics.



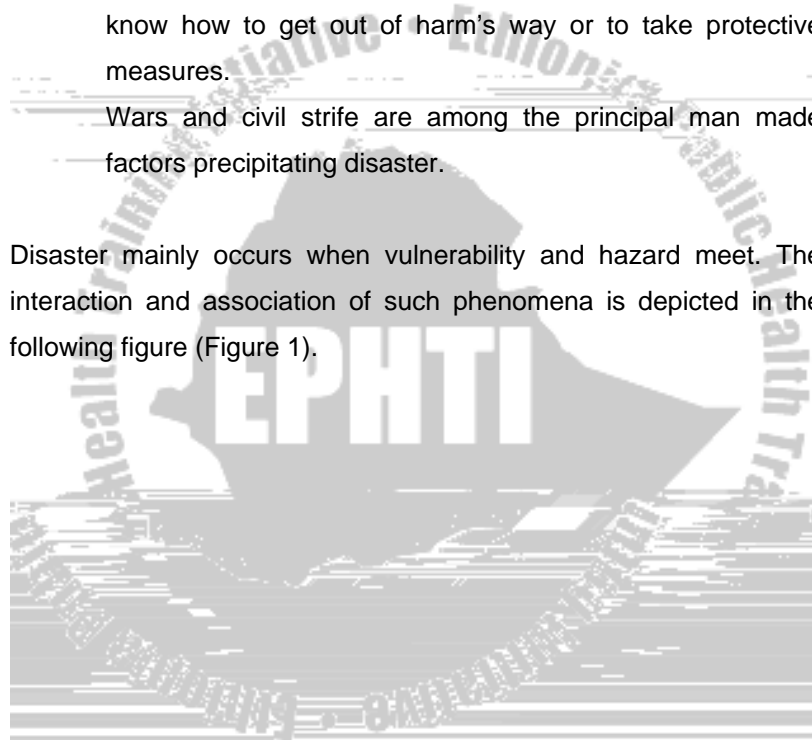
lead to civil conflict (e.g. communal violence triggered by religious differences).

Environmental degradation: Deforestation leads to rapid rain run off, 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.

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



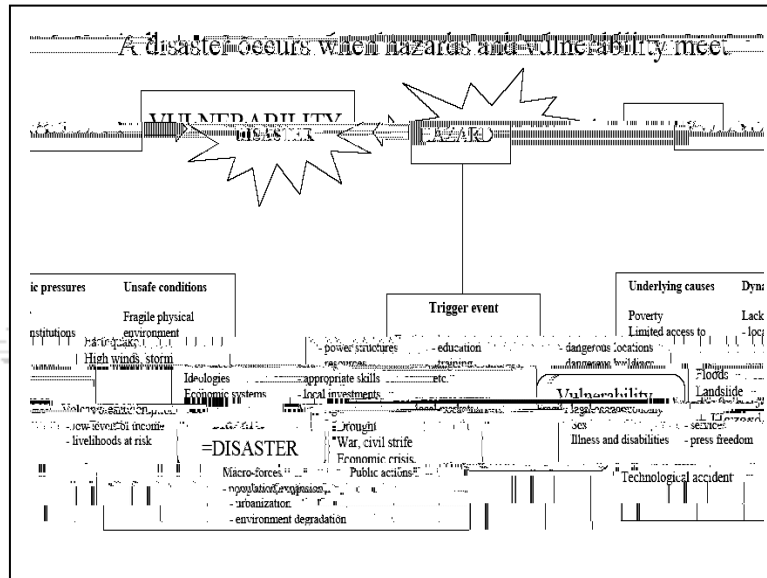


Figure1: Relationship of vulnerability, hazard and disaster

Source: WHO/EHA, 2002

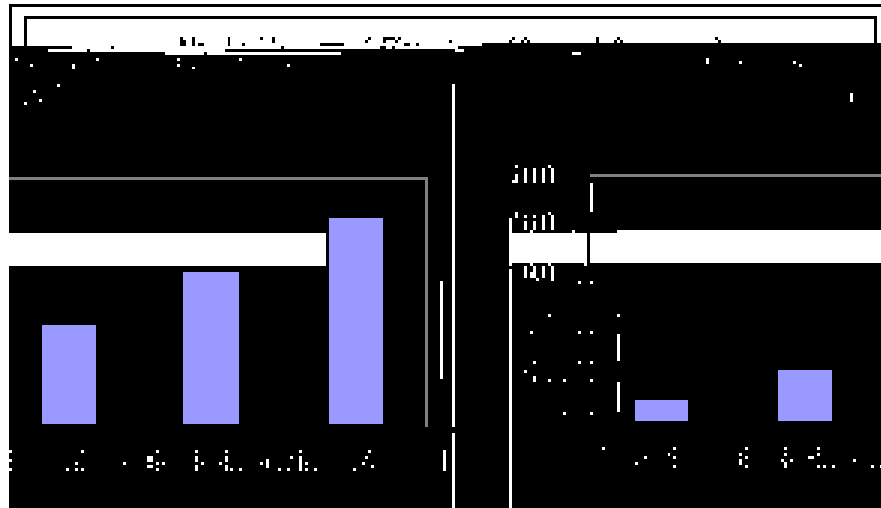
1.3. TYPES OF DISASTERS

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

1.3.1. Natural disasters

Natural disasters occur as the **result of action of the natural forces** and tend to be accepted as unfortunate, but inevitable. The





Source: Emergency Disasters Data Base, EM-DAT.

<http://www.em-dat.net/>

Figure 2: Global trends of natural disasters.

In 1992 alone, natural disasters costed the world economy more money than it 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 that 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 for 97 percent of the total people affected by disasters, and 60 percent of the total economic losses⁽³⁰⁾. The damage and costs inflicted by natural disasters spread well

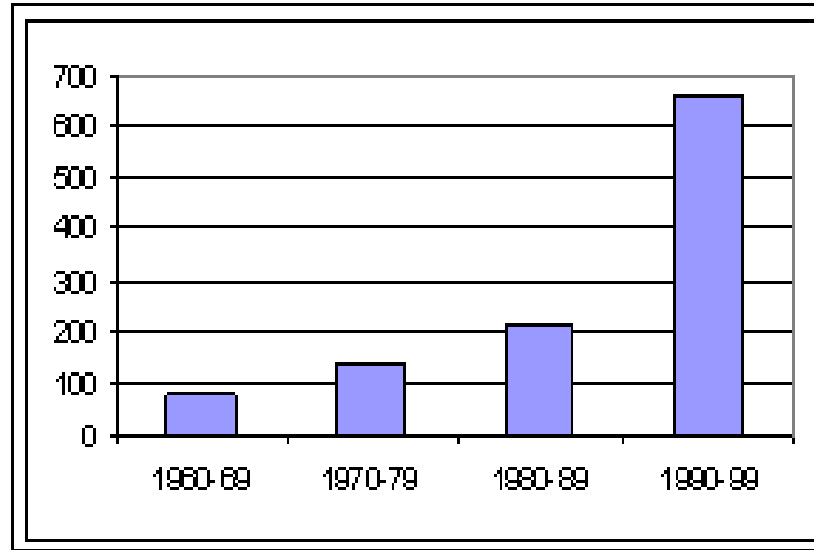
beyond the immediate regions affected, to countries as a whole and often to the wider global community.

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





development, and they account for more than 53 percent of total recorded deaths⁷. For each hazard type, disaster risk is considerably lower in high-income countries than in medium- and low-income countries.



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

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 the 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 establishing 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.

1.3.2. Human (technological) causes

The 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



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

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,



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

1.4. 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:

1. 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.

2. Impact and flight phase: when a disaster strikes the hazard (fire,



that they can return home, integrate with the local community or relocate else where. 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 the 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.

5. 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.

6. Rehabilitation 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.





CHAPTER TWO

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.

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.



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



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. T



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.

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

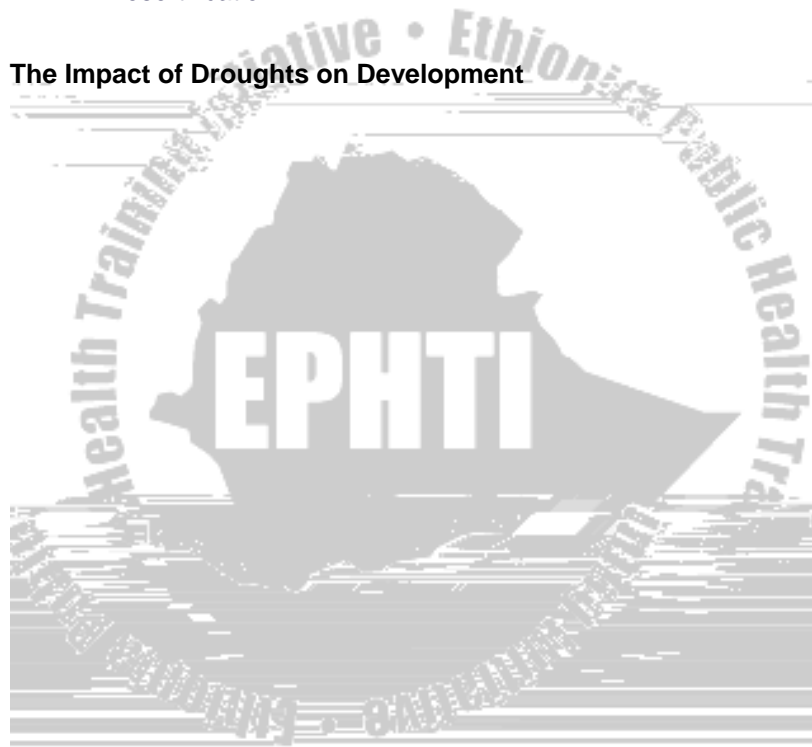
- Water supplies are overtaxed and finally dry up
- Loss of crops
- Loss of livestock and other animals, and
- Loss of water for hygienic use and drinking.

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



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.

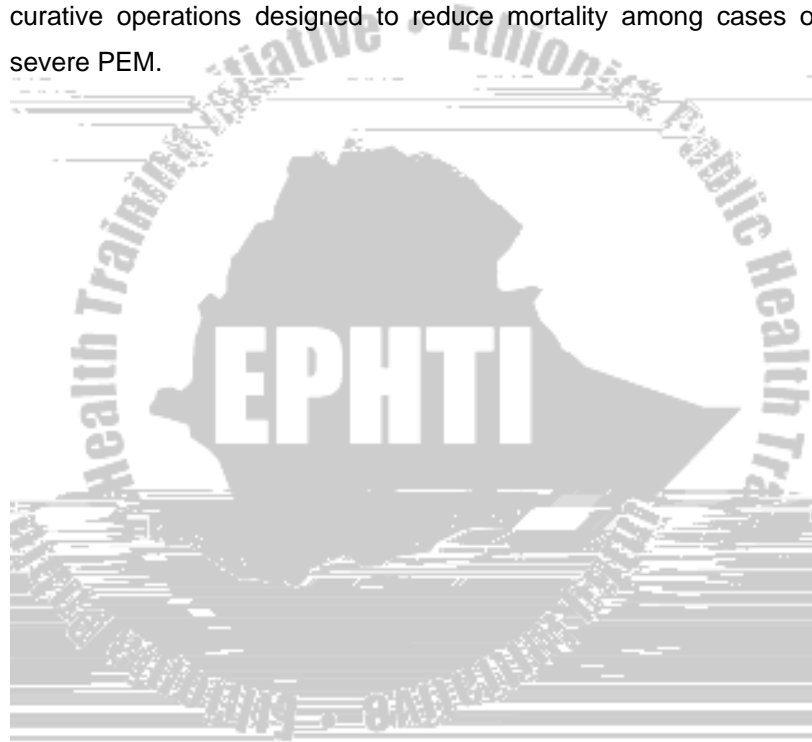




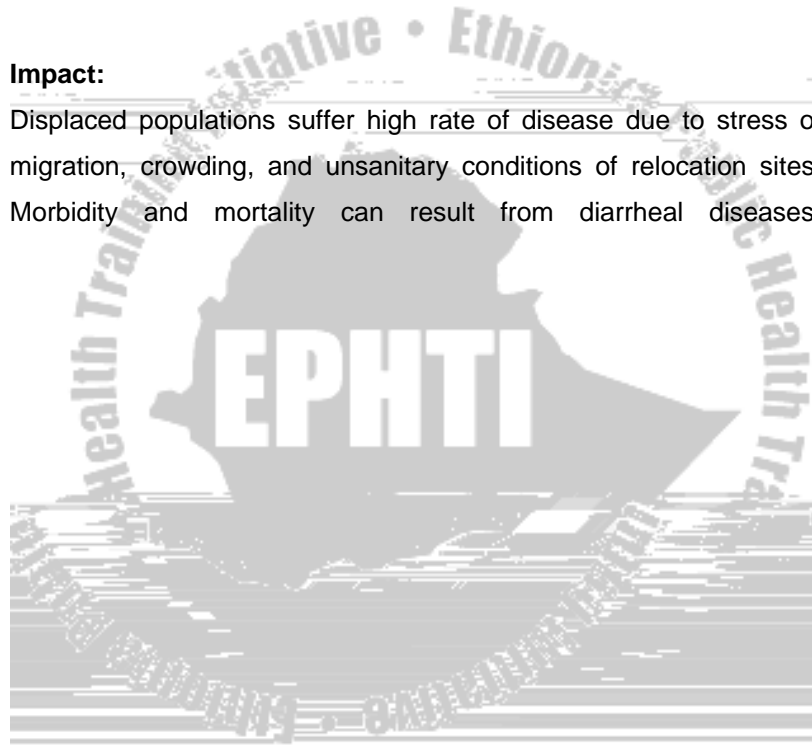
Figure 5 African Countries facing food emergency, 1996 Map



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,



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,



persist long after the floods have receded, since people have lost their homes, their livelihood and their confidence.

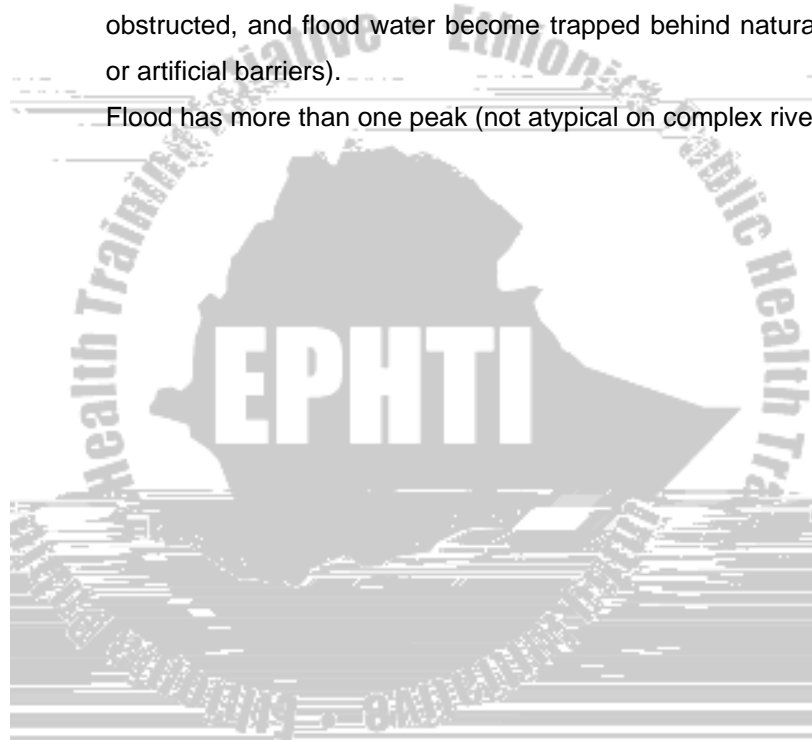
Risk of morbidity and mortality



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





- 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-meess), 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. T

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 isn't 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 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.

deaths each year may be associated with PM pollution. The American Lung Association believes that PM2.5 represents the most



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 (NO_x): Nitrogen monoxide (NO) and nitrogen dioxide (NO₂)

The two forms of nitrogen oxide 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 colorless, odorless 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 colorless 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.

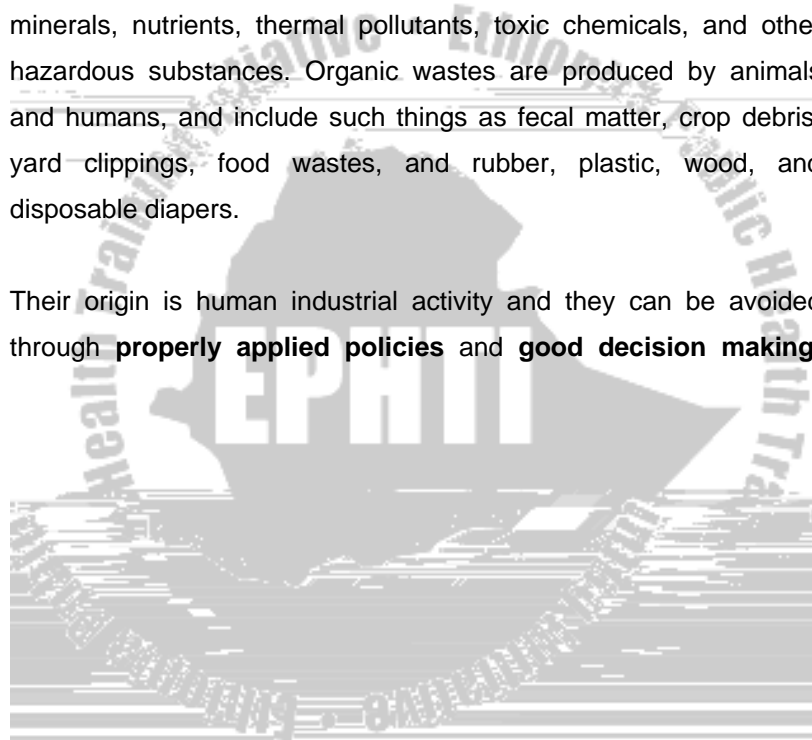
2.9.2. Water pollution and contamination

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**.





- More frequent extreme high maximum temperatures and less frequent extreme low minimum temperatures;
-



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.

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 extreme high water levels from [storm surges](#). Related problems are the contamination of coastal freshwater supplies with encroaching sea water, 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 modeling 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 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

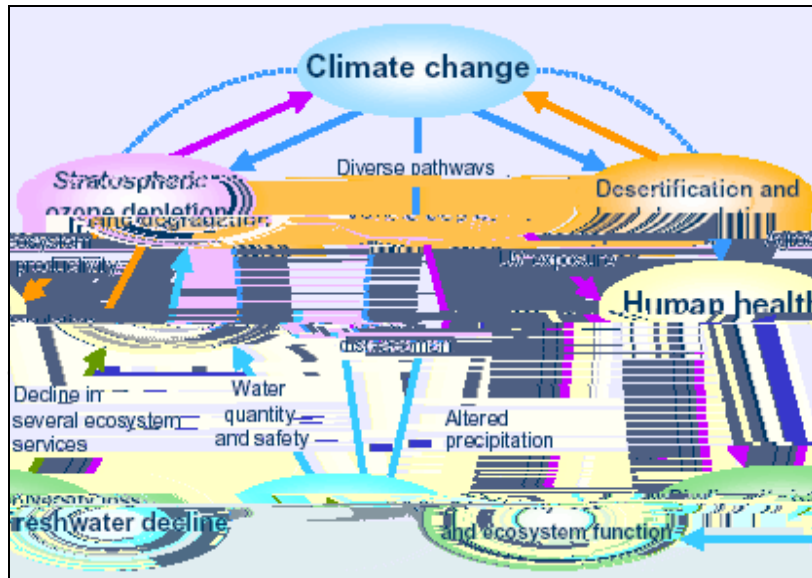
Climate change may increase the risk of death, according to World Health Organization report of 2006. Many important diseases that affect developing countries are sensitive to climate variations, according to the report, and even a proportionally small change in the global incidence of some diseases 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 diarrhea, malaria, and cardiovascular disease related to heat and cold, malnutrition, and flooding in several developed and developing regions ⁽²²⁾.

"Provision of clean water and sanitation not only cuts overall diarrhea rates, but also decreases the importance of the bacterial pathogens that respond positively to temperature, and decreases risks of diarrhea 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/> (date of access Aug 10, 2006)

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



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 from 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 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

extinguishers. As a result of 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 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⁽⁴³⁾.

Solar UVB radiation has been found to cause damage to early developmental stages of fish, shrimp, crab, 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

secondary wound infection). Stress-related disorders are more common, as is 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 wild fires. Fires can be triggered or exacerbated by lightning, high winds, earthquakes, volcanoes, floods and 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



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

- 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
<p>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.</p>	<p>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.</p>

- 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:



- Mark the entrance to your property with address signs that



- Have chimneys, wood stoves, and all home heating systems



- Connect garden hose to outside taps. Place lawn sprinklers



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

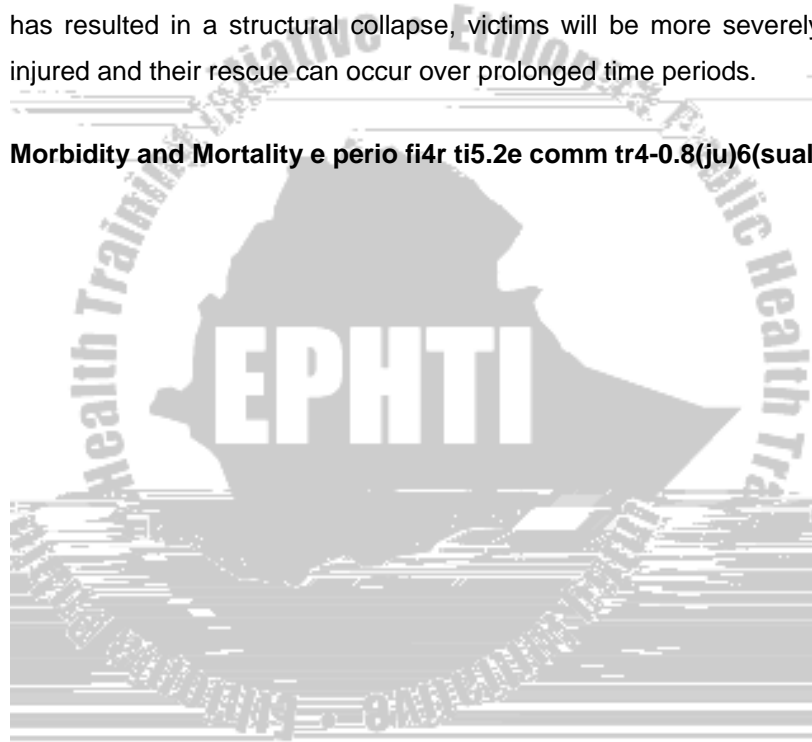
More than four out of every five wildfires are started by people. **Negligent human behavior,** such as **smoking in forested areas** or **improperly extinguishing campfires,** are the causes of many forest fires. Another cause of forest fires is **lightning.** Prevention efforts include working with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

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 e perio fi4r ti5.2e comm tr4-0.8(ju)6(sual7.6(mand03 Trvivors5.2)8I7.6-2.2)



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 protocols for disaster preparedness?



CHAPTER THREE

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 causes and consequences of population displacement.

List 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

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.

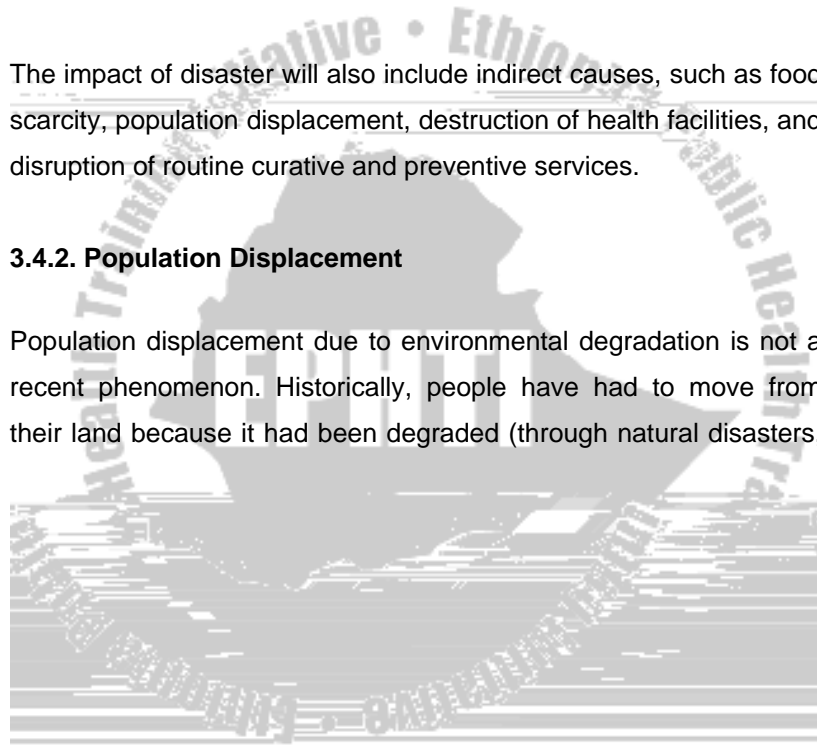
Human right violations:

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,



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;

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.

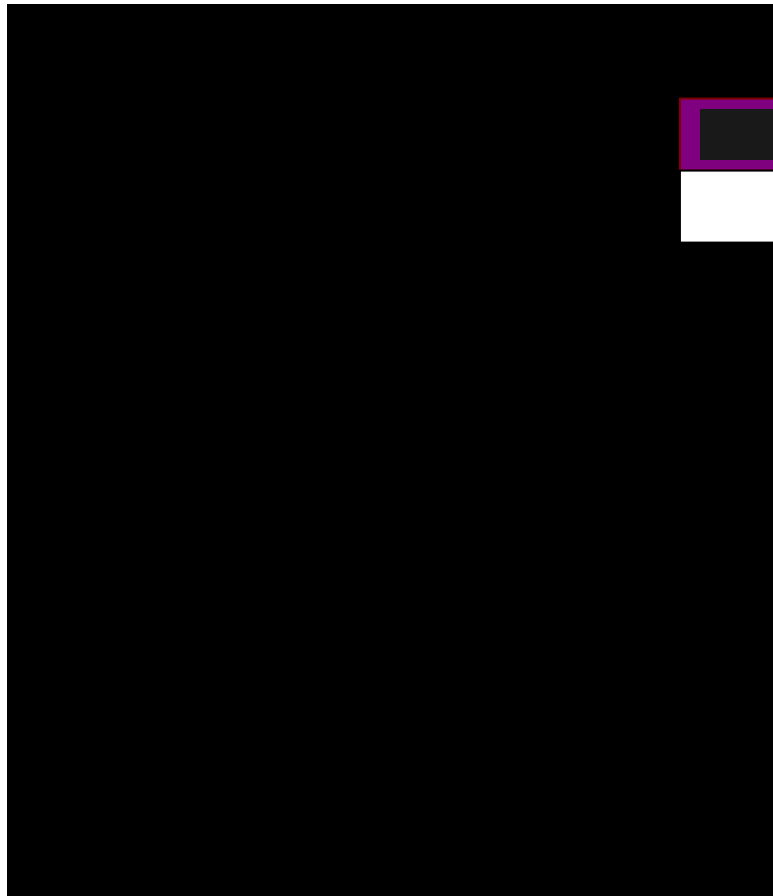
3.4.4. Climatic exposure

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







Drought
Prone are

Non-dro
prone are

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;

more than six weeks, the patients are considered to have been entered stage two.

- **Stage two** is characterized by a sense of helplessness and



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;

3.4.6.2. The elderly in disasters:





maturity;
experience with prior disasters;
Leadership type (good leadership).



- 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.



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



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.



CHAPTER FOUR

DISASTER MANAGEMENT

Learning Objectives:

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



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



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



- *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.

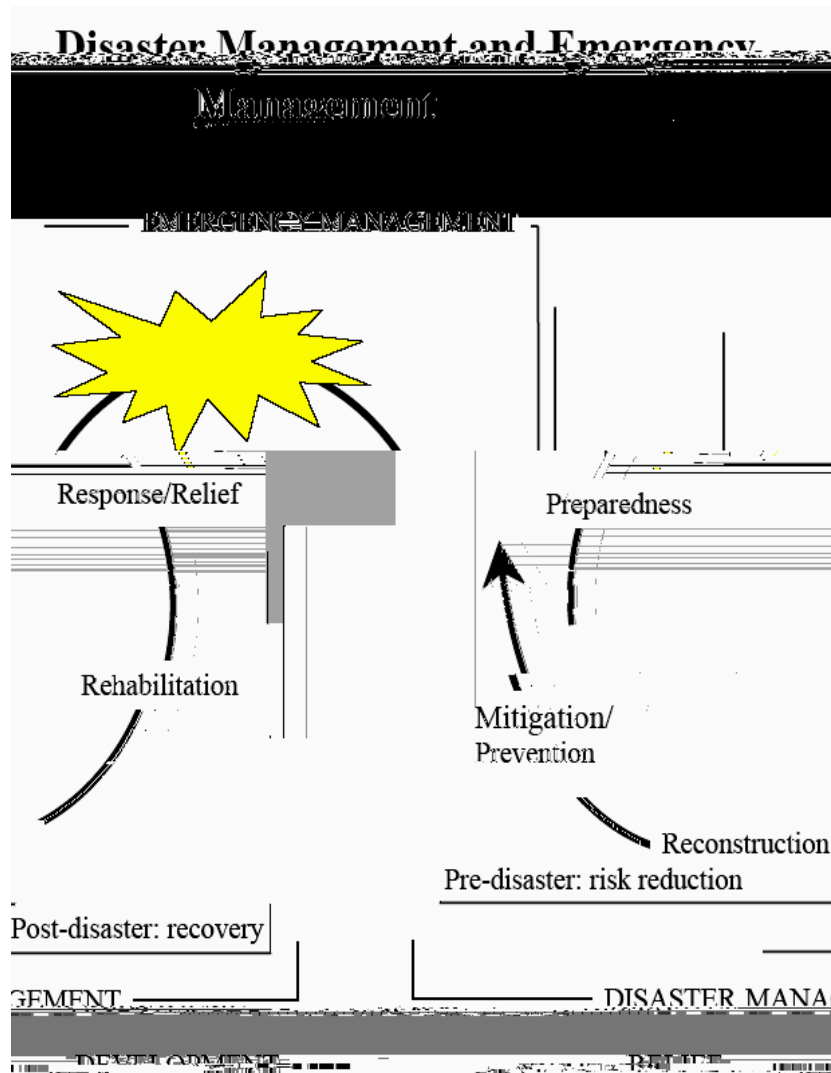


Figure 8 Phases of Disaster Management

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. Pick also 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:





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

Triage



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



1. Community recovery:

Have we considered the specific needs of our



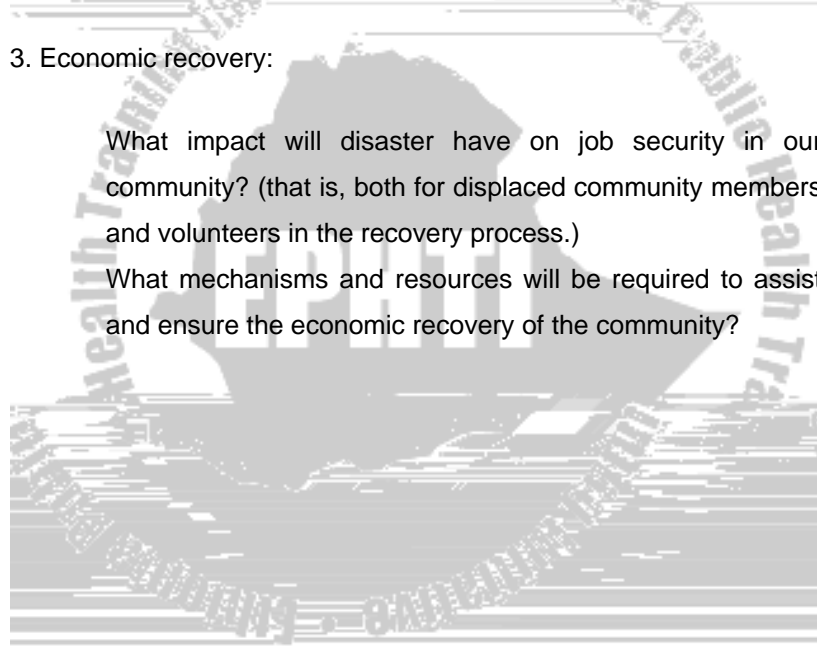
circulating information to and from the community. It also encompasses communication with disaster workers (staff and volunteers), media, local government management, suppliers, groups and authorities including the local disaster management group.

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?



Principles of disaster recovery and reconstruction:

Three phases describe as to what happens to post-impact in the affected community:

1. *Emergency phase*: activities should focus on saving lives through search and rescue, first aid, emergency medical assistance and overall 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.
2. *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.
3. *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

- *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



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:

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.

Principles of the undertaking are to:

Maximize use of pre-existing surveillance data for "baseline" information, and to modify conditions

Coordinate efforts after 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 rumored.
2. Establishment of a mechanism for dissemination of surveillance information to both encourage taking of appropriate measures and discourage 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



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.

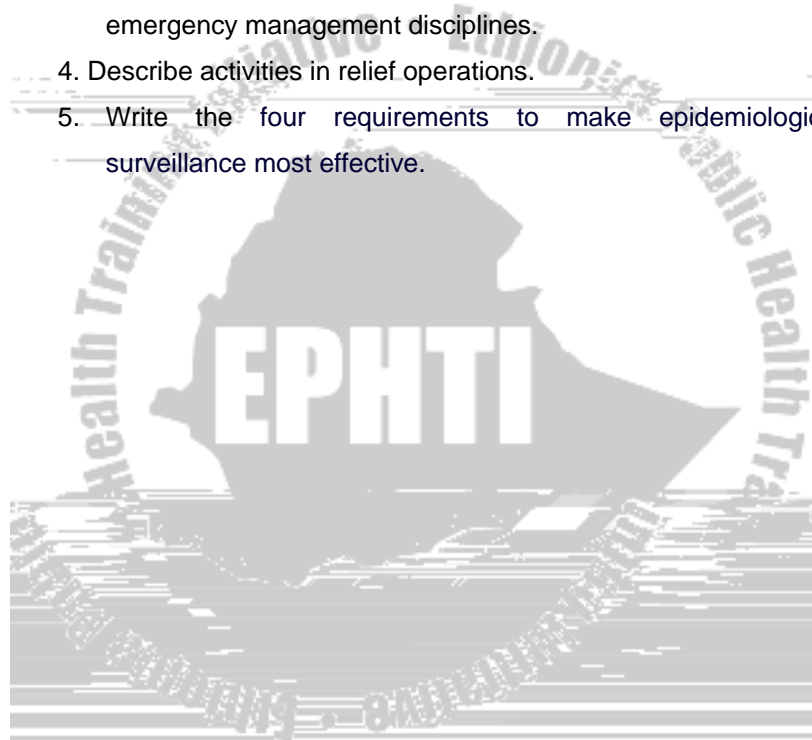
Surveillance During and After the Recovery Phase

With 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.



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.



CHAPTER FIVE

DISASTER IN ETHIOPIA

Learning objectives:

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

Explain most prevailing disasters in Ethiopia.

Describe parts of Ethiopia frequently affected by drought and famine

5.1 Introduction:

There are different disasters that affect Ethiopia. The country has been drastically hit by and still is vulnerable to disasters due to various reasons such as low socio-economic development and hence inadequate action both to prevent and to respond to disasters. Among the frequent ones the following are worth mentioning: **famine, drought, forced displacement** (due to war, civil strifes, political), **floods, landslides, fires, epidemics** (of human and animals), **pests** etc. Some of these will be discussed in detail as follows.

5.2. Drought and Famine

The most serious impact of droughts can be the initiation of famine. Its importance warrants an in depth discussion. It should be

regarded as a parallel disaster that will have parallel implications for **preparedness, mitigation, and relief activities.**

Drought affects more people than any other environmental hazard. Yet, it is perhaps the most complex and least understood type of all environmental hazards. Drought is often seen as too little rain and used to be synonymous with famine. However, fluctuation in rain fall does not cause a famine. Drought often triggers a crisis in the arid and semi-arid areas, since rain is sparse and irregular, but alone does not cause desertification. The ecosystem changes leading to desertification are all attributed to human activities, such as **over cultivation, deforestation, overgrazing, and unskilled irrigation.** Each of these activities is exacerbated by increasing human populations. The first three activities strip the soil of vegetation and deplete its organic substances and nutrient.

Famine is a disaster that occurs as the result of primarily drought, but it can also follow pestilence, windstorm, and human- induced catastrophes such as war and civil strife. Starvation is the result of food shortage. Famine and food emergencies are common events particularly in Africa, including Ethiopia and Asia, despite many intense and continuing efforts to address the problems. Drought-related famines appear to occur with cyclical frequency in many parts of Africa, both along the edges of deserts and in certain rain forest regions.

Famines rarely occur unexpectedly. Food stocks are not often depleted or destroyed suddenly and simultaneously in large

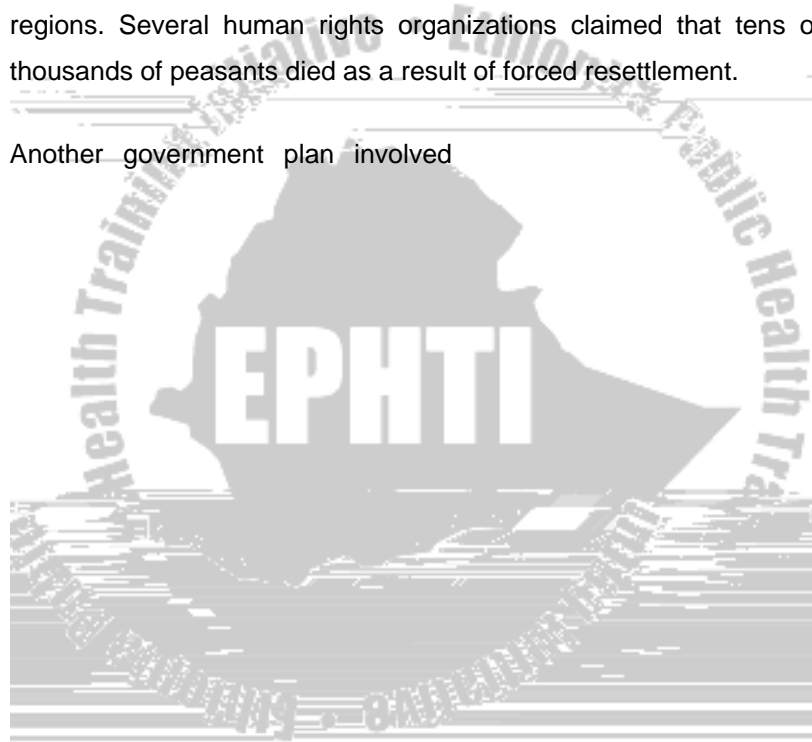
communities. More frequently, famine is predictable. In other words, the creeping onset of crop failure or food emergency is predictable from a series of meteorological, agricultural, political and/or economic indicators that may be monitored continuously. This process of famine preparedness through surveillance is a major





the affected areas in the north and to resettle them in the southern part of the country. In 1985 and 1986, **about 600,000 people were moved, many forcibly**, from their home villages and farms by the military and transported to various regions in the south. Many peasants fled rather than allow themselves to be resettled; many of those who were resettled sought later to return to their native regions. Several human rights organizations claimed that tens of thousands of peasants died as a result of forced resettlement.

Another government plan involved



Drought is the primary reason Ethiopians go hungry, but it intertwines with other factors that keep Ethiopians too poor and too sick to recover from drought years. Rural Ethiopians have never fully recovered from the famine of 1984, nor the severe droughts that have come after, especially in 1999 and 2000. The impact of drought in Ethiopia is magnified by **the country's deforestation** and the **depletion of soil by farmers** who cannot afford to let land lie fallow. The effects of dry periods linger long after the rains return.

Drought reduces harvests and deprives livestock of water and pasture, forcing farmers and animal herders into a spiral of debt. Even if the rains are good, each year Ethiopians get hungrier. The long-term issue is poverty - famine hits those too destitute to buy food or produce their own. Fighting famine inside Ethiopia means providing not only emergency food, but also programs to help people emerge from the trap of destitution. Rural Ethiopians need more markets for their crops and better roads to be able to move their products to other parts of the country. Famine is not a sudden event, but an evolving process, one that involves much more than food.

Traditionally the [Economy of Ethiopia](#) is based on [subsistence agriculture](#)... Due to a number of causes, the peasants did not have incentives to either improve production or to store their excess [harvest](#). Despite the extensive modernization of Ethiopia in the last 120 years, [as of 2005](#) the overwhelming majority of the populations are still peasants who live from harvest to harvest, and are vulnerable to crop failures. Table 1 summarizes the types of

disasters, area (regions) affected, possible causes, and their effects in chronological order.

Table 1 Chronology of major drought and famines in Ethiopia.

Date	Regions affected	Causes and severity (description):
1535	Tigray	Famine and epidemic documented in <i>Futuh</i> , affecting Ahmad Gragn's occupying army
1540	Not mentioned	Contemporary accounts describe this famine as "worse than that which occurred at the time of the destruction of the Second Temple " (Pankhurst
1567-1570	Harar	Famine in combination with plague and Oromo incursions. Nur ibn Mujahid died. "The Amir Nur exerted every effort to help his people to recover, but after every respite the Oromo would again descend like locusts and scourge the country.
1611	Northern provinces	The heavy rains that fell that year and extreme cold caused extensive crop failures. This same year a plague called

		<i>mentita</i> also afflicted Ethiopia.
1633-1635	Tigray and Gondar (Dambiya)	Reports of locusts in Tigray 1633-1635. An epidemic of <i>kantara</i> or <i>fangul</i> (cholera) also afflicted Dambiya, spreading into Tigray.
1653	Not mentioned	Epidemic of <i>kabab</i>
1678	Not mentioned	Cost of grain inflated; this led to the death of many mules, horses, and donkeys.
1702	Not mentioned	Starving peasants appealed to Emperor lyasu I , crying that if he did not feed them they would die. In response the Emperor and his nobles fed an uncountable number of the destitute for two months.
1774	Not mentioned	Famine attributed to locusts in Royal Chronicle. There was an epidemic of fever (<i>gunfan</i>), possibly influenza .
1752	Not mentioned	Remedius Prutky ignores (unaware of?) famine.
1783	Not mentioned	Famine called "my sickness" in Royal Chronicle
1789	Ethiopia	Famine afflicted "all the provinces"
1796	Gondar	This famine was particularly serious, and blamed on an infestation of

		locusts.
1800	Not mentioned	Soldiers died on campaign due to famine.
1880	Tigray and Gondar	Much loss of livestock.

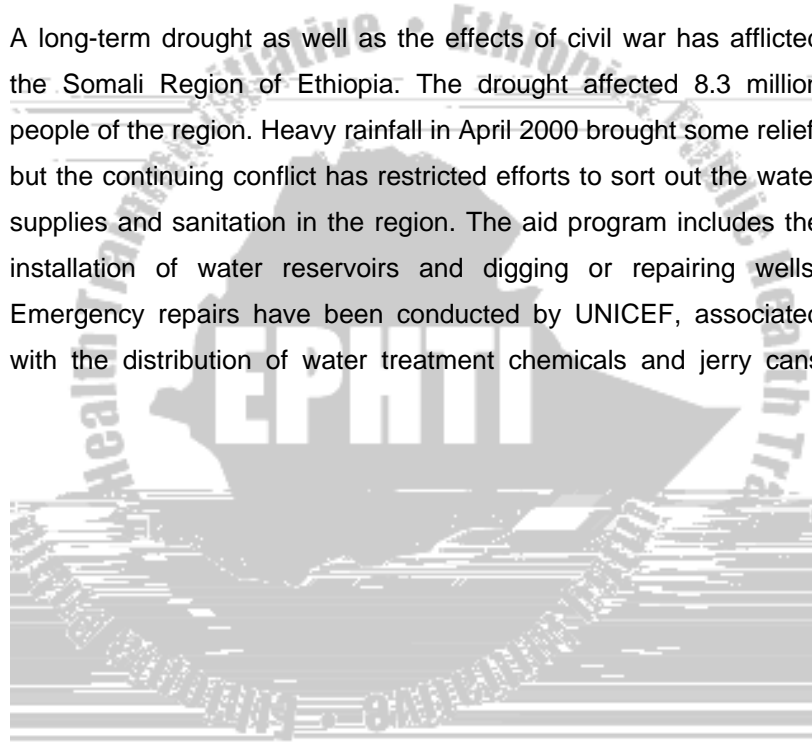


	Wollo	epidemic in 1958.
1962-1963	Western Ethiopia	Very severe
1964-1966	Tigray and Wollo	Undocumented; said to be worse.
1971-1975	The whole Ethiopia	Sequences of rain failures; estimated 250,000 dead; 50% of livestock lost in Tigray and Wollo. Contributed to fall of the Imperial Government and led to Derg rule.
1978-1979	Southern Ethiopia.	Failures of Belg rains.
1982	Northern Ethiopia.	Late Meher rains.
1984-1985	The whole Ethiopia	Sequential rain failures; 8 million

Sources:http://www.answers.com/main/ntquery?method=4&dsid=2222&dekey=Ethiopian+famine&gwp=8&curtab=2222_1&linktext=Ethiopian%20famine (date of access: August 10, 2006).

Water shortages due to drought and war in Ethiopia

A long-term drought as well as the effects of civil war has afflicted the Somali Region of Ethiopia. The drought affected 8.3 million people of the region. Heavy rainfall in April 2000 brought some relief, but the continuing conflict has restricted efforts to sort out the water supplies and sanitation in the region. The aid program includes the installation of water reservoirs and digging or repairing wells. Emergency repairs have been conducted by UNICEF, associated with the distribution of water treatment chemicals and jerry cans



related to climate that has many of the worst characteristics of technological disasters. In general drought is characterized by the following features:

A drought's onset and end are difficult to determine because the effects accumulate slowly and may linger even after the apparent termination of an episode;

The absence of precise and universally accepted definition adds to the confusion about whether a drought exists, and if it does, the degree of severity;

Drought effects are less obvious and spread over a larger geographic area.

Disaster Preparedness for famine and drought

Several preparedness activities will decrease the impact of droughts on human settlements. Establishment of a monitoring system is very important. The first step in drought preparedness is to **establish a monitoring system to provide warning** if a drought is imminent. A monitoring system should be based on simple information that non-technical observers can easily acquire and transmit. Such a system is usually based on indicators. Am

- an increase in the death rate of animals;
- changes in the migratory patterns of nomads;





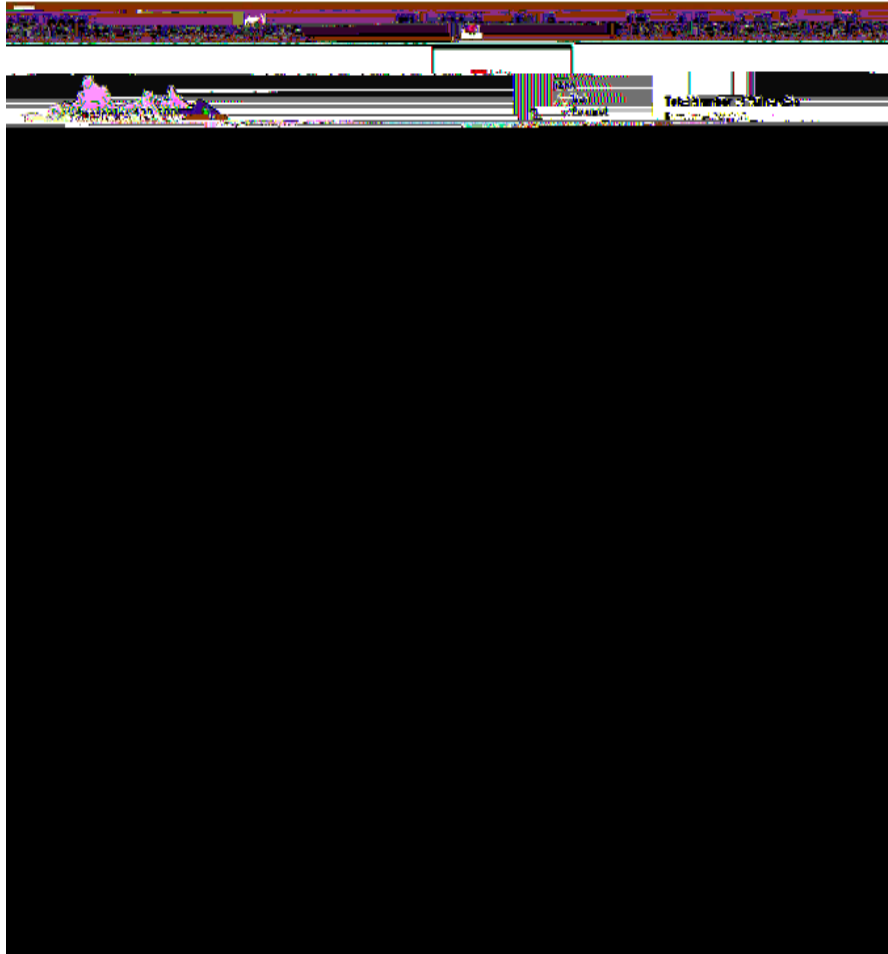


Figure 8 Flood vulnerable areas and population at risk as of August 24, 2006.

The distribution affected and vulnerable population by region is shown in table 2 below.

Table 2 Distribution of Flood Vulnerable and Affected population of Ethiopia by administrative regions, September 2006

No	Region affected	Vulnerable population	Affected Population
1	Afar	28,000	4600
2	SNNP	106,300	44,000
3	Amhara	47,100	47,100
4	Oromia	61,300	21,900
5	Tigray	122,300	2,600
6	Dire Dawa	10,400	10,400
7	Somali	87,000	43,200
8	Gambella	62,000	26,100
Total		524,400	199,900

The effects and distribution of the 2006 floods are summarized as follows:

- **Dire Dawa:** the heavy rains from the high lands of East Hararge zone of Oromia regional State caused flash flood from the overflow of Dechatu dry season stream that severely affected Dire Dawa in the middle of the night on the six of August 2006, while residents were asleep where by it killed 256 and affected 9,000 people. It also washed away houses and properties of many people living along the riverbank. Roads, bridges and other properties were damaged and washed away. The estimate of over all loss of

damage of properties of individuals and infrastructure was Eth Birr 27 million.

- **South Nation and Nationalities People Region:** over flow of Omo River in August 2006 affected about 8,000 people in Desenech and Gngatom districts of South Omo zone. It also killed 364 people and took away some 3,200 cattle and destroyed other properties, including 760 traditional stores. Furthermore, flash floods from Bilate River was reported to have affected 5370 households, in Humbo district, of Wolayta zone of which 2,515 were severely affected and required immediate emergency assistance.
- **Amhara Region:** overflow of Rib and Gomara Rivers and Lake Tana in Libo kemekem and Fogora districts of south Gondar, and Bahirdar town of west Gojam and flash floods in Dewcheffa and Ansokia of Oromia and north –shewa zones respectively, displaced people from their residential places and forced about 13,362 people to stay under temporary shelters.

- **Somali Region:**



Location	Year	Magnitude	Damage
Langano	1906	6.8 Richter	Felt as far as Addis Ababa
Kara Kore	1961	6.7 Richter	Town of Majete destroyed. Kara Kore seriously damaged.
Central Afar Area	1969	-	Town of Serdo destroyed.
Rift Valley Area	1987	6.2 Richter	Widely felt and widely-spread damage.
Dobi [Central Afar]	1989	6.3 Richter	Several bridges damaged.
Nazareth	1993	6.0 Richter	Injuries and damage in Nazareth. Also felt in Debre Zeit and Addis Ababa.

Source: Earthquake Risks in A

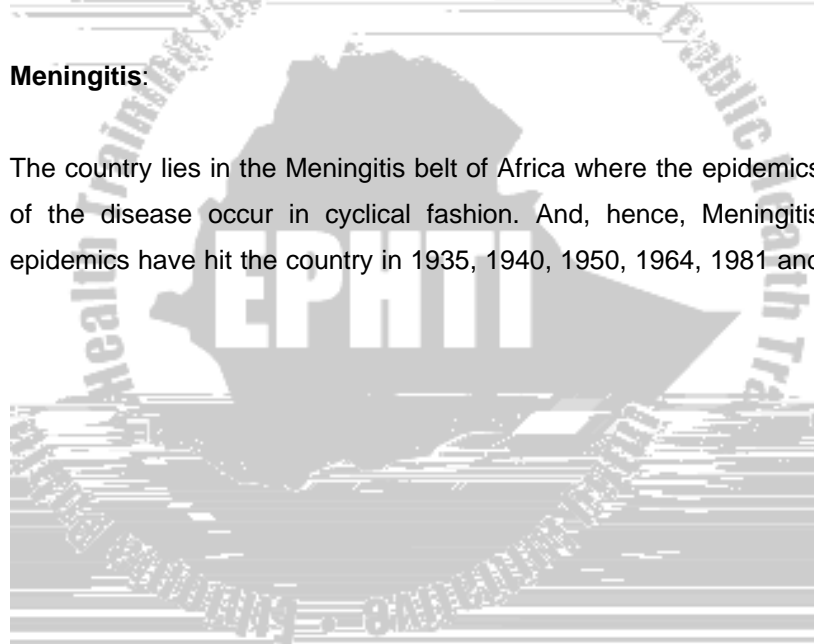
-In Damot Gale -625 hectares of crop land and 266 roofs were destroyed

5.6. Epidemics:

Ethiopia has been exposed to many epidemics of different magnitudes at different times in history. Among others, the following are worth mentioning

Meningitis:

The country lies in the Meningitis belt of Africa where the epidemics of the disease occur in cyclical fashion. And, hence, Meningitis epidemics have hit the country in 1935, 1940, 1950, 1964, 1981 and



examination. This condition is aggravated when compounded by other disasters due to migration to malarious areas, lowered immunity, changes in rain patterns, etc.

Cholera, Typhoid fever, Bloody Diarrhea, Louse-borne Relapsing fever, Measles and other communicable diseases are problems following other disasters due to low level of hygiene, shortage of potable water supply, overcrowding, pollution of water



Exercises:

1. Write true if the statement is true and false if the statement is false.
 - 1.1. Famine is predictable _____.
 - 1.2 It is difficult to closely monitor and take measures quickly if it appears that a food shortage is developing _____.
 - 1.3. It is possible to determine drought onset and end _____.
 - 1.4. Preparation can help reduce the impact of drought _____.
2. List 10 famines that were significant in the history of Ethiopia.
3. Mention the causes as well as the impacts of drought in Ethiopia.
4. Describe common disasters in Ethiopia.

CHAPTER SIX

ROLE OF THE PRIMARY HEALTH CARE UNIT (PHCU) IN DISASTER MANAGEMENT

Learning objectives:

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

Describe the roles and responsibilities of public health in both disaster preparedness and response.

Organize the functional model of public health response to disasters.

6.1. Role of Primary Health Care Unit Team in the event of Disaster

The three main objectives of public health response to a disaster are to **mitigate mortality and morbidity**, **restore the health status to pre-disaster levels**, and **establish a recovery process** that *will* promote health and a preparedness level to even beyond the pre-disaster condition.

Public health professionals must take responsibility for community health in both disaster preparedness and response. The following are some of the roles of public health:



Communicating with government officials about the public health effects of potential disasters and providing expert assistances during and after disasters;

Collaborating with other health and human service professionals to rigorously evaluate the intervention outcome.

The responsibilities of public health agencies in disaster preparedness and response are more complicated than in a typical public health activity. In order to discharge the above duties and responsibilities the public health team should develop an action plan.

6.2 Action plan

The health sector is responsible for ensuring the continuity of health care services. Components of the plan may include:

- Ensuring continuity of health care services (by checking the availability and functionality of all necessary

6.3 Functional model of public health response

The functional model summarizes a typical disaster response within the public health field and categorizes the cycle of activities. The model identifies tasks assigned to each of the core areas of public health in the context of emergency management activities.

The functional model outlined below comprises of six phases that correspond to the type of activities involved in preparing for and responding to a disaster: planning, prevention, assessment, response, surveillance, and recovery. The model additionally delineates the responsibilities of various disciplines of public health.

6.3.1 Planning:

Apply basic concepts of local public health (promotion, prevention, control, curative and rehabilitation activities) to disaster management;

Conduct health facilities disaster planning and coordinate with hospitals

Help community develop plan with public health focus;

Develop health promotion and disease prevention protocols and motivate use through education campaign;

Conduct needs assessments and analyze hazards and vulnerability;

Work with other health professionals to write a disaster plan specifically for public health and health concerns;

Train workforce on public health responsibilities;

Inventory supplies, equipment, communications, and people available for response;

Develop mutual aid agreements in advance;

Conduct facility-wide/agency-wide exercises to stress organizational mobilization, coordination and communication.

6.3.2 Prevention:

Primary prevention (before event):

Immunization;

Control/prevent outbreaks;

Protect against risks identified in hazards, vulnerability, and needs assessments;

Conduct community education in first aid, personal hygiene, and injury prevention;

Protect and distribute safe food and water;

Ensure availability and functionality (or reestablish) of sanitation systems.

Secondary prevention (response to event):

Detect and extricate victims;

Provide emergency medical care;

Organize services and treatment;

Conduct case identification and surveillance;

Establish infectious disease control;

Conduct short-term counseling/intervention;

Establish continuous data monitoring.

6.3.4 Response:

Conduct “quick and dirty” assessment on which to base initial decisions;
Administer logistics;



What is risk of delayed (long-term) effects (i.e. cancer, birth defects) from the chemical or nuclear mishap to the average citizen and to those who are pregnant?

How to protect from hazards.

6.3.4.2 Management:

Dispose of waste, debris, human and animal bodies, and biologic hazards;

Control disease vectors;

Monitor water, sanitation, food, and shelter;

Control infection;

Control clean-up injuries (i.e. chainsaw accidents, electrocution, fire, unsafe structure);

Control delivery of mental health services;

Communicate health information and risks via media outlets;

Control diseases and issue quarantines where necessary;

Provide interventions into large groups.

6.3.4.3 Surveillance:

Establish syndromic information systems for disaster;

Conduct sentinel surveillance, using active or passive systems, of disease and public health conditions;

Use data to recognize acute disease state and high risk groups.

6.3.4.4 Recovery:

- Determine present level and extent of patient care capability;
- Interpret data to influence deployment of resources;
- Work with community agencies to mitigate long-term impact of public health;
- Conduct evaluations (structured, semi-structured, qualitative);
- Plan and direct field studies;
- Manage media;
- Use principles of capacity building;
- Mobilize resources;
- Use techniques for supplemental and therapeutic food distribution and feeding;
- Organize and conduct large-scale immunization and primary health care;
- Ensure maintenance of mental health program;
- Establish and operate special needs shelters.

Exercises:

Briefly explain phases of the functional model that corresponds to type of activities involved in preparing for and responding to a disaster:



REFERENCES

1. Landesman, Y.L., 2001, Public health management of disasters: The practice guide. American Public Health Association, 800 I Street, NW, Washington, DC.
2. Hoodgkinson, E. P., and Stewart, M., 1998, coping with Catastrophe: A Handbook of post-disaster psychosocial after care, Great Britain by MPG Books Ltd, Bodmin.
3. Waugh, W., L., JR., 2000. Living with hazards dealing with disasters: An introductory to emergency management, M. E. Sharpe, Inc. New York.
4. Hogan, E., D., Burstein, L., J., 2002, Disaster Medicine: Lippincott Williams and Wilkins, 530 Walnut Street, Philadelphia, PA 19106 USA, LWW.com
5. Haddow, G., D., Bullock, J., A., 2003, Introduction to Emergency Management, Elsevier Science, USA.
6. Braun, J., V., Teklu, T. and Webb, P., 1999, Famine in Africa: Causes, Responses, and Prevention. The International Food Policy Research Institute, USA.
7. Schneid, T., D., Collins, L., 2000, Disaster Management and Preparedness, CRC press, USA.
8. Kevin, M., Chahill, M., D., 2003, Emergency Relief Operations. The Center for International Health and Cooperation, USA.
9. Runge, C., F., Senauer, B., Pardey, P., G., Rosegrant, M., W., 2003, Ending Hunger in Our lifetime: Food Security and

- Globalization. The International Food Policy Research Institute, USA.
10. Leisinger, K., M., Schmitt, K., M., Lorch, R., P., 2002, Six billion and counting: Population Growth and Food Security in the 21st Century. The International Food Policy Research Institute, Washington, D. C.\
 11. Disaster Management Center, Department of Engineering Professional Development University of Wisconsin-Madison, 2006, Natural Hazards: Causes and Effects: 432 North Lake Street Madison, WI 53706 U.S.A.
 12. WHO/EHA, 2002. Disasters and Emergencies, Definitions Training Package. Pan African Emergency Training Centre, Addis Ababa.
 13. Transitional Government of Ethiopia (TGE) 1993. National Policy on Disaster Prevention and Management (Unpublished Document), Addis Ababa – Ethiopia.
 14. Wetern A. Karl, 1982. Epidemiologic Surveillance after Natural Disaster: Pan American Health Organization, Pan American Sanitary Bureau, Regional Office of the World Health Organization, 525 Twenty-third Street, N.W. Washington D.C. 20037, U.S.A.
 15. [Ethiopian famine information From Answers.com.htm](#) (Date of access 2/1/2006).
 16. [Ethiopian history, the history leading to Ethiopia's famine.htm](#) (Date of access 2/1/2006).
 17. [Rosenzweig, C.](#) and [Hillel, D.](#), Potential Impacts of Climate Change on Agriculture and Food Supply: Consequences Vol. 1, No. 2, Summer 1995, U.S. Global Change Research

- Information Office, Suite 250, 1717 Pennsylvania Ave, NW, Washington, DC 20006, <http://www.gcrio.org/>.
18. *Policy statement excerpted from [Social Work Speaks, 5th Edition: NASW Policy Statements, 2000-2003](#), from NASW Press (2000).*
 19. <http://www.who.int/entity/globalchange/en/> (date access May 20, 2006)
 20. [CSD 1998 Background paper ch 176-disast2 NATURAL DISASTER AND FRESHWATER RESOURCES.htm](#) (date access April 10, 2006)
 21. [Effects of Global warming- Wikipedia, the free encyclopedia.htm](#) (date of access June 1, 2006).
 22. <http://www.science.org.au/nova/081/081print.htm> (date access April 28, 2006)
 23. <http://msglossary.allenpress.com/glossary/search?id=air-pollution1> (date of access: June 18, 2006)
 24. <http://courses.dce.harvard.edu/~environment/National-International-Environmental-Legislation-new/sld002.htm> (date access: August 10, 2006)
 25. http://www.answers.com/main/ntquery?method=4&dsid=2222&dekey=Ethiopian+famine&gwp=8&curtab=2222_1&linktext=Ethiopian%20famine (date of access: 2/1/ 2006)
 26. [Church World Service Emergency Response program Training and Resources Hazards and Disaster Linking Disaster and Development+pdf.htm](#) (date of access: April 15, 2006).
 27. http://www.ace.mmu.ac.uk/eae/Ozone_Depletion/Older/Causes.html (date of access: August 10, 2006).

28. <http://www.epa.gov/ozone/uvb> (date of access: August 10, 2006).
29. UNDP and UNDRP, 1992. An Overview of Disaster Management, 2nd edition. Disaster Management Training Program.
30. MOH, 2004. Guidelines for the Prevention and Control of Selected Epidemic Disease in Ethiopia. Department of Disease Prevention and Control, Addis Ababa, Ethiopia.
31. Kinde Samuel, March 2002. Earthquake Risks in Addis Ababa and Other Major Ethiopian Cities – Will the Country be caught off-guarded?
32. United Nations Institute for Training and Research, 1991. The Challenge of African Disasters: 801 United Nations Plaza, New York, N. Y. 10017 U.S.A.
33. <file://localhost/D:/Environmental%20Management%20and%20Disaster%20Reduction.htm>. (Date of access 2/7/2006).
34. Disaster Prevention and Preparedness Agency August 2006. Joint Government and Humanitarian Flash Appeal for the 2006 Flood Disaster in Ethiopia, Addis Ababa, Ethiopia (A Preliminary document).
35. <file://localhost/D:/Loss%20of%20Stratospheric%20Ozone%20and%20Health%20Effects%20of%20Increased%20Ultraviolet%20Radiation.htm> (Date of access 2/1/2006).
36. <file://localhost/D:/Frequently%20Asked%20Questions%20About%20Ozone%20to%20the%20Environmental%20Effects%20Assessment%20Panel.htm> (Date of access 2/1/2006).

37. <file:///localhost/D:/EPAOAQPS%20%20Risk%20Assessment%20for%20Toxic%20Air%20Pollutants%20A%20Citizen's%20Guide.htm> (Date of access 2/2/2006).
38. <file:///localhost/D:/Coalition%20for%20Clean%20Air%20-%20Air%20Pollution%20-%20Pollutants%20&%20Health%20Effects.htm> (Date of access 2/2/2006).
39. <file:///localhost/D:/Damage%20and%20Needs%20Assessment%20Lesson%201%20Setting%20Up%20Surveillance%20Systems%20After%20a%20Disaster%20University%20of%20Wisconsin%20Disaster%20Management%20Center.htm> (Date of access 2/2/2006).
40. <file:///localhost/C:/Documents%20and%20Settings/Admin/My%20Documents/Disasters/potential%20climatic%20effects.htm> (date of access 1/24/2006).
41. UNDP/UNDRO Disaster Management Training Programme