LECTURE NOTES

For Health Science Students

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

deaths, injuries, illness, and property damage cannot be effectively managed with routine procedures or resources.

Disaster is further defined as an event in which a society or a community undergoes acute deprivation of food and other basic necessities due to natural and man made calamities to such an extent that the normal function of the society or the community is disrupted and that it cannot subsist without outside intervention [13].

Emergency is a state in which normal procedures are suspended and extra-ordinary measures are taken in order to avert a disaster. An emergency can be defined in the context of the social, political and epidemiological circumstances in which it occurs.

Hazard is a rare or extreme event in the natural or human made environment that adversely affects human life, property or activity to the extent of causing a disaster. It is essential to make a distinction between hazards and disasters, and to recognize that the effect of the former upon the latter is essentially a measure of the society's vulnerability.

[12]

Mitigation: is permanent reduction of the risk of a disaster. Primary mitigation refers to reducing the resistance of the hazard and reducing vulnerability. Secondary mitigation refers to reducing the effects of the hazard (preparedness).

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

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

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).

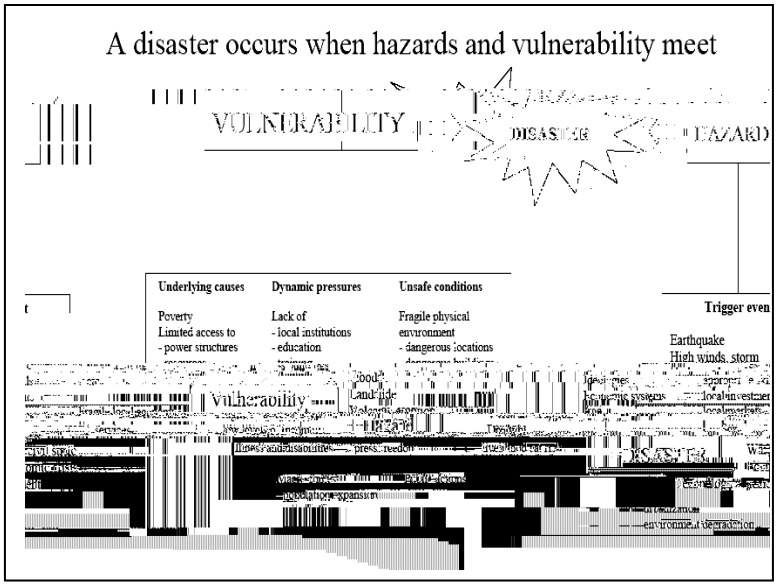


Figure1: Relationship of vulnerability, hazard and disaster

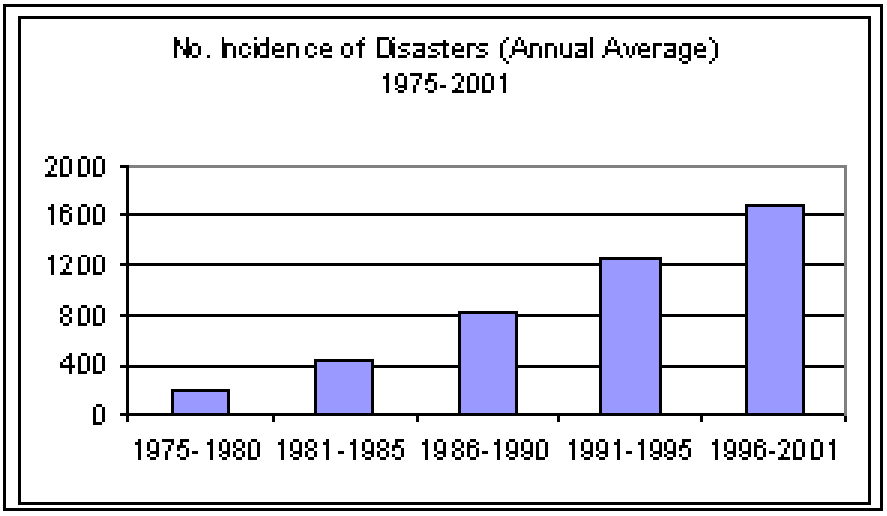
Source: WHO/EHA, 2002

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



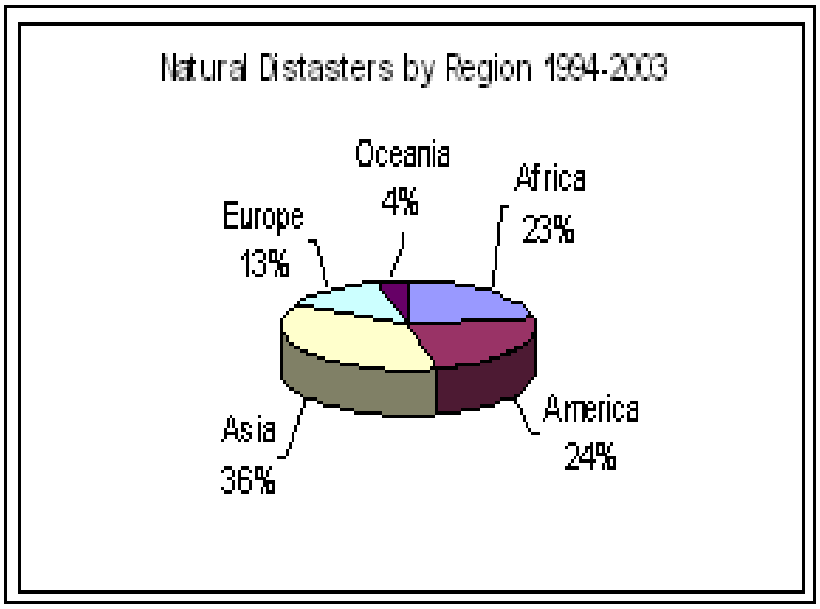
Source: Emergency Disasters Data Base, EM-DAT.
(http://www.em-dat.net/)

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 (IS EmohSof thec *), 5.8323 4.1377.0004 th

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

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

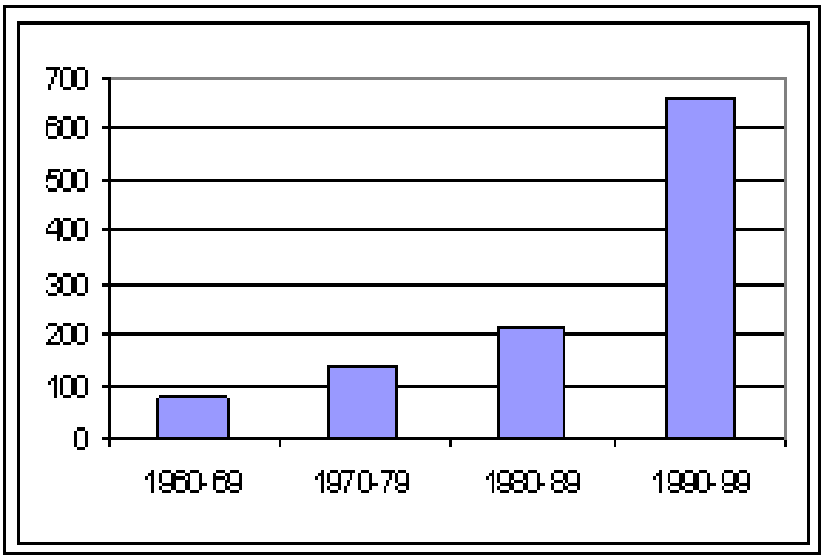


Source: Emergency Disasters Data Base, EM-DAT.
(http://www.em-dat.net/)

Figure 3: Distribution of natural disasters by Region

Around 75 percent of the world's population lives in areas affected at least once by earthquake, tropical cyclone, flood or drought between 1980 and 2000. Billions of people in more than 100 countries are periodically exposed to at least one event of earthquake, tropical cyclone, flood or drought. As a result of disasters triggered by these natural hazards, more than 184 deaths per day are recorded in different parts of the world, 11 percent of the people exposed to natural hazards live in countries classified as having low human

development, and they account for more than 53 percent of total recorded deaths[7]. 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

sewer lines, deforestation, war, etc. Technological disasters tend to involve many more casualties than natural disasters of the same magnitude of energy release.

Technological or man-made disasters are unpredictable, can spread across geographical areas, may be unpreventable and may have limited physical damage but long-term effect. They are also much

hospital and hospital systems to care for patients exposed to industrial agents, the training of medical personnel to work in contaminated environments, and the stockpiling of personal protective equipment for responders – is key for providing care following industrial accidents.

Another classification of disasters will be as follows:

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

2. **Slow-onset disasters** include droughts, famine, environmental degradation, deforestation (loss of trees and vegetation), pest infestation and desertification (conversion of arable lands to deserts). These disasters are usually the result of adverse weather conditions combined with poor land use. Traditionally, African communities, particularly the poor, have been at increased risk of

these types of disasters because of poverty and social inequality,

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

stocking basic supplies, planning evacuation routes, monitoring trends, etc.

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

3. Acute phase: this phase begins immediately after the impact of the disaster and marked by intense, often reactive activities by many humanitarian agencies responding to media reports of very high death rate (may be 5-60 times the normal death rate). The priority is to keep the affected people alive. Security may be a major concern in complex emergency situations. Critical services such as providing food, water, sanitation, basic health care, protection from violence and harassment are to be quickly organized. This phase ends when crude death rate falls below 1/10,000 persons per day (the crude mortality rate for stable population in Africa is about 0.5/10,000 individual per day).

4. P**ost emergency phase**: the population movement usually slows down. This enables critical services to be properly established and maintained. During this phase the cause of displacement may be evolving. The displaced people wait for “something to happen” so

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

Exercise:

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

CHAPTER TWO

FACTORS LEADING TO DISASTERS

2.2. Deforestation

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

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

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

Impacts

The greatest and most immediate danger of deforestation is that gradually diminishing forested area

earthquakes.

Impact on Agriculture and Ecology

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.

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

westerly currents as they descend east of the summits. This allows them to hold moisture and carry it away.

- **Absence of rainmaking disturbances** causes dry weather even in areas of moist air. In general, rain is caused by the travel of organized disturbances across a region--i.e., systems that involve actual uplift of humid air. There is plenty of water in the air, but nothing to bring it down as rain.
- **Absence of humid airstreams**. The relationship between the water available for precipitation (precipitable water) and the precipitation that actually falls is by no means simple.

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

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

Human activities also contribute to the development of drought conditions. Overgrazing,s aliti1rgrazuTJ0 malg

Recurrence Interval

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

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

Impact of Droughts on Built and Natural Environments

Primary (Immediate) Effects

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

Secondary (Resulting) Effects of Drought

- Migration in search of better grazing lands

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

The Impact of Droughts on Development

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

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

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

Relief Operations for Famine and Food Emergencies

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

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

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.

1.4.13. Countries Facing Food Emergencies 1996, Map

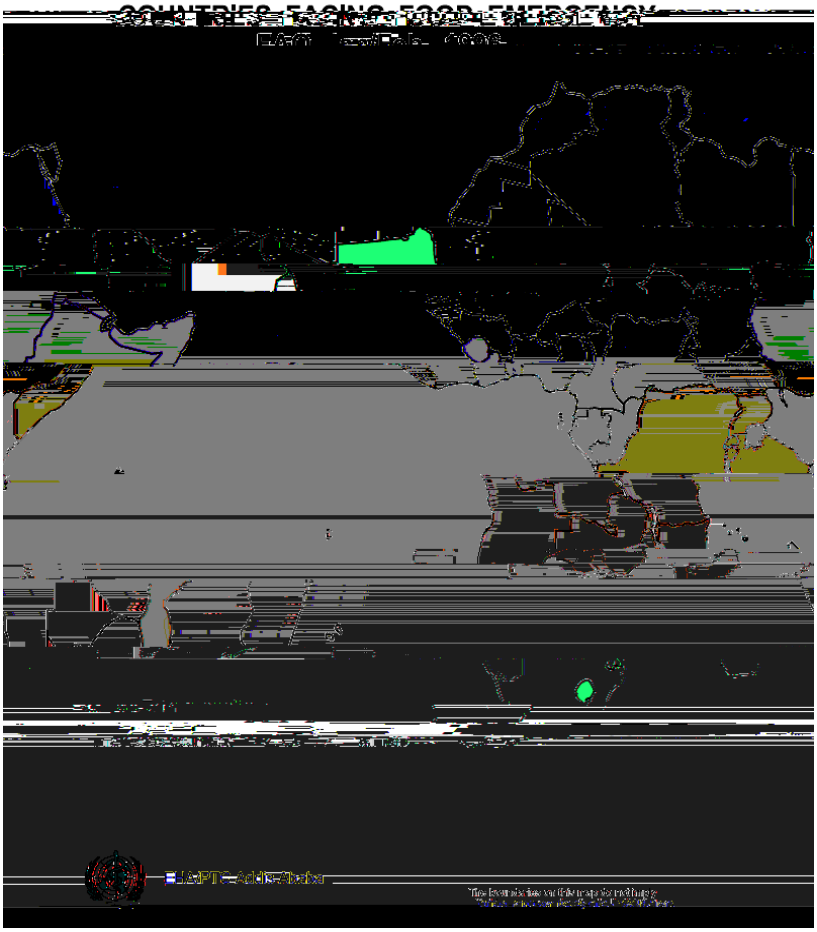


Figure 5 African Countries facing food emergency, 1996 Map

Public health interventions

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

2.4. Epidemic

Definition:

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

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

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

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

Impact:

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

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

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

- Risk of introduction to and spread of the disease in the population;
- Large number of cases may reasonably be expected to occur ;
- Disease involved is of such severity as to lead to serious disability or death;
- Risk of social or economic disruption resulting from the presence of the disease;
- Authorities are unable to cope adequately with the situation due to insufficient technical or professional, organizational experiences, and necessary supplies or equipment (eg. Drugs, vaccines, laboratory diagnostic materials, vector control materials, etc.);
- Risk of international transmission.

Public health intervention:

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

2.5. Pest Infestation

Pest infestation can cause tremendous damage to crop production and thus undermine the food security of a particular area. Locust

(desert and migratory) and grasshopper's infestations are the main threats in sub-Saharan Africa. Current pest monitoring and control programs together with the promotion of agricultural diversity have lessened, though by no means eradicated, the threats of food shortages due to infestation.

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

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

Recent food safety issues related to diseases such as bovine spongiform encephalopathy (BSE) and avian flu have become a serious concern for consumers, farmers, food processors, food retailers and governments alike. Furthermore, food contamination with non-authorized food additives, chemicals such as polycyclic aromatic hydrocarbons (PAHs) and acryl amide, microbiological pathogens (*Salmonella, E. coli*,) and mycotoxins, among others,

have created worldwide concern regarding the safety of food supplies. To better address the existing and emerging challenges, FAO is recommending, as well as applying, a comprehensive approach, food chain approach, to food safety and quality issues that shares the responsibility for providing safe food among all players in the food and agricultural sector, from food producers and processors to retailers and consumer households.

Management/ Public health intervention:

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

increasing faster than any type of disaster. Much of this rise in incidence can be attributed to **uncontrolled urbanization**, **deforestation**, and more recently, **the effect of El Niño**. Floods

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

Risk of morbidity and mortality

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

Life-threatening characteristics of floods:

- Absence of warning of a flood (either 'official' warning or warning derived from cues e.g. heavy rain).
- High floodwater velocities (like in hilly or mountainous terrain or where stream disgorge on to plains from upland areas; in river valleys with steep gradients; in areas behind floods embankments or natural barriers which may breach or overtop, below dams which may break).
- Rapid speed of flood onset (like in areas when streams are 'flashy' i.e. rise and fall rapidly; these are usually urban areas or arid rural areas where soil surface becomes compacted and hard; or in areas where high floodwater velocities are expected).

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

Management/ Protective Measures

Before a Flood, you should:

- Avoid building in a floodplain unless you elevate and reinforce your home.
-

- Construct barriers (levees, beams, floodwalls) to stop floodwater from entering the building.
- Seal walls in basements with waterproofing compounds to avoid seepage.
- Learning swimming skill is helpful.

During a Flood

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

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

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

- Secure your home. If you have time, bring in outdoor furniture. Move essential items to an upper floor.
- Turn off utilities at the main switches or valves if instructed to do so. Disconnect electrical appliances. Do not touch electrical equipment if you are wet or standing in water.

If you have to leave your home, remember these evacuation tips:

- Do not walk through moving water. Six inches of moving water can make you fall. If you have to walk in water, walk where the water is not moving. Use a stick to check the

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

Protective Measures

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

Magnitude:

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

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

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

- 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.

Public health interventions:

- ❖ Encourage earthquake drills to practice emergency procedures;
- ❖ Recommend items for inclusion in an extensive first aid kit

2.9. Pollutions and health consequences of pollutions:

Definition:

2.9.1. Air pollution:

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

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

Primary Pollutants & their Health Effects:

Particulate Matter (PM):

Particulate matter consists of soot and dust particles that are smaller than the diameter of a human hair. Particulate matter is all particles smaller than 10 microns in diameter are classified as PM10 or coarse size particles. Fine size particles, or PM2.5, are those particles less than or equal to 2.5 microns in diameter. Sources of PM include diesel exhaust, soil dust, tire wear, and soot. These particles penetrate deeply into the lungs and are captured by lung tissue. A major contributor to the PM pollution problem is exhaust from diesel vehicles, which produce 79% of the particulate emissions from mobile sources. Exposure to PM pollution has been associated with **respiratory and cardiac problems**, **infections**, **asthma attacks, lung cancer** and **decreased life expectancy**. The World Health Organization has estimated that **500,000 premature**

deaths each year may be associated with PM pollution. The American Lung Association believes that PM2.5 represents the most serious threat to our health. Segments of the population that are more susceptible to PM pollution include children, athletes, senior citizens, and people with pre-existing respiratory problems.

Ozone (O3)

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

Hydrocarbons

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

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

- The two forms of nitrogen oxide 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**. With increased urbanization, increase in population density and industrialization, the problem of pollution might also become more important. The polluted water may cause death or diseases by poisoning.

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

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

2.10. Global warming

How might the climate change?

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

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

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

Effects of global warming

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

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

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

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

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

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

Rising sea levels as the result of global warming

Global warming is predicted to **lead to thermal expansion of sea water.** Scientists predict that sea levels will rise as the global temperature rises, due to the **melting of land-based ice** in the Polar Regions and **glaciers**, and the thermal expansion of the oceans. According to the most recent projections, sea levels could rise between 9 and 88 centimeters by the year 2100. A rise of this magnitude would have disastrous consequences for people living on

low-lying islands, such as the Maldives group in the Indian Ocean and many South Pacific islands. In parts of Egypt, Bangladesh, Indonesia, China, the Netherlands, Florida, and other low-lying coastal areas already suffering from poor drainage, agriculture is likely to become increasingly difficult to sustain.

Higher sea levels lead to coastal flooding and an increase in the frequency of 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 (

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 evidence, from climate models and hydrological impact studies, which flood frequencies, are likely to increase with global warming.

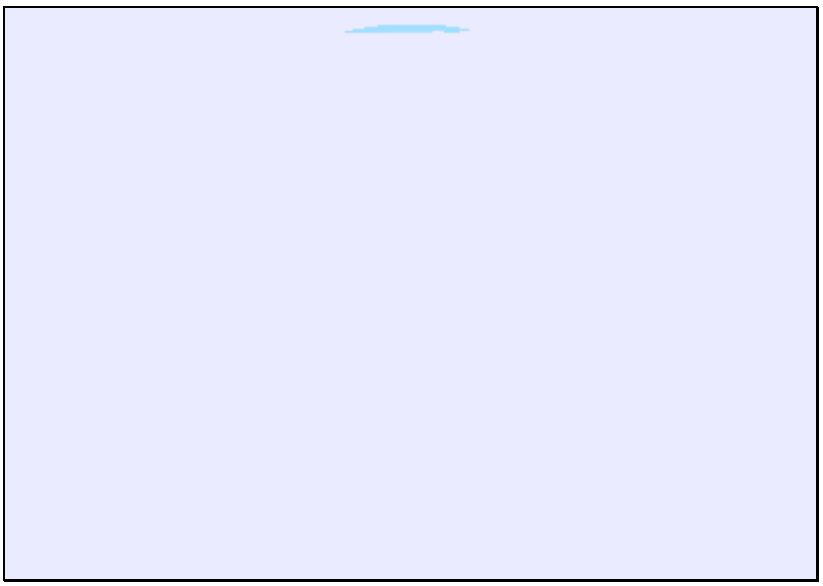
Climate change may increase the risk of death, according to World Health Organization report of 2006. Many important diseases that affect developing countries are sensitive to climate variations, according to the report, and even a proportionally small change in the global incidence of some diseases 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

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:

$Cl + O_3 \quad ClO + O_2$

$ClO + O \quad Cl + O_2$

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 exposure could result in significant reduction in the size of the population of animals that eat these smaller creatures.

On Biogeochemical Cycles

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

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

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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

- Place smoke alarms on every level of your residence. Place them outside bedrooms on the ceiling or high on the wall (4 to 12 inches from ceiling), at the top of open stairways, or at the bottom of enclosed stairs and near (but not in) the kitchen.
- Test and clean smoke alarms once a month and replace batteries at least once a year. Replace smoke alarms once every 10 years.
- Have record of fire brigades telephone in safe and accessible to member of the family.
-

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.
-

- 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.

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

- 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

before the box has cooled, the contents could burst into flames.

- If you must leave your home because a building inspector

- Mark the entrance to your property with address signs that are clearly visible from the road.
- Keep lawns trimmed, leaves raked, and the roof and rain gutters free from debris such as dead limbs and leaves.
- Stack firewood at least 30 feet away from your residence.
- Store flammable materials, liquids, and solvents in metal containers outside your residence at least 30 feet away from structures and wooden fences.
- Create defensible space by thinning trees and brush within 30 feet around your residence. Beyond 30 feet, remove dead wood, debris, and low tree branches.
- Landscape your property with fire resistant plants and vegetation to prevent fire from spreading quickly. For example, hardwood trees are more fire-resistant than pine, evergreen, eucalyptus, or fir trees.
- Make sure water sources, such as hydrants, ponds, swimming pools, and wells, are accessible to the fire department.
- Use fire resistant, protective roofing and materials like stone, brick, and metal to protect your residence. Avoid using wood materials.
- Cover all exterior vents, attics, and eaves with metal mesh screens to prevent debris from collecting and to help keep sparks out.
- Install multi-pane windows, tempea1,g((6s7safeproglasalyptu)etal)6.5( )]TJ1.3353 -1.722

- Have chimneys, wood stoves, and all home heating systems inspected and cleaned annually by a certified specialist.
- Insulate chimneys and place spark arresters on top. The chimney should be at least 3 feet above the roof.
- Remove branches hanging above and around the chimney.

Follow Local Burning Laws

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

During a Wildfire:

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

- Shut off gas at the meter. Only a qualified professional can safely turn the gas back on.
- Turn off propane tanks.
- Place combustible patio furniture inside.

- Connect garden hose to outside taps. Place lawn sprinklers on the roof and near above-ground fuel tanks. Wet the roof.
- Wet or remove shrubs within 15 feet of your residence.
- Gather fire tools such as a rake, axe, handsaw or chainsaw, bucket, and shovel.
- Back your car into the garage or park it in an open space facing the direction of escape.
- Shut doors and roll up windows.

Risk of Morbidity and Mortality

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

Public Health Interventions

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

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

2.14. Explosions

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

Public Health Interventions

- Identify the medical institutions and personnel who can provide emergency care

- Ensure that the community preparedness plan includes structure for surge capacity. To estimate the "first wave" of casualties, double the number appearing for care in the first hour. Prepare written communications and instructions for victims who may experience temporary or permanent deafness.

- Work with the regional Emergency Management Organization, police, fire, etc to have a plan in place to identify potential toxic exposures and environmental hazards for which the health department will need to help protect responders in the field and the community.

- With the hospital community, establish a victim identification registry.

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

Exercises:

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

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

months. These stress reactions may be categorized as physiological, cognitive/intellectual, emotional, and behavioral symptoms and may include the following:

Physiological Symptoms

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

Cognitive/Intellectual Symptoms

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

Emotional Symptoms

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

Behavioral Symptoms

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

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

3.3. Factors which may affect reactions

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

Host Related Factors

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

Health

- Disabled: physical, sight, hearing, speech

- Health and medical problems, receiving medication

Social

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

Demographic

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

Past History

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

3.4. PUBLIC HEALTH IMPACT OF DISASTER

3.4.1. Sexual violence

Rape is increasingly recognized as a feature of internal wars, but it 3.4.1.coulnes8.-a

exploitation may also be widespread in refugee camps, although the extent of its recognition is limited, widely varying estimates of the numbers of victims have been reported.

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

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

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

Human right violations:

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

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

3.4.2. Population Displacement

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

- Possibly large numbers of unaccompanied children;

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

- Extremes of both heat and cold can cause potentially fatal illnesses, e.g. heat stress or hypothermia, as well as increasing death rates from heart and respiratory diseases.
- In cities, stagnant weather conditions can trap both warm ai

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

3.4.5. Food shortage and malnutrition

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

DROUGHT PRONE COUNTRIES

Figure 7 Drought Prone Countries in Africa

3.4.6. Mental Health:

Post traumatic stress disorder:

Each disaster presents a slightly different profile of emotional trauma. However, some trends are predictable. All persons involved

with a disaster will suffer to some degree from the emotional trauma. Human-created disasters seem to cause a more intense reaction than those of natural occurrence. The most consistent positive predictor of significant symptoms is the degree of direct involvement in the disaster.

Risk factors for post traumatic stress disorder development after disaster:

- intense exposure to death and injury;
- exposure of survivors to dead bodies;
- overwhelming life threatening danger;
- unexpected or first exposure to disaster;
- intense initial phase (prolonged stress);
- manmade disaster with no warning;
- high impact ratios;
- dependence on outside agencies;
- exposure to prolonged stress.

Time course of post traumatic stress disorder:

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

- **Stage one** is associated with an adrenergic surge that occurs acutely, but persons rarely dwell long term on the incident. It may last up to one month, and, if symptoms last

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

- **Stage two** is characterized by a sense of helplessness and a loss of self-control. Autonomic and somatic manifestations dominate. Moreover, it is accompanied by lifestyle and personality changes.
- **Stage three** is characterized by profound despondency and demoralization.

Prognosis:

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

3.4.6.1. Children in disasters:

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

- Most studies to date have had significant methodological flaws.

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

The impact of disaster on children should be thought of in terms of their developmental age and not their **chronologic age**. Preschoolers are still exercising some normal separation anxiety. Disaster will increase the normal feelings. *Increased arousal, sleep disturbances, clinging and fear of being alone all become manifest*. School-age children tend to be less dependent on their parents. As such their response to the stress of a disaster may be less consistent. They may exhibit reckless behavior and may experience psychosomatic complaints. Adolescents, who are independent, often become involved in productive activities, such as rescue and recovery work. Some; however, may regress and may display withdrawn functioning under significant denial. Normal adolescent anxiety may be increased particularly if they identify with the victims.

Risk factors of an increased emotional trauma in children:

- high intensity event;
- injury to the child;
- loss of parent or significant person;

- ❖ fear of death, separation and recurrence of the disaster;
- ❖ insecurity, lack of support;

3.4.6.2. The elderly in disasters:

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

Treatment:

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

3.4.6.3. Rescue workers in disaster:

stress reactions seen in non-professionals involved in disaster response resemble the symptoms seen in primary victims. Many professional responders also report serious symptoms following disaster. Rescue workers will have more intense emotional trauma if

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

Coping methods for disaster recovery workers include:

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

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

3.4.7. Five experiences borne by survivors are:

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

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

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

- **Psychic numbing***:* it is manoeuvre, presenting survivors from experiencing the reality of the catastrophic destruction and death about them, and the massive personal threat implied.
  - It blocks the experience of too much unbearable pain at any time, and its first manifestations are present in the so called ‘disaster syndrome’, where immediately following the impact, behaving remarkable calmly.
  - They may seem to be in control and coping bravely – in fact, they have not yet to react. They are behaving as though they are calm observers of someone else’s experience.

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

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

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

Mutual assistance and disaster intervention programs may

response-not as a part of long term development programming. When a disaster did occur, the response was directed to emergency needs and cleaning up.

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

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

3.5.1 Disruption of Development by Disasters:

- Impact on investment
- Impact on the non-formal sector
- Political destabilization

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

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

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

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

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

3.5.2 How Development May Cause Disasters

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

3.5.3 Development opportunities afforded by disasters

Disaster can serve as a catalyst for introducing mitigation activities. Disasters often create a political and economic atmosphere wherein extensive changes can be made more rapidly than under normal circumstances. For example, in the aftermath of a disaster, there may be major opportunities to **execute land reform programs**, to **improve the overall housing stock**, to **create new jobs and job skills**, and to **expand and modernize the economic base** of the

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:

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

4.1 Introduction

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

Aims of disaster management are to:

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

or remote communities. The *public health infrastructure* is particularly important for the immediate measures needed and for public information on reducing the health risks.

The most important challenge is to change from concentrating solely on post-disaster relief and to

- *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

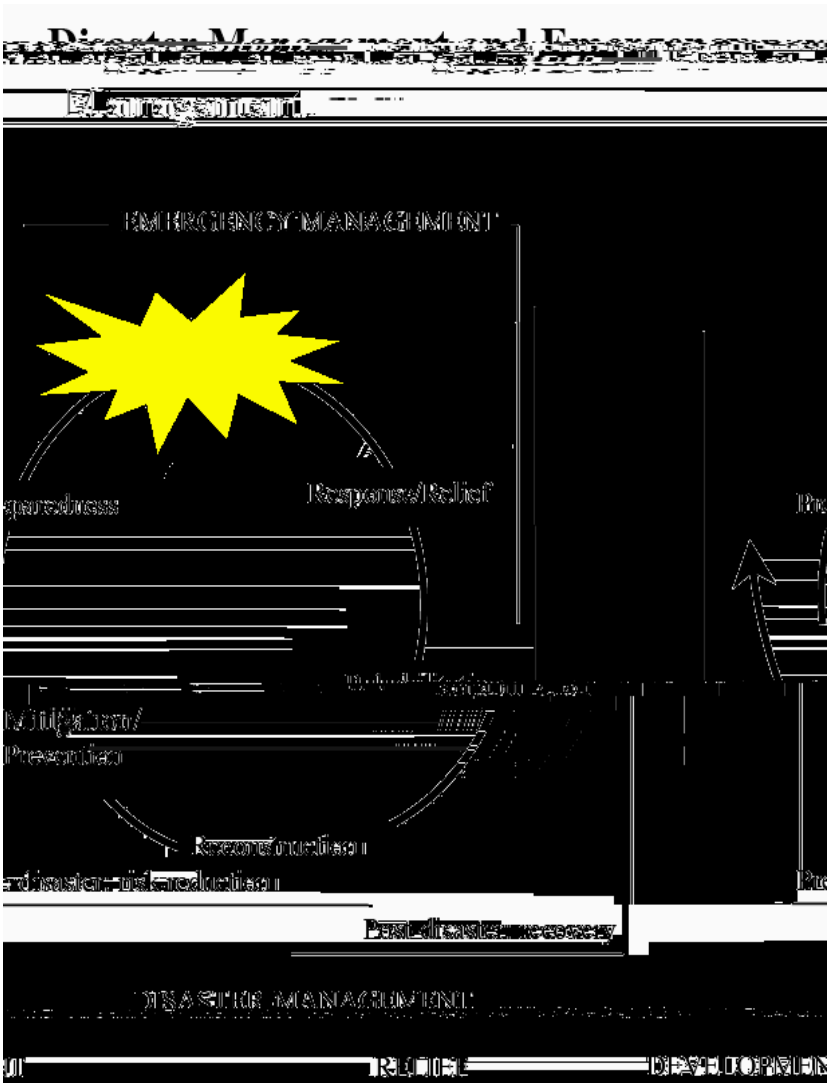

Figure 8 Phases of Disaster Management

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

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

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

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

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

Preparing to Shut Off Electricity

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

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

Insurance and vital records:

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

Planning for Special Needs

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

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

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

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

Emergency Response Activities:

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

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

- *Interorganizational coordination is* important.
- *Sharing information among organizations*,
- *Resource management*,
- When advance *warnings* are possible, *evaluations* from areas of danger can be the most effective life-saving strategy in disaster.
- The public tends to underestimate risks and downplays *warnings* if messages are ambiguous or inconsistent.
- *Search and rescue*
- *Using the mass media*: to deliver warnings to the public and to educate the public

- *Triage*: is a method of assigning priority for treatment and transport for injured citizens.
- *Casualty distribution*: in most domestic disasters, several medical resources can handle the casualty distribution.
- *Patient tracking*: is complicated by the fact that most persons evacuating their homes do not seek lodging in public shelters where their presence will be registered.
- *Caring for patients when the health care infrastructure has been damaged requires careful advance planning*.
- *The management of volunteers and donations*: is a common problem in disasters. Procedures should be established to manage large number of resources.
- *Plan for organized improvement in response to the disruption of shelter, utilities, communication systems, and transportation.*

4.4. Declaration of disaster:

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

Disaster shall be declared when convincing and complete socio-economic reports from regional councils and the National Early

Warning System are provided. National level declaration for disaster will be made only by the National Disaster Prevention and Preparedness Committee (NDPPC). The commencement of relief measures shall automatically follow the declaration of disaster in the area. However, it is not always necessary to wait such formal declaration, or NDPPC's decisions on measures to be taken. Having regard to the policies of the Government, relief operation may commence with the available local resource before a formal declaration if the state of distre

and victims, job assistance, small business loans, and debris clearance.

Recovery involves decisions and actions relative to rebuilding

1. Community recovery:

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

2. Infrastructure recovery:

- ❖ How will we ensure the restoration of essential services?
- ❖ How will our community access essential services?
- ❖ How will we ensure or facilitate restoration of living conditions and housing security?
- ❖ How will we rebuild our community infrastructure? This includes ports, airports, dry storage, roads, public transport, fuel, gas, water, electricity, telecommunications, garbage and sewerage, waterways, parks, flora and fauna.
- ❖ How will we communicate with our community and external agencies? This includes gathering, processing and

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

- ❖ Are our recovery plans adequately integrated and/or considerate of plans of other relevant services (such as health, energy, telecommunications, etc)?

3. Economic recovery:

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

4. Environmental recovery:

- ❖ What issues do we need to consider in preparing for and managing environmental damage caused by a disaster event?
- ❖

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 over all disaster assessment. Efforts immediately begin to repair critical facilities, to restore communications, and transportation networks, and in some cases, to evacuate residents from areas still vulnerable to further disaster.
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 attempt to find better water and food supplies.
- Provision of *emergency supplies of safe drinking water.*
- *Emergency repairs to homes, drains and water supply and sanitation infrastructure.*

- *Early warning systems to identify health effects* and to detect rise in mosquito borne diseases, such as malaria, and diarrheal diseases, such as cholera.

Both disaster preparedness and its mitigation require multisectoral cooperation and joint planning. Both need evaluation after a disaster to reduce the ill effects of later crises.

The goal of mitigation is to **create economically secure, socially stable, better built,** and **more environmentally sound communities**

Disaster Mitigation Strategies

Risk Identification

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

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

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

Land-Use Planning

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

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

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

Impediments to Mitigations

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

4.7. Post disaster epidemiological surveillance:

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

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

responsibilities, and development of an assessment and surveillance plan.

The Collection, Interpretation and Utilization of Data

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

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

Innovative ways to facilitate rapid reporting during the period of

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

and risk assessment can make a major contribution to a reduction of risks and mitigation of any impacts.

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

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

Exercises:

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

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 strives, 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 function of the Food & Agriculture Organization (FAO) headquartered in Rome. Thus, it is extremely important that:

- indicators of an impending famine be closely monitored and measures taken quickly if it appears that a food shortage is developing;
- priority be given to developing strong food and agricultural systems that provide an adequate fall-back resource in threatened areas.

Regarding Ethiopia, most famines have concentrated geographically within two broad zones of the country. The first comprises of the central and northern high lands, stretching from northern previous **Shewa through Wollo and Tigray**. The second is made up of the crescent of low-lying, agro-pastoral lands ranging from **Wollo in the north, through Hararge and Bale to Sidamo and Gamo-Gofa in the south**. More than half of the crises of drought and famines have occurred in these two zones.

Ethiopia had previously suffered major drought and famine during the early 1970s. The late 1970s again brought signs of intensifying drought. By the early 1980s, large numbers of people in central Tigray, Wollo, and parts of Begemder (Gondar) and Shewa were beginning to feel the effects of renewed famine.

From 1982 to 1984, northern Ethiopia had no rain to water crops or for drinking. By mid-1984 it wa

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 **villagization,** which was a response not only to the famine, but also to the poor security situation. Beginning in 1985, peasants were forced to move their homesteads into planned villages, which were clustered around water, schools, medical services, and utility supply points to facilitate distribution of those services. Many peasants fled rather than acquiesce in relocation, which in general proved highly unpopular. Additionally, the government in most cases failed to provide the promised services. Instead of benefiting agricultural productivity, **the program caused a decline in food production**. Although temporarily suspended in 1986, villagization was subsequently resumed.

In 2003**, more than 12 million people were at risk of famine,** half of whom being children under 15 years of age. Perhaps the most chilling aspect of this crisis was that the famine persists despite generous outside food aid. Donations of wheat, soyabeans and oil can stave off much of the starvation in the short term, but they cannot keep hunger from returning year after year.

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.

		mentita also afflicted Ethiopia.
1633-1635	Tigray and Gondar (Dambiya)	Reports of locusts in Tigray 1633-1635. An epidemic of *kantara* or *fangul* (cholera) also afflicted Dambiya, spreading into Tigray.
1653	Not mentioned	Epidemic of *kabab*
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 Iyasu 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 (*gunfan*), 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.
1888-1892	The whole Ethiopia, except south most provinces	Drought and spread of render pest (introduced from India) caused loss of 90% of cattle and more than 30% of human population.
1895-1896	The whole Ethiopia	Minor drought; loss of livestock and human lives.
1899-1900	The whole Ethiopia	Drought inferred from levels of Lake Rudolf and low Nile floods.
1913-1914	Northern Ethiopia.	Lowest Nile floods since 1695; grain prices said have to risen 30-folds.
1920-1922	The whole Ethiopia	Moderate drought similar to 1895-1896.
1932-1934	The whole Ethiopia	Inferred from low level of Lake Rudolf in northern Kenya.
1939	Amongst Yejjo Oromo	Famine, whico200222(TD.00199D.0014oo)he wSoe 524.94 .48 34.

	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 affected; estimated one million died; much livestock lost.
1987-1988	The whole Ethiopia	Drought of undocumented severity in peripheral regions.
1990-1992	Northern, eastern and southern Ethiopia.	Estimated 4 million people suffered food shortage.
1994	Not mentioned	0.7 Million people in need of food

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 throughout the hardest hit areas. 'Donor fatigue' and cynicism about the use of aid is a serious barrier to the international relief efforts to improve water supplies in the region.

Drought is related to climate and is relatively slow to develop. The primary public consequence of drought in developing countries, where food can't be easily imported, is *famine.* In addition, drought and famine may cause extensive, long-lasting social tensions because they act to deepen poverty very suddenly and divide society between those who can afford to get food at any price and those who cannot. Drought and famine are also associated with large population movements that complicate the task of providing medical care, food, and water to the affected communities. Thus, the combination of drought and famine is one type of natural disaster

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. Among the normal indicators of the onset of drought are:

- an unusual dry period;
- an increased number of wind storms;
- an increased number of dust storms;
- diminishing water supplies;

- an increase in the death rate of animals;
- changes in the migratory patterns of nomads;
- reduced price of animals;
- changes in vegetation, especially the introduction of desert plants such as scrub brushes;
- unusual changes in the prevalence rates of specific communicable diseases associated with personal and environmental hygiene, principally non-venereal skin diseases and diarrheal diseases, indicating the diminished use of water for washing.

Identify and stockpile seeds for **alternative drought-resistant crops**. Once drought begins, some attempts must be made to stimulate alternative agricultural activities. A number of crops can survive mild droughts.

Identify and stockpile feeds for cattle or other livestock. Losses can be greatly reduced if herds are penned up and fed in feedlots. This will save the animals, take pressure off the land, and let vegetation regenerate.
Determine human nutritional requirements and develop an on-site relief distribution plan.

Identify and select **appropriate action to fight desertification**. If desertification is a potential threat, measures should be taken to identify suitable approaches that could be employed to prevent the creation of deserts during a drought period.

5.3. Floods

- Flooding due to outburst of banks of Awash River, and over flow from Koka reservoir led to displacement of 40,000 people in Wonji and Metehara in1996.
- Wabishebele river flooding affected 100,000 people in Somali region in 2003.
- 260,000 were displaced and 170 died due to flooding from Wabe Shabelle, Hargeysa, Bilate, Ashewa, Genale, Dawa, Fafen, Sile and Sego rivers in months of April and June 2005.
- The worst scenario of flood in Ethiopia occurred in the summer of 2006 as the result of prolonged and intensive rainfall which resulted in flash floods and overflow of rivers and dams affecting 199,900 people in eight regions of Ethiopia, resulting in loss of lives, damage of property, and destruction of livelihoods of tens of thousands of people. According to the government and humanitarian partner flash appeal of the year 2006 preliminary document, a total of 635 people have been died (364 in South Omo, 256 in Dire Dawa and 19 in other parts of the country).

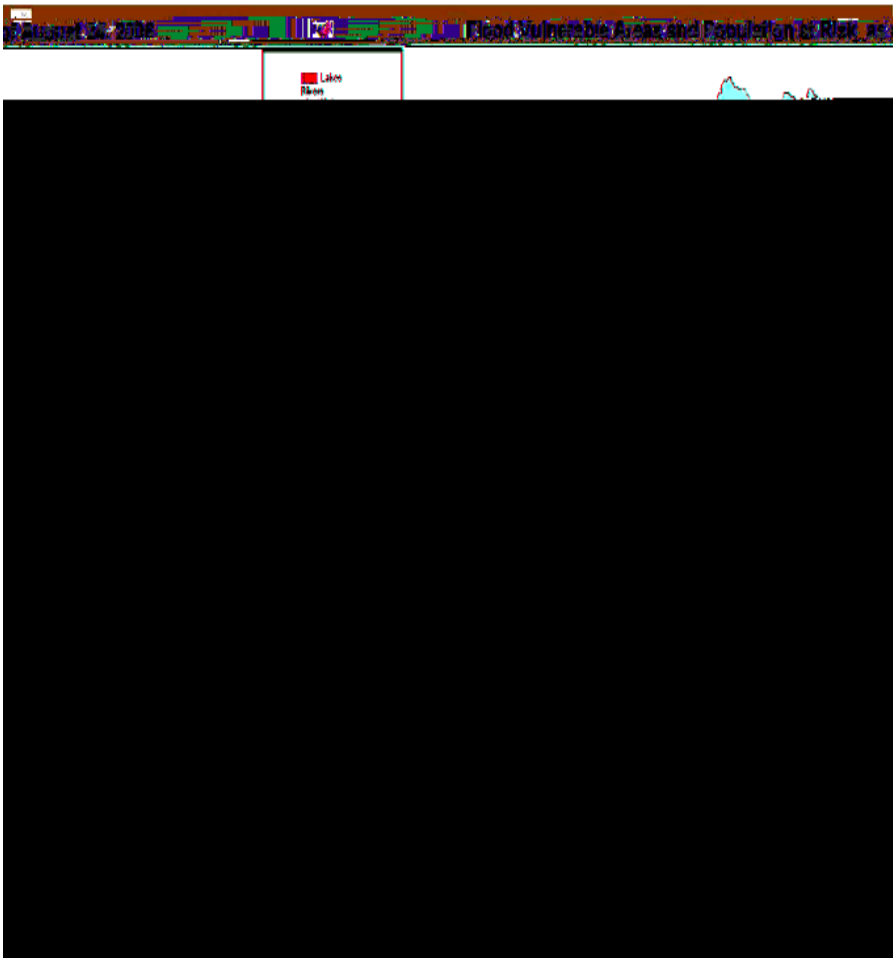

Figure 8 Flood vulnerable areas and population at risk as of August 24, 2006.

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 Gnangatom districts of South Omo zone. It also killed 364 people and took away some 3,200 cattle and destroyed other properties, including 760 trditional 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 Dewchefa 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.
- **West Shewa Zone of Oromia Region:** flooding of the upper basin of Awash River affected 14 peasant associations in Illu, Sebeta Awaso, and Ejere districts of the zone. The flood affected a total of 14,790 people out of which 2052 people were displaced and forced to live in temporary shelters.
- **Gambella Region:** Overflow of Baro River affected crop fields of Gambella zuria, Jikawo, Itang, and Gillo distrcts.

- **Somali Region:** overflow of Wabishebele Riveraffected 3,000 people from Mustahil and 4,500 people from Kelafo districts; also it destroyed 650 hectare of farmland.
- **Tigray Region:** overflow of Tekeze Eiver in Kefta Humera of the Western Tigray zone displaced 450 households, destroyed houses and damaged crop fields.

According to the preliminary document, the overall resource needed to withstand the disaster, both for emergency relief and rehabilitation was estimated to be US$ 60,907,574 [(33).]

5.4. Earthquake:

At different times and in various places earthquakes have been noticed in Ethiopia. Some of the

Location	Year	Magnitude	Damage
Langano	1906	6.8 Richter	Felt as far as Addis Ababa
Kara Kore	1961	6.7 Richter	

-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 1989; with 50,000 cases and 990 deaths in1981; and 45,806 cases and 1686 deaths in 1989 and later as well including Addis Ababa in the year 2000-2001.

Malaria:

Three-fourth of Ethiopian land area is malarious and about 68 % of the population is at risk of infection; therefore, the country is repeatedly affected by different waves of epidemics. For instance, in 1958, 3 million people were affected, and 150,000 died. Currently, averages of 400,000-600,000 cases with positive blood film for malaria are treated annually. Additionally three to four times of this figure are clinically treated at community level without blood film

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

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:

- Identification of community resources applicable to the physical, social, and psychological effects of disaster;
- Identification of groups most at risk of disaster (children, older adults; homeless, chronically ill, homebound, physically or mentally disabled);
- Provision of disaster education both in advance of (i.e., what to expect in disaster) and after (i.e. how to deal with effects) event;
- Taking responsibility for the health of community following a disaster;
- Using such resources as assessment, epidemiology, and data analysis to make and implement recommendations for limiting morbidity and mortality following disaster;
- Cooperation and collaboration with colleagues in the health sector to ensure that primary health, public health, mental health, and social impacts are adequately addressed in disaster planning;
- Prevention of diseases by providing health advisories on injury prevention, food and wate

- 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:

- o

6.3 Functional model of public health response

The functional model summarizes a typical disaster response within the public health field and categories 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: pl

- ✓ Inventory supplies, equipment, communications, and people available for response;
- ✓ Develop manual 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 eTuent):

and injury prevens6 TD0 Tc(s)-3.3T.ii.9(.2((-736.5)nju))11.dent):

- ✓ Manage bystanders' response;
- ✓ Burial of dead bodies.

Tertiary prevention (recovery from event):

- ✓ Provide long-term counseling and mental health intervention;
- ✓ Manage emergency services;
- ✓ Manage injuries and clean-up behavior;
- ✓ Reestablish health services;
- ✓ Use records from response to update action plan

6.3.3 Assessment:

- ✓ Identify potential outbreaks;
- ✓ Identify potential medical, behavioral, social, and political effects of events;
- ✓ Assess potential effect loss of infrastructure on health and mental health;
- ✓ Identify potential hazards and level of acceptable exposure;
- ✓ Determine incidence of disease and causal factors;
- ✓ Understand mechanics of hazardous agents (i.e. radiation, toxins, thermal and water pollution, landmines and weapons);
- ✓ Determine vulnerability, level of risk and requirement for rapid needs assessment;
- ✓ Identify appropriate data to collect for decision-making;
- ✓ Summarize damage to health care infrastructure;

- ✓ Establish continuous data monitoring.

6.3.4 Response:

- ✓ Conduct “quick and dirty” assessment on which to base initial decisions;
- ✓

- ✓ 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;
- ✓

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

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 access2/1/2006).
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*

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 access2/1/2006).

37. file://localhost/D:/EPAOAQPS%20%20Risk%20Assessment%20for%20Toxic%20Air%20Pollutants%20A%20Citizen's%20Guide.htm (Date of access2/2/2006).
38. file://localhost/D:/Coalition%20for%20Clean%20Air%20-%20Air%20Pollution%20-%20Pollutants%20&%20Health%20Effects.htm (Date of access2/2/2006).
39. file://localhost/D:/Damage%20and%20Needs%20Assessment%20Lesson%2011%20Setting%20Up%20Surveillance%20Systems%20After%20a%20Disaster%20University%20of%20Wisconsin%20Disaster%20Management%20Center.htm (Date of access2/2/2006).
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 1992. An Overview of Disaster Management. 2nd Edition.
42. file://localhost/D:/EO%20Library%20Tropical%20Deforestation%20Fact%20Sheet%20Page%204.htm (date of access 1/24/2006).
43. **http://www.ust.hk/~webpepa/pepa/special_topics/atmosphere/effects_of_ozone_depletion.html** (date of access 23 Oct 2006).