

Module 1

Understanding disasters and emergency management

Introduction

Module 1 introduces the definition of disaster management, the effects of disasters around the world, and the four pillars on which emergency management is founded. We will also discuss and clarify various terms used by disaster management professionals.

Upon completion of this module you will be able to:



Outcomes

- *describe* global disaster trends including refugee crises
- *explain* why disasters are on the rise around the world
- *explain* the difference between emergencies, disasters and complex emergencies
- *discuss* how disasters are similar and different from one another (disaster typology)
- *identify* disaster myths
- *explain* the disaster management cycle and the four phases of emergency and disaster management
- *identify* the principles of disaster management
- *define* various terms used in disaster management.

Unit 1

Introduction: Understanding disasters

Introduction

Unit 1 discusses disaster trends as well as refugees and internally displaced persons around the world. The unit explains both the typology of disaster as well as the meaning of the four pillars of *comprehensive* emergency management (mitigation, preparedness, response and recovery). Finally, the concept of vulnerability (both physical and human) is introduced.

Upon completion of this unit you will be able to:



Outcomes

- *define* various terms used in disaster management
- *differentiate* between emergencies, disasters and complex emergencies
- *describe* the magnitude of disasters around the world
- *explain* why disasters are increasing
- *explain* the typology of disasters
- *describe* the disaster management cycle and the four phases of emergency and disaster management
- *describe* different dimension of vulnerability and resilience.

Terminology



Terminology

Complex emergency	A humanitarian crisis in a country or region where there is a breakdown of authority resulting from internal and/or external conflict and which requires an international response that exceeds the capacity or mandate of any single agency (FAO, 1994).
Disaster	A serious disruption of the functioning of society, causing widespread human, material or environmental loss which exceeds the affected community's coping capacity (UNDHA, 1992). Disasters are usually larger in scale than emergencies.

Emergency management	<p>The discipline of preparing for and responding to both natural and human-induced risks. Comprehensive emergency management is an integrated approach that addresses all hazards and all phases of related planning including mitigation, preparedness, response and recovery.</p> <p>Includes hazard identification and mitigation, emergency response planning, disaster recovery, business continuity and resumption, crisis management, and continuity of operations.</p>
Internally displaced person (IDP)	<p>People who have been forcibly uprooted from their home because of fear for their lives or their freedoms, but remain in their own country.</p>
Refugee	<p>Someone who “owing to a well-founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular social group or political opinion, is outside the country of his nationality, and is unable to, or owing to such fear, is unwilling to avail himself of the protection of that country” (UNHCR, 1951).</p>

What is a disaster?

Communities and countries experience many types of events that may cause damage and disruption, such as:

- air crashes
- technological accidents (for example gas leaks or oil spills)
- acts of terrorism
- infectious disease outbreaks
- natural events (for example earthquakes, flooding or hurricanes).

Not all of these events are disasters. Events like air crashes and industrial accidents may require an immediate response, but are not regarded as disasters. Even in larger-scale emergencies, a community may well be able to respond and recover using its own resources.

This is essentially the difference between an *emergency* and a *disaster*.

An **emergency** is:

An unplanned event that necessitates the immediate co-ordination of services to protect the health, safety or welfare of a community, or to minimise damage to property or the environment.

Emergencies are different from disasters in that they do not exceed the resources or capacities of a community to respond and recover (UNDHA, 1992).

A disaster is:

An event which occurs when there is a serious disruption of the functioning of community or society, causing widespread human, material or environmental loss that exceeds the ability of the affected community or society to fully cope alone using its own resources (United Nations, 1992, p.27).

Figure 1 provides a graphic illustration of the difference between an emergency and a disaster.

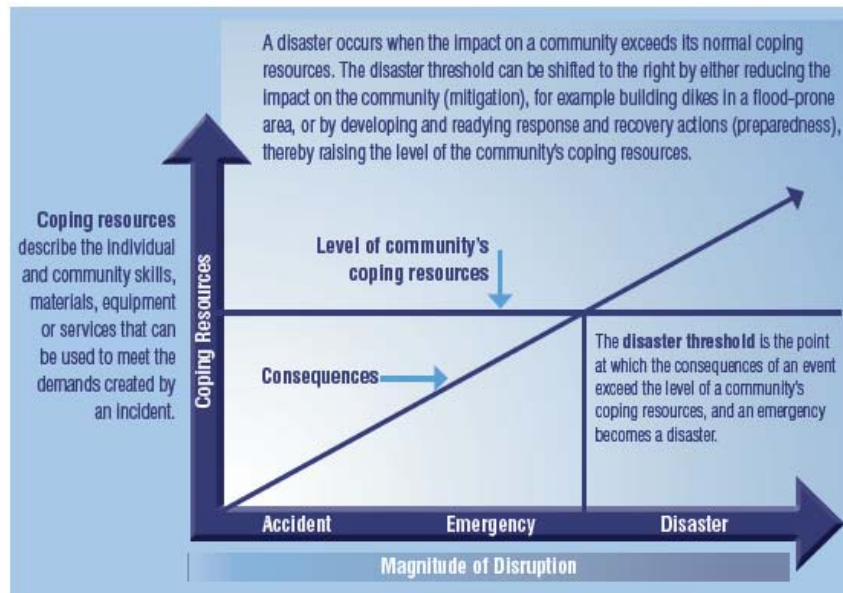


Figure 1: Emergencies and Disasters.

Source: Federal Provincial Territorial Network, Ottawa

The consequences of disasters are frequently widespread and complex.

For example, a disaster may:

- result in a loss of lives and cause serious injuries
- damage or destroy physical infrastructure such as roads, bridges, or dams
- disrupt transportation systems including airports, railroads and trucking arrangements
- damage or destroy basic utilities such as electricity, gas, water and sewerage systems
- damage or destroy essential services such as medical facilities and hospitals resulting in a lack of emergency and longer-term medical care for the affected population
- damage or destroy homes and other housing properties, resulting in the displacement of large numbers of people
- disrupt agriculture and food production systems, reducing the availability and distribution of commercial foodstuffs

- damage or destroy local factories and manufacturing, resulting in loss of goods and materials for rebuilding and reconstruction
- disrupt local markets and economies, which may lead to job losses and opportunities for income generation
- disrupt vital community self-help networks that form the basis of people's lives.

Disasters can have natural or technological origins.

Natural disasters

Natural disasters are triggered by a hazard event (for example, flood, tornado, hurricane, volcanic eruption, earthquake, or landslide) that results in the loss of life or injury, property damage, social and economic disruption or environmental degradation.

Technological disasters

Technological disasters are caused by a failure in technology or engineering, infrastructure failure, neglect, dangerous procedures or other human activities that result in loss of life, injury, property damage, social and economic disruption or environmental degradation.

One important difference between natural and human-induced disasters is how people respond to them. Where natural disasters may be seen as 'acts of God', human-induced events are often seen as being caused by human negligence. As a result, technological disasters involve identifiable parties to blame and hold accountable, which in turn typically leads to litigation processes being implemented.

In some cases, disasters may be of such magnitude or duration that they become **humanitarian crises** and can be defined as: "a situation which results from a combination of the consequences of a hazard and the severely diminished coping capacity of a population and which will worsen without outside intervention. Characteristics of humanitarian crises generally can include starvation, malnutrition, disease, lack of shelter, lack of security, and a growing number of victims" (Coppola, D.P. (2007).

Humanitarian crises are most often associated with large-scale disaster events such as the 2004 Indian Ocean earthquake (Asian tsunami), the 2005 Kashmir earthquake, and most recently the 2010 Haiti earthquake.

A **complex humanitarian emergency** can be defined as: "a humanitarian crisis in a country or region where there is a breakdown of authority resulting from internal and/or external conflict and which requires an international response that exceeds the capacity or mandate of any single agency" (FAO, 1994).

Complex humanitarian emergencies are often characterised by civil conflict rooted in traditional, ethnic, tribal or religious animosities; a deterioration of the national authority to the point that public services disappear; economic collapse and a loss of food security; increased risk of severe malnutrition and starvation; and mass movements of the population to escape conflict or to obtain basic necessities like food.



An example of a recent complex humanitarian crisis is that in Darfur. Beginning in 2003, more than 4.7 million people were affected by the conflict, of which nearly 2.7 million became internally displaced persons (IDPs). Some 2 million people were killed by famine, fighting and disease.

Figure 2 illustrates the scope of this complex humanitarian crisis

Internally displaced persons (IDPS) in Sudan		
In Darfur	1.9 million to 2.7 million ¹	UN – 07/10
In Southern Sudan	391,379 million	OCHA – 12/09
In Eastern Sudan	168,000	U.N – 09/07
In Northern Sudan	1.7 million ²	UNHCR ³ – 12/09
Refugees in Sudan		
From Darfur	268,000	OCHA – 06/09
From Southern Sudan	138,270	UNHCR ³ – 2/09
Returnees to Southern Sudan	330,608	UNHCR – 08/10
Refugees in Sudan		
From Eritrea, Chad, Ethiopia, Democratic Republic of the Congo (DRC), and other countries	220,790	UNHCR – 12/09

1 This range represents calculations from IOM, U.N., and non-governmental organisation (NGO) reports and does not represent registered persons.
2 This figure includes approximately 400,000 IDPs who live in four formal sites recognised by Sudanese authorities. Most IDPs in Northern Sudan live in informal settlements inside and outside Khartoum.
3 Office of the U.N. High Commissioner for Refugees (UNHCR)
4 USAID's Office of Food for Peace (USAID/FFP)
5 U.S. Department of State's Bureau of Population, Refugees, and Migration (State/PRM)

Figure 2: Example of complex humanitarian crisis.

Source: USAID

Disasters around the world

No region in the world is safe from disasters.

In fact, figures on the number of people affected by disasters show a number of upward trends.

- The number of disasters worldwide is increasing rather than decreasing.
- Although disasters are (on average) less deadly nowadays, the number of people affected by these events has increased.
- Disasters are causing much greater financial impact than in the past.
- Less-developed and poor countries are disproportionately affected by disasters. In fact, over 95 per cent of deaths caused by disasters occur in developing countries.

In 1992, an estimated 118 million people were affected by natural and technological disasters. In 2000 this rose to 275 million. This is an 11.6 per cent increase in eight years.

In 2009, the total number of people affected by disasters was lower than in previous years; however there were 327 events which killed more than 10,400 people and affected nearly 113 million others. In terms of the estimated costs of natural and technological disasters, this rose from USD 2.86 billion in 1992 to USD 14.294 billion in 2001.

In 2009, the cost of disasters around the world was estimated at USD 34.9 billion.

Figures 3 and 4 illustrate the increase in the number of disasters, and the cost of natural disasters worldwide, between 1975 and 2009.

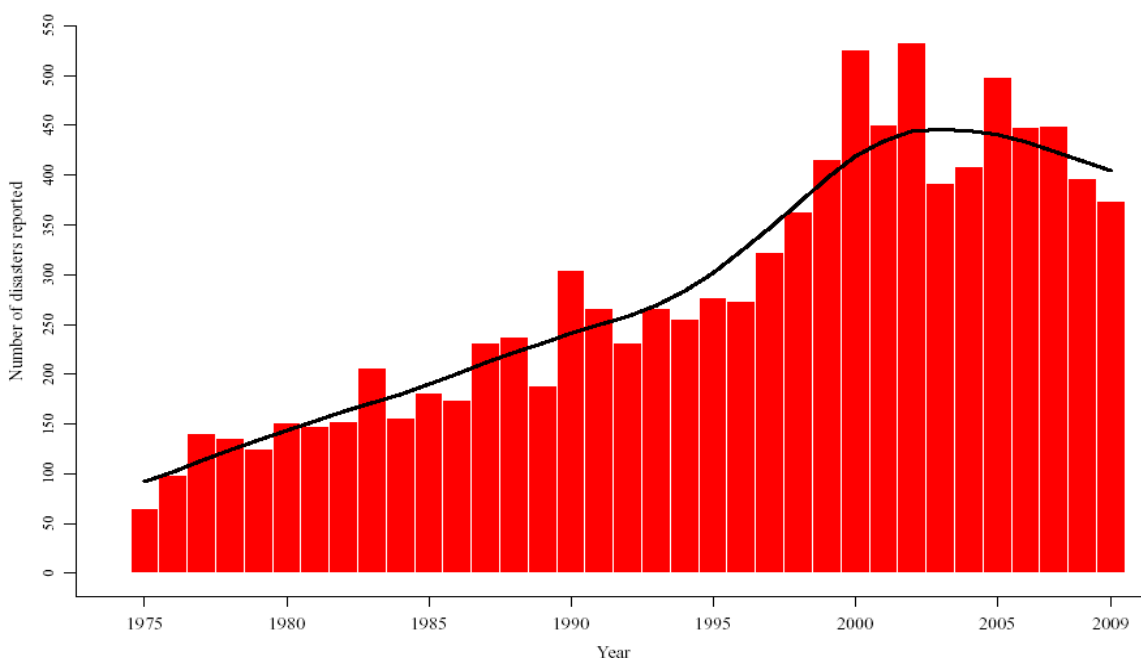


Figure 3: Number of natural disasters reported between 1975 and 2009.

Source EM-DAT

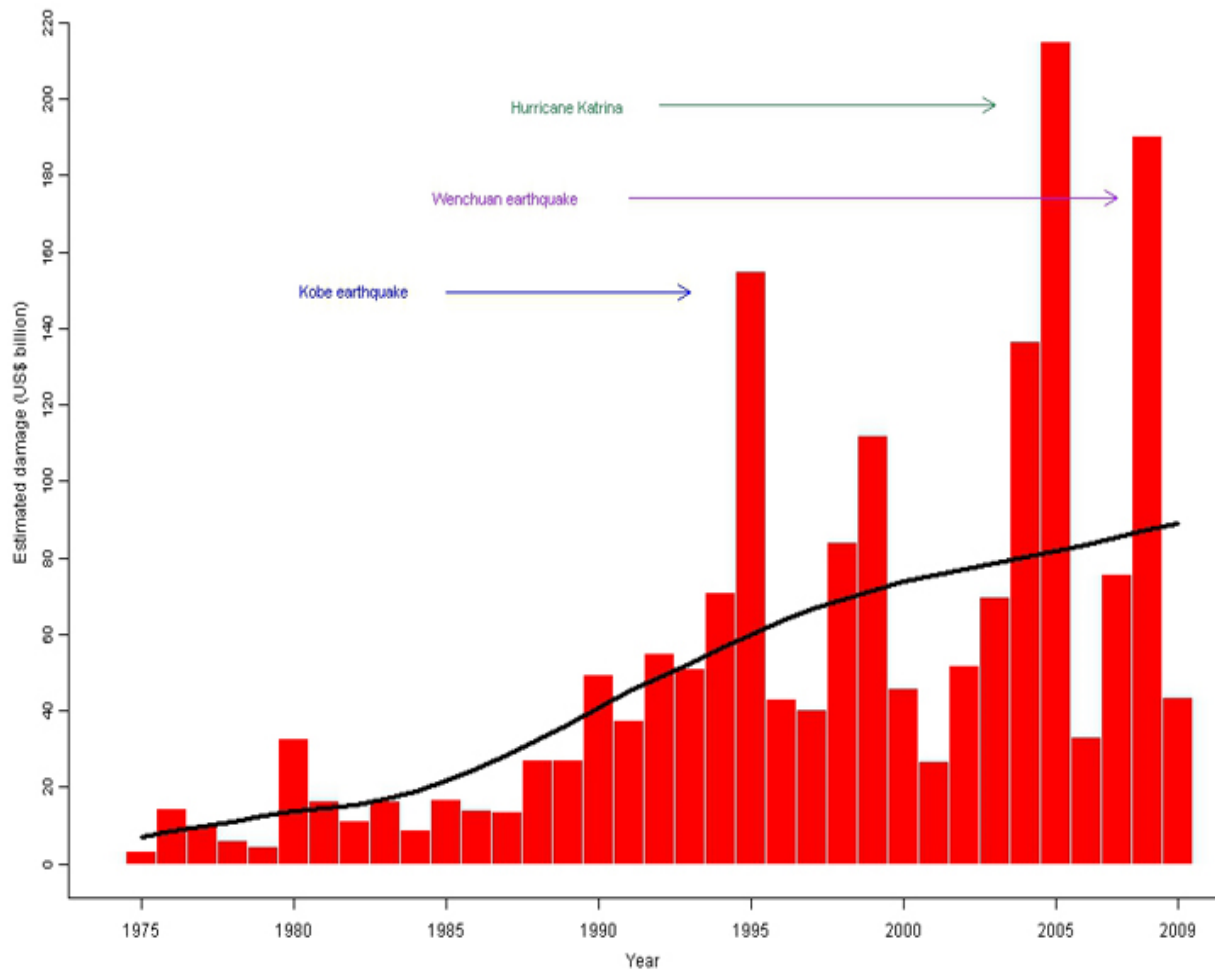


Figure 4: Estimated Damage (USD billion) caused by reported natural disasters 1975–2009.

Source: EM-DAT

Examples of major natural disasters since 2005 include:

- **Asian Tsunami (2004)** in which more than 220,000 people lost their lives and 2.2 million were displaced from their homes. Financial loss totalled USD 10 billion.
- **Pakistan Earthquake (2005)** resulted in 88,000 deaths and 3.3 million people displaced. Loss estimated at USD 5 billion.
- **Hurricane Katrina (2005)** in which 1,300 people died. More than one million people were displaced. Financial cost exceeded USD 125 billion.
- **The China Earthquake (2008)** killed 84,000 people and displaced 15 million people. The earthquake resulted in losses of USD 85 billion.

- **Haiti Earthquake (2010)** which caused more than 220,000 deaths and displaced 2.3 million people. Losses came to USD 8 billion.

The global incidence of **industrial disasters** since 1975 is shown in Figure 5. During this period, there were a total of 50 technological disasters.

The most notable include:

- **Three Mile Island, U.S.A. (1979)**. A partial core meltdown of a nuclear reactor resulted in the release of radioactive gases and led to the voluntary evacuation of 140,000 people.
- **Bhopal, India (1984)**. A release of toxins from a pesticide plant resulted in 2,000 deaths and 100,000 injured.
- **Sao Paulo, Brazil (1984)**. A gasoline leak from a pipeline caused an explosion and destroyed a nearby shanty town, killing 500 people.
- **Mexico City, Mexico (1984)**. Millions of litres of butane exploded at a storage facility, leading to more than 400 deaths, 7,000 injuries and 700,000 people being evacuated.
- **Chernobyl, Ukraine (1986)**. The most serious nuclear accident in the history of nuclear power generation. The Chernobyl accident resulted in the release of massive amounts of radioactive materials which spread over much of Europe. Some 116,000 people who were living within a 30 kilometre radius were evacuated and later relocated. The impact on human health and the environment remains significant to this day.

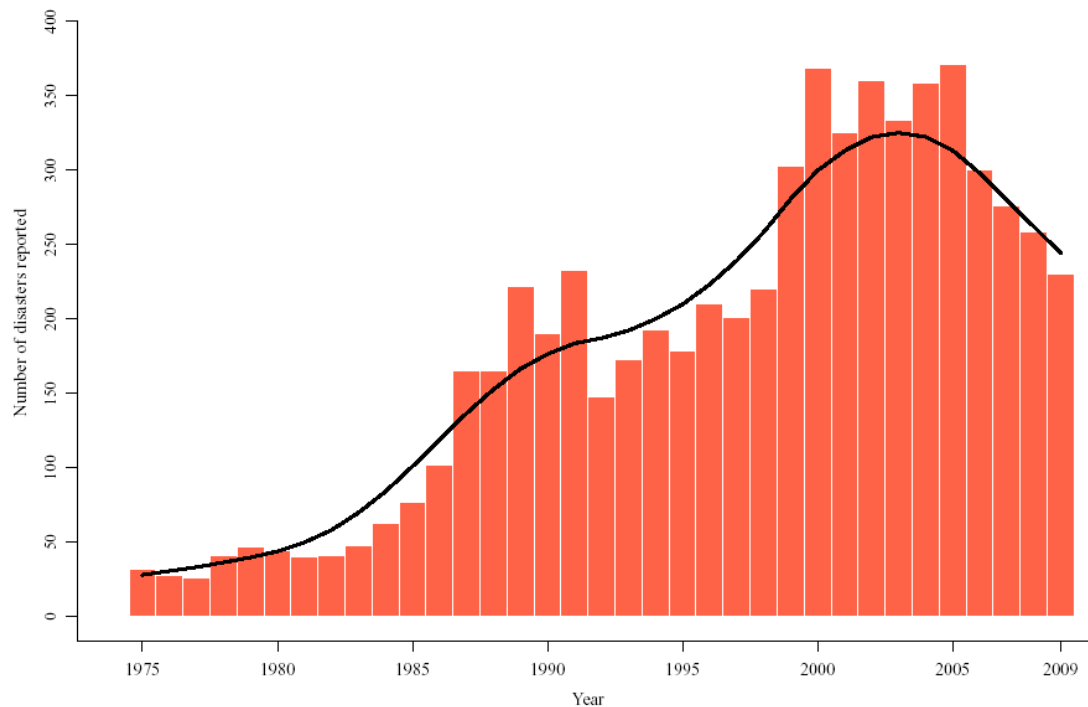


Figure 5: Technological disasters reported 1975–2009.

Source: EM-DAT



Hazards

Human beings have been living with hazards for thousands of years. They are part of the world around us and their occurrence is inevitable. Floods, hurricanes, earthquakes and volcanic eruptions are natural phenomena that we cannot control.

A hazard can be defined as a potentially damaging physical event, phenomenon or human activity that may cause loss of life or injury, property damage, social and economic disruption or environmental degradation.

Hazards can be both natural (geological, hydro-meteorological and biological) or induced by human processes (environmental degradation and technological hazards). A detailed description of different hazards can be found in Appendix 1.

Not all hazards become disasters. For example, an earthquake or cyclone that occurs away from humans in an uninhabited area will not be a disaster. Disasters only occur when a hazard combines with human conditions or vulnerabilities.

An example of a hazard (earthquake) combining with a human vulnerability (city built on a fault zone) is the 17 October 1989 **Loma Prieta earthquake**. The magnitude 6.9 earthquake severely shook the San Francisco and Monterey Bay regions in northern California – killing 63 people and injuring more than 3,700 – when the crustal rocks comprising the Pacific and North American Plates abruptly slipped as much as 2 metres (7 ft) along their common boundary – the San Andreas fault system. More information on the Loma Prieta Earthquake can be found at:

http://www.nap.edu/openbook.php?record_id=2269&page=105

Another example of how hazards connect with human vulnerability to cause a disaster is the **Armero mudslide** which was caused when the Nevado del Ruiz stratovolcano erupted in Tolima, Colombia, on November 13, 1985. After 69 years of dormancy, the volcano's eruption caught nearby towns unaware, even though the government had received warnings to evacuate the area from multiple volcanological organisations. As pyroclastic flows erupted from the volcano's crater, they melted the mountain's glaciers, sending four enormous lahars (volcanically induced mudslides, landslides and debris flows) down its slopes at 60 km/h (37 mph). One of the lahars virtually erased Armero; three-quarters or 20,000 of the town's 28,700 inhabitants were killed.



Reading

More information on the Armero disaster can be found at:

http://wapedia.mobi/en/Armero_tragedy

Why disasters are increasing

There are a number of reasons why disasters have been increasing around the world. These include:

Population growth and urbanisation

Between 1950 and 1998, the world's population grew from 2.5 billion to 5.7 billion. By 2025, the United Nations (UN) estimates that there will be 8.3 billion people, of which 60 per cent will live in cities.

As populations grow and urbanisation increases, people become more exposed to hazards. Events that (in the past) might have only impacted a small number of people may now become large-scale disasters affecting hundreds or thousands of people.

Living in high-risk areas

People often live in areas that have ready access to the necessities of life, such as food and water, but also access to trade and commerce. Because of this, many cities have been established by rivers, close to the sea, and in fertile farming valleys in mountainous areas. These locations often expose people to greater risk; rivers overflow, seas spawn hurricanes and tropical cyclones, and mountain slides devastate.

Poverty

People with limited income are generally compelled to live in less costly but more dangerous locations such as in floodplains or on hillsides that may be prone to mudslides or collapse. In some developing countries, this is often compounded by inadequate building safety codes that might otherwise ensure that such structures might be able to withstand disaster damage.

Climate change

The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (2007) indicates that "climate change is unequivocal".

It is predicted in the 21st century that floods and droughts will increase, sea levels will rise and cause flooding to millions of people and that hurricane intensity will increase. Other projected effects of climate change include longer periods of cold weather and heat waves.

Environmental degradation

Human activity (however unintentional) has at times degraded natural environments, increasing the risk of disaster. For example: building dams in earthquake zones can lead to flash floods; deforestation can lead to landslides.

Here are some other examples of how human activity has increased the risk of disaster:



- The increased sedimentation of rivers or drainage channels due to logging practices, dredging, or debris flow can increase the risk of flooding. Poorly maintained drainage systems during torrential rains can result in severe loss due to flash floods.
- Over-paving surfaces in large cities can result in lower water tables and lead to the depletion of fresh water sources.
- Pollution of air (CO₂ emissions) and water (contamination of ground water sources) are other examples of human intervention leading to changes in the ecological balance that can result in hurricanes, sea surges, and coastal flooding.

Developing countries are at particular risk to disasters because they generally experience many of the above conditions. Poverty, urbanisation and environmental degradation are prevalent in most developing countries and exacerbate a population's vulnerability towards destruction. Additionally, the social, economic, and physical infrastructure in developing countries is often not suited to withstand the unpredictable extremes of catastrophes. These factors both increase the consequences of natural disasters as well as impede recovery in the aftermath.



Case study

Read: Case Study in Appendix 2 “Turkey Grounded by Earthquake” by Gadhok and Saxena.

Activity 1.1



Activity

1. What is the difference between an emergency and a disaster?
2. Describe **five** ways a disaster can impact a community or country.
3. What is a complex humanitarian crisis?
4. Name **three** reasons why disasters are increasing around the world.

The impacts of wars and conflicts: refugees and internally displaced persons

In addition to natural and technological disasters, millions of people are affected by wars and conflicts.

In cases where people flee their countries, the term *refugee* may be used. At the end of 2009, there were 15.2 million refugees worldwide.

According to the Geneva Convention and Protocol relating to the Status of Refugees, a refugee is defined as someone who: “owing to a well-founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular social group or political opinion, is outside the country of his nationality, and is unable to, or owing to such fear, is unwilling to avail himself of the protection of that country” (UN, 1951). People who have been forcibly uprooted from their home because of fear for their lives or their freedoms (but who remain in their own country) are known as *internally displaced persons* (IDPs).

As of 2009, there were 27.1 million IDPs worldwide.

Examples of **refugee crises** include:

Afghanistan

For the past 30 years, Afghanistan has been the leading country of origin for refugees. In 2009, there were close to 3 million Afghan refugees in Afghanistan. One out of every four refugees worldwide is from Afghanistan.

Iraq

Iraqis are the second largest group of refugees, with an estimated 1.8 million having sought refuge since the Iraq invasion in 2004, mainly fleeing to neighbouring countries such as Syria and Jordan. Violence continues in Iraq and there is a general lack of access to basic human requirements, such as security, shelter, safe water, and employment.

Somalia

As of 2009, there were 678,000 Somali refugees. Security and humanitarian conditions in Somalia continue to deteriorate and Somalia is considered one of the most insecure places in the world. This crisis has been made worse by severe drought conditions, poverty, food insecurity and periodic heavy flooding in the Horn of Africa.

Examples of **IDP crises** in 2009 include:

Colombia

As of mid-2009, there were more than 3 million IDPs in Columbia. The displacement of the Columbian IDPs has been largely a result of a long-lasting conflict and illegal coca production. Poverty and human rights violations have also been attributed.

Democratic Republic of Congo

There are more than 2 million IDPs in the Democratic Republic of Congo. Continuing armed conflict and widespread violence has compromised the safety and welfare of millions of Congolese, with gender-based violence a major concern.

Sudan

Increasing inter-tribal violence in the south of the country, and continuing clashes in Darfur, contribute to the rising numbers of internally displaced



persons. As of May 2010, there were at least 4.9 million IDPs in Sudan, some of whom have been displaced for more than two decades.

Pakistan

There were almost 2 million IDPs in Pakistan in 2009. The Pakistani government, under pressure to take on militant forces, launched successive military operations in that year, resulting in the displacement of millions of people.

In many cases, the needs of refugees and IDPs are the same as those of disaster survivors. They have lost their homes, they no longer have jobs or means to earn money and buy the basic necessities of life, and they often cannot access basic services such as health care and education for their children.

Like survivors of disasters, attention needs to be given to a range of needs such as:

- **Shelter** to ensure people have a place to live as well as essential personal and household items such as clothing, blankets, cooking utensils and fuel.
- **Water and sanitation** for drinking and domestic and hygiene purposes. Fresh water and sanitation is also critical to prevent the spread of disease and promote the establishment of a healthy environment.
- **Food and nutrition** to ensure basic sustenance and prevent the deterioration of the nutritional condition of more vulnerable people including pregnant women, infants, young children and the elderly.
- **Health care** to ensure basic medical treatment, access to drugs and other essential supplies, and the control of communicable diseases.
- **Maternal and child health** to ensure the health of new-born infants and young children, pregnant women and lactating mothers.
- **Education** to restore and promote the development of education in the community, especially among children and women.
- **Psychosocial support** for children, adults and families experiencing social, emotional and/or psychological difficulties as a result of the event they have experienced.
- **Protection** to ensure that the basic human rights of refugees and displaced persons are not violated, including their right to life, liberty, freedom of thought and expression, and equal treatment before the law (among others).

Activity 1.2



Activity

1. What is the difference between refugees and internally displaced persons (IDPs)?
2. Name **four** common humanitarian needs of refugees and IDPs.
3. Explain what the term “protection” means.

Understanding the impact of disasters: disaster typology, vulnerability and resiliency

As an emergency manager, it is important to understand how people and communities may be affected by hazards.

This enables emergency managers to effectively plan and respond to disasters because they know the characteristics of different hazards and how these will generally strike a community, as well as the ways in which their community may be more or less vulnerable to the impacts.

In order to understand the impacts of a disaster event, it is important to consider:

- The characteristics of hazards and disasters, referred to as *disaster typology*.
- The vulnerabilities of a community and how a hazard may impact them.
- The capacities of a community to prepare for, respond to and recover from a disaster, referred to as *resiliency*.

Disaster typology

Disaster typology (or classification) provides a systematic way to understand how hazards and disasters occur and how they may affect communities and people.

This means that while there are different types of hazards and disasters, they also share common characteristics which can be used by emergency managers to plan and respond to them.

Important characteristics to be considered when planning include:

1. the **location** of the event in relation to where people are living
2. the **predictability** of the event
3. the **rate of onset** (or rapidity) of occurrence
4. the **intensity and magnitude** of the event’s impact



5. the **duration** that a community is affected
6. the **frequency** of (and familiarity with) the event
7. the **controllability** over the impact of an event by an affected community.

We discuss these concepts in more detail below.

Location

This is one of the strongest planning considerations.

For example, living near an earthquake fault line can increase a population's vulnerability, as can living near a volcano or in a flood zone.

Location can also refer to a particular locality such as a city or town. For example, poorer people may be forced to live in slums located on unstable hillsides that may be subject to mudslides during heavy rains.

A recent example of this is the April 2010 mudslide which destroyed the Niteroi shantytown of Morro do Bumba, located in the state of Rio de Janeiro, Brazil. Built atop an old garbage dump (which made it especially unstable and vulnerable to the heavy rains), more than 200 people were buried when rains triggered a massive mudslide.

Predictability

This refers to the extent to which a community can predict the occurrence of a possible hazard.

Sometimes populations can predict their possible involvement in disasters; other times, the crises are unexpected. Sudden onset events such as earthquakes are usually difficult to predict, even though people may know such an event will eventually happen if they are living near an earthquake fault zone.

Other events may be less predictable, such as a large scale industrial accident like the 1986 Chernobyl nuclear accident or the 2001 September 11th terrorist attacks on the United States which resulted in the collapse of the World Trade Center.

In other cases, hazards can be fairly accurately predicted, one example being normal annual floods that occur in many countries as a result of rainfall and the melting of winter snows. Flood waters often arrive slowly and with sufficient warning to allow for preparations to be undertaken such as dyking, sandbagging and evacuation. Flood waters can also be predicted based on severe weather predictions, accumulated precipitation levels, modelling and satellite imagery.

Predictability can also be enhanced through early warning systems. Some examples of early warning systems include hurricane tracking and forecasting systems and earthquake seismic motion sensors. Seismic monitoring is also used to detect rock movement in the Earth's crust that is often associated with the rise of magma beneath an awakening volcano.

After the 2004 Asian Tsunami, the Indian Ocean Tsunami Warning System was developed to warn inhabitants of nations bordering the Indian Ocean of future tsunamis. Measures like this greatly reduce the

possible impact of a disaster by giving people sufficient time to evacuate and secure safety.

The common thread in all of this is the element of the unexpected, which means that people are unable to bring their normal routines and coping mechanisms to bear during a sudden and unexpected crisis. The less a situation is expected, the less likely relevant organisations are to have prepared and trained for the occasion. When predictability is high (such as when populations live near chemical complexes or on floodplains) there is greater sensitivity to danger cues and more willingness to act upon them.

Rate of onset

Refers to how quickly a disaster occurs.

Sometimes a population becomes slowly involved in a disaster event, or sometimes its involvement is rapid. Events that occur suddenly, such as earthquakes or flash floods, can be more devastating than disasters that occur gradually (slow-onset floods) because there is little or no time for people to prepare or evacuate.

Rapidity of involvement is sometimes related to predictability but is independent of it. Predictability has to do with expectedness, rapidity with speed. The two can vary independently. For example, flooding is usually predictable because it occurs gradually, with waters accumulating and finally cresting as levels reach their peak.

It should be noted that the rapidity of a response is almost always viewed from the perspective of those involved. Additionally, it may (or may not) correspond with the actual time available to a community to respond to the event, for example; an earthquake may last only minutes but search and rescue efforts and other emergency response activities may last days.

Generally, populations and organisations adjust best when events are predictable and communities have time to respond before they strike, for example, evacuating in face of a hurricane. Adjustment is much more difficult when events occur suddenly and involvement is rapid.

Intensity and magnitude

This refers to the severity of a disaster.

Earthquakes are measured on the Richter scale, tsunamis on the height of the wave crest, cyclones measured by their wind speed, and volcanic eruptions by the eruption size and duration.

Magnitude refers to the degree of impact that the disaster has on a community and its critical equipment, facilities and property. Disasters of greater magnitude and severity damage critical infrastructure and services, disrupt businesses and the economy, and may cause injuries and deaths.

Generally speaking, the greater proportion of the population involved relative to some base is far more important for planning purposes than absolute numbers. For example, 500 dead in a metropolitan area of 5 million involves proportionately far less of the community than does 100 dead in a town of only 1,000 inhabitants. Similarly, in terms of property



damage or destruction, the same absolute numbers might mean a catastrophe in some communities but only a bigger-than-usual emergency in others.

Duration

This refers to the length of time a disaster affects a community, not to the duration of the threat, which is a dimension of the physical agent. Sometimes the duration of the primary disaster agent is short but the length of crisis involvement is longer because of perceived secondary threats. For example, some events like earthquakes happen unexpectedly and last only a few minutes, although frequently with devastating effects. Other events like flooding and droughts have much longer durations.

Duration may also have an individual context. For example, an earthquake may be over in a matter of minutes for survivors but may last hours or days for a person trapped in the rubble. Some events may also leave lasting fears and concerns about one's safety and wellbeing. An accident involving a train carrying chemicals may be over in a few minutes, but the threat or actual slow release of toxic chemicals from the wrecked train may generate a crisis that lasts days. In the case of the Chernobyl nuclear accident, concerns about contamination of lakes and fish lasted for years in the affected areas of Ukraine, Belarus and Russia as well as parts of Scandinavia.

Frequency

Also known as reoccurrence, frequency is measured by the interval of time when the hazard is expected to reoccur. For some populations, involvement in disasters is recurrent and not a new experience. Communities living on floodplains in Bangladesh can count on flooding every year, just as people living in certain parts of the coastal United States, such as Florida, can expect hurricanes on a seasonal basis.

When disasters occur regularly in a location, both individuals and emergency responders gain first-hand knowledge and lessons learned that will prepare them for subsequent events. This prior exposure will help people know what to expect and how best to respond. For example, people repeatedly exposed to hurricanes will have more experience and better knowledge in how to prepare for such storms (boarding up windows, having emergency supplies at hand).

Everything else being equal, most organisations plan and respond better the more experiences they have with a type of disaster because they are better able to forecast what problems might arise should disaster strike. Experience with disasters is not automatically an improvement. Some groups learn little and, worse, a few learn the wrong lessons. There is also a strong tendency to take the last disaster, (its needs and problems), as the prototype of future disasters. This can prove very misleading; the next disaster may be drastically different and may create very different demands for the organisations involved.

Controllability

This refers to the extent that people can control the impact of a hazard or disaster event. This can (to some extent) be determined by steps taken by a community to prepare for a possible disaster, for example, building dykes around communities located in floodplains or making sure construction of homes and apartments comply with building codes as ways that the impacts of a disaster can be controlled. Controllability can also depend on what people can do during an emergency, for example, boarding up windows before a hurricane or sandbagging during a flood.

Controllability is also a function of planning, experiences and know-how held by emergency organisations and managers. One of the reasons disaster response is difficult to co-ordinate is because disasters are different from routine, daily emergencies. Disasters may cross jurisdictional boundaries, create the need to undertake unfamiliar tasks, change the structure of responding organisations, and trigger the mobilisation of participants that do not ordinarily respond to local emergency incidents.

An effective emergency response in the immediate aftermath of a disaster event requires that many different tasks must be undertaken in very short periods of time. Depending on the level of planning experience and expertise, responders and community members alike may feel they lack control over the situation because what in normal times is familiar and spread out over time may occur almost simultaneously during a sudden-impact disaster such as an earthquake.

Vulnerability and capacities

In addition to the characteristics of a hazard or disaster event, the impact of these events is also determined by the capacity of community, society or country to prepare and respond to crises. This can be expected to differ from one community or country to the next.

The ability of a community to withstand the impacts of a disaster will generally reflect both its vulnerabilities and its capacities.

Vulnerability is “the conditions determined by physical, social, economic and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards. In other words, vulnerability refers to those conditions that determine how a community, region or country will experience a certain hazard” (ISDR, 2004).

Capacity can be defined as “a combination of all the strengths and resources available within a community, society or organisation that can reduce the level of risk, or the effects of a disaster. Capacity may include physical, institutional, social or economic means as well as skilled personal or collective attributes such as leadership and management” (ISDR, 2004).

Resiliency is a term used to describe the “capacity of a system, community or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure. This is determined by the degree to which the social system is capable of organising itself to increase its capacity for



learning from past disasters for better future protection and to improve risk reduction measures” (ISDR, 2004).

Four main characteristics will generally determine the vulnerability and/or capacity of a community to prepare for and respond to a disaster. These are:

1. physical
2. environmental
3. social and organisational
4. economic.

Physical characteristics

Physical characteristics of a community or country which can interact with hazards can be broadly grouped into the following three categories:

1. **Geography** – the natural factors that make up the geographic profile of a particular community, region or country. These can include topography or terrain of a region, geographic faults that might eventually cause earthquakes, water resources (lakes, rivers and reservoirs), land cover (vegetation) as well as the climate (rainfall, snow cover).
2. **Infrastructure and technology** – the basic physical and material structures of a community that will be affected by a hazard. Examples of infrastructure that may affect how a hazard affects a locality include:
 - land use
 - transportation systems
 - critical infrastructure such as hospitals, schools and other public facilities, as well as the location and construction of homes and other buildings.

Generally speaking, communities that have greater physical resources are better able to recover from the impacts of disasters.

3. **Population** – how a hazard interacts with people. This includes such factors as the population size and areas of residential and commercial development. When people settle in areas at risk of particular hazards, their physical vulnerability is amplified. This may be further increased if there is high population density in an area prone to certain hazards.

Environmental characteristics

Environmental vulnerability refers to whether a community’s natural environment contributes to or reduces the potential impacts of a disaster on its population. For example, a community’s environmental profile is in part shaped by the amount of rain and snow fall it receives, as well as exposure to severe storms and other weather events. However, poor land-use planning such as building homes on floodplains or on deforested hillsides can place populations at heightened risk of a disaster.

Maintaining a healthy natural environment through the management of lakes, waterways and forests can help protect the population from the effects of specific hazards. For example, preservation of dunes and wetlands can provide coastlines with buffers from hurricane storm surges. This is extremely important in protecting populations. The erosion of Louisiana's wetlands around New Orleans caused by the building of levees is one of the reasons the city was flooded during Hurricane Katrina. Over the years, as levees were built to protect the area from the flooding of the Mississippi River, waters were steered directly into the Gulf of Mexico. This eventually drained a substantial proportion of the delta region, which had up to that time served as a buffer zone to protect New Orleans from the full brunt of hurricanes.

Social and organisational characteristics

Social and organisational characteristics include cultural, political, societal and individual factors that can influence peoples' capacity to mitigate or withstand harm or incur damage as the result of a hazard. Some communities may be fairly economically, socially and ethnically homogenous, whereas other communities may comprise a number of groups which have different backgrounds, values and priorities.

Disasters often bring people together, especially in the immediate aftermath when people pull together to make their neighbourhoods and communities liveable again. Over time, however, differences are likely to emerge as decisions have to be made about allocating resources, adopting new urban planning or building regulations, and/or relocating businesses or residences to safer areas. Generally, the more mixed the population of victims, the more likely there will be problems with community cohesion as people's diverse interests and needs begin to compete and come into conflict.

Communities can also be expected to differ in terms of leadership, decision-making, planning, and organisational structures. Whereas one community might have a number of strong leaders who are able to collectively advocate on behalf of the community, another might have leaders who are driven by their own interests and therefore more likely to compete for available resources. Similarly, while one community might have open, transparent and democratic processes to come to decisions, another might be dominated by a wealthy and powerful elite.

Finally, social characteristics can include people's levels of education and poverty, as well as factors such as race, ethnicity and language that may create divisions and weaken the social fabric of a community. For example, new immigrants to a country may lack the language skills and political experience to effectively advocate on their own behalf. Socio-economic and political inequities – often experienced by the poor and some minorities – may also mean that some groups are largely excluded from planning decision-making processes, as well as having less access to available resources.

Economic characteristics

Economic factors that affect a country's capacity to withstand disasters include but are not limited to gross domestic product, debt, insurance,



disaster funds held in reserve and business continuity planning efforts. Depending on the economic vitality of the region, a disaster will have varying economic impacts including damage to factories and other infrastructure, lost production, loss of jobs and lost business opportunities – all of which can contribute to economic downturns.

It is important to note that financial security is only a measure of the ability prepare for and respond to the consequences of disasters, not a guarantee that these measures will be adopted. However, wealthy countries are generally better able to withstand the economic impacts of disasters than poorer countries which are often forced to borrow money to cover relief and recovery costs, creating a greater financial strain on their economies. Similarly, people who are economically well-off have more resources to take actions that will enable them to recover from the losses of a disaster than people living in poverty.

Vulnerability at work

Disasters do not affect all people equally. People hardest hit are usually the most vulnerable living in a community: the poorest and socially marginalised, the frail and the elderly, people with health conditions and disabilities, and single-parent households (especially when headed by women).

Human vulnerability is most often associated with lower-income countries which may lack adequate resources to prepare for large-scale disasters. Hurricane Katrina, however, illustrated that that vulnerability cuts across all regions of the world.

- Of the nearly 1,800 people who died during Hurricane Katrina, 74 per cent of the deaths were among people aged 60 and over; 49 per cent were over the age of 71 years.
- Of the people who did not evacuate New Orleans because they lacked means, 84 per cent were poorer (with incomes less than \$50,000), 58 per cent were African American and more than half (57 per cent) indicated that their highest qualification was a high school education or less.
- People who did not evacuate were also more likely to report that they had a physical disability (32 per cent) and were not be employed (53 per cent). Nearly four in ten (37 per cent) did not have a car.
- Five years after event, twice as many African Americans as white (42 per cent versus 16 per cent) felt they had not yet recovered from Hurricane Katrina.
- Just 24 per cent of the poorer Lower Ninth Ward's pre-storm population had returned five years after Katrina, in comparison to 55 per cent of the residents of middle-class Pontchartrain Park neighbourhood.



Reading

More information on Hurricane Katrina is available at:

Fritz Institute, *Hurricane Katrina: Perceptions of The Affected* at:
<http://www.scribd.com/doc/265367/Hurricane-Katrina-Perceptions-of-the-Affected>

Kaiser Family Foundation, *New Orleans Five Years After the Storm: A New Disaster Amid Recovery* at: <http://www.kff.org/kaiserpolls/8089.cfm>

The Brookings Katrina Reading Room at:
<http://www.brookings.edu/metro/katrina-reading-room.aspx>

Activity 1.3



Activity

1. Name and describe **four** characteristics of disaster typology.
2. Define the terms vulnerability and resiliency.
3. What are the different factors that can make communities more vulnerable or resilient?



Unit summary



Summary

In this unit you have learnt:

- The differences between emergencies, disasters and complex emergencies.
- The magnitude of disasters around the world and reasons why disasters are increasing.
- The typology of disasters.
- The types of factors that make communities more vulnerable or resilient to hazards and disasters, including physical, environmental, economic, and social and organisational conditions.
- Various terms used in disaster management.

Unit 2

Understanding emergency management

Introduction

This unit examines the discipline of emergency management and the principles that guide practitioners.

The four phases of emergency management are explained and actions and activities typically included in each phase are discussed. Finally, disaster myths are identified and debunked.

Upon completion of this unit you will be able to:



Outcomes

- *define* emergency management
- *explain* the principles of emergency management
- *describe* the disaster management cycle and the four phases of emergency and disaster management, providing examples of tasks specific to each phase
- *identify* disaster myths and realities.

Terminology



Terminology

Mitigation	Any effort taken to reduce risks before, during and after a disaster. This phase of emergency management is related to short-term and long-term measures; for example, preventing or reducing risk to property or lives by improving the coping capacities of people and the strengths of habitats, infrastructure and critical facilities.
Preparedness	Activities designed to build an emergency response capability before disasters occur, to facilitate effective and efficient response (Mileti, 1999).
Recovery	The co-ordinated process of supporting disaster-affected communities in reconstructing damaged physical infrastructure and restoring the emotional, social, economic and physical well-being of people who have been impacted by the event (Emergency Management Australia, 2004.).



Response	Actions taken immediately before, during and after a disaster to help save lives, minimise damage to property, and enhance effectiveness of recovery (Mileti, 1999).
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What is emergency management?

Although the impacts of disasters have devastating impacts – often resulting in the loss of lives, homes and property – these can also be reduced by good emergency management practices.

Emergency management (or disaster management) can be broadly defined as the discipline of preparing for, responding to, and recovering from emergencies and disasters of all types. It has three main objectives:

1. To reduce risks to potential hazards before disasters occur, by developing long-term and short-term policies and strategies.
2. To assure prompt and appropriate assistance to communities, during and immediately after the disasters.
3. To achieve rapid and sustained recovery and rehabilitation after the occurrence of disasters.

Among other activities, emergency management involves:

- Identifying and assessing the hazards that may affect a community.
- Developing plans that may be quickly put into action should a disaster strike a community?
- Stockpiling equipment and supplies which may be used during an emergency or disaster.
- Making the community aware of possible disasters and promoting individual and household awareness.
- Working with relevant volunteer organisations to ensure they have the knowledge and means to assist in a major emergency.

It is important to understand that effective emergency and disaster management requires the participation of entire communities. On one hand, fire services, ambulance services, police, and emergency health and medical services must have plans in place and know how to communicate and work with one another should a disaster strike. On the other, it is important to organise and train volunteer and non-government organisations in order that they step in and support an emergency response (for example, through feeding stations, shelter, distribution of comfort kits, food, clothing, emergency transportation and/or home repairs). No less important, public education and awareness-raising on disaster preparedness is essential to ensure the public know what to expect and how to prepare themselves for a disaster event.

Disaster management, then, can be described as a process of forming common objectives and common values in order to encourage stakeholders to plan for and deal with potential and actual disasters. It implies integration of all disaster-related activities in an organised and well-co-ordinated manner, before, during and after a disaster, using valuable human and financial resources efficiently. Disaster management also means framing institutional and legal frameworks for facilitating equipment and actions to best serve and save the affected community.

To accomplish such tasks, good emergency management is guided by a number of principles. These principles include being:

Comprehensive: Emergency managers should consider all hazards and their potential impact on communities. Planning should also be comprehensive, taking into account all phases of the emergency management cycle (mitigation, preparedness, response and recovery), as well as including all relevant stakeholders in planning and response activities.

Progressive: Emergency managers should be pro-active and anticipate future disasters and take preventive and preparatory measures to build disaster-resistant and disaster-resilient communities.

Risk-driven. Emergency managers need to use sound risk management principles (hazard identification, risk analysis and impact analysis) in planning and assigning resources.

Integrated: Emergency managers should ensure unity of effort among all levels of government and all elements of a community. Disasters are recognised as affecting all parts of society and thus require an integrated and co-ordinated approach.

Collaborative: Emergency managers need to create and sustain broad and sincere relationships among individuals and organisations should an integrated and co-ordinated emergency management system be maintained.

Co-ordinated: Emergency managers need to synchronise the activities of all relevant stakeholders to achieve a common purpose.

Flexible: Emergency managers need to use creative and innovative approaches in solving disaster challenges. Disasters often result in unforeseen impacts that require emergency managers to consider new ideas and alternatives.

Professional: Emergency managers need to value a science and knowledge-based approach to planning. Good emergency management should be based on strong research and continuous improvement, drawing upon better practices and lessons learned.

The disaster management cycle

The disaster management cycle, as depicted in Figure 6, illustrates the cyclical nature of emergency management's four phases:

1. mitigation
2. preparedness
3. response
4. recovery.

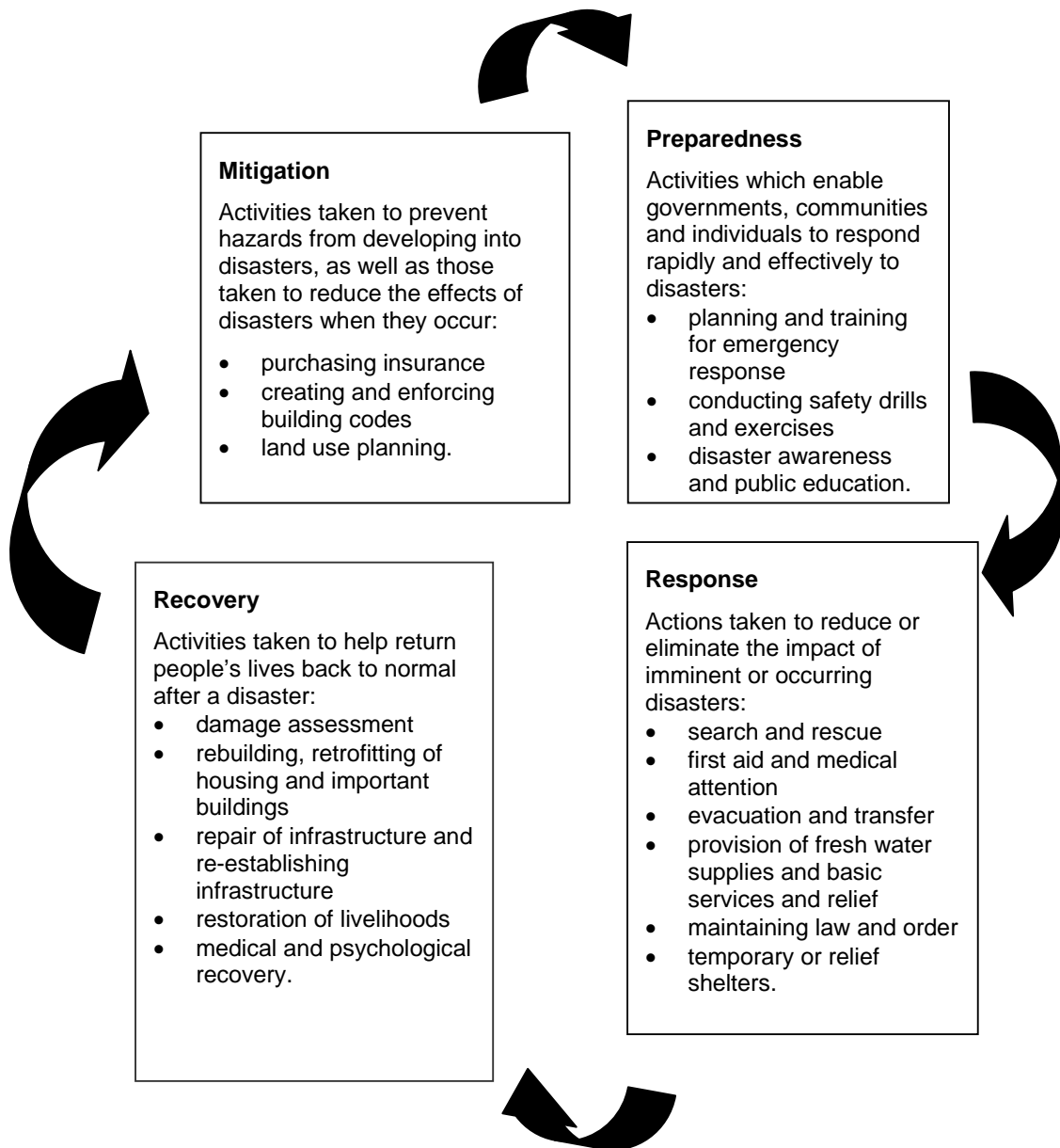


Figure 6: The disaster management cycle.

It is important to understand, however, that each phase does not automatically lead into the next in a neat, orderly manner. Phases can be inter-mixed and overlap, depending on the circumstances of the emergency or disaster. An emergency response can begin before a disaster actually happens, for example, evacuating a community before a hurricane strikes. Likewise, mitigation actions, such as taking steps to secure your home from future damage following an earthquake, can be part of the recovery phase.

The disaster management cycle illustrates the on-going process by which emergency planners, governments, businesses and civil society can effectively plan and prepare for disasters, react during and immediately following a disaster and initiate activities to recover in the aftermath. Effective actions throughout the cycle can result in lessons learned that can be used to enhance planning and communications, alerts systems and warnings, supplies and equipment, as well as equipment and inter-operability – all of which can reduce vulnerability or the prevention of disasters during the next iteration of the cycle. The complete disaster management cycle culminates in the development of public policies, regulations and plans that can reduce or mitigate the impacts of future disasters on people, property and infrastructure.

Mitigation

Mitigation, sometimes called prevention or risk reduction, has been called the “cornerstone of disaster management” (FEMA, 2005). Mitigation is central to emergency management in that it seeks to reduce or eliminate the likelihood that a hazard will occur, or at least reduce the negative consequences should it occur. In this sense, mitigation can be said to “treat” the hazard so that its impact on a community or country is reduced. There are two main types of mitigation: structural and non-structural.

Structural mitigation refers to efforts to reduce a hazard through some form of construction, engineering, or other structural measure. These are often seen as human attempts to control nature. Examples of structural mitigation include:

- **Building codes and regulations** to ensure buildings and other structures are constructed in ways that are resistant to hazards, for example, buildings that are designed to withstand earthquakes.
- **Construction of barriers** to block the impact of a physical force. Examples of barriers include seawalls to protect against storm surges and coastal erosion, security fences to block civil disturbances, and mass movement protection walls to stop avalanches and rockslides.
- **Structural modifications** of buildings in identified risk zones which are not able to withstand the forces of a hazard. These modifications are also known as “retrofitting” a structure. Examples of hazard-specific retrofits are: installing wind-resistant shingles and shutters to withstand cyclones; elevating buildings so that they will be higher than flood waters;



constructing a “safe room” in a home which will shelter people from destructive tornadoes; and installing lightning rods.

- **Construction of community shelters** to create safe places for residents to go to for protection from hazards. In order for community shelters to be effective, there must be a warning system in place to allow residents to get to the shelter in time, and also a public education campaign to raise awareness of the shelter and instruct people to know when and how to get to the shelter.

Relocation may be a viable option in certain circumstances to protect people and structures. The most common reason for relocating structures is flooding when it may be more practical to move a building to protect it from flood waters than to re-build it after it has sustained damage.

Non-structural mitigation refers to actions that can reduce the likelihood of a hazard or its consequences by changing human behaviour, not structures. Examples of non-structural mitigation include:

- **Regulatory measures**, which can be used to control individual and societal actions that might otherwise expose people to hazards. Examples include zoning and land use management regulations, (restrictions on how land may be used), building use regulations (restrict the type of activities that building may be used for), or density control (limit the number of people who may reside in a high risk locality).
- **Community awareness and education programmes**, which inform people about hazards in their community and how to reduce their risks. Public education programmes may also recommend pre-disaster preparedness activities that may help people be prepared for disasters.
- **Non-structural physical modifications**, which may be taken to reduce risk. Examples include securing furniture and wall hangings to avoid earthquake injuries, and removing or securing items such as barbeques and woodpiles, which may become projectiles in tornadoes.
- **Environmental control**, which is a way to lessen the negative impacts of a hazard. Setting off explosives to relieve seismic build up in an earthquake zone, grading slopes to avoid landslides and rock falls, and setting controlled forest fires to lessen the likelihood of wildfires, are all examples of environmental control efforts.
- **Behaviour modification**, which uses collective action to reduce community risk, and, because it often relies upon forms of sacrifice, it is sometimes a more challenging strategy. Examples of behaviour modification include rationing (water in times of drought, electricity in extreme heat), environmental conservation (pesticide use), tax incentives (housing buyout programmes to move people out of high-risk areas), and the strengthening of social ties to ensure a community works together to stay safe in hazardous conditions (checking in on people living alone).

Preparedness

Preparedness refers to actions taken before the occurrence of a disaster with the aim of minimising the impacts of that event. Preparedness activities aim to equip communities with the knowledge and tools to minimise infrastructure damage, respond to safety and health needs, and ensure people are able to meet their basic needs in the aftermath of a disaster. Preparedness is best through an integrated and collaborative process. Government agencies at all levels have an obligation to prepare themselves and the public for emergencies. Community groups, service providers, businesses, civic and volunteer groups are all partners in this effort. Everyone needs to be prepared.

Critical preparedness tasks typically include:

- Understanding potential hazards, their frequency of occurrence and risks.
- Developing and ensuring that alert systems work.
- Preparing emergency plans and testing them at the community, regional and national level, as appropriate.
- Establishing evacuation routes and means to support more vulnerable persons like the elderly and disabled.
- Ensuring rapid availability of appropriate life-saving material resources like transport, equipment and essential supplies.
- Stockpiling inventory, and maintaining emergency supplies and equipment.
- Conducting disaster awareness and public education in order that the public knows what to do in an emergency as well as to increase individual and household preparedness.
- Ensuring facilities like emergency shelters are accessible and ready for use in an emergency.
- Developing communication plans with easily understandable terminology and methods.
- Developing and practising multi-agency co-ordination and incident command.
- Ensuring proper maintenance and training of emergency services, including mass human resources such as community emergency response teams.
- An efficient preparedness measure is an emergency operations centre (EOC) combined with a practised region-wide doctrine (such as the incident command system) for managing emergencies.

Response

The response phase refers to actions taken immediately before (warning phase), during, and after a disaster to reduce or eliminate the impacts of a



disaster. Response activities typically aim to save lives, prevent further suffering, minimise damage to property, and enhance the effectiveness of recovery (Mileti, 1999). It is during initial stages of the response phase that emergency services and first responders are mobilised in the disaster area. This is likely to include a first wave of core emergency services, such as fire-fighters, police and ambulance crews. They may also be supported by a number of secondary emergency services, such as specialist rescue teams.

Tasks that commonly occur during the response phase include:

- Co-ordination and management of the overall response through activation of an Incident Management System.
- Implementing pre-impact precautionary measures during the warning and alert period (including evacuation and dissemination of warnings).
- Establishing communication with communities, local authorities and national authorities.
- Conducting a rapid assessment of potential losses and subsequent needs including:
- Obtaining information on the available resources (both supplies and expertise).
- Organising appropriate rescue and relief operations promptly with adequate human and financial resources, and procuring necessary equipment.
- Providing humanitarian assistance in the form of emergency medical care, food, shelter and psychosocial support.
- Constructing or making arrangements for temporary shelters.
- Ensuring access to sufficient stocks of essential and relief supplies.

Recovery

The aim of the recovery phase is the restoration of services to the public and returning the affected community to its previous state, although efforts might also be taken to build back better in order to strengthen communities and reduce their risk to future disasters. Recovery efforts typically involve the rebuilding of damaged or destroyed infrastructure, restoration of housing and property, and the re-establishment of commerce and businesses. In more severe disasters especially, where there is loss of life and significant injury, efforts should also be taken to support the social and psychological well-being of survivors (Emergency Management Australia, 2004).

Recovery activities occurring immediately after a disaster include:

- debris removal and clean-up
- restoration of health and social services
- provision of interim housing and other basic necessities to those displaced or otherwise unable to return to their homes

- repair of lifeline utilities (power, water, sewers).

Medium and longer-term recovery activities include:

- repair and reconstruction of damaged infrastructure, housing and commercial facilities
- restoration of normal municipal services like transportation
- economic recovery measures aimed at the re-establishment of business and commerce
- strengthening of preparedness and response activities in order to mitigate the impacts of future disasters.

Activity 1.4



Activity

1. Select **four** principles of emergency management and explain how emergency managers should apply them in their work.
2. Name the **four** phases of the disaster management cycle.
3. What common activities take place in the different phases of the disaster management cycle?

Disaster mythology

Despite a significant body of research about how people behave during disasters, a number of myths still circulate and influence expectations about how the public will respond to an emergency or disaster.

This section reviews disaster myths that continue to circulate and presents the reality that corrects the myth. However, before you begin this section, take a few moments to test your disaster knowledge below, to see if you are influenced by any disaster myths.



Activity 1.5



Activity

Determine whether each statement below is myth or reality, tick the appropriate column.

When you have completed the grid below, check your answers against those at the end of this module.

	Myth	Reality
1. There will be widespread panic after a disaster.		
2. People who are not hurt in the immediate aftermath of a disaster usually help people who have been injured before professional responders arrive.		
3. People cannot make rational decisions immediately after a disaster.		
4. Looting after a disaster is common.		
5. Disasters affect people randomly; they are “equal opportunity” events.		
6. Emergency responders often abandon their response duties to protect their families and loved ones.		

Disaster myths and realities

The following myths and reality checks are published by the World Health Organization.



Reading

See <http://www.who.int/hac/techguidance/ems/myths/en/> for more information.

Myths relating to dead bodies

Disaster Myth	Reality
Myth: Dead bodies pose a health risk and cadavers are responsible for epidemics in natural disasters.	Reality: Dead bodies pose no more risk of disease outbreak in the aftermath of a natural disaster than survivors.
Myth: Epidemics and plagues are inevitable after every disaster.	Reality: Epidemics do not spontaneously occur after a disaster and dead bodies will not lead to catastrophic outbreaks of exotic diseases. The key to preventing disease is to improve sanitary conditions and educate the public.
Myth: The fastest way to dispose of bodies and avoid the spread of disease is through mass burials or cremations. This can help create a sense of relief among survivors.	Reality: Survivors will feel more at peace and manage their sense of loss better if they are allowed to follow their beliefs and religious practices and if they are able to identify and recover the remains of their loved ones.
Myth: It is impossible to identify a large number of bodies after a tragedy.	Reality: Conditions always exist that allow for the identification of bodies or body parts.



Reading

For more information about myths relating to dead bodies, see *Management of dead bodies after disaster situations: a field manual for first responders*, at:

<http://www.paho.org/english/dd/ped/DeadBodiesFieldManual.pdf>

Other disaster myths and realities

Disaster Myth	Reality
Myth: Foreign medical volunteers with any kind of medical background are needed.	Reality: The local population almost always covers immediate lifesaving needs. Only medical personnel with skills that are not available in the affected country may be needed.
Myth: Any kind of international assistance is needed, and it's needed now!	Reality: A hasty response that is not based on an impartial evaluation only contributes to the chaos. It is better to wait until



Disaster Myth	Reality
	genuine needs have been assessed.
Myth: Disasters bring out the worst in human behaviour.	Reality: Although isolated cases of antisocial behaviour exist, the majority of people respond spontaneously and generously.
Myth: The affected population is too shocked and helpless to take responsibility for their own survival.	Reality: On the contrary, many find new strength during an emergency, as evidenced by the thousands of volunteers who spontaneously unite to sift through the rubble in search of victims after an earthquake.
Myth: Disasters are random killers.	Reality: Disasters strike hardest at the most vulnerable groups, the poor – especially women, children and the elderly.
Myth: Locating disaster victims in temporary settlements is the best alternative.	Reality: It should be the last alternative. Many agencies use funds normally spent for tents to purchase building materials, tools, and other construction-related support in the affected country.
Myth: Things are back to normal within a few weeks.	Reality: The effects of a disaster last a long time. Disaster-affected countries deplete much of their financial and material resources in the immediate post-impact phase. Successful relief programmes gear their operations to the fact that international interest wanes as needs and shortages become more pressing.
Myth: Starving people can eat anything.	Reality: It is widely held that people who are starving will be very hungry and eat any food that can be supplied. This attitude is inhumane and incorrect. Even if hungry initially, people often do not consume adequate quantities of unvaried and unfamiliar foods for long enough. More importantly, the starving people are often ill and may not have a good appetite. They will therefore languish in an

Disaster Myth	Reality
	<p>emaciated state or get even sicker. Even someone well-nourished would fail to thrive on the monotonous diets of three or so commodities (such as wheat, beans and oil) as that is all that is available, month in, month out, to many refugees and displaced people. And this is aside from the micro-nutrient deficiencies that often develop. This misconception starts, in part, from a failure to agree on explicit objectives for food assistance – which should surely be to provide for health, welfare, and a reasonably decent existence and help in attaining and acceptable state of self-reliance and self-respect. (Mason et al., 1992)</p>
<p>Myth: Children with diarrhoea should not be intensively fed</p>	<p>Reality: A view from many years ago, and from non-emergency situations, sometimes persists – namely that children must be rehydrated (and diarrhoea prevented) before re-feeding. This practice is incorrect and, with severely malnourished children, it can be fatal. Any child with diarrhoea must be fed, if necessary with a liquid diet by nasogastric tube, at the same time as additional fluids are given. Even if the diarrhoea is profuse, some nutrients are absorbed and can start the recovery process. To begin feeding after rehydration will often be too late. (Mason et al., 1992).</p>
<p>Myth: Refugees can manage with less.</p>	<p>Reality: This misconception dehumanises the refugee. It implies that, once uprooted, he or she no longer has the basic human rights to food, shelter and care – that these are now offered as charitable acts and that refugees can (or should) make do on much less than non-refugees. In fact, they will often need more than their normal food requirement at first if they</p>



Disaster Myth	Reality
	have become malnourished and sick before arrival at a camp and need rehabilitation, and may suffer exposure from inadequate shelter.
<p>Myth: Trading foods indicates that people do not need all of the rations.</p>	<p>Reality: If the only food source is provided by camp organisers, these rations have to be adequate in all nutrients. This requires a mixed food basket, including fruits and vegetables. If this cannot be ensured then trading may have to be encouraged if refugees are not to become undernourished and deficient in micro-nutrients. The fact that some foods may be traded, to add variety to the diet, is no grounds for reducing the ration. (Mason et al., 1992).</p>
<p>Myth: A standard ration is suitable for all populations.</p>	<p>Reality: The recommended per person calorie output for a refugee population should vary according to demographic composition, nutritional and health status of the population (allowing for an extra “catch-up” allowance where people are malnourished), the activity level the intake is intended to support, environmental temperature, and likely wastage in the chain from supply of food in a country to its consumption by individuals. In other words there is a range of requirements for dietary energy, which will depend on the circumstances, and use of a single figure is likely to lead to either deficit or wastage. The figure of 1900 kcal (commonly assumed to be of general application) often underestimates what is needed. (Mason et al., 1992).</p>
<p>Myth: Energy adequacy means nutritional adequacy.</p>	<p>Reality: The diet needs to be adequate in both quantity and quality, meeting requirements for calories, protein, and micro-nutrients. Where refugees are completely dependent on the ration</p>

Disaster Myth	Reality
	<p>provided – for example, in the early stages of an emergency or in closed camps, where trading for diversity cannot be ensured – the ration must be designed to meet the requirements of all nutrients in full. Often, a ration is designed to meet minimum energy requirements and micro-nutrients are left to look after themselves. How micro-nutrient needs are to be met must be made explicit, especially when the ration provided is calculated on the basis of fully meeting energy needs. Foods should be diverse and palatable, and the special needs of weaning children must be met.</p>
<p>Myth: Disasters cause deaths at random.</p>	<p>Reality: Disasters tend to take a higher toll on the most vulnerable geographic areas (high-risk areas), generally those settled by the poorest people. (WHO, n.d.).</p>
<p>Myth: It is best to limit information on the magnitude of the tragedy.</p>	<p>Reality: Restricting access to information creates a lack of confidence in the population, which can lead to misconduct and even violence. (WHO, n.d.).</p>



Activity 1.6



Activity

1. What are the **two** main types of mitigation? Provide **two** examples of each type.
2. List **five** examples of preparedness activities.
3. Correctly label the following activities as either “response” or “recovery”:
 - a. Activating an Incident Management System
 - b. Repair of critical utilities
 - c. Conducting a rapid needs assessment
 - d. Making arrangement for emergency shelters
 - e. Removing debris from affected area
 - f. Repairing damaged infrastructure
 - g. Immediate provision of humanitarian assistance, such as medical care, food and water.

Unit summary



Summary

In this unit you have learnt:

- The definition of emergency management
- About the principles which guide good emergency management
- The four phases of emergency management and common activities undertaken in each phase
- Disaster myths and the realities that truly reflect disaster situations.



Activity answers

Activity 1.1

1. What is the difference between an emergency and a disaster?

An emergency is an unplanned event that necessitates the immediate co-ordination of services to protect the health, safety or welfare of a community, or to minimise damage to property or the environment. Emergencies are different from disasters in that they **do not exceed** the community's resources or capacities. A disaster, on the other hand, seriously disrupts the functioning of a community or society, causing widespread human, material or environmental losses that exceed the ability of the affected area to cope using its resources alone.

2. Describe **five** ways a disaster can impact a community or country.

All of the following answers are correct. Disasters can:

- Cause loss of lives and serious injuries.
- Damage or destroy physical infrastructure such as roads, bridges, dams.
- Disrupt transportation systems including airports, railroads and trucking arrangements.
- Damage or destroy basic utilities such as electricity, gas, water and sewerage systems.
- Damage or destroy essential services such as medical facilities and hospitals resulting in a lack of emergency and longer-term medical care for the affected population.
- Damage or destroy homes and other housing properties, resulting in the displacement of large numbers of people.
- Disrupt agriculture and food productions systems, reducing the availability and distribution of commercial foodstuffs.
- Damage or destroy local factories and manufacturing, resulting in loss of goods and materials for rebuilding and reconstruction.
- Disrupt local markets and economies, which may lead to job losses and opportunities for income generation.
- Disrupt vital community self-help networks that form the basis of people's lives.

3. What is a complex humanitarian crisis?

A complex humanitarian emergency involves a breakdown of authority resulting from internal and/or external conflict and which requires a multi-agency, international response.

4. Name **three** reasons why disasters are increasing around the world.

All of the following reasons are correct:

- Population growth and urbanisation
- Living in high risk areas
- Poverty
- Climate change
- Environmental degradation.

Activity 1.2

1. What is the difference between refugees and internally displaced persons (IDPs)?

A refugee is someone who, because of well-founded fears of being persecuted for reasons of race, religion, nationality, membership of a particular social group or political opinion, is outside the country of their nationality, and is unable to, or is unwilling to avail themselves of the protection of that country. An IDP is a person who has been forcibly uprooted from his or her home because of fear for his or her life or freedom, but who remains in his or her own country.

2. Name **four** common humanitarian needs of refugees and IDPs.

All of the answers below are correct:

1. Shelter
2. Water and sanitation
3. Food and nutrition
4. Health care
5. Maternal and child health
6. Education
7. Psychosocial support
8. Protection.

3. Explain what the term “protection” means.

Protection means that the basic human rights of refugees and displaced persons are not violated, including their right to life, liberty, freedom of thought and expression and equal treatment before the law (among others).

Activity 1.3

1. Name and describe **four** characteristics of disaster typology.

All of the following answers are correct:

- a. Location – the proximity of people to the event.
- b. Predictability – the extent to which a community can predict the occurrence of a possible hazard.
- c. Rate of onset – how quickly a disaster occurs.
- d. Intensity and magnitude – the severity of a disaster.
- e. Duration – the length of time a disaster affects a community.



- f. Frequency – also known as reoccurrence, frequency is the interval of time when the hazard is expected to reoccur.
 - g. Controllability – the extent to which people can control the impact of a hazard or disaster event.
2. Define the terms vulnerability and resiliency.

Vulnerability refers to the physical, social, economic, and/or environmental conditions that may increase the susceptibility of people to hazards.

Resiliency describes the capacity of a system, community or society to resist or change to reach and maintain an acceptable level of functioning and structure. Learning from past disasters contributes to better future protection.

3. What are the different factors that can make communities more vulnerable or resilient?
1. Physical characteristics, such as the topography of the area, its infrastructure, and population.
 2. Environmental characteristics, such as its exposure to severe storms or the amount of precipitation the area receives, which can make a community more vulnerable to the impacts of a disaster.
 3. Social and organisational factors, including cultural, political, societal and individual, which can influence people's capacity to weather a disaster.
 4. Economic characteristics, including a country's gross domestic product, its debt, available disaster funding, and business continuity plans.

Activity 1.4

1. Select **four** principles of emergency management and explain how emergency managers should apply them in their work.

All of the following answers are correct:

Comprehensive: Emergency managers should consider all hazards and their potential impact on communities. Planning should also be comprehensive, taking into account all phases of the emergency management cycle (mitigation, preparedness, response and recovery), as well as including all relevant stakeholders in planning and response activities.

Progressive: Emergency managers should be pro-active and anticipate future disasters and take preventive and preparatory measures to build disaster-resistant and disaster-resilient communities.

Risk-driven: Emergency managers should use sound risk management principles (hazard identification, risk analysis, and impact analysis) in planning and assigning resources.

Integrated: Emergency managers should ensure unity of effort among all levels of government and all elements of a community. Disasters are recognised as affecting all parts of society and thus require an integrated and co-ordinated approach.

Collaborative: Emergency managers need to create and sustain broad and sincere relationships among individuals and organisations should an integrated and coordinated emergency management system be maintained.

Co-ordinated: Emergency managers need to synchronise the activities of all relevant stakeholders to achieve a common purpose.

Flexible: Emergency managers need to use creative and innovative approaches in solving disaster challenges. Disasters often result in unforeseen impacts that require emergency managers to consider new ideas and alternatives.

Professional: Emergency managers need to value a science and knowledge-based approach to planning. Good emergency management should be based on strong research and continuous improvement, drawing upon better practices and lessons learned.

2. Name the **four** phases of the disaster management cycle.
 1. Mitigation
 2. Preparedness
 3. Response
 4. Recovery

3. What common activities take place in the different phases of the disaster management cycle?

Mitigation activities include: purchasing insurance, creating and enforcing building codes, and land use planning efforts.

Preparedness activities include: planning and training for emergency response, conducting safety drills and exercises, and disaster awareness and public education campaigns.

Response activities include: search and rescue operations, first aid and medical attention, evacuation, provision of water and basic relief services, maintaining law and order, and providing temporary shelters.

Recovery activities include: damage assessment, rebuilding and retrofitting houses and important buildings, repairing infrastructure, restoring livelihoods, and providing medical and psychological recovery services.



Activity 1.5

Determine whether each statement below is a myth or reality by ticking the appropriate column.

	Myth	Reality
<p>1. There will be widespread panic after a disaster.</p> <p>REALITY: Panic after a disaster is rare. Several specific conditions must be present to trigger panic:</p> <ul style="list-style-type: none"> • Immediate threat of being trapped in a confined space • Escape routes are rapidly closing • Flight is only way to survive • Feeling of isolation. 	✓	
<p>2. People who are not hurt in the immediate aftermath of a disaster usually help people who have been injured before professional responders arrive.</p> <p>REALITY: In the immediate aftermath of a disaster, the first responders on the scene are usually neighbours and passers-by who happen to be in the area, who act quickly to save lives.</p>		✓
<p>3. People cannot make rational decisions immediately after a disaster.</p> <p>Another common myth is that after a disaster people are so overwhelmed that they develop what has been called "disaster shock" or the "disaster syndrome". This is said to be a state of stunned psychological incapacitation that results in the inability to take care of oneself or others.</p> <p>REALITY: Actually, only a small proportion of people suffer from this type of shock, which tends to be limited to sudden, violent disasters. Even when it occurs, the condition is usually short lived.</p>	✓	
<p>4. Looting after a disaster is common.</p> <p>REALITY: While anti-social behaviour, such as looting, does sometimes occur, it is not as prevalent as supposed. Sometimes what is thought to be looting may actually be the salvage of property belonging to people who have been impacted by the disaster. Except in civil disorders and riots, increased criminal activity is uncommon.</p>	✓	
<p>5. Disasters affect people randomly; they are "equal opportunity" events.</p> <p>REALITY: Disasters impact some groups of people more than others. Disaster vulnerability is rooted in the social, cultural and economic variables that influence people's</p>	✓	

ability to weather a disaster.		
<p>6. Emergency responders often abandon their response duties to protect their families and loved ones.</p> <p>REALITY: The exact opposite of this myth has been found to be true. The tendency is for workers to not only remain on the job, but often work too long. Although role conflict will sometimes occur, it rarely causes people to abandon their emergency roles. Once people know their families are safe, they will continue to fulfill their emergency responsibilities.</p>	✓	

Activity 1.6

1. What are the **two** main types of mitigation? Provide **two** examples of each type.

The two main types of mitigation: structural and non-structural.

Structural mitigation refers to efforts to reduce a hazard through some form of construction, engineering, or other structural measure. These are often seen as human attempts to control nature. For example, imposition of building codes, constructing barriers to block a physical force, and building community shelters.

Non-structural mitigation refers to actions that can reduce the likelihood of a hazard or its consequences by changing human behaviour. For example, community awareness and education programmes designed to inform people about hazards in their area and ways to reduce their risks; also securing furniture and wall hangings to avoid earthquake injuries would be another example of non-structural mitigation efforts.

2. List **five** examples of preparedness activities

All of the following examples are correct:

- Understanding potential hazards in one's community, their frequency of occurrence and risks.
- Developing and ensuring that alert systems work.
- Preparing emergency plans and testing them at the community, regional and national level, as appropriate.
- Establishing evacuation routes and means to support more vulnerable persons like the elderly and disabled.
- Ensuring rapid availability of appropriate life-saving material resources like transport, equipment and essential supplies.
- Stockpiling inventory, and maintaining emergency supplies and equipment.
- Conducting disaster awareness and public education in order that the public knows what to do in an emergency as well as to increase individual and household preparedness.



- Ensuring facilities like emergency shelters are accessible and ready for use in an emergency.
 - Developing communication plans with easily understandable terminology and methods.
 - Developing and practising multi-agency co-ordination and incident command.
 - Ensuring proper maintenance and training of emergency services, including mass human resources such as community emergency response teams.
 - An efficient preparedness measure is an emergency operations centre (EOC) combined with a practised region-wide doctrine (such as the incident command system) for managing emergencies.
3. Correctly label the following activities as either “response” or “recovery”.

		Response	Recovery
a	Activating an incident management system	✓	
b	Repair of critical utilities		✓
c	Conducting a rapid needs assessment	✓	
d	Making arrangement for emergency shelters	✓	
e	Removing debris from affected area		✓
f	Repairing damaged infrastructure		✓
g	Immediate provision of humanitarian assistance, such as medical, care, food, and water	✓	

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Appendix 1

Different types of hazards

Hazards are identified by cause:

- natural hazards
- biological hazards like diseases, epidemics and infestations
- person-induced hazards.

Natural hazards

Classification	Hazards
Astronomical	<ul style="list-style-type: none"> • asteroid crashes • comet crashes • geo-magnetic storms • meteor showers
Atmospheric	<ul style="list-style-type: none"> • blizzards/extreme cold/fog/freezing rain or drizzle • heat waves • hurricanes • snow storms/ice fogs and ice storms/frost/hailstorms • thunderstorms • tornadoes • wind storms
Fires	<ul style="list-style-type: none"> • forest fires • grass, bush and brush fires • urban wildland interface fires
Geological	<ul style="list-style-type: none"> • avalanches • debris avalanches, debris flows and torrents • expansive soils • landslides • land subsidence and sinkholes • sand and dust storms • submarine slides
Hydrological	<ul style="list-style-type: none"> • drought • erosion, accretion and desertification • floods – flash urban • floods – river ice jam • floods – snow melt • glaciers • icebergs, ice islands and sea ice • sea storms • seiche • storm surges • rain storms



Classification	Hazards
Seismic	<ul style="list-style-type: none"> • ground failure • liquefaction • surface faulting • tectonic deformation • tsunamis
Volcanic	<ul style="list-style-type: none"> • ash falls, projectiles and lateral blasts • lava flows • mudflows, pyroclastic flows

Table 1: Natural hazards

Biological Hazards

Classification	Hazards
Diseases affecting people	<ul style="list-style-type: none"> • viral and bacterial human-transmitted epidemics • viral and bacterial insect-borne epidemics • viral and bacterial animal-borne epidemics • water- and air-borne epidemics, parasites
Diseases affecting animals	<ul style="list-style-type: none"> • viral and bacterial human transmitted epidemics • viral and bacterial insect-borne epidemics • viral and bacterial animal-borne epidemics • water- and air-borne epidemics, parasites
Diseases and infestations affecting plants	<ul style="list-style-type: none"> • viral and bacterial human transmitted epidemics • viral and bacterial insect-borne epidemics and infestations • viral and bacterial animal-borne epidemics and infestations • water- and air-borne fungus and mould, diseases, parasites

Table 2: Diseases, epidemics and infestations

As a guideline the following diseases, epidemics and pest infestations are provided. However, you should consult with local sources to expand on the list, keeping in mind local conditions.

Human	Animal	Plant
Acute encephalitis Acute meningitis AIDS Cholera Cryptosporidium Diphtheria Ebola Fever Flu Hepatitis Malaria Measles Pandemic SARS Scarlet Fever Tuberculosis Typhoid Yellow Fever	Anthrax Brucellosis Foot and Mouth Gastroenteritis Lump jaw Mad Cow Disease Rabies Swine Fever Tuberculosis	Asian Gypsy Moth European Gypsy Moth PYK Spruce Budworm

Table 3: Diseases, epidemics and pest infestations

Person-induced hazards

A number of the hazards included on the person-induced hazards list also appear in the natural hazards list.

Classification	Hazard
Accidents	<ul style="list-style-type: none"> • air crashes • marine accidents • motor vehicle crashes • rail accidents • subway accidents
Dam failure	<ul style="list-style-type: none"> • flooding • landslides • soil erosion • sedimentation
Ecological Destruction	<ul style="list-style-type: none"> • deforestation • disruption in natural hydrological cycle • global warming • ozone depletion
Explosions and leaks	<ul style="list-style-type: none"> • gas explosions and gas leaks • mine • other explosions
Famine	<ul style="list-style-type: none"> • drought • depletion of ground water resources. • erosion and accretion



Classification	Hazard
	<ul style="list-style-type: none"> • local flooding • desertification
Fire	<ul style="list-style-type: none"> • forest fires • urban fires • urban wildland interface • grass, bush and brush fires
Geological	<ul style="list-style-type: none"> • avalanches • debris avalanches, debris flows and torrents • landslides • sand and dust storms • submarine slides • land subsidence
Hazardous material accidents – In situ	<ul style="list-style-type: none"> • gas leaks • chemical leaks • oil spills
Hazardous material spills – Transport	<ul style="list-style-type: none"> • air • marine • land • rail
Conflict-induced hazards	<ul style="list-style-type: none"> • nuclear accidents • riots • terrorism • wars • hijacking • bombing
Complex emergencies	<ul style="list-style-type: none"> • power outages • pollution • sudden gas leaks • grid failures
Space object crashes	<ul style="list-style-type: none"> • meteoroids • spaceship crash
Structural collapse	<ul style="list-style-type: none"> • buildings • structures
System attack	<ul style="list-style-type: none"> • cyber-terrorism

Table 4: Natural hazards

Appendix 2

Case Study: Turkey Grounded by Earthquake

Taranjot Gadhok and Rinki Saxena

Ripping through towns and cities as people slept, the tremor was the worst to shake earthquake-prone Turkey in half a century. Centred on the drab industrial town of Izmit, which borders the Sea of Marmara, the quake measured 7.4 on the Richter scale. Trembling was felt as far as Ankara, the capital, 340 kilometres (210 miles) away. Up to 10,000 victims remained buried under the rubble of collapsed apartment blocks at Turkey's biggest naval base, Golcuk, two days after the quake occurred.

In the aftermath of the 45-second-long tremor, hundreds of dazed residents in Izmit, many of them bleeding, wandered about the wreckage of row upon row of crumpled buildings, searching for signs of life. Pain among survivors began to turn to rage as help from the authorities failed to reach them. Using axes and picks, and their bare hands, they cursed the government as they sought to pull out their family and friends. Local hospitals were overwhelmed; the wounded lay lined up on the floor, holding up their own drips.

Nobody can be surprised that an earthquake of this magnitude – bigger than that which rocked Kobe in Japan in 1995, though nothing like as massive as the one in Mexico City ten years earlier – struck Turkey. The entire country lies in a 'ring of fire', a band of fault-lines where the earth's tectonic plates collide, which covers the Pacific rim, and arches across Central Asia to the Mediterranean. Earthquakes have shaken Turkey periodically, the most devastating of all being in 1939, when nearly 33,000 people died.

The question Turks are asking is why this tremor killed so many people. Part of the answer, according to the Turkish authorities, is that it occurred in the country's most densely populated region, whose industries draw thousands of migrants from the poorer central and eastern part of Turkey every year. This was compounded by the time that the quake struck. Residents of many apartment buildings were asleep, and so were crushed by the weight of collapsing buildings and debris. Had it occurred in the day, they might well have been out on the streets and so safer.

Lessons from Turkey Earthquake – Concerns of the Future

Reports of flattened buildings across the area, rippling of electric poles and leaning of power cables apart, toppling of minarets of dozens of mosques, a huge fire at the Turkey's biggest oil refinery and blazing out of control, blocking of roads to the towns were some of the worst scenes one can only imagine.



It was not the older buildings that collapsed. Indeed, many of the older mosques lost nothing more than the odd minaret. Rather, it appeared to be the newer buildings, made of flimsy materials and put up by cowboy builders that gave way. In Istanbul, the country's biggest city, hundreds of apartment blocks were literally pulverised by the impact of the tremor. It is thought that some of these blocks may have been built after contracts were handed out to cronies by corrupt municipal officials. Worst was the fact that rescue teams, which flew from Switzerland, the United States, Greece and Germany, struggled to reach residents buried under dozens of collapsed buildings. The frantic search for possible survivors was called off on Friday, 27th August, when rescue teams found no signs of life beneath the ruins of mountains of twisted concrete and steel. But the worst was that some cries were only unanswered because rescue teams struggled to reach residents buried under dozens of collapsed buildings. Witnesses said, "In one place the earth had shifted five meters to the west".

Frantic survivors tore at tangled steel and concrete to free loved ones and officials sought international aid to send sniffer dogs and lighting equipment to help the rescue.

One of the American volunteers reports, "I was just passing by and I heard, I believe I heard with my ears, sort of a muffled moan and then with a stethoscope knocking on concrete... We asked the person to knock on concrete, if indeed there was a person. There, and I believe, I heard knocking," she said.

Teams of rescuers used drills and other equipment to dig through the debris and tried to pop up whatever possible, but such efforts resulted in some dashed hopes when no survivors were found and cries for help died away in the five-day operation.

The randomness of the earthquake's trail of devastation has left no reasonable logical explanation because there were no answers for one street being untouched and the very next street massively affected, or one building having flattened into a pancake pile, its neighbour half-tilted like a shuffled pack of cards and the very next building left upright as if scornful of nature's brutal force.

It was the buildings that killed and not the earthquake. Scientists admitted that they had learned key lessons from the deadly quake.

"Tell me my children are alive," pleaded Muzaffar Yarla, grabbing the arm of a Reuters reporter. Minutes later a pair of bare feet, clearly lifeless, poked through the tangle of steel and concrete and the search halted briefly before neighbours struck up a loud wail.

Images of destruction in Turkey confirmed what seismic engineers already knew, that a powerful earthquake has an ally in a weak building.

Most of the framed concrete buildings had walling of bricks and mortar, which turned them into massive structures. Collapse of mass at that scale

in the event of a quake would kill. Another reason given was lack of uniformity of loading in the framed structure; for example, the first floor had a glass window front while the lower level had brick walls. Another very important factor was the lower reinforcing steel with plain bars, which pulled out much more easily. Tor steel would have had better grip in concrete. Lessons from the California quake taught engineers to have lighter-weight steel frames, which reduced the weight of the buildings, and hinged short joints, which kept buildings flexible. Earthquakes have shown that rigid joints in buildings are weak points while it is desirable that structures be allowed to sway, which render steel frames to be ideal.

Other areas which need to be looked into, are the joints and bracing joints, which have to be carefully designed so that the stresses are not transferred to the lowest section of the frame. Also, bracings connect various floors and keep them from moving relative to each other in an earthquake.

It has been observed that Turkish engineers knew how to build in seismic zones and even codal provisions were well laid out – but only on paper. In a developing country like Turkey, where stringent building regulations exist but are seldom applied, and where governments have more pressing tasks than the organisation of earthquake drills, a natural disaster on this scale will unfortunately almost always kill many people. But perhaps the main reason for the large number of deaths was the nature of the apartment buildings themselves. The system failed to produce earthquake-resistant buildings. Reports said that “middle class dream neighbourhoods” had been built by the building companies who had mixed sea sand into the concrete. This was admitted under a pretext that the builders did not know it was wrong. Such building practices had been a cause of major collapses in Turkey.

Estimates of rebuilding alone amounted to around USD 8 billion. An area the size of Belgium and Holland combined, was devastated. Turkey has a USD 20 billion deficit with annual inflation of 50 per cent. The government was in the process of securing a USD 5 billion loan from the IMF to be able to increase economic standing to enable it to cut the deficit. A burden of USD 8 billion due to the destruction would aggravate Turkey’s economic crisis.

While the scientists had predicted the impact of an earthquake of this magnitude, having seen it meant a lot more. The quake in Turkey, with a magnitude of 7.4 was located on the Anatolian fault which jumped over lakes and ignited other faults. The major concerns of the future are the theory that the quake’s seismicity or the movement of its epicenter has migrated westward towards Istanbul, a city of 12 million.

Turkey’s quake and the 800-kilometre (500-mile) fault is important to seismologists and geologists who study the San Andreas, which is nearly identical in length and type. Both run along two tectonic plates grinding against each other.

In the earthquake, the Anatolian fault jumped the 5-kilometre (3-mile) Lake Sapanca and skipped from one fault to another, activating the second. Dozens of waterfront homes fell into the lake. Scientists do not know why it leaped across the lake, located between Izmit and Adapazari, and crushed



the city of Golcuk. Perhaps it released energy in spurts of the same intensity but in different directions.

Seismologists also worry about the western migration of quakes along the Anatolian fault, which began when a 1939 quake killed 33,000 people in eastern Turkey. As it slowly moved west, 10 earthquakes of at least a 6.7 magnitude occurred between 1939 and 1992.

If the theory holds true, then the next should be in the Sea of Marmara, which borders Turkey's biggest city. Most experts agree it could occur within a decade. This is a wakeup call for all of us, not just Istanbul. It is said lessons learned from Turkey need to be learned and there is no option but to build seismically safe buildings, no matter the cost.