

# Hazards and Disasters

# HAZARD

**A hazard is a natural or man-made event which may cause physical damage, economic losses, or threaten human life and well-being if it occurs in an area of human settlement agricultural, or industrial activity.**

The United Nations International Strategy for Disaster Reduction or UNISDR 2004 defines hazard as “A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation.



## The concept of Hazard

What is **hazard**?

A hazard is a situation or an occurrence with capacity to bring damages to lives, properties and environment.



Hazards can include latent conditions that may represent future threats and can have different origins: natural (geological, hydrometeorological, and biological) or induced by human processes (environmental degradation and technological hazards)

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## SOME DEFINITIONS

- ***Natural Hazards*** are those elements of the physical environment harmful to Man and caused by forces extraneous to him. (*Burton and Kates, 1964*)
- ***Hazards*** are threats to people and the things they value. (*Curren 1993*)



- ***Natural Hazards:*** Any natural event which has an adverse socio-economic impact on the human being. Alternatively, a natural extreme event, such as cyclone, flood, earthquake etc. that is not caused by human beings. These are naturally occurring phenomenon that only becomes hazardous due to the intervention of human infrastructure. *(Banglapedia 2003)*
  - ***A Hazard*** is an extreme geophysical event that is capable of causing a disaster. *(Alexander 2000)*
  - ***A Hazard*** is a threat posed to people by the natural environment. *(Oliver 2001)*

- **Calamity** is an event that causes a great deal of damage, destruction or personal distress. Calamity is an event resulting in great loss and misfortune; "the whole city was affected by the irremediable calamity".
- **Disasters:** The culminating events that result from environmental hazards, and which are characterized by major losses of life and property. A Hazard is something which could be dangerous to man's life, livelihood, health, safety and property.



- **Hazards are in part socially constructed by people's perceptions and their experiences.**
- **The hazard exists because humans or their activities are constantly exposed to natural forces.**
- **Natural hazards constitute a threat to all societies.**
- **Extreme events that do not affect human activities do not constitute a hazard.**

# **DEFINITIONS OF DISASTER**

“A disaster can be defined as any occurrence that cause damage, ecological disruption, loss of human life, deterioration of health and health services on a scale, sufficient to warrant an extraordinary response from outside the affected community or area”.

**(W.H.O.)**

- “A disaster can be defined as an occurrence either nature or manmade that causes human suffering and creates human needs that victims cannot alleviate without assistance”.

**American Red Cross (ARC)**



# What is a “disaster” ?

The United Nations International Strategy for Disaster Reduction (UNISDR, 2004) defines disaster as “ a serious disruption of the functioning of a community or a society causing widespread human, material, economic, or environmental losses, which exceed the ability of the affected community or society to cope, using its own resources”.



Disasters are frequently described as a result of the combination of (1) the exposure to a hazard; (2) the conditions of vulnerability that are present; and (3) insufficient capacity or measures to reduce or cope with the potential negative consequences (DepEd, DRR Manual 2008).

# TYPE OF DISASTERS

- Natural Disasters
- Technological Disasters
- Complex Disasters



## **Natural disasters**

Natural disasters arise without direct human involvement, but can become more severe because of human actions prior, during or after the disaster itself. Also, one specific event may spawn another type of disaster. For example, a hurricane may cause flooding by excessive rain or by pulling seawater onshore, also called a storm surge.

A volcanic eruption is particularly prone to spawning additional events like earthquakes, structural fires and wildfires, flooding from melting of mountain snow and ice, landslides, mudslides, thunderstorms and, if the volcano is located in or near the ocean, tsunamis.

A **natural disaster** is the effect of a **natural hazard** (e.g. **flood**, **tornado**, **hurricane**, **volcanic eruption**, **earthquake**, or **landslide**) that affects the environment, and leads to financial, environmental and/or human losses. The resulting loss depends on the capacity of the population to support or resist the disaster, and their resilience. This understanding is concentrated in the formulation: "disasters occur when hazards meet **vulnerability**."

A natural hazard will hence never result in a natural disaster in areas without vulnerability, e.g. strong earthquakes in uninhabited areas. The term *natural* has consequently been disputed because the events simply are not hazards or disasters without human involvement.



## HOW NATURAL ARE NATURAL HAZARDS?

Notwithstanding the term "natural," a natural hazard has an element of human involvement. A **physical event**, such as a volcanic eruption, that does not affect human beings is a **natural phenomenon** but not a natural hazard. A natural phenomenon that occurs in a populated area is a **hazardous event**. A hazardous event that causes unacceptably large numbers of fatalities and/or overwhelming property damage is a **natural disaster**.

In areas where there are no human interests, natural phenomena do not constitute hazards nor do they result in disasters. This definition is thus at odds with the perception of natural hazards as unavoidable havoc wreaked by the unrestrained forces of nature. It shifts the burden of cause from purely natural processes to the concurrent presence of human activities and natural events. *Contd....*



Although humans can do little or nothing to change the incidence or intensity of most natural phenomena, they have an important role to play in ensuring that natural events are not converted into disasters by their own actions. It is important to understand that **human intervention can increase the frequency and severity of natural hazards**. For example, when the toe of a landslide is removed to make room for a settlement, the earth can move again and bury the settlement. **Human intervention may also cause natural hazards where none existed before**. Volcanoes erupt periodically, but it is not until the rich soils formed on their ejects are occupied by farms and human settlements that they are considered hazardous. Finally, **human intervention reduces the mitigating effect of natural ecosystems**. Destruction of coral reefs, which removes the shore's first line of defense against ocean currents and storm surges, is a clear example of an intervention that diminishes the ability of an ecosystem to protect itself. An extreme case of destructive human intervention into an ecosystem is desertification, which, by its very definition, is a human-induced "natural" hazard.

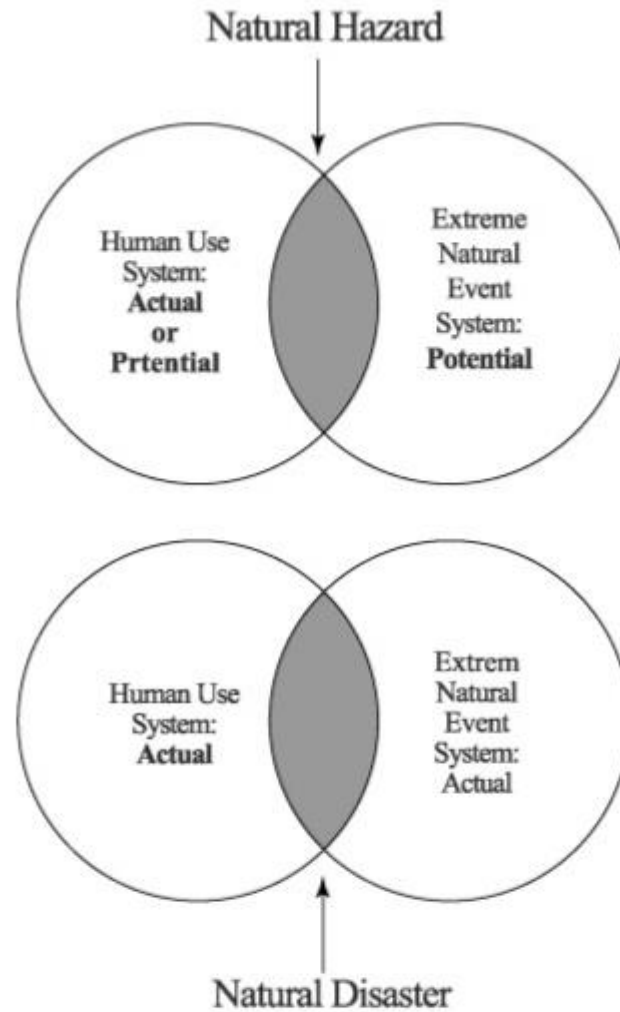


FIGURE 1.1. Natural hazards and natural disasters. In both cases, the overlap between human and physical systems is of concern; their difference relates to potential versus actual occurrences. Hazards represent potential events while disasters result from actual events

Natural

## *Geological Disasters*

- Earthquakes
- Tsunamis
- Volcanic eruptions
- Landslides



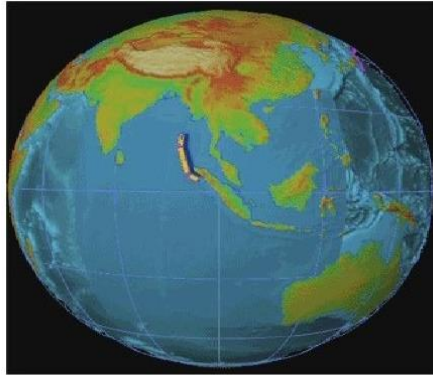
# Earthquake



**Earthquake is a sudden slipping or movement of a portion of the earth's crust accompanied and followed by a series of vibrations**

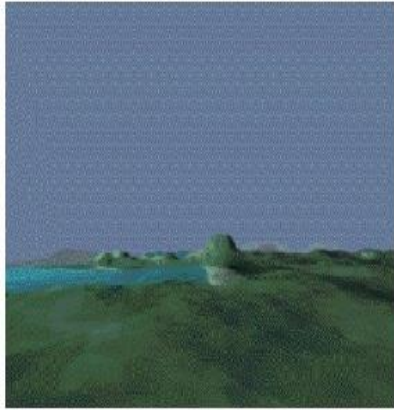
It is any sudden shaking of the ground caused by the passage of seismic waves through Earth's rocks. Seismic waves are produced when some form of energy stored in Earth's crust is suddenly released, usually when masses of rock straining against one another suddenly fracture and "slip." Earthquakes occur most often along geologic faults, narrow zones where rock masses move in relation to one another. The major fault lines of the world are located at the fringes of the huge tectonic plates that make up Earth's crust.

# Tsunami



Tsunami is a series of waves created when a body of water, such as an ocean, is rapidly displaced. Earthquakes, mass movements above or below water, volcanic eruptions and other underwater explosions, landslides, all have the potential to generate a tsunami.

Out in the depths of the ocean, tsunami waves do not dramatically increase in height. But as the waves travel inland, they build up to higher and higher heights as the depth of the ocean decreases. The speed of tsunami waves depends on ocean depth rather than the distance from the source of the wave. Tsunami waves may travel as fast as jet planes over deep waters, only slowing down when reaching shallow waters.



## Volcanic eruption



Volcanic eruption is the point in which a volcano is active and releases lava and poisonous gasses in to the air. They range from daily small eruptions to extremely infrequent super volcano eruptions.

Some eruptions form high-temperature clouds of ash and steam that can travel down mountainsides at speeds exceeding that of an airliner.

## LANDSLIDE



Landslide is a disaster involving elements of the ground, including rocks, trees, parts of houses, and anything else which may happen to be swept up. Landslides can be caused by an earthquake, volcanic eruptions, or general instability in the surrounding land.

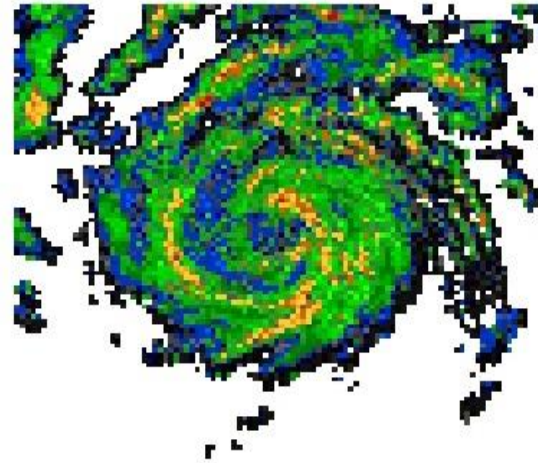


**Natural**

## **Climatic Disasters**

- **Tropical cyclones**
- **Floods**
- **Storms**
- **Mud Slides**
- **Avalanches**
- **Drought**
- **Wild/Forest Fires**

# Cyclone



Tropical Cyclones are large rotating, migratory storms that form over the tropical oceans.

Tropical Cyclones are called Hurricanes in Atlantic, Caribbean, and Eastern Pacific.

Typhoon in western Pacific

Cyclone in Indian Ocean

They occur primarily during the late summer month.

# FLOODS



Flood is an overflow of an expanse of water that submerges land, a deluge. It is usually due to the volume of water within a body of water, such as a river or lake, exceeding the total capacity of the body, and as a result some of the water flows or sits outside of the normal perimeter of the body.



## Storm/Dust Storm

**A dust storm is a strong, violent wind that carries fine particles such as silt, sand, clay, and other materials, often for long distances. The fine particles swirl around in the air during the storm.**



**A windstorm is generally a short duration event involving straight-line winds and/or gusts in excess of 50 mph. A windstorm can knock down trees and power lines, damage homes, businesses, public facilities, and create tons of disaster related debris.**



# Mudslides

Mudslides or mudflows, are a special case of landslides, in which heavy rainfall causes loose soil on steep terrain to collapse and slide downwards.



# AVALANCHE



Avalanche is a geophysical disaster involving a slide of a large snow or rock mass down a mountainside, caused when a buildup of material is released down a slope, it is one of the major dangers faced in the mountains in winter.



# DROUGHT



Drought is an extended period of months or years when a region suffers a severe deficiency in its water supply. Generally, this occurs when a region receives consistently below average rainfall. Drought can cause significant damage and harm the local economy.

## WILD/FOREST FIRES

Wildfires can start as a slow burning along the forest floor, killing and damaging trees. They often spread more rapidly as they reach the tops of trees, with wind carrying the flames from tree to tree. Usually, dense smoke is the first indication of a fire.

Common causes include lightning, human carelessness, arson, volcano eruption, and pyroclastic cloud from active volcano. They can be a threat to those in rural areas and also to wildlife.



**California wildfires  
Oct 23, 2007**

Natural

## *Environmental Disasters*

- Environmental pollution
- Deforestation
- Desertification
- Pest Infestation
- Epidemics



# Environmental Pollutions

Environmental pollution is a term that refers to all the ways that human activity harms the natural environment.

- **Gases**
- **Solid Waste**
- **Sewage**
- **Industrial Waste**
- **Automobile black smoke**



## Deforestation



Deforestation is the large-scale removal of trees by any method. From slash and burn deforestation to land clearing.

## Desertification



Desertification is the expansion of dry lands due to poor agricultural practices, degradation of soil fertility, erosion, forest removal, and climate change.



# EPIDEMICS

Common diseases spreading rapidly and extensively by infection and affecting many individuals in an area or a population at the same time: *an epidemic outbreak of **influenza, malaria, dengue fever, bird flue** etc.*



# **Technological Disasters**

Situations in which large numbers of people, property, infrastructure, or economic activity are directly and adversely affected by major industrial accidents, severe pollution incidents, nuclear accidents, air crashes (in populated areas), major fires, or explosions.

- **Industrial Accidents**

- Chemical spills
- Infrastructure Collapse
- Gas Leaks
- Explosions
- Radiation

- **Transport Accidents**

- Road, Rail, Air or space etc

- **Miscellaneous Accidents**

- Domestic
- Fire
- Collapse of residential buildings

# Complex Disasters

- Terrorism
- Civil Unrest/ War
- Refugee Problems
- Border Disputes



Another way of  
Categorizing Disasters  
(with examples)

# Major Categories

- Natural Hazards
- Anthropogenic Non-Intentional
- Anthropogenic Intentional

# Earth Hazardous to your health?

- 516 active volcanoes, eruption every 15 days (average)
- 2,000 tremors daily
- 2 significant earthquakes daily, severe damage 15-20 times annually
- 1,800 thunderstorms at any given time

# Still hazardous?

- Lightning strikes 100 times per second
- Late summer, an average of 5 hurricanes developing
- 4 tornadoes per day or 600-1000 annually
- 11 blizzards annually in the United States



# Categories of Natural Hazards

- Atmospheric (Meteorological)
- Geological (Earth)
- Hydrological (Water)
- Extraterrestrial
- Biological

# Atmospheric-Sourced Processes

- Tropical cyclones
- Thunderstorms
- Tornadoes
- Lightning
- Hailstorms
- Windstorms
- Ice storms
- Snowstorms
- Blizzards
- Cold waves
- Heat waves
- Avalanches
- Fog
- Frost

# Geological-Sourced Processes

- Earthquakes
- Volcanoes
- Tsunami
- Landslides
- Subsidence
- Mudflows
- Sinkholes

# Hydrological-Sourced Processes

- Floods
- Droughts
- Wildfires

# Extraterrestrial Processes

- Meteorites
- Asteroids



# Biological Processes

- Diseases
- Epidemics
- Pandemics
- Overpopulation
- Famine

# **Anthropogenic Non-Intentional**

- Technological
- Hazardous Materials
- Environmental
- Industrial
- Mining
- Nuclear
- Transportation
- Structural

# Technological

- Acts of People
- Technological systems that fail because of complexities and human fallibility (accidents)

# Hazardous Materials

- Can classify in different categories

# Environmental

- Can classify in different categories



# Industrial

- Factories
- Refineries

# Mining

- Coal
- Safety Standards

# Nuclear

- Power plants
- Industrial use
- Medical use

# Transportation

- Aviation
- Highways
- Railroads
- Maritime

# Structural

- Fires
- Collapse

# **Anthropogenic Intentional Hazards**

- Mass Shootings
- Civil Disobedience
- Terrorism
- Weapons of Mass Destruction



# Mass Shootings

- School shootings
- Workplace violence
- Hate crimes

# Civil Disobedience

- Labor riots
- Race riots
- Political riots

# Terrorism

- State/State Sponsored
- International Non-state
- Domestic

# Weapons of Mass Destruction

- Explosives
- Chemical
- Biological
- Nuclear/Radiological