

## CHAPTER 6

### When is a natural hazard considered a disaster?

- If it kills a minimum of 10 people
- If it harms 100 people
- If the government declares a state of emergency
- When the government asks for international assistance

### Types of Crust on Earth

#### 1- The oceanic crust (sial)

- Made of basalt
- Thin
- Very dense
- Can sink

#### 2- Continental crust

- Made of granite
- Thick
- Light weight
- Old
- Cannot sink and cannot be destroyed

### Factors that affect the strength of a disaster?

- Length of time people exposed to it
- Area where people live in. For example, people living in poor
- housing areas are more likely to be affected
- The ability of people to cope with it

### Plate Tectonics: theory that outer shell of earth is divided into plates that glide over the mantle

- Magma moves under the plates due to convection currents, and this what makes the plates move as well.
- Plates can move away from each other or towards each other. They meet in a Plate boundary

## Types of Plate Boundaries

- 1- **Constructive Plate Boundary:** when there are two plates moving apart from each other. They are called constructive plates because when they move apart, magma rises up in the gap- this forms volcanoes and eventually new crust.
- 2- **Destructive Plate Boundary:** sometimes called a convergent. This occurs when oceanic and continental plates move together. The oceanic plate is forced under the lighter continental plate. Friction causes melting of the oceanic plate and may trigger earthquakes. Magma rises up through cracks and erupts onto the surface through composite volcanoes.
- 3- **Collision Zone Plate Boundary:** when two continental plates collide. Neither plate is forced under the other, and so both are forced up and form fold mountains.
- 4- **Conservative plate boundary:** plates slide past each other in opposite directions. Friction takes place and the plates slip past in a sudden movement causing earthquakes.

## Geological hazards

### A- Earthquakes

#### Characteristics of Earthquakes

- The focus is where it begins underground
- Epicenter is the point right above the focus on the surface of the ground
- It may cause liquefaction: conversion of soil into a fluidlike mass
- Measured in Richter scale using a seismometer

#### Factors that affect Death caused by earthquakes

- Magnitude of the earthquake
- The closer to the epicenter the more damage will be caused
- The time of the earthquake. If it occurs in winter or at night there will be more deaths
- Geology of the area because it may lead to liquefaction
- Relief of the area. Areas with mountains may face landslides. Areas with ocean may face Tsunamis
- Severity of aftershocks
- The population. The higher the population, the more deaths will take place
- Buildings strengths. People living in poor housing are more likely to face deaths

## **B- Volcanic Eruptions**

### **Characteristics of volcanoes**

- Intrusive: Magma cools down and forms igneous rocks
- Extrusive: Magma comes out as lava. Also Pyroclastic material may come out as well. These include ash, hot gases and volcanic bombs.
- Sometimes the lava mixes with water in an area or melting ice and forms lahars which are very dangerous and can be faster than humans

### **Types of Extrusive volcanoes**

#### **a- Shield volcanoes**

- Found on constructive plate boundaries
- Magma has low viscosity
- Eruptions are non-explosive

#### **b- Composite volcanoes**

- Found on a destructive plate boundary
- Looks like a cone
- Magma is viscous
- Eruptions are explosive but not frequent

### **Impacts of Geological hazards**

- Lava, lahar and ash flows
- Landslides causing damage to buildings
- Tsunamis
- Destruction to farmlands leading to starvation
- Water can be contaminated due to broken sewage pipes leading to water related diseases
- Trauma
- Loss of habitats

## **Climatic hazards**

### **A- Cyclones**

#### **Conditions that cause a cyclone**

- The ocean surface temperature must be at least 27C
- The ocean must be at least 60m deep
- Enough Coriolis Force is required
- Change in wind speed or direction

#### **Direction of cyclones**

- They move in anticlockwise direction in the Northern hemisphere
- They move in a clockwise direction in Southern hemisphere

#### **What happens to weather when a cyclone passes by an area?**

- Air pressure falls
- Cumulonimbus clouds are formed causing very heavy rain
- Wind speed increases
- In the eye, winds are light, sky is clear, temperature is warm and there is little rain

#### **Impacts of tropical cyclones**

- Damage to buildings due to strong winds
- Heavy rainfall leading to floods, especially in low lying coastal areas
- Interruption in electricity and transport
- Spread of water borne diseases
- Damage to crops leading to food shortage
- Loss of wildlife

### **B- Floods**

#### **Causes**

##### **a. Natural Causes**

- When the river reaches its maximum infiltration capacity to hold water, due to very heavy rainfall
- Soil and Rock type: impermeable rocks will have low infiltration capacity
- Earthquakes can cause tsunamis that cause floods
- Relief: Steep lands will not give water the chance to infiltrate
- Antecedent soil moisture. If the soil was already moist before the rainfall, it will be more saturated and reduces infiltration capacity

## **b. Human Causes**

- Deforestation: cutting trees prevents interception so all rainfall falls on trees
- Agriculture: Overgrazing makes soil compact and unable to hold water. Removal of natural vegetation to grow crops makes the soil exposed to heavy rainfall for some time and prevents interception
- Urbanization: concrete and impermeable surfaces like roads cannot absorb water
- Climatic changes: Global warming caused by human activity led to rise in sea levels due to melting of glaciers in some areas as well as heavy rainfall and
- storms

## **Impacts of Floods**

- Migration
- Contamination of water leading to water related
- diseases
- Loss of crops leading to food shortage
- Accumulation of silt in rivers due to flood water

## **C- Droughts**

### **Natural Causes**

- Changes in atmospheric circulation at the equator.
- Higher temperature due to direct sun rays and trade winds from Northern and Southern hemispheres lead to droughts
- Sinking air in some high pressure area is warmer. This warm air will make all water droplets evaporate and skies will have no clouds and eventually no rain. This leads to sunny and dry weather with dry winds
- El Nino Southern Oscillations

### **Human Causes**

- Deforestation: cutting trees leads to less infiltration
- Building dams reduces the flow of water and cause droughts downstream
- Overcultivation and overgrazing make soil compact and unable to hold water so it evaporates quickly

## **Impacts of Droughts**

- People and animals will be forced to migrate
- Loss of crops and animals
- fall in land prices
- Unemployment to farmers
- Shortage of food which leads to famine and increased food prices
- Desertification
- Conflict between people and countries over water

## **Strategies to Manage Natural Hazards**

### **A- Earthquakes**

#### **Prediction**

- Use instruments like seismometer to measure shaking of earth
- Detect the location of epicenters and record the pattern of old earthquakes
- Detect unusual animal behavior

#### **Preparation and Protection**

- Build aseismic buildings
- Smart meters to cut off gas supplies to prevent fire
- Schools and hospitals must be built in low risk areas

### **B- Volcanoes**

#### **Prediction**

- Use seismometers to monitor shaking caused by rising magma
- Tiltmeters to monitor the change in shape of the volcano
- Monitor the emission of steam and gas from the volcano
- Satellites can be used to detect increasing ground temperature

#### **Preparation and Protection**

- Study past eruptions and create a hazard map
- Build lava diversion channels
- Have buildings with sloping roofs to protect against ashfall

### **C- Tropical Cyclones**

#### **Prediction**

- Track the cyclone using satellites

### **Preparation and Protection**

- Build cyclone shelters for people
- Have buildings on stilts so they don't get flooded by
- storm surge
- Grow mangrove swamps to absorb energy of the storm and slow down the cyclone

### **D- Floods**

#### **Prediction**

- Monitor rainfall and river discharge

#### **Preparation and Protection**

- . Use hard engineering such as building a flood
- Use soft engineering: such as afforestation (growing trees and plants as a barrier)
- Widening and deepening the river by dredging and clearing vegetation to increase its water holding capacity
- Use sandbags
- Adapt houses for example by making sockets high above ground level

### **E- Droughts**

#### **Prediction**

- Monitor precipitation and temperature

#### **Preparation and Protection**

- Increase water supplies by having reservoirs and use aquifers
- Growing drought tolerant crops
- Fencing to control overgrazing
- Governments saving food, water and medicine

### **Why do people continue to live in areas with natural hazards?**

- They might have lived there all their life so cannot easily leave the place or have nowhere else to go
- Confident about prediction, preparation and protection
- Cannot leave their jobs such as tourism or fishing
- Soil surrounding volcanoes are more fertile. There is also impressive scenery that attracts tourists.
- Geothermal energy around volcanoes