GEOGRAPHY NOTES (4022)

NEW CURRICULUM

FORM 3

Topics

- Topic 1: Weather and Climate.
- Topic 2: Landforms and Landscape processes.
- Topic 3: Ecosystems
- Topic 4: Natural Resources
- Topic 5: Energy and Power
- Topic 6: Mapwork and GIS
- Topic 7: Minerals and Mining.
- Topic 8: Environmental Management.
- Topic 9: Agriculture and Land Reform.
- Topic 10: Industry
- Topic 11: Settlement and Population.
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TOPIC 1

WEATHER AND CLIMATE

Air Masses

- Air Mass is an extremely large body of air whose properties of temperature moisture content (humidity) and lapse rate at any given altitude, are fairly similar in any horizontal direction.
- The regions where air masses form are referred to as air mass source regions

Characteristics of an air mass depend on

- where it originates/form - the source region,
- time of the year (summer, winter or autumn),
- the underlying surface (land, water or desert) and
- the length of time the air mass remains in the source region

Classification of Air masses

- Four general air mass classifications categorized according to the source region.
- Polar latitudes **P** - located poleward of 60 degrees north and south
- Tropical latitudes **T** - located within about 25 degrees of the equator
- Continental **c** - located over large land masses--dry
- Marine **m** - located over the oceans----moist

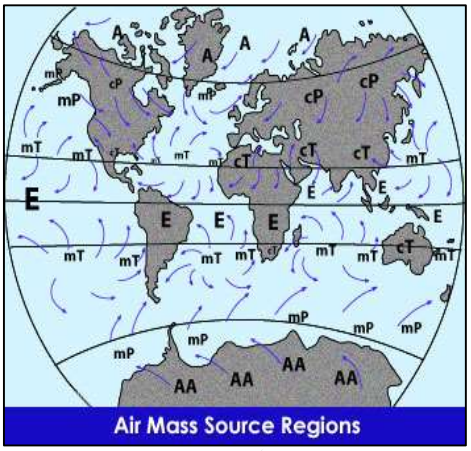
The letters can then be combined to describe various types of air masses.

- **cP** continental polar =cold, dry, stable
- **cT** continental tropical= hot, dry, stable air aloft
- **mP** maritime polar =cool, moist, and unstable
- **mT** maritime tropical= warm, moist, usually unstable

In order to distinguish among different air masses, the meteorologist uses a simple classification system shown in this table.

Name of air mass	designation	Source region	characteristics	Weather condtions produced
Continental Polar	cP	Forms over dry cold land eg Central Canada	Dry and cold	Cold winter, cool summer, low humidity all year round, clear skies for greater part of the year
Continental Tropical	cT	Forms over dry hot land eg Mexico, North Africa and the Sahara desert	Dry and warm	Warm and dry conditions Wide temperature ranges between night and day Cloudless clear skies
Maritine Polar	mP	Forms over cold sea eg North Atlantic ocean	Wet and cold	Cool weather in summer Low humidity throughout the year
Maritine Tropical	mT	Forms over warm seas eg Indian ocean	Wet and warm	warm summer, mild in winter, with high relative humidity throughout the year. Heavy rainfall

Source Regions



Are simply geographic areas where an air mass originates. Should be:

- uniform surface composition - flat light surface winds .
- The longer the air mass stays over its source region, the more likely it will acquire the properties of the surface below.
- Air masses can control the weather for a relatively long time period: from a period of days, to months.
- Most weather changes occurs along the edges of these air masses at boundaries called fronts.

Air Masses Affecting Africa

- In moving away from their source regions, air masses modify the weather and are also modified by the surfaces over which they pass through
- Africa is affected by tropical and equatorial air masses with tropical continental (cT) air masses dominant in the northern third of the continent, tropical maritime (mT) and equatorial air masses affecting coastal and equatorial africa.

Tropical continental

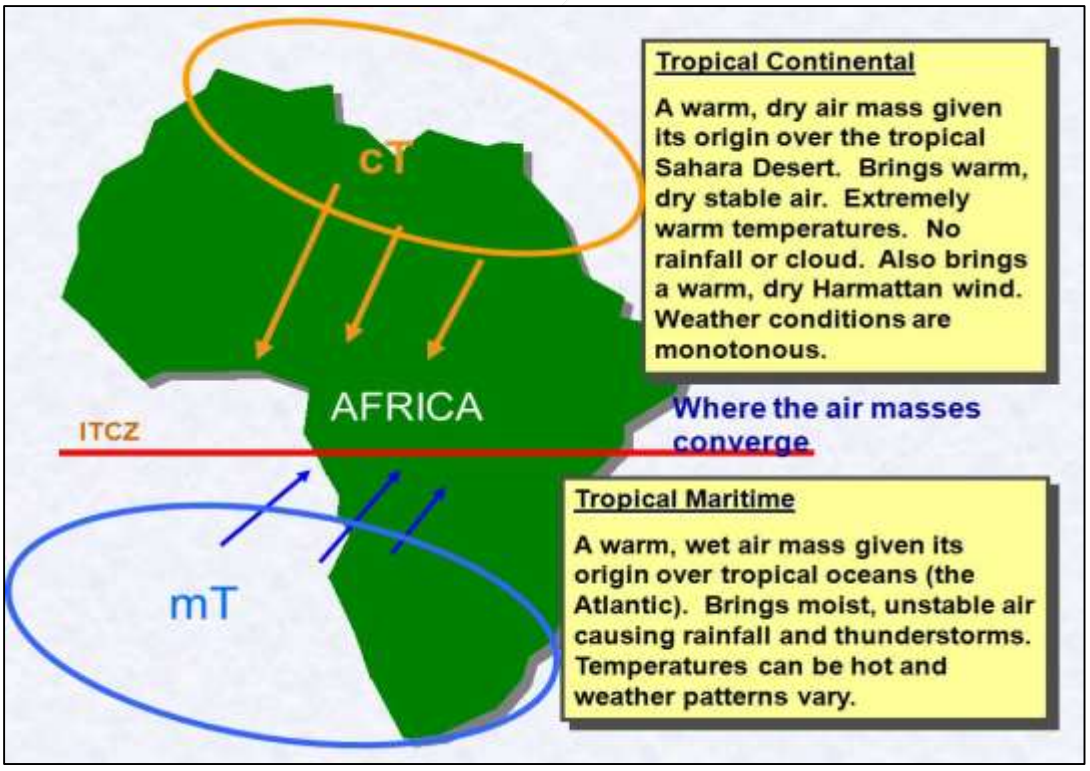
- Originate over north Africa and the Sahara desert
- Is very hot and very dry
- Very unstable yet clear conditions predominate due to lack of water vapor

Tropical maritime

- Form over low latitude oceans hence are very warm, humid and unstable

Polar maritime

- These are SE trade winds which originate from the southern hemisphere that comes from the Antactic



Air masses affecting Zimbabwe

South East Trade Winds

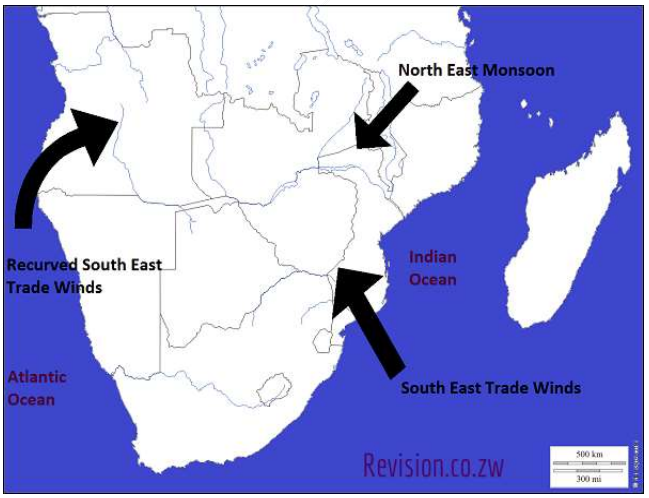
- Are cool moist prevailing winds which blow throughout the year.
- Associated with light showers and drizzle and often give rise to guti after the rain season.
- In summer they blow strongly giving clear weather and cloudy weather in winter.

Zaire Air North West Monsoons

- They only blow in summer.
- Are the re-curved SE trade winds which approach Angola into Zimbabwe via DRC by the intense low pressure of the ITCZ.
- They bring a lot of rainfall to Zimbabwe and Central Africa because they collect moisture form the Atlantic Ocean and Congo rainforest.

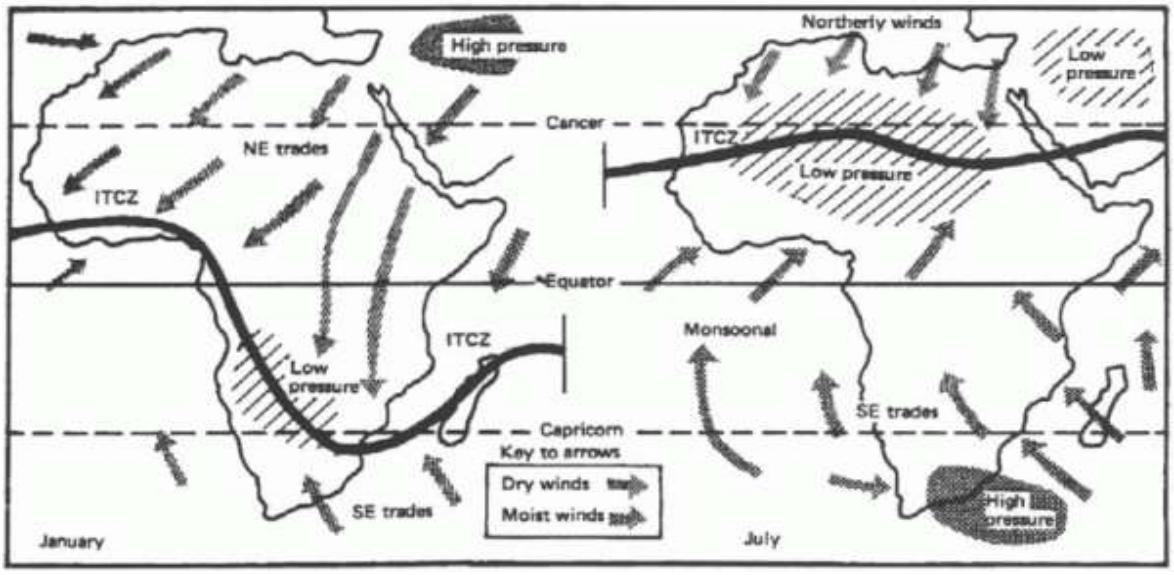
North East Monsoons

- Only blow in summer and cause rainfall in the Northern parts of Zimbabwe in December to January.
- They are not as moist as the North West Monsoons.



Inter – Tropical Convergence Zone (ITCZ)

- This is broad low pressure zone where air masses with different characteristics meet and mix without any boundaries resulting in rainfall. It forms along the thermal equator within the tropics of cancer and Capricorn.
- It migrates within the tropics following the apparent movement of the overhead sun (thermal equator).
- The sun is overhead the equator on 21 March, Tropic of Cancer 21 June, equator again on 21 September and Tropic of Capricorn on 21 December.
- The rainfall formed as a result of this meeting is called convergence rainfall.
- Convergence rainfall is seasonal. It follows the low pressure belt along the thermal equator.
- These seasonal changes are vividly evident over land but remain subtle over oceans. This is because the land quickly responds to high insolation levels by producing high temperatures, ideal conditions for ITCZ locations.
- The seas, on the other hand, respond slowly to high insolation levels. This is why temperatures remain subdued over oceans, creating high pressure (anticyclones) cells that block the movement of the ITCZ and prevent it following the apparent position of the sun.



The ITCZ in winter (July)

- In the northern hemisphere, the ITCZ is experienced between July and September.
- In winter the sun is overhead the Tropic of Cancer. That creates a belt of low pressure along this area.
- Strong insolation from the sun heats both the land and the oceans (Indian/Atlantic). The land is a good heat conductor/absorber and so heats up faster than oceans.
- A low pressure cell develops over the continental interior. Moderate pressure cells develop over oceans. The southern Africa will be having high pressure due to low temperatures.
- Winds are then forced to blow from HP cells to LP cells. These winds are the N.E trade winds from the Indian Ocean, and NW (recurved N.E) from the Atlantic and the dry and dust Harmattan winds from the Sahara desert.
- These winds converge with the SE, SW trades (Zaire winds) from south bringing convergence rainfall along the ITCZ low pressure zone over central Northern Africa.

The ITCZ in Summer (January)

- In the southern hemisphere, the ITCZ occurs between October and March.
- Because of different thermal capacities, low pressure develops over continents leaving oceans in high pressure cells.
- North easterlies and the prevailing 'traditional' south easterlies converge over the ITCZ over Central Africa.
- Recurved NW monsoons (Congo air) and SW trade winds bring rain on the western half.
- Usually the influence of the ITCZ is felt on the Northern part of Zimbabwe excluding Matabeleland region.

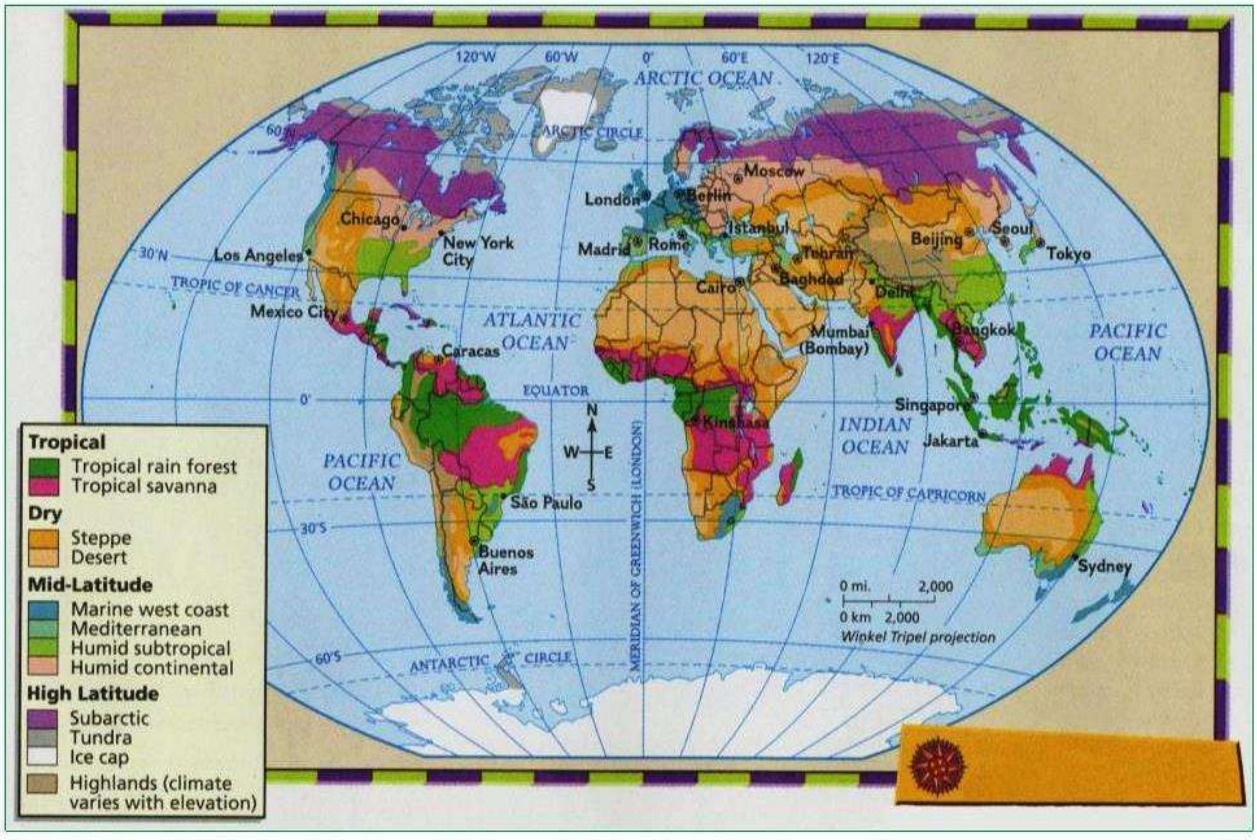
Weather conditions associated with the ITCZ

- ❖ The direct sun causes very high temperatures.
- ❖ Excessive heating by the sun causes an intense low-pressure belt.
- ❖ North westerlies, north east and south-east trade winds converge to replace air that has been heated and forced to rise over the 'thermal Equator' by the great heat from the sun. These are very moist air masses, and therefore the relative humidity values are very high. (This normally happens over central Southern Africa).
- ❖ Heating and convergence force the moist air masses to rise, expand, cool and condense creating towering cumulonimbus clouds.
- ❖ Rainfall torrential accompanied by thunder and lightning results.
- ❖ Floods and high speed winds usually occur especially in Muzarabani and Tokwe Mukosi.
- ❖ Diurnal temperature ranges are low due to the greenhouse effect of the clouds. (This is because of warm nights and subdued daytime temperatures).

Climate Types On A Global Scale

- Climate classification assumes, on one hand, the identification of areas with distinctive climatic patterns. On the other hand, it provides the possibility of finding climatic similarities in different parts of the world.

Global Climate Classification



1. The Hot, Wet Equatorial Climate
2. The Tropical Monsoon and Tropical Marine Climates
3. The Savanna or Tropical Continental or Sudan Climate
4. The Hot Desert and Mid-latitude Desert Climates:
5. The Warm Temperate Western Margin (Mediterranean) Climate
6. The Temperate Continental (Steppe) Climate
7. The Warm Temperate Eastern Margin (China Type) Climate
8. The Arctic or Polar Climate (Tundra)

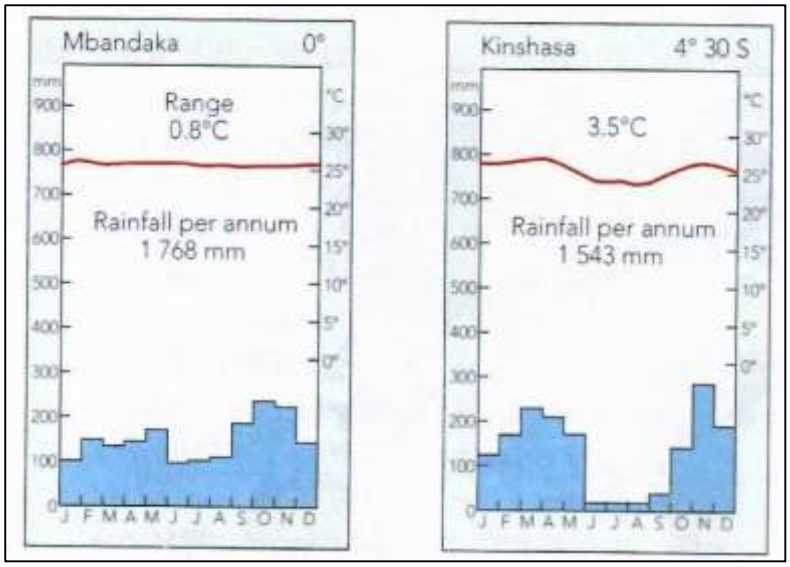
The Hot, Wet Equatorial Climate

- The equatorial, hot, wet climate is found between 5 and 10 degrees north and south of the equator.
- Its greatest extent is found in the lowlands of the Amazon, the Congo, Malaysia and the East

Indies. Further away from the equator, the influence of the on-shore Trade Winds, gives rise to a modified type of equatorial climate with *monsoonal influences.*

Climatic Conditions

- The most outstanding feature of the equatorial climate is its great uniformity of temperature throughout the year.
- The mean monthly temperatures are always around 27°C with very little variation. There is no winter.
- Cloudiness and heavy precipitation moderates the daily temperature, so that even at the equator itself, the climate is not unbearable.
- The diurnal range of temperature is small, and so is the annual range.
- High humidity about 90 %.
- Precipitation is heavy, around 2000 mm and well distributed throughout the year. There is no month without rain and a distinct dry season like those of the Savannah or the Tropical Monsoon Climates, is absent.
- Some areas receive double maxima of rainfall and temperature.
- Due to the great heat in the equatorial belt, mornings are bright, and sunny. There is much evaporation and convectional air currents are set up, followed by heavy downpours.



The Tropical Monsoon and Tropical Marine Climates

- It is found in the zones between 10° and 25° latitudes on either side of the equator.
- These areas are the **tropical monsoon** lands with on-shore wet monsoons in the summer and off-shore dry monsoons in the winter. They are best developed in the Indian sub-continent, Burma, Thailand, Laos, Cambodia, parts of Vietnam and south China and northern Australia.
- Outside this zone, the climate is modified by the influence of the on-shore Trade Winds all the year round, and has a more evenly distributed rainfall. Such a climate, better termed the
- **Tropical Marine** Climate, is experienced in Central America. West Indies, north-eastern Australia, the Philippines, parts of East Africa, Madagascar, the Guinea Coast and eastern Brazil.

Climatic Conditions

- The basic cause of monsoon climates is the difference in the rate of heating and cooling of land and sea.
- Average temperature of warm dry summer months ranges between 27°C and 32°C.
- In the summer, when the sun is overhead at the Tropic of Cancer, the great land masses of the northern hemisphere are heated.
- The seas, which warm up much slower, remain comparatively cool. At the same time, the southern hemisphere experiences winter, and a region of high pressure is set up in the continental interior of Australia.
- Winds blow outwards as the South- East Monsoon, to Java, and after crossing the equator are drawn towards the continental low pressure area reaching the Indian sub-continent as the South-West Monsoon. In the winter, conditions are reversed. The sun is overhead at the Tropic of Capricorn, central Asia is extremely cold, resulting in rapid cooling of the land. A region of high pressure is created with out-blowing winds-the North-East Monsoon.
- *The Seasons of Tropical Monsoon Climate:* In regions like the Indian sub-continent which have a true Tropical Monsoon Climate, *three* distinct seasons are distinguishable - The cool, dry season (October to February), the hot dry season (March to mid-June) and the rainy season (mid-June to September).

- *The Tropical Marine Climate:* This type of climate is experienced along the eastern coasts of tropical lands, receiving steady rainfall from the Trade Winds all the time. The rainfall is both *orographic*, where the moist trades meet upland masses as in eastern Brazil, and *convectional* due to intense heating during the day and in summer. Its tendency is towards a summer maximum as in monsoon lands, but without any distinct dry period.

The Savanna or Tropical Continental

- The Savanna or Sudan Climate is a transitional type of climate found between

the equatorial forest and the trade wind hot deserts.

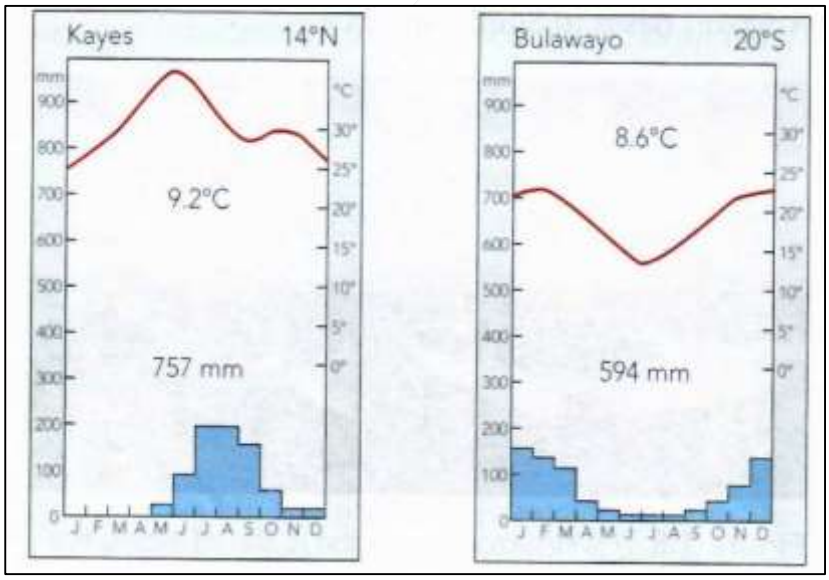
- It is confined within the tropics and is best developed in the Sudan where the dry and wet seasons are most distinct, hence its name the Sudan Climate.
- The belt includes West African Sudan, and then curves southwards into East Africa and southern Africa north of the Tropic of Capricorn (Zimbabwe and Zambia).
- In South America, there are two distinct regions of *savanna* north and south of the equator, namely the *llanos* of the Orinoco basin and the *Campos* of the Brazilian Highlands.

Climatic Conditions:

- The Savanna climate is characterised by distinct wet and dry seasons. Mean high temperature

throughout the year is between 24°C and 27° C.

- The annual range of temperature is between 3°C and 8°C, but the range increases as one move further away from the equator.
- The extreme diurnal range of temperature is a characteristic of Sudan type of climate. The average annual rainfall ranges between 594 mm and 750 mm.
- The prevailing winds of the region are the Trade Winds which bring rain to the coastal districts.



The Hot Desert and Mid-latitude Desert Climates:

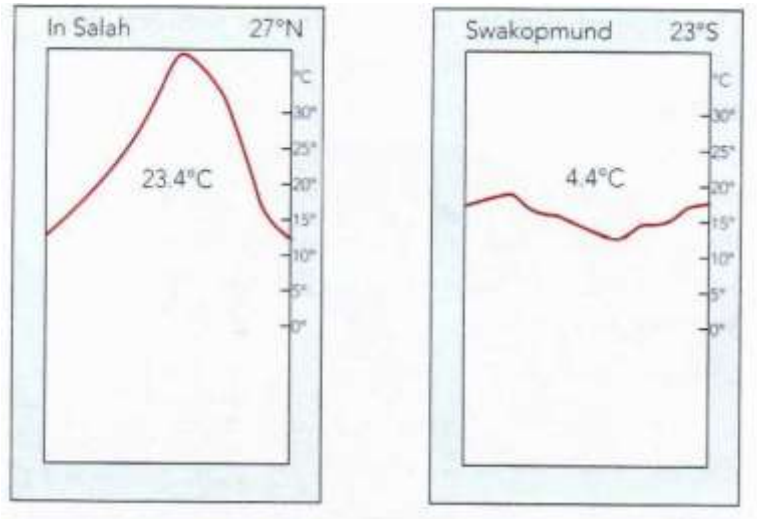
- Deserts are regions of scanty rainfall which may be hot like the hot deserts of

the Saharan type or temperate as are the mid- latitude deserts like the Gobi.

- The major hot deserts of the world are located on the western coasts of continents between latitudes 15º and 30ºN and S. They include the Sahara Desert, the largest single stretch of desert, which is 3,200 miles from east to west and at least 1,000 miles wide **(Convert to km).**
- The next biggest desert is the Great Australian Desert which covers almost half of the continent.
- The other hot deserts are the Arabian Desert, Iranian Desert, Thar Desert, Kalahari and Namib Deserts.
- In North America, the desert extends from Mexico to USA and is called by different names at different places, e.g. the Mohave Sonoran, Californian and Mexican Deserts.
- In South America, the Atacama or Peruvian
- Desert is the driest of all deserts with less than 250 mm of rainfall annually.
- The Patagonian Desert is more due to its rain- shadow position on the leeward side of the lofty Andes than to continentality.

Climatic Conditions:

- The aridity of deserts is the most outstanding feature of the desert climate.
- Few deserts whether hot or mid-latitude have an annual precipitation of more than 250 mm while in others less than 250 mm.
- The hot deserts lie astride the Horse Latitudes or the Sub- Tropical High Pressure Belts where the air is descending, a condition least favourable for precipitation of any kind to take place.
- The rain bearing trade winds blow off shore and the Westerlies, that are on-shore, blow outside the desert limits. Whatever winds reaches the deserts blow from the cooIer to the warmer regions, and their relative humidity is lowered, making condensation almost impossible.
- The deserts are some of the hottest spots on earth and have high temperatures throughout the year.
- There is no cold season in the hot deserts and the average summer temperature is around 30°C.
- The highest shade temperature recorded is 58°C at Al Azizia, some killometres south of Tripoli, Libya, in the Sahara.
- The diurnal range of temperature in the deserts is very great.

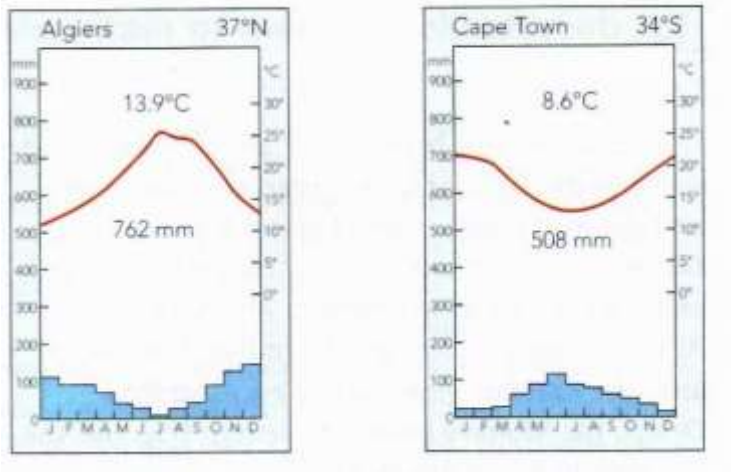


The Warm Temperate Western Margin (Mediterranean) Climate

- The Warm Temperate Western Margin Climate is found in relatively, few areas in the world.
- They are entirely confined to the western portion of continental masses, between 30° and 45° north and south of the equator.
- The basic cause of this type of climate is the shifting of the wind belts. Though the area around the Mediterranean Sea has the greatest extent of this type of 'winter rain climate', and gives rise to the more popular name Mediterranean Climate.
- Other Mediterranean regions include California (around San Francisco), the south-western tip of Africa (around Cape Town), southern Australia (in southern Victoria and around Adelaide, bordering the St. Vincent and Spencer Gulfs), and south-west Australia (Swanland).

Climatic Conditions

- The Mediterranean type of climate is characterised by very distinctive climatic features - a warm summer with off-shore trades, a concentration of rainfall in winter with onshore westerlies, bright, sunny weather with hot dry summers and wet, mild winters and the prominence of local winds around the Mediterranean Sea (Sirocco, Mistral).
- Since all regions with a Mediterranean climate are near large bodies of water, temperatures are generally moderate with a comparatively small range of temperature res between the winter low and summer high.
- Areas with this climate receive almost all of their yearly rainfall during the winter season, and may go the summer without having any significant precipitation.



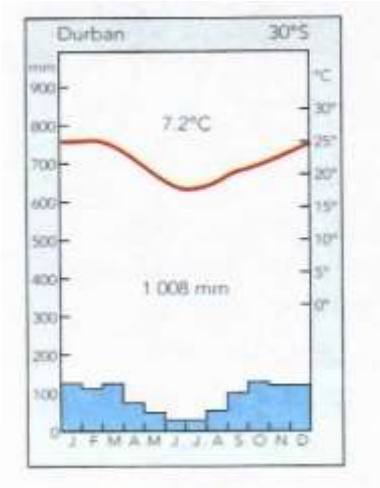
The Warm Temperate Eastern Margin (China Type) Climate

- This type of climate is found on the **eastern margins of continents** in warm temperate latitudes, just outside the tropics. Lattitude 20 ° to 35° $N\ and\ S\ of\ the\ equator$.
- It has comparatively more rainfall than the Mediterranean climate in the same latitudes, coming mainly in the summer. It is, in fact, the climate of most parts of China –a modified form of monsoonal climate. It is thus also called the *Temperate Monsoon or China Type* of climate.
- In south-eastern U.S.A., bordering the Gulf of Mexico, continental heating in summer induces an inflow of air from the cooler Atlantic Ocean.

- It is sometimes referred to as the Gulf type of climate.
- In the southern hemisphere, this kind of climate is experienced along the warm temperate eastern coastlands of all the three continents: in New South Wales with its eucalyptus forests; in Natal where cane sugar thrives; and in the maize belt of the Parana-Paraguay-Uruguay basin.

Climatic Condition:

- The Warm Temperate Eastern Margin Climate is typified by a **warm moist summer and a cool, dry winter**.
- The mean monthly temperature varies between 5°C and 25°C and is strongly modified by maritime influence.
- The relative humidity is a little high in mid-summer.
- Rainfall is more than moderate, anything from 1000 mm. Another important feature is the **fairly uniform distribution of rainfall throughout the year**. There is rain every month, except in the interior of central China, where there is a distinct dry season. Rain comes either from convectional sources or as orographic rain in summer, or from depressions in prolonged showers in winter.
- Local storms, e.g. typhoons, and hurricanes, also occur.
- It can be sub-divided into three main types – a) The China type: central and north China (including southern Japan (temperate monsoonal). b) The Gulf type: south-eastern United States, (slight-monsoonal). c) The Natal type: the entire warm temperate eastern margin (nonmonsoonal areas) of the southern hemisphere including Natal, eastern Australia and southern Brazil-Paraguay-Uruguay and northern Argentina.



Tundra (Cold Climates)

- Found along the polar margins
- Areas include parts of Finland, Sweeden, Russia and Iceland.

Climatic Conditions

- Have long winters and lack warm seasons.
- Temperature ranges between 29℃ and 40℃ in winter.
- Te sun does not rise over the horizon for weeks.

- Summers are short and cold.
- Rainfall is low and mostly occur in summer.

Mountain or Montane Climate

- Areas include mountains such as Mt Kilimanjaro, Andes of South Africa and Rockies of North America.

Climatic conditions

- Temperatures are low.
- Cool conditions and daily temperature range is small.
- Rain increases and then decreases with altitude due to the effect of leeward and rainshadow.

Temperate Continental

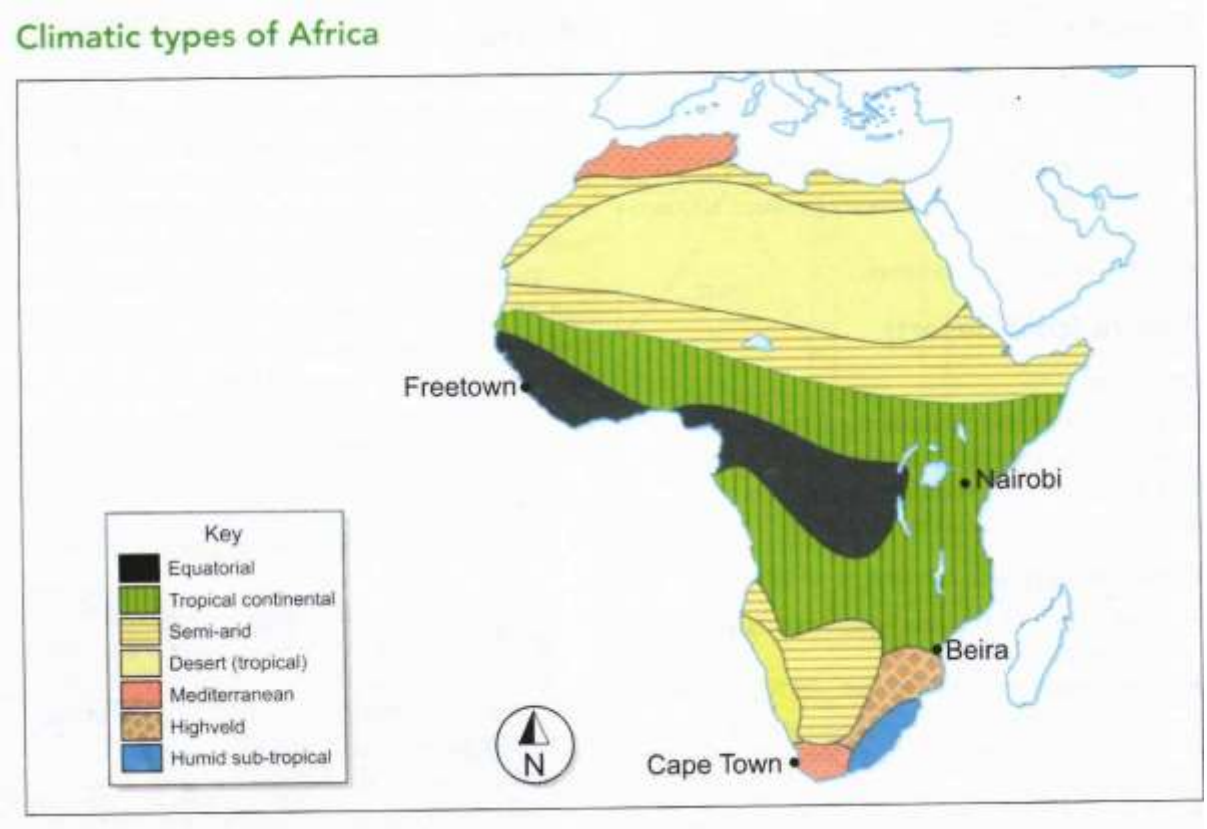
- Also known as the warm continental climates.
- Found 30° to 50° North and South of the equator.
- Areas include the igh veld of South Africa and the Prairies of Canada.

Climatic conditions

- There are seasons.
- It si very cold in winter 3℃ and frost may occur.
- In summer the days may be hot (25℃) and short.
- There is low rainfall.

Climatic Types of Africa

Describe and explain the climatic classification shown. (10)



Climate Graphs

Climate graphs show the average temperature and rainfall for a city or region over the year. Temperature is always shown in the form of a line graph. Some climate graphs have the average maximum temperature and the average minimum, others just have the overall average temperature. The line graph is normally coloured in red. Rainfall is always shown in the form a bar graph and normally coloured in blue.

Climate graphs are very good for showing averages, but they don't show anomalous years, because it is based on averages and it doesn't show things like the number of days of rain. A month may have 50mm of rain, but we don't know if that comes in small rain showers or one big thunderstorm.

When reading climate graphs you should look for trends and anomalies.

Interpreting climate graphs

In the exam you may be asked to look at the information in a graph and describe the area's climate.

1. Look for patterns in the temperature data
    - Is the temperature the same all year round? If it is different, how many seasons does the location experience?
    - Which season is the warmest? Is it warm (10 to 20°C), hot (20 to 30°C) or very hot (above 30°C)?
    - Which season is the coolest? Is it mild (0 to 10°C), cold (-10 to 0°C) or very cold (below -10°C)?
    - What is the range of temperature? (Subtract the minimum temperature from the maximum temperature).
2. Look for patterns in the rainfall data
    - Does the rainfall occur all year round?
    - What is the pattern of the rainfall? Check which season(s) is/are drier or wetter than others.

- What is the total annual rainfall? Add each month's total together to get the annual total.
- Then put the rainfall and temperature information together - what does it tell you about this area?

3. Describe the patterns in temperature and rainfall, including how they relate to each other. You now have a description of the climate.
   - Now look again at the climate graph above. What can you deduce about the climate?

Calculate the following:

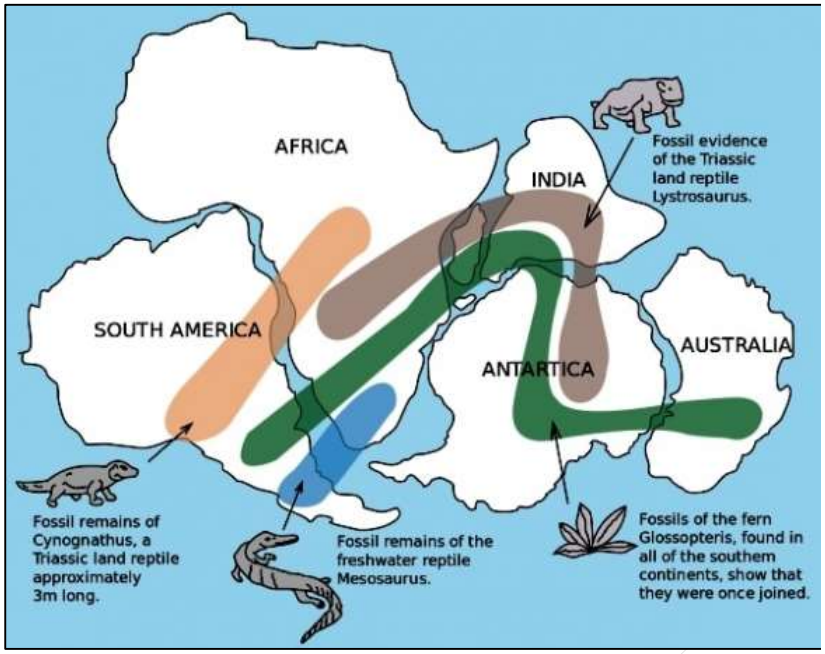
Mean daily temperature – sum of hourly temperatures divided by 24 hours
Diurnal temperature range –maximum temperature minus minimum temperature
Mean monthly temperature – sum of mean daily temperatures in the month divided by number of days in the month
Mean annual temperature – sum of mean monthly temperatures in the year divided by 12
Annual temperature range – maximum temperature minus minimum temperature recorded in a year

Daily rainfall - the amount of rain that falls over 24 hours
Monthly rainfall - total amount of rainwater collected throughout the month
Annual rainfall - total amount of rainwater collected throughout the year.

TOPIC 2

LANDFORMS AND LANDSCAPE PROCESSES

Continental Drift



- Refers to the movements of continents.
- The idea was propounded by Alfred Wegner.
- The theory starts that present day continents were once one single continent.
- The theory says that continents have been moving for millions of years and still do so today.

- About 180 million years ago, the continent was only one super continent called Pangea.
- This later broke into two parts northern and southern blocks called Gondwanaland and Laurasia respectively.
- Laurasia divided to form North America and Europe and Gondwanaland formed South America, Africa, Australia and sub – continents.
- The sub-division of these two continents has resulted in the formation of present day continents.

Evidences on Continental Drift

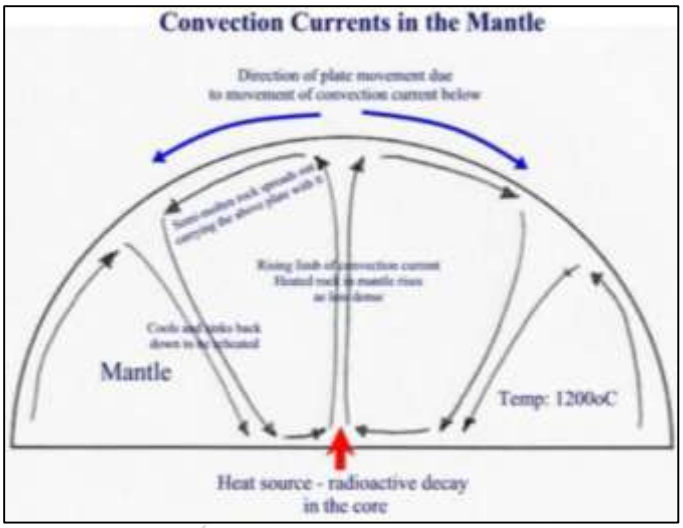
1) The way some of the continents fit like a jigsaw puzzle. It is especially visible at Coastal Eastern South America which fits into Coastal West Africa
2) Paleomagnetic dating and fossil remains- according to paleomagnetic dating, when rocks solidified they were magnetised in the direction of the Magnetic North at that time. Using the data of information, the scientists can tell where they were first formed and if they moved from these places.
3) Geological similarities of flora and fauna show that India, Australia, South America and Africa were once joined together
4) In the Congo Basin, they were glacial deposits joined in the Antarctic, they were fossilised remains of animals, plants and coral lime stones in the Greenland all show climatic different from what they are today
   - Flora – plants
   - Fauna – animal.

Plate Tectonics

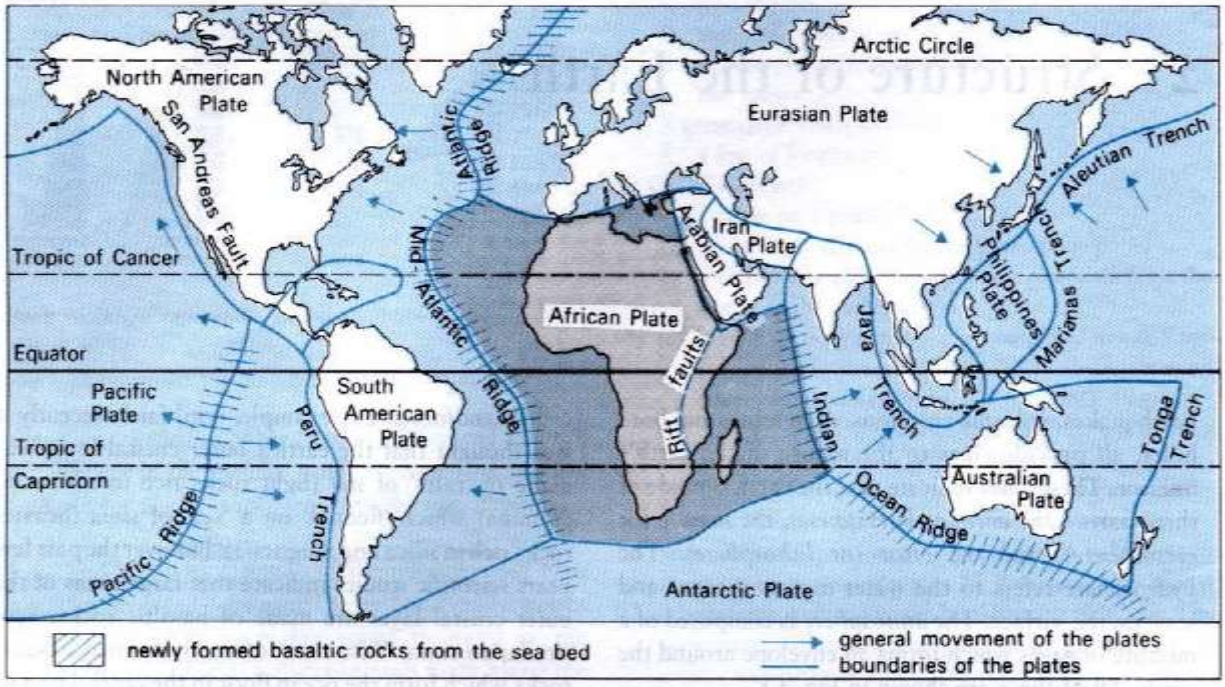
- The earth's crust is broken up into pieces.
- These pieces are called plates and are more than ten of these plates.
- The movement of the plates, and the activity inside the earth, is called plate tectonics.
- Plate tectonics cause earthquakes and volcanoes.
- The point where two plates meet is called a plate boundary.

What Causes Tectonic Movement?

- Heat rising and falling inside the mantle creates convection currents.
- The semi-molten rock spreads out andd carries the plate above with it.
- This sideways motion moves the Crust's Plates.
- After movement, the mantle cools and sinks back down to be reheated in the core.



Major and minor plates



Major Plates	Minor Plates
1. Eurasian Plate	i. Iranian Plate
2. African Plate	ii. Arabian Plate
3. Antarctica Plate	iii. Indian Plate
4. Indo-Australian Plate	iv. Carribean Plate
5. Pacific Plate	v. Turkish Plate

6. North America Plate	vi. San Francisco Plate
8. Nazca	vii. Phillipine Plate

9. South America Plate	viii. Cocos Plate
	ix. Juan de Fuca Plate

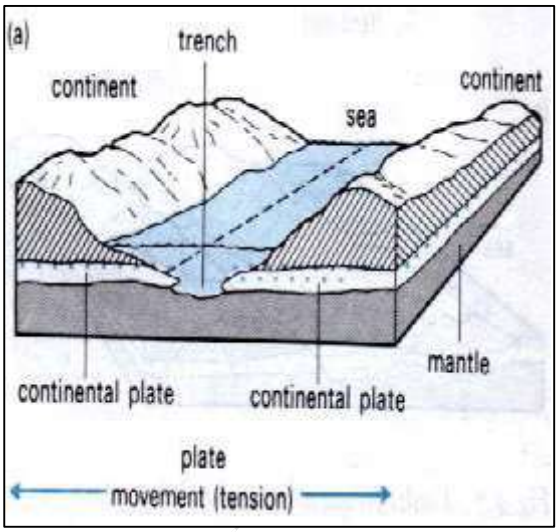
Effects of plate tectonics on climate

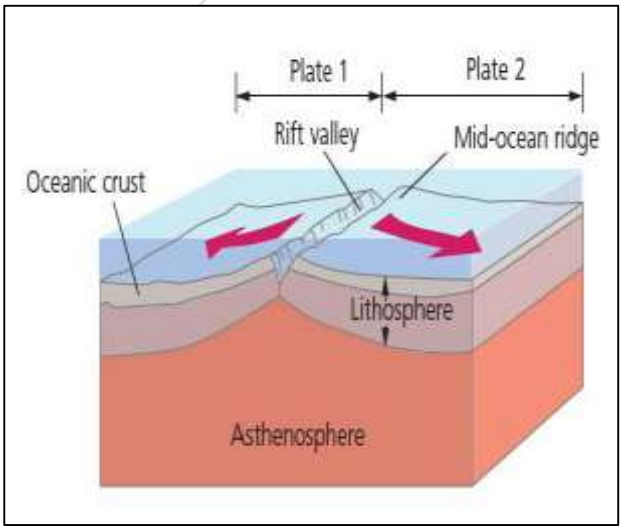
1. Tectonic plate shifts that cause volcanic eruptions cause changes in ocean currents, which inturn generates more heat.
2. Volcanic eruptions increase the amount of carbon dioxide and sulfur dioxide hence a rise in temperature.
3. An increased heat leads to shift in the tectonic plates.

Plate movement and change in climate go hand in hand.

Types of Plate Boundaries

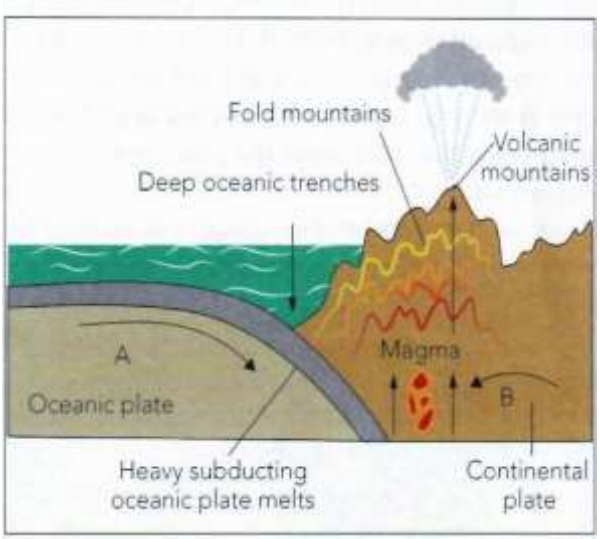
Divergent / Constructive Zone





- Plate move away from one another.
- Magma up-wells from the mantle to fill the gap left by diverging plates and provides new material forming new oceanic crust.
- Forming mid – oceanic ridge with volcanoes.
- For example the Mid – Atlantic Ridge was formed by diverging America and Eurasian and African plates.
- The East Pacific Rise was due to Nazca and Pacific plates moving apart.
- Divergent of continental plates forms volcanic mountains.
- The zone is marked by volcanoes, very young lithosphere, topographic ridge and shallow earthquakes.

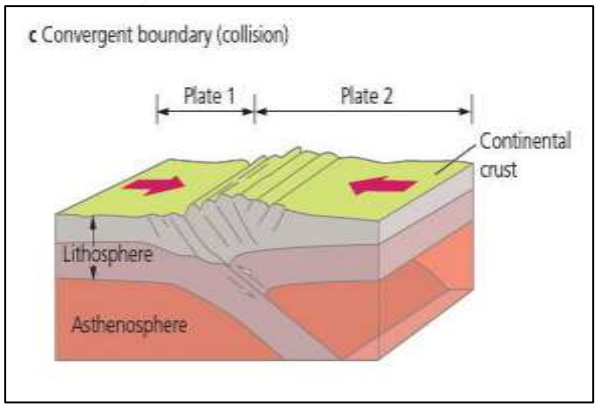
Convergent Zone / Destructive



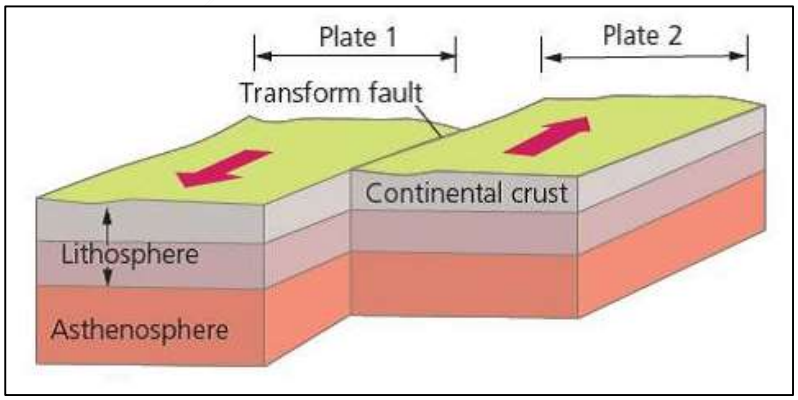
- Known as destructive of zone of subduction.
- Two plate move towards each other.
- An oceanic plate moves towards a continental plate but being heavier,
- The oceanic plate sinks or is subdued by the continental plate and is destroyed into the mantle giving rise to deep – sea trenches and island arcs with volcanoes.
- The oceanic plate and sediments are being destroyed, the zone termed zone of destructive.
- When plates move towards each other, their edges are destroyed as they collide and push one another.
- Nazca plate near Peru South America sinks under the South American plate (the Andes) and Juan de Fuca sinks under the North American plate (Rockiers) forming the island arcs of the West Indies.

Collision Zone

- This is when two continental crust collide and as neither can sink.
- They are formed into fold mountains.
- For example the Indian plate collided with the Eurasian plate form the Himalayas and African plate collided with the Eurasian plate forming the Alps.



Conservative / Transform Zone



- At constructive zone plates slide sideways past each other.
- In opposite directions in a tear or shear fashion.
- The lithosphere or oceanic crust is neither created nor destroyed.
- Neither plate is constructed but are both conserved giving rise to the term conservative zones.

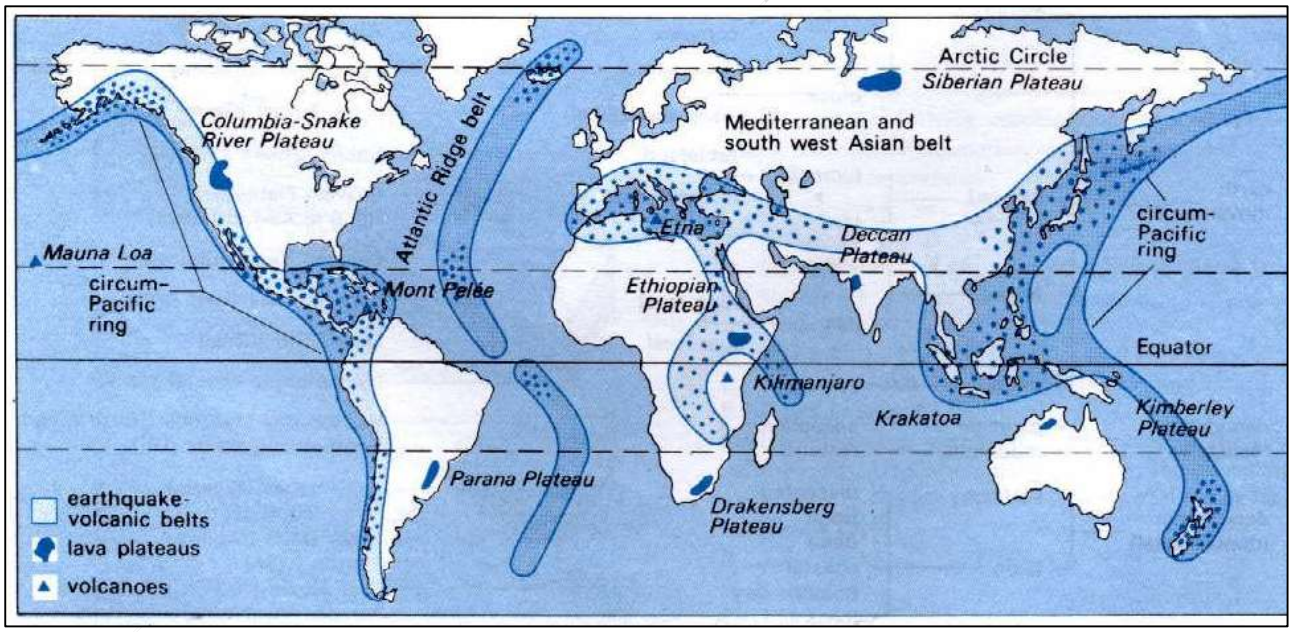
- Most transform zones are found on the sea floor where they connect segments of diverging mid – oceanic ridge.
- Examples include the North American and Pacific Plate - San Andreas Fault in California.
- Landforms include rift valleys e.g Great African Rift Valley.
- Lakes also found e.g Lake Tanganyika in Tanzania.

Volcanoes and Earthquakes

Earthquakes and their Causes

- Is a shaking, vibration, trembling or movement in the earth`s surface.
- They are due to one tectonic plate sliding over or past another plate along a fault line.
- May be due to volcanic eruptions when magma moves below or on the earth`s surface like the movement of plates.
- Building dams and Lakes may result in minor earthquakes and tremors.
- Zimbabwe, Zambia and Mozambique have experienced tremors due to weight of water building up in Lake Kariba and Cabora Basa.
- Nuclear weapon testing underground have been known of triggering earthquakes.

Distribution of Earthquakes and volcanoes



- The distribution is uneven with most along and within major plate boundaries.
- Occur near convergence, along conservative zone and transformational zones.
- Along or near ocean ridges, near volcanic islands, along the Pacific Ring of Fire e.g. Hawaii.
- In Africa they are located in the Great Rift Valley and some parts of North West Africa.
- Serious earthquakes occurred in Malawi in 1989, El Asnam Algeria in 1980 and Orkney South Africa in 2014.

Volcanoes and their causes

❖ Define a volcano.(2)

A volcanoe is an opening in the Earth`s crust through which got molten magma, molten rock and ash are erupted on the land.

Formation of a volcano

1. At a destructive plate boundary convection currents cause the oceanic plate and continental plate to move towards each other.
2. The oceanic plate is denser and is forced under the continental plate.
3. The oceanic plate is broken up with the heat of the mantle in the subduction zone.
4. This causes pressure to build up as carbon is released from the rock.
5. This causes magma to rise up the vent and creates a volcanic eruption.

Earthquakes

Prediction

- Measure earth tremors, pressure, and release of gas
- Use maps and facts to find pattern in time/location
- Unusual animal behavior

Short term Effects

- Loss of life.
- Destruction of homes.
- Landslides due to ground shaking.
- Destruction of transport and communication networks e.g. roads.
- Leads to nuclear disasters such as the Fukushima – Daichii in March 2011.
- Power failure leads to blackouts.
- Trade, commerce and industries are destroyed.
- Tsunamis can result especially in coastal areas and may cause damage.

Long Term Effects

- Spread of diseases such as cholera and dysentery due to unsanitary and shortage of clean water hence loss of life.
- Expensive rebuilding exercise e.g. in Nepal investments were directed towards repairs.
- Fall of standards of living due to loss of income and livelihood.
- Long term radiation effects including cancer, deformed births and cataracts.
- Damage from aftershocks.

Mitigation

- Disaster preparedness practice drills on dos and don`ts when an earthquake occurs.
- First aid kits in homes.
- Seismic studies to forecast the likelihood of an earthquake.
- Disaster relief operations such as medicines, clean water and food supplies.
- Provision of tents for shelter.
- Rescue operations using earth moving equipments.
- Donations towards reconstruction funds.
- Building strong and more earthquake resistant buildings.
- Communication methods e.g. radio to disseminate information.

Volcanoes

Prediction

- Tremors within volcano
- Ground temperatures rises, detect by heat seeking cameras
- Volcano swells and bulges
- Volcano emits gas and steam
- Animal behavior changes.

Benefits and problems of Volcanoes

Benefits

- Lava and ash form fertile soils for agricultural activities.
- Geothermal electricity.
- Contain precious minerals such as Opals and obsidian.
- Tourist attraction.
- Habitable islands for example the Hawaii islands in the Pacific Ocean.
- Produce condensation nuclei.
- Igneous rocks for building.
- Caldera lakes as source of water.

Problems

- Loss of life as in the Pombeii.
- Destruction of crops due to lava flow as in Hawaii.
- Loss of ecosystem and biodiversity.
- Leads to acid rain and natural fires.
- Settlement disruption and displacement of people.
- Can cause tsunamis. What are tsunamis?

Mitigation

- Rescue operation to affected areas.
- Dissemination of information through effective media when the eruption is predicted.
- Diverting lava flows using barriers.
- Monitoring volcanoes using latest seismic technology.
- Evacuation from affected areas prior to the eruption.

TOPIC 3

ECOSYSTEMS

Ecosystem

Refers to the links or relationships or interactions between living organisms (biotic) and non-living organisms (abiotic) in relation to the environment. Ecosystems vary in size; examples include the equatorial, the Savanna and the hot desert ecosystem.

Components of the ecosystem

An ecosystem is made of two components:

- **The biotic component.**-this is the living component which include all the living organisms ie, plants and animals.
- **The abiotic component**- this is the non- living component which include the soil, sunlight, temperature, precipitation and water or moisture.

Biochemical Cycles

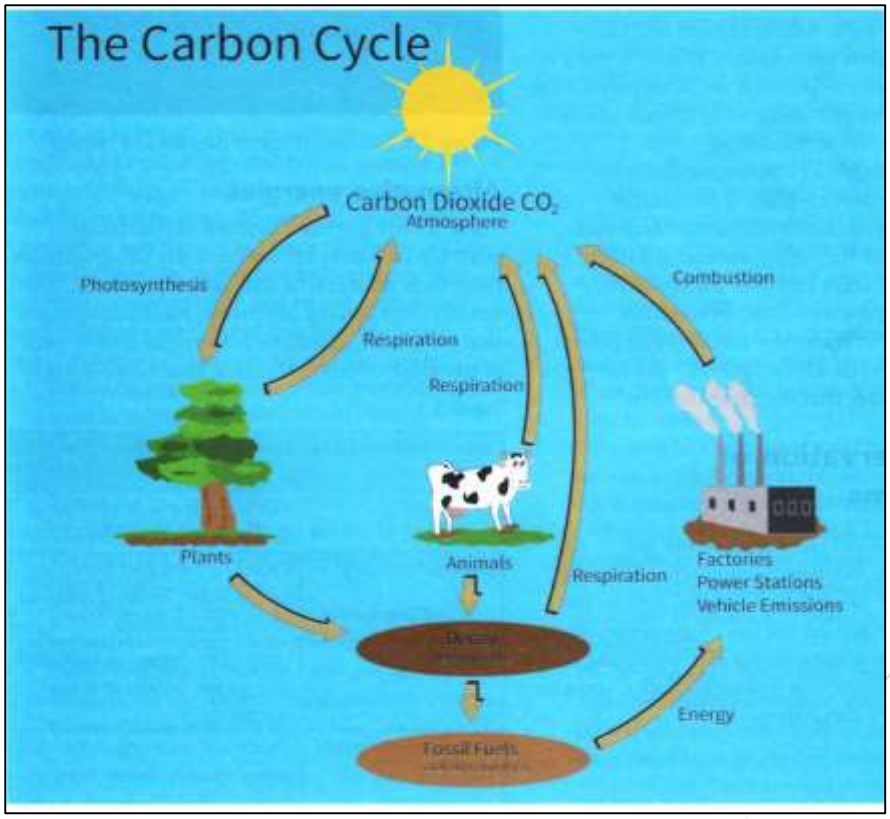
- Key processes in ecosystems include the capture of light energy and carbon through photosyntesis, the transfer of carbon and energy through food webs and the release of nutrients and carbon through decomposition.

Nutrient Cycles in Ecosystems

- Materials such as carbon, nitrogen, oxygen and other nutrients are needed by organisms for growth and healthy.
- Nature recycles these materials.
- The carbon and nitrogen cycles are two vital cycling processes.

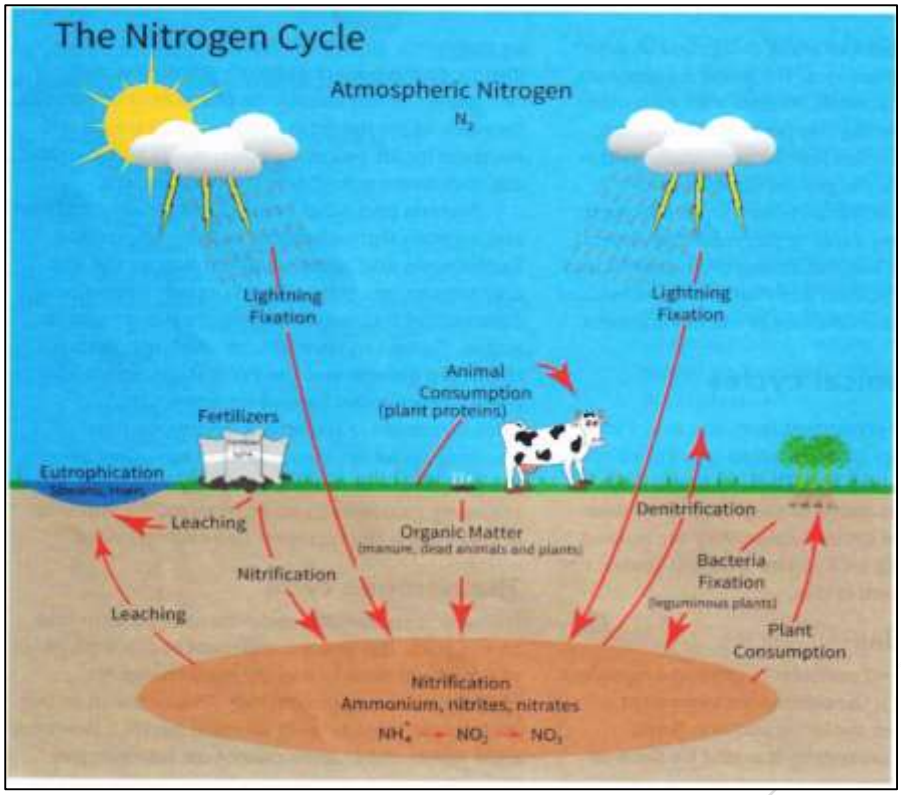
Carbon Cycle

- Carbon in ecosystems comes from carbon dioxide in the atmosphere.
- Plants remove carbon from the air during photosynthesis and build it into food compounds.
- Animals obtain carbon by eating plants and other animals. They use carbon to make carbohydrates, fats and proteins.
- During respiration, carbon is released in the atmosphere by micro-organisms, plants and animals.
- Carbon enters the atmosphere when fossils fuels such as coal are burnt (Combustion).



Nitrogen Cycle

- Nitrogen is need by organism so as to make proteins.
- Nitrogen is present in the atmosphere in a form not useable by organisms.
- It must be changed to nitrates which plants can use to make proteins.
- Animals get proteins from plants and other animals that they eat.
- Nitrogen – fixing bacteria converts nitrogen into nitrates which can dissolve in water so that plants use it to make proteins.
- Animals excrete nitrogen in form of ammonia and urea. Decomposers such as nitrifying bacteria converts nitrites into nitrates.
- Nitrogen in the atmosphere can be converted into a form that plants can use by lightning. However, the fixation is not efficient as by bacteria.
- Denitrifying bacteria converts nitrates into nitrites and ammonia.



Wetlands

The Environmental Management Act (Cap 20; 27) define wetlands as : "Areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including riparian land adjacent to the wetland".

- In Zimbabwe, wetlands cover approximately 4.6 percent of the land; vleis are the most dominant as they cover 3.6 percent of the land area and it is estimated that there are 1 262 000 hectares of wetlands.
- In Zimbabwe wetlands are also known as Matoro (Shona), Mapani (Shona) and Amaxhaphozi (Ndebele).
- Zimbabwe is a Signatory to the Ramsar Convention on Wetlands of 1971 and has domesticated provisions for the protection of wetlands under the Environmental Management Act (Cap 20;27), Statutory Instrument 7 of 2007 on Environmental Management (Environmental Impact Assessment and Ecosystems Protection) and Regulations and Government Gazette 380 of 2013.
- The Ramsar Convention embodies commitments by member countries to maintain the ecological character of wetlands and to plan for the "wise use" or sustainable use of all of the wetlands in their territories.
- In Zimbabwe seven sites have been designated as Ramsar protected wetlands and these are: Victoria Falls, Driefontein, Middle Zambezi/Mana Pools, Lake Chivero, Monavale Vlei, Chinhoyi Caves and Cleverland Dam.
- The Government Gazette 380 of 2013 declares 26 wetlands in Harare as protected areas. These include Mabvuku, Honeydew, Balantayne Park etc.

Importance of wetlands

a) Provide important habitat for a wide variety of wildlife.
b) Ensure food security if sustainably utilized.
c) Trap moderate amounts of soil running off nearby uplands before they enter lakes and streams.
d) Maintain and improve water quality by filtering contaminants and excessive nutrients.
e) Renew groundwater supplies.
f) Help and control flooding and reduce flood damage.
g) Fire control.
h) Provide a source of economically valuable products such as wild rice and commercial fish.
i) Support recreational activities including fish, hunting, nature appreciation, bird watching and so much more.
j) Provide opportunities to participate in outdoor educational activities and to enjoy the aesthetic qualities of wetlands.

However, settling in wetlands makes the spreading of water-borne diseases easy. Diseases such as cholera, typhoid, dysentery, and diarrhoea among others thrive in such environments.

Causes of Wetland degradation

- Agricultural activities.
- Drilling of boreholes.
- Commercial and residential development; road construction; impoundment; resource extraction; industrial siting, processes, and waste; dredge disposal; care and cultivation of forest trees (silviculture); and mosquito control through drainage, channelization and use of toxic pesticides.

What does the law say?

- The Environmental Management Act (CAP 20:27) and Statutory Instrument 7 of 2007 Environmental Management (EIA and Ecosystems Protection Regulations) govern wetland utilisation in Zimbabwe.
- Section 113 of the Environmental Management Act (Chapter 20:27) section 113 gives the Minister of Environment powers to declare any wetland to be an ecologically sensitive area and may impose limitations on development in or around such an area.
- Prohibit the reclamation or drainage, disturbance by drilling or tunneling in a manner that has or is likely to have an adverse impact on any wetland or adversely affect any animal or plant life therein.
- Prohibit the introduction of exotic animal and plant species into a wetland.
- Failure to abide by the law is a crime that attracts a fine not exceeding level eight ($500, 00) or to imprisonment not exceeding two years or to both such fine and such imprisonment.

Measures

- Plant native species to maintain the natural balance of the wetland. The plants in and around a wetland trap and filter out sediments and chemical pollutants and aid in groundwater recharge by retaining runoff waters;
- Direct storm water into wetlands especially in urban areas because they supply much of the water necessary to maintain wetlands.

- Maintain a green belt around the wetland.
- Fence the wetland against animals that may destroy vegetation.
- Do not cut down trees and clear grass.
- Do not introduce non-native (exotic) plants as they damage or ruin ecosystems e.g. gum trees drain a lot of water.
- Use organic manure instead of fertilizers and pesticides.
- Avoid dumping waste on wetlands, this causes land and water pollution.

World Wetlands Day Commemoration is on the **2nd of February each year**.

Conservation of ecosystems

Conservation - is the sustainable use of resources and encompasses protection as well as exploitation and;
Preservation - is an aspect of conservation meaning to keep something without altering or changing it.

- Initiating laws to protect them.
- Afforestation.
- Use of alternative sources of energy such as solar, electricity and biogas.
- Reuse, reduce and recycle of materials- why is recycling importany to a country?
- Controlling human activity such as deforestation and veld fires, etc.
- Increasing "Communication, Education and Public Awareness" (CEPA) programmes related to ecosystem conservation
- Ensuring local people benefit from the ecosystems.
- Ecosystem restoration.
- Sustainable use of resourses.
- Terracing.
- Destocking.
- Use of Indegenous Knowledge Systems (IKS).

Ecosystem restoration

Ecosystem restoration is founded upon ecological and conservation principles and involves management actions designed to facilitate the recovery or re-establishment of native ecosystems.

- ∂ Channels and wetlands must be stabilized against erosion, run-off rates reduced, and fire and other techniques introduced to stimulate vegetation recovery
- ∂ Heavily cultivated lands planted in single crops can be replaced with diverse cropping systems that help maintain soil productivity and prevent erosion.
- ∂ Gully reclamation.
- ∂ Grass planting.
- ∂ Tree planting.

Ecosystem conservation

Importance of ecosystems

- ∂ Ecosystems are the life supporting systems:
- ∂ It facilitates mankind with several services like extractive benefits (such as foodstuff, fibres).
- ∂ Act as carbon sinks.

- ∂ Provision of raw materials for industries such as timber.
- ∂ Provision of fruits and honey.
- ∂ Water purification.
- ∂ Renewal of soil fertility through humus.
- ∂ Reducing soil erosion.
- ∂ Increasing precipitation through evapotranspiration.
- ∂ Climate regulation.
- ∂ Also provide intellectual, aesthetic, cultural (medicines), religious and spiritual values.

TOPIC 4

NATURAL RESOURCES

Conservation and Management of Natural Resources

Ways include the following:

1. Environmental education.
2. Legislation.
3. Substitution of minerals.
4. Improved technology.
5. Waste disposal

Fish Conservation

Fishing

- The act of catching fish and other aquatic animals.
- Fisheries are fishing grounds or areas where water resources such as fish, seals, clubs, whales, etc. are exploited.

Management and Conservation of Fisheries

Management of fisheries refers to effective planning and control of fish resources and their habitats while conservation of fisheries is careful use and protection of fish resources from overexploitation by people.

Management Measures

- Establishment of research stations to come up with fish species which can do well in various conditions and know fish predators and separate them from fish.
- Educating people on the importance of fishing grounds and fish resources such as by advising farmers not to cultivate near fishing grounds to prevent siltation and industrialists to treat wastes before disposing them.
- Government inspecting inland water resources to ensure people don`t interfere with regular flow of water through their activities.

Conservation Measures

- Enact law banning of small meshed nets to prevent catching of immature fish.
- Improve transport infrastructure to enable exploitation of fishing grounds in remote areas in order to reduce overexploitation of the few accessible fishing grounds.
- Fish farming to ensure fish caught in natural waters aren`t overexploited and depleted.
- Restocking overfished waters using fingerings from hatcheries or from overpopulated fishing grounds.
- Banning fishing temporarily whenever over fishing is detected to let fish to mature and breed.
- Licensing fishermen to regulate the rate at which fish are exploited to prevent their depletion.

Water Conservation Measures

- ∂ dam construction

- ∂ water recycling
- ∂ cloud seeding
- ∂ rationing of water
- ∂ government can legislate against misuse of water
- ∂ educating people on wise use of water through print media e.g. newspaper or electronic media e.g. television radio
- ∂ including local people in decision making

Soil Conservation

- Soil is the uppermost layer of earth's crust, which supports growth of plants.
- Soil is a renewable as well as non-renewable resource.
- Soil is renewable because its productivity can be maintained with fertilizers and manures rich in humus.
- If the soil has been removed from a certain place by erosion, it is practically non-renewable because formation of new soil may take hundreds and thousands of years.

Soil Erosion

- Erosion literally means "to wear away" or removal and detachment of soil from the earth`s surface is called soil erosion.

Causes of soil Erosion

- Natural causes; and Anthropogenic causes (human generated causes)

Natural Causes

- Natural agents like wind and water – high velocity winds and running water over lands.

Human generated causes

- Deforestation.
- Poor farming methods.
- Overgrazing

Effects of soil erosion

- Loss of topsoil - topsoil is so fertile, if it is removed, this can cause serious harm to farmer's crops or the ability to effectively work their land.
- Soil compaction - compacted and stiff topsoil infiltration hence keeping runoff at greater levels and serious erosion.
- Reduced organic and fertile matter - removing topsoil will reduce the ability for the land to regenerate new flora or crops.
- Poor drainage - Sometimes too much compaction with sand can lead to an effective crust that seals in the surface layer, making it even harder for water to pass through deeper layers hence perpetuating runoff or flooding.
- Issues with plant reproduction - seeds and seedlings to be buried or destroyed by strong wind hence no dispersal and crop production.
- Soil acidity levels: When the structure of the soil becomes compromised, and organic matter is greatly reduced, there is a higher chance of increased soil acidity, which will significantly impact the ability for plants and crops to grow.

- Long term erosion leads to desertification.
- Water pollution – siltation of water sources by sediment and contamination due to use of fertilizer or pesticide. This can have significant damage on fish and water quality.

Conservation of Soil

Soil conservation means checking soil erosion and improving soil fertility by adopting various methods:

- Maintenance of soil fertility by adding manure and fertilizers.
- Mixed cropping and rotation of crop.
- Control on grazing through paddock system.
- Afforestation and reforestation.
- Terracing - dividing a slope into several flat fields to control rapid run of water.
- Contour ploughing.
- Education.
- Stone lining to prevent gullies as in Zimunya in Zimbabwew and Burkina Faso.
- Ploughing across slopes.

Forests Conservation

- Exotic plantations-these are extensive forest areas planted with imported tree verities like pine, wattle and eucalyptus.
- Indigenous forests-these are mainly found in reserves mainly locally found

Problems of exotic forests

These are threatened by:

-uncontrolled veld fires.

-tree diseases and fungi.

-constant drought.

-strong winds.

-competition for land with other land uses e.g. fruit farming, tea, and coffee

-growth of population which leads to demand for settlement and crop farming

Classes of Forests

1. Tropical Forests
2. Temperate Deciduous Forests
3. Coniferous Forests

Indigenous Timber Resources

FOREST	MAIN SPECIES	USES
Hwange ,Nkayi, Chimanimani	Mukwa, teak and mahogany	quality furniture ,construction ,railway slippers ,mine props

Exotic Timber Resources

FORESTS	MAIN SPECIES	UESES
Inyangani, Stapleford Penhalonga ,Juliasdale ,Vumba ,Chimanimani	pine ,wattle, Cyprus and eucalyptus	trusses and poles for construction ,furniture, pulp paper ,fencing ,electricity and telephone poles wood fuel ,production of tannin(wattle)

Sustainable Management of Forests

- reforestation-afforestation.
- new technology which ensures maximum utilisation of wood fuel
- substitution of wood fuel for other uses e.g. Solar and biogas
- resettlement
- recycling
- population control
- CAMPFIRE.

Wildlife Management

Wildlife

- All forms of animal life vertebrates and invertebrates and all forms of plant life

Conservation

- Is the wise use of natural resources
- Conservation plus utilization

Preservation

- Protecting without consuming them

The function of the Zimbabwe Parks and Wildlife Management Authority

- Mandated by government to oversee conservation of flora and fauna
- Conservation is done using various legislations, the principal Act in Zimbabwe is the Parks and wildlife Act Chapter 20.14.
- Other laws include:Satutory instrument 362 of 1990 (general regulations),S I 114 of 1993 (law governing professional hunters), Trapping of animals (control) Act Chapter 20:21)
- Falls under the ministry of environment water and climate

What is Wildlife Management?

- It is to maintain populations of wild animals at levels consistent with the best interest of wildlife and the public
- Wildlife management can be defined as the manipulation of wildlife populations and habitat to achieve a goal e.g for hunting , photographing (Sargent and Carter, 1999).
- Disease, loss of habitat, improper hunting management, drought and invasive species are some of the reasons why numbers of animals can change.
- A wildlife manager's job is to make sure we have enough members of a species
- Involves habitat management and population management

National Parks

- It is a park in use for conservation purposes.
- A national park is an area designated and run by the government to enhance ecosystem integrity and natural ecological processes.

Functions

- To preserve and protect the natural landscape and scenery
- To preserve and protect wildlife and plants and the natural ecological stability of wild life and plant communities **.**
- In Zimbabwe these parks fall under the governance of Zimparks . They are areas of important natural beauty, fauna and flora and offer legal protection within park boarders.
- They promote use for recreation or education and they have infrastructure like roads , lodges, campsites and chalets. E.g. Hwange, Matopo, Chimanimani, Nyanga , Mana pools, Gonarezhou ,Matusadonha, Chizarira and Zambezi national parks.

Conservancies

- It is Land set aside by an individual landowner, body corporate, group of owners or a community for purposes of wildlife conservation e.g. Save Valley Conservancy, Malilangwe
- They started in the early 1970s
- There are over 140 conservancies spread across 22 Counties covering over 7.5 million acres.
- A park conservancy is a private, non-profit, non-political organization that works in partnership with a local government to help improve and/or manage one or more parks in the community. Conservancies work in collaboration with the local government entity, usually with a formal agreement or "memorandum of understanding" (MOU) in place.

Game Park / Reserve

- Is a large area of land, especially in Africa, where wild animals can live safely.
- On the other hand exists specifically for the preservation of wild animals.
- There are activities like hiking and game viewing but hunting may also be permitted.
- If hunting is prohibited then a Game Park can be classified as a **Nature Reserve**.

Safari Areas

Functions

- To preserve and protect natural habitat and the wild life in order that facilities and opportunities may be afforded to the public camping, hunting, fishing, photography, viewing of animals, bird-watching.
- Hunting is done through a quota system whereby each safari area is allocated a certain number of animals per species e.g 10 elephants, 10 impalas, 20 doves
- All clients i.e. hunting clients , photographing, viewing and bird watching clients pay certain fees
- Examples include Chirisa, Doma, Chete, Matetsi,Malipati, Dande and Chewore

Botanical Gaderns

- It may contain specialist plant collections such as cacti and other succulent plants, herbs and trees
- Is a garden dedicated to the collection, preservation , propagation and protection of both **exotic and indigenous** plants for the enjoyment, education and benefit of the public.
- Visitor services at a botanical garden might include tours, educational displays and research
- Examples are Ewanrigg and Vumba botanical g

Botanical Reserve

- Preserve and protect rare or endangered indigenous plants or representative plant communities **growing naturally** in the wild for the enjoyment and education of the public
- Examples include **Haron forest ,Rusitu and Bunga**

Sanctuary

- A wildlife sanctuary is a place of refuge where abused, injured and abandoned captive wildlife may live in peace and dignity for the remainder of their lives.
- There is no breeding for commercial activities or use of animals for entertainment or sport, sale of animals, their offspring or animal parts and by-products in a true sanctuary.
- The integrity of individual animals, providing safe, healthy and secure refuge in enclosures specifically designed for the unique animal which it supports is respected.
- Examples of sanctuaries in Zimbabwe are Mushandike, Tshabalala ,Boulton , Nyamanechi and Chimanimani Eland Sanctuary

Recreational Parks

- Aims at protecting and preserving natural features for the enjoyment , benefit and recreation of the public
- Examples in Zimbabwe include Kyle in Masvingo, Ngezi and Sebakwe in Kwekwe and Lake Chivero
- Activities done include fishing , boating and in walks

Differences Between a National Park and Game Reserve

NATIONAL PARK	GAME RESERVE
Larger	Small
Maintained by governments and allow no human activities inside the parks	National reserves allow limited human activities inside the reserves
Absolutely no hunting is allowed	Hunting is allowed only on permission of the authority
Human activity is not allowed for example grazing, farming, hunting and living.	Human activities like grazing and hunting exists even homesteads (wild animals and human exists)
maintained by a government for the purpose of people to visit, enjoy, and marvel at its beauty as a natural wonder	Maintained by a government for wild animals

Advantages of wildlife management

Economic

- Employment e.g. rangers , ecologists, professional hunters and guides
- Cash from hunting, photographing and fishing.
- Food e.g. meat
- Raw materials e.g. hides for shoe making

Medical and Scientific

- Something with aesthetic value is pleasing to the eye, such as watching a deer graze or enjoying the sun set.
- Wild plants and animals have this aesthetic value. They are a source of awe, joy, wonder, and pleasure for many people. Wildlife recreation is more than activities designed to take wildlife species.
- People enjoy seeing plants and animals in their natural habitats. This is why travelers stop along the roadside whenever

Recreational

- **E.g.** Elephant riding, fishing e.g. tiger fishing tournament in Kariba

Ecological

- Environmental indicators e.g. migratory birds such as white storks
- Environmental health indicators for example death of fish in a dam can be an indicator that the water is polluted, death of vultures after eating a poisoned elephant
- Clean the environment e.g. vultures and hyenas

- Pollination ..birds and bees
- Seed dispersal
- Parasite controllers e.g. oxperkers

Cultural

- Totem
- Disadvantages?
-

Problems Facing Wildlife Areas

- Poaching resulting in extinction of some animal species.
- Veld fires which destroy plants hence shortage of pastures.
- Human wildlife conflicts when farmers kill canvoires which kill their livestock.
- Pests and diseases

Human–Wildlife Conflict

- It refers to the interaction between wild animals and people and the resultant negative impact on people or their resources, or wild animals or their habitat.

Causes of Human and Wildlife Conflicts

- Loss of habitat due to human encroachment e.g. Munyokovere village, Chitsa people in Gonarezhou
- Habitat fragmentation
- Lack of wildlife corridors
- Unplanned human settlement e.g. in Save valley
- Disturbance of livestock grazing
- Crop losses (10-18% of household income)
- Manpower requirements for guarding

- Lack of support in developing protection/mitigation measures
- Attacks on humans – injuries and death

Possible Sollutions To Human and Wildlife Conflicts

- Burning chilli pepper bricks
- Chilli pepper plant fences
- Bee fences
- Electric predator proof fence kraals
- Early maturing seeds
- Alternative livelihoods in tourism sector
- Fence in your garden, and plant with unpalatable vegetation to discourage browsing.
- Compensation / insurance
- Payment for Environmental Services - financial reward for the sequestering of carbon.
- Lethal is the last option.

CAMPFIRE

- Communal Areas Management Program for Indigenous Resources (CAMPFIRE) initiated in 1988 `with Mbire and Nyami Nyami districts
- The Parks and Wildlife Act of 1975 gave private landholders in pre-independent Zimbabwe the right to manage wildlife for their own benefit,
- In 1982, the legal provisions of this Act were extended to Rural District Councils (RDCs), on behalf of rural communities in communal lands in whose areas viable populations of wildlife are found.
- The private landholders and RDCs are given Appropriate Authority (user rights)
- Examples include Mahenye CAMPFIRE in Chipinge district, Mbire , Nyaminyami

Reasons For Establishment of Campfire

- Devolution of ownership rights
- To ensure that local communities benefited from hunting safari concessions operating in their area
- designed to give control of wildlife management to rural communities, so that they would invest in wildlife and habitat conservation and in turn, receive dividends
- Instil sense of ownership to communities adjacent to protected areas

Benefits of Campfire

- It improves the livelihoods of rural people.

- It empowers rural communities to manage wildlife (management by the community for the community in the community) thereby imparting the sense of self-confidence and self-dependence.
- It provides an incentive for rural communities to conserve wildlife through direct and indirect benefits.
- Contributes to job creation e.g. managers, guides, environmental monitors.
- Diversification of livelihoods for rural communities.
- Some communities benefit from infrastructure such as clinics, schools, grinding mills, boreholes and roads e.g. Mahenye and Mbire

Is Campfire Sustainable?

- Sustainable wildlife management (SWM) is the sound management of wildlife species to sustain their **populations** and **habitat over time**, taking into account the **socioeconomic needs of human populations**. This requires that all land-users within the wildlife habitat are aware of and consider the effects of their activities on the wildlife resources and habitat, and on other user groups.
- **Yes…….**

Why?

- Quarter setting by zimparks and other stake holders.
- All hunts are monitored by zimparks.
- Park is reported and actioned by ZIMPARKS in collaboration with RDC.
- Hunting returns are sent to the appropriate authority (ZIMPARKS).
- Communities because they benefit they conserve and protect wildlife

However…..

- There is need to devolve user rights to communities at village level.
- Capacity building for communities to sustainably manage wildlife

TOPIC 5

ENERGY AND POWER

Energy Forms

Non-renewable energy: Energy that cannot be reproduced in the time that it takes to consume it e.g. coal.
Renewable energy: Energy that is naturally occurring and potentially infinite.
Fossil fuels: Any combustible organic matter that is made from the remains of former flora and fauna.

Management and Conservation of Energy

- Management of energy is effective planning and control of energy resources.

Management Measures

- Encouraging many people to use public transport.
- Educating people through mass media to create awareness on the importance of conserving energy.
- Improvement and proper planning of road network to reduce traffic jams in which a lot of fuel is wasted.
- Agroforestry, afforestation and reforestation programmes to reduce overexploitation of natural forests.
- Banning logging, selective felling of trees and resettling people who have settled into forests.

Ways of Conserving Energy

- Conservation of energy is using available energy resources in the most effective manner to ensure there isn`t wastage.
    - Turn down your thermostat at night or when you're away for more than four hours during the day.
    - Dress warmly to help retain body heat. Wear closely woven fabrics. Dressing in layers retains more heat than a single thick piece of clothing.
    - Use natural gas for heating. Consider switching to a natural gas heating system.
    - Natural gas is less expensive than other heating fuels.
    - Boil water in a kettle or covered pan; the water will boil faster and use less energy.
    - Use small electric cooking appliances (such as portable grills and skillets) for small meals rather than the stove or oven.
    - Use Energy Star LED or compact fluorescent light bulbs. Energy Star light bulbs last longer and use up to 80 percent less energy than standard light bulbs.
    - Turn off lights in any room not being used. Turn on outdoor lights only when needed.
    - Put your computer to sleep instead of using a screen saver.
    - Make sure that no furniture or other obstacles are blocking ducts or fans. This will enable cooled air to circulate more freely.

- Set the refrigerator thermostat at 38 degrees F for fresh food compartments and 5 degrees F for the freezer compartment.
- Replace inefficient appliances – even if they're still working. An aging water heater or refrigerator could be costing you much more than you think.
- Dry your clothes on an outside clothesline whenever possible
- Pull the plug on battery chargers. Laptops, cell phones and digital cameras always draw power if they're plugged in.
- Use reusable containers for food storage instead of wrapping food in foil or plastic wrap.
- Bring a reusable water bottle! Packaged bottled water is a waste and highly inefficient in most of the developed world.
- Educate and encourage employees who identify and implement energy savings.
- If you can travel at off peak hours or use public transport, do so. Traffic jams only create more pollution, waste fuel, and cause stress!
- Keep your tires properly inflated-under-inflated tires will reduce mileage.
- Turn off your engine if you are stopping for any more than 30 seconds.

Energy Conservation Technologies

Biogas

- Anaerobic digestion is a natural process in which bacteria convert organic materials into biogas.
- It occurs in marshes and wetlands, and in the digestive tract of ruminants.
- The bacteria are also active in landfills where they are the principal process degrading landfilled food wastes and other biomass.
- Biogas can be collected and used as a potential energy resource.

Advantages of using anaerobic digestion for dairy farm wastes

- Renewable energy source.
- Reduction of odors, flies, and pathogens.
- Decrease greenhouse gas (GHG) and other undesirable air emissions.
- It also stabilizes the manure and waste material are transformed into a valuable resource.
- The potential for the leaching of nitrates into groundwater, the potential release of nitrates and pathogens into surface waters, and the emission of odors from storage lagoons is significantly reduced with the use of anaerobic digestion.
- There may also be a reduction in the level of ***Volatile Organic Compound*** (VOC) emissions.

Biogas use.

- Recovered biogas can be used directly as fuel for heating
- It can be combusted in an engine to generate electricity or flared.
- If the biogas is upgraded to biomethane, additional uses may be possible.

Tsotso Stove

Qn: Describe how the stovo is used. (6)

Impacts of Energy Crisis

- Increase in the prices of many commodities.
- Increase in the prices of imports due to high oil prices.
- Retrenchments in industries because of the high cost of production which can cause losses.
- It causes the price of other forms of energy e.g. charcoal and gas also to become expensive.
- Environmental degradation as a result of environmental degradation brought about by the high demand for charcoal and firewood which leads to soil erosion.

Solutions

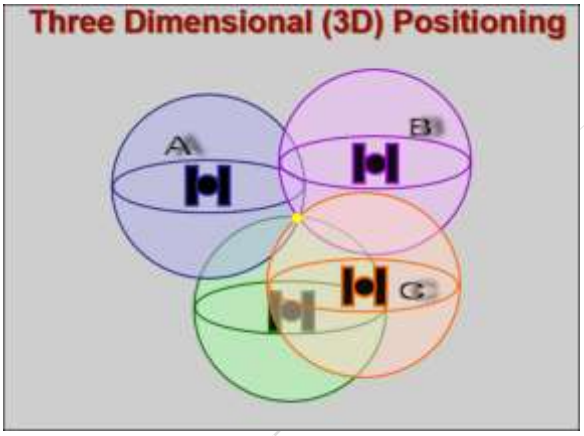
- Developing alternative sources of energy e.g. solar, biomass, Geothermal and HEP.
- Management and conservation of energy.
- Encouraging industries to use coal which is slightly cheaper than petroleum.
- Afforestation and reforestation programmes.
- Education campaigns on how to conserve fuel.
- Use of tsotso stove for wood.
- Developing new thermal power stations in GOKWE NORTH.
- Refurbishing KARIBA.

TOPIC 6

MAP WORK AND GEOGRAPHIC INFORMATION SYSTEMS (GIS)'

Global Positioning System (GPS)

- The Global Positioning System (GPS) is a U.S. owned satellite system that provides users with positioning, navigation, and timing (PNT) services. It is also known as NAVSTAR ((**NAV**igation **S**atellite **T**iming **A**nd **R**anging).
- The GPS will use your location relative to these satelites to determine your location on Earth.
- First, your receiver determines how far away you are from satelite A. This narrows down your location to somewhere in the first circle.
- Your receiver will find your location relative to satelites B and C.
- Then your location is where the three circles overlap.



Application of GPS Technology in Navigation

1. In Everyday vehicles

   Hand-held or built-in GPS receivers are inserted in cars and programmed to talk to thedrivers while they drive, to find routes and destinations.
2. In Aeroplanes and ships

   They are used to pinpoint their speed and position on the land or sea hence aiding pilots and sea captains to navigate.
3. Hikers

   Route and position location while hiking to avoid being lost in the mountain.
4. Emergency Services

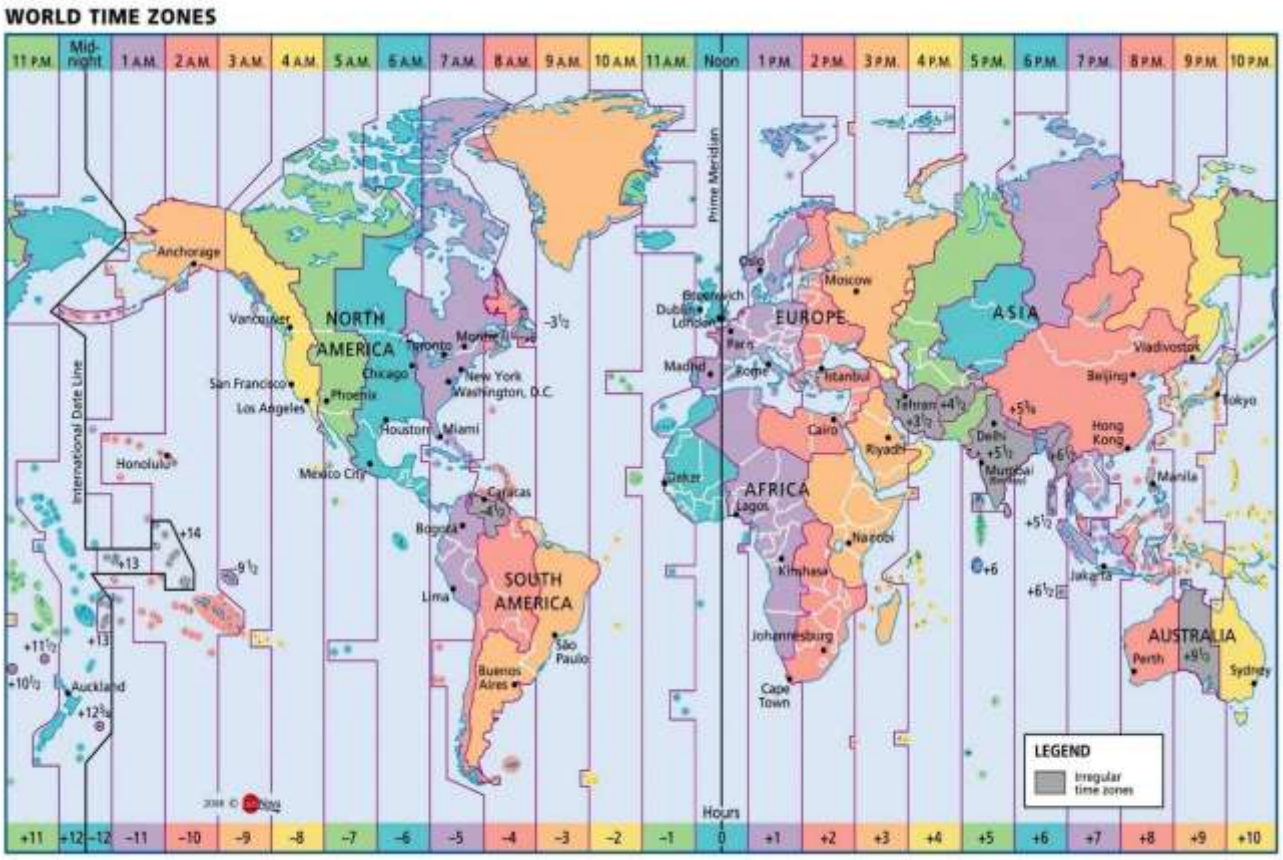
   Emergency services can use GPS to locate emergency scenes quickly.

5. Monitoring Geological activity

   Scientists use GPS to monitor earthquakes, volcanic activities and even veld fires and notify affected parties on time.

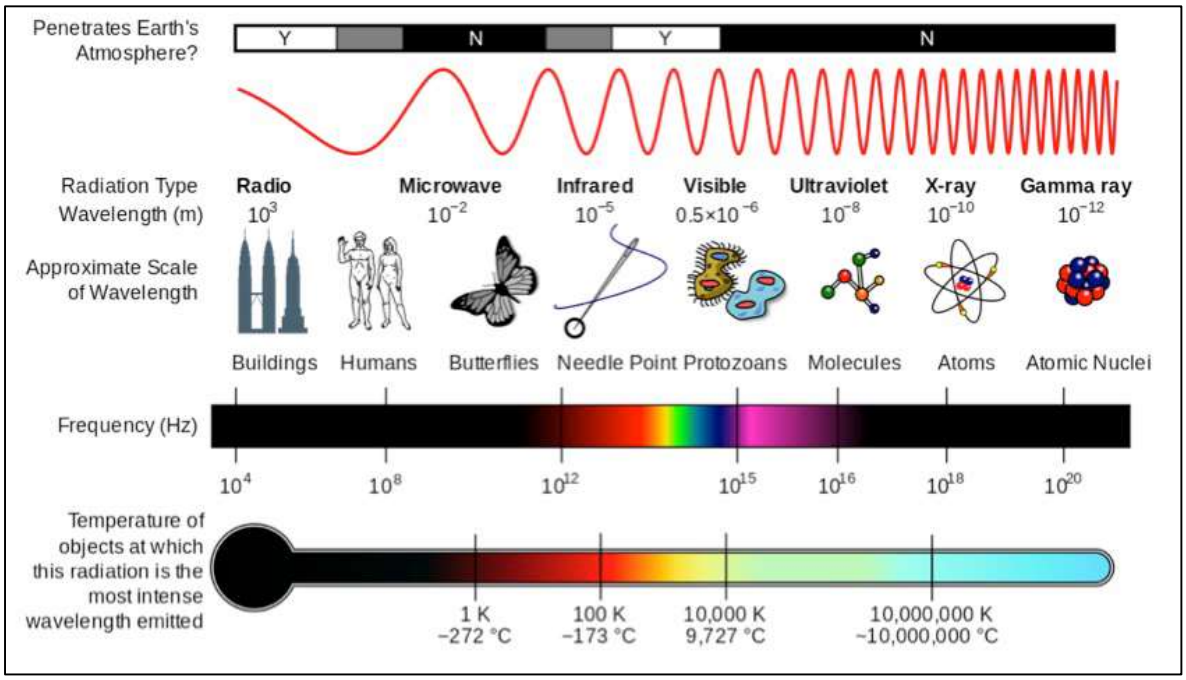
Time Zone

- Is a region on Earth, more or less bounded by lines of longitude, that has a uniform, legally mandated standard time, usually referred to as the **local time**
  - The longitude of London and Accra is taken as 0 degree and is called the Prime or Greenwich Meridian after the point passes through London.
  - The world time is based on the Greewich Meridian (GMT).
  - Due to the fact that countries may cover several degrees of longitudes along their east-west breath, there was need to divide the world into time zones which are broad longitudinal zones in which there is the same or standard time.
  - Places in the east see daylight early than those in the west this means that places in the east are ahead of time and those in west are behind.
  - The earth's rotation = 360 degrees
  - One complete rotation = 24hrs
  - In one hour the earth turns through 15 degrees that is 3660 divided by 24=15
  - Every 15 degrees we move eastwards, local time is one hour ahead, but as we move westwards will be one hour behind
  - e.g. If the time is 4.00 p.m. at Accra in Ghana whose longitude is 0 degrees what time will be the local time at Kadoma Zimbabwe 30 degrees east
  - 30-0 = 30
  - 30 divided by 15 degrees = 2
  - Kadoma is 2hrs ahead of Accra so it is 4.00 +2hrs = 6.00pm.
  - If two people were to meve, one eastwards and one westwards at the same speed, gaining or loosing time respectively, they would meet on the 180 degrees longitude.
  - One moving eastwards would be 24 hours ahead and one westwards would be 24 hours behind.
  - The 180 degree longitude is called the International Date Line.



Electromagnetic Spectrum

- Solar radiation reaches the Earth as electromagnetic waves.
- The electromagnetic spectrum describes the wavelength of light and their properties, most of which humans have learned to use in a variety of ways.
- On a narrow part of the electromaginetic spectrum is visible to the human eye.
- As you go from left-right, the wavelengths get smaller and the frequencies get higher. This is an inverse relationship between wave size and frequency. (As one goes up, the other goes down.) This is because the speed of all EM waves is the speed of light (300,000 km/s).
- The higher the frequency, the more energy the wave has.
- EM waves do not require media in which to travel or move.



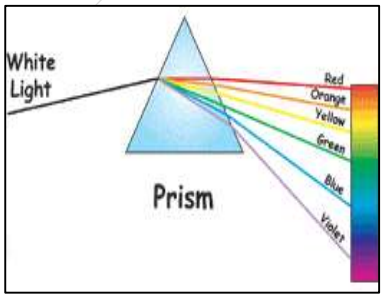
Radio waves

- Have the longest wavelengths and the lowest frequencies; wavelengths range from 1000s of metres to .001 m.
- Used in RADAR, cooking food, satellite transmissions.
- However, large doses of radio waves are believed to cause cancer, leukaemia and other disorders.
- Some people claim that the very low frequency field from overhead power cables near their homes has affected their health.

Infrared waves (heat)

- Have a shorter wavelength, from .001 m to 700 nm, and therefore, a higher frequency.
- Used for finding people in the dark and in TV remote control devices.
- The danger from too much Infra-Red radiation is very simple - it makes you hot.

The visible wave bands



- The visible part is seen by the human eye.
- These are colours you see every time you look at an object.
- Light from an object reaches your eyes allowing you to see different colours that fall within the visible spectrum.
- Different colours on the spectrum correspond to different wavelengths of light (See the Electeomagnetic spectrum).

- Too much light can damage the retina in your eye. Especially when you look at something very bright, like the sun.

Ultraviolet Light
- Wavelengths range from 400 nm to 10 nm; the frequency (and therefore the energy) is high enough with UV rays to penetrate living cells and cause them damage.
- Although we cannot see UV light, bees, bats, butterflies, some small rodents and birds can.
- UV on our skin produces vitamin D in our bodies. Too much UV can lead to sunburn and skin cancer. UV rays are easily blocked by clothing.
- Used for sterilisation because they kill bacteria.

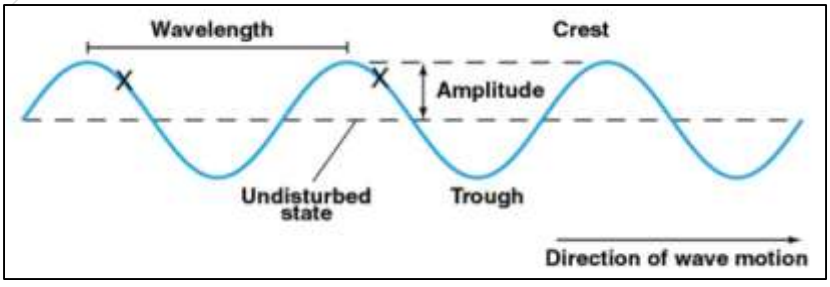
X-Rays

- Wavelengths from 10 nm to .001 nm. These rays have enough energy to penetrate deep into tissues and cause damage to cells; are stopped by dense materials, such as bone.
- Used to look at solid structures, such as bones and bridges (for cracks), and for treatment of cancer.
- X-Rays can cause cell damage and cancers.

Gamma Rays

- Carry the most energy and have the shortest wavelengths, less than one trillionth of a metre.
- Gamma rays have enough energy to go through most materials easily; you would need a 3-4 ft thick concrete wall to stop them!
- Gamma rays are released by nuclear reactions in nuclear power plants, by nuclear bombs, and by naturally occurring elements on Earth.
- Sometimes used in the treatment of cancers.
- However, Gamma rays cause cell damage and can cause a variety of cancers. They cause mutations in growing tissues to unborn babies.

Light as a wave



- Light is a visible form of energy that behave like a wave.

- It has a wavelength shown by a letter lambda, a frequency (how many waves pass through a point at any time) and an amplitude (the height of the waves). The crest is the highest point in a wave and the trogh is the lowest point.
- Waves can be refracted (bent). The speed of of light changes as it moves from the water to air.
- Light can be reflected e.g. when sunlight bounces off a smooth surface or when reflected off a mirror.
- Wavelengths are measured as the distance between two crests after each other.
- Microwaves have long wavelength than gamma rays.

Electromagnetic Spectrum and Photographs

- Electromagnetic spectrum can be in geographical imaging. The two important types of imagery are aerial photographs and Remote sensing.

Aerial photographs

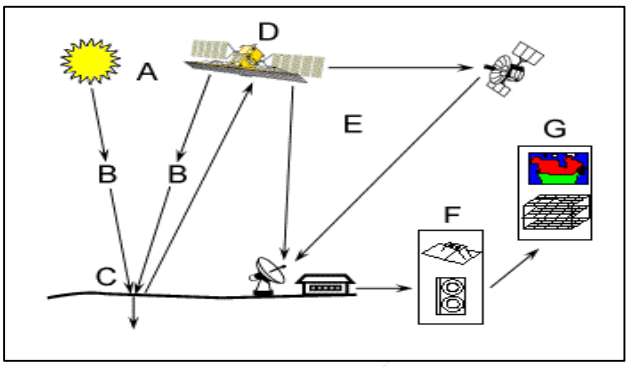
These are taken from the air, high up using aeroplanes or helicopters. Satelites also help us to map out the surface of the earth using aerial photographs. They make use of the visible light in the electromagnetic spectrum.

Remote Sensing

- Remote Sensing is defined as the science and technology by which *characteristics* of objects of interest can be identified without direct contact.
- One example of RS is Light Detection and Ranging (LIDAR) which uses laser pulses to measure various distance on Earth.
- Use of satellites or aircraft to capture information about the earth's surface (a laser, scanner and a GPS receiver are used to take LIDAR images).

Process of Remote Sensing

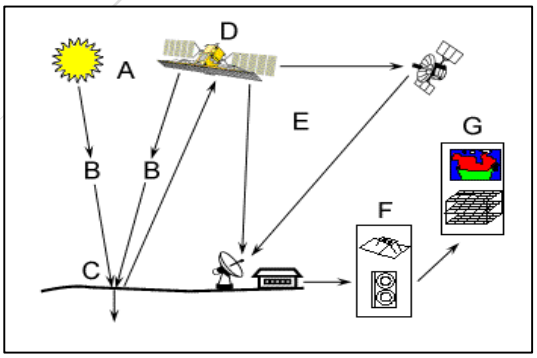
Energy Source or Illumination (A) - the first requirement for remote sensing is to have an **energy source** which illuminates or provides electromagnetic energy to the target of interest.



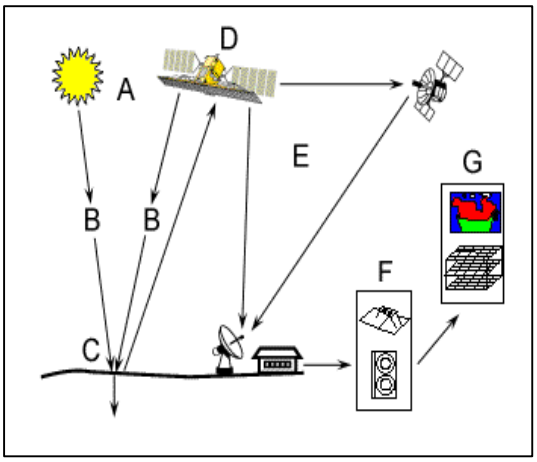
Radiation and the Atmosphere (B) - as the energy travels from its source to the target, it will come in contact with and **interact with the atmosphere** it passes through. This interaction may take place a second time as the energy travels from the target to the sensor.

Interaction with the Target (C) - once the energy makes its way to the target through the atmosphere, it **interacts with the target** depending on the properties of both the target and the radiation.

Recording of Energy by the Sensor (D) - after the energy has been scattered by, or emitted from the target, we require a **sensor** (remote - not in contact with the target) to **collect and record** the electromagnetic radiation.

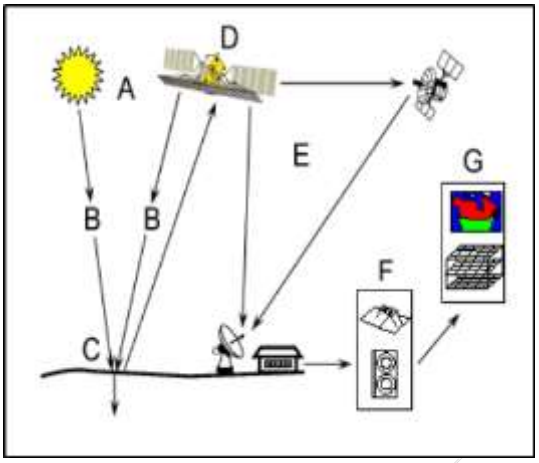


Transmission, Reception, and Processing (E) - the energy recorded by the sensor has to be **transmitted**, often in electronic form, to **a receiving and processing station** where the data are processed into an image (hardcopy and/or digital).



Interpretation and Analysis (F) - the processed image is **interpreted**, visually and/or digitally or electronically, to extract information about the target which was illuminated.

Application (G) - the final element of the remote sensing process is achieved when we **apply the information** that we have been able to extract from the imagery about the target, in order to **better understand it**, **reveal some new information**, or **assist in solving a particular problem.**



TOPIC 7

MINERALS AND MINING

Small Scale Mining In Zimbabwe

- Small scale miners, also known as artisan.

Benefits

- It is a source of income and wealth for the miners.
- Increased foreign currency earnings for the country.
- Small scale miners are informal markets informal traders.
- Employment creation.

Problems of small scale mining

Physcal environmental problems

- Forest destruction
- Environmental degradation.
- Cause soil erosion. And siltation of rivers.
- Causes water pollution due to use of mecury.
- Destoys the natural beaut of the land.

Economic problems

- Demage to infrastructure such as Effel flats Primary in Kadoma.
- Reduce water supplies for agriculture due to siltation.
- Destruction of farm lands.

Social problems

- Exploitation of labour.
- Loss of life (Explain why and how).
- Increase in crime rates.
- Increase in prostitution hence spreadal of diseases.

Measures to control the problems

- Close monitoring of activities and increase police.
- Licensing of miners.
- Enforcing environmental laws.
- High penalties to those not observing the law.
- Educating and training miners on environmentally friendly methods of extracting minerals.

Challenges facing small scale miners in Zimbabwe

- Evacuation of miners due to lack of licenses.
- No access to credit facillaties and finance.
- Lack of equipments and machineries.
- Poor technologies posing dangers to themselves.
- Lack of skills.
- Lack of market information and access to it.

Solutions to the challenges

- Training of amall scale miners.
- Provision of proper equipments and machinery.
- Establishment of Miners` Association.
- Obtaining permits and licences.
- Environmental, Safety and Technical Assistances.

The legislative Framework on Mining and Mineral Rights

- The extraction and processing of minerals in Zimbabwe is governed by Acts of Zimbabwe.

- The Acts are the legislative framework which govern the mining and mineral rights.

The Mining and Mineral Act

- The extraction and processing in Zim is governed by act of government .
- The acts are the legislative frame works which the mining and mining right.
- The mines and minerals was put in place in Zimbabwe in 1961 but section has been revicised and amounted through out the year .
- The acts governed the registration of miners and issung .
- The acts also stipulate rules and regulations on how to carry out the mining and the payment of fees to local aothorities.

The Environmental Management Act

- The mining of mineral ores is also governed by acts such Environmental Managementa Act 13 of 2002.
- This act stipulate rules and regulations to protect the enviroment from the negative effects of mining activities.
- It governs water pollution,harzadous wastes,effulent and sewerages disaharges by the mining componus
- The act also governs air and noise pollution and the use of pestcide and toxic substances

Processing of Selected Minerals in Zimbabwe and Africa

Gold Extraction

Gold extraction refers to the processes required to extract gold from its ores.

Gold occurs mainly as a native metal, usually alloyed to a greater or lesser extent with silver (as electrum). Native gold can occur as sizeable nuggets, as fine grains or flakes in alluvial deposits, or as grains or microscopic particles embedded in rock minerals.

Grinding

Once the gold ore has been mined, it usually is washed and filtered at the mine as a preliminary refinement technique. It is then shipped to mills, where it is first combined with water and ground into smaller chunks. The resulting mixture is then further ground in a ball mill—a rotating cylindrical vessel that uses steel balls to crush the ore.

Separating the gold from the ore

The gold is then separated from the ore using one of several methods. Floatation, cyanidation, and the carbon-in-pulp method are 3 processes used to refine gold. They can be used alone or in combination with one another.

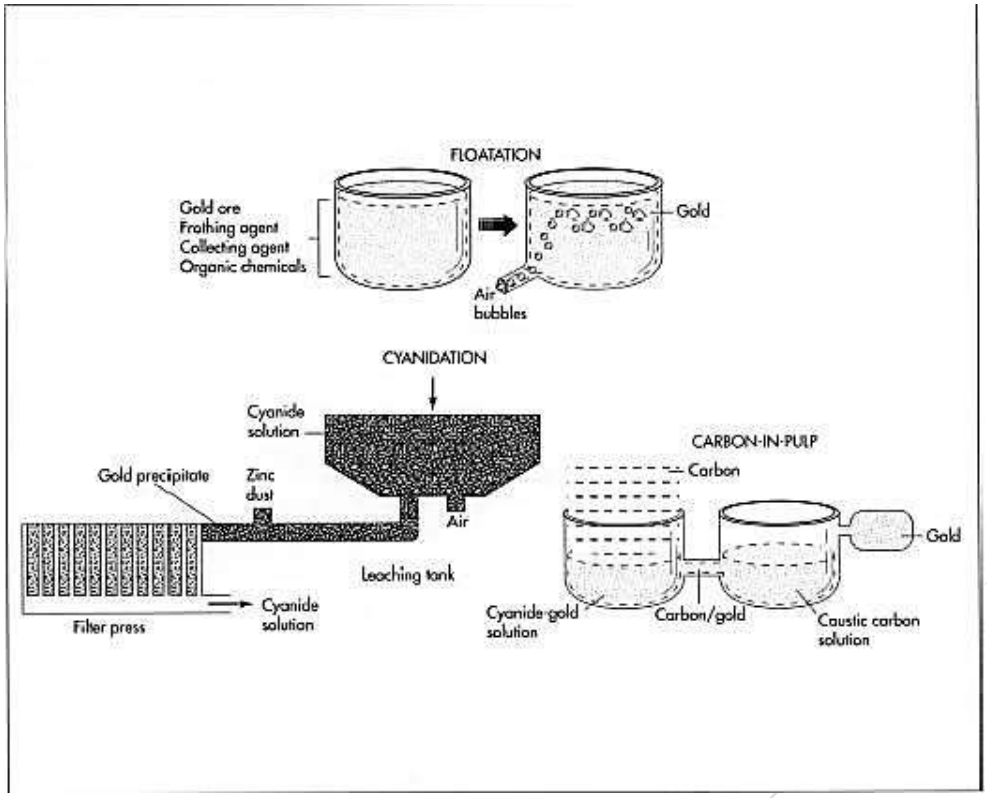
a) Floatation involves the separation of gold from its ore by using certain chemicals and air. The finely ground ore is dumped into a solution that contains a frothing agent (which causes the water to foam), a collecting agent (which bonds onto the gold, forming an oily film that sticks to air bubbles), and a mixture of organic chemicals (which keep the other contaminants from also bonding to the air bubbles). The solution is then aerated—air bubbles are blown in—and the gold attaches to the air bubbles. The bubbles float to the top, and the gold is skimmed off.

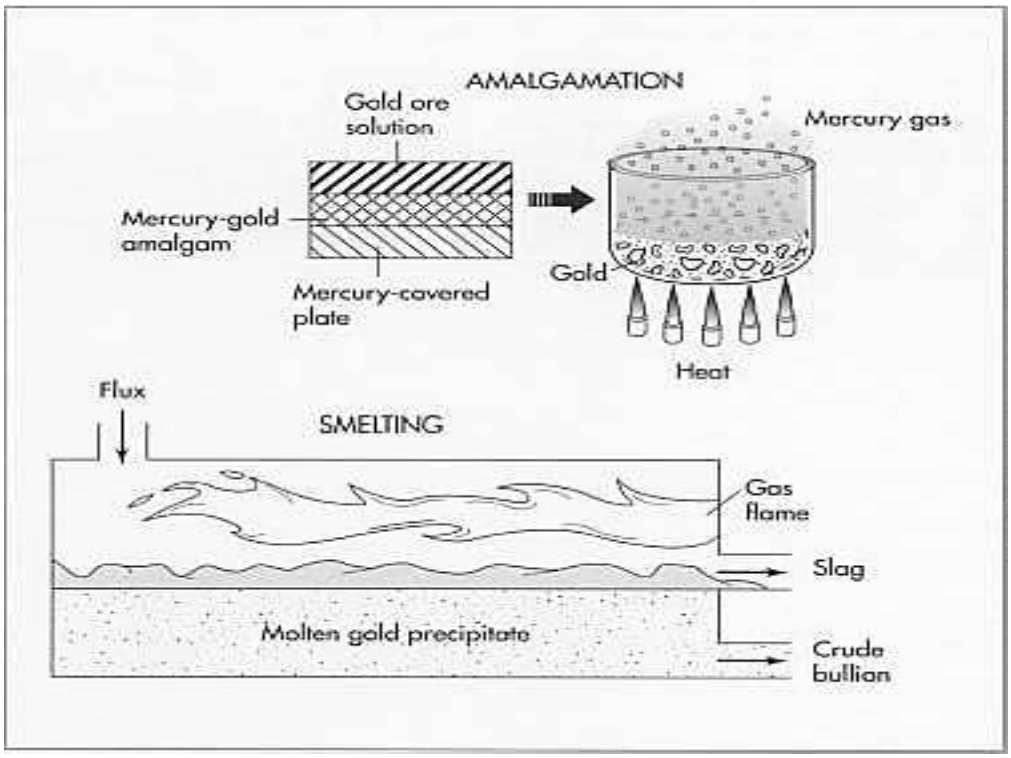
b) Cyanidation also involves using chemicals to separate the gold from its contaminants. In this process, the ground ore is placed in a tank containing a weak solution of cyanide. Next, zinc is added to the tank, causing a chemical reaction in which the end result is the precipitation (separation) of the gold from its ore. The gold precipitate is then separated from the cyanide solution in a filter press. A similar method is amalgamation, which uses the same process with different chemicals. First, a solution carries the ground ore over plates covered with mercury. The mercury attracts the gold, forming an alloy called an amalgam. The amalgam is then heated, causing the mercury to boil off as a gas and leaving behind the gold. The mercury is collected, recycled and used again in the same process.

c) The carbon-in-pulp method also uses cyanide, but utilizes carbon instead of zinc to precipitate the gold. The first step is to mix the ground ore with water to form a pulp. Next, cyanide is added to dissolve the gold, and then carbon is added to bond with the gold. After the carbon particles are removed from the pulp, they are placed in a hot caustic (corrosive) carbon solution, which separates the gold from the carbon.

d) Amalgamation. In amalgamation, the gold ore is dissolved in solution and passed over mercury-covered plates to form a gold/mercury amalgam. When the amalgam is heated, the mercury boils off as a gas and leaves behind the gold.

e) Smelting. In smelting, the gold is heated with a chemical substance called "flux. The flux bonds with the contaminants and floats on top of the gold. The gold is then cooled and allowed to harden in moulds, and the flux-contaminant mixture (slag) is hauled away as a solid waste.





Platinum

Platinum Ore

Platinum is always found alongside other PGMs (Platinum Group of Metals). Extracting platinum from ore is both capital and labour intensive. It can take up to 6 months and 7 to 12 tons of ore to produce one troy ounce (31.135g) of pure platinum.

Extraction of Platinum

The first step in this process is to crush platinum containing ore and immerse it in the reagent containing water; a process known as 'froth flotation'. During flotation, air is pumped through the ore-water slurry. Platinum particles chemically attach on to the oxygen and rise to the surface in a froth that is skimmed off for further refining.

Once dried, the concentrated powder still contains less than 1% platinum. It is then heated to over 1500C° in electric furnaces and the air is blown through again, removing iron and sulphur impurities. Electrolytic and chemical techniques are employed to extract nickel, copper, and cobalt, resulting in a concentrate of 15-20% PGMs.

Aqua regia which is a mixture of nitric acid and hydrochloric acid is used to dissolve platinum metal from the mineral concentrate by creating chlorine that attaches to platinum to form chloroplatinic acid. In the final step, ammonium chloride is used to convert the chloroplatinic acid to ammonium hexachloroplatinate, which can be burned to form pure platinum metal.

Applications for Platinum

Below is a list of some of the many other applications for platinum:

- With rhodium, used to make high-temperature thermocouples
- To make optically pure, flat glass for TVs, LCDs, and monitors
- To make threads of glass for fibre optics
- In alloys used to form the tips of automotive and aeronautic spark plugs
- As a substitute for gold in electronic connections
- In coatings for ceramic capacitors in electronic devices
- In high-temperature alloys for jet fuel nozzles and missile nose cones
- In dental implants
- To make high-quality flutes
- In smoke and carbon monoxide detectors
- To manufacture silicones
- In coatings for razors

Nickel

Nickel ore

Nickel is primarily extracted from the nickel sulphides pentlandite, pyrrhotite, and millerite, which contain about 1% nickel content, and the iron-containing lateritic ores limonite and garnierite, which contain about 4% nickel content.

Extraction of Nickel

Sulphide ores can be separated using froth flotation and hydrometallurgical or magnetic processes to create nickel matte and nickel oxide. These intermediate products, which usually contain 40-70% nickel, are then further processed, often using the Sherritt-Gordon Process.

The Mond (or Carbonyl) Process is the most common and efficient method to treat nickel sulphide. In this process, the sulphide is treated with hydrogen and fed into a volatilization kiln. Here it meets carbon monoxide at about 60°C to form nickel carbonyl gas. The nickel carbonyl gas decomposes on the surface of pre-heated nickel pellets that flow through a heat chamber until they reach the desired size. At higher temperatures, this process can be used to form nickel powder.

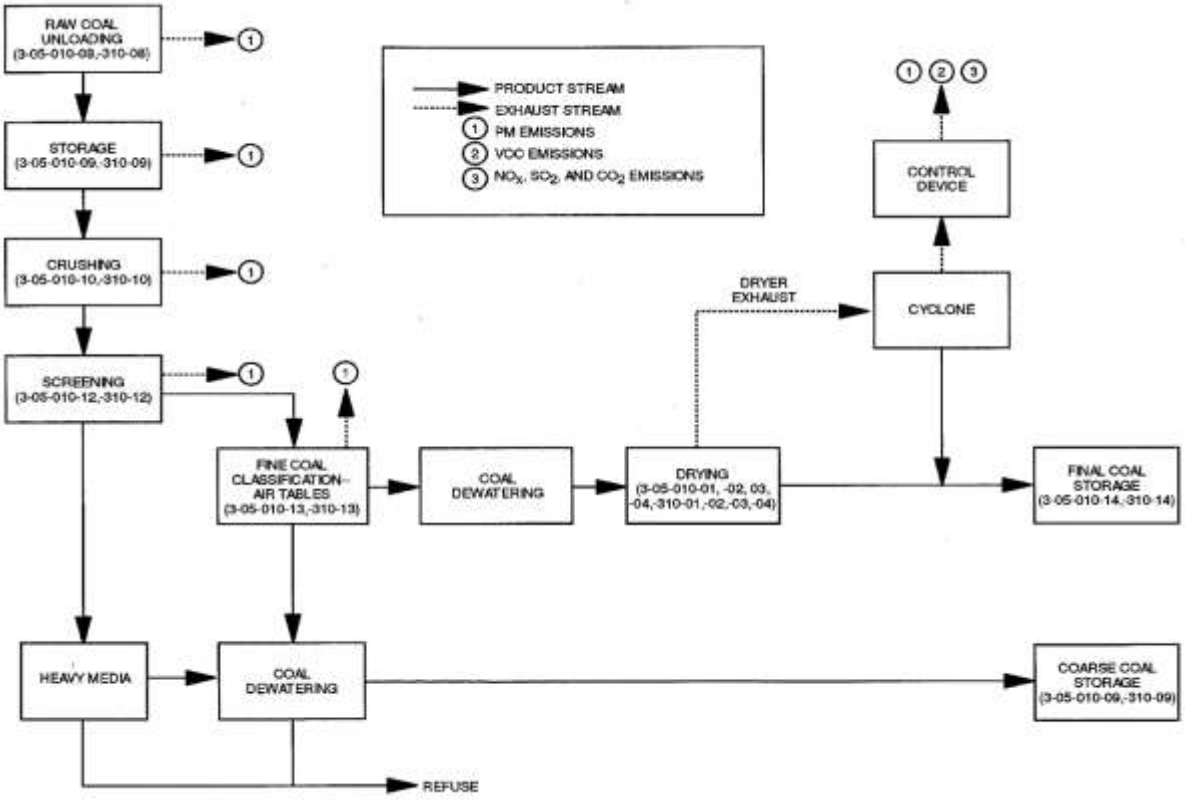
Lateritic ores, by contrast, are usually smelted by pyro-metallic methods because of their high iron content. Lateritic ores also have high moisture content (35-40%) that requires drying in a rotary kiln furnace. It produces nickel oxide, which is then reduced using electric furnaces at temperatures between 1360-1610 °C and volatilized to produce Class I nickel metal and nickel sulphate.

Due to the naturally occurring iron content in lateritic ores, the end product of most smelters working with such ores is ferronickel, which can be used by steel producers after silicon, carbon, and phosphorus impurities are removed.

Coal Processing

- After coal comes out of the ground, it typically goes on a conveyor belt to a preparation plant that is located at the mining site.
- The plant cleans and processes coal to remove dirt, rock, ash, sulfur, and other unwanted materials to upgrade its value.
- Coal cleaning processes are categorised as either physical cleaning or chemical cleaning.
- Physical coal cleaning processes, the mechanical separation of coal from its contaminants using differences in density.
- Chemical coal cleaning is a bit more expensive .
- coal cleaning processes varies among coal cleaning plants and can be divided into four basic phases: initial preparation, fine coal processing, coarse coal processing, and final preparation.
- In the initial preparation phase of coal cleaning, the raw coal is unloaded, stored, conveyed, crushed, and classified by screening into coarse and fine coal fractions. The size fractions are then conveyed to their respective cleaning processes.
- Fine coal processing and coarse coal processing use similar operations and equipment to separate the contaminants. The majority of coal cleaning processes use upward currents or pulses of a fluid such as water to fluidize a bed of crushed coal and impurities. The lighter coal particles rise and are removed from the top of the bed. The heavier impurities are removed from the bottom. Coal cleaned in the wet processes then must be dried in the final preparation processes.

- Final preparation processes are used to remove moisture from coal, thereby reducing freezing problems and weight and raising the heating value. The first processing step is dewatering, in which a major portion of the water is removed by the use of screens, thickeners, and cyclones. The second step is normally thermal drying, achieved by any one of three dryer types: fluidized bed, flash, and multilouvered. In the fluidized bed dryer, the coal is suspended and dried above a perforated plate by rising hot gases. In the flash dryer, coal is fed into a stream of hot gases for instantaneous drying.
- The dried coal and wet gases are both drawn up a drying column and into a cyclone for separation. In the multilouvered dryer, hot gases are passed through a falling curtain of coal, which is then raised by flights of a specially designed conveyor.
- Emissions from processing phases can be controled by water wetting technique and enclosing the process area that applies to unloading, circulating air from the area through fabric filters.



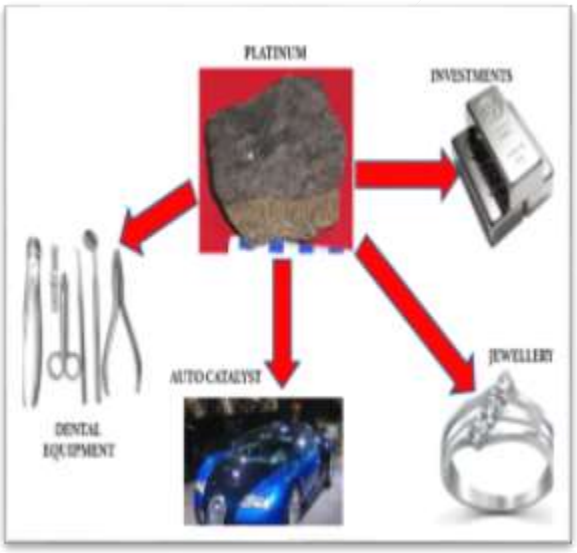
Beneficiation and Value addition

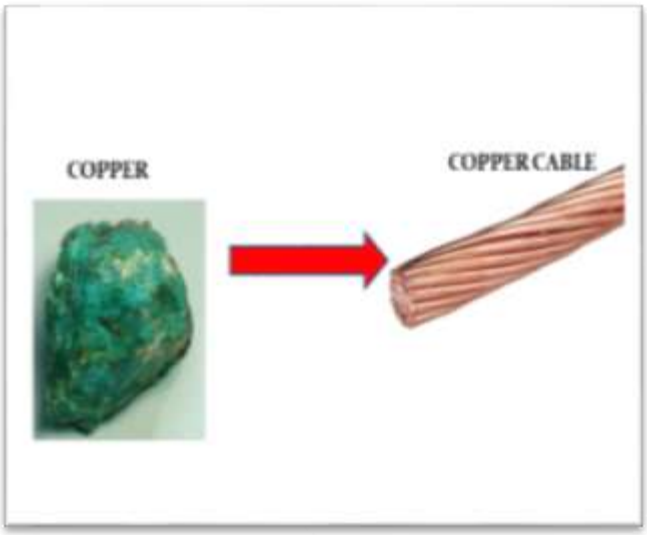
Beneficiation refers to conversion of ores into concentrated metals for example conversion of iron ore into its alloys.

Importance

- More tax and benefits from exports of processed minerals.
- Creation of employment when refining and processing factories are set up.
- Community share ownership schemes ie development of infrastructure like roads , clinics, communities get a certain percentage of profits.

Value addition and Beneficiation of Metals





Safety and Health in mining

- Mining is a hazardous occupation due to explossions of mines leading to death e.g. Hwange disaster of 1976 which killed 427 people.
- Companies are responsible for drafting and controlling all health and safety regulations within the company.
- Managers have to identify workplace hazards and find solutions so as to avoid accidents and disasters.
- Safe operation of equipments and chemicals and wearing of protective clothes should be considered by mining managers.

TOPIC 8

ENVIRONMENTAL MANAGEMENT

Environmental management

Is the way in which different groups of people undertake to protect the health of the environment (waste management, controlling air and water quality and protecting and conserving biodiversity).

Legislation for Environmental Protection

- The government of Zimbabwe has put in place a number of laws or policies to protect the environment and ensure sustainable development.

1. The Mine and Mineral Act
   Is a powerful Act and overrides most acts as far as mining is concered. It controls the expoloitation of mineral resources.

2. The Water Act
   It focuses on development and utilisation of water in a sustainable manner. It discourage discharge of effluents and pollution of water sources. ZINWA sets the minimum pollution standards to be adhered to.

3. The Parks and Wildlife Act
   It looks at wildlife management in national parks, safari areas and recreational parks so that wildlife is used and managed sustainably.

4. The Forest Act
   Its objective is protection, management and utilisation of forests in a sustainable manner. It discourages deforestation and regulates cultivation, stipulating that ccultivation should not be undertaken 100m within a river bank.

5. Environmental Management Act of 2002
   It brings together all laws and measures to protect, conserve and manage the environment and its resources.

6. Environmental Impact Assessments (EIA)
   Is a planning tool used to identify, predict and assess the potential impact of a proposed development / project. The following are types of projects that require EIA:
   -Dams and man-made lakes
   -Drainage and irrigation
   -Housing development
   -Industry
   -Infrastructure
   -Mining and quarrying
   -Waste disposal and treatment
   -Water supply e.t.c

The effectiveness of legislation

The Environmental Management Agency is responsible for enforcing protection laws and the protection of the environment.

QN: Is the Environmental Managent Act effective in protecting the environment of Zimbabwe? (10)

*NB: Read more on**: www.ema.co.zw***

Challenges and sustainability

- The Mines and Mineral Act does not give explicit guidance on how to combat the negative effects of defoestation, siltation and mine dumps on the environment.
- Who rehabilitates an area degraded by illegal panners?
- Through CAMPFIRE programme, people are co-managers of their resources, protect and use the environment responsibly.

Solutions to challenges on implementation of environmental legislation in Zimbabwe

- Education and public awareness.
- Provision of funding by government.
- Developing advanced and improving technology.
- Strict legislation.
- Heavy fining of environmental offenders.
- Increased commitment by government.

TOPIC 9

AGRICULTURE AND LAND REFORM

Land Tenure Systems

- FAO (2005) defines land tenure as the way by which land is held or owned within societies, or as indicated by as a set of relationship whether legally or customarily, among people, as individuals or groups, with respect to land and other natural resources such as water and trees.
- In simple terms, land tenure systems determine who can use what resources for how long, and under what conditions.

Forms of land tenure

1. Freehold - the farmer owns the land on which he / she farms.
2. Communal- the land is held in trust by the Head of State. This customery tenure gives all members right to use but not own land.
3. Leasehold- this give the owner the right to use the land for a specified period of time. In large and small-scale commercial areas, leasehold users would be given freehold ownership after making the required infrastructural improvements.
4. State-owned tenure- the owner of land is the the state.

Freehold and leasehold tenure	
Advantages	**Disadvantages**
The farmer can make improvements on the land that benefit the farming process.	No more equitable acess to the land.
Lease or title deed can be used as security in money borrowing.	Farmers may pursue personal profitability in way that are socially or environmental unsound.
Communal tenure	
Improvements can be made on the land e.g fencing and tree planting.	No title deeds snd colleteral security.
Offers chance for community cooperation e.g on destocking, paddocking and conservation.	Allocation of land to all members encroaches pastureland and streams hence land degradation.
People have access to woodland resources like fruits, insects and game.	Inheritance law leads to land fragmentation causing fields to be small.

Land reform in Zimbabwe

Land reform in Zimbabwe is an attempt by governments to correct a colonial imbalance by equitably redistributing land to the landless Zimbabwean rather than a situation whereby 1 % of the population (whites) occupy more than 70 % of the land.

It can be divided into 2 phases

- Phase 1 -1982-1997.
- Phase 2 -2000 onwards.

Aims of the land reform programme

- Rectify the colonial land take over.
- Utilise land lying idle and increase food production in the process.
- Equitably redistribute the land to the majority blacks.

- Relieve pressure on overcrowded communal lands.
- Give land to the landless.
- Improve the living standards of the poor.
- Give land to people displaced during the war of liberation.
- Create jobs on farms owned by individuals and co-operatives.
- Provide a token of appreciation to those who fought during the liberation struggle.
- To facilitate profitable farming by the peasants.

Phase I : 1980s

- It began soon after independence in 1980 through an act of parliament which was drawn in the spirit of the Lancaster house agreement i.e. willing seller, willing buyer. This could not be changed for 10 years.
- The government only acquired 40 % of the required 8 million hectares of land to resettle about 162000 families.
- The government only managed to resettle 71 000 families in 1992.
- Another act of parliament was enacted to remove the willing seller willing buyer close and to limit the size of the farm and to introduce a land tax which was never implemented.
- The aim was to speed up the land reform programme.
- The act empowered govt to compulsorily buy the land for redistribution however land owners could challenge the decision by government in court.
- In the 1990s 2.47 million acres were acquired and this benefited only less than 20 000 families.
- The land acquired during this phase was of poor quality according to the Human Rights Watch.
- In 1997 the government conducted a land identification exercise where it published a list of 1471 farms it intended to acquire compulsorily.
- The costs were to be paid by the British government.
- The then secretary of state for the labour government rejected the responsibility of paying for the land if it were acquired.
- In 1998 the Zimbabwe government published a policy frame work on land reform and resettlement programme phase 2

Phase 2 : LRRP II

- The policy frame work envisaged the compulsory purchase of over 50 000 square kilometres from the 112 000 owned by white commercial farmers, public corporations, churches, MNCs in the next 5 years between 1998-2003.
- Broken down it meant that the government was going to compulsorily buy 10 000 square kilometres of land each year.
- In 1998 September the government of Zimbabwe held a donor conference on Harare on the LRRPII to inform the donor community and involve them in the exercise.
- 48 countries attended and endorsed unanimously the programme in 1999.
- The commercial farmers union offered 15 000 square kilometres of land for sale.
- The constitution was amended so that acquisition of land was to be done compulsorily without compensation.
- The draft constitution was put to a referendum where it was rejected.
- A few days later war veterans decided to march on white owned farms biting drums singing and dancing. As marching continued they began seizing the land violently and when the violence ended they had seized 110 000 square kilometres of land.
- In 2004, the minister for lands, land reform and resettlement John Nkomo declared that all land would soon become state land.
- Farm land deeds would be replaced by 99 year leases and wild life conservancies would be limited to 25 years.
- Farmers resettled under A1 and A2 Models in 2006.

- Newly resettled farmers fail to secure loans because of lack of collateral.
- Minister of agriculture was considering legislation which would compel commercial banks to issue loans to the newly resettled farmers. Failure of which the operating licence would be withdrawn.
- The land reform in Zimbabwe was a strong tool for the 2000, 2008 and 2013 presidential elections which saw Zanu PF winning resoundingly according to the reports published by the ZANU PF spokesperson.

Results of the land reform programme

- Many thousands of people resettled.
- Living standards raised.
- People given the right to own land.
- Crop production per family increased for those who were resettled.
- Some equity in the ownership of the land established.
- Commercial farmers abandon their operations.
- Inexperienced new farmers led to a reduction in the overall production of food crops hence the country experienced food shortages from 2008 -2009.
- Movement of animal across ecological regions saw the spread of animal diseases such as foot and mouth and anthrax.
- Lack of technical knowhow saw a general decrease in the national herd.
- Poor quality livestock produced.
- Corrupt practices in land allocation.
- Deforestation.
- Multiple ownership of land resulted in much land under utilised.

Measures and solutions

- Availability of loans from AGRIBANK.
- Farmers pursuing other income generating projects.
- Education through AREX officials.
- Eradicating corruption in land allocation and equipment distribution through public involvement.
- Encouraging full-time farming.
- Carrying out land audits to eliminate multiple farm ownership and maximise use of land.

Small-scale farming and food security

Agriculture is an important form of livelihood for many people in Zimbabwe.

QN: What are the importance of small-scale farming to a country such as Zimbabwe? (7)

Livelihoods- are the activities which households rely on to earn a living.

Food security- the availablility of adequate food to a household obtained through its own farming, food purchases,and other sources which is necessary for a productive and healthy living at any given time.

Food insecurity- exists when households or individuals are not able to meet their daily minimum energy requirements of 2100 kilocalories.

Vulnerable groups of people (Food insecure households)

1. A child and with orphans
2. The elderly
3. Single parent
4. Widows
5. People with low education level
6. A frequently ill person.

Causes of Food shortages

Human Causes
-poverty
-poor distribution/transport difficulties
-war and civil conflict
-commercial farming
-overpopulation
-poor government management of resources

Physical causes
-soil exhaustion
-drought
-flood
-tropical cyclones
-pests
-disease

Effects:
-hunger
-susceptible to infectious diseases.
-impair physical and mental development.
-reduce labour productivity.
-increase risk of premature death.
-5 to 10% reduction in lifetime earnings.

Solutions

- High-yield Varieties (HYVs) and traditional and drought resistant crops.
- Storing grains for home consumption not for sale.
- Irrigation - overcoming unreliable weather.
- Having nutritional gardens or other food sources.
- Appropriate technology – simple wells, low cost sustainable schemes.
- Land reform – improve efficiency, increase farm size for small landowners, set an upper limit of land owned by the wealthy, give surplus land to landless people.
- Nitrogen fertilisers – increasing yield, surplus can be sold for profit but, expensive, possible eutrophication.
- Food aid - collecting and transporting food to crisis areas.

TOPIC 10

INDUSTRY

Small to Medium Enterprises (EMEs)

- Small business is independently owned and operated, has a capital contribution from a limited number of individuals, would operate in a local area and is probably not dominant in its field of operation.
- Gazaland, Machipisa and Lusaka in Highfield, Glenview area 8 and Siyaso in Mbare aree examples of Small Industries or home industries in Zimbabwe.

- ❖ SMEs play a more personal service and are able to adapt to the whims of the customer easily. This culminates in the improvement of the quality of life of the nation.
- ❖ SMEs offer greater flexibility in the manufacture of products by allowing for subcontracting.
- ❖ Poverty is a serious malaise that afflicts almost all developing countries. Every SME creates employment opportunities.
- ❖ SMEs allow for innovation as individuals and their small business units provide major source for new ideas, concepts, and technical inventions.
- ❖ SMEs allow for competition to prevail as the participation of SMEs allows for the creation of a free market system and these allow players in the market.
- ❖ SMEs give birth to big entrepreneurs. As these continue to grow they will one day become the giants in the market.
- ❖ SMEs are a bed rock for economic development, contributing 50% of the GDP.
- ❖ The SMEs in Zimbabwe remain the powerhouse of economic growth and improvement of the welfare of the general population.
- ❖ SMEs in Zimbabwe can generate more income.

Challenges faced by SMEs

- ❖ Lack of markets,
- ❖ lack of government support.
- ❖ lack of capital for expansion
- ❖ lack of knowledge on the latest technology.
- ❖ unfair treatment from the local authority.
- ❖ stiff competition from the established enterprises who imports from the neighboring countries,
- ❖ lack of managerial skills and training.
- ❖ poor markets,.
- ❖ lack of financial assistance, access to raw materials and lack of proper infrastructure.

Role of informal industries

- ❖ Informal sector has helped in livelihood strategies i.e. money obtained for various purposes such as education, remittances, rentals and groceries.
- ❖ Increasing the GDP of the country,
- ❖ Informal traders contribute significantly more revenue to than the “gainfully” employed in the formal sector by way of value added tax.
- ❖ Urban street vending creates employment .

- It provides affordable goods and services to the majority of the rural/urban poor.
- Promotes artistic skills such as carving,basketing and pottery.
- Recycles materials that would have been wasted.

Challenges faced by informal industries

- Shortage of capital to start a business or to expand. People are operating below capacity because they have no access to loans from financial institutions since they do not have collateral security
- High competition from unregistered operators. Many people are operating without licenses
- Vendors are tightly packed in a flea market the size of a football field on the border of the same suburb and the CBD. The flea market, called Mupedzanhamo or poverty reliever,
- Outside the market's dirty and damaged precast wall, thousands more people everyday set up shop to eke out a living in a trade where competition is tough and stiff among merchandisers of both imported and locally produced goods.
- The vendors have to endure endless cat and mouse battles with both the Harare Municipality Police and the Zimbabwe Republic Police, who appear determined to bring sanity on the streets
- Lack of clean water for drinking.
- High risk of fire outbreaks e.g. Magaba
- Lack of sanitary facilities.

Solutions to challenges

- Government through the Ministry of Small and Medium enterprises can mobilise and organise informal economy participants into industrial business associations (Informal Sector Associations – ISAs).
- The government should incorporate the informal activities into the national budget i.e. loan facilities.
- Training and education should be provided for the business entrepreneurs.
- Proper structures should be provided by the local authorities.
- Vendors should join hands with stakeholders (EMA, HCC, police), in creating a safe and clean environment for business activities as the site is an environmental and health time bomb.
- The informal sector are subject to a number of constraints especially that of competition due to unregistered businesses however, the sellers should inform the local authority of such activities in a curb to reduce corruption.

Case Study

Siyaso Home industry

Siyaso in the Magaba area is somewhat the industrial hub of Mbare. The industries are family-owned. It is includes many indigenous traders and manufacturers of various products. It is where all sorts of products are manufactured and sold; building material, car parts and tires, farming equipment, household goods, timber, car panel beating, mechanics, carpentry, and welding among others. The area is usually packed by customers who will be buying the seemingly affordable products of various types. The area has grown to be one of the biggest informal markets in Zimbabwe where customers are presented with a wide range of locally produced products.

Location of Siyaso in Mbare

Solutions

- There is need to develop appropriate financial models for SMEs in Zimbabwe;
- Provision of proper infrastructure to provide a conducive environment for production and trading by SMEs;
- Subsidies in the prices of raw materials;
- Tax reliefs;
- Imports Control; and
- Availability of continuous trainings and capacity building activities.

Problems faced by manufacturing and processing industries in Zimbabwe

- Old equipments and machinery.
- Lack of spare parts.
- Poor energy supply e.g electricity load shedding.
- Shortage of capital and raw materials.
- Lack of skills.
- Water supply.
- High utility bills of water, electricity and communication hence high production costs.
- Hyper inflation.

Solutions to the challenges

- Credit facilities to purchase equipments.
- Improving border management to protect local industries.
- Invest in new technology and equipments by companies.
- Government to develop infrastructure such as roads, rail and air.
- Control prices of water, electricity and communication.
- Review import tarriffs for motor industries, beverage industry and agriculture.

Occupational Safety and Health in Industry

Occupation Safety and Health Laws (OSH)

Adopting to OSH laws such as the Labour Act Chapter 20.01 and thye NSSA Act Prevention Worker`s Compensation Scheme Notice no: 68 of 1990. The Acts safe guard all workers from unfair labour practices and guarantee their commensurate compensation in the events of mishaps at work places. In Zimbabwe, laws are at sector level e.g. the Mining Management and Safety Regulation SI 109 of 1990 and the Environmental Management Act Chapter 20:27.

Establish Open Communication

A key component in maintaining the trust of the employees is to encourage open communication on any health or safety related issues. No employee should fear in expressing concern for safety goals in the company. An HR Personnel should hold one on-one meetings with the employees so that if any employee is fearing to express safety concerns to the direct managers, will feel more at ease while talking to an HR personnel.

Implement strict safety policy

Those employees, who are not designated to work in a certain high-risk position should be discouraged to enter hazardous zones. By wearing protective clothes, labeling unsafe environments, posting stringent warning signs and mentioning the qualifications required for such jobs on worksites, the candidates will get to know if they are suitable for such roles. For a corporate office that have less physical risks, it is advisable to identify all potential hazards early on such as broken glass or any kind of leaks.

Provide health and safety training

It is a must to provide required safety training programs for all employees who should necessarily include emergency action plan training and how to treat yourself while injured and alone. Make sure the employees are well efficient at the time of crisis by holding fire and emergency drills from time to time. Encourage employees to be responsible if they fall sick and take leaves without reprimand. With safety standards in place, a company can identify all the potential risks and keep the employees safe and sound while on the ground.

Coordinate with facility management

Facilities department play an important role in carrying out safety policies for business. By harmonizing Occupational Health and Safety goals in the organization, facilities manager can better protect employees. Encourage them to invest in safety tools and equipments, such as anti-slip safety mats, Eye Protection, Ear Protection, masks etc. These simple yet effective products will cultivate a general sense of wellbeing in the workplace.

TOPIC 11

SETTLEMENT AND POPULATION

Population
Total number of people occupying a given area.

Demography-study of statistical data on human populations or the study of population

Population Terms

Natural increase: When birth rates are higher than death rates.
Natural decrease: Where death rates are higher than birth rates.
Growth Rate - birth Rate – death rate.
Birth rates: The number of births per 1000 of population per year.

$$\text{Birth Rate} = \frac{\text{Number of births x 1000}}{\text{Total population}}$$

Dependency Ratio: The ratio between the amount of dependents (old and young) and the economically active.
Young Dependents: The number or the percentage of the population under the age of 16.
Old Dependents: The number or the percentage of the population over the age of 65.
Economically Active: People between the ages of 16 and 65. This is basically the working active group.

$$\text{Dependency Ratio} = \frac{\text{No: of elderly people + No: of children}}{\text{Number of people of working age}}$$

Fertility-number of live births a woman has during her reproductive period.
Fecundity-ability of a woman to conceive and give birth to a child regardless whether alive or still born.
Infecundity/Sterility-inability of a woman to conceive and give birth to a child regardless whether alive or still born.
Fertility Rate- average number of children that a woman of child bearing age (15-49 years) will have in her lifetime.

Doubling time is the time takes for a population to double.

$$\text{Doubling Time:} \quad \frac{70}{\text{Percentage growth rate}}$$

$$\text{Percentage growth rate} = \frac{\text{growth rate X100}}{1000}$$

Life expectancy: The average age that someone is expected to live within a country. Generally women tend to live a few years longer than men.
Population explosion or population bomb: The rapid growth in population or the rapid population growth of just one country.
Mortality

- Mortality refers to deaths among members of a population.
- It reduces the population in a given area.

- It also affects its structure or composition of the population in terms of age and sex whereby if there is consistent death of a particular age or sex there will be marked change in the population because the other ages or sex will be more than the affected ones.

Infant Mortality - is the number of deaths of babies less than one year old per 1000 babies born that year.
Infant mortality rate may be caused by the following factors:

a) Diarrhoea.
b) Economic situations affecting health services and purchase of nutrient supplements.
c) Impact of HIV/ AIDS pandemic on child health and survival.
d) Mother`s educational levels

Death rates: The number of deaths per 1000 of population per year.

$$\text{Death Rate} = \frac{\text{Total number of deaths} \times 1\,000}{\text{Total population}}$$

Population Data Collection

Census- This is the door to door counting of people, recording of economic activities, age, sex, education, information flow (e.g. radio) and occupation.

Enumerators - are people who do the counting of people.

Advantages of a census

- Information is collected from almost every corner of a country.
- Information is reliable and fairly detailed hence reasonable planning can be based on such information i.e. it helps the government to plan for the future.
- Keeps the government more organised.
- Keeps detail of all the people within the country.
- Shows the government the population status of the country.

Disadvantages of a Census

- Very expensive to conduct.
- People may feel uncomfortable revealing their personal details.
- It is time consuming
- Some areas are not reached or inaccessible and information may not be collected.
- There may be language barriers when asking for information.
- Some people can run away from enumerators due to ignorance and low level of education.

Other Ways of Collecting Population Data Include

- Sample surveys.
- School registers.
- Vital registration of events (office of the registrar general).
- Maternity clinics and child welfare services.

Population Data Presentation and Interpretation

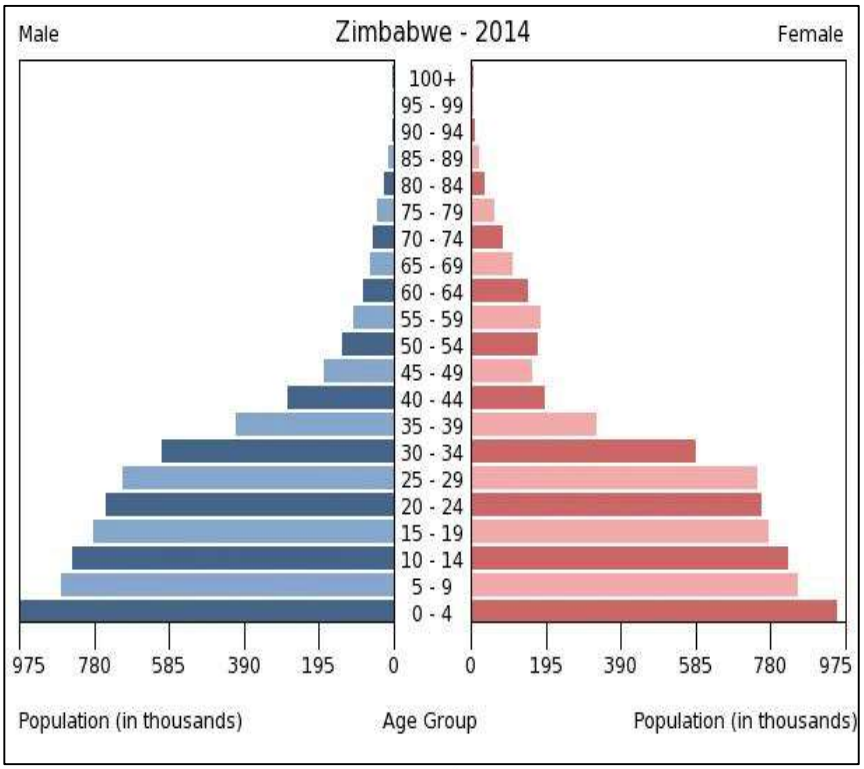
Population Pyramids

- A population pyramid shows the age and sex structure of the country.
- Population pyramids can be related to stages in the DTM.

Characteristics of an Age Sex Pyramid

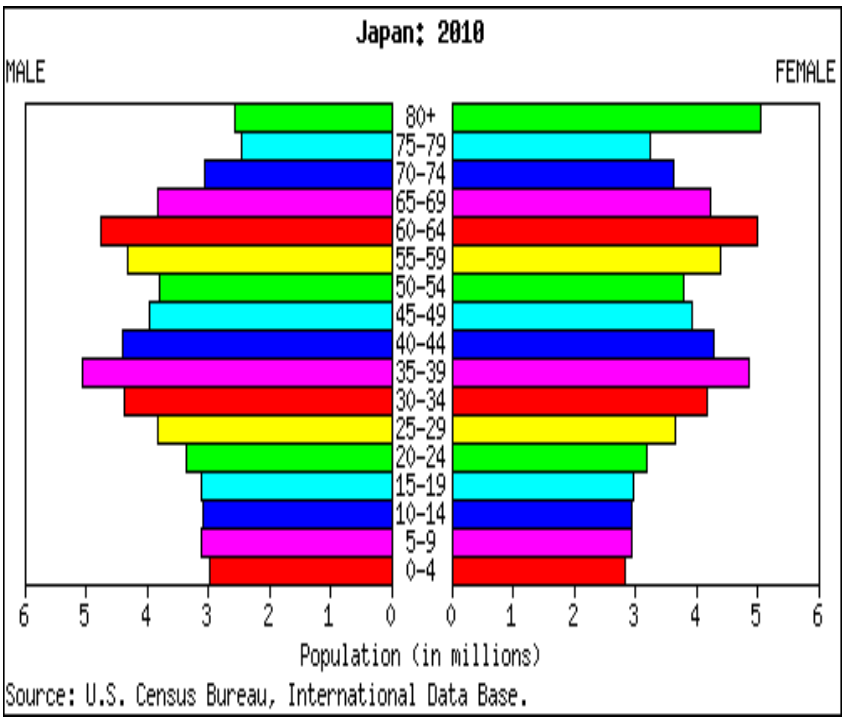
- Vertical axis represents age ranges.
- Horizontal axis represents percentage of total population.
- Right hand side represents female proportion.
- Left hand side represents male proportion

Population Structure of a Developing Country



- It`s broad at the base due to factors contributing to high fertility rates already discussed.
- Hollows for ages 5-9 due to high mortality rate.
- Thins towards the top due to the low life expectancy (average number of years a person is expected to live) as few people survive to 70 years.
- Tapers towards the top due to relatively high death rates throughout age groups.

Population Structure of a Developed Country



- Narrow at the base due to low birth rates causing low population of children and young people.
- Broadens towards the top due to high life expectancy leading to a high population of old people (ageing population).
- Broadens towards the top which is an indication of low mortality rate throughout age groups.

Significance of Population Structure

- For planning by enabling the government to know the percentage of available funds to allocate for various sectors e.g. if most of the people in the population are youth it will allocate more funds for education and health services and if most are elderly more funds will be allocated for health and social welfare.

Consequence of Population Structure

- Strain on budget due to developing countries having a large population of young people whose health and education cost is high and developing countries having a large proportion of old people whose cost of health and social welfare is high.
- Low quality of education and health care in developing countries due high population leading to the high cost of those services.
- Better quality of health and education in developing countries due low population.
- Strain on working population in developing countries since most of the money is consumed leaving less for investment. Large population of old people does the same in developing countries.
- Boost in food production when there is a large proportion of males due to the availability of a large labour force.
- Heavy taxation of the working population when the dependency of young and old is high in order to avail funds for provision of social amenities.
- Large number of females than males leads to low birth rates and consequently slow growth of population.
- Increase in promiscuity when there are a large number of females than males.

Ageing Population

This is when the proportion of old dependents is increasing. This happens because life expectancy increases, but also because birth rates start to fall. This happens in stage 4 of the DTM (it is currently happening in very developed countries like Japan).

Problems of Ageing population

- There may be a shortage of workers (not enough economically active).
- If there is a shortage of workers there are less tax payers and the government receives less money.
- Old people tend to get sicker, so there will be an increase in pressure on hospitals.
- In many countries retired people can claim pensions off the government. If there are a lot of old people this can be very expensive.

Solutions to Ageing Population

- The government has to provide places in care homes or provide services so people can care for themselves at home e.g. meals on wheels.
- Increase the retirement age. In the UK the retirement age has increased from 65 to 67.
- Increase the amount of tax charged to economically active.
- Introduce private healthcare, so that the government doesn't have to pay.
- Encourage people to have private pensions so that the government does not have to pay.
- Economic immigration could be encouraged to reduce the dependency ratio.
- Have a pro-natalist policy so that birth rates and the number of young people increase

Retirement Age: The age at which people officially stop working. People have retired are often called pensioners because they receive a pension.
Pensions: Money that people who have retired receive. The money may be received from the government or from private pensions.

Advantages of ageing population

- Less need to spend money on schools
- Older people are less likely to commit crimes.
- Old people tend to travel less (no commuting) so congestion and pollution might reduce.

Young Population: When talking about a young population, you are usually referring to young dependents (those under the age of 16)..

Problems of Young Population (too many)

- Child care has to be provided so that parents can return to work.
- Governments need to pay so that young people can go to school
- Young people get sick so the government has to pay for healthcare.
- An increase in the dependency ratio

Solutions of Young Population (too many)

- Creation of teaching and nursing jobs.
- An anti-natalist policy might be introduced like China's one child policy.
- Increase family planning. Make contraception available and affordable
- Ensure females are educated and emancipated.

Problems of Young Population (too few)

- Closure of child related services and loss of jobs e.g. schools and nurseries.
- Less consumers and taxpayers in the future.
- An increase in the age of the population.
- Birth rates fall below replacement rate cause the population decline.
- Also in the future there will be less people in the reproductive age range causing further declines.

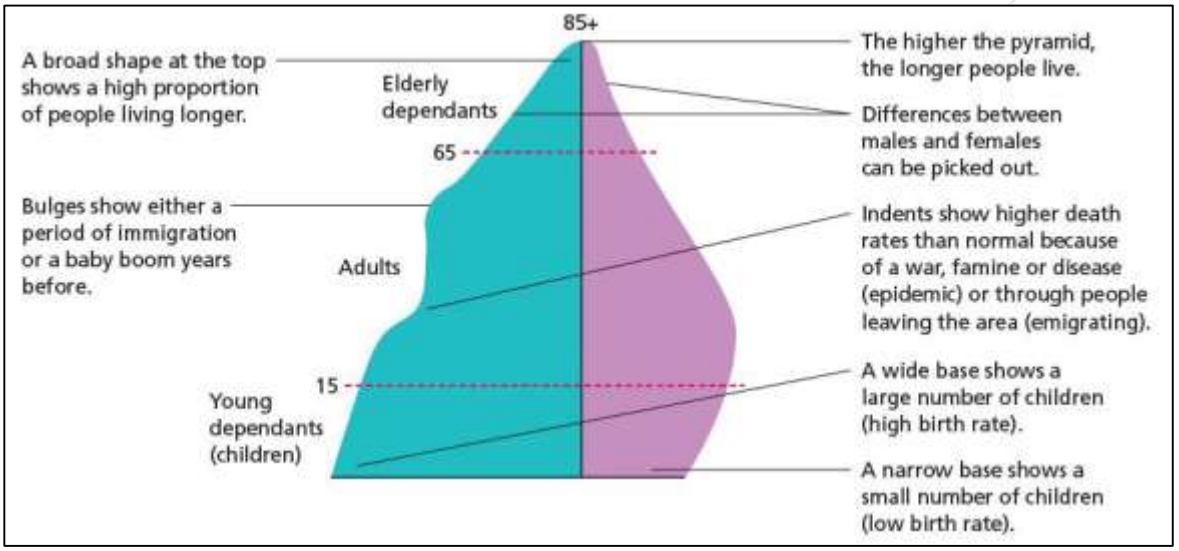
Solutions

- A pro-nalalist policy to increase birth rates.
- Subsidised childcare and education to encourage more families to have more children.

Replacement Rate: The number of children each couple has to have to maintain a country's population. The replacement rate is about 2.1 - two to replace the couple when they die and then 0.1 for children who might die in infancy or who are unable to have children themselves (infertile).

Reproductive age range: The age that females normally have babies. Biologically this can be anytime between puberty and menopause but is more likely to be between 18 and 35.

Summary: Annotated population pyramid



Case Study

Japan's Ageing Population

- Japan has an ageing population because the birth rates have fallen and it has one of the world's highest life expectancy. In fact the islands of Okinawa of Japan's south coast have the highest life expectancy and the greatest percentage of centenarians.
- Japan has the highest proportion of old dependents (about 23%) and the lowest proportion of young dependents (about 13%) in the world. It has a total fertility rate of only 1.25. This is well below the replacement rate of 2.1.
- Even though the Japanese are working longer, it may have to look outside its borders to prevent future population decline and economic decline. Japan is traditionally a very insular (closed) country so allowing large scale immigration would involve huge social and cultural changes.

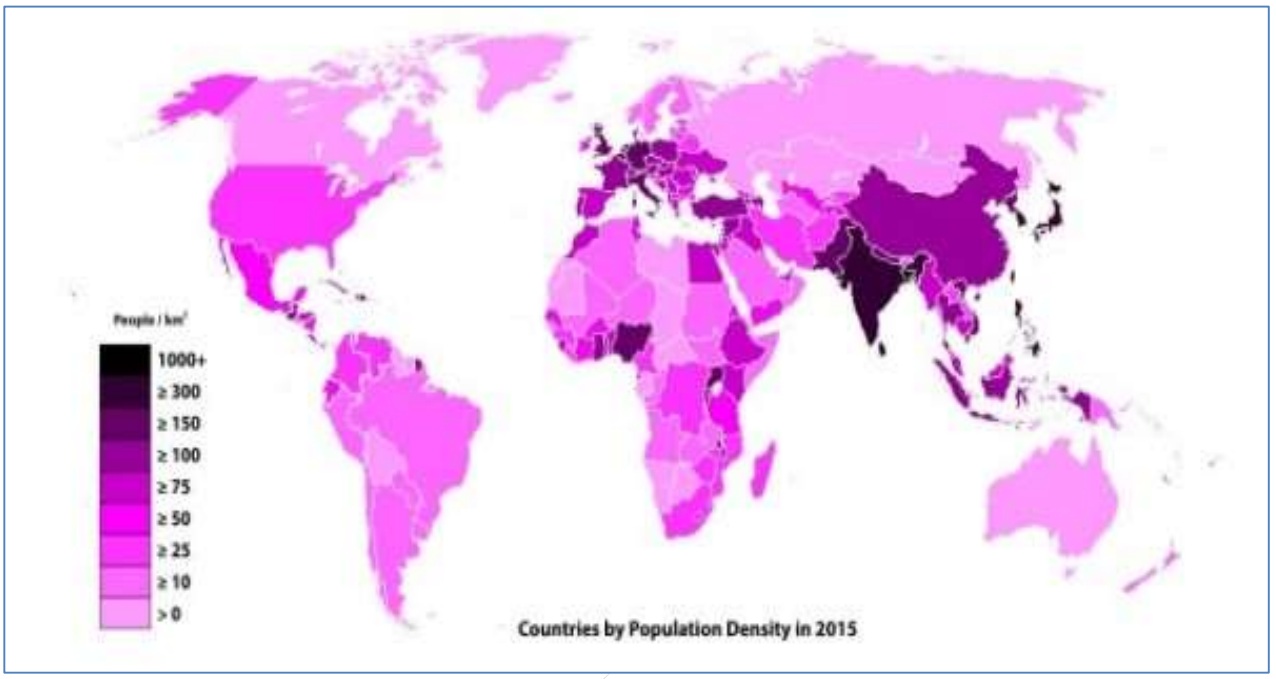
Population Distribution and Density in Zimbabwe, Africa and the World

Population density-number of persons per unit area= number of people in a given area/total area of the place=XP/km2.

Population distribution-the way people are spread out on the land. If a country's population is distributed in a regular pattern then we say it has an even population distribution. However, if there are areas with many people and then areas with few people, then we would say that it has an uneven population distribution.

Sparse population: When not many people live in an area e.g. Commercial areas in Zimbabwe.
Dense population: When a lot of people live in an area e.g. the communal area of Zimbabwe.

World Population Distribution



- 1n 2012, world population was at 7 billion people.

Causes of Sparse Population

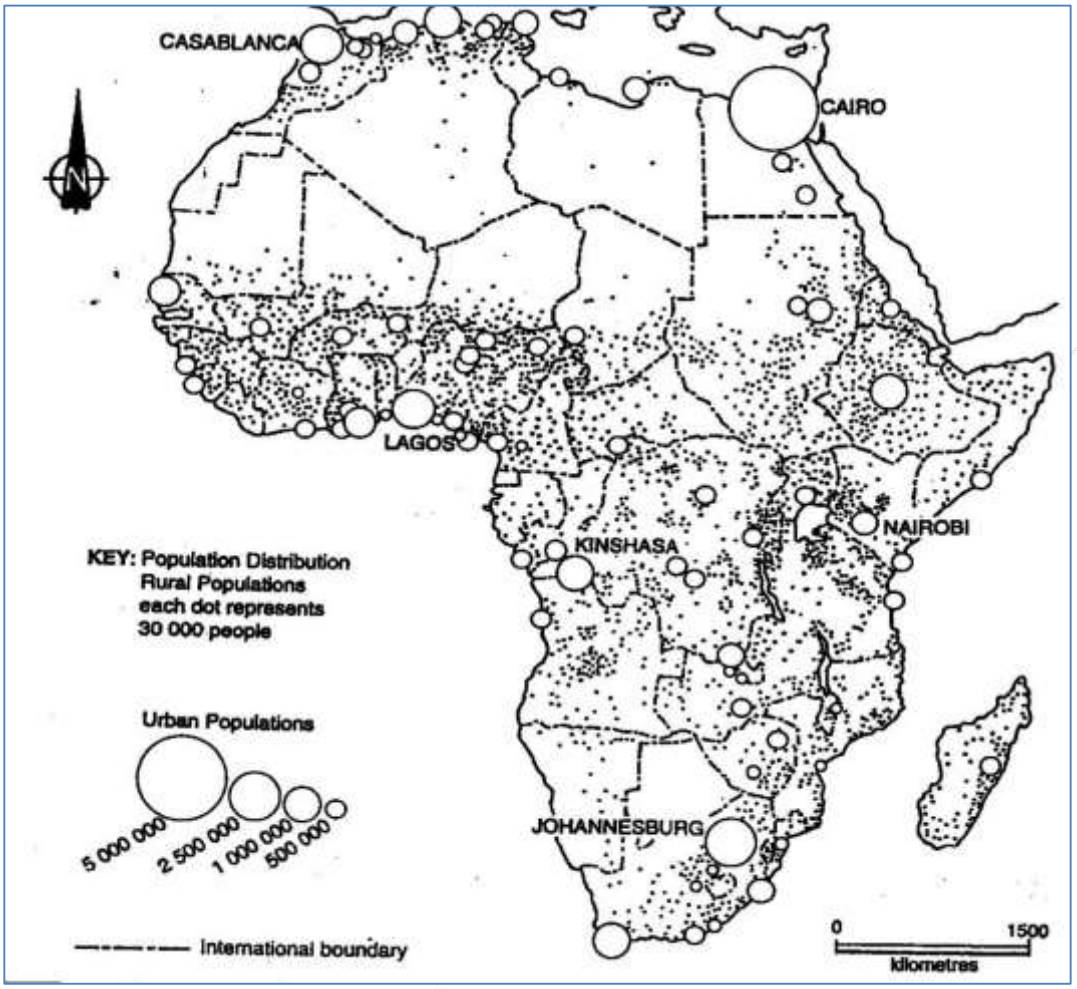
- Mountainous area e.g. Himalayas that are hard to build houses and transports links on.
- Very hot or very cold area e.g. Sahara desert, Namib desert of Africa, or Antarctica, cold desert of Alaska and Iceland.
- A heavily forested area e.g. the Amazon Rainforest.
- Areas that flood a lot e.g. Mekong river delta.
- Areas with poor economic development.
- Areas that regularly suffer from natural disasters e.g. volcanoes or droughts e.g. Sahel region.

Causes of Dense Population

- Coastal areas that are good for fishing, trading etc. Brazil and Nigeria.
- A flat area of land that is easy to build on.
- Areas that are close to a good supply of water e.g. River Thames in London. Water is important for fishing, drinking, washing, East Asia there are finger-like extension of dense population that follows the Ganges and Indus rivers. etc.
- Areas with good natural resources e.g. wood and minerals e.g. Zambian copper belt and Rand region in South Africa and Europe's population distribution is not closely tied to terrain, but more closely tied to coal fields.
- Areas that are close to good fertile agricultural land e.g. Nile valley in Egypt.

- Economic development – Areas with good developed transport links, plenty of available jobs, available electricity and water supply, good communications e.g. internet and mobile phone network, good quality schools and hospitals e.g. Harare, Johannesburg and Nairobi.

Population Distribution in Africa



- In 2012, Africa had a total population of 1.32 billion.

Regions of low population concentrations

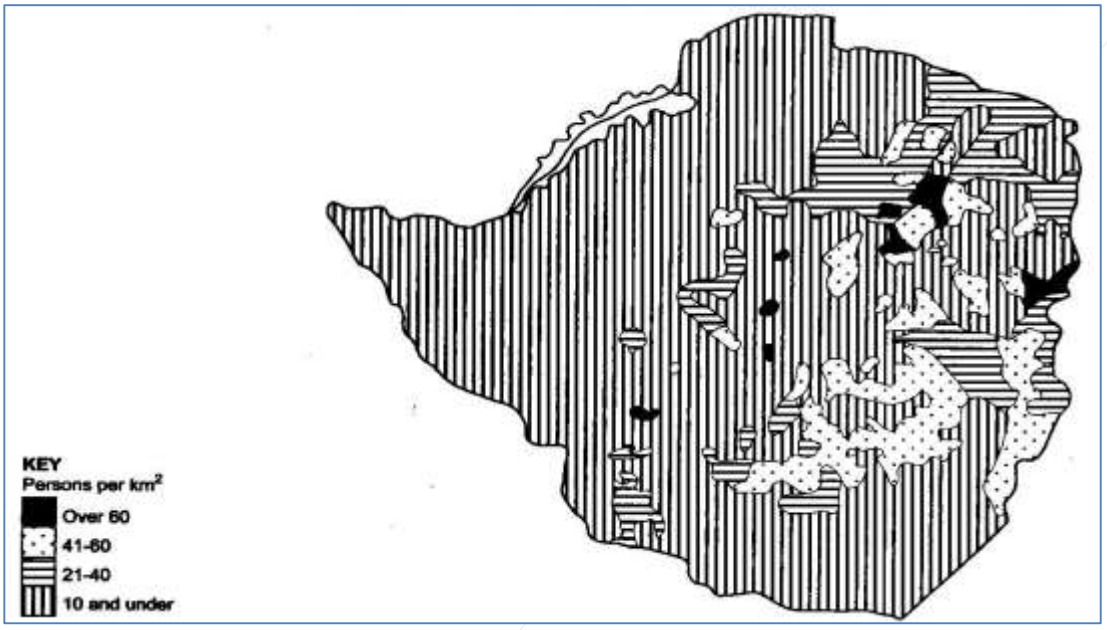
- The northern fringe of West Africa – slave trade encouraged conflicts that led to depopulation of certain regions in Africa.
- The desert and semi-desert region of Botswana, Namibia, Angola, Sahel region, western South Africa and Zimbabwe due harsh climatic conditions.
- Landlocked states of west central Africa between Chad and Angola, most tropical zones in Congo, Gabon, Zaire due rainforests, swamps, pests and diseases.
- Horn of Africa (Somalia, Djibouti, Ethiopia, Eritrea) due to aridity and persistent droughts hence low population densities.
- Middle belt of West Africa and river valleys, parts of Zambia and Zimbabwe e.g. Gwaai, S.E. Lowveld– diseases and pests such as sleeping sickness and river blindness and malaria.
- Commercials areas of Zimbabwe.

Areas of high population concentrations

- West Africa along coasts and Savanna region due historical reasons- slave trade and strong political kingdom and trade.

- Savanna grasslands – cereal production and capacity of area to support life.
- Southern Africa in small nodes- the Rand region (rich in diamond and gold), coastal areas in the east, in Natal and arrears of (Johannesburg, Pretoria) due to industrial conurbations.
- Along railway lines in Zimbabwe and Zambia, N. Eastern Zimbabwe due to economic development, agriculture and mining e.g. copper belt in Zambia.
- Shores of Lake Victoria population density is 100 people/ km2.
- Availability of water and pastures also encourage high population concentrations.
- Mining towns and urban areas due to better facilities and employment.
- Communal areas of Zimbabwe have high population densities.

Population Distribution and Density in Zimbabwe



- Zimbabwe has total population of 13,061,239 where 52% are women and 48 are men (ZIMSTAT 2012).
- Harare with a population of 2,123,132.
- High population densities – over 41 people per km2

a. A horse shoe shaped area from NE to East and SE of the country, Eastern Mash west, Southern Mash Central, Manicaland Central, Masvingo and Southern Midlands due to cool, wet, good agric soils, disease free, industries, transport networks, mining and towns.

- Medium population densities – 21 – 40 people per km2

a. High density areas, west of Kadoma, Karoi, around Bulawayo and Plumtree, North of Nyangaand west of Zishavane due to agro – ecological region and Land Apportionment factors (1930), small industrial towns and commercial centres.

- Low population densities – below 0-20 people per km2

a. Low veld areas (Limpopo valleys), around Hwange, Kariba, Beitbridge, Gweru, Kwekwe etc. this is due to hot, dry, poor soils e.g. Kalahari sands, national parks and forest lands, diseases, remote, commercial farms and mining concessions.

TOPIC 12

TRANSPORT AND TRADE

Trade

- Buying and selling or exchange of goods and services.
- It can be domestic or international.

Trade imbalances

- No country has all resources or goods it needs for developmenthence need for an epanding market which goes beyond the borders of other countries.
- International trade consists of ***export*** and ***import trade***. Define the terms. (4)
- A **balance of trade** is a situation in which a country balances off its earnings from exports and its expenditure on imports.
- A **fouvaouarble balance of trade** (Positive) is when a country exports more than what it imports.
- An **unfavourable balance of trade** (Negative) is when a country spends more money on imports than it earns on exports.
- **Visible trade** are items traded and can be seen e.g. raw materials, fuels and manufactured goods
- **Invisible trade** cannot been seen e.g. tourism, technology advice and finance

Importance of trade

1. Employment creation.
2. It`s a source of revenue for the government by charging sales tax such as V.A.T. on manufactured goods sold locally and tariffs at the point of entry into the country.
3. Foreign trade enables a country to earn foreign currency.
4. Leads to development of settlements e.g. many towns started as a small market and more people moved there when trading activities increased.
5. International trade ensures availability of a wide range of goods for consumers.
6. It leads to development and improvement of transport infrastructure such as roads and railways.

7. Leads to development of industries because as the goods are bought demand for goods increases hence more industries are set or existing ones increase their activities in order to satisfy the increased demand.

Problems with International trade (Home work)

- Outline the prroblems as a result of international trade. (7)

Solutions to problems of international trade (Home work)

-Suggest the solutions to identified problems.

Trading Blocs

Trading bloc is a group of countries that have joined together to improve trade e.g.SADC,EU

The Common Market for Eastern and Southern Africa (COMESA)

- It was established in 1994 to replace Preferential Trade Area (P.T.A.).
- It has 22 member states e.g. Kenya, Uganda, Ethiopia, Zambia, Zimbabwe, Namibia, etc.

Objectives of COMESA

(a) To reduce and eliminate trade barriers on selected commodities to be traded with member states.

(b) Abolish restrictions in administration of trade among member countries.
(c) Fostering relations, peace and political stability for member states.
(d) Raise the standard of living within member states.
(e) Promote goods being produced in the member states.
(f) Establish and foster co-operation in all fields of economic activity.

Achievements
(a) Increased volume of trade.
(b) Increased accessibility to markets in member countries.
(c) Free movement of goods among member countries due to elimination of trade barriers.
(d) Increased efficiency in production as each member is allowed to specialise in what she produces.
(e) Improvement of transport and communication facilities.
(f) Increased political and economic cooperation among member states.

The Southern African Development Community (SADC)

- It started as Southern African Development coordination in 1980 in Lusaka Zambia and transformed into SADC after collapse of apartheid.
- It has 15 member states e.g. Tanzania, DRC, S. Africa, Zambia, Zimbabwe, Mozambique, etc.

Member states	Responsibility
Angola	Energy conservation and development
Botswana	Agricultural research and animal disease control
Lesotho	soil and water conservation and land use
Malawi	Fisheries, wildlife and forestry
Mozambique	Transport and communications
Namibia	Sea fisheries
Tanzania	Industry and trade
South Africa	Finance and investment
Swaziland	Manpower development and trade
Zambia	Southern African Development fund and mining
Zimbabwe	Food security
Mauritius	Tourism

Objectives
(a) Encourage self-reliance among member states in the face of instability posed by apartheid regime of S. Africa.
(b) Promote and defend peace and security.
(c) Promote regional integration.
(d) Eradicate poverty.
(e) Facilitate trade and economic liberalisation.
(f) Promote self-sustaining development on the basis of interdependence on member states.
(g) Promote and maximise utilisation of natural resources and effective protection of environment.

Achievements
(a) Promotion of regional industries based on domestic and regional raw materials.
(b) Reliability and development of regional transport and communication infrastructure.

The Economic Community of West African States (ECOWAS)

- Was established in 1976 by the treaty of Lagos.
- It has headquarters in Lagos Nigeria.
- It has 15 member states e.g. Nigeria, Liberia, Ghana, Benin, Guinea, Sierra Leone, etc.

Objectives

(a) Promote mutual trade by eliminating trade restrictions among members.
(b) Create a monetary union.
(c) Impose uniform tariffs for imports from non-member countries.
(d) Give special treatment to goods imported from member states.
(e) Promote free movement of people to and from member countries by eliminating visas.

Achievements
(a) Brought peace to troubled countries like Liberia and Sierra Leone.
(b) Promotion of trade in the region through the peace achieved.
(c) Development of schools to train people on peace keeping e.g. The National War College.
(d) Free movement of goods among member states.

The European Union (EU)

- An organisation of European countries dedicated to increasing economic integration and cooperation among members.
- It was formerly inaugurated in 1993 and has headquarters in Brussels in Belgium.

Objectives
(a) Promote cooperation in economic, trade, social, security and judicial matters.
(b) Implementation of economic and monetary union.

Achievements
(a) Signing of many trade agreements between EC and other countries.
(b) Free trade among members as a result of abolishing trade barriers.
(c) High agricultural production as farmers receive guaranteed prices which have enabled them to increase efficiency.
(d) Free movement of factors of production which include capital and labour.

Problems Facing Regional Trading Blocks

(a) Civil wars taking place in some countries which has caused insecurity in turn affecting trade between countries.
(b) Political differences among leaders of member states may affect cooperation among member states.
(c) Some countries produce similar goods making the volume of trade to be low and less rewarding.
(d) Free trade affects local industries as the imported goods without taxes are usually cheaper than locally produced goods.
(e) Free trade denies countries revenue they would have earned from taxing imported goods.
(f) Poor transport and communication limits inflow of goods and services.
(g) Some member states don`t remit their annual subscriptions which affects the operations of the organisations.

QN: 1 a) Using a map, show the members of The Organisation of Petroleum Exporting Countries (OPEC) (8)
b) What are the main aims of OPEC? (4)
c) How successful is this trading bloc? (4)

FORM 4
New Curriculum 4022

TOPICS

- Topic 1: Weather and Climate.
- Topic 2: Landforms and Landscape processes.
- Topic 3: Ecosystems-Soils.
- Topic 4: Mapwork and GIS
- Topic 5: Minerals and Mining.
- Topic 6: Environmental Management.
- Topic 7: Agriculture and Land Reform.
- Topic 8: Industry
- Topic 9: Settlement and Population.
- Topic 10: Map work: Basic Techniques and Skills.
- Topic 11: Common Geo Concepts

TOPIC 1

WEATHER AND CLIMATE STUDIES

Temperate Depressions (temperate cyclones)

- Is an area of low pressure with an oval shape on a map.
- Shown by closed isobars with low pressure at the centre.
- Air circulates in a clockwise direction in southern hemisphere and vice versa.
- Winds blow towards the centre.
- Are associated with unsettled weather hence are termed extra – tropical cyclones or lows.
- Rain occurs when warm moist tropical air is uplifted by the cold drier air.

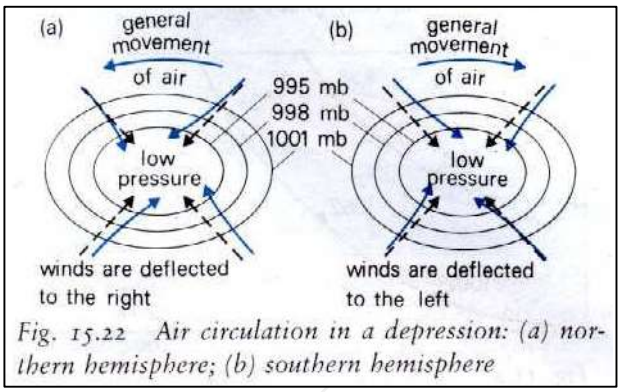
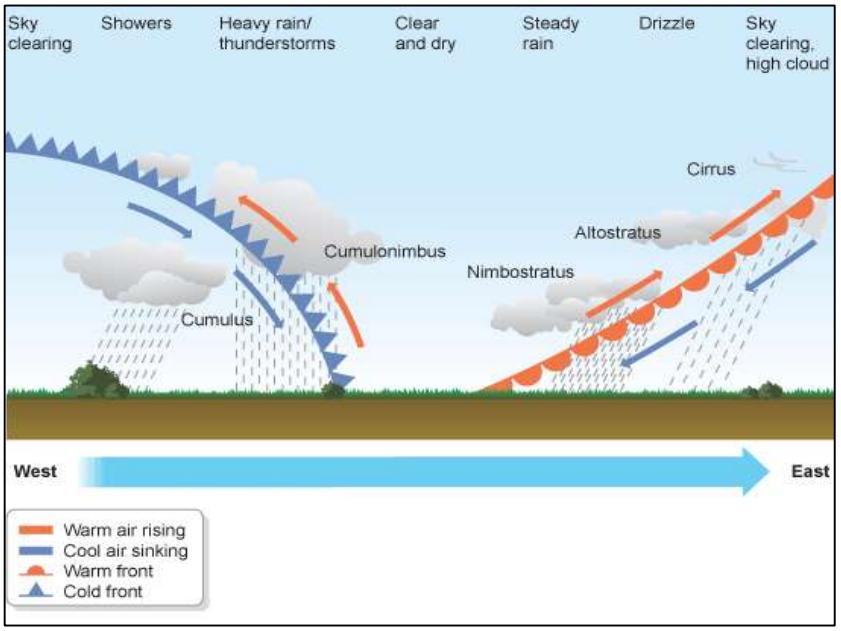


Fig. 15.22 Air circulation in a depression: (a) northern hemisphere; (b) southern hemisphere

Formation of a depression

- Formed in temperate latitudes when humid tropical air meets cold polar.
- Westerly winds meet polar winds.
- A depression is formed at the polar front.

Qn: Describe the main stages in the formation of a depression.



Weather associated with a depression

a. Passage of a warm front- clear skies with few cirrus clouds. Wind blows from SE for a while.
b. The warm sector – is the area between two fronts. Weather clears, temperature rises, and the air is humid. Wind blows from SE to SW.
c. Passage of cold front – temperature falls, heavy rain with cumulonimbus clouds. Wind blows from NW.
d. Passage of the depression – the sky clears and temperature remains cool.

Tropical Cyclones

- ❖ Are systems of intense low pressure.
- ❖ They form over warm oceans where sea temperature exceeds 27℃ and in the tropics latitude 10 and 25 north and south of the equator.
- ❖ The winds spiral upwards (the air rapidly rises/gusty winds) in an area called a **vortex,** which surrounds the centre or the **eye** of the cyclone. An eye is a calm area in the centre of a cyclone with upper air divergence. The towering cumulonimbus clouds are associated with heavy rains and thunder. The air keeps the cyclone afloat to reduce ground friction.
- ❖ Air sinks in the eye to maintain calm conditions but if the air blows inwards violently the cyclone will die.
- ❖ Cyclones vary in diameter from 50 km to about 750 km. the size of the eye varies between 15 km and 30 km across.
- ❖ The wind speeds can reach 200 km per hour
- ❖ Generally move in a westerly direction, driven by tropical easterly winds.
- ❖ Examples cyclone Eline and Japhet.

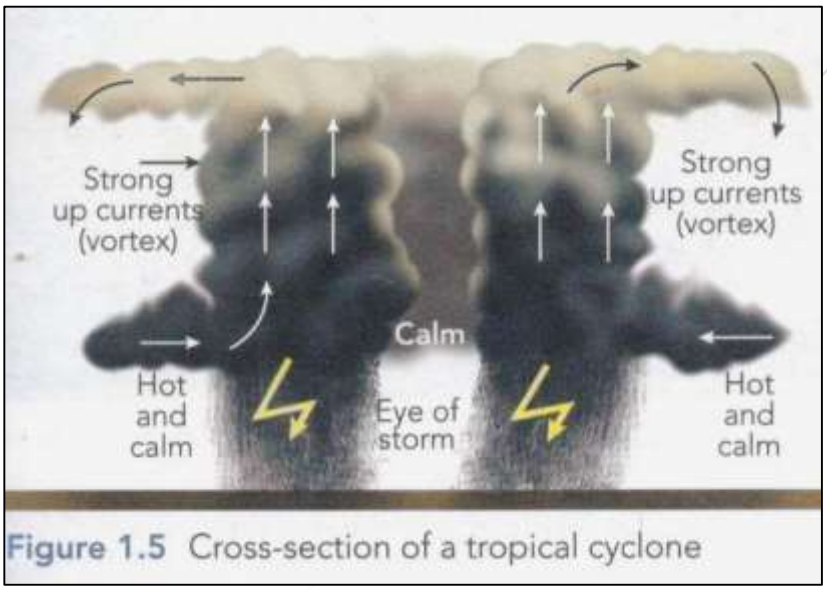


Figure 1.5 Cross-section of a tropical cyclone

Weather associated with cyclones

- The approach of a cyclone is usually accompanied at first by calm conditions, high temperature and high humidity.
- Strong warm moist easterly winds prevail thereafter.
- As the vortex approaches, thick and dark clouds and gusty winds (strong and destructive) are experienced.
- The arrival of the vortex (front vortex) is accompanied by violent winds of greet speed and heavy torrential (pouring in abundance) rains with thunder and lightning. It also reduces visibility.
- After several hours, rains stop signalling the eye.
- When the eye of the cyclone arrives, calm conditions are experienced. The eye experiences calm spiralling winds, high temperatures, and lowest pressure is recorded. The eye lasts for a few hours.

- The arrival of the rear of the vortex is characterised by violent winds, dark and thick clouds with heavy rainfall accompanied by thunder and lightning, but the winds will be blowing in an opposite direction to that of the front of the vortex.
- Pressure increases gradually until the cyclone passes until the clouds disappear and the rain stops.

Effects

a. Heavy rainfall, landslides and mudflows.
b. Destruction of houses, dams and bridges.
c. Blockages of roads and power lines.
d. Death due to lightning

Mitigations

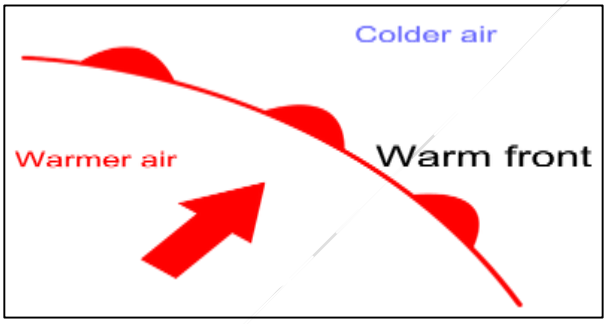
- ❖ Early warnings.
- ❖ Building strong houses.
- ❖ Afforestation as wind breaks.
- ❖ Evacuating people from affected areas.
- ❖ Relief and rescue operations.
- ❖ Provision of food and safe water to the affected.

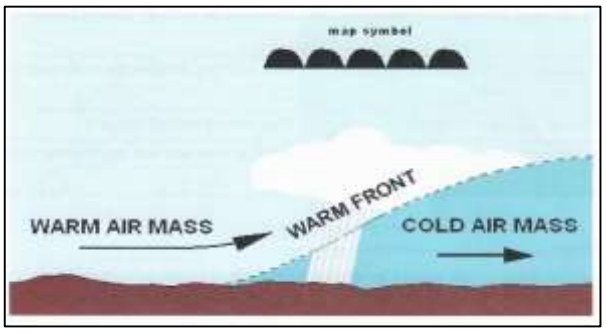
Frontal systems

Front – is a boundary between two air masses and are named according to which air mass is replacing the other.

Warm Front

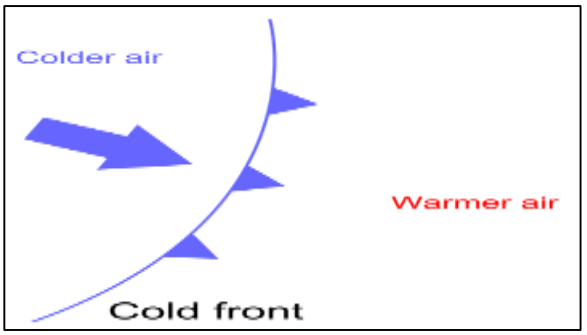
- Warm air displaces a cold air.
- Air behind the warm front is warm and moist and that ahead is cooler and less moist.
- Warm fronts have more gentle slopes than cold fronts hence leads to gradual air rise.
- Gradual rise of air initiates continuous precipitation along and ahead of the warm front.
- Are shown by a solid red line with semi – circles pointing the direction of its movement.

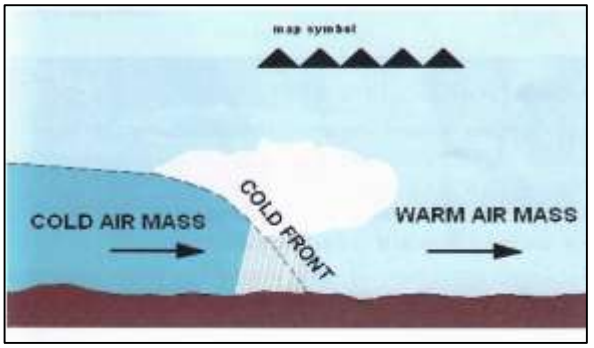




Cold front

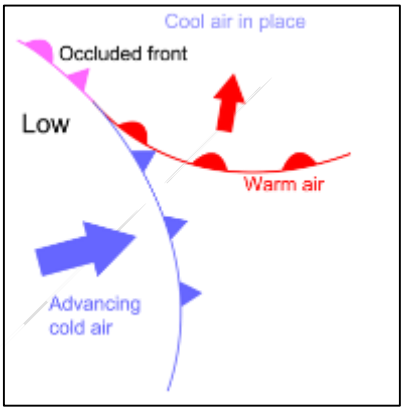
- Cold air displaces warm air mass.
- Air behind a cold front is cooler and drier than that ahead which is warm and moist.
- Are associated with cirrus clouds along the front, strong thunderstorms ahead of the front.
- They usually bring cooler weather, clear skies and change in wind direction.
- Have a steep slope hence air is forced upward along its leading edges.
- Are shown by a solid line with tringles pointing in the direction of its movement.





Occluded

- Cold fronts move faster than warm front.
- The cold front will catch up to the warm front.
- Cold air behind the cold front meets the cold air ahead the warm front
- The coldest air undercuts the other.
- The boundary between the two cold air masses is called occluded front.
- Is shown by solid purple line with alternating triangles and semi – circles pointing in the direction of its movement.
- Are also linked with areas of low pressure called depressions.



Human impact on weather and climate

- The earth's climate and weather conditions have been changing constantly throughout geological time scale.
- This has then impacted strongly on people's culture, history, economic and social activities
- For example people who lived during ice age had completely different life style compare to today's people.
- Coal developed in Hwange because there once thrived a large forest in the pluvial period.

How people have changed weather

- People have been changing weather deliberately and unintentional since time immemorial
- Deliberate changes can be seen as attempts to aid agriculture through dam construction, cloud seeding, green house construction etc
- Many of these changes have become detrimental causing greenhouse effect, global warming, acid rain and urban heat island effect

Intentional changes to weather

1. Greenhouses

- These are used to grow plants that are susceptible to frost conditions
- They create a microclimate within the enclosed area
- Are made up of glass or thin layer of polythene
- They cause a localized greenhouse effect in that they allow short wave radiation from the sun to enter through but do not allow terrestrial long wave radiation from the earth to pass through
- As a result heat is trapped inside causing them to be warmer than the surrounding areas.

Other methods of protecting crops from frost

- Burning old tyres, manure or modern gas or electrically powered frost prevention heaters
- Covering crops with a thin layer of polythene sheets ie on the sides and top to make tunnels
- Spraying the crops with water which act as an insulator. However this method is not very effective especially against extreme cold
- Blowing warm air around the field

2. Cloud seeding

- Not all clouds will give rain due to lack of condensation nuclei in the atmosphere
- Cloud seeding is a way of making the clouds that will not give rain to do so by spraying the cloud with silver iodide or dry ice which increase condensation nuclei
- This makes the cloud droplet to grow bigger due to more condensation surfaces so that it becomes heavy, move downwards and melt to give rain
- However there is no guaranty that the cloud will give rain in the area it is seeded, it may migrate to neighboring areas

3. Dam construction

- Big dams such as Kariba dam can change weather conditions within their surrounding areas due to increasing amount of humidity
- Lake shore breeze occur around the lake to produce more precipitation
- The breeze cools the vicinity

4. Deforestation

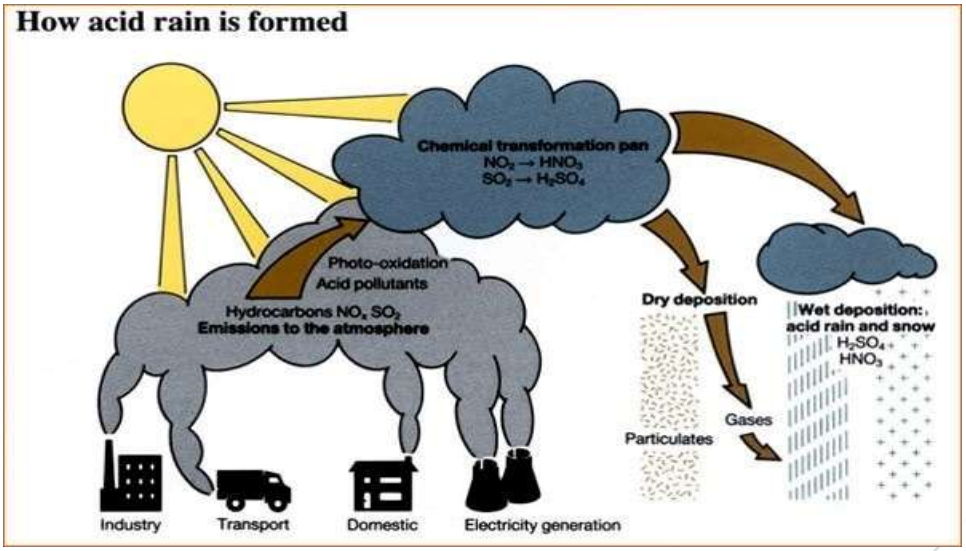
- Is the cutting down of trees without replacing them i.e. without reforesting.
- The high demand for timber, wood and land cultivation has led to the continuous clearance of forests.
- This reduces the humidity in the atmosphere and subsequently rainfall with long term effects of climate change and desertification.
- Deforestation also reduces the amount of trees which convert carbon dioxide back into oxygen resulting in a retrogression on the speed of global warming.

Unintentional changes to weather

1. Acid Rain

- The smoke from burning fuels and chemical industries rises into the air and mixes with water vapour.
- When the rain falls down it becomes acidic.
- The acid rain is a weak acid made up of sulphuric and nitric acids.
- Over, a long time (years for example), the rain eats into limestone installations as well as natural landscapes, stone walks, statues and metals.
- It also destroys vegetation as it has done to entire forests in the Eastern countries like the Black Forest in Germany.
- Has negatively impacted on tree growth in Scandinavian countries.
- Since acids accrue in water they pose a health risk to humans and animals.

How Acid Rain is formed



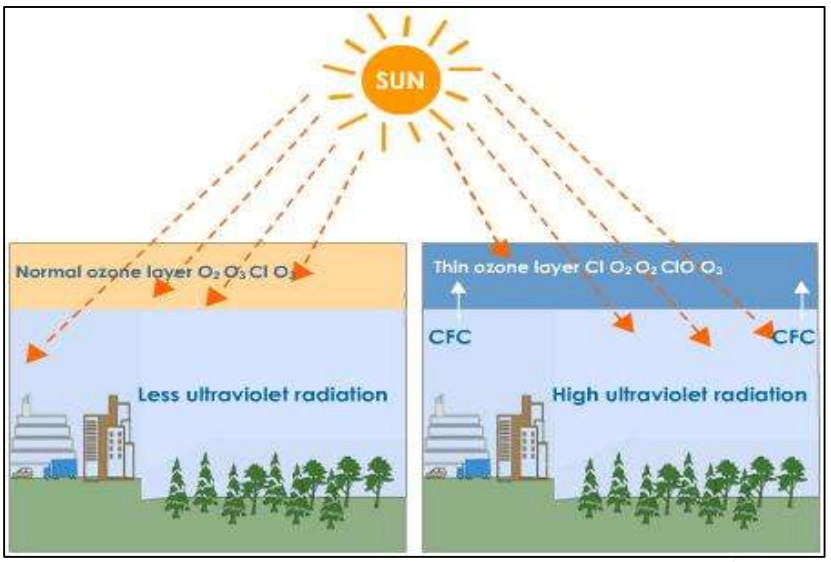
2. Global Warming

- Due an increasingly industrialised world a lot of Carbon Dioxide is being emitted into the atmosphere from industries, motor vehicles, machinery and other human activities.
- The solar irradiation from the sun comes mainly in the form of short UV radiation (light).
- These are converted into longer infra-red waves (heat) when it reaches the earth's surface.
- Some of the heat is radiated back into the atmosphere by the earth's surface.
- Due to increased carbon emissions the amount of carbon dioxide in the atmosphere has increased.
- This layer of Carbon Dioxide has an insular effect; it acts as a blanket preventing the longer waved infra-red waves from escaping back into space.
- The result is a general increase in the world's mean temperatures.
- This is known as global warming.
- The effects of global warming include a general increase in mean temperatures in some places, the melting of Polar ice resulting in sea level changes: this leads to flooding in low lying coastal areas, destruction of Polar ecosystems, persistent droughts in some areas, flooding and mudslides due to excessive rain in other areas for example Indonesia, freak weather storms and increasingly unpredictable weather, droughts and increased aridity in some areas.
- The effects of global warming are being compounded by deforestation.

3. Ozone Layer depletion

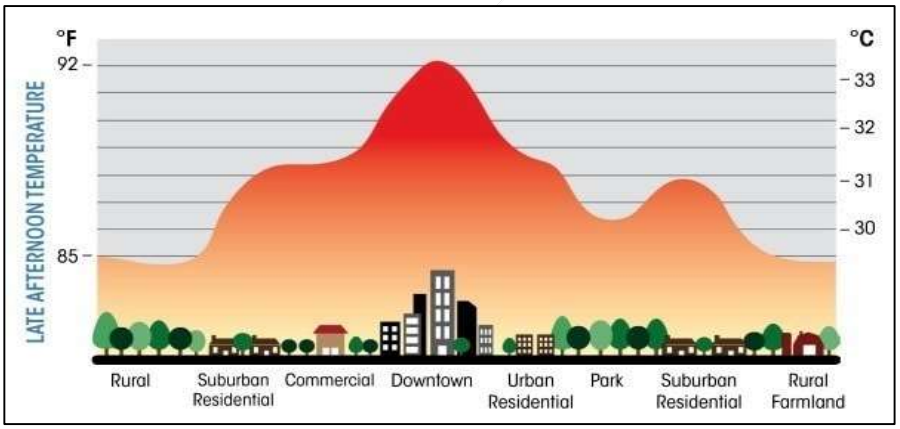
- In the upper layers of the earth's atmosphere (between the stratosphere and the troposphere) there is a layer known as the Ozone Layer.
- It is composed of special bonds of Oxygen (O3) and about 30 km from the earth's surface.
- It acts a shield by blocking out the sun's dangerous UV radiation from reaching the earth.
- It is being depleted by chemicals from factories and some antiquated forms of aerosol sprays.
- These make emissions containing nitrous oxide compounds, bromine and chlorine compounds.
- These chemicals are often referred to as organohalogen, chloroflurocarbons (CFCs) and Bromoflurocarbons.
- They are depleting/reducing the Ozone layer by chemically breaking it down.
- This has resulted in Ozone holes in some places.

- This results in higher cases of non-melanoma skin cancer, eye cataracts and blindness and weakening of human immune systems (immuno-supression) to people living underneath these Ozone holes.
- Other effects include: reduced plant growth harming agricultural activities as well as natural vegetation, reduction in plankton populations (these is the major source of food for most fish and features prominently in marine ecosystems), loss of marine biodiversity, higher incidents of cancer in domestic animals, adverse effects on flowering and pollination of plants and damage to important synthetic materials like plastics and rubber.



4. Urban Heat Islands

- Due to a number of reasons the climate and weather of urban areas is different from the adjacent rural areas.



Climate Change

A change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer (IPCC, 2007).

Causes of climate change

Greenhouse effect

The warming of the atmosphere is happening because the atmosphere is continuing to trap the heat that radiates from the earth and traps it between earth and space. Carbondioxide, water vapour, methane and nitrous oxide due to human activities, play a part in the greenhouse effect, and most of these gases will actually block the heat to force climate change.

Volcanic Eruptions

A volcano releases a large amount of sulfur dioxide (SO2), water vapor, dust, and ash into the atmosphere when it erupts. These large volumes of gases and ash can trigger climate change by increasing planetary reflectivity causing atmospheric cooling. Aerosols are tiny particles that are produced by volcanoes. They remain in the atmosphere for only a few days and reflect solar energy back into space they have a cooling effect on the world.

Ocean Currents

Variations in ocean currents can also influence climate change for short periods of time. Ocean currents move vast amounts of heat across the planet. Movement of cold water deep under the oceans towards the regions near the equator and movement of warm water near the equator back towards the pole play an important role in determining the atmospheric concentration of carbon dioxide.

Solar Radiations

The sun is the ultimate source of supply of energy for the earth's climate system. A small change in the output of the sun's energy can influence climate change. These changes include changes within the sun and changes in Earth's orbit. Changes occurring in the sun can cause climate to become warmer during periods of stronger solar intensity and cool during periods of weaker solar intensity. For example, the period between approximately 1650 and 1850 is known as "Little Ice Age" which may have been partially caused by low solar activity.

Earth Orbital Changes

A slight change in the tilt of the earth can lead to climatic changes. While less tilt means cooler summers and milder winters; more tilt means warmer summers and colder winters. These small and slow changes can lead to important changes in the strength of the seasons over tens of thousands of years.

The evidence of climate change extends well beyond increases in global surface temperatures:

- Changing precipitation patterns.
- Melting ice in the Arctic.
- Melting glaciers around the world.
- Increasing ocean temperatures.
- Rising sea level around the world.
- Acidification of the oceans due to elevated carbon dioxide in the atmosphere.
- Responses by plants and animals, such as shifting ranges.

Effects of climate change

According to an analysis of several studies on the impacts of climate change, it is likely that by 2050 and until the end of the century there will be:

- Rising sea levels as sea water in warmed oceans expands and ice at the poles melts.
- Melting of glaciers which then retreat and no longer feed the rivers on which people rely.
- A modest decrease in total amount of rainfall.
- Changes to the onset and end of the season.
- More frequent and longer mid-season dry periods.
- Reduced ground water recharge.
- Erratic rainfall distribution across the country.
- Drying up of some rivers, lakes and wetlands.
- Habitat change for endangered species including lions, tigers and penguins.
- More droughts and floods that may recur in successive years.
- Reduced water supply for domestic and agriculture use from both surface and groundwater sources.
- The expansion of Natural Region V and the shrinking of Natural Region I and shifts in the areas covered by natural regions III and IV .
- Degradation of natural resources, especially soil, water, natural vegetation, crop, livestock and wildlife species.
- Reduced food security because of the impacts on agriculture possibly leading to increased undernutrition, particularly in children.
- Increases in the incidence of diseases such as diarrhoea, malaria and cholera due to reduced water quality, temperatures and flooding and cholera due to increased flooding.

Adaptation to climate change

- Using alternative energy sources.
- Designing and building energy-efficient buildings and motor vehicles.
- Moving people from areas that might be threatened by, for example, rising sea levels.

Mitigation against climate change

- Laws and international agreements regarding carbon dioxide emissions.
- Setting standards for vehicle exhaust emissions.
- Carbon trading.
- Designing more efficient aircraft and jet engines.
- Mixed farming and intercropping.
- Introducing GM maize seeds with a shorter growing season.
- Education and training of farmers to enable them adapt to.
- Irrigation.
- Introducing cattle like bovine which can adapt to drier conditions.using indigenous farming knowledge like growing drought resistant crops.

TOPIC 2

LANDFORMS AND LANDSCAPE PROCESSES

Rivers

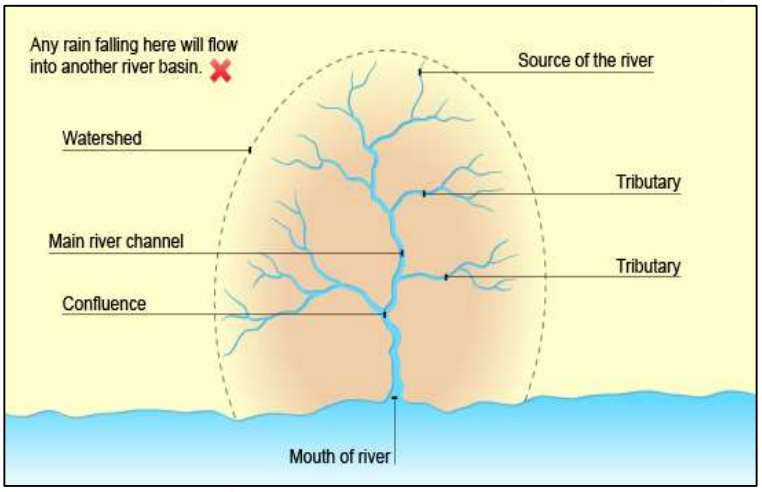
Surface water flow and origin of rivers

- Rain falling down on land flows down the slope as sheet flow, rill flow and gully flow all of which contribute to stream discharge.
- Underground water oozes at certain points called springs and also contributes stream discharge.
- It is a type of overland flow or downslope movement of water which takes the form of a thin, continuous film over relatively smooth soil or rock surfaces is generated when rain falling onto the earth's surface flows over the whole surface as a thin layer of water.
- It commonly occurs at the head of the watershed where the slope is gentle and the surface flat e.g. artificial surfaces, rocks etc.
- Rivers erode, transport,and deposit sediments thus creating different landforms.

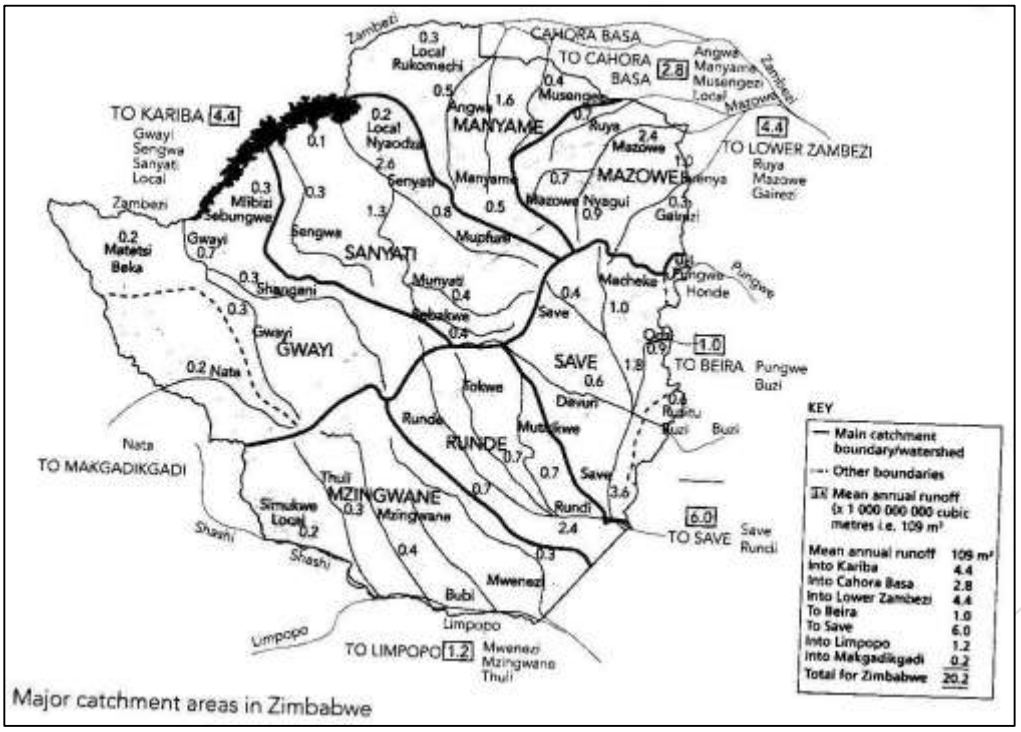
Seasonal flow of rivers

- Large rivers in Africa flow all year round and receive its waters in summer. However, some carry little or no water in the dry season (perrennial and intermittent respectively).
- Zimbabwe`s main rivers are Zambezi, Limpopo and Save.

Drainage basin



- The term drainage basin refers to an area of land drained by a river and its tributaries (river system).
- It includes water found in the water table and surface run-off.
- The drainage basin is also known as catchment area among an assortment of terms.
- There is an imaginary line separating drainage basins called a watershed.
- Usually, the watershed is a ridge of high land for example mountains forming a boundary between two adjacent drainage basins.
- The point where a river begins is called the source. It is usually in the form of a lake or spring.
- A confluence is the point where two rivers join.
- A tributary is a stream or smaller river that joins a larger river.
- The mouth is the point where a river enters the sea.
- Interfluves are highlands separating river valleys and define the watersheds.
- Zimbabwe is divided into seven catchment areas: Manyame, Sanyati, Gwayi, Mazowe, Runde, Mzingwane and Save.



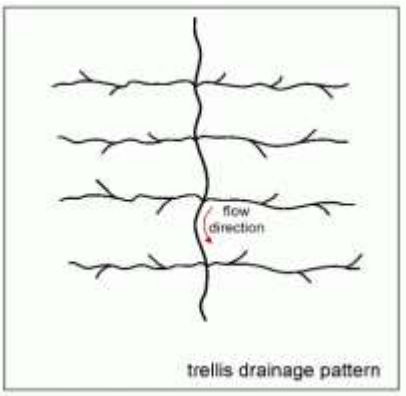
Major catchment areas in Zimbabwe

Drainage patterns

- Drainage pattern is a term that refers to the way in which a river and its tributaries arrange themselves in the drainage basin.
- The drainage pattern evolves over a long period of time and is affected by such factors as the underlying rock, the slope of the land, the existence or nonexistence of fault lines and tectonic movements.
- The most common drainage patterns are: trellis, dendritic, radial, centripetal and parallel.

Trellis

- It is formed where streams join the main river at right angles.
- The trellis pattern develops in areas of alternate hard and soft rocks.
- The main river (also known as the consequent stream) follows the dip of the rocks down the slope after an initial uplift.
- The tributaries (also known as the subsequent streams) which develop along the soft rock join the main stream at right angles.
- These tributaries are at times joined by their own tributaries at more or less right angles.
- Streams that flow against the dip of the rock strata are called obsequent streams.
- In Zimbabwe Trellis drainage is found in the Chimanimani mounts.

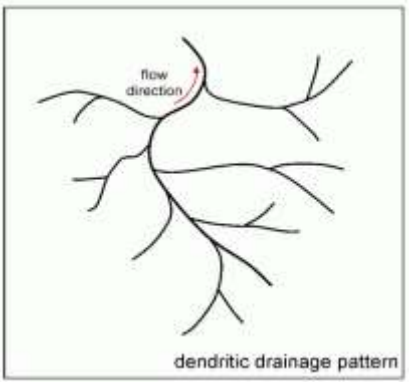


trellis drainage pattern

- Trellis drainage also occurs along fault lines and rectangular joints in eroded fold mount areas due to headward erosion by stream.

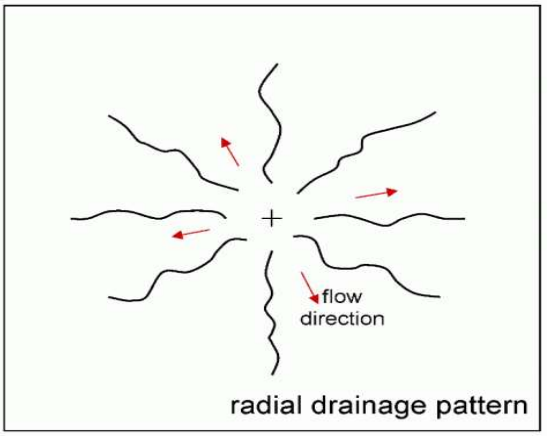
Dendritic

- The word dendritic comes from the Greek dendron meaning tree.
- In dendritic drainage patterns the streams join one another in a shape that looks like the branches of a tree.
- These streams eventually end up as one big river (the trunk).
- The tributaries join each other at acute angles.
- It is commonly found in areas with a uniform rock structure resulting in uniform erosion.
- It is also found in areas which have gentle slopes.



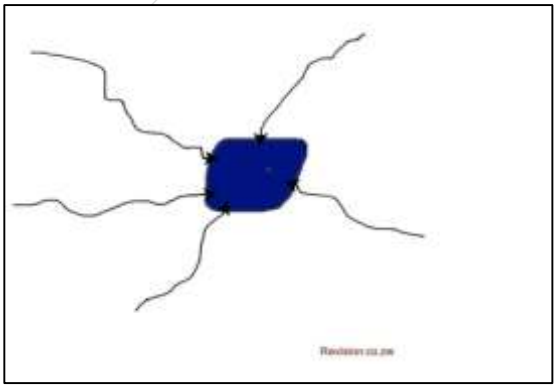
Radial

- Is formed where streams drain from a central highland in all directions.
- It is also known as centrifugal and divergent drainage.
- It is common in areas with conical hills and/or domes for example volcanic cones and other conical landforms.
- Streams radiating from these areas can later end up forming other patterns as the flow downstream and meet up with other tributaries.
- In Zimbabwe these type of drainage pattern is found in areas that have granite domes still covered by soil.



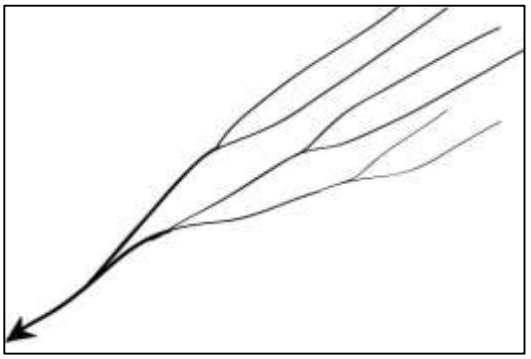
Convergent Drainage

- Is found in areas where rivers drain towards a central inland lake, swamp or depression.
- It is in essence an inland drainage system e.g. as in the case of the Dead Sea.
- It is common in inland depressions such as faulted intermountain (between mountains) basins, calderas as well as in arid and semi-arid areas.



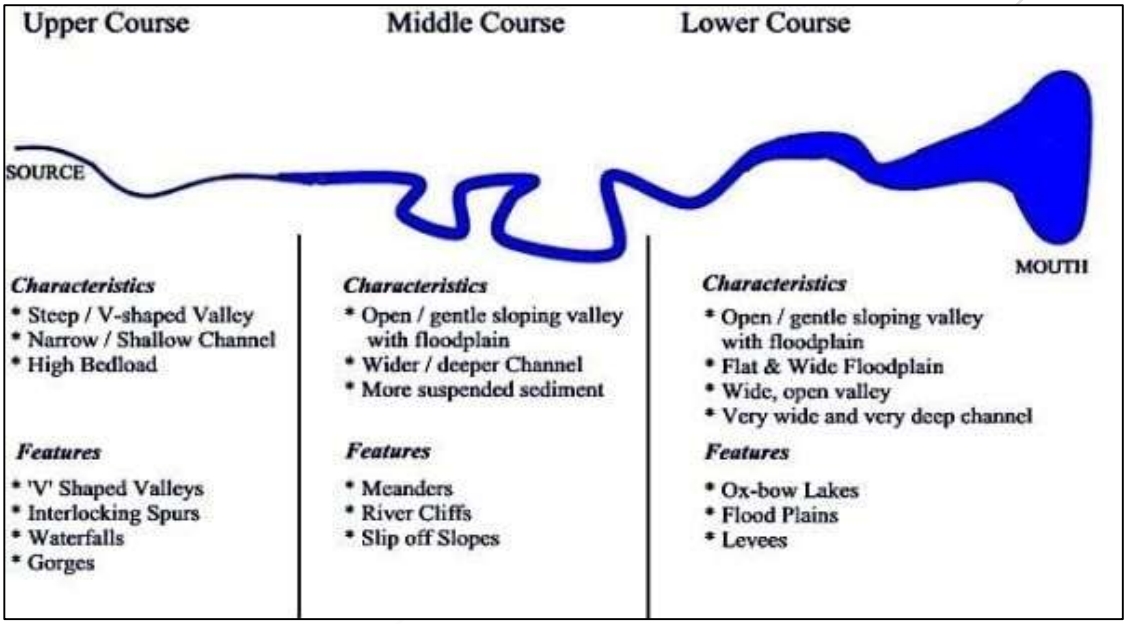
Parallel

- Rivers and tributaries flow downhill together in a more or less parallel pattern.
- It is the simplest and most basic drainage pattern.
- It occurs on newly uplifted land or land that is gently sloping allowing rivers and tributaries to flow in parallel channels.
- Examples include the Zambezi and its tributaries.



River profiles

- The long profile-this is the cross section along the river's entire length from its source to its mouth.
- The short profile-this is the cross section across a river's valley from the crest line(on one bank) to the channel to the other crest line. This is known as the river's valley.
- There is only one cross profile but an innumerable short profiles that can be taken at any point in a river's length.
- The short profile however tends to widen the further one moves downstream.
- The diagram above shows the three main sections of a river/stream's long profile and the diagram below show the corresponding typical short profiles at each stage.
- Short profiles that correspond to the long profile.
- A river's long profile can be divided into three sections viz: the upper course or headwater reaches, the middle course or middle reaches, the lower course or the lower reaches.
- The base level of a river is the lowest point a river can erode its channel, this is equal to the sea level of the ocean into which the river empties.



Upper course

- Common features include: V-shaped narrow valleys, potholes, interlocking spurs, waterfalls and rapids, gorges, strewn boulders.
- The most dominant form of erosion is vertical erosion and headward erosion also takes place.

Middle course

- It's less steep, has more water volume, a wider channel and more velocity due to reduced channel roughness.
- Common features include: Open V-shaped valleys, truncated spurs, meanders, ox-bow lakes and braids.
- Erosion is mostly in the form of lateral erosion.

Lower course

- Is flat and has a very wide channel with less energy.
- Common features include: bluffs and other flood plain features such as swamps, braiding, deltas, alluvial fans, deferred junctions and natural levees.
- These features are mostly due to deposition which is more dominant than erosion due to the reduced river energy due to the lower gradient and increased wetted perimeter.

River processes

- Rivers are perhaps the most important denudation agent.
- They carve channels, form valleys, transport and deposit regolith over great distances and other material to form other types of landforms.

Flow of water in streams

- Rivers always flow downstream because of the pull of gravity.
- A river's erosion, transport and deposition depends on the flow of water in its channel.
- This flow is determined by several factors viz:

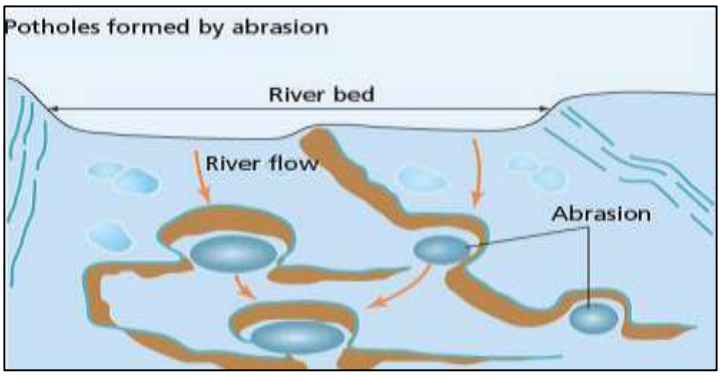
a) The energy which is provided by gravity and is affected directly by they gradient of the river's bed the steeper the slope the more energy a river has.
b) Volume is the amount of water in a river's channel. Volume increases during the wet seasons when most of the precipitation occurs or if a river's course passes through a region experiencing wet climatic conditions
c) Conversely a river's volume falls during dry seasons such as winter and spring in Zimbabwe or if it passes through arid conditions/regions experiencing dry conditions.
d) The nature of flow also affects and channel shape also affects a river's energy.

River erosion

- River erosion involves the wearing away of rock and soil found along the river bed and banks.
- It also involves the breaking down of the rock particles being carried downstream by the river.
- There are four main processes of erosion (corrasion, attrition, hydraulic action and solution (also known as corrosion).

Corrasion

- Is the wearing down of the sides and bed of the river by the load as it is being transported by the river.
- Corrasion occurs when a river picks up material and rubs its bed and bank wear them away by abrasion like sandpaper.
- Corrasion therefore happens when the river's sides and bed are scrapped off by the material being transported by the river.
- This process is most pronounced during flooding.
- This is the major means of erosion by which a river extends both vertically and horizontally.
- If there are hollows in the river bed, pebbles can get trapped in these and whirled by turbulent eddies (in circular motion) to form potholes.
- When pebbles are trapped in existing potholes these are deepened further by the whirling pebbles.
- Corrasion wears away the channel's river bed and add more material to the river's load thus amplifying the processes as more load means more corrasion.



Attrition

- Is a process by which the river's own load is broken down from larger particles into smaller ones.
- This happens because the river's load which is made up of different sized particles which collide and knock into each other causing them to break into smaller fragments.
- As the load progresses downstream it gets smaller and smaller.
- Also angular rocks become increasingly rounded.

Hydraulic Action

- Refers to the sheer force and turbulence of the moving water which can be able to remove loose material such as gravel, sand and silt.
- This force can also weaken solid rocks by surging into cracks in the rock.
- This processes can be aided when there is air in the cracks which is compressed causing eventual bank collapse.
- Cavitation is a form of hydraulic action caused by bubbles of air collapsing and the resultant shock waves hit and weaken the banks of the river.
- Hydraulic action by itself is very effective if the river does not have some load to produce corrosive erosion/abrasive erosion.
- Hydraulic action is the weakest and least effective form of erosion.

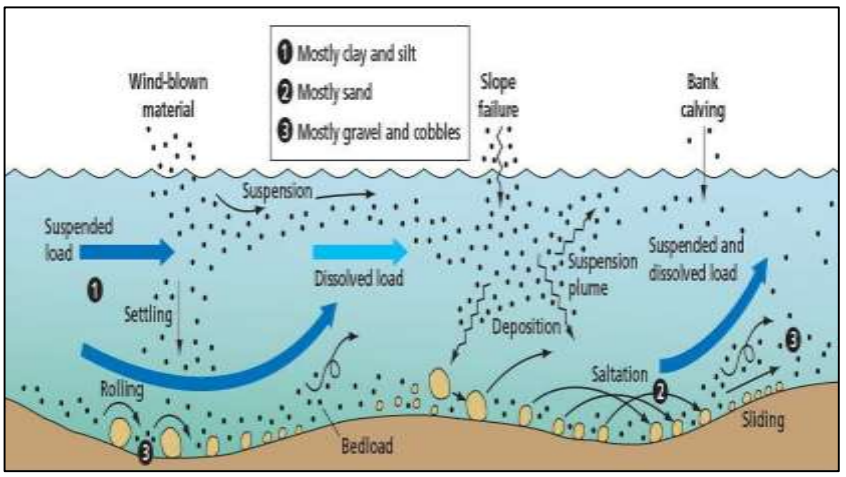
Solution or Corrosion

- The water in the river dissolves some soluble rocks such as rock salt and sometimes limestone.
- This is most effective in areas where the stream bed and banks are composed of soluble rock for example in limestone regions

River transportation

- Any energy left after a river has overcome friction is used to transport sediment.
- This energy varies directly with a river's discharge, velocity and turbulence
- That is if they increase the amount of a river's energy to erode and transport also increases until a river reaches flooding level when deposition is likely to occur due to an increase in the wetted perimeter and thus friction.

- There are three main processes by which a river's load is transported: suspension, solution and bedload (sometimes divided into saltation and traction making them four methods instead of three in this case).



Suspension

- This is when light silt and mud floats along with the water.
- Very fine particles of silt and clay are dislodged and carried away in the turbulence of the flowing water.
- The greater the turbulence the greater larger the quantity and size of particles picked up by and carried away by the river.
- This partly explains why flooded river often have mud coloured water, it is due to the heavy amounts of suspended material with the water.
- The suspended material usually forms the largest part of a river's total load.
- It increases in amount towards a river's mouth also giving the black/brownish colour to the water that is similar to that of most rivers after a storm.

Solution/Dissolved Load
- Is when material dissolves in the water and is carried away in solution form for example rock salt.
- Flowing water within river channels almost always contain acids in the form carbonic and nitrous acids especially after a storm or due to pollution.
- This dissolves the bedrock especially if it is soluble for example limestone.
- It dissolves in water and is carried away in solution form.
- This is a very active form of transportation in limestone regions and in other regions it forms a comparatively small part of the load.

Bed load
- Is divided into two processes traction and saltation.
- Saltation is when smaller particles bounce along the bed of the river.
- Traction is when larger boulders and pebbles roll and are dragged along the river's bed.
- Since larger particles cannot be picked up by the current they are moved along the bed of the river in these two ways.
- Saltation happens when pebbles, sand and gravel are temporarily lifted up by the river's current and bounced along the bed of the river in a hopping motion.
- Traction occurs when the largest cobbles and boulders roll or slide along the bed of the river.
- The largest loads can only be moved in this way during flood periods for example after a storm.

River deposition
- Deposition occurs when a river no longer as sufficient energy to transport its load.
- When its velocity begins to fall and has less energy, a river's competence (maximum size of material which a river is capable of transporting) and capacity (maximum amount of load that a river is capable of transporting) falls and therefore deposition begins.
- Deposition occurs when:

a) Discharge is reduced after a period of low precipitation.
b) Velocity is reduced upon the river reaching the dam, lake, sea or ocean resulting in the formation of deltas.
c) Shallow water occurs on the inside section of a meander for example.
d) The load is suddenly increased for example in the event of a landslide for instance when a portion of bank collapses into the river.
e) When the river overflows its banks so that the velocity outside the channel is reduced resulting in the formation of a floodplain.
f) During floods, especially in the lower course rivers spread to the sides of the channel.
g) Frictional drag and the reduced gradient slow down the flowing water resulting in deposition.

Deposition occurs along the entire course of the river:
- On the channel bed.
- The river valley floor especially during floods.

- On the river's banks as in a meander.
- At the river's mouth when it empties into the sea.

NB Deposition occurs at any part of a river's course depending on a river's energy and velocity. The division of a river into stages is therefore useful but by no means conclusive.

Deposition

- When the river loses its energy to any of the reasons pointed out above the following happens.
- The heaviest material/load is deposited first this is why rivers are littered with boulders in the upper course.
- This is because traction load and siltation loads require more energy to transport.
- The finest material is deposited last and may reach the sea where it is deposited onto and to form deltas.
- The dissolved load which is in solution water is deposited at all but transported to the sea where it maintains the saltiness of oceans.
- The deposition of sand and silt leads to the development of a gently sloping plain known as a flood plain.
- Deposition can result in aggradation where the river's bed and gradient are increased. This can happen at deltas and on alluvial fans.

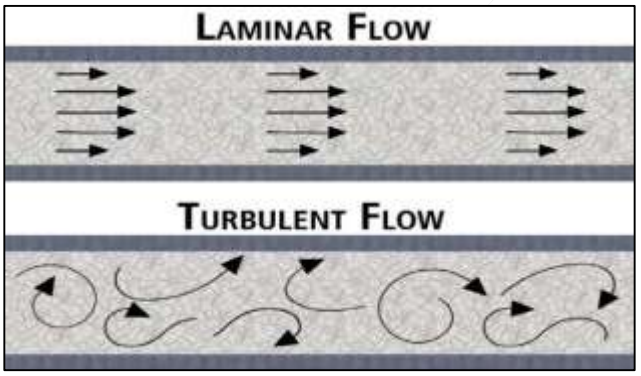
Factors affecting river processes

The following factors affect the river's energy and ability to erode, transport and deposit its load.

- Type of flow, gradient of channel, volume/discharge, cross-sectional channel shape, channel roughness
- When water flows downhill under gravity it follows the path of least resistance.

There are two patterns of flow: laminar and turbulent.

Laminar and turbulent



Laminar

- Is a horizontal movement of water in a river with minimal vertical mixing.
- The water is in layer; such a form of flow would result in minimal erosion and more deposition.
- In reality such a type of flow does not exist although something close to this can be observed in flat terrain when rivers are relatively calm during their flow.

Turbulent flow

- Consists of a series of vertical and horizontal eddies and a lot of vertical mixing of the water as it flows downhill.
- Turbulent flow results in more erosion and transportation and this form of flow increases with an increase in a river's energy.

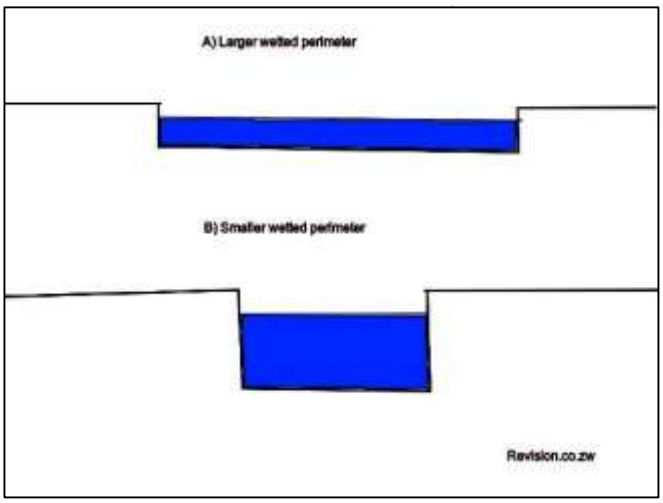
Gradient of the channel

- The gradient of the channel determines a river's ability to erode, transport and deposit its load.
- The upper course of a river is associated with steep gradients therefore a lot of velocity and energy and therefore river erosion and transportation takes place in the upper course.
- The middle and lower course have a much gentler gradient and therefore the slower moving waters have less erosive power and therefore more deposition takes place and less transportation and erosion.

Discharge/Volume

- As already said, water flows in response to the pull of gravity which is also determined by the mass and in turn the volume of the moving water.
- Rivers have less water in the upper course because of most have fewer tributaries at this stage therefore they have less energy to erode.
- Middle course and lower course river sections have higher volumes of water since they have more upstream tributaries at this stage resulting in more energy to transport and erode and transport in terms of water volume.

Cross Sectional Channel shape.



- Channel cross-section: A has less energy due to friction
- Channel A has a larger wetted perimeter which means more friction and leaves less energy to erode its bed and to transport load.
- Channel B has a smaller a smaller wetted perimeter resulting in more vertical erosion because it has more energy left over from overcoming friction.
- In terms of channel cross section upper course streams have more energy to erode when compared to lower and middle course streams.

Channel roughness

- Channel roughness channel A) is typical in the upper course streams and B) in the lower course streams.
- Upper course streams encounter more friction due to their rough channels which are a result of protruding boulders and rocky outlines. This means such channels will have less energy left over to erode and transport their load.
- Middle and Lower course streams have more energy to transport and erode since they have smooth channels resulting in less friction.

Conclusion

- More erosion takes place in the middle course since the channels are smooth, the gradient steeper than in the lower course, the wetted perimeter smaller than in the lower course and the volume of water is high.
- A lot of vertical erosion takes place in the upper course.
- Most deposition takes place in the lower course of the river since the gradient is smaller, the wetted perimeter larger, and the gradient considerably less steep when compared to the other two courses.

Calculating wetted perimeter and discharge

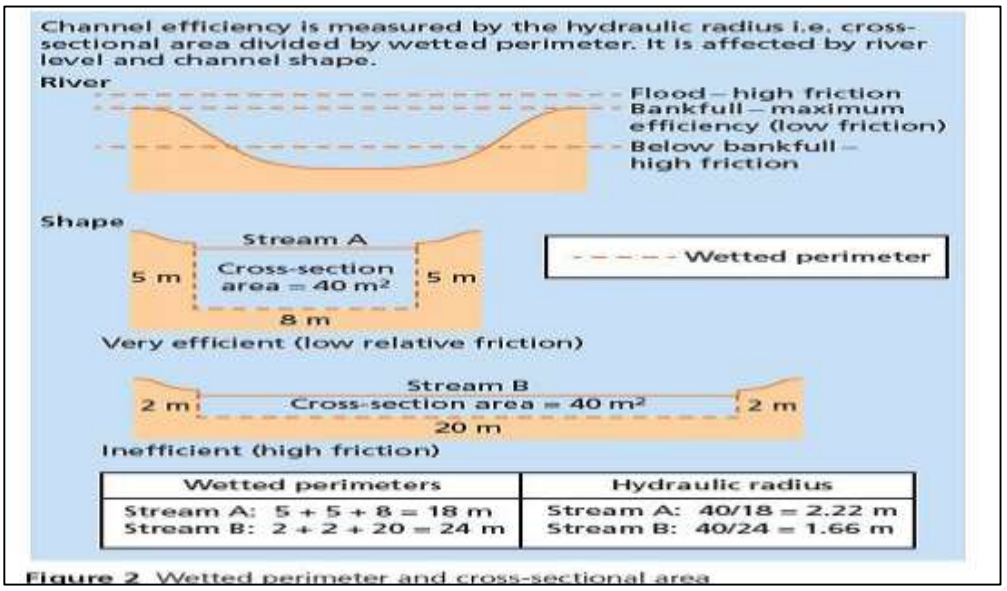


Figure 2 Wetted perimeter and cross-sectional area

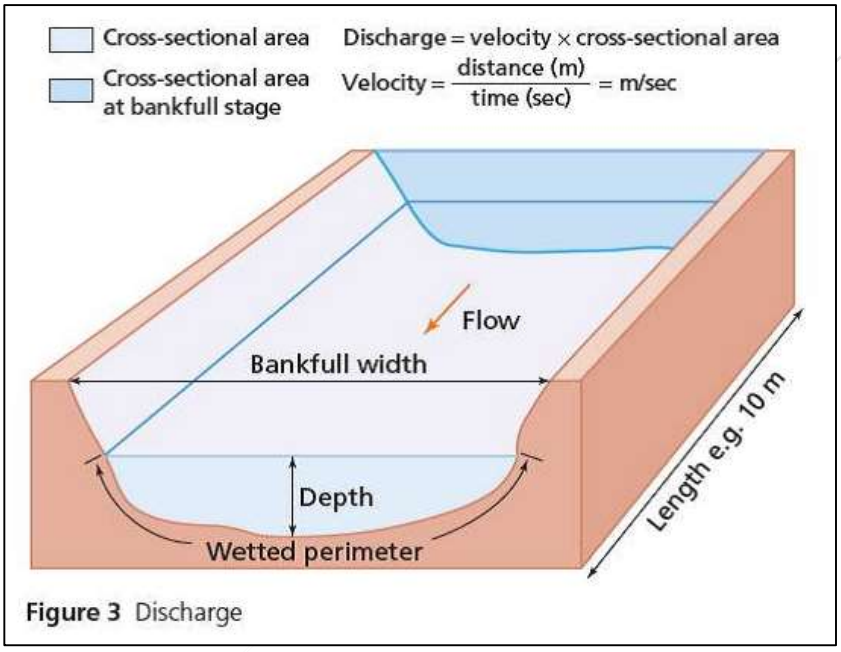


Figure 3 Discharge

Landforms

- These can be broadly divided into those landforms resulting from erosion and deposition.
- Those from erosion include Narrow valleys, Interlocking spurs, Waterfalls and rapids, Pot holes, Gorges.
- Those resulting from mainly deposition include Flood Plains, Meanders, Ox-bow lakes, Braids, Levées, Deltas
- A lot of river features such as floodplains and meanders are formed by both erosion and deposition acting in tandem.

- Interlocking spurs occur mainly in the upper course section of streams and rivers as rivers have little energy to erode.
- Steep sided valleys
- Since water flows in small amounts and in predominantly steep areas in the upper course section vertical erosion is more dominant than lateral erosion.

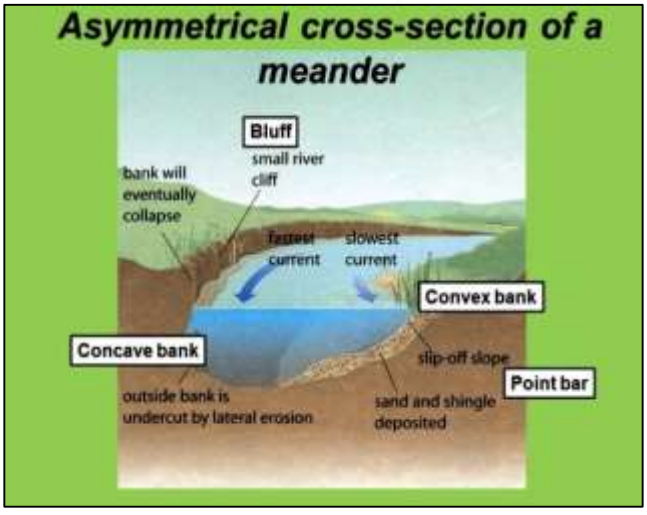
Interlocking spurs.

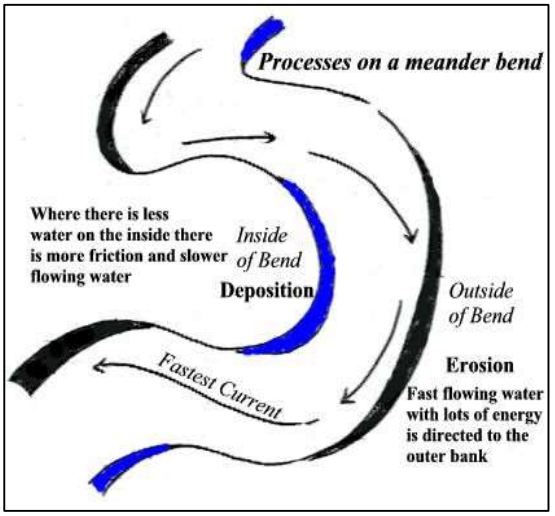
- This also facilitated by the load which the river carries because it cannot reach the upper levels of the valley walls once they have been formed so much of corrasion processes are limited to the lower sections of the river and this tends to deepen the channel.

Meanders

Meander cross section

- Meanders are pronounced bends in a river's course
- They are formed when a river twists and turn in wide bends.
- They are common on the floodplain but can develop in any part of the river's course.
- Meandering is a common behaviour of fluids that avoid a straight path to flow in a twisting and turning path.
- It is believed that meandering is a thermodynamics behaviour that maximizes velocity and reduces friction.
- Other experts have theorized that meanders start when friction with the channel bed and banks causes turbulence in the water flow.
- This results helicoidal flow.

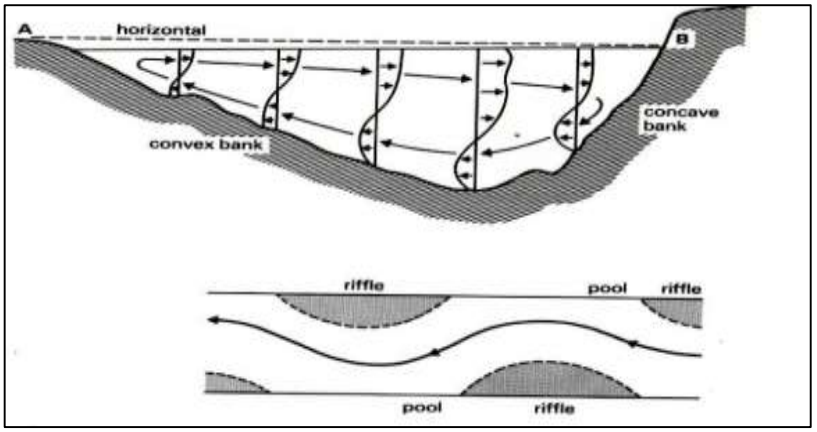




Helicoidal flow in a meander.

- This is a corkscrew like movement of the water as it spirals downstream from bank to bank as shown in the diagram above.

- This often occurs during floods and results in the formation of meanders and their associated features such as pools and riffles.



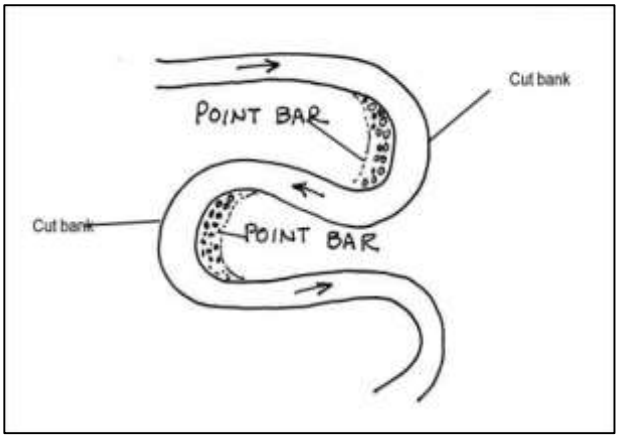
Pools and riffles

- Pool-this is a deep section in a meander where a lot of erosion takes place where the river's energy builds up due to reduced friction and the water has higher velocity.
- Riffle-this is a shallow section in a river where there is deposition due to reduced capacity in a river resulting from energy dissipation (reduction) in a river due to increased friction and a reduction in a river's velocity.
- The spacing of the pools and riffles are fairly regular in a river channel about six to five times the width of the channel.
- Helicoidal flow is responsible for the erosion on the outside bends and then depositing it into the inside bends of meanders.
- Water flows fastest on the outer bend (concave bank) of the river where the channel is deeper and there is less friction.
- It erodes this bank laterally by attrition and hydraulic action.
- There also vertical erosion which deepens the channel, which reduces friction and increases in energy results in further erosion.
- The lateral erosion results in undercutting of the river bank and the formation of a steep sided river cliff these cliffs are also known as bluffs. The inner bend water is slow flowing, due to it being a low energy zone, deposition occurs resulting in a shallower channel.
- This increased friction further reduces the velocity (thus further reducing energy), encouraging further deposition.
- Over time a small river beach or runoff slope builds up on the inner bend.
- The greater erosion of the concave bank occurs just downstream of the axis of the meander bend, because the course of the maximum velocity zone in the channel does not reflect the meander shape.
- This causes meander to migrate down the valley.
- The lateral erosion of the meanders and their migration widen the flood plain.

A point bar

Is a depositional feature made of alluvium that accumulates on the inside bends of streams and rivers below the slip-off slope.

- They are crescent-shaped and located on the inside of a stream bend of meanders.
- They show the former positions of a meander during its downstream migration.
- The term is sometimes used synonymously with slip-0ff slopes although the term slip-off slope is used to refer to the cross section and the term point bar is used to refer to the aerial view.
- It is important to note again that meanders to not remain stationary but migrate downstream resulting in the widening of the flood plain.



Gorge

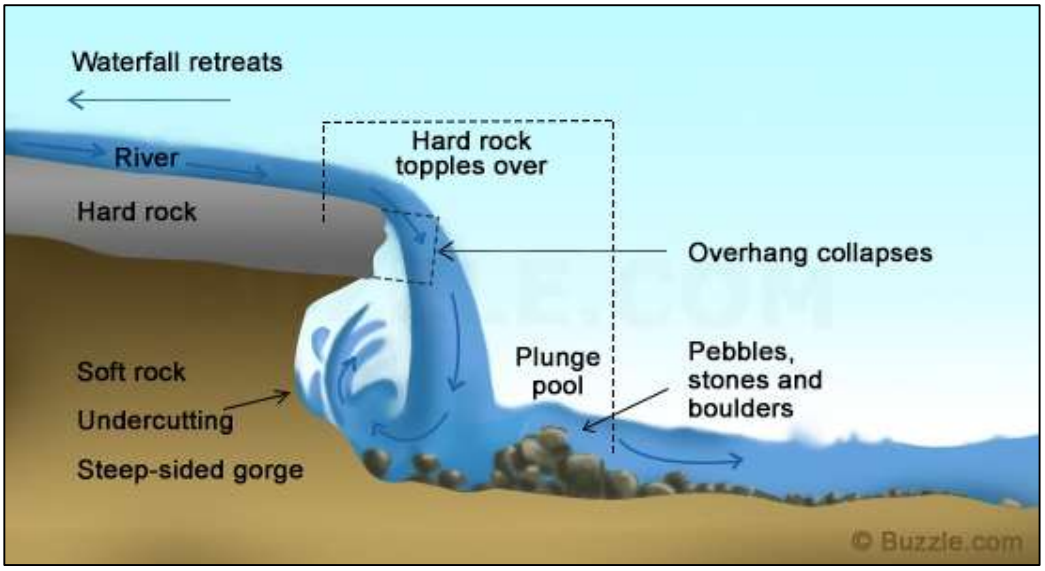
- Is a narrow valley between hills or mountains, typically with steep rocky walls and a river/stream running through it.

b) An actively flowing river may carve a gorge if it flows through a plateau which is made up of layers of resistant rock alternating with lays of less resistant rock.
c) If the region in which the plateau is found is arid or semi-arid there will be little weathering of the valley sides resulting in a narrow and deep gorge.
d) When the gorge is large it is sometimes referred to as a canyon for example the Fish River Canyon in Namibia and the Grand Canyon in the United States.
e) The later was formed in part by the process of river rejuvenation.
f) Gorges can be formed due to vertical erosion in areas of vertical uplift.
g) They can also result from the collapse of underground caves in limestone regions.

a) A gorge may develop if a river's course follows a line of weakness such as a fault line. For example the Kaduna river in Nigeria forming the Shiroro Gorge.

h) Vertical erosion into resistant rock can also result into the formation of a gorge as the valley walls on both sides of the river remain intact due to minimal weathering. For example the Lupata gorge was developed when the river incised into resistant rhyolite rock.
i) A gorge can also result from the upward migration of a waterfall for example the gorges at Victoria Falls.
j) Vertical erosion on a once buried hard rock layer by an existing stream in cases of superimposed drainage.

k) Down-cutting of the predator or victor stream in cases of river capture for example the Pungwe Gorge.



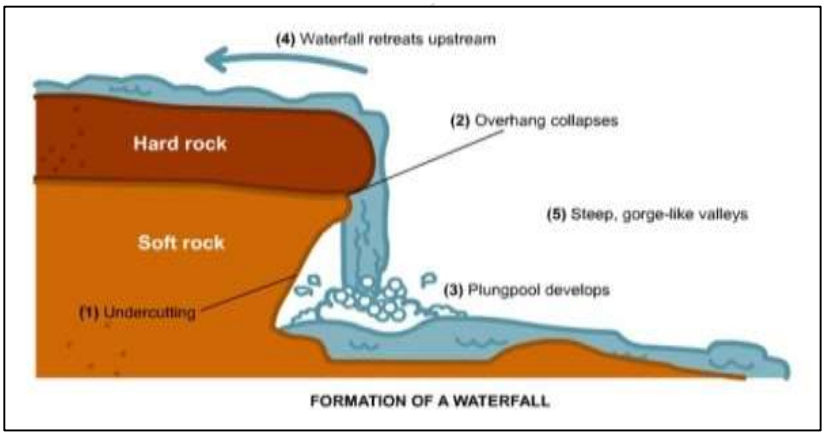
The diagram above shows a gorge being formed as a result of a waterfall migrating upstream
Note this is just one of many ways in which a waterfall can be formed.

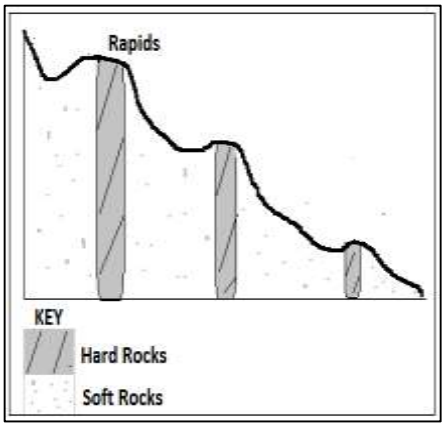
Waterfalls and Rapids

- Waterfalls commonly occur in the upper course section of the river although they can occur at any part in a river's course.
- There are various ways in which a waterfall/rapid can be formed.

a) A sharp break in the bed of a river produces a waterfall.
b) A band of resistant rock with a vertical face overlying less resistant rock produces a waterfall when it is exposed at the surface by river erosion can also result in the development of a waterfall.
c) A rapid is formed if the rock lies at a steep angle but is not vertical.
d) A waterfall can also develop when resistant rock overlies a less resistant is horizontal or dips gently up river.

e. A rapid might be formed first in such instances but continued erosion at the base of the pool will resulting into the rapid developing into a waterfall.
f. A rapid develops when the resistant rock, overlying a less resistant rock dips gently down river.





The Victoria Falls are the widest falls in the world.

- They may have developed as a result of the river Zambezi uplift of an almost horizontal basaltic plateau.
- Where a river flows across a line of weakness it erodes vertically to form a waterfall.

The Victoria Falls may also have been formed in this way.

- It has retreated upstream along fault lines and might cease to exist one day.
- A river might descend the scarp in areas of faulting resulting in a waterfall at the knickpoint.
- A waterfall may also be formed where a river descends from a highland area (for example a plateau) into a lowland area.
- A river might erode backwards to undercut and divert the water of a neighbouring stream and the point of capture is marked by a waterfall.
- An example is the Pungwe Falls which marks the point where the Pungwe River captured the waters of the Nyakupinga River which is a tributary of the river Odzi in the Eastern Highlands.

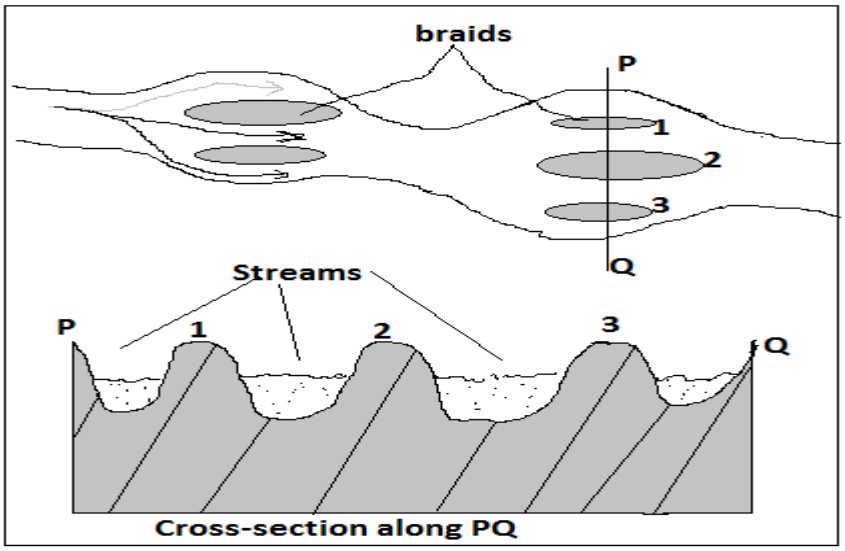
Plunge pool

- Is deep pool that is formed at the base of waterfalls due the swirling water eroding the base of the waterfall via hydraulic action and corrasion aided by bits of the hard rock that falls into the pool and becomes part of the load and the eddying and turbulent motion of the water at the base.
- As the undercutting continues the waterfalls migrate upstream.

Braided channels

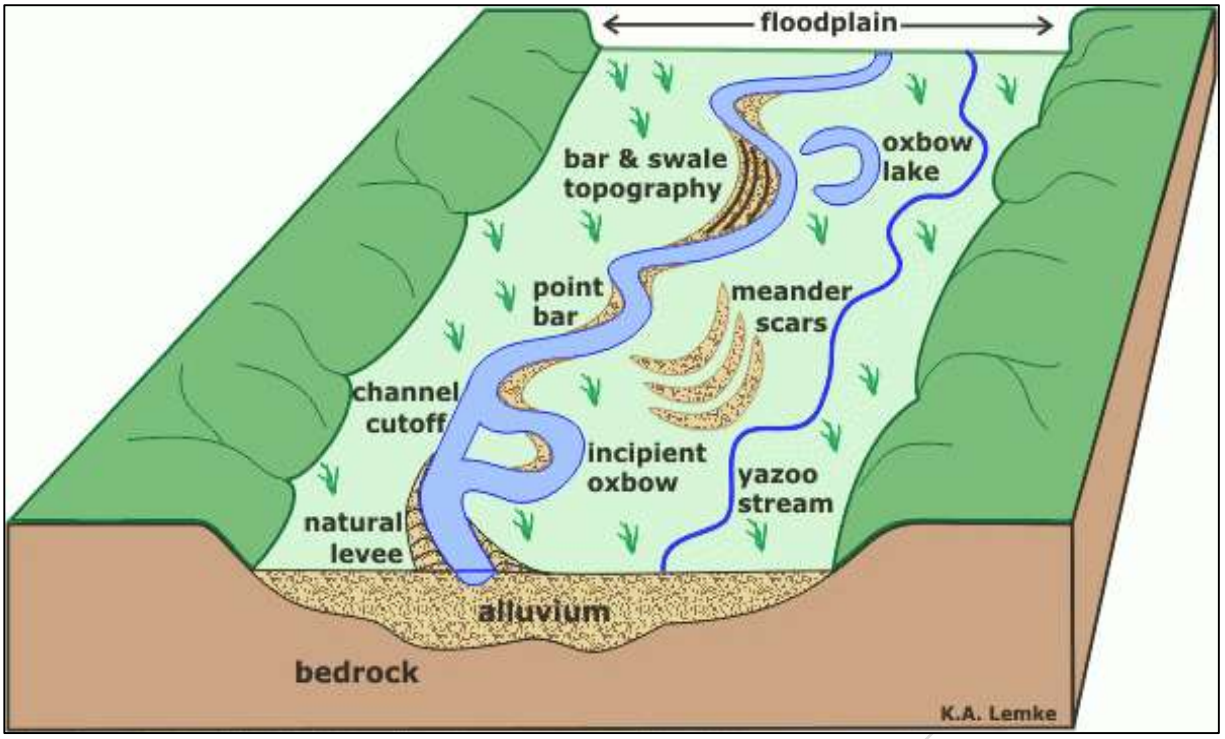
Qn. What are braided channels? (2)

Describe how braided channels are formed with reference to the diagram below (8).



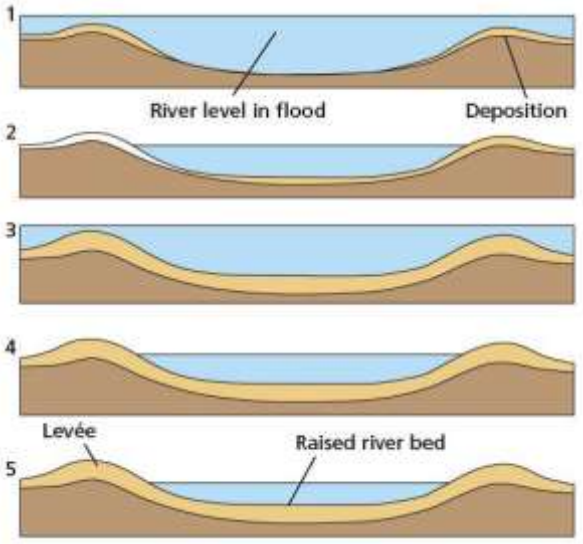
Floodplain

- These are typically found in the middle and lower course sections of the river.
- They are gently sloping surfaces of alluvium that result from lateral erosion and material deposited onto the valley floor.
- A flood plain commonly has the following river features alluvium, marshes, meanders and ox-bow lakes which are remnants of cut off meanders.
- When a river is in flood it overflows its banks and covers the whole plain upon which it deposits some of its load.
- The continual deposition results in the formation of levees.



Leeves

- These are ridge like features resulting from deposition.
- Flood plains may become so large and wide the edges of the meanders may not be able to reach the sides of the valley for example the Nile River and the (Yellow River) Huang Ho.
- In meanders both lateral and vertical erosion takes place resulting in the removal of the original floodplain and the formation of a new one.
- The pieces that survive the erosion form terraces which have varying heights and often times the heights of terraces might not match those on the other side.
- This differentiates these terraces from the ones formed by river rejuvenation.
- The river Benue has a well-developed flood plain.
- It is important to note that floodplains are both a depositional and erosional feature.
- Natural terraces resulting from successive erosion of floodplains.



Levees and tributaries with deferred junctions

- Flooding causes deposition to take place on a river's banks because the water is slower there and therefore has less energy to transport the load.
- As already said above, continued flooding results in the formation of raised banks.
- These ridges are known as natural levees.
- Most flooding takes place at the edges of the channel since the water is slower
- The river then flows above the level of the floodplain which causes tributaries to defer joining with the main stream.

- Tributaries flow parallel to the river, with some flowing into depressions resulting into swamps, while others eventually join the main river further downstream forming what are known as deferred junctions.
- Rivers that flow above the flood plain present great risk of flooding to nearby settlements for example the (Yellow River) Huang Ho in China and the Mississippi in the United States.

Swamps/Marshes

- This is stagnant water that is clogged with water loving vegetation.
- They occur in the flood plain due to frequent flooding and where tributaries fail to enter the main stream (i.e. deferred junctions where a tributary flows over a depression).

Bluffs (see diagram on flood plain)

- This is a prominent slope that mark the edge of a floodplain.
- These steep promontory cliffs are sometimes found on the outside bend of a meander.

Oxbow lakes

- An oxbow lake is a U-shaped body of water that forms when a wide meander from the main stem of a river is cut off, creating a free-standing body of water.
- This landform is so named for its distinctive curved shape, resembling the bow pin of an oxbow. Development of Ox-bow lakes.
- Ox-bow lakes form when an acute meander leaves a narrow neck separating the two ends of a meander.
- Active lateral erosion takes place on the outside bends and break through this neck especially during floods.
- In flood the cut ends are sealed off by deposition and the meaner becomes an ox-bow lake.
- The banks are steadily raised by depositions resulting tin the river lying above the level of the lake.
- The lakes gradually lose water as vegetation and sediment fill them up.

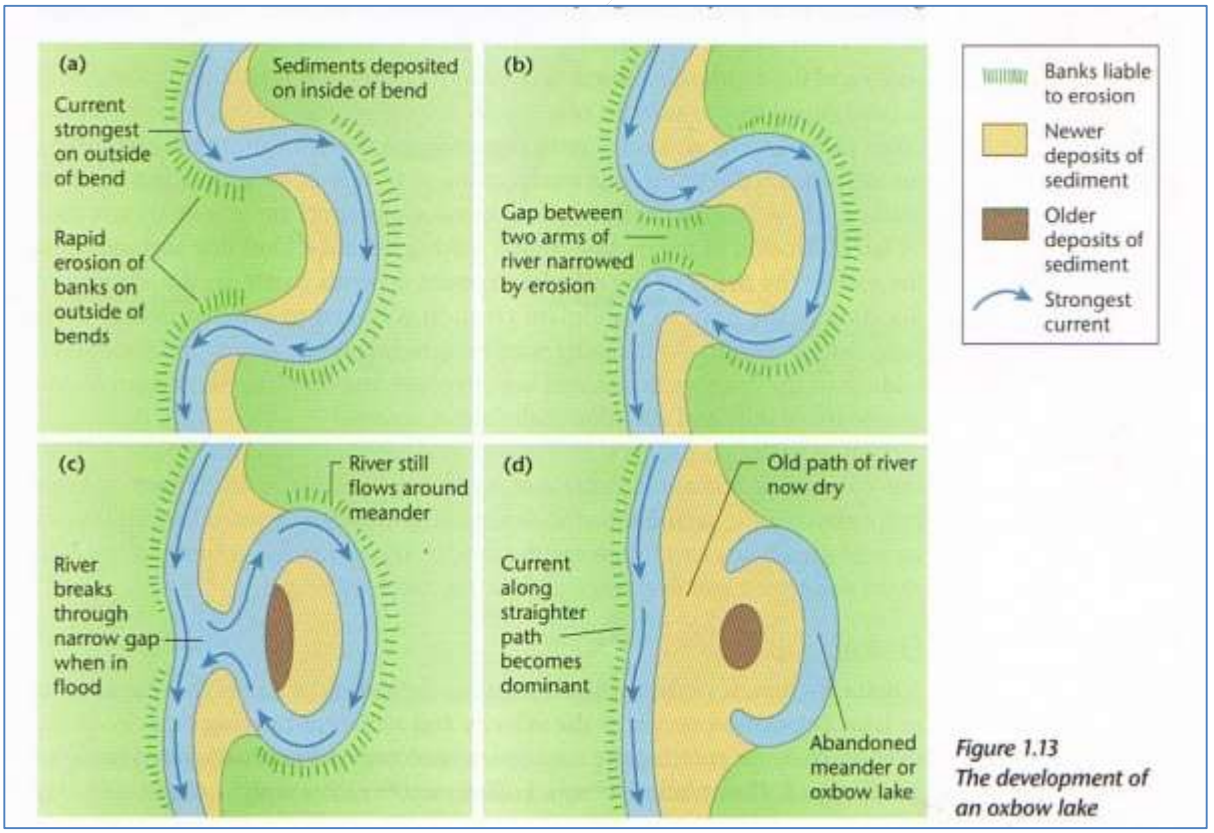


Figure 1.13
The development of an oxbow lake

Deltas

Low lying tract of alluvial deposits formed at the river's mouth.

Ideal Conditions for Formation of a Delta at a River`s Mouth

1. Large load such as from a large catchment area where erosion is taking place actively.
2. The rivers course to be free from obstacles such as swamps so as not to filter sediments before they reach the mouth.
3. Low speed at the point where the river is entering a sea or lake for deposition to take place.
4. The rate of deposition should be higher than the rate of erosion by sea or lake currents.

How a Delta Forms

- The speed of the river is checked by sea or lake.
- Heavy load is first deposited.
- Lighter load is carried further into the sea causing that part of the sea to become shallower.
- The part is colonised by plants making it swampy but firmer.
- Plants trap more alluvium making the delta to grow in height.
- The river builds levees making it narrower.
- The river burst its banks and small channels branch off the main river and carries water into the sea or lake (distributaries).

Types of Deltas

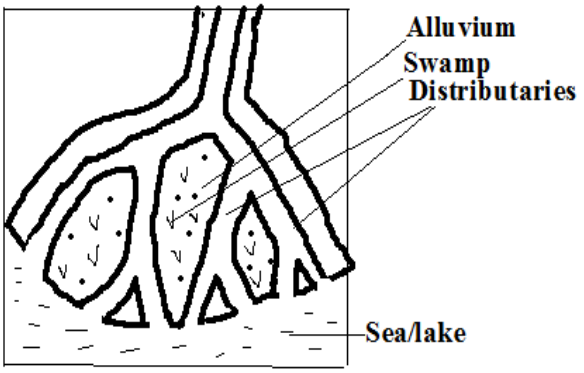
1. Marine: Type formed at sea.
2. Lacustrine: at a lake.
3. Inland Delta: Deltas which form along a rivers course before it reaches the lake or sea.

Formation

- The velocity of the river is checked on entering a relatively flat swampy land.
- The river builds up levees.
- The river bursts banks forming distributaries.
- Alluvial deposits are spread over vast areas when river floods e.g. Niger and Okavango deltas.

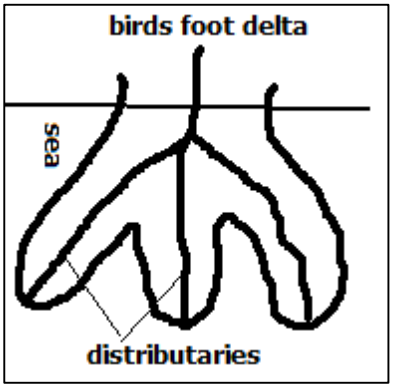
4. Arcuate Delta

- A delta with a convex shoreline on the seaward end due to strong currents spreading materials over a wide area on seaward side.
- Has many distributaries e.g. Tana and Rufiji deltas.



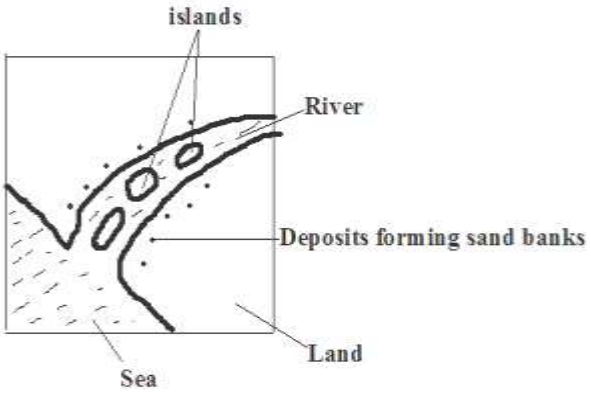
5. Bird`s foot

- Type of a delta with a pattern resembling the
- Has few distributaries.
- Formed on a river carrying large quantities of fine alluvium into water where there is low wave energy e.g. Omo and Mississippi deltas.



6. Estuarine Delta

- The rivers load is deposited on the estuary when the speed is checked by sea.
- The river cuts across in a single channel that may be bordered by levees e.g. on R.Volta in Ghana and on R. Zambezi.



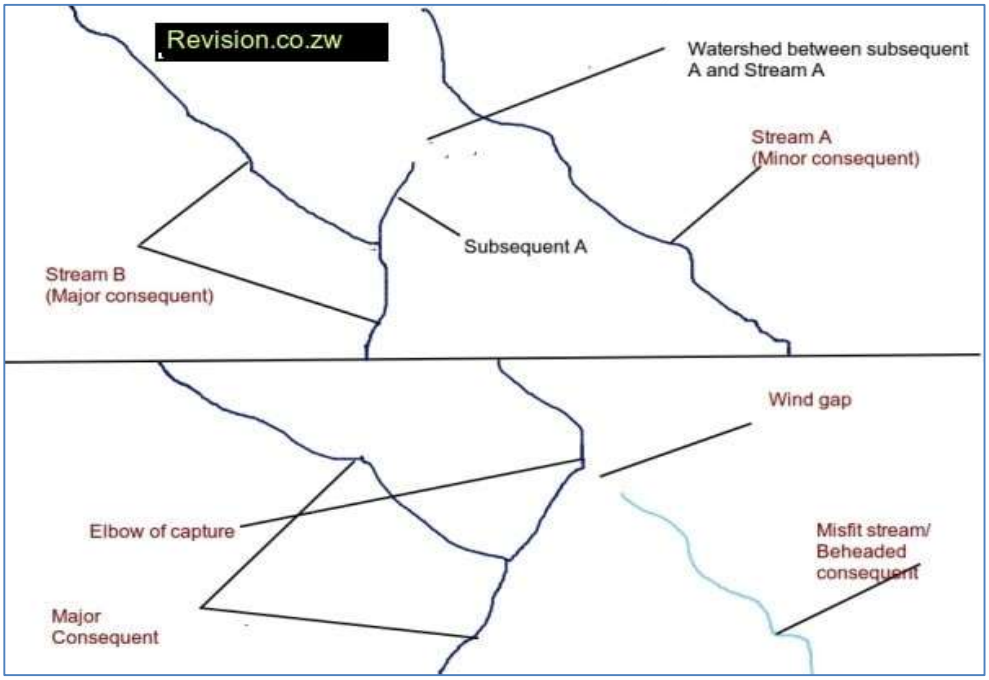
Home work

Qn 1 (a) what are braided channels? [2]

(b) describe the formation of braided channels. [4]

River capture

- This is a process where one River captures the headwaters on a nearby stream.
- This can occur due to several reasons viz:
- Tectonic earth movements, where the slope of the land changes, and the stream is tipped out of its former course.
- Natural damming, such as by a landslide or ice sheet.
- Erosion, either: headward erosion of one stream valley upwards into another, lateral erosion of a meander through the higher ground dividing the adjacent streams.
- In an area of karst topography, where streams may sink, or flow underground (a sinking or losing stream) and then reappear in a nearby stream valley.



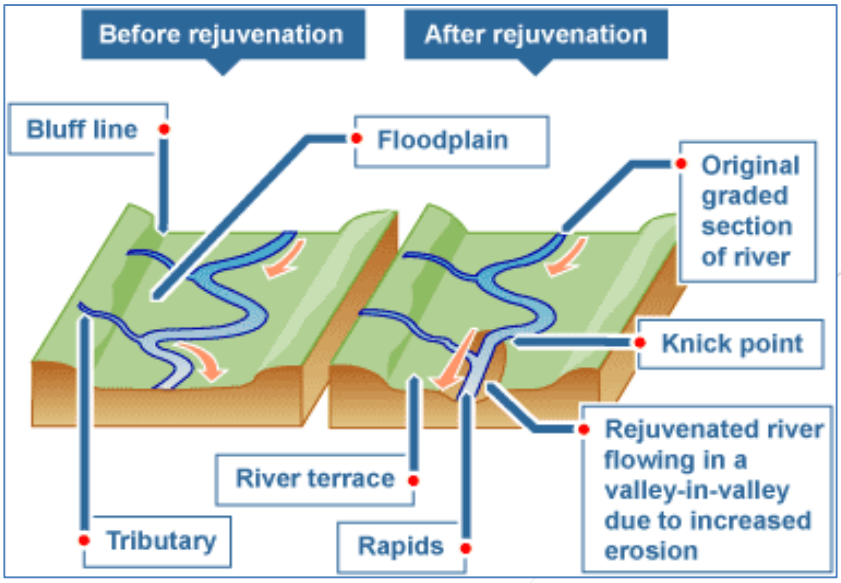
The process:

The diagram above shows how river capture can occur.

- There are two consequent rivers: Stream A and B and Stream B has a tributary (subsequent A)
- Stream B has higher discharge and thus higher erosional activity than stream A.
- Stream B might also have a lower base level and thus increasing its ability to erode.
- Subsequent A migrates upstream (headward erosion) until it reaches Stream A's channel.

- Through a process known as watershed migration Subsequent A enlarges its own drainage basin at the expense of Stream A.
- In time because Subsequent A and Stream B have a lower base level the headwaters of Stream A will be captured and diverted into Subsequent A.
- The point at which the headwaters of the minor river change direction is known as the elbow of capture.
- Below this point a wind gap marks the former course of the now beheaded stream or misfit stream.
- A misfit stream is a river whose headwaters were captured resulting in the stream flowing in a valley that is too large to be accounted for by the low discharge.
- A knick point and waterfall might form at the elbow of capture especially if the base level of the capturing river is far lower than that of the beheaded stream.

Rejuvenation



- Occurs when there is a negative change in a river's base level (i.e. when the river's base level falls) which increases its potential energy and thus enables it to revive its erosive energy in the processes.

- A river's base level is the lowest point to which a river can erode.
- A negative change in a river's base level may be brought about by vertical uplift (for example isostatic uplift) or by a fall in the level of the sea for example due to tides.
- This change renews a river's ability to erode due to an increased gradient.
- A rejuvenated river erodes vertically into the floodplain to produce new features that are different from those typically found in the flood plain.

Landforms resulting from rejuvenation

- Rejuvenation produces several features including: incised meanders, terraces and waterfalls/knick points.
- River terraces and incised meanders
- River terraces are remnants of former floodplains.
- Which following vertical erosion brought about by rejuvenation have been left high and dry above the current and present-day flood plain.
- If a river quickly erodes and cuts quickly into the floodplain a pair of terraces of equal height may be seen flanking the flood plain creating a valley into a valley feature known as paired terraces.
- Sometimes the river does quickly cut into the flood plain, allowing it to meander, resulting in one terrace being removed as the meander migrates downstream.
- This results in the formation of unpaired terraces.
- If uplift continues for some time, incised meanders may form.
- These are meanders that have been cut deeply into the valley floor.
- Incised meanders are also known as entrenched meanders.

Knickpoint, rapids and waterfalls.

- Sometimes the point where the uplift occurs can be visible especially when the uplift or fall in base level is rapid.
- The point where the river crosses from the old plain into the new plain is known as knickpoint.
- A river may have to descent this knick point as either a rapid or waterfall.

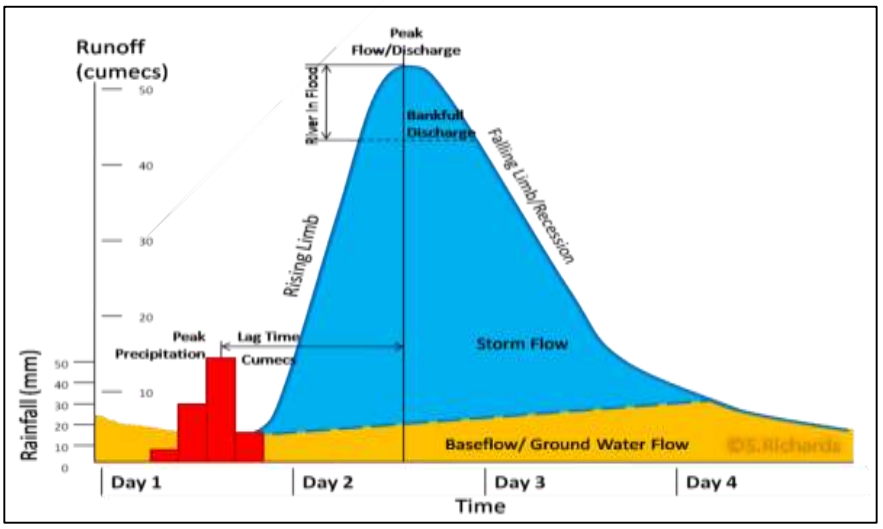
River regime

- A river regime is the term used to describe the annual variations in a specified river's discharge.
- A river's discharge is the volume of water flowing through a river channel.
- This is the total volume of water flowing through a channel at any given point and is measured in cubic metres per second.
- Sometimes this measure/unit is known as cumecs.
- A river's regime is shown on a graph called a hydrograph.
- A hydrograph shows the discharge of a river as well as total rainfall in the river's basin/catchment area over a period of time, before, during and after the storm.
- It allows for a relationship between the rainfall falling in a river's catchment area and the river's discharge.
- Such information can be used to, for example, predict the risk of flooding in a given area after a storm event.

Hydrograph

- As already said a river's regime is shown on a storm hydrograph.
- During a storm most of the rain falls onto the land rather than directly into the river.
- The water then will make its way into the river and you can use a hydrograph to see how quickly this occurs.
- By looking at the peak rainfall and comparing it with the peak discharge you can work out the lag-time (the time between the two peaks).
- Different catchment areas will have different flood hydrographs.
- A river's regime is shown on an annual hydrograph with all the months listed.

Characteristics of a hydrograph



- Peak discharge-shows the maximum amount of flow in the river.
- Peak rainfall-the maximum amount of rainfall and when it fell.
- Lag time-the difference between the peak rainfall and the peak discharge i.e the time it takes for the rain to reach the river.
- A rising limp which shows a rise in discharge.
- A falling limp which shows a fall in discharge.

Factors affecting a river's regime.

- Seasons- there will be a rise in discharge during summer/rain months and a fall in discharge in the dry months when there is little rainfall. There will be a lag time as water moves through the ground and from storages into the stream.
- Climate-rivers that pass through Mediterranean climates tend to have more than one peak period as they have another surge in discharge during the winter months when these regions receive their rains.
- The same is also true of rivers that pass through areas that experience snow for example the Nile's famed floods are due to snow melting in the Kilimanjaro mountains resulting in peak discharge even in the hot dry months as water moves from snow storage e.g. glaciers into the streams.
- Geology for example rivers that flow through porous and pervious rocks tend to have smaller peaks/small changes in discharge as opposed to rivers in granite (non-porous and impervious) rocks.
- Human activities for example urbanisation results in more impervious surfaces and very high peaks, short lag time and higher peaks (differences between the lowest and highest discharge.)

Wind action

- Wind action in deserts are also known as aeolian processes.
- Wind is responsible for eroding, transporting and depositing materials in deserts.

Wind erosion

- Wind is a process where the wind detaches soil particles from the land surface and transports them by its force along the surface of the ground.

Erosion

- Wind erosion involves three main processes: deflation, abrasion and attrition.

a) Deflation

- This is the progressive removal of fine material by wind leaving reg landscapes behind.
- By blowing away sand and other rock waste, the wind lowers the desert surface producing depressions known as closed depressions or deflation hollows.
- Because the finer material is composed of smaller particles, it is lifted off and carried away by the force of the wind.
- The deflation process provides the supply of sand used to build up sand dunes in other parts of the desert.
-

b) Abrasion

- is the sandblasting action produced by materials during saltation as they are transported by wind.
- This process smooths, pits, polishes and wears away rocks that are close to the ground.
- Since sand particles cannot be lifted up very high off the ground the zone of maximum erosion tends to be within about 1 meter from the desert surface.
- This sometimes results in undercutting of effects on rocks.
- Large rocks are polished on their windward sides and rocks that are not uniform like granite are turned into spongy, pitted, rough surfaces due to some minerals being softer than others.
- Pebbles and small rocks are shaped into ventifacts with polished windward sides. see diagram above.

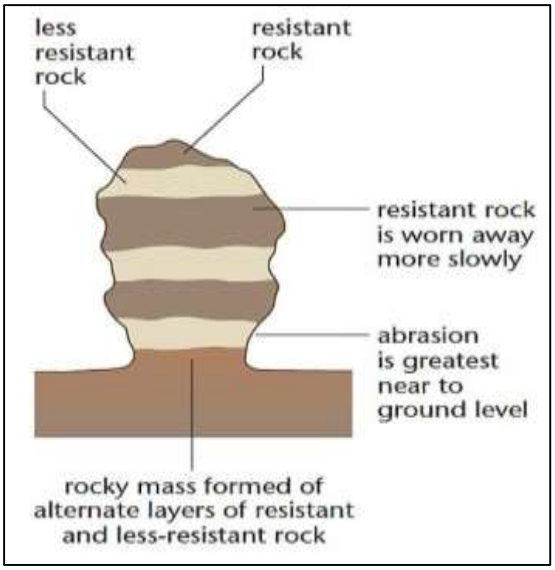
c) Attrition

- Is the process by which large rock particles roll and rub against each other and wear away.
- This happens during the wind transportation processes.
- This process produces sand particles that are rounded into particles about the size of millet seeds.

Landforms produced by wind erosion

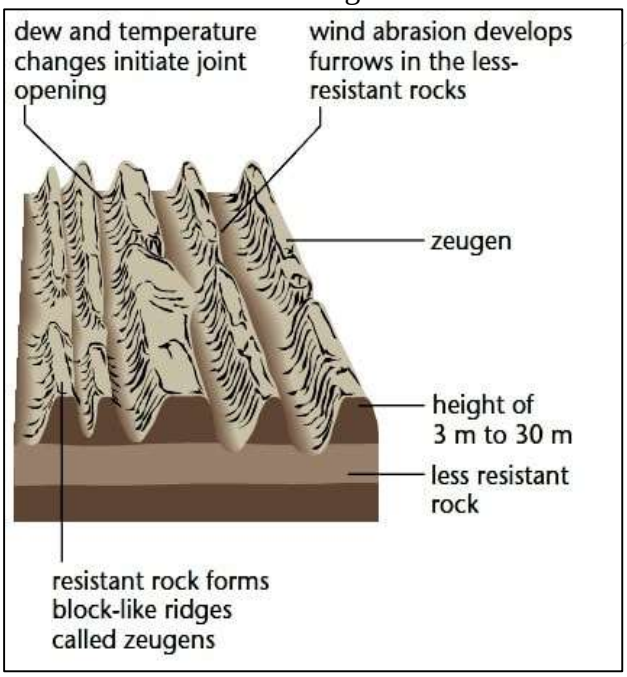
Rock pedestals

- Wind abrasion attacks rock masses and sculptures them into strange shapes.



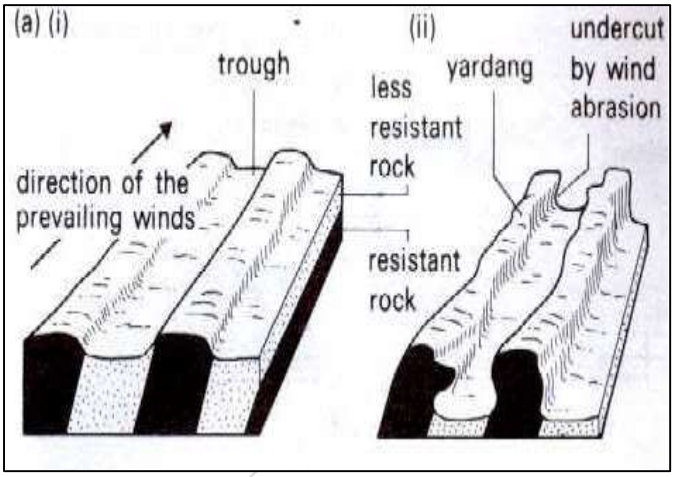
Zeugen

- Wind abrasion turns a rock surface with layers of horizontal resistant rock underlain a non-resistant rock into a ridge and furrow.



Yardang

- Develops when bands of hand and soft rock lie parallel to prevailing winds, wind abrasion produces a ridge and a furrow e.g. Salah in Algeria.



Landforms by wind deposition

Sand dunes

- As soon as wind velocity drops wind deposition occurs.
- The heaviest material is deposited first while the finer material and dust is carried further before being dropped.
- As a result loess (which consists of fine particles) is sometimes deposited thousands of kilometers from deserts.
- Large mounds of sand result from sand depositions within the desert.
- These result in the formation of erg landscapes such as those found in the Sahara.
- Three major types of features result from wind deposition and form part of the erg landscape: sand ripples, barchan dunes and seif dunes.

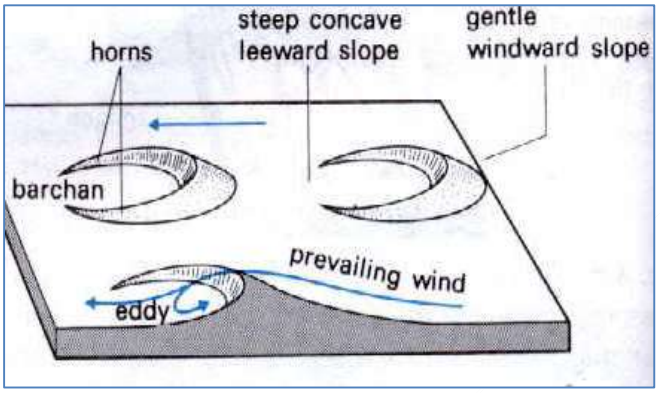
Sand ripples

- These are small wave-like features which develop on sand which move easily.
- They range from a few centimeters to about a meter in height
- They are often temporary and suffer destruction when the wind changes direction.

Sand Dunes

- These are hills of sand which are found in a variety of shape, size and direction.
- Dunes develop when sand grains moved by saltation and surface creep are deposited (remember suspension material forms loess which is deposited outside deserts).
- Some dunes, but not all, form around obstacles such as trees, bushes, rocks, a small hill or even a dead animal.
- Most dunes form on areas that are flat and sandy rather than those areas that are rocky and uneven.
- Dunes vary in size from a few meters to over a 100 meters in height.
- Although they take many shapes, there are two common types of dunes: Barchan and Seif dunes.

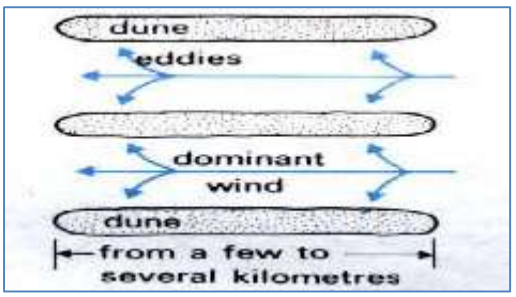
Barchan



- A barchan dune is a small crescent shaped dune.
- It has a height can range from a few meters to about 30 meters in height and it can be 400 meters wide.
- They lie at right angles to the prevailing wind.
- It has its "horns" pointing downwind.
- They usually form around an obstacle such as a rock, piece of vegetation or even a dead animal.
- As the mound, which is wind ward grows due to continued sand depositions,
- Its leading edges are slowly carried forward in a downwind direction.
- The windward slope of the dune is gentle.
- The downwind side is steep and slightly curved.
- This is caused by eddies that are set up by the prevailing wind.
- A barchan dune moves as grains of sand are moved up the windward slope to fall onto the leeward side.
- They can occur both singly or in groups.

Seif dunes

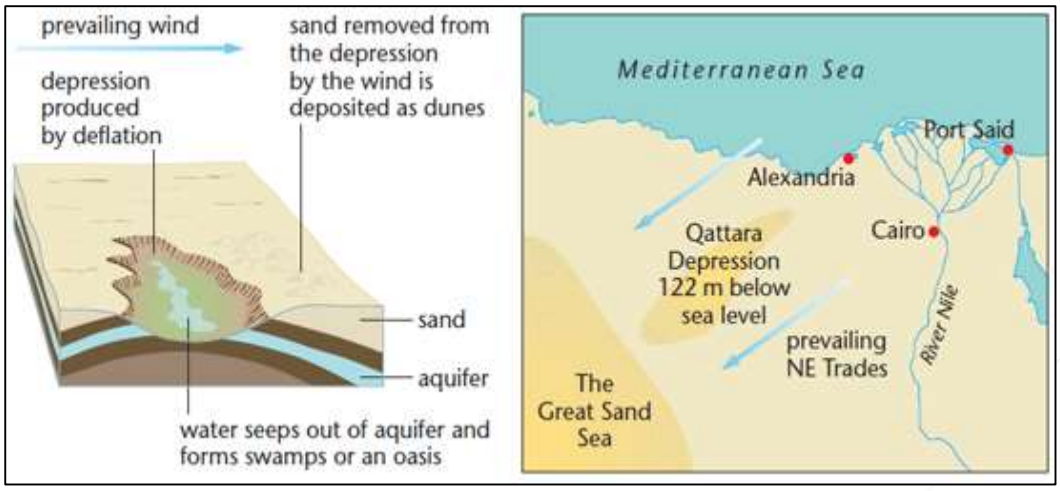
- Are also known as transverse dunes, linear dunes.
- They are ridge-shaped with steep sides and lie parallel to the prevailing wind.
- They are also formed and appear parallel to each other.
- A seif dune has a sharp crest which may be a 100 meters in height and they can stretch for up to 150 kilometers in length.
- They are separated by flat corridors which are between 25 and 400 meters wide.
- These corridors are swept clear of sand by the prevailing wind.
- Eddies blow up against the sides of dunes and drop deposit sand that is added to the dunes.
- They usually develop from small sand ridges.
- They slowly move forward in the direction of the prevailing wind as they move forward.
- They feature in parts of the Namib Desert and the Sahara Deserts as well as other deserts.



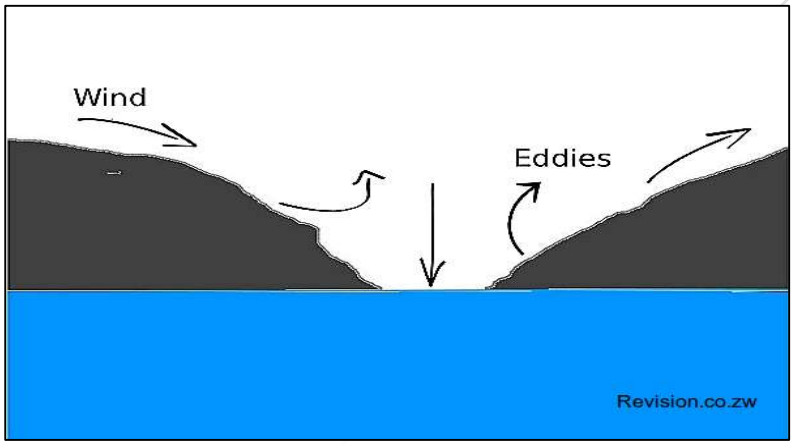
Deflation hollows

- Are also known as closed hollows or blowouts
- These are enclosed depressions caused by wind erosion.
- In deserts the wind erodes loose material from flat areas which have, uncemented sediments such as those occurring in tropical deserts.
- Deflation hollows develop in areas where the transported materials is deposited.
- As already mentioned deposition occurs when the wind meets with an impediment.
- Deflation hollows are usually formed on surfaces patches where the protective vegetative cover has been lost for example due to human activities or periods of extended droughts.
- Since that portion becomes unprotected, the wind deflates and scours continuously at relatively unconsolidated material,
- The material is deposited on the edges of the hollow that are still protected by vegetation such as marram grass.
- The removal of the fine particles the lowering of the landform leads to the formation of a depression.
- An example is the Qattara Depression
- Sometimes water that falls in these depression hollows during freak storms collects to form pools in the midst of deserts providing an essential source of water for local ecosystems, animals and humans and their activities.
- If an area is eroded down to the water table, further deflation is prevented unless the water table is also lowered by evaporation.

The Qattara Deflation hollow



A diagram showing the formation of deflation hollows.



- Some oases in the Sahara were formed in this manner and may be below sea level.
- Dunes are made from sand that is deposited at the leeward side of the wind.
- Some deflation hollows may be formed in part due to the presence of faults within the rocks which are exploited and widened by weathering and the regolith removed by wind erosion.
- Note: all oasis are formed by deflation some are naturally occurring springs and some result as a result of freak storms and the underlying geological rocks limiting the amount of infiltration.

TOPIC 3

ECOSYSTEMS-SOILS

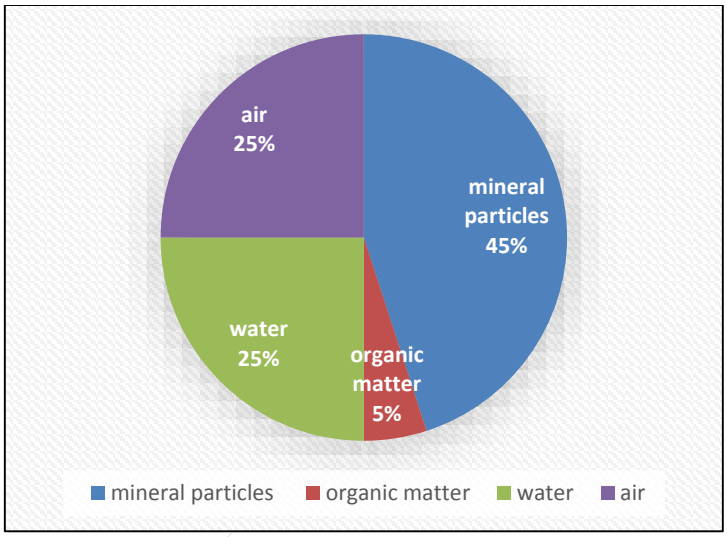
The Soil

- Soil is the upper layer of the earth surface where planys and animals live.
- Is made up of rocks break down to form small particles.
- Is important for plant growth as it provides water, air and minerals.

Soil components

- Soil contains water and air in the spaces between particles.
- It also contains living organisms such as worms termites and bacteria for decomposition of plant and animal remains.

The soil composition is shown below:



Soil Formation

Factors Influencing Soil Forming Processes

a) Parent Material

- Determines the type of soil, mineral composition and texture e.g. granite and sandstone weather to form sandy soils rich in quartz, volcanic lavas form clay soils with low quartz content and plants decompose to form loam rich in humus.

b) Climate

- Affect rate and type of weathering e.g. heavy rainfall results into deep soils due to heavy weathering and leaching.

- Wind in deserts causes formation of loess soils.

c) Living Organisms

- Micro-organisms such as bacteria cause plant and animal remains to decay into humus.

- Burrowing animals and worms mix organic remains with mineral soil component.

- Roots penetrate and add more porosity, improve soil depth and aeration.

d) Topography

- There is maximum soil development in rolling and well drained uplands where the rate of erosion matches that of soil erosion.

- Steep slopes result in shallow immature soils due to severe erosion.

Time

- The longer the time taken by soil forming processes the deeper and well developed soil is

Soil Forming Processes

1. Weathering

- Breakdown of parent rock to form rock particles called regolith.

2. Decomposition of Organic Matter

Processes

a) MineraliSation

- Biological and chemical breakdown of dead plant tissues by soil micro-organisms to simple soluble organic substances.

b) Humification

- Regrouping of mineralised dead plant material into large molecules to form humus.

3. Leaching

- Carrying of minerals from top layer down to the middle layer.

Types

i) Ferralisation/lateralisation

- Moving in solution or in suspension of weathered material from horizon "A" to "B."

- Red soil form in horizon A as ferrisols/laterites (murrum).

ii) Illuviation

- Accumulation/redeposition of materials which had been leached to horizon B.

- Hard soil mass (hard pan) results.

iii) Eluviation

- Mechanical washing down of fine mineral particles in suspension from upper layer to lower layers by water which is percolating downwards. e.g. clay

iv) Podzolisation

- Heavy depletion of horizon A of all minerals especially bases and iron by soluble organic substances.

- Forms ash like soils which are acidic.

v) Calcification

- Limited leaching which allows redeposition of calcium compounds within the same soil profile.

vi) Ribification

- Dehydration of soils during dry season and leaching during the rainy season

Properties and Characteristics of Soil

a) Texture

- Composition of soil in terms of its particles.

SOIL CLASS	PARTICLE DIAMETER
Gravel	More than 2mm
Coarse sand	0.2 - 2mm
Fine sand	0.2 - 0.02mm
Silt	0.02 - 0.002mm
Clay	Below 0.002mm

Can be coarse/gritty (sand), medium (loam) or fine (clay).

Importance

a) Determines soil water retention by that coarse grained soils have poor retention while those fine grained have high water retention.

b) Influences ease of root penetration into the soil whereby it is easy on coarse textured and difficult in fine textured.

c) Determining soil fertility in that clay content prevents humus from being washed down the soil by water.

b) Structure

- Arrangement of soil particles into aggregate compound particles.

Types

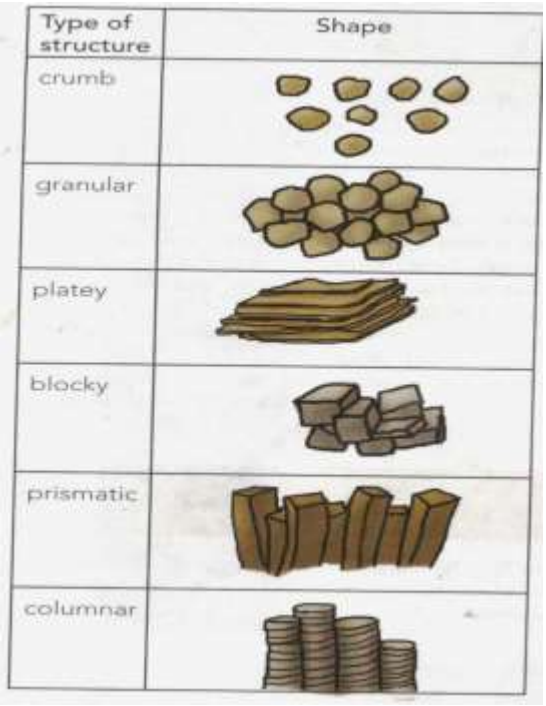
i)Crump soil structure - soil made of small, soft, groups of particles of irregular shape.

ii) Granular structure - soil made of porous groups of particles of irregular shape called granules.

iii) Plate structure - soil made of plate like flat particles arranged in horizontal manner.

iv) Prismatic structure - soil made of vertical prism like particles with rounded tops.

v) Blocky structure - soil made of irregular pieces of soil with sharp corners and edges.



Importance

Helps to determine:

a) The rate at which soils absorb water.
b) How vulnerable the soil might be to soil erosion.
c) The volume of air and water the soil can hold.
d) The ease with chich the soil can be worked or ploughed.

c) Soil PH

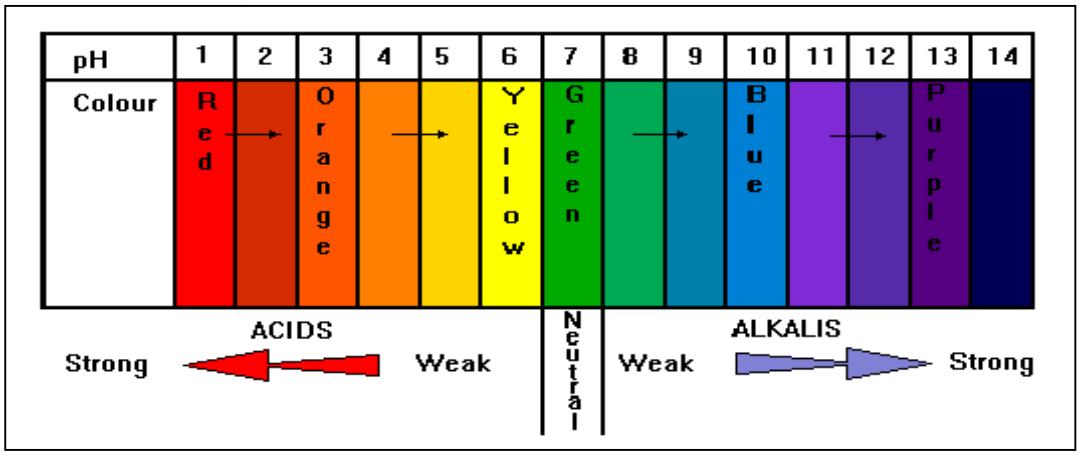
- Basicity or acidity measure of a soil.

- Sulphate/phosphate - acidity due to low lime / low calcium.

- Calcium/magnesium - Basicity due high lime content.

-Soil pH is measured using a pH scale which runs from 1 to 14.

-the neutral point is around 7, values below 7 indicate an increase in acidity and values above 7 show increasing alkalinity.



Importance

i) Influences the activity of soil micro-organisms and hence decomposition of organic matter.

ii) Influences rate at which roots absorb minerals.

iii) Determines the types of crops to be grown e.g. tea-acidic.

iv) Determines availability of different nutrients to the plants e.g. phosphorous is not available at low PH while potassium and iron not available at high PH.

d) Soil Colour

- Visible quality of soil.

-Gives clues regaring the soil composition and origin.

-Dark brown or black – high amount of organic matter.

-Red soils- rich in iron oxides.

-Brown is a mixture of red and yellow.

-Wind blown sand are yellow in colour.

-Grey-green soils - poorly drained or water logged.

-Whitish- lacks organic matter, iron oxides and has soluble salts concentration.

Importance

i) Influences soil temperature in that light coloured soils have low temperature and hence low organism activity.

ii) High temp destroy humus, increase organism activity and provide warmth required for germination.

e) Soil Porosity

- Amount of pore spaces in a soil sample.

Importance

i) Influences soil temperature in that light coloured soils have low temperature and hence low organism activity. High temp destroy humus, increase organism activity and provide warmth required for germination.

ii) Influence soil water retention. Clay has high retention and is water logged because it doesn‟t allow drainage due to many tiny pore spaces while sand has poor water retention due to rapid percolation caused by large pore spaces.

f) Soil Permeability

- Ability to allow the water to pass through.

Depends on texture and porosity. Clay is impermeable due to being fine textured and tiny pored while sand is permeable due to being coarse textured and very porous.

g) Soil depth

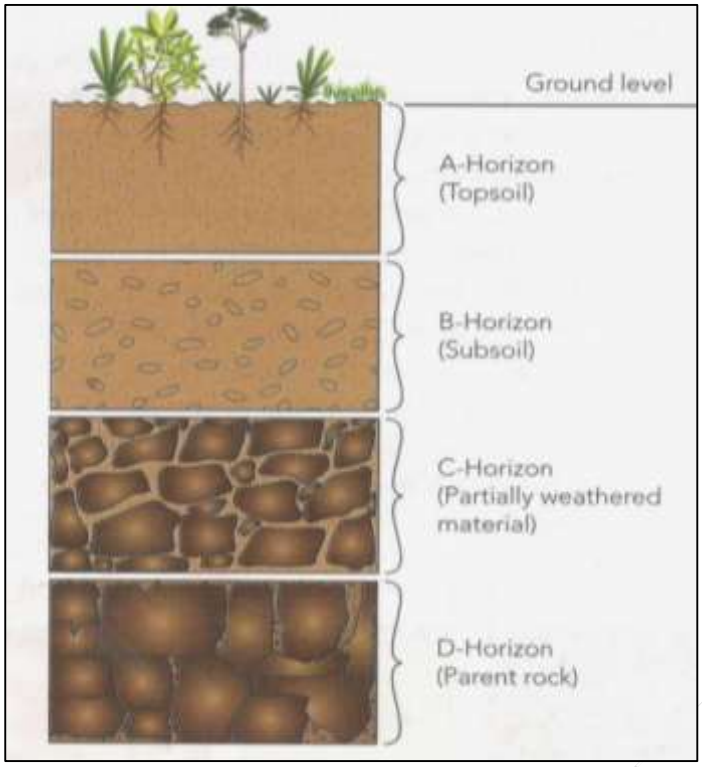
-soil depth is important to plants and farmers.

-deep soils support vegetation and farming activities while thin shallow soils are not good for planta nad farming.

- steep soils have thin / shallow soils than gentle / flat slopes.

Soil profile

-Mature soil is one with a fully developed profile while a young soil is one with a not fully developed profile.



Superficial layer

- Dry decaying organic matter covering the soil surface.

Horizon 'A'Top soil

- Lies under a mat of surface vegetation and raw humus.

- Darker due to high humus content.

- Contains most of plant nutrients.

- Where most plant roots are found.

- Contains active micro organisms which breakdown organic matter into humus.

-Leaching takes place under high rainfall hence refered to as the zone of eluviation. Define the term leaching.

Horizon 'B' Sub soil

- Lies below top soil with few roots and humus.

-Lighter in colour.

- Has small spaces between particles and hence less aerated.

- Has a hardpan or layer impeding drainage.

- it is the zone of illuviation where most materials washed from horizon A have accumulated.

Horizon 'C' Partly weathered or broken rock

- Lies below sub soil.

- Made of partly mechanically weathered rock.

- Product of bed rock or may have been transported.

Horizon 'D' Unweathered parent rock

- Solid underlying rock.

- May have ponds of water which can be used by deep rooted plants during dry season.

Importance of Soil Profile

a) Determines the crops to be planted i.e. mature soils favour deep rooted crops while young soils favour shallow rooted crops.

b) Bed rock determines the chemical properties of the soil such as PH and nutrients.

Soil types

-Soil types are identified using texture and these are sandy, clay and loam.

-Qn Describe the features of the soil types identified above. (9)

TOPIC 4

MAPWORK AND GEOGRAPHICAL INFORMATION SYSTEMS (GIS)

Geographic Information System (GIS)

- Is a computer-based system that provides the capabilities for input, data management (data storage and retrieval), manipulation and analysis, and output to handle georeferenced data.

Logic

- Is the reasoning conducted or assessed according to strict principles of validity.

Boolean Logic

- Is a form of algebra where letters and symbols are used to represent numbers and values in equations in which all values are reduced to either TRUE or FALSE.
- Boolean logic is important in computer science and GIS because it fits with the binary numbering.
- Binary means two numbers, each bit of information with value of either 1 or 0, but Boolean logic a bit has a value of either TRUE or FALSE.

Idea of Boolean Logic

- We start off with a statement, which we will call P, which is either TRUE or FALSE. It cannot be anything in between. This is called the law of the excluded middle. The statement is true, or it is false. For example, a person is either alive, or they are dead, there is no state in-between!
- We then form other statements, which are TRUE or FALSE, by combining our original statement with other statements using AND, OR and NOT.
- For example, if P is true then NOT(P) is false. So, if 'this is Zimbabwe' is TRUE then 'NOT(this is Zimbabwe)' is false. We often translate the logical expression into English as 'this is not Zimbabwe' and this makes it easier to see that it is FALSE, as our country is indeed Zimbabwe.

- We can write down arguments clearly in symbolic form in what are known as ***truth tables.***
- The rules for combining expressions are usually written down as tables listimg all the possible outcomes.
- The three fundamental operators are: ***AND, OR and NOT.***

P	Q	P AND Q
F	F	F
F	T	F
T	F	F
T	T	T

P	Q	P OR Q
F	F	F
F	T	T
T	F	T
T	T	T

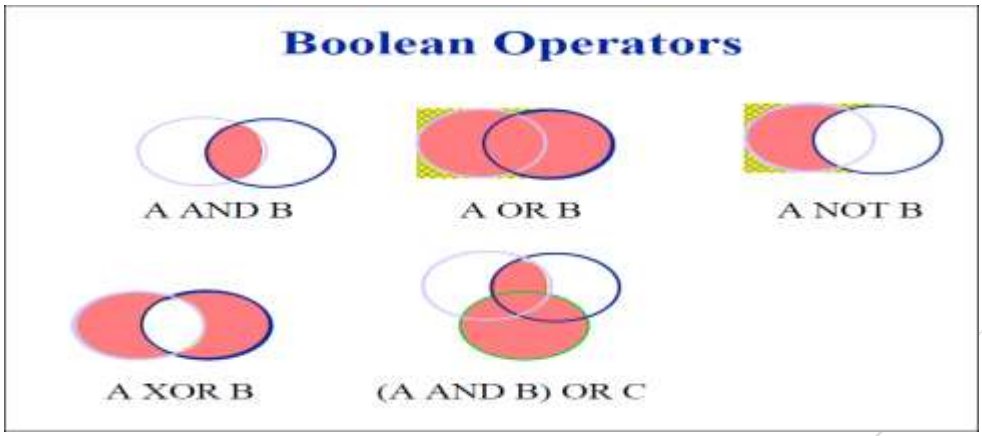
P	NOT P
F	T
T	F

- NB: the Boolean OR bit includes both.when P is True and Q is True, the combined expression is also True. OR is called the `EXCLUSSIVE OR ` written as EOR OR XOR as shown below:

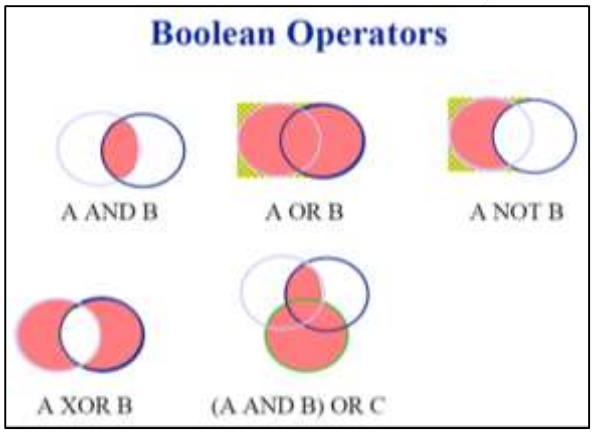
P	Q	P XOR Q
F	F	F
F	T	T
T	F	T
T	T	F

Venn Diagrams

- Shows the possible relationships between sets.
- Boolean algebra uses the logical operators AND, OR, NOT, XOR to determine whether a particular condition is true or false.
- These simple relations can be visualised through the use of Venn diagrams.

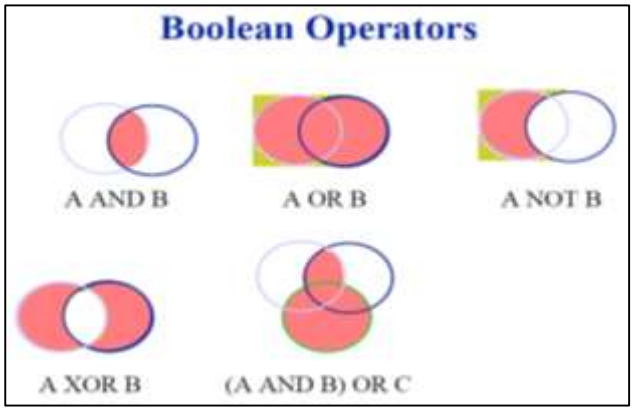


- Each attribute can be thought of as defining a set. Consider two sets (set A and set B);
- The AND operator (∩) is the intersection of two sets - for example those entities that belong to both set A and set B (A∩B)
- The OR operator (∪) is the union of two sets - for example those entities that belong to either set A or to set B (A ∪B)
- The NOT operator (¬) is the difference operator identifying those entities that belong to A but not B (A ¬ B) These simple relations can be visualised through the use of Venn diagrams



- Intersection, where the result includes all those polygon parts that occur in both A and B
- Union, where the result includes all those polygon parts that occur in either A or B, so is the sum of all the parts of both A and B
- Complement, where the result includes only those polygon parts that occur in A but not in B

- Exclusive or (XOR), which includes polygons that occur in A or B but not both, so is the same as (A Union B) minus (A Intersection B)



TOPIC 5

MINERALS AND MINING

Sustainable use of mineral resources

- Sustainable use involves careful and continued use of natural resources.
- The environment in which people live should be safe, clean and properly managed to achieve **sustainable development.**
- Exploitaion is the use of something else, be it a person or resource with no regard for impacts for that person or resource.
- Resources such as soil and water are renewable but minerals are non-renewable.
- For sustainable development, the 3 "R" should be applied. i.e. **Reuse, Recycle and Replace.**

Environmental Impact Assessment (EIA)

Simply defined, the EIA process helps identify the possible environmental effects of a proposed activity and how those impacts can be mitigated.

Benefits of the EIA Process

- Potentially screens out environmentally-unsound projects

- Proposes modified designs to reduce environmental impacts

- Identifies feasible alternatives

- Predicts significant adverse impacts

- Identifies mitigation measures to reduce, offset, or eliminate major impacts

- Engages and informs potentially affected communities and individuals

- Influences decision-making and the development of terms and conditions

Who Prepares an EIA?

Depending on the EIA system, responsiblity for producing an EIA will be assigned to one of two parties: (1) the government agency or ministry, or (2) the project proponent. If EIA laws permit, either party may opt to hire a consultant to prepare the EIA or handle specific portions of the EIA process, such as public participation or technical studies.

EIA Steps

1. Screening

The first step in the EIA process is the screening of projects.This is an evaluation of proposals

To findout which ones should be subjected to EIA and which ones should not.

In Zimbabwe, all projects listed in the First schedule of the Environmental Management Act

(CAP 20:27) are called prescribed activities and should undergo the EIA process before implementation.

2. Scoping

A scoping process identifies issues that are likely to be important during the detailed EIA phase

And eliminates those that are not.

It involves the interaction between the interested and affected parties, government departments and proponent(s) for identifying issues with respect to a proposed development.

3. Baseline study

From scoping, all the necessary information on the present state of the environment is collected. It provides a baseline against which possible imacts and change as a result of project can be measured.

4. Impact prediction

Impact prediction involves predicting the the likely changes to the environment as a result of the project.

5. Impact assessment

Assessment requires careful, expert interpretation and understanding of impacts so as to influence decision makers as to reject or let the project go ahead.

6. Mitigation

It involves taking measures to reduce or remove environmental impacts raised in the above stage.

7. Producing Environment Impact Statement

Is a formal document which sets out factual information relating to the development, the information gathered during all the above steps and monitoring measures.

8. EIA Review

The EIA Review Team drawn from EMA assesses the adequacy and quality of an EIAreport, taking into account project impacts and mitigation measures as well as public comments.

EIA review process also establishes if adequate and comprehensive information has been provided by the proponent.

Review also checks whether all relevant and sufficient stakeholders have been consulted during the compilation of the report.

9. Monitoring and audits

Monitoring is carried out to provide information that will aid impact management, thus helping the developer achieve a better understanding of cause effect relationship sand to improve EIA prediction and mitigation methods. EIA audits are used to identify the impacts of project

implementation; test accuracy ofi mpact predictions and effectiveness of mitigation measures and toi mprove compliance and performance of EIA practice.

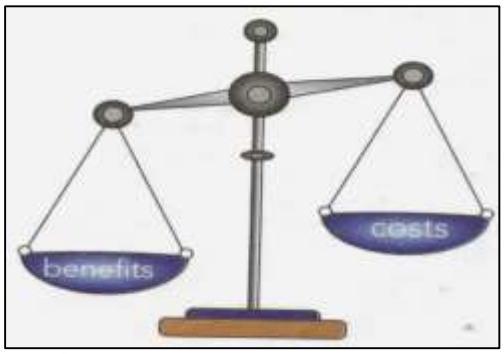
The importance of EIA in mining

- The mining is one area of economic activity where an EIA needs to be considered.

1. Encourage sustainable use of resources.
2. Helps reduce land and water pollution.
3. Helps to minimise climate change.

Cost Benefit analysis (CBA)

- It involves weighing up benefits against cost.
- If the scale tips one way, it is worth it. If the scale tips the other way, it is not worth it.
- This forms the bases of almost all business decisions.



Steps in Cost-benefit analysis

1. Make a complete list of costs and benefits of a new project. The costs include direct, indirect, unseen costs and costs of risks. Benefits include direct and indirect income, and unseen benefits e.g. increased production.
2. A unit of monetory measurement (US $) must be applied to all things on the list. Do not underestimate costs and overestimate benefits.
3. Compare the results of total costs and total benefits to see if the benefits outweigh the cost.
4. Lastly a decision is made to undertake a project or not.

Cost-benefit analysis problems

1. The bigger the project, the more complex the CBA.
2. Over long periods of time, the may be drop in demand for a particular mineral or an increase in production costs.
3. Interest and borrowing rates may change.
4. New technologies or methods of production may make the existing project obsolete.

Importance of the cost-benefit analysis in mining

1. A mine that is profitable today may not be in a few years`time.
2. It is very expensive to set up and operate a new mine .
3. For the sake of a country or environment, it would be irresponsible not to perform a proper CBA on any new or expanded. mining operation.

TOPIC 6

ENVIRONMENTAL MANAGEMENT

Environmental management at a global scale

Environment means:—
(*a*) the natural and man made resources physical resources, both biotic and abiotic, occurring in the
lithosphere and atmosphere, water, soil, minerals and living organisms whether indigenous or exotic and the interaction between them;
(*b*) ecosystems, habitats, spatial surroundings or other constituent parts whether natural or modified
or constructed by people and communities, including urbanised areas, agricultural areas, rural landscapes, and places of cultural significance;
(*c*) the economic, social, cultural or aesthetic conditions and qualities that contribute to the value of
the matters set out in paragraphs (*a*) and (*b*) (EMA 2002).

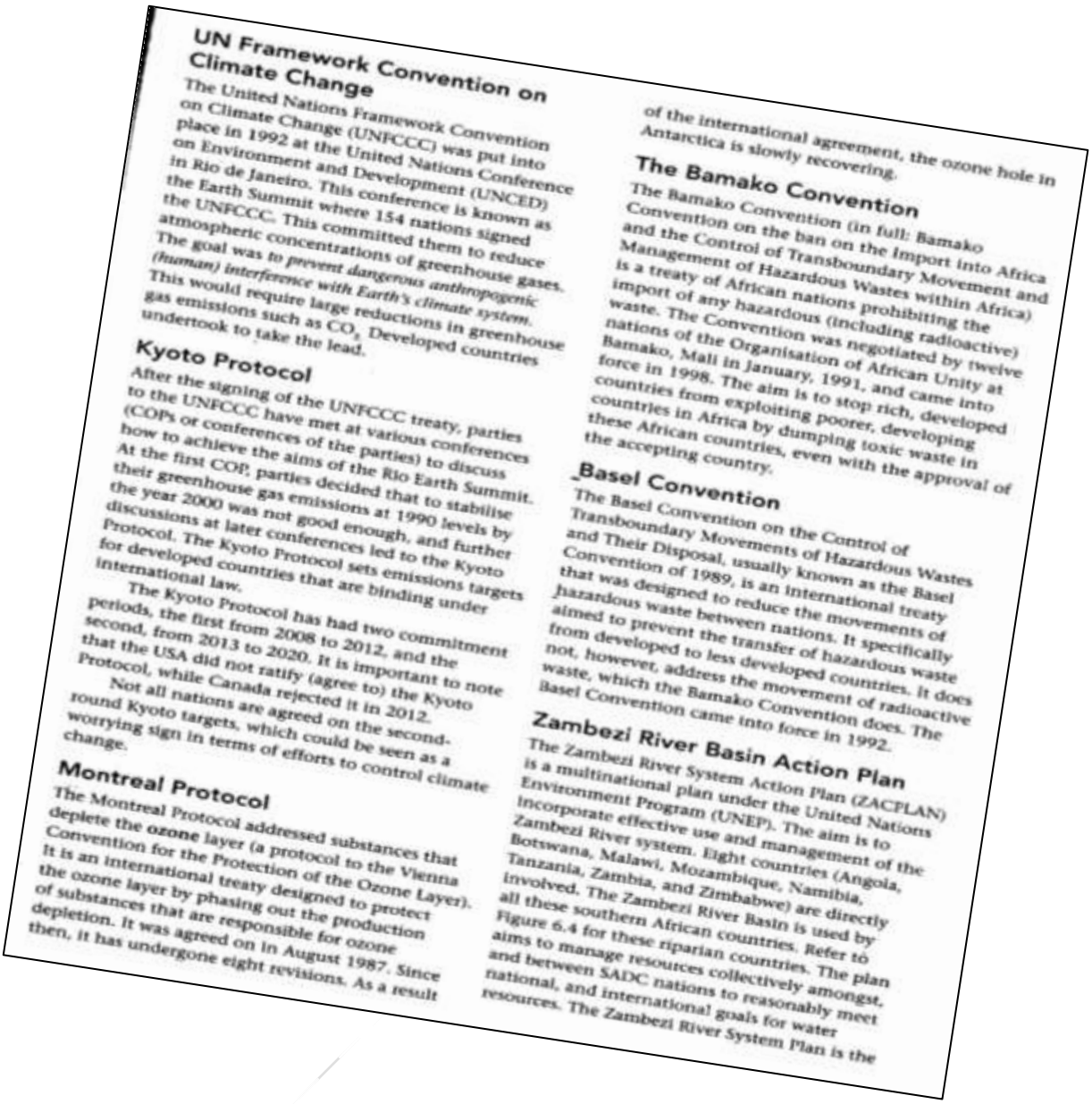
- Environmental management at a global scale deals with managing, conserving and using resources at an international level.
- An **open system** is one where energy and matter can move into or out of like a lake.
- A **closed system** is one where neither energy nor matter can enter or leave.

Current global environmental issues or problems

- Climate change
- Global warming
- Pollution
- Tropical cyclone, hurricanes and typhoons
- Drought
- Deforestation
- Veldfires

International protocols and treaties

- A protocol is an agreement that negotiators from different countries put together after discussion and form the bases for a treat or convention.
- A treaty is an agreement where the parties negotiate to reach a common ground and avoid further conflict or disagreement.
- QN: What is a convention? (2)



UN Framework Convention on Climate Change

The United Nations Framework Convention on Climate Change (UNFCCC) was put into place in 1992 at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro. This conference is known as the Earth Summit where 154 nations signed the UNFCCC. This committed them to reduce atmospheric concentrations of greenhouse gases. The goal was to *prevent dangerous anthropogenic (human) interference with Earth's climate system.* This would require large reductions in greenhouse gas emissions such as CO_2. Developed countries undertook to take the lead.

Kyoto Protocol

After the signing of the UNFCCC treaty, parties to the UNFCCC have met at various conferences (COPs or conferences of the parties) to discuss how to achieve the aims of the Rio Earth Summit. At the first COP, parties decided that to stabilise their greenhouse gas emissions at 1990 levels by the year 2000 was not good enough, and further discussions at later conferences led to the Kyoto Protocol. The Kyoto Protocol sets emissions targets for developed countries that are binding under international law.

The Kyoto Protocol has had two commitment periods, the first from 2008 to 2012, and the second, from 2013 to 2020. It is important to note that the USA did not ratify (agree to) the Kyoto Protocol, while Canada rejected it in 2012.

Not all nations are agreed on the second-round Kyoto targets, which could be seen as a worrying sign in terms of efforts to control climate change.

Montreal Protocol

The Montreal Protocol addressed substances that deplete the **ozone** layer (a protocol to the Vienna Convention for the Protection of the Ozone Layer). It is an international treaty designed to protect the ozone layer by phasing out the production of substances that are responsible for ozone depletion. It was agreed on in August 1987. Since then, it has undergone eight revisions. As a result of the international agreement, the ozone hole in Antarctica is slowly recovering.

The Bamako Convention

The Bamako Convention (in full: Bamako Convention on the ban on the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa) is a treaty of African nations prohibiting the import of any hazardous (including radioactive) waste. The Convention was negotiated by twelve nations of the Organisation of African Unity at Bamako, Mali in January, 1991, and came into force in 1998. The aim is to stop rich, developed countries from exploiting poorer, developing countries in Africa by dumping toxic waste in these African countries, even with the approval of the accepting country.

Basel Convention

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, usually known as the Basel Convention of 1989, is an international treaty that was designed to reduce the movements of hazardous waste between nations. It specifically aimed to prevent the transfer of hazardous waste from developed to less developed countries. It does not, however, address the movement of radioactive waste, which the Bamako Convention does. The Basel Convention came into force in 1992.

Zambezi River Basin Action Plan

The Zambezi River System Action Plan (ZACPLAN) is a multinational plan under the United Nations Environment Program (UNEP). The aim is to incorporate effective use and management of the Zambezi River system. Eight countries (Angola, Botswana, Malawi, Mozambique, Namibia, Tanzania, Zambia, and Zimbabwe) are directly involved. The Zambezi River Basin is used by all these southern African countries. Refer to Figure 6.4 for these riparian countries. The plan aims to manage resources collectively amongst, and between SADC nations to reasonably meet national, and international goals for water resources. The Zambezi River System Plan is the

Advantages and disadvantages of domesticating international treaties or protocols

Advantages

1. Recognition as part of the wider international community`s efforts to control climate change.
2. Access to international expertise on environmental issues.
3. Access to funding that promote sound environmental initiatives.
4. Collaboration and co-operation in preserving the environment.

Disadvantages

1. Zimbabwe`s own needs or policies might have to take second place to what the global community feels is necessary.
2. Once a nation has signed an agreement, it is binding.
3. Developed countries push their agenda at the expense of the developing countries.

Land use planning as a strategy for sustainable management

- ❖ Sustainable environmental management involves planning for today and future.
- ❖ Sustainable implies that the plan for an area or region must be workable in long term.
- ❖ Environmental planning must not cause harm or damage to the environment.

Zimbabwe`s Regional Town and Country Planning Act of 1998

- ❖ Is the main ***Act*** **dealing :-**
  - with the physical environment of the country.
  - planning of regions, district and local areas with the object of preserving and improving the physical environment.
  - authorise making of regional, master plans and local plans.
  - protect rural and urban amenities, preserving buildings and trees
  - control landuse and overdevelopment.
  - ***For more information, read the RTCP Act of (1998).***

QN: a) What are the challenges faced in land use planning? (4)

b) Suggest measures to minimise the problems faced in land use planning. (4)

NB: Read Step Ahead Bk 4 pg 94.

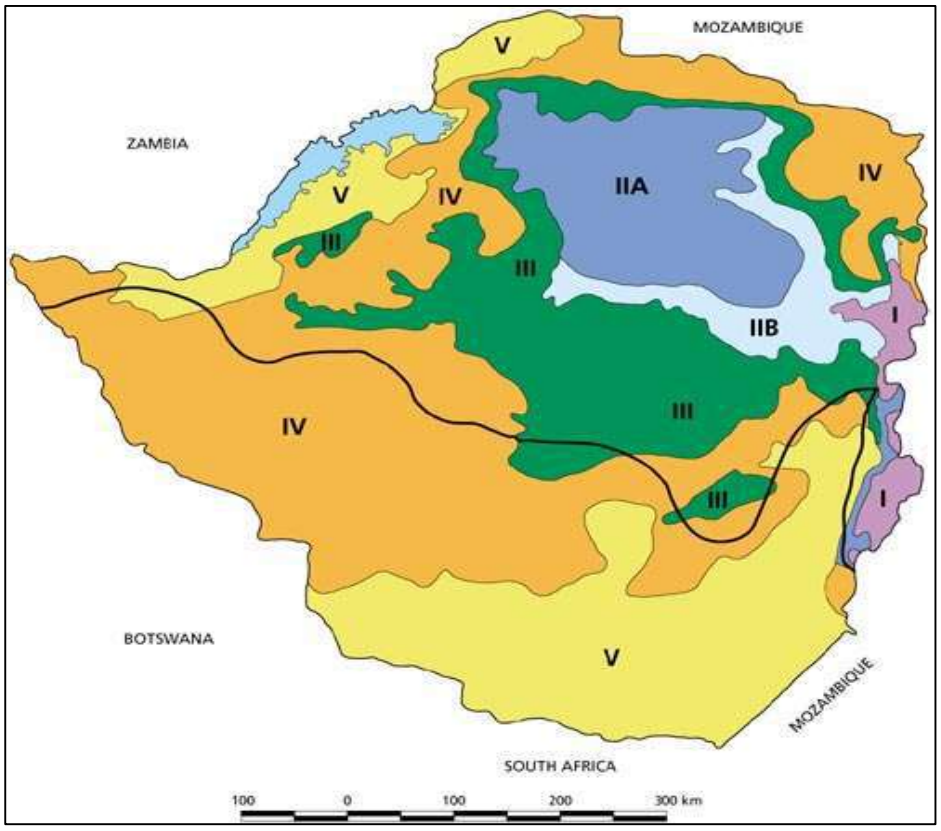
TOPIC 7

AGRICULTURAL AND LAND REFORM

Agriculture in Zimbabwe

- Zimbabwe is a landlocked country in the Southern Africa region with an area of over 390 000 km2. It is situated between 15 and 22° south latitude and 26 and 34° east longitude.
- Climatic conditions are largely sub-tropical with one rainy season, between November and March.
- Rainfall reliability decreases from north to south and also from east to west. Only 37% of the country receives rainfall considered adequate for agriculture.
- Zimbabwe was once the bread basket of southern Africa producing most of the food crops but it has since changed due to a number of factors.
- Zimbabwe can be divided into 6 agro ecological regions looking at annual rainfall and annual temperature variations.

Natural farming Regions of Zimbabwe



Source: Rukuni and Eicher, (1994 pp.42)

Natural Region I: Specialised and diversified farming region

- This region lies in the east of the country.
- It is characterised by high rainfalls of over 1000mm per year, low temperatures, high altitude and steep slopes.

- The country's timber production is located in this region. The plantations are owned mainly by the State through the Forestry Commission and by multinationals. There are several small owner-operated plantations and sawmills.
- It is ideally suitable for intensive diversified agriculture and livestock production, mainly dairy farming.
- Common crops are tropical crops such as coffee and tea, deciduous fruits, such as bananas and apples, and horticultural crops, such as potatoes, peas and other vegetables. Flowers, such as protease (Proteaceae spp.), are grown for export.

Region IIA - Intensive Farming

- This region is located in the middle of the north of the country.
- Rainfall is confined to summer and is moderately high (750-1000mm).
- Two sub-regions have been defined. Sub-region IIA receives an average of at least 18 rainy pentads per season and normally enjoys reliable conditions, rarely experiencing severe dry spells in summer.
- The region is suitable for intensive systems of farming based on crops (tobacco, maize, cotton, sugar beans, sorghum, barley, various horticultural crops and coffee) and /or livestock production including beef, dairy, pig and poultry.
- Supplementary irrigation is done for winter wheat (May-September).
- A large proportion of the farms were subdivided into smaller units and allocated to new farmers under the A1 and A2 small-scale farming system.

Region IIB - Intensive Farming

- This sub-region receives an average of 16-18 rainy pentads per season and is subject either to rather more severe dry spells during the rainy season or to the occurrence of relatively short rainy seasons.
- In either event, crop yields in certain years will be affected, but not sufficiently and frequently to change the overall utilisation from intensive systems of farming.

Region III - Semi-Intensive Farming

- NR III is located mainly in the mid-altitude areas of the country.
- Rainfall in this region is moderate in total amount (650-800mm), but, because much of it is accounted for by infrequent heavy falls and temperatures are generally high, its effectiveness is reduced.
- The region is also subject fairly severe mid-season dry spells and therefore is marginal for maize, tobacco and cotton, groundnuts and sunflower production, fodder crops) and cash crops.
- Smallholders occupy 39% of the area of this region. Large-scale crop production covers only 15% of the arable land.

Region IV - Semi-Extensive Farming

- This region experiences fairly low total rainfall (450-650mm) and is subject to periodic seasonal droughts and severe dry spells during the rainy season.
- The rainfall is too low and uncertain for cash cropping except in certain very favourable localities. Smallholder farmers grow drought-tolerant varieties of maize, sorghum, pearl millet (mhunga) and finger millet (rapoko).

- NR IV is ideally suitable for cattle production under extensive production systems and for wildlife production, but it can be intensified to some extent by the growing of drought-tolerant fodder crops.
- Communal farmers occupy 50% of the area of Natural Region IV.

Region V : Extensive Farming

- The rainfall in this region is too low and erratic for the reliable production of even drought-resistant fodder and grain crops like millet and rapoko and farming has to be based on the utilisation of veld alone.
- The extensive form of cattle ranching or game ranching is the only sound farming system for this region.
- Included in this region are areas of below 900m altitude, where the mean rainfall is below 450mm in the Zambezi valley and below 600mm in the Save-Limpopo valleys. 46% of the area of Natural Region V.

Region V1
- This is a more recent demarcation which does not appear on the map. The area around the Tuli circle.
- Consists of barren soils unsuitable for arable farming. Used mainly for wild life.

NOTE:
A rainy pentad is defined as the centre one of three five-day periods (pentads) which together receive more than 40 mm and two of which receive at least 8 mm of rainfall.

Climate Change and Agriculture
See Topic 1 Notes

Climate Change in Zimbabwe

Case study 1: Coping with climate change in Muzarabani

- In hot, dry Muzarabani district on Zimbabwe's northern border with Mozambique, droughts and floods are common, and community members say that the climate in the area is becoming drier with shorter growing seasons punctuated by mid-season dry spells.
- Rivers, streams, ponds and wetlands are drying up and pest populations are increasing.
- Locals have noted changes through their study of the behaviour of migratory birds (*mashuramurove*) and the flowering pattern of certain trees that they use to predict droughts and floods.
- Short-term coping practices and long-term adaptive strategies based on indigenous knowledge are being adopted. These include social safety nets such as "the chief's granary" (*Zunde raMambo*) whereby the general community contributes to a grain store to help needy families during times of hardship.
- In addition *nhimbe*, or collective work, is carried out by community members.

Drought-coping measures:
- Wild fruit harvesting
- Dry planting (before the rains have started)

- Streambank cultivation
- Conservation agriculture
- Planting drought-tolerant small grains
- Traditional food storage and processing techniques

Flood-coping measures:

- Traditional flood-proof building designs, temporary migration and dual-season cropping.
- Indigenous adaptation strategies can be used effectively in conjunction with conventional strategies through the participation of local community members.

Case study 2: Mainstreaming climate change adaptation in Zimbabwe's agricultural extension system

- The effects of climate change are already being felt by Zimbabwean farmers, resulting in increased vulnerability and reducing their ability to produce adequate harvests.
- Practical Action Southern Africa implemented a project in Masvingo, Midlands and Matabeleland South provinces aiming to improve the capabilities of smallholder farmers to cope with and adapt to climate change and variability.
- Key project partners were the Department of Agriculture, Technical and Extension Services (AGRITEX) and the Meteorological Services Department.
- The project enabled smallholder farmers to make better plans and decisions based on accurate climate and weather information.
- This was achieved by training professional staff from AGRITEX to increase their knowledge and awareness of climate change issues.
- Farmers can now make informed decisions about which crops to plant and when to plant them.
- They are also diversifying their livelihoods to include horticulture, small animal husbandry and growing supplementary feed for livestock during the dry season.
- The farmers are also using conservation agriculture techniques that give better yields during dry years than conventional methods.

Agricultural Pests and Diseases, and Solutions

A Pest

Is an annoying, harmful and destructive organism that destroy or harm crops or animals.

Effects of pests

i) Destroy habitats of other organisms.
ii) Reduce market value for agricultural products.
iii) Transmission of viral diseases and extreme crop loses.

Diseases

Is a condition of plant or animal body impairs normal functioning. Diseases are caused by virus, protozoa, bacteria and fungi.

Qn: Suggest the effects of diseases to crops or animals. (4)

Major outbreaks in Zimbabwe

- Common pests and diseases in Zimbabwe include: arm worm, red locust,quelea birds, foot and mouth, anthrax, new castle, cocidiocis and others.
- Arm worm outbreaks in 1994 to 1995, 2005 to 2007 caused extensive damage to communual farmers, chemical methods were used to destroy the pests (spraying using carbaryl and malathion.
- The red locust outbreak in 1995 to 1996 destroyed plant flowers, leaves and fruits.
- A quelea bird invasion in August 2005 affected the wheat farms to an extent wiping the whole farm in few days. Farmer in rural areas beat drums to scare the birds, some trapped them and spraying using chemicals was done in commercial farms. However, this had a negative impact to the environment.
- An invasion of tsetsefly in 2005 in Mbire and Muzarabani due to wildlife movements. Tsetsefly carried nagana and sleeping sickness which affected wild and domestic animals and people.

Pest and disease control methods

1. Manual or direct control- includes traping, catching or killing rats and even removing ticks. Invasive plants can be destroyed by hacking out or cutting.
2. Biological control- involves using a known enermy of a particular pest or disease to kill it or eradicate it.
3. Chemical involves spraying using pestcides, herbicides and fungicides.

Home work

1. a) Name pests, diseases and animals that affect crops or animals. (6)
   b) Identify the effects of the above on crops and animals. (16)
   c) Suggest measures to control the effects mentioned above. (16)

Urban Agriculture (UA)

- Urban Agriculture is the growing of plants and rearing of livestock for food, aesthetic value and commercial purposes within the urban and peri-urban areas (Mbiba 1995).
- It also includes related activities such as production and delivery of inputs, and the processing and marketing of products.
- The scale of activities is determined by the land size, water availability, skills, labour, legislative framework as well as finance.

Perspectives of UA

- Marongwe (2003) says that urban agriculture is to some extent viewed as illegal since it is not backed up by any statutory instrument. There is no clearly laid down policy on urban agriculture in Zimbabwe.
- Despite all these unclear policies and legislations, urban agriculture has always been practiced in since 2002.
- The local authorities supported urban agriculture, emphasised it to be organised in a systematic manner.
- The Nyanga Declaration on Urban Agriculture in Zimbabwe and the Harare Declaration by Ministers of Local Government in Eastern and Southern Africa acknowledged that urban agriculture contributes to the country `s economy (Hungwe 2006).
- The declaration also urged local authorities to develop appropriate incentives necessary for the growth of urban agriculture. Non-Governmental Organisations (NGOs) were also encouraged to support sustainable urban agriculture projects for the benefit of the poor.

Classification of UA

According to Mbiba (1995), urban agriculture can be classified in three categories based on its location:

1. *On-plot agriculture:* farming practised on the plots around houses, like backyard gardening. It involves mainly crop production to include vegetables.
2. *Off-plot agriculture:* this is conducted in public open spaces, utility service areas and agricultural allotments. The production is mainly for home consumption, although a slightly higher percentage is marketed as compared to on-plot production.
3. *Periurban agriculture:* this third category is the production of crops and livestock in areas outside the city boundary, formally rural agriculture - up to a radius of 150 km - which is economically integrated into the city.

Types of Urban Agriculture

1. Crop husbandry – crop production, horticulture and urban greening e.t.c.
2. Livestock/animal husbandry - cattle rearing, poultry (fowls and rabbits), goats and sheep. for eggs and meat, fishery, piggery permitted in specific areas and Bee keeping (in plots of more than an acre).

Contributions of UA

- Urban agriculture in developing and developed countries provides meaningful contributions towards household food security, which ensures availability, accessibility and affordability

of unprocessed and processed foods.These enhance improved nutrition and they boost the immune system that contribute towards the fight against the HIV/AIDS pandemic.

- The urban agriculture practice also promotes self-production and self-reliance among the vulnerable groups such as widows, unemployed youths, the economically disadvantaged and those living with HIV/AIDS.
- Urban agriculture practices contribute to income generation of surplus products which can be sold for cash needed for education, health, clothing etc. It can also be a source for foreign currency generation.
- Therapeutic treatment, improved environmental health, environmental restoration and greening of the city can also be realised through the practice of urban agriculture.
- The beneficiaries of urban agriculture enjoy safer living environments and improved environmental awareness. Currently men and women migrate to urban settings in search of jobs and money and it is hoped that urban agriculture in the cities will promote reversal of urban migration.
- Urban agriculture can bring about the establishment of a wide range of small to medium enterprises (SME) and these would include the following:
  - Nurseries that supply seedlings and seeds for the farming community and individuals.
  - Production, promotion and sale of organic fertilizers
  - Agro supply stores that supply tillage tools, fertilizers, pesticides and irrigation equipment.
  - Maintenance services for repairs of farming equipment
  - Garden services to maintain gardens, provide pest control and refuse removal
  - Market agents services to facilitate the sale of surplus produce. e.t.c.

Implications of urban agriculture

1. Agriculture should be confined to rural areas, as it can interfere with more productive land to be utilised by other economic activities (hampers urban development).
2. Soil erosion.
3. Chemical pollution.
4. Changes in species types.
5. Reduced biodiversity.
6. Loss of scenery and diversity of environment.
7. UA threatens public health – diseases outbreak.

Mbiba B. (1995). Urban agriculture in Zimbabwe: implications for urban poverty and management. Aldershot: Avebury.

Ways to mitigate challenges of AU

a) Introduce planned, controlled, no permanent user utilisation of urban space for agriculture policy.
b) Use a plot allocation process that involves every urban dweller from the poor, homeless and unemployed to landlords.
c) Enforce applicable environmental management regulations for example on streambank cultivation.

Agribusiness

- Is the business of agricultural production.
- It deals with everything to do with farming as a business e.g animal breeding, crop production, farm machinery, processing, seed supply marketing and sales.

Conditions and advantages of agribusiness

- The agricultural potential of the country is diverse with possibilities for producing all forms of agricultural outputs.
- Source of employment and livelihood framework for the unemployed youth.
- There is a high irrigation potential, which can be developed to curb the problems of frequent droughts.
- It is a source of government revenue from taxes.
- The high literacy rate enables the majority of people run their own agricultural related ventures.

Prohibitive conditions and disadvantages of agribusiness

- Small-scale and individual players face stiff competition from large scale actors.
- Lack of finance and high interest rates.
- Unfavourable prices from the domestic markets.
- Underperforming economy with shrinking industrial base limits the potential market for agro-products.
- Climate change induce droughts and erratic rainfall are problems in the agric sector.

TOPIC 8

INDUSTRY

Service Industries

- The Tertiary Sector is actually the service sector, which involves the giving away direct services to its consumers.
- It supplies services to the immediate consumers and the business houses and it includes services related to retail, transportation, hotels, sales and much more.
- It is seen that nearly 80% of the workers are related to this industry in sourcing out the best services and has even improved the income standards.
- This also helps in spending on the luxury items and tourism industry too.
- People who are serving in this sector are generally the white-collar job holders and involve communication from the distant places too.

Characteristics of services

1. Perishability:

Service is highly perishable and time element has great significance in service marketing. Service if not used in time is lost forever. Service cannot stored.

2. Fluctuating Demand:

Service demand has high degree of fluctuations. The changes in demand can be seasonal or by weeks, days or even hours. Most of the services have peak demand in peak hours, normal demand and low demand on offperiod time.

3. Intangibility:

Unlike product, service cannot be touched or sensed, tested or felt before they are availed. A service is an abstract phenomenon.

4. Inseparability:

Personal service cannot be separated from the individual and some personalised services are created and consumed simultaneously.

Heterogeneity:

The features of service by a provider cannot be uniform or standardised. A Doctor can charge much higher fee to a rich client and take much low from a poor patient.

6. Pricing of Services:

Pricing decision about services are influenced by perishability, fluctuation in demand and inseparability. Quality of a service cannot be carefully standardised. Pricing of services is dependent on demand and competition where variable pricing may be used.

7. Service quality is not statistically measurable:

It is defined in form of reliability, responsiveness, empathy and assurance all of which are in control of employee's direction interacting with customers. For service, customers satisfaction and delight are very important. Employees directly interacting with customers are to be very special and important. People include internal marketing, external marketing and interactive marketing.

Employment structure of an LEDC e.g. Zimbabwe

- The majority of people work in the ***primary*** sector.
    - This is due to the lack of machinery available in farming, forestry and mining.
    - Farming is very important because people often grow the food they eat.
- Few people work in ***secondary*** industries due to the lack of factories –
    - machinery is too expensive
    - Multi-national companies rely on the raw materials available in Ghana to assist in manufacturing products
- Tertiary sector can be larger than secondary sector.
    - Most informal work is in the tertiary sector
    - Growth of jobs in tourism

Employment structure of a NIC e.g. Brazil

Brazil is a NIC or Newly Industrialized Country. While it is developing its economic base there are still a large number of people employed in primary industries such as farming. There are a large proportion of people employed in tertiary industries. One reason for this is because of the growth of Brazil as a tourist destination. Also, there have been significant improvements in the provision of health care, education and transport.

Tourism as a Service Industry

Tourism: The business or industry of providing information, accommodations, transportation, and other services to tourists.
Leisure: Any freely chosen activity that takes place in non-work time.
Domestic Tourist: Someone who goes on holiday in the country that they are resident in (live in).
International Tourist: Someone who goes on holiday to a country they are not resident in e.g. they live in Zimbabwe but go to the USA for holiday.
Resort: A type of large hotel that offers extra facilities like swimming pools, spas, restaurants, bars, activities, etc.
Package Holiday: This is when all aspects of a holiday e.g. flights, hotel, transfers, etc. are included in one overall price.

All-inclusive: A hotel or resort that includes everything e.g. food, activities and drink in one overall price.

Growth of Tourism

Tourism is a rapidly growing industry and is considered by many countries to be an important development strategy. Currently the majority of international tourists go to MEDCs, but many LEDCs are also seeing rapid growth in tourism.

Reasons for Growth in Tourism

- Leisure Time: Most workers now enjoy a two day weekend and in addition are entitled to several weeks holiday. This holiday time can be spent going on holiday.
- Paid Holiday: Not only do an increasing amount of workers receive holiday, they are also paid for it. This means that people do not lose their weekly income by going on holiday.UK workers get least paid leave.
- Income: More and more people are working in the secondary and tertiary sectors, where pay is generally higher. Also many more females are now working. This means that more people now have money to spend on holidays (higher disposable income).
- Transport: Air travel has become relatively cheaper and there are now more airports open for holiday flights.
- Advertising: People are now bombarded by holiday adverts on the internet, television, radio, mobile phones, billboards, etc. This makes people more aware of holiday destinations and possibly more tempted to book them.
- Tourist facilities: Tourist facilities have generally improved and increased in number. There are now many more hotels of all sizes and most have fairly standard services.
- Freedom: More people, especially women and the elderly are free to travel and go on holidays. In addition formerly closed countries like China now allow most of their citizens to travel.
- Passport Ownership and Visa Regulations: More people now own passports so are able to travel and the process of obtaining visas is now much more straightforward.

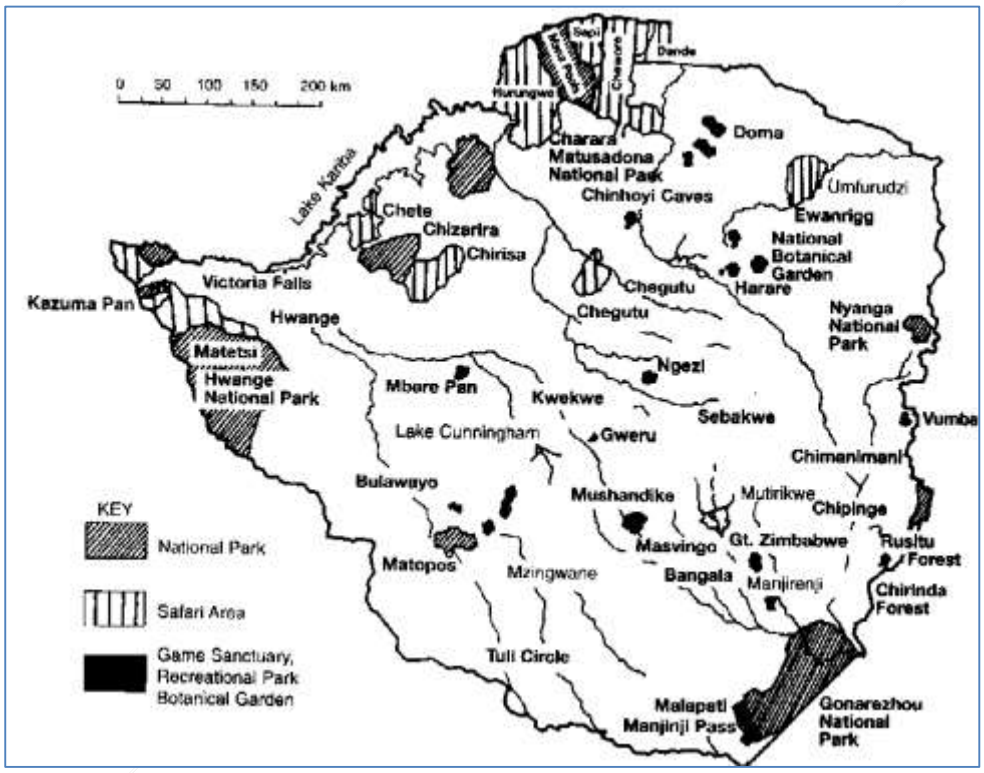
A region may experience a decline because of:

- Terrorism e.g. Bali bombing or Mumbai terror attacks.
- Crime e.g. South Africa.
- Natural disasters e.g. tsunami in Indian Ocean or hurricanes in the Caribbean.
- Economic downturn e.g. recessions and debt crisis in Zimbabwe from 2000 to 2008.
- Wars e.g. Afghanistan.

Tourist Attractions in Zimbabwe

Physical Attractions

a. Victoria Falls – the waterfalls, rain ball, rainforest, gorges, crocodile farm, traditional dances, photography, hotels and golf courses.
b. Matopos – the granite topography, caves, monuments, paintings, birds wildlife and vegetation.
c. Nyanga, Vumba – mountains, forests, gardens, gorges, waterfalls, cool climate.
d. Chinhoyi – Limestone caves and paintings.
e. Hwange – wildlife, lodges and vegetation.
f. Gonarezhou – wildlife and scenery.
g. Lake Kariba - fishing, boat cruising, gorge and bird viewing.
h. Matusadona – Vegetation.
i. Mana Pools – wildlife.
j. Dande, Devule–wildlife, hunting and scenery.
k. Kyle, Great Zimbabwe – fishing, wildlife, Mushandike Rrruins, African Heritage.
l. Harare – botanic garden, heroes acre, City life.



Tourist Attractions in Kenya

Main Attractions at the Coast
(b) Beautiful natural uncrowded and unpolluted sandy beaches which are ideal for sun-bathing (sitting or lying in strong sunlight in order to make the body brown).
(c) Warm and sunny climate due to tropical location which attracts tourists from temperate regions who escape from the harsh winter cold and come for health purposes.
(d) Water sports like yatching, surfing and sport fishing which are carried out in the Indian Ocean.
(e) Historical sites such as Fort Jesus, Gedi ruins, Vasco Dagama and slave caves in Malindi and Shimoni.
(f) Traditional culture of the coastal people e.g. they have a unique way of dancing, songs, clothing and handicrafts and shrines e.g. Kaya of the Mijikenda which attracts tourists.
(g) Mangrove swamps which have unique plants and different species of fish, snails, snakes, birds etc.

Main Attractions Inland
(a) Wild life conserved in National Parks and Game Reserves. Wildlife is conserved in their natural habitats.
(b) The Famous wildebeest migration in the Mara.
(c) The sunny warm climate which attracts tourists from temperate countries.
(d) Attractive scenery such as the snow capped Mt. Kenya, the Great Rift Valley and its lakes and hot springs and geysers and great rivers with waterfall .

Diverse culture of inland people e.g. the Maasai way of dressing, dancing, housing.
(f) Historical attractions such as Kariandusi near Gilgil and Orgesailie near Magadi featuring artefacts of Iron Age.
(g) National museums of Kenya in Nairobi.

Question 1

Compare tourism industry of Zimbabwe and Kenya. [10]

Advantages of Tourism

Social/Cultural

- Local people can perform traditional dance and music to tourists therefore protecting their local culture.
- Tourists may pay to visit museums protecting local artifacts.
- May improve countries reputation and create cross-cultural links.
- Encourages education in order to work in tourist sector and should improve linguistic skills

Disadvantages

- Tourism can increase certain crimes, like prostitution and theft
- People may become more materialistic and homogenised with the arrival of international tourists.
- May create racial tensions between tourists and locals

Economic

- Jobs are created for local workers in hotels, restaurants, etc.
- Workers and companies pay taxes to the government. This money can then be invested.
- People learn new skills that can then be transferred to other parts of the economy.
- New equipment or technology may be introduced to the country which again can be used in other sectors of the economy.
- Local infrastructure like roads and electricity may be improved.
- Attracts foreign investment hence country get foreign currency.
- Diversification of the economy

Disadvantages

- Many of managerial jobs go to overseas workers. Local workers often get low paid jobs
- There is economic leakage (loss of money overseas) because many of the tourist companies are TNCs and the profit is sent elsewhere
- Many jobs are only seasonal so workers are only paid half of the year e.g. the ski season is less than 6 months long.
- The increased demand for products and services may cause inflation
- Countries or regions may become dependent on just one industry.
- Increased congestion on roads

Environmental

- National Parks may be created protecting areas of natural beauty
- Animals obtain an economic value if people are willing to pay to see them. Sometimes tourist developments may cause the destruction of forests, sand dunes, etc.
- Noise and light pollution created by tourist developments may also interfere with animals.

Problems facing Tourism in Zimbabwe

1. Illegal hunting of animals which reduces some rare wildlife species which attract tourists which reduces the number of tourists visiting the country e.g. death of Cecil (Lion). The solution using game rangers to patrol game parks to hunt for illegal hunters and banning trade in game trophies and inspecting tourists at departure.
2. Pollution of aquatic systems such as Lake Mutirikwi which has caused the death of fish reducing the number of tourists since some are specifically attracted to fishing. The solution is regular inspection of factories to ensure treatment of effluents before they are released to water bodies.

3. Lack of incentives e.g. tariffs levies etc.
4. Funding and operation of National Parks has been reduced.
5. Sudden changes in domestic airline schedules.
6. Political instability, disputed elections and failure to respect property rights.
7. International media giving negative publicity of Zimbabwe by portraying it as an insecure country.
8. Lack of tourism national policy.
9. Air fares from and to many parts of the world is high due to high fuel prices which discourages tourists from coming to Zimbabwe.

- Sustainable tourism: Tourist activities that are socially, environmentally and economically sustainable.

Eco-tourism

Environmentally friendly tourism or tourism emphasizing environmental conservation where tourists and local communities are involved in enjoying nature as well as conserving it or.

Aspects/Characteristics of Ecotourism

(a) Tourists are guided along marked trails instead of driving to the areas where there are animals.
(b) Telescopic viewing of animals to avoid disturbing animals.
(c) Use of camping sites rather than big tourist hotels so as not to put pressure on resources which animals depend on.
(d) Prohibiting off road driving and travelling by foot.
(e) Allowing particular types of vehicles.
(f) Warning people against throwing cigarette remains on dry vegetation.

Ecotourism Activities

- Bird watching, safari (animal watching), cycling, beach cleaning

How Ecotourist Resorts Can Be Eco-friendly

- Tree planting, Use renewable energy sources e.g. wind and solar, build using only local products, serve only local food, using locally sourced products, employ only local staff, recycle all waste, treat and clean all water, educate guests about the importance of protecting the environment promote local culture

Protectionism

- Protectionism is measure that a government uses to try and protect domestic industry. The three main ways that a government aims to protect its domestic industry are through; tariffs, quotas and subsidies:
  a) Tariffs: A tax placed on foreign imports to make them more expensive and less competitive than locally produced products.
  b) Quotas: A limit placed on the amount of foreign imports. By limited the amount of imports this again should increase the price of them and make them less competitive.
  c) Subsidies: Financial support given to domestic producers to make their products cheaper compared to foreign imports. This might take the form of a grant or loan (money), or it might be reduced taxes or a plot of land that is given to them to build on.

The Quaternary sector

- Is an improved form of tertiary sector as it involves the services related to the knowledge sector, which includes the demand for the information- based services like taking the consultancy from tax managers, statisticians and software developers.
- The services involved in this type of economy are outsourced in varied forms as the doctor' services, elementary schools and university classrooms, theaters, and brokerage firms.
- It also includes intellectual activities and services as research and development (R&D), media, culture, and information and communications technology (ICT).
- The woforce who is readily involved in this sector is typically well-educated, and people are often seen earning well through their participation in this industry.

Problems faced by quaternary industries

- Hampered by lack of expertise and capital.
- Lack of knowledge hence channel money towards hiring people from deveped countries.

Quinary Sector

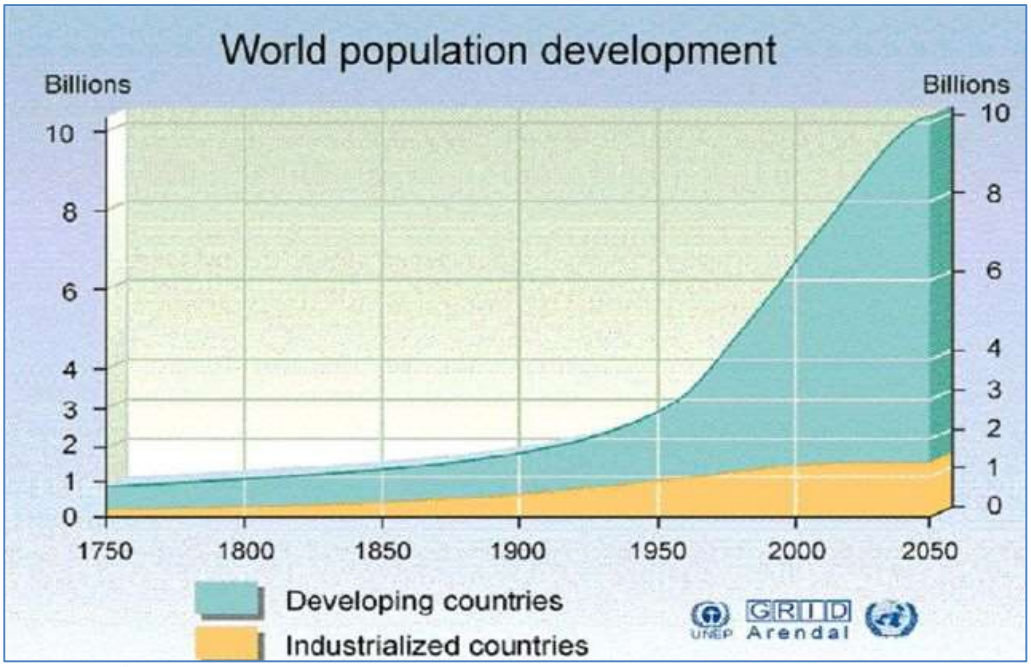
- The professions of the people working in this industry are generally referred to as "gold collar" professions since the services included in the sector focus on interpretation of existing or the new ideas, evaluation of new technologies, and the creation of services.
- It is also one of the parts of the tertiary sector, but it involves highly paid professionals, research scientists, and government officials.
- The people are designated with high positions and powers, and those who make important decisions that are especially far-reaching in the world around them often belong to this category.

TOPIC 9

SETTLEMENT AND POPULATION

World Population Growth

- When describing a graph it is important look for trends, changes in trends e.g. quicker increase, slower increase and also anomalies.
- It is also very important to support your findings with evidence (this means figures e.g. dates and population figures).
- From 1750 to the present day the world's population has been constantly increasing. In 1750 the population was less than 1 billion.
- The population rose very slowly for the next two hundred years reaching 1.2 billion in 1850 and 2.7 billion in 1950. From 1950 to 2012 the population started to rise at a faster rate. By 1975 it reached about 4 billion and 2000 about 6 billion.
- In the last decade the population has increased at an even faster rate reaching 7 billion by 2012.
- Population growth takes place when birth rates are higher than death rates (natural increase).



Mortality

- Mortality refers to deaths among members of a population.
- It reduces the population in a given area.
- It also affects its structure or composition of the population in terms of age and sex whereby if there is consistent death of a particular age or sex there will be marked change in the population because the other ages or sex will be more than the affected ones.

Infant Mortality - is the number of deaths of babies less than one year old per 1000 babies born that year.

Infant mortality rate may be caused by the following factors:

e) Diarrhoea.

f) Economic situations affecting health services and purchase of nutrient supplements.
g) Impact of HIV/ AIDS pandemic on child health and survival.
h) Mother`s educational levels

Death rates: The number of deaths per 1000 of population per year.

$$\text{Death Rate} = \frac{\text{Total number of deaths X 1 000}}{\text{Total population}}$$

Causes of High Death Rates
- Natural disasters (often only causes short term increases) e.g. Indian Ocean tsunami.
- Conflicts and wars.
- Poor medical care.
- Poor hygiene and sanitation.
- Poor diet (might be a shortage of food or unhealthy food).
- Shortage of clean water.
- Diseases e.g. cancer and AIDS

Causes of High Birth Rate

- Lack of contraception e.g. condoms
- Religious beliefs e.g. belief against contraception and abortion (Roman Catholicism).
- Agricultural based society (need for people to farm and collect water).
- High infant mortality (if some babies may die, couples will be tempted to have more children).
- No care homes or pensions so old dependents will need their children to care for them in old age.
- Pro-natalist policies (governments encouraging couples to have more children)

Cause of low birth rate
- Availability and affordability of contraception e.g. cheap or free condoms.
- Emancipation (freedom) of women (freedom to get an education and work).
- Improved levels of education (especially female).
- Reduced infant mortality.
- Introduction of pensions and care homes.
- Development of economy into secondary and tertiary sectors.
- Delayed marriages and less children.
- Anti-natalist policies e.g. China's one child policy.
- High cost of raising children.
- Immunisation programs e.g. small pox.
- Availability of clean water.
- Improved diet and knowledge of diet e.g. five portions of fruit and diet.
- Improved medical care.
- Improved preventative testing e.g. for cancer so people can be treated before it kills them.

Demographic Transition Model (DTM)

Demographic means population and transition means change, so the DTM basically means the population change model. The DTM looks at how a country's population may change as it develops. It looks at birth rates, death rates and total population. The DTM is usually divided into four stages. Stage 1 is the poorest stage and stage 4 is the richest stage.

Stage 1: High stationery

- High birth rate and high death rate due to inadequate food supply, wars, diseases and insufficient medical facilities.
- Little or no increase in population.
- Was experienced in Europe before 19th Century.

Stage 2: Early expanding

- High birth rate and a decline in death rate due to improved food supplies and medical facilities.
- High population growth rate.
- Zimbabwe and Kenya are in this stage.

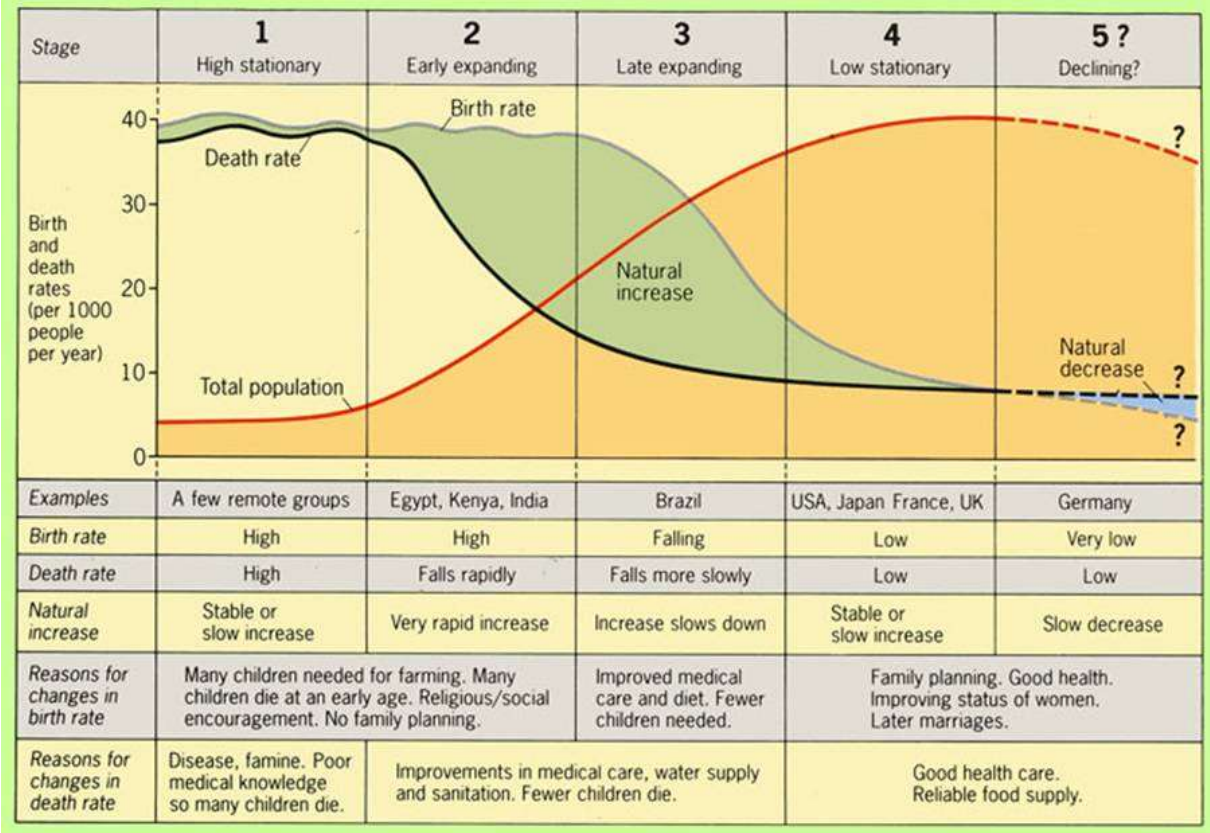
Stage 3: Late expanding

- Relatively low death rates and declining birth rate due family realisation of the need to have small families due to pressure exerted on economic resources and social facilities, level of education attainment leading to use of birth control measures e.g. South Korea, Singapore and Hong Kong.
- Moderate population growth rate.

Stage 4 : Low stationary

- Low birth and death rates.
- Low population growth rate.
- The population becomes static and can only reproduce to replace the dying ones (population replacement level).
- It`s experienced in industrialised countries like Germany, UK, France and Sweden where death rate is falling below death rate.

Stage 5: Declining
See the DTM below

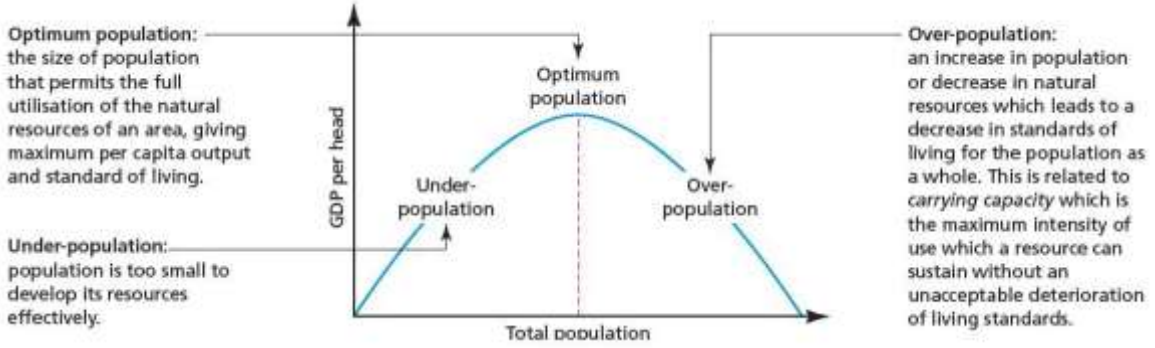


Limitations of the demographic transition method

- LEDCs may not follow the pattern of change found in MEDCs (More Economically Developed Countries) 30-50 years ago.
- Birth rates have not fallen as rapidly as might be expected on some LEDCs because of some social customs and beliefs.
- Government planning for population change may interrupt the model e.g. the one child policy in China.
- Some industrialising LEDCs are ,moving more rapidly through the stages than MEDCs did.

Consequences of Population Growth

Overpopulation (Positive Population Increase); Under population (Negative/Slow Population Growth) and Optimum Population. QN: What are the effects of these situations?



Carrying Capacity: The amount of people that the resources of a country can support. The carrying capacity of a country can change with improvements in technology e.g. desalination, discoveries of new resources, or the loss of existing resources e.g. volcanic eruption destroying farm land.

Theories about population and resources

Malthus

- Malthus looked at population and resources and believed that population was growing at a much fast rate than resources.
- He believed that this would cause a series of preventative and positive checks.
- Preventative checks would be people trying to reduce population growth themselves and positive checks would be famines and conflicts.

Boserup

- Boserup was a more optimistic person who believed that humans always came up with solutions to problems.
- Her famous saying was 'necessity is the mother of invention' which basically means that humans will also find a solution to resource shortages e.g. desalination, development of renewable energy.

Population Policies

Pro and Anti Natalist Birth Policies

Pro-natalist Policy: A policy that encourages couples to have more children. You can not force people to have more children so you have to offer incentives instead e.g. free childcare or even money.

A government can't force couples to have more children, so instead it must offer incentives. Incentives may include:

- Cash payments.
- Free or subsidised healthcare and childcare.
- Free or subsidised education.
- Reduced tax rates.
- Child benefits e.g. weekly or monthly payments.
- Poster and advertising campaigns

Singapore's Pro-natalist Policy

- Singapore is a developed country in SE Asia with a population of about 5 million people. For many years the Singaporean government has believed that Singapore is underpopulated and has tried to increase its population.
- Singapore has one of the lowest total fertility rates in the world, standing at 1.1, which is well below the replacement rate of 2.1. Already 36% of the Singapore population is made up of foreign nationals and in some sectors like industry, 80% of the workers are foreign.
- To overcome worker shortages, the Singapore government has encouraged immigration, but it is also trying to increase the population through raising birth rates.

- The government is doing this in a number of ways. It has increased maternity leave by 50% to 12 weeks and it will cover the cost of maternity leave (the cost to the parents' employers) for the first four babies.
- The Singapore government is also increasing child benefits paid to families. The government will pay money into a special bank account of up to nearly $1000 for six years.
- The Singapore government has also sponsored dating organisations to encourage people to get married earlier and start having children.

Anti-natalist policy: A policy that attempts to reduce birth rates. This might be through better education and supply of contraception or through much stricter policies like China's one child policy.

China`s anti-natalist policy - One Child Policy

- After China were invaded and occupied by Japan in the World War II, they wanted to strengthen their military so that it never happened again.
- To do this they encouraged citizens to have more children, because a bigger population potentially meant a stronger army.
- This policy would have been fine if China had the resources and technology to match. However, they did not and coupled with the crippling policies of the cultural revolution, mass famines ensued. It is estimated that up to 30 million died during the 1960's and 1970's. This was not a sustainable policy, so the Chinese government was forced to introduce an anti-natalist policy.
- The policy China decided to introduce was extremely strict and probably not possible in a non-communist country.
- The government stated that from 1979 all couples were only allowed to have one child. They also increased the marriageable age of men to 22. To get married and to have a child, citizens had to apply to the government. If you applied by these rules you were entitled to free education, healthcare, housing and given a job. If you did not follow the rules, then benefits would be removed and females who were found to be pregnant were given forced abortions and even sterilised.
- To enforce the policy the government relied on community enforcement. Often elderly residents who were trusted within the community were asked to inform, elderly female informants were nicknamed 'granny police.
- The strict enforcement of the policy led to a problem of female infanticide. This is the killing of female babies, because couples favoured male children. Males ensured the family name was maintained and were able to work manual jobs, whereas females would be lost after marriage (females normally went to live with their husband's family).
- There were a number of exceptions to the rules, if you had twins or triplets this was fine, if your first child had a physical or mental disability you could have a second, families in rural areas (farming areas) were often allowed a second, ethnic minorities were allowed a second and often couples who bribed officials could have a second.
- The policy has been relatively successful, birth rates have fallen from a peak off 44 in the 1950's down to just 12. China's population is also expected to peak in the next 20 years and then slowly start to decrease. Because of its success there have been further relaxations including:
  - All of families in females areas can now have two

- Two people who marry from single children families they are allowed two
- Females are better educated about contraception and are free to make their own choices.

However, there are also a few problems:

- China is still overpopulated; there are over 1.3 billion Chinese.
- There is a male female imbalance in the population.
- People are demanding greater freedom and choice.
- China will slowly get an ageing population.
- There are large numbers of abandoned children

Population Health and Disease

1) Nutritional disease: Kwashiorkor

Qn: What are the causes, effects and symptoms of kwashiorkor? [10]

- **Water linked diseases: Cholera**

  ➢ Is a bacterial disease caused by some strains of Vibrio cholerae

  ➢ It is mostly waterborne and is common in areas with poor sanitation and poor water purification facilities

  ➢ The disease also spreads through food that is contaminated by human or animal faeces, by human carriers, flies and rodents

  Signs and symptoms of cholera

  ➢ A cholera patient will suffer from watery diarrhea (rice water) and vomiting

  ➢ This can lead to dehydration and, if fluids and electrolytes are not replaced, the patient will go into coma and die

  Controlling and treating cholera

  ➢ Can be treated by administering tetracycline and chloramphenicol to the patient

  ➢ There are vaccinations against cholera

  ➢ To prevent the spread of cholera, good food hygiene is essential

  ➢ Proper use of toilet facilities is vital such that faeces do not end up in water sources; e.g. building Blair pit toilets in rural areas

  ➢ Washing of hands with soap and water after using the toilet is necessary

  ➢ Having enough treated or boiled clean water for drinking and cooking.

- **Vector linked disease: Malaria**

  ➢ Is caused by a plasmodium, a parasitic protozoan, found in the salivary glands of the female mosquito of the anopheles genus

  ➢ The anopheles mosquito is a vector, that is, an insect carrying a parasite to its next host

  ➢ The malaria parasite completes its life cycle partly in the female mosquito and partly in humans

  The life cycle of the malarial parasite

  ➢ When the anopheles female mosquito (first vector) bites a human, the malaria parasites are injected into the bloodstream

➢ The malaria parasites travel in the blood to the liver and invade the liver cells

➢ The malaria parasite reproduces asexually in the liver cells, forming thousands of parasites

➢ The parasites are released from the liver into the blood, where they enter the red blood cells

➢ In the red blood cells parasites reproduce asexually

➢ The parasites burst the red blood cells causing cycles of violent feverish attacks of malaria

➢ The released parasites then infect new red blood cells

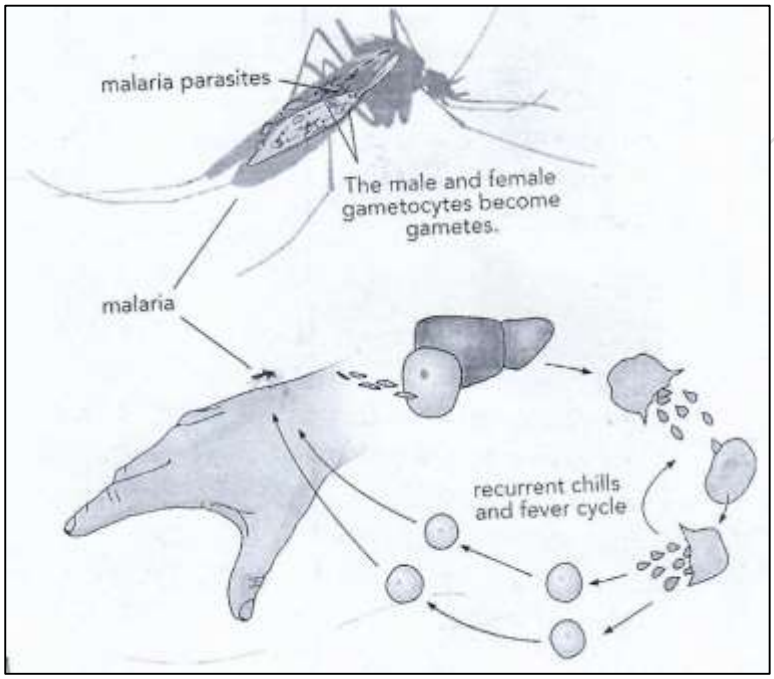
➢ Some of the parasites become male and female gametocytes

➢ When a mosquito (second vector) bites an infected human, it sucks up the blood and the gametocytes pass into the mosquito's intestine

➢ Inside the mosquito, the male and female gametocytes become gametes

➢ Fertilization takes place inside the mosquito and the parasites mature

➢ Mature parasites finally leave the mosquito's intestine and migrate to its salivary glands



Signs and symptoms of malaria

➢ The symptoms appear about two weeks after infection

➢ These symptoms include high fever, shivers and sweats, headaches, vomiting and an enlarged spleen

➢ In some cases the malaria parasite attacks the brain and the patient can fall into a coma and die

Controlling and treating malaria

➢ There is no vaccine for malaria but the disease can be prevented by taking preventative drugs such as quinine and chloroquine when visiting a malaria prone area

➢ Other preventative drugs are paludrine, deltaprim, malasone and malaquine

➢ High rates of malaria occur in the lowveld of Zimbabwe, in the Zambezi escarpment and in Mashonaland Central.

➢ Other ways of preventing the disease are to sleep under mosquito nets, spray mosquito repellents and to wear long-sleeved clothes from early evening when mosquitos become active

➢ The best protection against malaria is to avoid being bitten especially for little children who cannot be given antimalarial drugs

➢ Stagnant waters should be drained to destroy breeding areas

➢ Spraying oil on the surface of stagnant water such as drains suffocates and kills mosquito larvae

➢ In some rural areas, the poison DDT is used to spray houses to kill mosquitos

➢ Biologically anopheles mosquitos can be controlled using toxins produced by bacteria referred to as Bacillus thuringiensis and by stocking ponds with fish that feed on mosquito larvae

➢ Cutting down tall grasses to destroy their habitat, breeding places and food

Typhoid

➢ Is caused by the bacterium salmonella typhosus and is common in most parts of the world but Southern Asia, Africa, Latin America, India and Pakistan are high risk areas

➢ The bacteria spread through contaminated food and water

➢ The bacteria enter the small intestine and the bloodstream of a person that has come into contact with contaminated food or water

➢ In the blood, the bacteria are carried by the white blood cells to the liver, spleen, gal bladder and bone marrow where they multiply very quickly

Signs and symptoms of typhoid

➢ These include high fevers, weakness, stomach pains, headaches, a poor appetite and a rash (rose spots) on the abdomen and chest

➢ The first signs of infection are high temperature, stomach pains and diarrhea

➢ Typhoid can be diagnosed by testing a stool sample or blood sample

Controlling and treating Typhoid

➢ Treatment with antibiotics usually leads to patients recovering fully within 7-10 days

➢ There are vaccines for people travelling to high risk areas

➢ Other methods of control are putting good sanitation in place , giving people access to clean water, ensuring waste disposal and protecting food supplies from contamination

➢ Personal hygiene is critical to avoid contracting typhoid

➢ People with typhoid should not handle or prepare food

Ebola virus disease (EVD)

➢ EVD is caused by the deadly Ebola virus that is transmitted to humans through close contact with the blood, secretions and organs of animals such as chimpanzees, gorillas or fruit bats that are infected

➢ This contact happens mostly when people hunt bush meat in the rain forests

➢ Human-to-human transmission of the Ebola virus takes place when a person touches the broken skin of an infected person or comes into contact with infected body fluids such as blood, saliva, sweat, vomit, semen and breast milk

➢ Touching a person who has died from EVD or even touching contaminated bedding or clothing may lead to infection

➢ A person is infectious as long as one's blood contains the virus

Signs and symptoms of EVD

➢ The incubation period of EVD is 2-21 days after infection

➢ The first symptoms of EVD are headaches, high fever, weakness, muscle pain and a sore throat

➢ The virus destroys all tissues and organs of the body, except for the skeletal muscles and bones

➢ The patient will suffer from a high temperature, vomiting, diarrhea and a rash about 10 days after the appearance of the first symptoms

➢ The rash is caused by blood clots that weaken blood flow and the spots get bigger as the disease progresses

➢ By day 11, there will be bruising, brain damage and external bleeding from the eyes, nose, mouth and anus

➢ By day 12-16, there is massive internal bleeding of the lungs, brain, liver, intestines, kidneys, testicles, and breast tissue

➢ The person loses consciousness, will have seizures and will eventually die

Controlling and treating EVD

➢ There is no cure for EVD so that treatment is limited to supportive therapy

➢ Very ill patients require intensive supportive care: balancing the patient's fluids and electrolytes, maintaining their oxygen levels and blood pressure and treating complicating infections early

➢ The Ebola virus kills about 65% of its victims

➢ To protect yourself from getting EVD, make sure you wash your hands with soap and water or with an alcohol-based disinfectant

➢ People should cover their nose and mouth when coughing and sneezing, using a handkerchief or tissue

➢ Avoid contact with blood and bodily fluids

➢ Do not handle clothes, bedding, needles, and medical equipment that may have been contaminated with an infected person's blood or body fluids

➢ Do not touch someone at a funeral who has died of EVD

Bilharzia

- Schistosomiasis, also known as bilharzia or "snail fever.
- Is a parasitic disease carried by fresh water snails infected with five varieties of the parasite Schistosoma.

Symptoms

- Initial itching and rash at infection site.

- Frequent, painful or bloody urine.
- Abdominal pain and bloody diarrhoea.
- Fever, chills and muscle aches.
- Enlargement of the liver or spleen.
- Liver Cirrhosis.
- Blood disorders in cases of colon damage.
- Children with repeated infection can develop anaemia, malnutrition, poor growth and learning disabilities

Transmission

- The parasitic larvae live in fresh water and can penetrate human skin, placing people at risk through everyday activities such as washing, swimming or fetching water.
- The larvae migrate to the blood vessels where they mate and produce eggs. Some eggs travel to the bladder or intestines and are passed into the urine or stool. Others remain trapped in the body and cause damage to internal organs.

Prevention and Treatment

- Education campaigns about risks of infection by bathing in fresh water lakes and ponds.
- Praziquantel is the primary form of treatment.
- A single dose of praziquantel has been shown to reduce the severity of symptoms in cases of subsequent re-infection.
- Access to safe water.

Qn: Describe diseases of developed countries. (12)

Migration

-Movement of people from one place of residence to another.
It causes reduction of population in the place of origin and increase of population in the area of destination.

Terms used in Migration

Temporary Migration: Migration for a limited period, this might only be for a few weeks or even several years.
Permanent Migration: Migration with the intention of staying forever.
Forced Migration: When people are forced to migrate, often because their life is in danger.
Voluntary Migration: When people freely choose to migrate e.g. for better weather or better universities.
Economic Migration: Migration for work e.g. better salary or promotion
Seasonal Migration: Migration just for a particular season e.g. the ski season or the harvesting season
Commuting: Movement from home to workplace and vice versa.
Emigrant: A person who leaves a country to migrate to another.
Immigrant: A migrant arriving in a new country.

Migration Balance: The difference between emigrants and immigrants. If a country has more emigrants than immigrants that it is experiencing net migration loss. If a country has more immigrants than emigrants then it is experiencing net migration gain.

Rate of net migration = $\frac{\text{immigration}-\text{emigration X1000}}{\text{Total population}}$

Causes of Migration

Push Factors

-Problems or circumstances which force out a person from his/her area of residence.

1. Pressure on land due to increase in population which cause people to move to other areas where land is available e.g. from Masvingo Province to Gokwe North.
2. Land becoming too poor to support crops which cause people to move to other areas where fertile land is available.
3. Unemployment and underemployment which cause people to move to other areas to seek jobs or better paying ones.
4. Insecurity such as tribal clashes and terror gangs which cause people to other safer places.
5. Persecution of specific religious groups due to their faith which causes them to move to areas where they can practise their faith freely e.g. Jews from Europe to Israel.
6. Political persecution e.g. many Zimbabweans moved to neighbouring countries (South Africa) during 2008 political instability.
7. Occurrence of natural calamities such as diseases, floods and severe droughts forcing people out of their place of residence e.g. in monsoon Asia.
8. Government policy where people are moved from one area to give room for development e.g. Tokwe Mukosi dam.

Pull Factors

-Positive conditions which attract a person to a new place.

1. Attraction of urban life where there is electricity, piped water, entertainment and social amenities.
2. Availability of employment such as in urban areas where there are many industries and businesses or in rural areas with estates and plantations.
3. Opportunities for better education e.g. in urban areas with many education institutions.
4. Security
5. Plenty of land
6. Fertile land
7. Higher standard of living e.g. in urban areas

Types of Migration

- Two basic types namely: Internal and External

Internal migration

-Migration within a country e.g. Harare to Kadoma

Types of Internal Migration

Rural to urban Migration

-Movement of people from rural areas to urban areas.

It involves:

1. Youth who have completed various levels of education moving to urban areas to seek employment in while collar jobs.
2. People moving to urban areas in search of alternative ways of earning a living due to shortage of land in rural areas, unemployment and low prices for agricultural produce.
3. Traders relocating to urban areas where there is a larger market as the people in rural areas have low purchasing power.
4. People moving to urban areas where there is adequate social amenities such as hospitals, entertainment, electricity and generally exciting life.
5. Youth seeking for further education who join universities and colleges many of which are located in urban areas.
6. Transfer of people employed in rural areas to urban areas.

Rural to Rural Migration

-Movement of people from one rural area to another.
It involves:
1. People moving to plantations and other large farms seeking employment e.g. sugarcane harvesters, cotton pickers in SE Lowveld from rural areas.
2. Movement of nomadic pastoralists from one place to another in search of water and pasture.
3. People moving to other parts of the country to buy land and settle there.
4. Movement of people into settlement schemes e.g. Gambura and Chinhoyi to ease pressure on land.
5. Movement of public and private employees on transfer from one rural area to another.

Urban to Rural Migration
-Movement of people from urban areas to rural areas e.g. from Harare to Gokwe rural.
It involves:
1. Transfer of people employed in urban areas to rural areas.
2. Movement of people from urban areas to search for jobs in rural areas.
3. People moving from urban areas to rural areas to settle permanently after retirement.
4. People moving away from stressful urban life to suburbs to be commuting daily to work.

Urban to urban -Movement of people from one urban area to another or from one part of urban area to another e.g. Kadoma to Gweru.

- People moving from one part of town to another due to:
  - Transfer.
  - in search of affordable housing.
  - in search of better employment.
  - in search of better business opportunity

External Migration

Movement of people from one country to another e.g. Zimbabwe to South Africa or China.
It involves:

- People who seek employment abroad for a short period who end up settling permanently.
- Refugees who are forced out of their country by factors such as war.
- People seeking political asylum due to political persecution in their country.
- Government employees such as ambassadors who are in assignment abroad.

Problems faced by migrants

- They are represented on the Lee's Model by the wiggly line in between country of origin and destination country.
- Shortage of money, Language barriers, Passport or visa issues, Bad weather, Transport delays, Problems with housing, Kidnap, Rape, Robbery, Death and Torture

Impacts of Migration

- Migration can have positive and negative impacts on both the source country and the receiving country.

Impact on countries of origin	Impact on countries of destination	Impact on migrants themselves
Positive		
• Remittances are a major source of income in some countries. • Emigration can ease the levels of unemployment and underemployment. • Reduces pressure on health and education services and on housing. • Return migrants can bring new skills, ideas and money into a community.	• Increase in the pool of available labour may reduce the cost of labour to businesses and help reduce inflation. • Migrants may bring important skills to their destination. • Increasing cultural diversity can enrich receiving communities. • An influx of young migrants can reduce the rate of population ageing.	• Wages are higher than in the country of origin. • There is a wider choice of job opportunities. • A greater opportunity to develop new skills. • They have the ability to support family members in the country of origin through remittances. • Some migrants have the opportunity to learn a new language.
Negative		
• Loss of young adult workers who may have vital skills, e.g. doctors, nurses, teachers, engineers (the 'brain-drain' effect). • An ageing population in communities with a large outflow of (young) migrants. • Agricultural output may suffer if the labour force falls below a certain level. • Migrants returning on a temporary or permanent basis may question traditional values, causing divisions in the community.	• Migrants may be perceived as taking jobs from people in the long-established population. • Increased pressure on housing stock and on services such as health and education. • A significant change in the ethnic balance of a country or region may cause tension. • A larger population can have a negative impact on the environment.	• The financial cost of migration can be high. • Migration means separation from family and friends in the country of origin. • There may be problems settling into a new culture (assimilation). • Migrants can be exploited by unscrupulous employers. • Some migrations, particularly those that are illegal, can involve hazardous journeys.

Remittances: Money that is sent home to friends and family by migrants living in a different location, often overseas.

Refugee
A person who has been forced to leave their home and their country. This might be because of a natural disaster, war, religious or political persecution.
Persecution: When someone is attacked for what they believe in e.g. their religion or political belief.
Internally displaced person (IDP): When someone has been forced to leave their home but not their country.
Asylum Seekers: Someone who is trying to get refuge (residency) in a foreign country because their life is in danger in their home country. This is usually because of their political or religious beliefs.
Reasons for becoming a refugee

- War e.g. Iraq
- Natural disaster e.g. Indian Ocean tsunami
- Famine and/or drought in the Sahel region.
- Political and ethnic persecution e.g. Syria.

Problems faced by refugees

- No housing.
- Shortage of food and water.
- No job or no money.
- Poor medical care.
- Disease.
- Poor sanitation.
- Language barriers

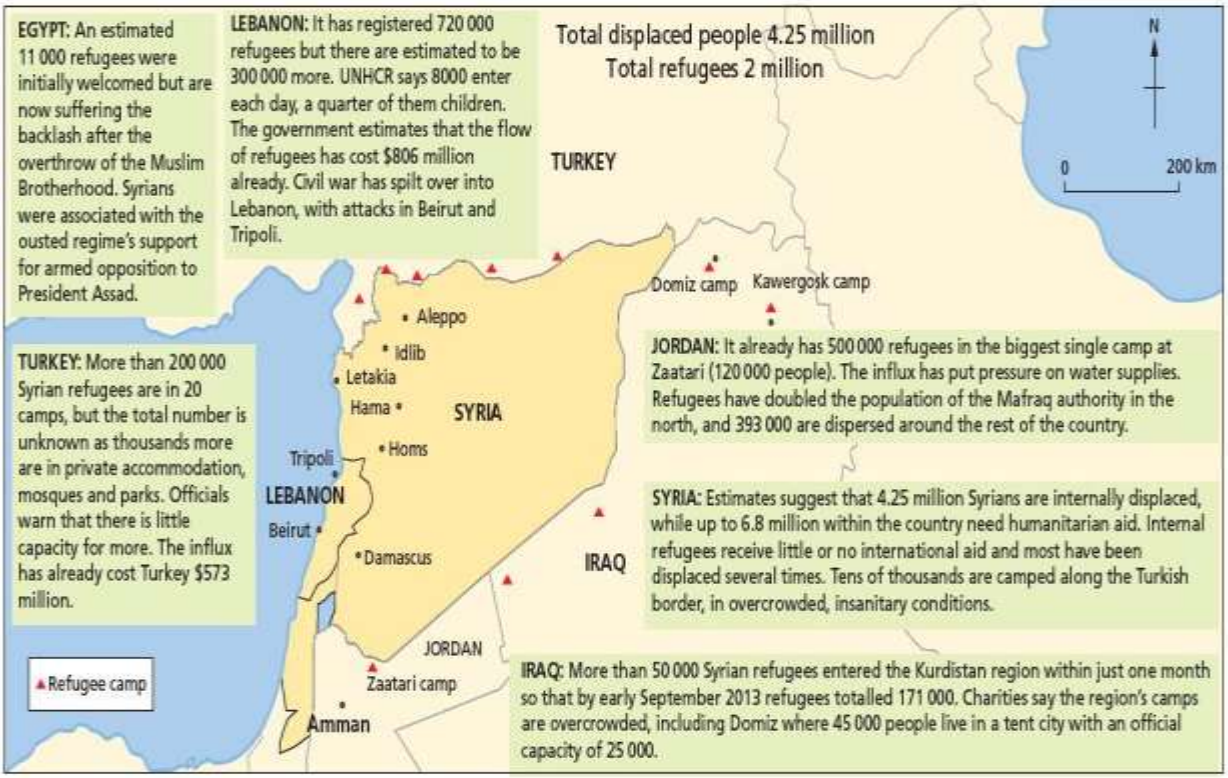
Problems faced by receiving country

- No education for children.
- Cost of providing food and water.
- Cost of providing education for children and medical care for everyone.
- Possible spread of disease to native population.
- Increased pollution and congestion
- Possible racial tension.
- Language problems of dealing with refugees
- Increased unemployment.
- Possible inflation because of rising demand

Solutions to refugee problem

- The return of migrants to their home (1st choice).
- The return of migrants to areas or countries near their home (2nd choice)
- Migrants settled in a foreign country a long way from their home (3rd choice)

Case Study (Syria: Refugees and Internally Displaced People, September 2013)



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END OF TEACHING NOTES