

GEOGRAPHY OF EAST AFRICA

East Africa comprises of three countries namely; Uganda, Kenya and Tanzania

SIZE

- East Africa covers a total land area of 1,773,200km².
- Tanzania is the largest country with an area of 943,800km².
- Kenya is second with 544,400km²
- Uganda is the smallest with 244,400km².

LOCATION

- East Africa is bordered by Sudan and Ethiopia in the North, Somalia in the North East, Indian Ocean in the East, Mozambique in the South, Malawi in the South west and Democratic Republic of Congo in the West.

East Africa lies astride the equator meaning that it's crossed by the equator which implies that much of East Africa receives rainfall throughout the year.

POPULATION

- East Africa is made up of three major races i.e. the blacks are the majority and Asians plus some few Europeans.
- Tanzania has got the highest population closely followed by Kenya and Uganda.
- Uganda has got the highest population density.

ECONOMIC PRODUCTION

- Agriculture is the major economic activity and the leading foreign exchange earner with coffee as the major export crop.

PHYSICAL FEATURES

- East Africa is blessed with a variety of features including mountains, Rivers, Lakes, and Swamps Valley etc.

TIME

- East Africa has got a standard time zone called East African time

RELIEF DIVISIONS OF EAST AFRICA

East Africa is made up of five relief divisions which are interested;

- (i) Coastal plains (0- 250m above sea level)
- (ii) Eastern plateaus (250-1100m above sea level)
- (iii) East African Rift valley (300-1800m above sea level)
- (iv) Central and lake plateau (1000-1500m above sea level)
- (v) East African highlands (1500-6000m above sea level)

COASTAL PLAINS

- This region forms low lying areas along the East African coast bordered by the Indian Ocean.
- The region is made up of sedimentary rocks due to wave deposition from the Indian Ocean and river deposition.
- Many rivers flow towards the Indian Ocean along this region e.g. R. Pangani, Ruvuma, Galana, Tana & Athi.
- Major activities on the coastal plains include Agriculture (sisal growing, cloves, coconuts, cashew nuts) Fishing, Trading, Quarrying and Tourism.

EASTERN PLATEAU

- From the coastal plains, the land generally raises towards the west.
- Here, Inselbergs (isolated hills and mountain ranges occur).
- In south East Kenya, the Eastern plateau is called Nyika, a Swahili word which means 'open grassland'.
- The major activities are animal grazing and tourism because Game parks & Reserves can be set up.

EAST AFRICA RIFT VALLEY

- Its sub- divided into two branches i.e. the western arm the Eastern arm.
- The Western arm stretches from Lake Albert to Lake Malawi (Lake Nyasa).
- Eastern arm stretches from Lake Turkana (Lake Rudolf) up to Lake Malawi in Tanzania.

- This region contains most of the lakes in East Africa e.g. L. Tanganyika, Albert, Turkana, George Edward, Tanganyika.
- Most of these lakes are very narrow and very deep.
- Economic activities here include; tourism, farming, fishing and animal rearing, mining.

CENTRAL & LAKE PLATEAU

- It's found between the arms of the rift valley.
- Most rivers pour their water into this region because its saucer shaped.
- It's the important region because of fertile soils for farming and it has the highest population densities.
- It has warped lakes i.e. Victoria & Kyoga and it has got major cities and towns.

EAST AFRICAN HIGHLANDS

- Most of the highlands here were formed as a result of folding, faulting, Volcanicity and warping,
- Mountains here include Rwenzori, Kilimanjaro, Elgon Usambara, Muhavura, Kenya, Uluguru ranges e.t.c.
- The high lands have got fertile soils which favour crop growing especially coffee.
- The East African highlands have got the highest population densities in East Africa.

A SKETCH MAP OF EAST AFRICA SHOWING RELIEF DIVISIONS

ROCKS IN EAST AFRICA

- A rock is an aggregate of mineral particles forming part of the earth's crust.
- Rocks may include substances like sand, stones, clay, coral reefs and shingle.
- Rocks are mainly classified into three major categories according to their mode of formation.

(a) Igneous rocks: These are fire formed rocks or volcanic rocks.

Formation of igneous rocks

- ❖ Molten rocks/magma under intense heat and pressure beneath the earth crust is ejected through cracks or faults/fissures/ line of weakness/vent onto the earth's surface or within the earth crust.
- ❖ When magma reaches the surface of the earth it is referred to as Lava which cools down and solidifies to form extrusive volcanic rocks e.g. obsidian, Basalt, gabbro and granite.
- ❖ When magma doesn't reach the earth's surface due to reduced pressure, it cools down and solidifies within the earth crust to form intrusive volcanic rocks e.g. pumice.

Characteristics of igneous rocks

- They are fire formed.
- They have large crystals when formed underground within the earth's crust (intrusive volcanic rocks).
- They are fine grained when formed on the surface of the earth (extrusive volcanic rocks).
- Some igneous rocks are spongy due to presence of gases at the time of formation e.g. pumice.
- They are very hard and resistant to erosion.
- Some are glassy in appearance e.g. obsidian.
- Some are basic and others are acidic depending on the lava type that was ejected.

(b) **Sedimentary rocks:** these are laid down rocks in different layers called strata.

Formation of sedimentary rocks

- ❖ These are formed by the process of deposition of sediments like sand, gravel and clay.
- ❖ Deposition is by water or on land as a result of processes like erosion, transportation and deposition.
- ❖ Several rock particles (sediments) are stratified and laid down in layers after deposition. This process is called stratification.

N.B: Sedimentary rocks are subdivided into three types which are;

- Mechanically formed sedimentary rocks;** pre-existing rocks or sediments are weathered, eroded, transported and deposited in layers by moving wind, ice or water. The layers are then cemented, compacted, compressed and hardened to form a rock e.g. Ice deposits moraine, wind deposits loess while water can deposit sand stone, clay and mud stones.
- Organically/biologically formed sedimentary rocks;** formed from remains of dead animals and plants which are laid down in layers. They accumulate in lakes or on land and are then compacted, sealed and compressed forming solid rocks e.g. limestone, coal, petroleum, lignite, peat and coral reefs.
- Chemically formed sedimentary rocks;** they are formed precipitation and evaporation of chemicals from solutions. When mineral particles are dissolved from land by moving water, they are carried in solution form into water bodies such as lakes. They accumulate at the bottom of the lake in different layers and are compressed and compacted to form a rock e.g. soda ash, Gypsum, Rock salt and Dolomite.

Characteristic of sedimentary rocks

- They are made of sediments that are found in layers or strata.
- The strata or layers are separated by bedding planes.
- They contain fossils or remains of dead plants and animals.
- They range from fine to coarse texture in their different layers.
- They are made of rock wastes e.g. precipitates.
- Some are porous or permeable (rocks allow water to seep through).
- Some are soft while others are hard.

(c) **Metamorphic rocks:** These are rocks which have been changed from their original nature.

Formation of metamorphic rocks

- ❖ Pre-existing rocks are subjected to intense heat or pressure.
- ❖ This changes the original rocks into a new form of rocks.
- ❖ Metamorphic rocks can be changed formed from igneous or sedimentary rocks into other rock types e.g.

Original	Changed form
Limestone	Marble
Granite	Gneiss
Clay	Slate or schist
Sand stone	Quartzite
Coal	Graphite

Characteristics of metamorphic rocks

- They are hardened rocks and resistant to erosion.
- They may contain precious minerals e.g. diamond, marble, slate and schist.

- They are changed rocks from their original nature.
- They form the basement of continental crust or bed rocks.
- They are foliated rocks (found in thin layers) e.g. schist.

Economic importance of rocks (positive)

- Rocks contain valuable minerals and natural gas that are sold for money e.g. copper at Kilembe, Lime stone at Tororo and Kasese, oil near Lake Albert.
- Rocks provide materials for building houses, dams and road construction e.g. Lake sand and murram.
- Rocks give rise to soil formation which supports agriculture e.g. the fertile red volcanic soils along mt. Elgon in Mbale.
- Rocky areas provide beautiful scenery for tourism which brings in foreign exchange e.g. the volcanic mountains.
- Some rocks are used for medicinal purposes e.g. clay for pregnant women.
- Rocks provide raw materials for industrial development e.g. rock salt used for making salt.
- Provision of employment opportunities which improves peoples' standards of living e.g. through mining and tourism.
- Some rocks are used domestically for grinding e.g. millet.
- Some rocks are sources of fuel used for boiling and cooking e.g. coal.
- Rocks such as mountains help to modify climate through the formation of relief rainfall on the wind ward side.
- Mountains are sources of water for rivers e.g. river Sebwe flows from the top of Mt. Rwenzori and provides water in Kasese.
- Rocks are used for study purposes by geologists and students on fieldwork which widens their knowledge scope.

Negative importances

- Rocks act as barriers to transport and communication lines making road construction difficult.
- Rocks help in promoting remoteness by limiting trade & commerce due to absence of roads.
- Mountain tops are too cold limiting agriculture and settlement.
- Landslides and mass wasting occur along slopes leading to loss of lives.
- Volcanic eruptions are dangerous hence leading to loss of lives and property.
- Mountains promote soil erosion and landslides hence hindering agriculture.
- Some rocks lead to water logging e.g. clay hence encouraging the spread of diseases such as cholera.
- The leeward side of mountains receives little or no rainfall at all hence limiting agriculture.
- Some rocks are infertile and don't support crop growing e.g. sand.
- Some rocks limit navigation and fishing in water bodies e.g. coral reefs at Mombasa.
- Porous rocks lead to loss of water hence accelerating drought e.g. in Kisoro.
- Caves are hideout area for criminals e.g. child sacrifices.

LANDFORM EVOLUTION IN EAST AFRICA

- Several processes are responsible for the formation of physical features in East Africa.
- These processes are mainly physical in nature although to some extent man has also been responsible for landform formation.

The physical processes are sub divided into two, i.e.

- Endogenic (internal processes)**; these are generated from within the earth crust and are popularly known as earth movements. Such processes include faulting, volcanicity, folding, warping and Earth quakes.
 - Exogenic (external processes)**; these are generated on the surface of the earth. Such processes include erosion, weathering, mass wasting, and deposition e.t.c. These processes are generally known as **Denudational processes**.
- NB. Endogenic processes are responsible for building up landforms while Exogenic processes are responsible for wearing down or removal of land forms.

Folding; It refers to the bending of earth's surface in which the crust is pressed into waves, valleys and hills. Folding is as a result of compressional forces being exerted onto sedimentary rock layers leading to the formation of Anticlines (up folds) and synclines (down folds). Within East Africa, folding has had little impact e.g. in western Uganda in the districts of Kabale and Kisoro and the Karagwe region in western Tanzania.

Before folding after folding

Faulting; It refers to the fracturing or cracking of rocks within the earth's crust followed by displacement of rocks along lines of weakness. Faults are cracks that develop after rocks have been subjected to both tensional and compressional forces. Faulting has been responsible for the formation of several features like;

- (i) Fault guided valleys e.g. Aswa valley occupied by River Aswa.
- (ii) Fault scarps / escarpments e.g. Nandi escarpment, Mau escarpment, Elgeyo escarpment, Butiaba escarpment near Lake Albert in Uganda and Manyara escarpment near Lake Manyara in Tanzania.
- (iii) The Great East African Rift valley with the western arm and the Eastern arm.
- (iv) Rift valley lakes formed as a result of secondary faulting within the Rift valley. Most lakes in East Africa are Rift valley lakes. They are also known as Graben lakes or Tectonic lakes or fault lakes. Examples of such lakes include Lake Albert, Baringo, Malawi, Naivasha, Turkana, Edward, George and Elmenteita.
- (v) Block Mountains or horsts e.g. Rwenzori in western Uganda, Uluguru, Pare and Usambara ranges in Tanzania.

THE GREAT EAST AFRICAN RIFT VALLEY

- ❖ The rift valley is an elongated trough bordered by steep side called escarpments.
- ❖ Two theories have been forwarded to explain the formation of the great East African Rift valley.
- (a) **Tension force theory:** Tension forces pull the landmass apart leading to the formation of normal faults. The landmass is then sub-divided into three parts and with continued pulling, the central block subsides / sinks under its own weight to form a rift valley. The side blocks remain standing to form the escarpments.

- (b) **Compression force theory:** Compression forces push the landmass from either side leading to the formation of reverse faults. The landmass is then divided into three parts and with continued pushing, the side blocks rise up leaving the central block in position. The central block then forms the rift valley while the side blocks form the escarpments.

ECONOMIC ACTIVITIES CARRIED OUT IN THE GREAT RIFT VALLEY

- Tourism due to the national parks in the rift valley e.g. queen Elizabeth and Lake Nakuru for flamingos which brings in foreign exchange.
- Fishing especially in the rift valley lakes e.g. Albert and George which provides food to the people.
- Mining e.g. oil from Lake Albert, soda ash from Lake Magadi and salt from Lake Katwe hence providing employment opportunities
- The Rift valley is also used for animal rearing e.g. Masai pastoralists and the Turkana of Northern Kenya.
- Transport especially water transport on Rift valley lakes e.g. kazinga channel connects Lake George to Lake Edward.
- Hunting especially in the National parks found within the Rift valley.
- Crop growing e.g. Maize and cotton in the Mobuku irrigation scheme in Kasese.

PROBLEMS FACED BY PEOPLE LIVING IN THE RIFT VALLEY AREAS

- Steep escarpments hinder development of transport and communication lines e.g. near Lake Albert.
- Low rainfall is received in the rain shadow areas of the rift valley e.g. in Kasese.
- Rift valley lakes are very deep hence they are poor fishing grounds e.g. Lake Tanganyika.
- Rift valley regions contain soils which are sandy hence not favouring farming.
- Rift valley areas are prone to earthquakes and volcanicity which are destructive to human survival e.g. in Bundibugyo.
- Steep slopes in rift valley areas hinder mechanization on farms.
- The escarpments are associated with soil erosion which leads to loss of soil fertility e.g. in Bundibugyo.
- Landslides are common in rift valley areas which lead to destruction of crops and settlements.
- Rift valley areas are infested with pests e.g. tsetse flies which spread Nagana.
- Some areas of the rift valley have got dangerous wild animals which scare away human settlements e.g. lions and monkeys within the Queen Elizabeth National Park.

SOLUTIONS TO THE ABOVE PROBLEMS

- ✓ Resettling people away from the rift valley to reduce effects of landslides and earthquakes.
- ✓ Irrigation can be used in the rain shadow areas to provide water.
- ✓ Soil erosion can be controlled through terracing and contour ploughing.

- ✓ Re-afforestation and afforestation can be used to control landslides.
- ✓ Spraying with pesticides to control pests and diseases within the rift valley.
- ✓ Fencing National parks to ensure security of people from wild animals in the surrounding areas.

BLOCK MOUNTAINS / HORSTS

- ❖ A horst or block mountain is formed due to faulting.
- ❖ There are many block mountains in East Africa e.g. Mt. Rwenzori in Uganda.
- ❖ In Kenya, they include; Aberdare ranges, Mt. Nyiru, Mt. Mathews and Mt. Ndoto.
- ❖ In Tanzania, they include; Usambara, Uluguru, Mt. Pare, Mbeya ranges, Iramba plateaus and Ufipa plateau.

FORMATION OF THE BLOCK MOUNTAIN

- ❖ It's formed as a result of tensional forces acting on the landmass.
- ❖ As the forces continue to pull apart, fault lines are formed and the landmass is divided into three blocks.
- ❖ Due to differential sinking, the side blocks sink downwards faster while the middle blocks remain standing to form a horst or block mountain.

ECONOMIC IMPORTANCE OF BLOCK MTNS

- They are tourist attractions hence promoting tourism which brings in foreign exchange.
- Block Mtns are sources of rivers which provide water for irrigation e.g. river Mobuku which originates from Mt. Rwenzori.
- Rivers along the mountainous areas are used for generation of H.E.P e.g. Mobuku Power Project in Kasese along river Mobuku.
- Block Mtns help in the formation of relief rainfall on the windward side hence boosting agriculture.
- Mining is carried out on the lower slopes of block Mtns e.g. copper and cobalt from Kasese.
- Block Mtns have got forests along the slopes hence promoting lumbering.
- Block Mtns contain rocks which provide building and construction materials e.g. gravel.

PROBLEMS FACED BY PEOPLE LIVING NEAR THE BLOCK MTNS

- The leeward side is in the rain shadow hence having dry conditions e.g. Kasese and Ankole-Masaka Corridor.
- Block Mountains are barriers to construction of transport and communication lines.
- Block Mountains accelerate soil erosion which leads to loss of soil fertility.
- Landslides are common along Mountain slopes which are destructive to human life.
- Mountain tops are not suitable for human settlement due to extremely low temperatures.
- Block Mountains are associated with earth quakes which are destructive to human life and property.
- Block Mountains limit the use of machines in agriculture due to steep slopes.
- Mountain tops are good hiding places for rebels who cause insecurity in surrounding areas.
- Forests along the mountains harbour dangerous wild animals which scares away human settlements.
- The dense population near mountains leads to land fragmentation on the lower slopes leading to low output.

VULCANICITY

- ❖ This is a process through which molten rocks (magma) are intruded within the earth's crust or extruded onto the earth's surface.
- ❖ Vulcanicity is aided by the process of faulting which forms cracks in the earth's crust through which magma escapes.
- ❖ When magma is intruded within the earth's crust, it cools down and solidifies to form intrusive volcanic features e.g. batholiths, sills, dykes, lapolith and lacolith.
- ❖ When magma is extruded onto the earth's surface, it changes to lava leading to the formation of lava plateaus, calderas, craters, hot springs, fumaroles and geysers.

Extrusive features; These are formed as a result of lava solidifying on the earth's surface. The features formed include;

(a) **Volcanoes:** They are formed as a result of subsequent eruptions through which magma is ejected onto the earth's surface. These volcanoes are mainly made up of alternating layers of ash and lava/cinder hence they are also called composite cones or ash and cinder cones e.g. mountain Kilimanjaro, Muhavura and Mt. Kenya.

Formation of composite volcanoes

These are formed as a result of volcanic eruptions leading to the extrusion of ash and cinder/lava at different intervals. With time, ash and

Cinder cones develop parasitic cones e.g. Kibo and Mawenzi peaks on Mt. Kilimanjaro.

N.B. Volcanoes are grouped according to their present states. There are 3 types of volcanoes i.e.

- (i) Active volcano; one which has erupted in recent years and still shows signs of eruption e.g. Muhavura ranges, Oldoinyo Lengai, Mt Longonot.
- (ii) Dormant volcanoes; these have taken a very long time without erupting but still show some signs of eruption e.g. Mt Kilimanjaro, Mt Kenya and Mt. Elgon.
- (iii) Extinct volcanoes; these show no signs of further eruptions and the original shape of the mountain has been destroyed by denudational processes e.g. Mt. Moroto.

(b) **Crater:** This is a shallow and funnel shaped depression found on top of a volcanic mountain. It's formed as a result of magma cooling in the vent without subsiding /sinking back to the magma chamber. When a crater is filled up with water, it becomes a crater lake e.g. Lake Katwe, Lake Kyamwiga, Nkugute, Nyamnuka and Nyamusingiri. Many explosion craters are found in Mt. Rwenzori National park acting as tourist attractions.

(c) **Caldera:** This is a large and rounded shallow depression on top of a volcanic mountain. It's formed when violent explosions blow off a mountain top with a crater leaving behind a large and rounded shallow depression. Examples in East Africa include; Ngorongoro, Oldoinyo Lengai, Napak and Longonot.

(d) **Volcanic plug:** It's also known as a volcanic neck. It's formed when magma solidifies and cools in the vent. It's then exposed as a result of erosion leaving behind a hard and resistant rock e.g. Tororo rock and Mwadui plug.

(e) **Lava plateau:** It's an extensive upland formed as a result of ejection of lava through many vents e.g. Kericho plateau, Yatta plateau, Nyika plateau, Aberdare ranges and Kaputiel plains.

(f) **Geysers and hot springs:** these are formed through ejection of hot water and steam from the underground water aquifers. Examples in East Africa include; Sempaya and Kitagata in Bushenyi, Maji Moto in Tanzania.

(g) **Inselbergs:** these are isolated hills found in plateau regions e.g. in Mubende, Nakasongola, Gulu, Lira, Kapchorwa and Songea.

(h) **Lava dammed Lakes:** formed when a mass of flowing lava blocks a river channel to form a Lake e.g. Lake Bunyonyi, Lake Mutanda and Lake Mulehe.

Intrusive volcanic features

- (i) **Batholiths:** This is a very large mass of magma which often forms the root of a volcanic mountain. It is made up of granite and it is formed very deep in the earth's crust but can be exposed on the surface by the denudational forces like weathering, mass wasting and erosion to form an Inselberg. Examples include; Singo in Mubende and the central parts of Tanzania.
- (ii) **Sill:** It is formed when a sheet of magma is intruded along the bedding planes (horizontally) in the earth's crust. It forms a ridge-like escarpment when exposed by erosion. Sills also lead to formation of water falls and rapids when they are crossed by a river e.g. waterfalls can be seen along Pakwach-Arua road.
- (iii) **Dyke:** It's formed when a mass of magma cuts across the bedding planes and it forms a wall-like feature. The magma may either be steeply inclined or vertically inclined. Examples of such can be witnessed in East Africa e.g. in the Rungwa complex in Kisumu and Thika falls in Kenya.
- (iv) **Lacolith:** This is a dome shaped feature formed when magma bulges near the surface. The magma forces the upper layer of the earth's crust to bulge e.g. at Voi in Kenya.
- (v) **Lapolith:** This is a saucer shaped feature that is formed when the over lying rocks lead to the formation of depressions on the intruded magma.

Economic importance of volcanicity

- ✓ Sills can lead to formation of waterfalls e.g. Karuma falls which are good sites for generation of hydro electric power.
- ✓ Volcanic Mountains help in the formation of relief rainfall on the wind ward side which supports agriculture.
- ✓ Hot springs provide medicinal water e.g. Kitagata hot spring water contains sulphur which is used to treat skin diseases.
- ✓ Volcanicity leads to the formation of lakes which provide water for domestic and industrial use e.g. Lake Bunyonyi.
- ✓ Crater lakes are a source of minerals which can be sold for money e.g. salt obtained from Lake Katwe.
- ✓ Volcanicity favours mining because it exposes valuable minerals near the surface of the earth e.g. Diamond mining in Mwadui plug in Tanzania.
- ✓ Volcanic features attract tourists who bring in foreign exchange used for national development.
- ✓ Volcanic lava leads to production of fertile soil hence favouring agriculture e.g. coffee growing along the slopes of Mt. Elgon.
- ✓ It's a basis for geographical studies hence improving on research and study purposes.

Negative importances

- Violent volcanic eruptions lead to destruction of property and human life.
- Volcanic mountains have caused rain shadows on the lee ward side of the mountain hence causing dry conditions.
- Salty volcanic lakes e.g. Lake Katwe can't support fishing and provision of water for human and domestic purposes.
- Mountains covered with thick forests which hide dangerous animals e.g. Gorillas, lions and Monkeys which make human settlement very difficult.
- Mountains are used as hide outs for criminals and rebels who destabilize peace and sanity in the surrounding communities.
- Volcanic rocks that are not fully weathered provide infertile soils that hinder agriculture.
- Landslides are common along Mountain slopes which are destructive to human life.
- Mountain tops are not suitable for human settlement due to extremely low temperatures.
- Mountains accelerate soil erosion which leads to loss of soil fertility.
- Dense population near mountains leads to land fragmentation on the lower slopes leading to land conflicts.

LAKES IN EAST AFRICA

A lake is a mass or a body of water contained within a basin or depression. Most lakes in East Africa are found in the Rift valley and were therefore formed as a result of secondary faulting.

In East Africa, lakes are grouped as;

Volcanic lakes: These are associated with volcanic activity and they occupy basins formed as a result of volcanicity.

- (a) **Crater lakes** e.g. Lake Katwe, Nyamulagira, Nyungu, Nyamusigira in South western Uganda.
- (b) **Caldera lakes** e.g. Lakes Nganzi, Menengai, Lake Ngorongoro, Lake Longonot.
- (c) **Lava dammed lakes** e.g. Lake Bunyonyi, Mulehe, Mutanda, Ndalaga and Lake Muhondo.

Rift valley lakes: They are also known as fault Lakes / tectonic Lakes/ Graben Lakes. Most lakes in East Africa were formed due to tectonism or faulting.

Formation

- ❖ They were formed as a result of secondary faulting on the rift valley floor.
- ❖ Tension forces acted within the rift valley and secondary faults developed.
- ❖ This forced the land to sink forming a valley within the rift valley.
- ❖ When it's filled up with water, it forms a rift valley lake e.g. Lake Albert, Lake Edward, Lake Eyasi, Nakuru, Amboseli, Bogoria, Naivasha, Manyara e.t.c.
- ❖ Rift valley lakes are very deep with steep sides which have greatly hindering fishing.

(d) **Crustal warped lakes:**

- ❖ These were formed as a result of down and up warping.
- ❖ Down warping leads to the formation of the Lake basin while up warping on the sides causes river reversal.
- ❖ The reversed rivers fill the depression in the middle to form a lake e.g. river Nzoia, river Kagera and river Katonga reversed their flow, to fill up the depression occupied by Lake Victoria.
- ❖ Other crustal warped lakes include: Lake Kyoga, Lake Wamala, Lake Bisina and Lake Opeta.

(e) **Manmade lakes:** formed as a result of man creating a dam along a river channel. When a dam is set up along a river, it blocks the flow of a river's water. The held up water is forced to pond back and form a lake e.g. Lake Kindaruma on river Tana, Lake Kibimba on river Kibimba. Other manmade lakes include Kabaka's Lake near Mengo.

(f) **Glacial lakes:** These are formed as a result of glacial erosion through processes like back wall recession, sapping, plucking and abrasion which form a depression along glaciated mountain slopes that appears in the shape of an arm-chair. They are also known as Tarn lakes or cirque lakes e.g. lac- du-Speke, lac- du-Stanley, lac-du-Catherine which are found on Mt. Rwenzori. Other glacial lakes include: Tyndal tarn and Teleki tarn on Mt. Kenya.

(g) **Ox-bow lakes:** They are found along river courses in the old stage or senile stage or lower course of the river. They are formed as a result of river deposition leading to the creation of meanders. These meanders are later cut off from the main river leaving behind a horse-shoe shaped Lake e.g. along river Rwizi in Mbarara, along river Nzoia, river Nyando and river Kilombero.

(h) **Lagoon lakes:** They are formed as a result of wave deposition along the coast line or shore line of the lake. Long shore drift along the shores leads to the formation of spits and sand bars which cut off the lagoon lake e.g. Lake Nabugabo in Masaka was cut off from Lake Victoria. Other lagoons are also found at Mombasa.

(i) **Solution lakes:** These are lakes found in limestone areas. They are formed as a result of water dissolving the calcium within rocks to form small basins. When these basins are later filled up with water, they form solution Lakes e.g. Lake Nanyuki. These lakes tend to be seasonal and only appear during the wet season.

Economic importance of lakes

- Lakes are tourist attractions and hence earn the government a lot of foreign exchange e.g. Lake Victoria.
- They also act as natural habitats for wildlife e.g. Lake Nakuru in Kenya is well known for flamingos which also attract tourists.
- Some lakes are sources of minerals e.g. Lake Magadi for soda ash, Lake Albert for oil and Lake Katwe for salt.
- Mining on lakes has led to the development of industries which provide employment e.g. Soda ash from Lake Magadi has led to development of glass manufacturing industry.
- Lakes are favourable fishing grounds e.g. Lake Victoria for tilapia and Nile perch, Lake Tanganyika for Dagaa, Lake Kyoga for moon or silver (Haplochromis also known as Mukene fish).
- Lakes help in the modification of climate through formation of convectional rainfall which boosts agriculture.
- Lakes provide water for domestic use e.g. cooking and washing.

- The shores of some lakes are fertile grounds hence favoring farming e.g. Robusta coffee grows well on the shores of Lake Victoria.
- Lakes also provide water for industrial e.g. cooling machines and also used as a raw material e.g. manufacture of soda and breweries, fruit canning.
- Lake shores provide building materials e.g. Lake Sand from the shores of Lake Victoria at Entebbe.
- Lakes provide water used for irrigation e.g. Lake Kindaruma provides water used at Mwea-Tebere irrigation scheme.
- Some lakes act as natural boundaries between countries e.g. Lake Albert, Lake Victoria, Lake Tanganyika and Lake Malawi.
- Lakes are also used for transport e.g. Lake Victoria which connects Uganda with Kenya and Tanzania.
- Swampy lake shores have provided clay and papyrus which have led to development of art and crafts industry.

Negative importances

- ❖ Lakes are used for smuggling purposes which leads to loss of government revenue e.g. Lake Victoria.
- ❖ Lakes with swampy shorelines act as good breeding grounds for disease spreading vectors like mosquitoes and snails e.g. Lake Kyoga and Lake Victoria.
- ❖ Lakes act as habitats for wild animals which scare away human settlements e.g. crocodiles, hippos e.g. Lake Mburo.
- ❖ Lakes are subjected to floods during heavy rains which endangers peoples' life.
- ❖ Waves on lakes cause accidents which claim many peoples' lives.
- ❖ Lakes have made the construction of roads and railway lines very difficult.
- ❖ Lakes with swampy shorelines are also used as hiding places for criminals and rebels hence destabilizing peace in the surroundings.
- ❖ Some lakes have got floating vegetation e.g. papyrus and water hyacinth which hinder navigation or water transport e.g. Lake Kyoga.

RIVERS IN EAST AFRICA

- A river is defined as a mass of flowing water from its source to the mouth in a defined channel. A river has got a life cycle along its profile. A river profile refers to a measured slope along which a river flows from its source to its mouth. A river profile is subdivided into three stages:
 - (i) Youthful / torrent / upper course
 - (ii) Mature /middle course
 - (iii) Old /senile/lower course.

CROSS SECTION ALONG A RIVER PROFILE

N.B: River sources are found in high altitude areas especially highlands or mountains and the Rivers mouth is always found at low altitude e.g. a lake, ocean or sea.

Characteristic features along a river profile

(a) Youthful stage

- Water flows very fast due to steep gradient.
- It mainly erodes vertically due to fast flowing water.
- The river flows in a V-shaped valley due to head ward erosion.
- Waterfalls, rapids, cataracts, potholes and plunge pools, interlocking spurs are common features at this stage along the profile.
- The load consists of big rock particles.

Middle stage

- The gradient becomes more gentle.
- Major activity is transportation of material eroded in the first stage.
- Lateral erosion is very common i.e. erosion on the side of the river valley.
- U-shaped valleys are formed because of erosion on the sides.

- The load consists of fairly rounded rock particles.

Old stage:

- The gradient is very gentle.
- The river flows very slowly.
- Deposition is the major activity.
- The load consists of very fine rock particles.
- The river develops meanders due to deposition of materials.
- Features formed in this stage include deltas, floodplains, levees, braided channels and ox-bow lakes.

N.B: (i) The general term given to material transported by a river is **Load**.

(ii) The general given to the material deposited by the river is **silt or alluvium**.

Major terms used under river action

- River confluence:** This is a meeting point of two or more rivers.
- River regime:** Refers to the seasonal variation/fluctuations in the amount of water carried by the river.
- River rejuvenation:** This refers to the renewed erosive potential of a river after the old stage.
- Catchment area:** It's an area that is drained by a river and its tributaries.
- Watershed/divide:** It refers to a ridge/highland that separates two or more rivers.
- River capture:** It's the diversion of water from a weaker stream into a much stronger stream.

River erosion: A river carries out erosion in four major ways;

- Solution/corrosion:** Here a river dissolves certain materials from the valley sides and bottom and transports them in a solution form e.g. limestone and Calcium can be dissolved and transported in water.
- Abrasion/corrasion:** It occurs when the load of a river rubs against the sides and valley bottom of the river channel hence breaking the rocks into smaller particles due to friction in water.
- Attrition:** It occurs when the load of a river rubs against each other during transportation hence becoming smaller and smaller rocks.
- Hydraulic action:** It occurs when the water enters the cracks or jointed rocks and it breaks some rock particles.

River transportation:

- Solution:** Materials are dissolved in water and then transported in a solution form by a river.
- Traction:** this involves transportation of large and heavy materials where the load is rolled down along the river bed.
- Suspension:** This involves transportation of lighter materials within or they float on top of the water.

Drainage patterns: It refers to the layout / plan made by rivers and their tributaries on the landscape. There are four major types of drainage patterns:

- Dendritic pattern:** Here, the tributaries join the main river from different directions and at acute angles.
- Trellis pattern:** here, tributaries join the main river at approximately 90°. (Right angle)
- Radial pattern:** It's an arrangement of streams flowing down a slope from one central point and then radiating in different directions e.g. on Mt. Elgon, rivers such as Malaba, Kotoibo, Manafwa and Sironko originate from its summit.
- Centripetal pattern:** It's an arrangement of streams where they pour their water into one common basin e.g. river Kagera, river Nzoia and river Katonga all pour their water into the basin occupied by Lake Victoria while Lake Baringo has got river Mukutan, river Malo, and river Arabel pouring their waters into its basin.
- Parallel pattern:** in this case, rivers flow parallel to each other. They flow through valleys that are common on ridge slopes or escarpments e.g. Aberdare and Mau escarpments. Examples of such rivers include; river Athi, river Tana and river Nkusi in western Uganda.

Economic importance of rivers

- Rivers are tourist attractions hence earning government a lot of foreign exchange used to develop infrastructures e.g. River Nile.
- Rivers help in the generation of Hydro Electric Power near sites of waterfalls used for industrial development e.g. Hale project on river Pangani, Owen falls and Nalubale power projects on river Nile and Seven folks dam on river Tana.
- Rivers in the old stage have fertile banks with deep and well drained alluvial which favour farming e.g. rice growing at Kibimba.
- Rivers provide water for a variety of uses e.g. domestic work and industrialization e.g. Nile breweries at Jinja.
- Rivers also provide water for irrigation which supports agriculture e.g. river Manafwa provides water for irrigation on Doho irrigation scheme.
- Rivers are used for transport / navigation hence connecting different places e.g. river Kafu and Katonga.
- They help in the modification of climate through the formation of the convectional rainfall which supports farming.
- Rivers are fishing grounds especially for tilapia, lung and mud fish which supplement on food e.g. river Katonga.
- Rivers in the old stage have got swamps which provide raw materials for the art and crafts industry e.g. clay and papyrus from river Katonga.
- They are used for study and research purposes hence widening our geographical scope of knowledge e.g. formation of waterfalls.
- Rivers also provide building materials e.g. river Sand along the banks.

Negative importances

- ❖ Rivers are used for smuggling purposes hence reducing on government revenue e.g. river Malaba at the border of Uganda and Kenya.
- ❖ Rivers harbour dangerous animals which scare away human settlement e.g. crocodiles at Murchison falls National park.
- ❖ Rivers lead to floods during heavy rains which destroy peoples' crops, houses and roads.
- ❖ Rivers that have got waterfalls and rapids hinder transport on water e.g. river Nile with Bujagali falls, Sezibwa falls and Karuma falls.
- ❖ Rivers with swamps make the construction of transport and communication lines very expensive e.g. river Katonga at Lwera near Masaka.
- ❖ River banks act as breeding grounds for disease spreading vectors e.g. mosquitoes and snails.
- ❖ Some rivers have got floating vegetation especially water hyacinth and papyrus which affect the respiration of the fish leading to destruction of aquatic life.
- ❖ Most rivers in East Africa are narrow and shallow hence can't be used for navigation.
- ❖ Some rivers are seasonal and they disappear in the dry season hence making their use very limited to specific times of the year.
- ❖ Floating vegetation e.g. Papyrus on river Katonga also hinders water transport/ navigation on rivers.

GLACIATION

- Glaciation refers to the formation of ice on a highland.
- When there is more snow falling than that which can melt, it leads to accumulation of ice on the top of a highland.
- When the temperatures remain constantly below 0⁰ (zero degrees), ice sheets known as glaciers are formed.
- A glacier is a mass of moving ice.
- As glaciers move, they erode the surface leaving behind glacial erosional features e.g. pyramidal peaks, hanging valleys, corries/cirques and arêtes.
- After transportation, glaciers deposit all the eroded materials leading to formation of glacial depositional features e.g. drumlins, outwash plains, eskers, kettle holes, boulders and moraine.

N.B: a) The general term given to all the material deposited by glaciers is **moraine**.

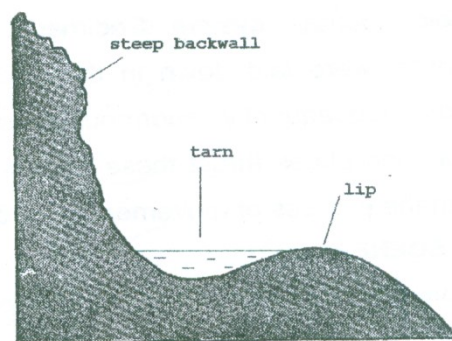
b) In East Africa, glaciers are only limited to the 3 highlands of Mt. Kilimanjaro (5895m), Mt. Kenya (5199m) and Mt. Rwenzori (5109m).

Limitations of glaciation in East Africa

- i) **Altitude:** Much of East Africa lies below 3000m above sea level which is below the snowline. This means that many areas in East Africa have high temperature which doesn't support accumulation of ice e.g. along the coastal plains.
- ii) **Latitude:** East Africa lies astride the equator (crossed by the equator) where temperatures are constantly high and this does not favour the accumulation of ice e.g. along the shores of Lake Victoria.
- iii) **Aspect:** This refers to the direction of earth's surface in relation to the angle of the sun. Much of East Africa receives direct heating from the sun throughout the year hence less glaciation.
- iv) **Global warming:** the ever increasing world temperatures have led to the destruction of the ozone layer which has exposed East Africa to direct sun's rays hence leading to high temperatures which don't support glaciation.
- v) **Low Precipitation:** Most areas in East Africa receive very little rainfall which implies that the temperatures are constantly high thus reducing the level of glaciation e.g. Ankole-Masaka corridor.
- vi) **Expansion of deserts:** Due to increased deforestation, urbanisation and industrialisation, the Sahara desert is widely spreading southwards into East Africa and since it's associated with extremely high temperatures and low rainfall, glaciation is reduced in East Africa.
- vii) **Industrialization; (green house effect):** Industries release dangerous fumes into the atmosphere hence destroying the ozone layer which has led to increase in temperatures thus reducing glaciation.
- viii) **Rain shadow effect:** some areas in East Africa are in the rain shadows which are made up of high temperatures and low rainfall hence limiting glaciation e.g. Kasese, Ankole-Masaka corridor and Turkana land.
- ix) **Urbanization:** The construction of roads and buildings has put the concentration of many people in one area which has led to high temperatures hence limiting glaciation. E.g. Kampala, Mombasa and Dodoma.

Glacial Erosional Features: glaciers carry out erosion just like rivers under processes like abrasion, sapping, plucking and back wall recession.

1. **CIRQUES/CORRIE;** A cirque is a semi-circular hollow depression on the side of a mountain. It's formed when a glacier or a block of ice erodes the side of the mountain through processes like back wall recession, abrasion, plucking or sapping leaving behind a depression that is like an arm-chair. When a cirque is filled up with water, it forms a lake known as a **Tarn Lake**.

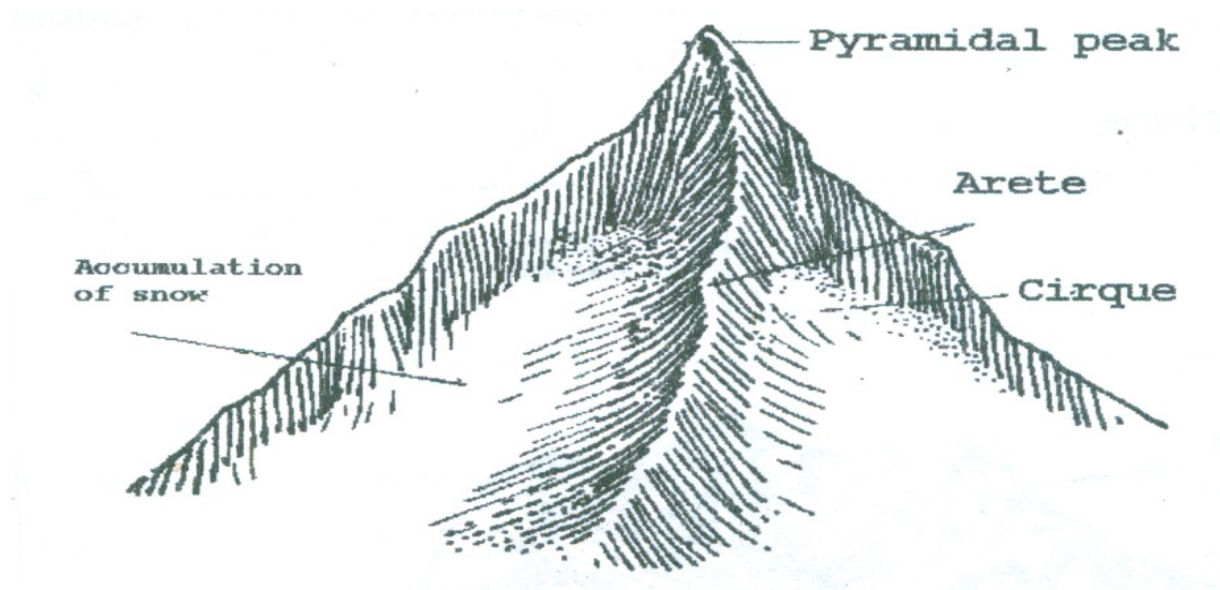


Examples of tarn lakes in East Africa include Lake Teleki and Tyndal tarn both on Mt. Kenya and Lac-du Speke, Lac-du-Catherine and Lac-du-Stanley which are all found on Mt. Rwenzori.

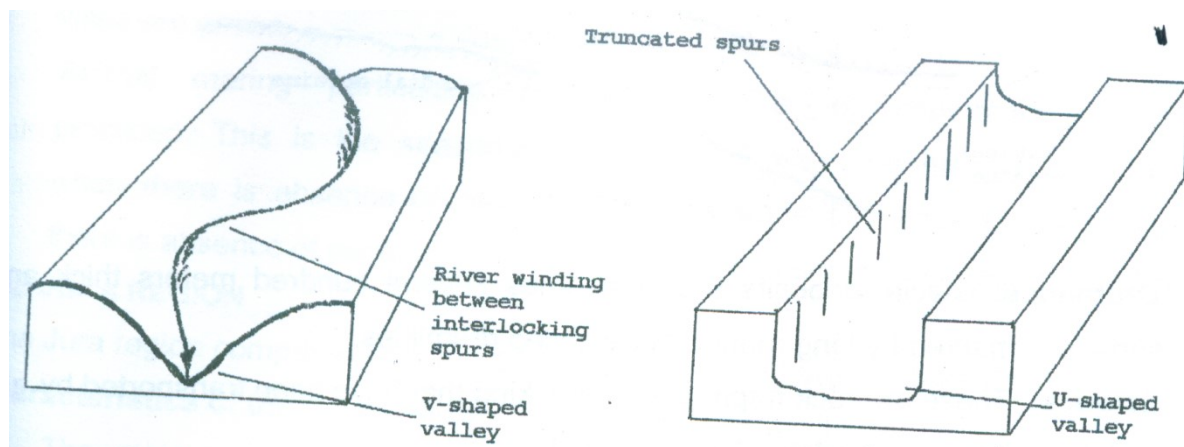
2. **ARETES;** These are Knife-edged ridges found between two corries. They are formed as a result of glacial erosion where two corries form adjacent to each other. These corries keep on widening through back wall recession and only leave behind a sharp ridge separating them.

3. **PYRAMIDAL PEAK OR HORN;** It is a sharp mountain peak in a glaciated landscape which is pointed like a pyramid.

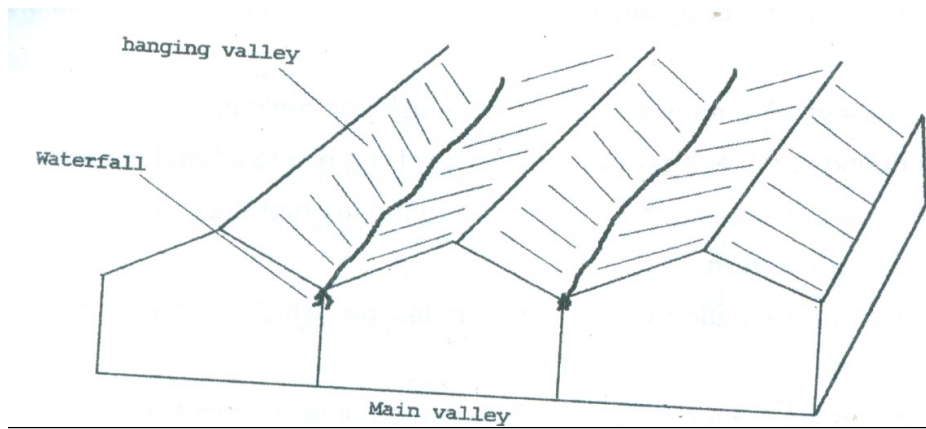
- ❖ It's formed when a resistant rock (hard rock) remains on top of the mountain after the weak rocks on the sides have been eroded by glaciers through processes like plucking, abrasion and sapping.
- ❖ It's also formed where two or more corries/cirques on opposite sides of a glaciated mountain keep on enlarging through back wall recession to leave behind a sharp pointed tip which forms the pyramidal peak e.g. Margherita peak on Mt. Rwenzori, Kibo and Mawenzi peaks on Mt. Kilimanjaro.



4. **U-SHAPED VALLEYS/GLACIAL TROUGHS;** This is a broad, flat bottomed, steep sided valley with a u-shaped cross profile. It's formed when glaciers erode the sides and bottom of small river depressions through processes like plucking and abrasion along the slope profile e.g. Mobuku valley along Mt. Rwenzori and Hobley and gorges valley on mt. Kenya.



5. **HANGING VALLEYS:** These are tributary valleys left high above the main valley. They are formed when the main valley is over deepened by glacial erosion by processes like abrasion, plucking and sapping such that tributary valleys are left standing high above the main valley e.g. river Little Nithi joins river Nithi on Mt. Kenya through a hanging valley.

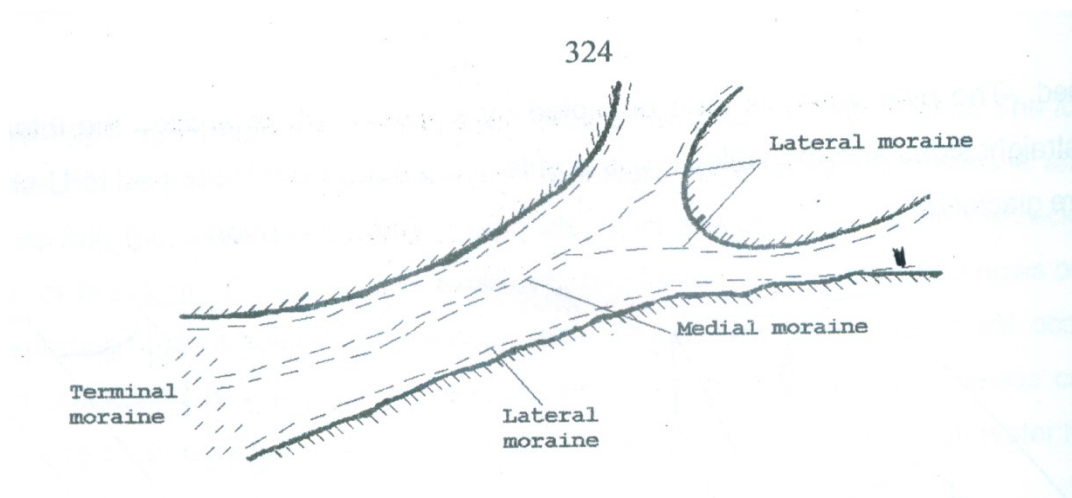


GLACIAL DEPOSITIONAL LANDFORMS

❖ **MORaine**; This refers to a large ridge of material transported and deposited by a glacier.

Formation of moraine

- Formed when glacier ice erodes pre-existing depressions or valleys along the glacial slope through processes like sapping, abrasion and plucking.
- In this process, glacial debris are transported and deposited down slope.
- Due to decrease in gradient and melting of the glacier, the material is then deposited in four major ways;
 - i. **Lateral**: moraine deposited along the sides of a glacier.
 - ii. **Medial**: moraine deposited in the middle when two glaciers meet.
 - iii. **Terminal**: moraine deposited along the front of a glacier.
 - iv. **Ground**: moraine deposited at the bottom of the glacier.



❖ **OUT-WASH PLAINS**; Terminal moraine transported by a glacier is deposited as a layer over a wide and large area called an outwash plain.

❖ **DRUMLINS**; Glacial deposits are sometimes several hundred meters thick and their surface is marked by long rounded hills called drumlins.

❖ **Erratics**; These are rock fragments of one kind that have been transported by glaciers and deposited on materials of another kind.

N.B: Glacial deposition also leads to the formation of kettle lakes and ribbon lakes.

Economic importance of glacial features

- Glacial features are tourist attractions hence earning government a lot of foreign exchange used to develop infrastructures.
- Hanging valleys form waterfalls which help in the generation of Hydro Electric Power used for industrial development e.g. Mobuku valley in Kasese.
- Glaciers are sources of water for rivers used for irrigation and domestic use e.g. river Mobuku provides water used on Mobuku irrigation scheme.
- Out wash plains provide fertile land for agriculture e.g. Mobuku valley in Kasese for cotton and maize.
- U-shaped valleys act as route ways/ paths in highland regions mainly used by tourists engaged in mountain climbing.
- Boulder day deposited in valleys can be used in the art and craft industry for making pots and bowls.
- Glacial features are used for research and study purposes which boosts our geographical knowledge.
- Eroded rocks and boulders provide building and construction materials.
- Provision of suitable sites for film industry which helps to diversify the economy.
- Glacial features are used for research and study purposes by students on field work which widens knowledge scope.

Negative importance

- Glaciation leads to landslides which destroy people's crops and houses.
- Glaciation also leads to soil erosion which results into loss of soil fertility.
- Glaciation leads to very low temperatures which are not favorable for human settlement.
- Sand and boulder rocks are normally deposited in the outwash plains which does not favor farming.
- Glaciation leads to the formation of rugged landscape that hinders the development of transport and communication lines.
- Melt water from glaciers may cause floods in the lower regions.
- Stagnant water on lower parts forms breeding grounds for disease spreading vectors and pests e.g. mosquitoes.

WEATHERING

- It refers to the disintegration of rocks into increasingly smaller particles.
- Weathering can also defined as the breakdown of bigger rocks into smaller rock particles.
- It's the first process during the formation of soil.
- Weathering is a denudational process which acts on existing rock particles.

TYPES OF WEATHERING

There are three types of weathering i.e.

- i. physical / mechanical
- ii. chemical weathering
- iii. Biological weathering.

i) **Physical/mechanical weathering:** It's mainly common in the hot/dry regions of East Africa e.g. North East Uganda (Karamoja), northern Kenya (Turkana land), and Central Tanzania (Miombo woodlands).

- It takes place as a result of temperature change which increases and then drops rapidly and this causes rocks to expand and contract. This continues over a period of time leading to the formation of cracks within the rocks. This process is known as **exfoliation or Onion weathering**. It leads to the formation of rock Scree and the feature formed after exfoliation has taken place is known as an exfoliation dome.
- Mechanical weathering also takes place under **frost shattering**: This is the action of ice on top of mountain summits e.g. Mt Rwenzori, Kenya and Kilimanjaro. It occurs when water enters into joints and cracks through hydraulic action and then freezes and expands in volume. This process continues over a long period of time leading to rock disintegration. It's also known as **freeze and thaw action**.

- ii) **Chemical weathering:** It's dominant in wet and humid conditions e.g. shores of Lake Victoria. Rocks are decomposed due to chemical reactions between rock minerals, water and gases such as oxygen and carbon dioxide.

Types of chemical weathering

- **Carbonation:** It takes place when carbon dioxide reacts with water to form a weak carbonic acid which reacts with rock compounds. It occurs mainly in limestone and dolomite rock.
- **Oxidation:** It involves the addition of oxygen in minerals leading to chemical reactions. It occurs when additional oxygen is taken in by a mineral compound and each time a reaction takes place, the rock acquires different characteristics hence losing its hardness and breaks down e.g. Oxidation leads to the formation of lateritic/murram soil. It's also common in sedimentary rocks like clay.
- **Hydrolysis:** It occurs when hydrogen ions from water react with minerals to form a different rock.
- **Hydration:** It occurs when rocks absorb water and expand causing stress to the rocks finally leading to rock fractures/cracks which lead to rock disintegration.

N.B Other process of chemical weathering include: **solution and reduction.**

- iii) **Biological weathering:** This involves disintegration of rocks by living organisms e.g. man, trees, grass, worms, and burrowing animals or rodents e.g. rabbits, squirrels, moles, rats and termites.

- Some of these animals also die and in the process lead to the accumulation of soil / humus.
- Man's activities through digging, road construction, grading of hills/quarrying and construction of industries, lead to disintegration of rocks hence breaking them up.
- When plant roots force themselves into rocks, they enlarge the rock joints which later break into smaller rocks. Plants also drop their leaves on the ground which also leads to accumulation of humus.

SOIL

- ❖ It refers to the loose substance that is formed on the upper layers of the earth crust. Soil is made up of both organic and inorganic materials.

Components of soil include;

- a) Minerals e.g. potassium and calcium.
- b) Water
- c) Humus
- d) Gases e.g. nitrogen, oxygen, carbon dioxide
- e) Living organisms e.g. bacteria.

N.B: The amount of the above components depends on the type of the soil.

SOIL FORMATION: The process of soil formation begins with weathering. Physical/mechanical weathering is responsible for breaking down rock particles into smaller pieces while chemical weathering is responsible for the decomposition of rocks. Soil formation depends on a number of factors, and these include;

- **The nature of the parent rock;** the characteristics of the parent rock are responsible for soil formation. Either thin or deep layers of soil form due to the major characteristics of the parent rock e.g. if the parent rock is very hard, then it becomes difficult to form deeper soil layers and rocks with a high degree of permeability (water retention) will be easily broken down than rocks that don't allow water to penetrate easily.
- **Climate;** high temperatures and heavy rainfall increase the rate of decomposition of dead materials leading to deeper soil layers. They also favour the growth of bacteria which decompose the dead materials to form humus.
- **Time;** the process of soil formation is slow, very long and a lot of time is needed for the full interaction of all the factors that influence soil formation. The longer the time, the well developed soil layers will be and the shorter the time, it leads to formation of thin soil layers.
- **Relief/topography;** the nature of the slope influences soil formation from thin to deep layers. On the steep slopes, due to too much erosion, there are thin layers of soil while in the valleys, there are deeper layers of soil due to too much deposition.

- **Living Organisms:** Animals, plant roots and leaves decay to form part of the soil. Also, man's activities through quarrying and mining lead to soil formation. Worms, ants and burrowing animals like squirrels, rats and rabbits lead to soil formation.
- **Vegetation:** leaves provide humus through decay. Plant roots also help to break down soil through biological weathering. Vegetation also helps to protect soil from erosion hence leading to deeper soil layers.

SOIL PROFILE: It refers to the vertical arrangement of soil layers from top to the bottom. These layers are sometimes called horizons. Along the profile, soil layers differ in colour, chemical composition and size of soil particles.

Soil catena: This is the sequence/arrangement of soil down the slope. It's the arrangement of soil from the top of the hill to the valley. It also shows differences in colour, soil depth, and water content in the soil. Normally, lateritic soil occupies hill tops while steep slopes are covered with loam soil and the valley with clay soils.

Soil texture: refers to the size of soil particles i.e. thickness or thinness of the soil particles. It's also concerned with roughness and smoothness of the soil particles.

Soil PH: This refers to the degree of alkalinity or acidity of the soil i.e. different soil particles have got different mineral composition.

Classification of soil types in East Africa

The main types of soil in East Africa are loam soil, clay soil, Sandy soil and lateritic soils.

Lateritic soils: they are mainly common on Buganda hills. They are also known as murram soil.

- They are a mixture of stones (gravel) and fine soil particles.
- They are usually reddish-brown in colour.
- They lack minerals because of excessive leaching.
- They don't support agriculture because of lack of humus.
- They are good for brick making.

Loam soils: These are the most fertile soils and support the growth of various crops.

- They are permeable and retain a lot of water.
- They are well aerated.
- They are easy to cultivate because they have thin particles of soil.
- They contain living organisms.
- They contain minerals which support agriculture.
- They are usually dark brown in colour.
- They are mixture of several soil types like sand, clay and humus.
- They are fertile and support agriculture.

Clay Soil: These are fine drained and contain less or no humus.

- They are acidic and sometimes may be rich in plant nutrients.
- They have a high water retention capacity.
- They are normally grey in colour.
- They are made up of fine particles which are compacted together making it difficult to cultivate.
- The rate of permeability is low.
- They become water logged during rainy seasons and hard and brittle during the dry season.

Sandy soil: These are so common in the dry areas of East Africa i.e. Turkana Land, Masai Land, Miombo woodlands and Karamoja e.t.c.

- They contain large particles.
- They are coarse or rough in nature.
- They contain less or no humus.
- They have large air spaces.
- They have a high degree of permeability of water.
- They are easy to cultivate because of the large soil particles.
- Leaching is very high due to high rate of rock permeability.

Soil erosion

- It's the washing away of the top soil from one place to another by erosional agents like wind, water, animals, and glaciers. It takes place in both dry and wet areas.
- The wet areas include; the shores of Lake Victoria, Kigezi highlands, Nyanza province, Imatong hills in southern Tanzania.
- The dry areas include; Karamoja in North Eastern Uganda, Ankole-Masaka Corridor, Masai land, Turkana Land and Machakos district in Kenya, Kondo region (Miombo woodlands) in Tanzania.
- Running water is the most common agent of soil erosion in East Africa.
- Glacial erosion is common in snowcapped mountains e.g. Mt. Kenya, Rwenzori and Kilimanjaro.
- Wind erosion is most common in the dry areas like Karamoja and Turkana land.

Types of soil erosion

- ❖ **Rill erosion:** This is the removal of top soil by water leading to the formation of small channels called rills.
- ❖ **Sheet erosion:** This is the uniform removal of top soil over a large area especially from the sloping land as a result of over flow of water. This type of erosion is difficult to notice or detect because of uniformity.
- ❖ **Gulley erosion:** This occurs when the rills are deepened by water to form depressions called gulleys.
- ❖ **Splash erosion:** This occurs from the impact of raindrops hitting the earth surface and the soil particles are splashed to different directions leaving behind small depressions.
- ❖ **Wind erosion:** This is the removal of top soil by wind and in most cases it's the lighter particles which are eroded. This type of erosion is common in dry areas and in areas with little or no vegetation.

CAUSES OF SOIL EROSION

- **Over grazing:** This is common in savannah and semi-arid areas of East Africa where pastoralists keep large numbers of animals e.g. Masai land, Turkana land and Karamoja. The animals especially goats eat up all the grass and leave the ground bare and exposed to agents of erosion like torrential rainfall.
- **Industrialization and mining:** these activities lead to the breakdown of soil during extraction of minerals and construction of buildings and when it rains heavily, the soils are easily washed away.
- **Deforestation:** here, the trees are cut down and the soil is exposed to agents like rain water and wind which easily carry away the soil particles.
- **Monoculture:** when one crop is grown season after season, this leads to soil exhaustion which loosens up the soil hence making the soil particles to be easily eroded.
- **Heavy rainfall of over 1500 mm** per annum leads to serious surface water runoff which easily erodes the soil from one place to another.
- **Bush burning:** This is commonly practiced by pastoralists when they are expecting rain which brings new pasture with it. It leaves the ground bare hence exposing it to erosional agents like surface runoff and strong winds.
- **Over population:** This leads to increased pressure on land through deforestation, monoculture and land fragmentation which are responsible for exposing the soil to agents of erosion like running water.
- **Cultivating up and down slope:** This loosens the soil particles making them to be easily eroded by runoff.
- **Steep relief:** this also leads to soil erosion due to downward movement of soil as a result of gravitational pull.

Effects of soil erosion

- Top soil which contains humus is removed hence barren soils are left behind.
- Barren soils have led to low agricultural output because less productive land is left.
- Famine is a result due to low agricultural productivity e.g. in Masailand and Machakos.
- It leads to mudslides in highland areas which cause loss of lives and property e.g. in Bududa and Mbale along Mt. Elgon.
- It leads to destruction of vegetation therefore opening the soil to even more severe effects.
- Deep and wide gulleys are created which leads to destruction of scenic beauty of the landscape.
- Gulleys created can lead to destruction of transport and communication lines e.g. roads in highland areas.

Soil Conservation methods

- ✓ **Terracing:** This is the digging of step-like trenches across a hill, which helps to trap the moving soil hence preventing soil erosion.
- ✓ **Crop rotation:** This is the planting of different crops on the same piece of land. This helps to control monoculture and its effects.
- ✓ **Afforestation and re-afforestation:** here, trees are planted in areas where they have been cleared or areas where trees have never been planted. The planted trees help in controlling the effects of heavy rain drops and speed of wind, which are major agents of erosion.
- ✓ **Mulching:** this is the covering of soil with different materials e.g. grass so that it can be able to store moisture in the soil. The stored moisture then helps to keep the soil intact hence reducing soil erosion.
- ✓ **Controlled grazing** e.g. paddocking, zero grazing and tethering. This can help to reduce on the effects of overgrazing like eating up of all the vegetation from the ground.
- ✓ **Educating people** about the importance of environmental conservation and the dangers of bush burning hence reducing on the effects of soil erosion.
- ✓ **Application of fertilizers/Manure:** this will help to hold soil particles together hence reducing soil erosion.
- ✓ **Strip cropping:** This is the planting of grass between strips of crops and the grass helps to trap the moving soil.
- ✓ **Contour ploughing** where cultivation takes place along contours on a hill. Farmers cultivate around a hill and not up and down the hill to prevent soil run-offs. It's common in Kigezi among the Bakiga and the Kenyan highlands.
- ✓ **Controlling bush burning** which is a necessary measure especially among the nomads.
- ✓ **Using the Umatengo system:** here, pits are dug on steep slopes to trap eroded soil and plants are cultivated between the pits. This system is mainly used among the Matengo people of South-Eastern Tanzania.
- ✓ **Population control measures** should be enforced so that pressure on land is reduced e.g. resettling people away from highland areas to lowland areas.

COASTAL LANDFORMS

A coast refers to the land bordering the sea. A coastline is a boundary between the land and the sea. Various coastal processes such as wave action and sea-level changes have been responsible for various coastal landforms in East Africa.

❖ **WAVE ACTION:** Waves are ripples/oscillations which appear on water bodies when disturbed. Waves either move towards the coast or away from the coast.

Swash: this is the forward movement of waves towards the coast and it leads to deposition of sand and shingle (mixture of smallish flat stones and sand).

Back wash: this is the back movement of waves away from the coast into the lake or ocean and it leads to erosion of the coastline.

There are two causes of waves;

- a) Wind blowing over a water body.
- b) Catastrophic events like Volcanicity and earthquakes.

N.B: Waves on water are responsible for the formation of several features at the coast which are grouped into wave erosional and wave depositional features.

WAVE EROSION

Waves are able to erode rocks through various processes and these include;

- **Hydraulic action:** water enters a rock and the air in the cracks of the rocks may be compressed by the breaking waves causing the rocks to fracture hence leading to wave erosion.
- **Attrition:** this is where sea waves hurl/throw pebbles and rock boulders against the rockface of a cliff thereby eroding it.
- **Solution:** some rocks near the coast are soluble e.g. limestone, and where the coastal line is made up of such a rock, it would be eroded by chemical reaction of water.

Features formed by wave erosion

- a) **Cliff:** it's a steep slope or a rockface along the sea coast. It's formed as a result of waves eroding a highland along the coast through processes like hydraulic action. A cliff tends to be undercut and in time the upper part collapses into the sea under its own weight. Examples include; Fort Jesus in Mombasa, at Lutembe beach in Entebbe and at Kasenye landing site on Lake Victoria.
- b) **Wave-cut platform:** as attrition and cliff recession take place, the base of the cliff is left behind as a platform of rock. Material deposited from the cliff may be deposited on top of this terrace-like feature. Wave-cut platforms are often visible only at low tide (low water level).
- c) **Bays and headlands:** these are formed in areas along the coast where a soft rock lies between two areas of hard rock. The sea doesn't erode soft rocks evenly with hard rocks. The softer rock is eroded through solution process while the hard rocks on either side are left jutting into the sea. The eroded area forms a bay while the projected areas form the headlands. Examples are found at Kasenye landing site on Lake Victoria.

- d) **Caves, arches, stacks and stumps:** **Caves** are hollows found at the base of the cliff. They are formed when waves erode the cliff along its line of weakness through processes like hydraulic action and solution, hence removing rock material. Caves can be seen at palm resort beach and Kasenye landing site in Entebbe.

However, when a cave forms on a headland, erosion through hydraulic action may continue until a passage is made through the headland and this leads to the formation of an **arch**.

With time, the rock above the arch may also be worn away by continued wave erosion through solution and attrition processes and eventually collapse. One wall of the arch is left projecting from the sea, forming a **stack e.g. at Kasenye**. Continued wave erosion through solution and attrition, will lead to the stack disappearing below the surface of the water to form a **stump e.g. at Kasenye**.

Wave deposition: the sea transports and deposits eroded material from the cliff and this process is known as **long shore drift**. It leads to the formation of several wave depositional features which include;

- i) **Beach:** a beach is an accumulation of sand, shingle and pebbles along the coast. It's formed when eroded rock material is transported by long shore drift to bays and deposited there. Examples of beaches include Lido, Lutembe and resort beach along the shores of Lake Victoria and several beaches at Mombasa, Pemba and Dar-es-salaam.
- ii) **Spit:** it's a long and narrow ridge made up of sand, pebbles and other deposits attached to the coast and which extended towards the sea. It's formed where there is a river discharging its waters into the sea. As a river pours its waters into the sea, sand is deposited and this material is added onto by long shore drift. A long narrow ridge of sand builds up to form a spit e.g. Kaiso and Tonya spits near Lake Albert.
- iii) **Sand bar:** it's a bank of sand or mud which extends from one headland across a bay to the headland on the other side. A bar is formed when two spits are joined together from either side of the headlands. Bars may be either partly submerged by sea or may be viewed at low tide.
- iv) **Tombolo:** it's a special kind of bar that forms and connects an island to the mainland. A tombolo provides access to the island from the mainland often at low tide and at high tide, the island remains cut off e.g. Lambu landing site on Lake Victoria is connected to the mainland by a tombolo.
- v) **Mud flats:** these are formed as a result of tides depositing fine silt along the gentle sloping coastal features such as bays and estuaries. Along the coast, salt-tolerant plants have colonized the flats leading to the development of mangrove swamps.

- vi) **Lagoons:** this is a depression formed behind a sand bar that is connecting one end of a headland to another. When it's filled up with water, it forms a lagoon lake e.g. Lake Nabugabo on Lake Victoria.

Types of coasts

Changes in sea level may lead to formation of either sub-merged coasts or emerged coasts.

- a) **Sub-merged Coasts:** These are caused by either a rise in sea-level or subsidence of the land adjacent to the sea. A sub-merged coast may lead to formation of the following land forms;
- i) Ria; a ria coast is a long narrow coastal inlet resulting from sub-mission of a river valley under the sea water. Examples include; Kilindini and Pemba.
 - ii) Fjord; this is a sub-merged glaciated valley.
- b) **Emerged coasts:** these are formed when there is relative fall in the sea level or when the land near the sea or lake rises up. Emerged coasts are characterized by raised cliffs and wave-cut platforms.

CORAL REEFS

- ❖ A coral reef is a limestone rock which is made up of skeletons of small living organisms called **polyps**.
- ❖ The formation of coral reefs is highly attributed to the presence of calcium carbonate in the skeletons of polyps.
- ❖ When the polyps die, their skeletons which contain calcium carbonate are compacted together to form a coral rock.
- ❖ In East Africa, they are only found along the East African coast.

Conditions for the formation of coral reefs

- Warm water temperatures of between 21°C to 30°C.
- Shallow water of less than 30m deep.
- Extensive continental shelf which has a base for growth of the coral platform.
- Well oxygenated water for the survival of polyps.
- Abundant supply of plankton used as food for the polyps.
- Clear water free from silt with no sediments and mud.
- Salty water of at least 27% to 40% of salt content.
- Calm waters which allow for the accumulation of dead polyps.
- Variations of water level to allow death of polyps and accumulation of coral shells.

TYPES OF CORAL REEFS

- i) **Fringing reefs:** this is a narrow coral landform separated from the coast by a lagoon which may disappear at a high tide. Examples include; Andromache and Leven reef at Mombasa.
- ii) **Barrier reef:** this is almost similar to a fringing reef but with a deeper and wider lagoon separating it from the mainland. It is formed far away from the coast. A barrier reef can be seen at Diani Beach and Tiwi in Mombasa.

Differences between fringing reef and barrier reef

- Fringing reef is joined to the mainland while the barrier reef is separated from the mainland.
- A fringing reef is separated from the mainland by a narrow lagoon while a barrier reef is separated from the mainland by a wide lagoon.
- A fringing reef is near the coast while the barrier reef is far away from the coast.
- A fringing reef is exposed at low tide while a barrier reef is never exposed at a low tide.
- Accumulated material of a fringing reef lies at shallow depth while accumulated material of a barrier reef lies at great depth.
- A fringing reef has a narrow platform while a barrier reef has a wider platform.
- The lagoon of a fringing reef may disappear but the lagoon of a barrier reef is permanent.

(iii) **Atoll reef:** An atoll is a circular or broken ring of small islands made up of coral reefs. It forms a shape of a horseshoe magnet. Such islands surround a fairly deep lagoon e.g. The Aldabara Atoll in Zanzibar.

Economic importance of Coral reefs

- Coral reefs contain limestone and are processed to obtain cement e.g. Tanga cement of Tanzania and Bamburi cement at Mombasa.

- Coral reefs provide beautiful scenery which attracts tourists who bring in foreign exchange.
- Fringing reefs shelter ports from sea waves and tidal currents e.g. Andra-mache reefs and Leven reefs at Mombasa hence favouring shipping activities.
- There are possibilities of obtaining chromium from under the coral polyps.
- Fringing reefs shelter lagoons from dangerous marine animals hence forming safe swimming places for tourists.
- Some coral reefs weather into good fertile soils which support growth of crops like coconuts, oil palms and cloves at Zanzibar.
- Coral reefs are used for research and recreation purposes.

Negative importance

- Coral reefs break down into coral Wanda which are infertile soils hence can't support agriculture.
- Coral reefs can be an obstacle to navigation because sharp rocks at the sea bottom can cause boats and ships to capsize.
- Lagoons resulting from coral reef formation are breeding grounds for disease spreading vectors like mosquitoes.
- Coral reefs damage fish nets by tearing them hence making losses for the fishermen.
- Quarrying of limestone leads to land degradation.
- Processing and mining of coal rocks produces dust which pollutes air.

CLIMATE OF EAST AFRICA

Climate is the average weather conditions for a place recorded for a long period of time usually 35yrs. In East Africa, there are four major types of climatic zones which are; Tropical/equatorial climate, Savannah climate, Desert/semi-arid climate and montane climate. Climate influences human activities e.g. agriculture, settlement, feeding, dressing and other physical aspects like vegetation.

Factors influencing the climate of East Africa

- Altitude:** Climate changes with height above sea level. Areas near mountains receive heavy rainfall and low temperature especially on the windward side e.g. Mt. Kenya, Elgon, Kilimanjaro. Altitude also influences temperature differences e.g. areas on a higher altitude are cooler e.g. Nairobi, Kabale and Kampala while lowland areas receive high temperate e.g. Mombasa and Kasese.
- Distance from the sea:** Areas close to water bodies receive heavy and reliable rainfall e.g. shores of Lake Victoria (Kisumu, Entebbe, Bukoba, Mwanza and Nyanza province). This is due to the abundant moisture released into the atmosphere through evaporation whereas areas which are far away from water bodies receive low and unreliable rainfall and hot temperature due to less moisture release e.g. Dodoma, Karamoja and Masailand.
- Latitude:** Climate changes as one moves away from the equator, North or south. The equator influences the occurrence of the Inter-Tropical Convergence Zone (ITCZ). This is in relation to apparent movement of the overhead sun. Areas around the equator receive double maxima of rainfall and hot temperature between February and May and between September and November e.g. Entebbe, Kisumu while areas that are far away from the equator receive single maxima of rainfall e.g. Gulu and Dodoma.
- Relief:** Highland areas act as barriers to prevailing winds. In such areas, there are differences between the conditions on the lee ward side and the wind ward side. The leeward side receives little or no rainfall because it's in the rain shadow e.g. Kasese and Arusha while areas on the wind ward side receive heavy rainfall and lower temperatures e.g. Mbale and Kigezi region.
- Vegetation:** Areas with tropical rainforests receive heavy rainfall due to abundant moisture release through evapo-transpiration e.g. near Mabira forest in Mukono district while areas without vegetation cover receive hot temperatures and low rainfall e.g. Kondoa region (Miombo woodlands), Machakos, Turkana land and Karamoja.
- Influence of man:** Due to man's activities such as bush burning, swamp reclamation and deforestation, this leads to disappearance of vegetation hence low rainfall and high temperature. Urbanisation through industrialisation and road construction has also led to global warming hence hot temperatures in cities e.g. Kampala and Dodoma. Activities such as afforestation and re-afforestation have led to growth of vegetation hence leading to heavy rainfall.

g) Influence of local trade winds: Trade winds have got an impact especially along the coastal areas and shores of Lake Victoria. They lead to formation of land and sea breezes.

i) Land breeze: it takes place during the night. After sunset, both the land and the sea cool down but land cools down faster than water meaning that air over land becomes cooler than air over water. Moist air therefore flows from land to the sea or lake. Warm air over the sea is forced to rise up to the condensation level forming clouds and forming rain which falls especially during the morning hours.

ii) Sea breeze: it takes place during the day when land heats up faster than the water. Air above land becomes warmer and it's forced to rise up forming a low pressure zone on land. Moist air from the sea begins to push its way beneath the warm air over the land. The warm air is pushed upwards to the condensation level where it forms clouds which fall back as rainfall especially during the afternoon hours.

N.B: temperature inversion: This is a situation where temperatures at high altitude are warmer than those in the valleys or it's a situation where temperatures increase with increase in altitude e.g. near Kenya highlands and Kigezi.

Characteristics of climatic zones

a) Equatorial/tropical climate:

- Heavy and reliable rainfall of about 1500mm per annum is experienced throughout the year.
- There are two rainfall seasons/peaks (double maxima) in a year.
- The length of the days and the nights is almost equal throughout the year (equinox).
- Humidity is always high due to high rate of evaporation.
- The climate is both hot and wet.
- It has a small annual temperature range of about $3^{\circ} - 4^{\circ}\text{C}$.
- The rainfall is received throughout the year and is well distributed.
- Rainfall is mainly convectional resulting from high evaporation from lakes, rivers and forests.
- Rainfall mainly falls in the afternoon accompanied by lightning and thunder.
- Temperatures are high in this region and even throughout the year.
- The region is also characterized by dense cloud cover making both days and nights warm.
- Low pressure all year round due to high evaporation rates.

Economic activities carried out in equatorial climate regions

- ✓ Due to the existence of dense forests, wild life conservation has been made possible and this attracts tourists.
- ✓ Equatorial climate has also favoured the existence of numerous water bodies giving rise to fishing activities.
- ✓ The dense vegetation in equatorial regions harbours wild animals making hunting possible.
- ✓ The dense forests due to heavy rainfall and hot temperatures experienced in that region have favored lumbering activities e.g. in Mabira forest.
- ✓ Agriculture and forest products existing in equatorial region have made industrial growth possible.
- ✓ Growing of perennial crops like coffee, palm oil, cocoa and tea due to heavy rainfall received throughout the year.
- ✓ Charcoal burning due to existence of dense forest cover.
- ✓ Food gathering e.g. passion fruits due to thick forests with fertile and dump grounds.

Problems faced in equatorial regions

- Rampant occurrence of pests and diseases which attack man, livestock, crops and this has scared away settlements leading to low development rates.
- Heavy rainfall received throughout the year and existence of the dense forested regions has made the establishment of transport network very difficult.
- The region with its dense forests has made it difficult to exploit such areas leading to remoteness.
- The equatorial forests are commonly inhabited by robbers and this has constrained any attempts to the development of the region.

- The heavy rainfall received throughout the year has caused a danger of erosion especially in areas where agriculture is practiced.
- Heavy rainfall may also lead to flooding which destroys peoples' lives and property.
- Leaching of the soils due to heavy rains and erosion has also led to serious loss of soil fertility.
- High rate of weed growth hence increasing costs of farming and clearance of land.

Steps taken to improve conditions in equatorial regions

- Establishment of transport and communication networks such as roads to reduce remoteness.
- Ensure political stability by talking peace with the respective rebel groups so as to allow development to take place in the affected areas.
- Practice modern methods of agriculture such as application of both organic and in-organic fertilizers to check on the rate of soil fertility loss.
- Setting up processing and manufacturing industries to take up products from agriculture and forestry to minimize wastage.
- Use of herbicides to control growth of weeds.
- Market research so as to enable the farmers in the region to sell their agricultural produce.
- Provision of capital in form of soft loans to enable different activities like agriculture and lumbering.
- Planting of trees to control soil erosion.

Conditions leading to equatorial climate

- **Influence of trade winds** especially the south east trade winds which blow over the Indian Ocean causing the inter-tropical convergence zone leading to heavy rainfall, high humidity along the equator.
- **Distance from the sea:** areas near water bodies e.g. Lake Victoria and Kyoga receive heavy rains due to on-shore and off-shore breezes hence equatorial climate.
- **Latitudinal location:** Areas along the equator experience hot and wet conditions due to inter-tropical convergence zone (ITCZ) formed when winds converge at the equator blowing from different areas especially over the Indian Ocean.
- **Ocean currents** especially the warm Mozambique currents that bring heavy rainfall along the equatorial belt of East Africa.
- **Man's activities** through afforestation & re-afforestation programs which lead to creation of green belts of vegetation leading to heavy rainfall along the equator.
- **Influence of vegetation:** Thick forests e.g. Mabira lead to rainfall formation through evapo-transpiration.

b) **Savannah climate:** it occurs between 5° to 15° north and south of the Equator. It's found in the broad zone between the equatorial climate and the hot desert.

Characteristics of savannah climate

- Rainfall varies in amount from 1000 mm near the equator and decreases towards the desert about 250 mm.
- Rainfall is mainly received in summer when temperatures and evaporation rates are high.
- The rainfall received in the region is convectional in nature coinciding with the over head sun.
- Receives single maxima of rainfall i.e. one peak.
- Annual temperature range is moderate ranging between 7°C – 9°C.
- Humidity is relatively high throughout the year due to high evaporation rates.
- The region experiences a low cloud cover generally though the cloud cover is a bit dense during the summer seasons.
- Alternate wet and dry seasons are experienced.

Economic activities that can be carried out in savannah regions

- ❖ Crop growing i.e. Annual/seasonal crops are grown e.g. maize, millet, groundnuts beans, and cotton due to seasonal rainfall.
- ❖ The natural vegetation in the savannah consists of mainly grasslands that favour livestock rearing.
- ❖ Lumbering has also been carried out in savannah from the woodlands.
- ❖ The Savannah grasslands provide a natural habitat for many species of wild life which forms the basis for the tourism industry.

- ❖ Due to agriculture that takes place in the savannah, development of processing and manufacturing industries has been made possible. E.g. grain mills, ginneries for cotton, milk processing plants e.t.c.
- ❖ Charcoal burning and extraction of wood fuel also has been favoured in the savannah due to the existence of woodlands.
- ❖ Hunting of animals has also been favoured in the savannah due to the existence of the wild animals.
- ❖ Bee keeping can also survive in the savannah woodlands.

Problems faced in savannah regions

- Low and unreliable rainfall which leads to crop failure after planting.
- Shortage of adequate pasture for the livestock especially during the dry season forcing people to live a pastoral life.
- Large herds of livestock are kept which leads to over stocking, over grazing and eventually soil erosion.
- Wide spread fire out break especially during the dry seasons which leaves the surface bare leading to erosion when the rain season begins.
- Occurrence of pests and diseases which affect the crops and livestock e.g. tsetse flies which spread sleeping sickness in human beings and Nagana in livestock.
- Poaching of wild animals and this has affected the tourism industry.
- The severe occurrence of drought conditions forces wild animals to migrate which affects tourism.
- Some savannahs have inadequate transport and communication net work which has led to remoteness and low levels of economic development.
- Inadequate capital to develop savannah regions.
- Growth of weeds during the wet season which makes crop growing very expensive.

Solutions to the above problems

- ✓ Use of chemical spraying to control weeds and pests.
- ✓ Provisions of soft loans to reduce shortage of capital for developing the regions.
- ✓ Encourage crop rotation to ensure soil fertility and high productivity.
- ✓ Construction of valley dams to store water for the dry season.
- ✓ Establishing ranches to act as demonstration farms for the pastoralists.
- ✓ Extending veterinary services to reduce animal diseases.
- ✓ Construction of roads to reduce remoteness of such areas.

(c) DESERT AND SEMI DESERT CLIMATE

This type of climate is mainly found in the sub-tropical belt. These areas include Karamoja, Turkana land and Chalbi desert in Northern Kenya.

Characteristics of desert and semi-desert climate

- They receive low and reliable Rainfall.
- Annual Rainfall total is below 250 mm per year.
- The region experiences hot temperatures above 30°C throughout the year.
- The days are very hot while the nights are very cold due to absence of cloud cover.
- These regions experience low relative humidity because of the extreme dry conditions.
- They experience hot and dry conditions throughout the year.
- Rainfall is rare but torrential which leads to seasonal floods.

Factors that have led to desert type of climate

- ✓ Latitudinal location far away from the equator where rainfall is low and unreliable.
- ✓ Location on Eastern side of the continent where off-shore winds especially the North East trade winds lead to aridity.
- ✓ Absence of large water bodies in the interior hence reduced evaporation e.g. Chalbi desert.
- ✓ Rain shadow effect due to presence of Ethiopian highlands hence dry descending winds reaching Karamoja and Turkana land.
- ✓ Presence of scanty vegetation which limits evapo-transpiration leading to low rainfall totals.
- ✓ Presence of off-shore winds which blow parallel to the coast diverting moisture bearing winds from the land mass.
- ✓ Bush burning by pastoralists which leads to rise in temperatures.

Economic activities in desert and semi-desert climate

- Tourism due to the existence of numerous desert landforms that attract tourists e.g. sand dunes.
- Nomadic pastoralism due to existence of scanty pastures e.g. the Karamojong.
- Mining and sand quarrying e.g. gold in Karamoja although it exists in small quantities.
- Cultivation of drought resistant crops under irrigation e.g. cotton in Kasese.
- Bee keeping due to the existence of scattered trees.

Problems faced by people living in desert regions

- ❖ Inadequate/limited supply of surface water for livestock and human consumption.
- ❖ Shortage of pasture for livestock rearing leading to nomadism.
- ❖ Infertile soils which don't support crop growing.
- ❖ Low and unreliable rainfall which limits growth of crops and vegetation.
- ❖ Excessively high temperatures during the day making settlements difficult.
- ❖ Very cold nights due to absence of cloud cover.
- ❖ Desert areas are remote due to absence of road network.
- ❖ Limited supply of food leading to frequent famine.
- ❖ Sandstorms due to strong winds are common leading to loss of lives and poor visibility.
- ❖ Small population makes it difficult to provide social services.
- ❖ Temporary flooding due to torrential downpours.
- ❖ Overcrowding near oases, rivers and water points.
- ❖ Shortage of labour and market due to small and sparse population.

Solutions to the above problems

- ✓ Construction of valley dams to help store water for pastoralists.
- ✓ Irrigation farming to improve food production and reduce famine.
- ✓ Planting of trees to help in climate modification through rainfall formation.
- ✓ Use of machines especially where labour is not enough.
- ✓ Educating pastoralists about the dangers of bush burning.
- ✓ Extending social services to attract big population and encourage people to settle down.
- ✓ Resettlement of people away from congested areas e.g. oases and river valleys.
- ✓ Encouraging tourism to acquire revenue for development of social services.

(e) MONTANE CLIMATE: This is experienced in highlands and mountainous regions of East Africa. Examples of these areas include; Kikuyu land (Mt. Kenya), Chagga land (Mt. Kilimanjaro), Bugisu land (Mt. Elgon) and Kigezi land.

Characteristics of montane climate

- The temperature decreases with an increase in height or altitude.
- They receive relief or orographic rainfall mainly on the windward side of highlands.
- The tops of the mountains do not receive as much rain as the lower slopes.
- Where altitude exceeds 4500m above sea level, the areas are covered by permanent snow/glaciers e.g. Mt. Kenya, Kilimanjaro and Rwenzori.
- The leeward slopes are often dry due to the rain shadow effect e.g. Kasese and Ankole-Masaka corridor.
- Lower slopes are warmer than higher slopes.

Economic activities carried out in montane climate

- Tourism due to existence of permanent snow and glacial features that attract tourists that brings in foreign exchange.
- Lumbering especially from the mountain forest favoured by the heavy rains.
- Slopes that have fertile soil and receive heavy rains favour agriculture for food production especially on the windward side.
- Nomadic pastoralism especially on the lee ward sides of the highlands.
- Mineral exploitation due to occurrence of some mineral deposits in mountain rocks e.g. copper at Kasese.
- Stone quarrying which provides materials for road construction and building.

A Sketch Map of East Africa Showing Different Climatic Zones

VEGETATION OF EAST AFRICA

Vegetation is the general term given to all living plants of various categories i.e. the trees & grass that cover the earth's surface and those that grow in water. Biologically, vegetation is known as Flora. There are four major types of vegetation in East Africa which include; Equatorial /tropical rainforest, Savannah vegetation (woodlands and grasslands), Swamp or mangrove vegetation and Semi-arid/desert vegetation.

Factors influencing vegetation distribution in East Africa

1. **Climate:** tropical forests grow in areas that experience heavy and reliable rainfall of about 1500mm and above. They also thrive well where temperatures are high throughout the year e.g. Mabira and Budongo forests. The amount of rainfall reduces as one moves away from the tropical region and this has led to Savannah vegetation consisting of Savannah Woodland and Savannah Grass Land e.g. Miombo woodlands. Desert regions receive rainfall which is very low, hence shrub and dry bush are dominant e.g. in Karamoja and Turkana land.
2. **Altitude:** Tropical rain forests, mangrove forests and savannah vegetation thrive well on the low altitude areas e.g. Masai Mara while montane forests, heath and moorland thrive well on high altitude areas e.g. in Kabale.

3. **Drainage:** Areas with permanent and stagnant water have favoured swamp vegetation as well as mangrove forest e.g. at the East African Coast. Areas with no permanent drainage features such as lakes and rivers tend to be very dry and these have a dominance of semi-arid vegetation e.g. Karamoja. Areas that are well drained have a dominance of savannah and tropical rain forests e.g. along mountain slopes.
4. **Soils:** Areas with deep and well drained fertile soils tend to favour tropical forest vegetation. Areas with moderately fertile soils favour the growth of Savannah grasslands whereas very infertile areas will favour semi-arid vegetation and at times do not favour vegetation at all e.g. Karamoja region. The water retention capacity of the soil (soil porosity) will also influence vegetation. High water retaining soils e.g. clay soils lead to occurrence of swamp or mangrove vegetation e.g. along the coastal belts.
5. **Biotic factors:** some areas that are infested with pests tend to scare away settlement creating favourable conditions for the growth of dense vegetation or savannah wood lands e.g. Miombo Woodlands of central Tanzania. Areas without pests attract settlements and lead to savannah grass land. Areas that are infested with locusts tend to have scanty vegetation because these insects destroy the existing vegetation.
6. **Human activities:** Large areas of forested land have been cleared for timber to create room for settlement and cultivation which has resulted into forested areas turning into savannah grasslands. Large areas of savannah vegetation have been turned into shrubs and wood lands because of activities like over grazing, bush burning, charcoal burning e.t.c. Some areas have been left without vegetation because of human practices like monoculture and shifting cultivation e.t.c leading to semi-desert and desert vegetation. In areas where man has engaged in afforestation and re-afforestation activities, he has led to luxuriant tropical rain forests.

Characteristics of vegetation zones

i) Equatorial / Tropical Rain forests.

- Trees have big trunks
- They are ever green through-out the year because of high rainfall.
- They have little or no undergrowth.
- Trees are very tall above 30-40 metres.
- Trees form canopies of about 3 different layers due to varying tree heights.
- Trees have many climbing plants (lianas) because of search for sunlight e.g. passion fruits.
- The trees mainly provide hard wood e.g. Mvule, Mahogany and Ebony.
- Trees have broad leaves.
- The trees have buttress roots to hold the huge tree trunks.
- Trees appear in impure stands.
- Forests are always thick i.e. impenetrable e.g. Bwindi impenetrable forest.
- Trees have a long gestation period of over 60 years.

ii) Savannah vegetation: it's divided into two i.e. grasslands which include; Queen Elizabeth National Park, Serengeti National Park, Kidepo valley National Park and Murchison Falls National Park and Woodlands which include; Miombo woodlands in Tanzania.

- Trees are ever green because of relatively high rainfall especially during the wet season.
- During the dry season, trees have brown leaves which they shade off to prevent loss of water (deciduous trees).
- Trees have got long tap roots in order to reach underground water.
- Trees are always scattered e.g. acacia.
- Grass grows up to 2m e.g. elephant grass.

iii) Semi-desert / Desert vegetation: Mainly found in areas that receive low rainfall below 750mm per year. Areas with this type of vegetation include; Turkana land, Karamoja region and Ankole-Masaka corridor.

- Trees are very short and usually stunted.
- Trees have very long tap roots to reach to the water level which is very deep.
- They have scattered bushes and thickets.
- Trees have thorny leaves e.g. lantana camara and baobab trees to prevent the animals from eating their leaves.

- Some plants have swollen trunks in which they store water to use during the long dry season e.g. Baobab.
 - The plants have seeds that can lay dormant on the ground for a long time until the rain falls to allow germination.
 - Many plants complete their life cycle within a few weeks before the soils dry up e.g. shrubs.
- iv) **Swamp/mangrove vegetation:** In East Africa, swamps are found around water bodies e.g. around Lake Victoria and Kyoga, along the coast (mangrove swamps) and around the various rivers (Riverine swamps) e.g. River Kafu, River Katonga and River Nzoia. Some swamps are also found in Dombos (broad valleys) e.g. Awoja swamp in Soroti, Olwenyi swamp in Lira.
- Swamp vegetation is found in water logged areas.
 - Vegetation is a mixture of mangrove trees, palm trees, coconuts and papyrus.
 - The ground has a lot of mud and it's marshy.
 - Trees are evergreen throughout the year.
 - Trees are medium height usually less than 10m due to high temperatures.
 - Trees grow close to each other making forests thick.
 - Trees have fibrous roots and straight stems.
 - Trees have broad leaves and are characterized by hard wood.
 - Some trees have twisted stems/trunks
- v) **Montane vegetation:** This occurs in mountain ranges and highland regions e.g. along Mt. Kenya, Elgon and Kilimanjaro. Due to varying altitude, the vegetation changes as one moves up the mountain as shown below.
- **Savannah:** this is found at the lowest level of the mountain below 1000 meters and consists of dry grasses and shrubs. It's due to man's interference through clearance of tropical forests.
 - **Tropical rain forests:** these are above savannah at an altitude between 1500 to 2500 metres. It consists of thick luxuriant and evergreen vegetation.
 - **Temperate and bamboo forests:** as altitude increases, the rainfall amount reduces and this gives rise to the temperate and bamboo forest which thrive well under cold conditions.
 - **Heath and moorland:** at the level between 3500 to 4500 m above sea level. The temperatures are very low as well as rainfall. Vegetation here consist of flowering plants, grasses and shrubs e.g. cedar and camphor.
 - **Snow and bare rock:** above 4500 above sea level, temperatures are extremely cold thus the existence of snow and bare rocks. No vegetation grows at this level. **Characteristics of montane vegetation** include;
 - Altitudinal zonation of forest vegetation i.e. tropical forests at lower slopes, temperate slopes at mid-slopes, coniferous and bamboo slopes at higher slopes.
 - Tropical forests (low altitude) are of mixed stand and have two layers of canopy.
 - Tropical forests are of hard wood.
 - Temperate, coniferous and bamboo forests are in pure stands and have single canopy.
 - Temperate and coniferous forests are soft wood, have thick barks, cone shaped trees, needle shaped leaves, straight trunks and some species have hollow stems.

N.B: for the economic activities carried out, problems faced and solutions to problems faced, in a particular vegetation zone, refer to climatic zones as seen above.

FORESTRY IN EAST AFRICA

A forest is an extensive tract of land covered with a close stand of trees. It can be natural or planted by man with either hard wood trees or soft wood trees or both. Forestry is the science of cultivating forests and is also called tree farming.

Conditions favoring the natural growth of forests

- Availability of extensive land with sparse population where forests grow with limited interference.
- Heavy rainfall of over 1500mm per annum for proper tree growth.
- Reliable and well distributed rainfall throughout the year for proper maturity of the trees.
- Hot temperatures of about 20°C- 30°C for the proper growth of trees.
- High humidity level which is responsible for heavy rainfall that supports tree growth.

- Altitude especially at higher altitude where the population is small and temperatures do not favor human settlement hence leaving aside the land for forest growth.
- Supportive government policy of emphasizing afforestation and re-afforestation programmes.
- Deep, fertile and well drained soils which support the growing of trees.
- Control of growing population to reduce on human interference with forests through settlement and agriculture.
- Abundant sunshine for the growth of natural forests.

Tree species in East Africa

1. **Hard wood trees:** These are mainly found in tropical rain forests e.g. Mabira, Budongo, Maramagambo, Bugoma, Kalinzu, Marabigambo and Bwindi. Examples include; Red heart, Musizi, Mvule, Mahogany and Ebony.
2. **Soft wood trees:** these are mainly planted forests. They include tree species like Eucalyptus, Pine, Cyprus and red cedar. They are mainly found in low lying areas e.g. Namanve.

NB: Montane forest also exists near the high mountains of East Africa e.g. Kilimanjaro, Kenya, Rwenzori and the vegetation appears in zones.

Other important trees in East Africa include; wattle (soft wood tree) planted because its bark contains Tannin used in leather tanning industries.

- Pines are largely used for pulp and paper making e.g. at Webuye.
- Eucalyptus trees are not indigenous trees but are important for the provision of firewood, electric and fencing poles and paper and pulp.

Problems facing the forestry industry in East Africa

- Deforestation due to the increased need for land for agriculture and settlement.
- Wild animals graze freely in the forests leading to their destruction e.g. elephants.
- Wild fires caused by either lightening or careless farmers leading to loss of extensive forested lands.
- Scarcity of rainfall and prolonged drought due to increased desertification leading to short and stunted trees.
- Population increase hence the need to create more land for settlement leading to clearance of forested land.
- Limited alternative power sources have led to high demand for wood fuel and charcoal hence destruction of forests.
- Increased urbanization has led to destruction of forests e.g. road construction and industrialisation.
- Mining and quarrying activities have also led to the destruction of forests due to the need to expose mineral bearing rocks.
- Occurrence of tree pests and disease that attack specific tree species leading to their depletion.
- Long gestation of some tree species has also led to shortage of wood fuel.
- Inadequate labour force to carry out forestry management.
- Inadequate capital for investment in forestry management.
- The bulky nature of some tree logs makes it difficult to transport them to saw mills.
- Inaccessibility of some forests has made it difficult to exploit some of them.
- Corruption and embezzlement of forest funds by some forestry officials.
- Limited valuable commercial tree species which leads to importation that is very expensive.
- Insecurity and wars due to rebel activity has led to destruction of forests that are used as hide-outs for rebels.
- Unfavorable government policies e.g. giving forested land to private investors to set up plantations hence clearance of forests.
- Low levels of technology for exploiting forests e.g. use of axes and pangas.
- Hostility of local communities towards forest staff hence creating insecurity for the forest guards.

Solutions to the above problems

- Offering licenses to lumbering companies and individuals to reduce deforestation.
- Evicting encroachers on forested land e.g. the Bakiga and Balaalo migrants in Kibaale forest reserve were evicted by government.
- Formation of a ministry to supervise forests and other aspects of the environment i.e. Ministry of Lands, water & Environment.

- Setting up Non Governmental Organisations to control environmental mismanagement e.g. National Environment Management Authority (NEMA).
- Training and equipping forest managers with modern skills on how to look after forests.
- Establishment of forest reserves where lumbering is prohibited e.g. Kibaale forestry reserve.
- Encouraging re-afforestation and afforestation programs e.g. cut one tree and plant two trees.
- Educating the masses about the dangers of deforestation.
- Practicing agro-forestry to ensure extensive tree growth by the farmers too.
- Encouraging the use of alternative sources of power e.g. solar energy to reduce forest destruction for wood fuel.
- Encouraging use of alternative building and construction materials e.g. plastics, metal and glass and reduce the demand for timber.
- Campaigning against degazetting forested land by government.
- Growing of quick and fast maturing species to ensure constant supply of forest products.

Effects of deforestation on the environment

- ❖ Reduction and lowering of water table due to reduced rainfall totals.
- ❖ Global warming and increased world temperatures due to reduced cloud cover.
- ❖ Mass wasting and soil erosion along the slopes due to absence of trees to trap the soil.
- ❖ Reduction of wildlife due to destruction of their natural which reduces foreign exchange.
- ❖ Loss of soil fertility due to severe erosion leading to low agricultural output.
- ❖ Desertification may arise leading to expansion of deserts.
- ❖ Flooding may occur due to mass wasting and soil erosion due to deposition of soil materials in the valley.
- ❖ Silting of river valleys due to increased erosion along slopes.
- ❖ Shortage of food leading to famine due to less agricultural output.

POPULATION IN EAST AFRICA

- Population refers to the number of people living in an area at a given time. Over 80% of the total population in East Africa depend on farming either directly or indirectly.
- Rainfall distribution and temperature as climatic factors play a big role in population distribution within East Africa because areas with heavy rainfall can support agriculture and therefore attract many people.
- On the other hand, areas with low and unreliable rainfall cannot support agriculture and these attract sparse population.
- Areas with **dense population** include shores of Lake Victoria, Kenya Highlands, Kigezi highlands, Slopes of Mountain Elgon and Rwenzori, Southern Tanzania highlands such as Usambara ranges and areas around Lake Malawi, islands of Zanzibar and Pemba along the East African coast. The major towns and cities like Kampala, Nairobi, Dodoma, Dar-es-salaam, Mombasa, Kilwa, Tanga, Mtwara, Mbale, Kisumu, Eldoret and Nakuru have got dense population totals.
- Areas with **moderate population** density are between Kenya highlands and Nairobi and some parts of the rift valley in Kenya and Tanzania, northern Uganda in Gulu, Acholi land and Lira, western Uganda in areas of Hoima and Mubende.
- Areas with **sparse population** include North-Eastern Uganda covering areas of Kotido, Kitgum, Moyo and other areas of game reserves and forest reserves. Northern Kenya including Turkana, southern Tanzania, West and central Tanzania i.e. Miombo woodlands.

Concepts used in population studies

- ❖ **Over population:** This is a situation where the number of people in a given area exceeds the available resources.
- ❖ **Under population:** This is a situation where the number of people in a given area/country is less than the available resources.
- ❖ **Optimum population:** This is where the available resources are equivalent to the population for maximum resource exploitation.

- ❖ **Population density:** It refers to the number of people per square kilometer.
- ❖ **Life expectancy:** This refers to the average age at which most people die in a country. In East Africa, the life expectancy is 50years for women and 45years for men.
- ❖ **Population distribution:** This refers to the way people are spread out on the earth surface in a given area.
- ❖ **Population census:** This is the process of counting the number of people in the country or region. It's usually done after every 10years. The major purpose for population census is for government to plan and provide services for its people.
- ❖ **Fertility rate:** This refers to the average number of children per woman in her productive life. The fertility rate in East Africa is seven children per woman.

SKETCH MAP OF EAST AFRICA SHOWING POPULATION DISTRIBUTION

FACTORS INFLUENCING POPULATION DISTRIBUTION IN EAST AFRICA

- **Climate:** Areas which receive heavy and reliable rainfall which support the growth of crops have attracted people in large numbers e.g. shores of Lake Victoria, Kenya highlands, slopes of Mt. Elgon and Kigezi highlands while areas which receive low and unreliable rainfall attract very few people e.g. Karamoja, Turkana land and Miombo woodlands.
- **Soils:** areas with deep and well drained fertile soils that support agriculture have attracted dense settlements e.g. Mbale, Kabale, shores of Lake Victoria while areas with infertile soils have sparse population e.g. Nyika plains, North Eastern Kenya and Masai land.
- **Altitude/relief:** areas with very high altitude e.g. top of Mt. Elgon and Rwenzori, Bundibugyo have sparse population because of the high pressure, difficulty in constructing houses and roads. However low altitude areas have attracted large settlements due to ease in constructing settlements and roads. However, areas in broad valleys occupied by swamps have sparse population due to presence of disease vectors like mosquitoes. Also, lowland areas are subjected to floods and therefore are always avoided.
- **Vegetation:** dense forests, bush lands and swamps are unfavorable areas for settlement because it's hard and expensive to clear the vegetation. They also harbour wild animals and disease carrying vectors like tsetse flies which scare away settlements. Areas with savannah vegetation are easy to clear for agriculture and settlement hence attracting dense population e.g. Masaka, Mpigi and Mukono.
- **Natural water resources:** The existence of natural water resources can attract dense population e.g. shores of Lake Kyoga and Victoria. Also, in areas of low rainfall many people are attracted near water courses or rivers e.g. along river Athi, Nile because the dense population utilizes the rivers for small scale irrigation, livestock rearing and domestic use. However, areas without surface water bodies have scared away settlements leading to sparse population e.g. in Karamoja and Turkana land.
- **Drainage:** Poorly drained areas e.g. coastal margins of Kenya and Tanzania are full of mangrove swamps which are unproductive in terms of agriculture, therefore leading to sparse population while areas which are well drained have high population densities like central Uganda, slopes of Mt. Kenya and Elgon.
- **Economic Activities:** Areas that have activities like mining, trading and manufacturing industries especially towns like Dar-es-salaam, Nairobi, Kisumu, Kampala, Jinja attract large population than areas where they are few economic activities e.g. Karamoja. This because people are more attracted to areas that have enough job opportunities than areas with less employment opportunities.
- **Government policy:** The government may determine settlement in an area e.g. the creation of national park and game reserves discourages settlement e.g. Kidepo valley game park and on other hand, the setting up of resettlement schemes and refugee camps has attracted settlement in large number e.g. in Kiryandongo and Internally Displaced Peoples' (I.D.P) camps in Gulu.
- **Political stability:** Areas that are unstable and insecure have got low population e.g. Karamoja where there is a lot of cattle rustling compared to areas which are generally politically stable and secure hence attracting dense settlements e.g. towns like Kampala and Mombasa.
- **Culture:** some areas have got low population density because of their culture of e.g. Ankole, Karamoja, Masai land areas are sparsely populated because of their practice of nomadic pastoralism which keeps them on the move always. Within central Uganda, dense settlements exist because of the settled ways of life that encourage family development e.g. in Mukono and Wakiso districts.

N.B: Population growth: this refers to the natural increase in population. Uganda's population growth rate is 3% per annum/year. East Africa's population has been increasing over the years and this increase is due to the following factors;

- (a) **Natural increase/ high birth rate:** in most areas of East Africa, the number of births in the year exceeds the number of deaths and such a difference has caused high population growth.
- (b) **Improved medical services:** this has led to low infant mortality rate and death rates causing population growth.
- (c) **Early marriages:** people tend to marry/get married at a tender age and this has led to a longer period of the child production cycle.

(d) High fertility rate: this refers to the number of children a woman can produce during her child bearing age. On average, African women give birth to 5 to 7 children and this has led to high rate of population growth.

(e) Value attached to children: many families value children especially girls as a source of wealth or boys as a source of labour and security. Others look at children as a source of insurance and help at an old age. They thus end up producing many hence leading to population growth.

(f) Polygamy: it refers to the act of marrying more than one wife. Polygamy is common because it is looked at as a sign of prestige in society and as a traditional obligation which has led to high population growth.

(g) Low levels of education: many people do not know the value of a small family. Besides, most people drop out of school early and end up into early marriages leading to production of many children.

(h) Religion: Some religions encourage polygamy which has resulted into high birth rates especially among Moslems, while others religions are opposed to family planning methods e.g. Catholics.

(i) Poverty: many families can't afford to buy pills, condoms for family planning and this has led to many families producing children without birth control measures.

(j) Improved nutrition levels: this has ensured balanced diet and steady supply of food which encourages people to have large families.

(k) Increased immigrations: many people have entered East Africa from other regions e.g. Asians, Europeans, Sudanese and Congolese and this has led to population increase.

Advantages of high/large population size

- High population provides enough labour force for the economic development of the country.
- It can be a source of a large amount of taxes that avails the country with enough revenue for development.
- It is easy and economical to provide social services in a situation where many people are concentrated in the same area.
- In case of security, a large population can easily provide enough man power for the army/defense of a country.
- It is a source of cheap labour since many people are willing to work at a low wage rate.
- A high population encourages the exploitation of idle resources.
- A high population also provides a large market for goods and services within a given country.
- It also encourages a high level of innovation and invention as people try to look for survival in a competitive environment.
- It encourages increased agricultural output as people try to produce enough food for their own survival.

Disadvantages of large population size

- Shortage of land for settlement and farming leading to land fragmentation.
- Shortage of social services e.g. schools and hospitals.
- High government expenditure to provide social services for the people.
- High dependency ratio since much of the population is made up of children hence reducing investments and future savings.
- High rates of unemployment because of the less available jobs.
- Unemployment leads to high rates of crime and social unrest especially among the youths.
- Exhaustion of resources due to over exploitation.
- It encourages rural-urban migration and its evils like high crime rate, unemployment and drug abuse.
- Shortage of accommodation leading to development of slums.
- Shortage of food which results to famine and starvation.
- Overcrowding which results into congestion and poor hygiene hence easy spread of diseases.
- High cost of living due to competition for scarce resources.
- Poverty as a result of high dependency ratio.
- Environmental degradation through pollution, soil erosion, swamp reclamation and deforestation.
- Desertification/global warming due to pollution, deforestation and industrialisation.

Steps being taken to solve such problems

- ✓ Encouraging family planning methods to reduce on the birth rates involving the use of pills, condoms and other contraceptives.
- ✓ Encouraging outward migration from the densely populated region to the sparsely populated areas.

- ✓ Setting up resettlement schemes for people from densely populated regions.
- ✓ Low enforcement policies are being emphasized to reduce the level of crime rates.
- ✓ Agriculture modernization has also been emphasized through the use of high yielding food varieties to increase food production and combat the problem of famine.
- ✓ Vertical expansion of towns and cities through building of storied buildings has been embraced to solve the problem of congestion in most African cities.
- ✓ Land reform policies like land consolidation are being emphasized to solve the problem of land fragmentation.
- ✓ Industrialization is also being encouraged in most African countries to reduce over dependence on the land and reduce the level of unemployment.
- ✓ The governments are also trying very hard to establish enough social services such as health centres, schools and transport to contain the problem of congestion over these services.
- ✓ Encouraging monogamy to reduce polygamy.
- ✓ Rising the marriage age for girls to reduce early marriages.

LOW/UNDER POPULATION: It refers to a situation where the number of people is less than the available resources within a given area.

Advantages of low/under population

- ❖ It avails enough land for agriculture and settlement.
- ❖ It minimizes the problem of congestion and overcrowding.
- ❖ Dependency ratio is low and this may encourage savings and investments.
- ❖ Less possibility of slum development since people are few.
- ❖ Less government expenditure on the provision of social services.
- ❖ Social conflicts over land are not likely to come up due to a low population.
- ❖ It avails people with enough food hence reducing the possibility of famine.

Disadvantages of low/under population

- Limited supply of labour.
- Small market size for goods and services due to low demand.
- It is expensive for the government to provide social services to a few users.
- It leads to low tax base hence low government revenue.
- It leads to under utilization of resources such as minerals and land.
- It leads to slow economic growth which leads to dependency on other countries for skilled labour and market.
- It limits the level of innovation and invention since most of the resources are not put to use.

POPULATION DENSITY: It refers to the number of people living in an area per square km. In East Africa, some places have got high population density while others have got low population density.

Causes of high population density (why some areas have high population e.g. Shores of Lake Victoria, Kabale, Mbale and along the coast)

- (a) Hot and wet climatic conditions that favour the growth of various crops to support high population e.g. shores of Lake Victoria.
- (b) Presence of deep and well drained fertile soils which support farming also attract a large number of people e.g. Kabale and Mbale.
- (c) Availability of abundant supply water for both domestic and commercial use e.g. Kampala and Nairobi.
- (d) Presence of many industries that attract a large labour force e.g. in Jinja and Dar-es-salaam.
- (e) Availability of a variety of minerals such as Diamonds in Shinyanga and limestone in Tororo.
- (f) Urbanization attracts many migrants into large cities for social amenities e.g. in Dodoma, Kampala and Mombasa.
- (g) Easy accessibility due to well developed transport and communication net work for easy movement.
- (h) Availability of a relatively flat landscape which make settlement and development of infrastructures relatively easy hence attracting large settlements.

Causes of low population density (why some areas have low population e.g. Karamoja, Ankole-Masaka corridor, Masai land and Turkana land)

1. Low and unreliable rainfall that cannot favour agriculture e.g. the desert region of Chalbi in northern Kenya.
2. Hot temperatures of 30°C and above that make it impossible for many people to live in such areas e.g. in Karamoja.
3. Absence of surface water that is essential for human life e.g. in Masai land.
4. Poor quality soils that can't support agriculture tend to scare away settlements e.g. Miombo woodlands.
5. Pests and diseases such as tsetse flies and mosquitoes in some parts of central Tanzania scare away man due to fear of loss his life.
6. Remoteness of the area that hinders accessibility due to poor transport and communication lines.
7. Limited economic activities which means that jobs are not existent.
8. Limited social services which scares away people.

TOURISM IN EAST AFRICA

- This is the practice for travelling for purposes of leisure, curiosity or study.
 - Tourism is the leading invisible export of East Africa and it's one of the major foreign exchange earners for the governments.
- Tourist attractions/tourism potentials in East Africa include:
1. Wildlife: this includes animals, vegetation and birds i.e. flora and fauna e.g. zebras, hippos, lions, flamingos, crocodiles, savannah vegetation, tropical forests e.t.c. these are conserved in national parks, game parks, game reserves like Queen Elizabeth, Serengeti, Kidepo Valley, Masai Mara, Mkomazi and Tsavo.
N.B wild life is the most important tourist attraction for East Africa.
 2. Climate and other resources attached to it e.g. sports, sunbathing, conducive situations of swimming e.t.c. East Africa has got a number of climate types e.g. savannah, equatorial, Semi-arid, Swamp and Montane climate.
 3. Relief features like high mountains e.g. Kilimanjaro, Kenya, and Rwenzori with snow at the top, and the rift valley plains.
 4. Historical sites e.g. Nyero rock paintings in Kumi, Kasubi tombs, Olduvai Gorge, and Fort Jesus at Mombasa e.t.c.
 5. Culture e.g. East Africa has got a number of cultures based on the different tribes e.g. the Masai, kiganda culture where people exhibit their cultures in different ways of dressing, eating.
 6. Drainage systems e.g. East Africa has got a number of drainage systems ranging from lakes like Victoria and rivers e.g. Rufiji, Nile and Tana.

A SKETCH MAP OF EAST AFRICA SHOWING TOURIST ATTRACTION CENTRES

Factors favoring the development of tourism industries in East Africa

- The region is endowed with a variety of tourist attractions such as wild life, drainage features, historical sites and coastal landforms which all attract foreign tourists.
- Peace and stability especially in Kenya and Tanzania and some parts of Uganda which has ensured that the tourists are sure of their safety.
- Improvement in the transport network system especially roads, water ways and air transport has facilitated easy movement of tourists to their areas of interest.
- Increased level of advertisement to outside countries is being done through embassies abroad through international Television channels, magazines, radios which have made tourists aware of what is in East Africa.

- Local people of East Africa provide good hospitality for the tourists which also attract foreign visitors because they are assured of good care and warm welcome.
- Improvement in the accommodation facilities e.g. hotels, lodges, and guest houses which have provided residential services to tourists.
- Increased level of education given to the local people has created more awareness and appreciations for the tourism industries e.g. courses related to tourism have been introduced at different institutions within East Africa e.g. Bachelor of Leisure and Hospitality Management.
- Presence of adequate capital from local and foreign individuals to invest in the sector e.g. for construction of hotels.
- Favourable government policy which encourages investment in tourism e.g. liberalization of the tourist sector, low taxation and increased subsidization of investors in the tourism sector.
- Availability of enough skilled and unskilled labour force to work in the industry e.g. hotel managers and game rangers.

Importance of tourism in East Africa

- Tourism is an invisible export which earns the government foreign exchange used for development of infrastructures e.g. roads.
- Tourism leads to development of international relationships which help in promoting world peace and establishing world unity.
- Tourism helps to conserve environment and protect natural beauty which is important for the present and future generations.
- It has created employment opportunities to the people of East Africa leading to improved standards of living e.g. game rangers, tour guides, travel agents e.t.c.
- It has facilitated the development of infrastructures like roads which help in the movement of goods and services in East Africa.
- Government earns revenue through taxation of people who work in the tourism industry used in the development of roads.
- It has led to the development of art and craft industry because the locally made items like drums, baskets mats are sold to foreign visitors.
- It helps to diversify the economy hence reducing dependence on agriculture ensuring constant capital flow.
- It helps to put idle land to good use hence reducing resource wastage e.g. Kidepo valley national park.

REASONS WHY KENYA'S TOURISM INDUSTRY IS MORE DEVELOPED THAN THAT OF OTHER EAST AFRICAN COUNTRIES

- Kenya is endowed with a variety of beautiful scenery in form of coastal land forms, volcanic features as well as coastal towns like Mombasa which attracts many tourists.
- Kenya has had a longer period of political stability which has attracted more tourists than Uganda and Tanzania.
- Kenya has various National parks and game reserves like Tsavo National Park that are well distributed throughout the country hence attracting a large number of tourists.
- Kenya's national parks are blessed with many well trained guides who encourage more tourists to go to Kenya.
- Kenya has a well established Hotel industry that is well managed and services are of high standards than in other East African countries.
- The government of Kenya through the Kenya Tourist Development Co-operation ensures strict wild life preservation programs and laws which ensures continuity of the activity.
- Kenya has a well developed transport system in terms of roads, railways and air transport making it easy for the tourists to move within the country.
- A lot of research is carried out by the Kenya Tourism Development Co-operation in terms of checking the population of animals and birds in National parks and Game reserves as well as improving the management of the entire tourism industry.
- Kenya lies along the coast of East Africa which is easily accessible by the tourists from Europe, Asia and U.S.A.

- Kenya introduced a new system of travel known as package holiday since 1970 which ensures that tourists are given subsidized rates hence attracting many more.

PROBLEMS FACING TOURISM INDUSTRY IN EAST AFRICA

- Poaching of wildlife has reduced the number of animals in National parks and Game reserves yet they are East Africa's major attractions.
- Inadequate supply of skilled manpower to handle wildlife and hotel management which therefore makes service provision very poor hence chasing away tourists.
- Inadequate capital for investment to set up roads, good accommodation facilities and to carry out research.
- Hostile tribes in East Africa e.g. the Masai and Karamojong scare away some of the tourists which limits the number of tourists that flow into East Africa.
- Low levels of advertisement which has made people unaware of the existence of tourist attractions in the countries hence reducing on the number of intending visitors and tourists.
- The high population growth rate which has resulted into increased demand for land leading to deforestation hence destruction of habitats for wildlife.
- Political instabilities in some parts of the East African countries have scared away tourists.
- Pests and diseases e.g. tsetse flies, mosquitoes which carry diseases like sleeping sickness, malaria for humans hence scaring away tourists and also reducing on the animal population.

SOLUTIONS TO THE PROBLEMS

- ✓ Eviction of encroachers and reduction of human settlement within the surroundings of the game reserves and National parks to reduce poaching.
- ✓ Setting up of anti-poaching squads to reduce on poaching to increase the animal population.
- ✓ Regular patrols and supervision should be done to protect the animals from poachers.
- ✓ Increased advertisement should be done through radio programs, TVs, News papers, magazines both within and abroad to increase on the level of awareness about tourism potentials within the region.
- ✓ The government should improve on the accessibility of tourist potentials e.g. Rehabilitation of roads for better transport.
- ✓ Educating the local people about the values of wild life and environmental conservation to reduce on the level of poaching and deforestation.
- ✓ Encouraging the local people to use family planning methods so as to control population growth and reduce the negative effects like deforestation.
- ✓ The government should fight corruption so that the resources allocated to the tourism industry are put into proper use.

AGRICULTURE IN EAST AFRICA

Agriculture is the practice of growing crops and rearing of animals. In East Africa, there are various systems of agriculture which are sub-divided into traditional systems and modern systems.

- Traditional/subsistence farming systems** mostly practiced in East Africa include nomadic pastoralism, shifting cultivation, bush fallowing and free range system.
 - Modern systems** include plantation farming, market gardening, irrigation farming, cattle ranching and poultry farming e.t.c.
- SUBSISTENCE FARMING:** This refers to all systems of agriculture where farmers grow crops and rear animals for their own consumption and it is only when there is surplus, when selling can be done. It's subdivided into the following systems of agriculture;
 - SHIFTING CULTIVATION:** This system is sometimes referred to as **slash and burn** farming system. It is a system where farmers clear the vegetation, plant crops and upon realizing that the soil has lost its fertility, the land is abandoned and farmers go to another fresh area.

CHARACTERISTICS OF SHIFTING CULTIVATION

- i. Scientific methods of farming are not used.
- ii. It employs only family labour because it's on small scale.
- iii. Traditional tools like hoes, pangas, digging sticks, axes and fire are used.
- iv. Food crops are mainly grown for home consumption e.g. potatoes, cassava, maize and sweet potatoes e.t.c.
- v. Farming is carried out on a small scale hence low output.
- vi. Farmers keep on moving from one place to another once soil has lost fertility and they don't come back.
- vii. Farmers do not set up permanent houses because they keep on moving.
- viii. Farming is practiced in sparsely populated areas with no permanent ownership of land.

ADVANTAGES OF SHIFTING CULTIVATION

- a. Provision of food especially for small families.
- b. The surplus can be exchanged on barter basis e.g. farmers obtain what they have not produced through exchange with their neighbours.
- c. Soil erosion is not serious because it's only a small piece of land which is cleared.
- d. Many crops are grown on the same piece of land which leads to high crop yields and reduced soil erosion.
- e. Farmers shift to better areas if there are more pests and diseases on the present land they occupy.
- f. Less capital is needed for investment.

DISADVANTAGES

- a. Low output is realized due to operation on a small scale.
- b. Soil erosion is always experienced especially after bush burning and clearing.
- c. Areas where shifting cultivation is carried out are always underdeveloped.
- d. It can't be carried out in areas with dense population.
- e. It leads to deforestation which retards the growth of forestry industry.

1. **BUSH FALLOWING:** This is another form of subsistence farming except that for bush fallowing, farmers stay in one place. Farmers leave the land under fallow (rest), to regain its fertility under the bush so that it can be re-used after some time. The length of the fallow period depends on population density. This practice is common in areas of Buganda, Teso and Kondo district (Miombo woodlands among the Wagogo people).

Characteristics of Bush fallowing

- Farmers settle in one place but they keep on rotating fields around the same homestead.
- There is permanent ownership of land.
- Food crops are mainly grown but of recent some cash crops have been introduced e.g. vanilla, cocoa e.g. in Mukono.
- Traditional tools are used e.g. hoes, pangas, digging sticks e.t.c.
- There is construction of permanent houses because farmers don't move around.
- Some scientific methods are used e.g. application of fertilizers.
- The rotation of fields depends on the size of the land owned and the population density in that area.
- Family labour is mainly used.
- Little capital is invested by the cultivators.

Advantages of Bush fallowing

- Provision of food capable of sustaining relatively big population.
- Reduces chances of soil erosion due to minimum application of scientific methods.
- Areas where bush fallowing is carried out are more developed than those where shifting cultivation is applied.
- It requires less capital since traditional tools are used.
- The surplus can be exchanged for income hence improving on the standards of living for farmers.
- Under bush fallowing, farmers can be able to grow perennial crops e.g. vanilla and coffee which is grown in Central Uganda e.g. Mukono.
- The soil under the fallow is left to regain its fertility which increases the crop yields.

Disadvantages of bush fallowing

- It depends on nature and which results into low crop yields in case of low rainfall and hot temperatures.
- With the increasing population in East Africa, the demand for land has gone high and bush fallowing stands higher chances of drying out.
- It's a backward farming system which is not economically viable because it's mainly food crops which are grown.
- It encourages land fragmentation which causes land disputes, soil erosion and low output.

N.B due to population increase in East Africa, the traditional farming systems are slowly dying out/disappearing.

3. NOMADIC PASTORALISM: This is another form of subsistence farming where farmers rear animals while moving from one place to another in search of water and pasture. Nomadic pastoralism is practiced by the Karamojong, Turkana, Bahima, Galla, Boran, Iteso and the Masai.

N.B the Masai practice **Transhumance** which is another form of nomadism which involves moving from highland areas to low land areas in search of water and pasture. Transhumance is a form of subsistence farming where a farmer grazes his livestock down the slope and when the pastures are over, he grazes on the top slope and then down. It is practiced in highland areas especially around Mt. Kilimanjaro e.g. Machakos and near the Serengeti plains.

Characteristics of Nomadic pastoralism

- ❖ It's practiced in sparsely populated areas e.g. North East Uganda and Northern Kenya.
- ❖ They occupy dry areas of East Africa which receive low rainfall of about 300 - 400mm per annum and temperatures are constantly hot e.g. over 30°C.
- ❖ They keep on moving from one place to another in such for water and pasture.
- ❖ Land is owned communally i.e. there is no individual ownership of land.
- ❖ They set up temporary huts or settlements because they are always on the move e.g. the Manyattas of the Masai.
- ❖ They mostly keep local breeds of animals e.g. Ankole long-horned cattle, zebu, Boran e.t.c.
- ❖ Cattle rustling i.e. stealing cattle from one another, is part of their culture.
- ❖ Crop growing isn't part of their culture but small scale farming is carried out and crops grown include millet, sorghum and cassava.
- ❖ Nomadic pastoralists keep large numbers of animals because they believe in quantity but not quality.
- ❖ The natural vegetation in areas occupied by nomads is always open grasslands and sometimes woodlands which is infested by tsetse flies.

Problems faced by nomads in East Africa

- Cattle rustling which leads to insecurity, loss of lives of the nomads and animals and destruction of property.
- They graze their animals communally which accelerates easy spread of diseases e.g. Nagana, sleeping sickness, East coast fever, foot and mouth disease e.t.c.
- They always burn the vegetation in anticipation of better pasture during the wet season but when the rain comes, the bare soil is eroded.
- Nomads over graze the land for years which exposes it to agents of soil erosion and hence soil exhaustion.
- Low rainfall which leads to shortage of drinking water especially during the dry season.
- There is a problem of tsetse flies which spread Nagana and sleeping sickness to animals and people respectively.
- Lack of storage facilities like refrigerators to store milk and houses for milk collecting centres and processing milk.
- Animals are fed on natural pastures which are of poor quality leading to unhealthy conditions for the animals hence low quality output.
- Cultural rigidity or conservativeness, whereby the farmers do not attain any changes regarding to better farming methods.
- Areas occupied by nomads are neglected by governments hence leaving pastoral areas to lag behind in terms of development.
- There is frequent occurrence of famine due to inadequate food supply.
- Wild animals e.g. lions and leopards attack their animals e.g. the Karamojong near Kidepo valley national park.

- Land disputes are becoming common especially with crop growers whose farms are destroyed by the wandering animals.
- Nomads walk for very long distances in their bid to search for water and pasture for their animals.
- Population increase and land ownership have led to reduction grazing areas for nomads.
- Remoteness or inaccessibility due to poor transport has led to limited market for the animals and their products.
- Government neglect has led to limited veterinary services hence increased disease outbreaks.

SOLUTIONS TO THE PROBLEMS

- ✓ Emphasizing massive education to teach the pastoralists about the values of modern farming and living a settled life.
- ✓ Encouraging individual land ownership to reduce on overgrazing and its effects e.g. soil erosion.
- ✓ Construction of boreholes and valley dams to provide water to pastoralists during the dry season to reduce on their movements.
- ✓ Infrastructural development e.g. roads, hospitals to reduce remoteness of pastoral areas.
- ✓ Establishing of markets and milk processing plants near the pastoral areas to enable them sell their animal products.
- ✓ Extending the veterinary services e.g. cattle dipping to pastoral areas to fight pests and diseases.
- ✓ Encouraging pastoralists to grow some crops to diversify their economy and also fight famine.
- ✓ Encouraging free and accessible education to fight illiteracy and hence change their beliefs for modern farming.
- ✓ Formation of co-operatives so that they can acquire loans and market for their products.
- ✓ Practicing ranching and paddocking to control over grazing.
- ✓ Setting up anti-theft units to improve security hence reducing cattle rustling.
- ✓ Diversification of the economy e.g. through tourism to ensure constant capital inflow for government.
- ✓ Practicing cross-breeding to improve on animal breeds for better yields.
- ✓ Using quarantine or restricting animal movements to reduce the spread of animal diseases.
- ✓ Carrying out scientific research to introduce quality pasture for animals to improve on output.
- ✓ Setting up anti-stock units to reduce over stocking and number of animals kept hence reducing soil erosion.

Importance of nomadic pastoralism to the economy of East Africa

- Source of human food with valuable proteins e.g. milk, meat/beef and blood.
- It's a source of income to the pastoralists by selling farm products hence improving on their standards of living.
- It's a source of employment e.g. through trade hence providing a livelihood for many people.
- It's a source of government revenue for setting up roads through taxing livestock transporters and dairy factories.
- The government earns foreign exchange used for setting up hospitals by exporting animal products e.g. hides and skins.
- It has helped to diversify the economy of East Africa hence ensuring constant capital inflow and reduced dependency on crop growing.
- Nomadic pastoralism has provided raw materials for industries which provide jobs e.g. meat packers and leather tanning industry.
- It has helped to put idle land into use hence reducing resource wastage e.g. Karamoja region.
- Animals are used as beasts of burden e.g. for transport and for pulling ox-ploughs hence promoting farming.
- Animal wastes are used as a source of fuel e.g. cow dung is used for bio-gas hence offering alternative source of energy.
- Source of wealth for social and economic status e.g. bride wealth hence promoting cultural conservation.

Why Nomadism has persisted

- Areas occupied by nomads are sparsely populated hence providing enough land for communal grazing.
- The areas are remote and located far away from centers of modernity leading to sparse population.
- The areas receive low and unreliable rainfall which can't support crops but can sustain pastoralism.
- Governments have deliberately ignored development in pastoral areas hence leaving them in their ways of life.

- The infertile sandy soils in these areas discourage crop growing but can support growth of pastures hence pastoralism.
- Cultural rigidity of the nomads makes them argue that it is the best way to live their lives.
- Low levels of education and ignorance has made nomads reject new methods of animal rearing.
- Presence of short savanna vegetation/grass lands which is open and favours movement of pastoralists without much forest vegetation.
- The gently sloping relief of the areas they occupy, makes it easy to move with their animals from one place to another.

A sketch map of East Africa showing Ranches and areas occupied by pastoralists

RANCHING IN EAST AFRICA

It's the rearing of animals purposely for the production of meat. Ranching schemes are set up by government to act as demonstration farms to the nomadic pastoralists.

Examples in East Africa include;

- Kaputiel ranching scheme in Masai land.
- Ankole – Masaka ranching scheme among the Bahima.
- Aswa ranching scheme in Acholi.
- Agago ranching scheme in Karamoja.
- Singo and Buruuli ranching scheme for Peasants in Luweero and Nakasongola.
- Kongwa ranching scheme in Gogoland (Central Tanzania in Kondoa region).

1. ANKOLE – MASAHA RANCHING SCHEME:

- It's located in Mbarara, Masaka, Rakai, Sembabule and Lyantonde districts.
- The Bahima pastoralists are the beneficiaries of the scheme.
- This area receives unreliable rainfall and the dry seasons are longer than the wet seasons.
- Work on the scheme began in 1960 when rinder pest killed over 90% of the animals owned by the Bahima.

- Wild animals were also killed because they acted as hosts of tsetse flies.
- In 1963, spraying using insecticides began and bushes along the Mbarara – Masaka road were cleared.
- A research station was set up at Ruhenge to cater for cross-breeding between Red Poll, Angus, Zebu, Ankole long-horned cattle and Boran.
- A pasture station was set up at Muko to improve on the grass for feeding the animals.
- A market was set up at Sangu along the Ankole-Masaka highway to encourage the Bahima to sell their animal products.

BENEFITS OF THE RANCHING SCHEME

- ✓ Weed killers have been applied to remove the unwanted plants.
- ✓ Leguminous grass has been planted which is nutritious for the animals to replace the unwanted spear grass from the ranches.
- ✓ Meat and milk collecting centres have been set up to encourage Bahima to sell the animal products.
- ✓ Veterinary services have been brought nearer to the pastoralists.
- ✓ Farmers have been encouraged to sell off some of their animals to control spread of diseases.
- ✓ Efficient transport systems have been developed to enable the farm products reach the urban market.

2. KONGWA CATTLE RANCH:

- ❖ This was formerly a **ground nut scheme** occupied by the Wagogo people.
- ❖ The area had very hard dry soils during the dry season and very wet soils in the wet season.
- ❖ Bushes were only cleared in the wet seasons because that is when all the roots could be uprooted.
- ❖ Today, the Kongwa ranching scheme is under the National Agricultural Company Limited with eight big ranches on 340,000 hectares with over 70,000 heads of cattle.

3. KAPUTIEL RANCHING SCHEME:

- It is a developed scheme within Masai land South East of Nairobi bordering river Athi.
- The Masai occupy a dry Savanna stretch from the Narok district of south-west Kenya to the Masai steppe of North East Tanzania.
- The ranches are not fenced but surrounded by ditches separating the different clans.

Benefits of the Scheme

- Cross-breeding has led to improved animal breeds which give off a lot of milk.
- Dipping of animals has also helped to control pests and diseases.
- There is improved water supply for the Masai animals through the construction of valley dams.
- Extension veterinary services are provided to provide assistance to the Masai against animal diseases.
- Schools were built and a few Masai children go to school.
- In Tanzania, a project called Masai development plan was introduced to improve the life of the Masai by putting in place ranches.
- Wheat growing, sheep and goat rearing have been introduced in Nandi districts to encourage them to grow some crops.
- Aerial spraying and bush clearing have been introduced in major lands to control tsetse flies and create more land for farming.
- The Masai cultivators are given incentives by the Kenya government to fence and cultivate their land.
- Roads, banks and hospital facilities have been introduced to improve their standard of living.

PLANTATION AGRICULTURE IN EAST AFRICA

- ❖ It refers to the commercial farming where cash crops are grown on a large scale specifically for sale.
- ❖ Crops that are grown under plantation agriculture include; sugarcane, tea, sisal, coffee, pyrethrum, cloves, bananas and oil palm.

- ❖ The major plantations in East Africa include Kakira in Jinja for sugarcane, Lugazi (SCOUL) for sugarcane, Kasaku tea estate near Lugazi, Kericho tea estate, Mwea-Tebere for rice, Mumias for sugar, Kibimba (Tilda Uganda Limited) for rice, Kilombero for sugarcane and Morogoro sisal estate and Zanzibar clove estate.

Characteristics of plantation farming

- Cash crops are grown on a large scale e.g. range from 105-1000km² of land.
- It involves use of machines e.g. combined harvesters, collecting trucks, ploughs and tractors.
- Monoculture is mainly practiced i.e. growing a single crop on a large area.
- It involves use of abundant skilled and unskilled labour force.
- It involves use of scientific methods e.g. spraying and irrigation.
- It requires large capital input for buying large chunks of land, machines and paying workers.
- The land must be flat or gently sloping to favor the establishment of plantation farms and mechanization.
- Crops grown are mainly for sale and export.
- They provide social services to workers e.g. schools, hospitals, recreational facilities and houses to ensure high productivity.

Benefits of plantation agriculture

- It has led to development of infrastructure e.g. roads, schools, hospitals leading to urbanisation.
- They employ many workers leading to improved standards of living.
- They increase on the tax base for government hence increased revenue used for developing roads.
- Foreign exchange is obtained from the exportation of the products used for developing hospitals.
- Leads to industrial growth through provision of raw materials especially to agro-based industries e.g. Kakira sugar works.
- Plantation farms provide market for the out growers' produce hence ensuring constant flow of income.
- Plantation farms encourage research leading to improved and better quality crops.
- Acquisition of skills by workers which helps them to ensure continuity on the job.

Disadvantages

- It encourages rural-urban migration and its effects like unemployment, high crime rate and slum development.
- It leads to displacement of people from their own land hence leaving many people landless.
- It has reduced on the vegetation cover in East Africa leading to desertification e.g. clearing of Mabira forest by SCOUL.
- Monoculture practiced by farmers on plantation leads to soil exhaustion and erosion hence loss of soil fertility.
- They require large capital (capital intensive) yet majority of people in East Africa are poor leading to foreign ownership.
- There is increased multiplication of pests and diseases due to monoculture on these plantations.
- Profit repatriation as most for the plantation farms are owned by foreigners leading to less local development.

Note: Out growers are farmers adjacent to plantations who grow similar crops as those grown on plantations and they therefore sell their crops to the plantation owners.

IRRIGATION FARMING IN EAST AFRICA

- ❖ Irrigation is the artificial adding of water to the soil.
- ❖ Irrigation schemes in East Africa are both small and on large scale.
- ❖ They are found in both dry and wet areas in East Africa.

Examples of irrigation schemes in East Africa include;

Country	Irrigation scheme	Source of water for irrigation	Crops grown
Uganda	1. Doho (Manafwa district)	River Manafwa	Rice (major)
	2. Kibimba (Bugiri district)	River Kibimba	Rice (cassava)
	3. Mobuku (Kasese district)	River Mobuku & Sebwe	Maize and cotton
	1. Ahero pilot scheme(Kano plains in Western Kenya)	River Nyando	Rice

Kenya	2. Galole pilot scheme	River Tana	Cotton
	3. Mwea-Tebere	River Thiba, Tana & Nyamindi	Rice
	4. Mumias	River Nzoia and River Khaleba	Sugarcane
Tanzania	1. Kilombero	River Kilombero and Ruaha	Sugarcane

REASONS WHY IRRIGATION IS CARRIED OUT IN EAST AFRICA

- In many parts of East Africa, rainfall is inadequate hence the need for adding water artificially e.g. in Kasese.
- There is need to increase food production through irrigation to sustain the ever increasing population.
- Some crops need too much water which can be easily provided through irrigation e.g. rice, sugarcane, yams e.t.c.
- Irrigation is carried out to maintain moisture in the soil in order to help in the maintenance of soil fertility.
- Some areas receive very hot temperatures and they lose a lot of water through evaporation in the dry season hence the need for irrigation e.g. Kasese and Mobuku valleys.
- The government policy of opening up remote areas and improvement of agricultural productivity has also led to irrigation.
- Existence of extensive free land due to sparse population in dry areas has also led to use of irrigation.
- Presence of rivers that provide permanent sources of water for irrigation e.g. river Malaba for Doho irrigation scheme.
- Availability of adequate capital to buy the machines e.g. water pumps and to extend social infrastructures e.g. railway lines e.t.c.
- Existence of gently sloping land which favours irrigation by gravity flow of water e.g. at Mwea-Tebere.
- Existence of modern technology which ensures use of irrigation e.g. over head sprinkling at Kilombero.

KILOMBERO VALLEY IRRIGATION SCHEME

- The scheme started in 1960 and it became a government parastatal called Sugar Development co-operation in 1968.
- Today, it employs over 46,000 workers and it contributes 40% of the total sugar production in Tanzania.
- It has mainly encouraged the development of outgrowers' schemes.

Sketch map showing the site of Kilombero irrigation scheme

Aims of Kilombero valley irrigation scheme

- ❖ To control flooding of river Kilombero and Ruaha in the area.
- ❖ To reclaim the fertile land for farming along River Kilombero.
- ❖ To open up the remote and poor areas of southern Tanzania economically.
- ❖ To diversify the economy of the area especially the out growers' to ensure constant flow of income.

Factors that favored location of the scheme

- ✓ Presence of rivers such as Kilombero and Ruaha that provide constant supply of water for irrigating sugarcane.
- ✓ The gently sloping land which favors use of machines for large scale farming e.g. ploughs and tractors.
- ✓ The flat nature of the area which favors irrigation by use of gravity flow of water.
- ✓ Extensive land due to sparse population also provided enough land for the large scale irrigation scheme.
- ✓ Availability of deep and well drained fertile alluvial soils deposited by R. Kilombero for the growing of sugarcane.
- ✓ Hot temperatures of about 23°C and above which favor the growth, ripening and harvesting of sugarcane.
- ✓ The rainfall is unreliable hence leading to the use of irrigation to supplement the rainfall.
- ✓ Presence of ready market for the sugar which is both local and international e.g. Zambia.
- ✓ Supportive government policy to open up remote areas in southern Tanzania also led to the setting up of the scheme.
- ✓ Opening up of the Tanzam-Tazara railway in 1975, also increased accessibility to the area hence providing cheap transport.
- ✓ Availability of adequate capital from Kilombero Company for investment e.g. Buying machines, land and paying workers.

- ✓ Availability of abundant and cheap labour to work on the scheme e.g. from the surrounding communities.

Benefits of the scheme

- It has provided employment opportunities for the Tanzanian population hence improving their standards of living.
- It has led to the development of roads and railways e.g. the extension of Tanzam-Tazara railway which has made transport easier.
- It has diversified the agricultural activities within the area which helps to fight food insecurity.
- It has put idle land into good use hence ensuring resource utilisation and reducing resource wastage.
- Sugar is exported and this brings in foreign exchange used for developing infrastructures e.g. roads.
- International relationship has been created between Tanzania and other countries e.g. Zambia leading to peaceful co-existence.
- It is a source of government revenue through taxation which is used for developing infrastructures e.g. hospitals.
- Source of sugar which is a vital commodity for the people in the area.
- It has helped to control the diverse effects of flooding in the area hence reducing on destruction of property.
- Infrastructure has been developed e.g. roads, schools, hospitals and markets leading to urbanisation e.g. Kidatu, Ifakara and Kilosa towns.
- Has led to development of research in sugarcane varieties hence boosting people's knowledge.
- It has led to establishment of processing industries which have provided employment opportunities to the people in the area.
- The scheme has helped resettle people who were formerly landless and jobless hence reducing on land wrangles and crime in the area.

Problems facing the farmers on the irrigation scheme

- Diseases e.g. yellow wilt that destroys the sugarcane leading to reduced output.
- Soil exhaustion due to monoculture leading to low output hence low export potential.
- Leaching of soil due to the excessive water which leads to poor soils hence low productivity.
- Pests e.g. snails which destroy the sugarcane hence leading to poor quality output.
- Price fluctuation due to over production and competition with other sugar producing countries e.g. Uganda leading to low morale of farmers.
- Shortage of labour especially during the harvesting period due to low population in the area.
- Fire out breaks which destroy large parts of the farms leading to losses for the scheme.
- Dangerous animals like snakes which scare away the farmers leading to labour shortage.
- Presence of weeds which compete with sugarcane for water and soil nutrients leading to poor quality output.
- Silting of the canals by floods which calls for regular dredging yet it's very expensive.
- It requires high capital investment to operate the scheme yet capital is not readily available.
- Salinity of the soils due to excessive evaporation as a result of hot temperatures in the area.
- Inefficient transport within the scheme which makes the delivery of sugar to the markets very difficult.
- Natural hazards e.g. hailstorms and strong winds also destroy large parts of the scheme leading to losses.

Steps being taken to solve the problems

- Spraying of crops by using pesticides to avoid pests and diseases.
- Price control by government and production by quota system to avoid price fluctuation at the world market.
- Research on better sugarcane varieties to increase production and quality.
- Applying fertilizers and manure to increase soil fertility and ensure high productivity.
- Use of herbicides to control weeds and reduce competition for soil nutrients.
- Controlling fire outbreaks by living bare land between plots (patching) to stop fire from spreading.
- Diversification of agriculture to reduce over reliance on sugarcane growing e.g. introduction of ranching.
- Encouraging mechanization to solve the problem of labour shortage especially during harvesting.
- Acquiring loans from banks to provide large capital base for farm operations.

- De-silting and dredging of canals to control floods and ensure proper flow of water.
- Construction of feeder roads and railways within the scheme to improve accessibility to markets.

MWEA-TEBERE IRRIGATION SCHEME

- It's the largest irrigation scheme in East Africa.
- Water is got from River Thiba, River Nyamindi and River Tana.

A sketch map showing site and extent of Mwea-Tebere

Aims of the scheme

- To provide employment to the political detainees.
- To resettle the land less people.
- To produce rice and other food crops on large scale.
- To develop the area of North East Kenya.

Conditions which have favored the location of Mwea-Tebere project

- ❖ Availability of permanent water sources e.g. River Nyamindi, Thiba and Tana to provide water for irrigation.
- ❖ The gently sloping landscape i.e. the piedmont plain on the lower slopes of mountain Kenya allowing irrigation by gravity flow.
- ❖ The presence of fertile black volcanic soils for cotton and red clay soils which support rice growing.
- ❖ Availability of extensive tracts of land which was sparsely populated hence providing free land for the project.
- ❖ The area receives low and unreliable rainfall of 750mm per annum which favors irrigation.
- ❖ Supportive government policy of setting up irrigation schemes to develop remote areas of Mwea-Tebere.
- ❖ Availability of adequate capital for investment e.g. to purchase farm inputs and tools to be used for farming.
- ❖ Availability of ready market both local and international for the farm produce.
- ❖ Availability of well developed transport lines e.g. Nairobi-Nyeri railway line for delivering rice to markets.
- ❖ Presence of landless people who were ready to be recruited and provide cheap labour to work on the scheme.

Benefits of Mwea–Tebere irrigation scheme

- ✓ Source of food especially rice for human consumption.
- ✓ Provided employment opportunities to the farmers hence improving their standards of living.
- ✓ The project has helped to re-settle people who were formally landless.
- ✓ The project has led to improvement in the infrastructure e.g. roads which has improved transport in the area.
- ✓ Flooding of the rivers has been controlled hence improving the safety of lives of the people around.
- ✓ It's a source of government revenue through taxes used to develop infrastructures e.g. roads.
- ✓ It has led to improvement in research hence resulting into high crop yielding varieties.
- ✓ The project led to effective utilization of the land which could have remained idle hence reducing resource wastage.
- ✓ It has led to development of processing industries which have led to urbanisation e.g. the rice mill at Mwea-Tebere.
- ✓ Infrastructural development has led to urbanisation e.g. Thiba and Embu towns.
- ✓ It has led to large scale output hence encouraging exports leading to acquisition of foreign exchange by government.

Problems faced by farmers on the scheme

- ❖ Pests which destroy stored crops leading to losses e.g. rice weevils.
- ❖ Diseases also destroy crops leading to low output e.g. rice blast and rice rust.
- ❖ Price fluctuations due to over production which discourage the farmers from further production.
- ❖ Weather changes which affect the output e.g. cool temperatures and heavy storms which destroy the crops.
- ❖ Reduction in soil fertility due to monoculture leading to low output.
- ❖ Weeds which compete with crops for soil nutrients leading to low quality output.
- ❖ Limited capital for further investment which also leads to reduced output.
- ❖ Soil salination due to high evaporation rates in the area leading to low output.
- ❖ Inadequate labour force especially during the harvesting period which brings activities to a standstill.
- ❖ Silting of canals which cause floods leading to destruction of farmlands.

Steps being taken to solve the problems

- Spraying of crops by using pesticides to avoid pests and diseases.
- Price control by government and production by quota system to avoid price fluctuation at the world market.
- Research on better rice varieties to increase production and quality.
- Applying fertilizers and manure to increase soil fertility and ensure high productivity.
- Use of herbicides to control weeds and reduce competition for soil nutrients.
- Weather studies are emphasized to reduce effects of weather destruction.
- Diversification of agriculture to reduce over reliance on rice growing e.g. introduction of cotton and peas.
- Encouraging mechanization to solve the problem of labour shortage especially during harvesting.
- Acquiring loans from banks to provide large capital base for farm operations.
- De-silting and dredging of canals to control floods and ensure proper flow of water.

TYPES OF CROPS GROWN IN EAST AFRICA

- a) **Perennial crops:** These are crops that take more than 1 year from the time of planting to the time of the first harvest e.g. coffee, tea, tobacco, sugarcane. Most of these crops require heavy rainfall throughout the year.
- b) **Annual crops:** These are crops which are grown and harvested in one season or harvested within a year e.g. beans, peas, cereals. Such crops require alternate wet and dry seasons.

1. **Sugarcane:** Sugarcane are widely grown around Lake Victoria shores at Lugazi, Kakira in Jinja, Mumias in Nyanza province, Bukoba and along river Kagera, in Rakai (Sango bay), at Kinyara (Masindi) and Kilombero valley irrigation scheme.

Conditions for the growth

- High levels of humidity which ensures heavy rainfall for proper growth.
- Average temperatures of about 20°C and above especially during the harvesting season.
- Low altitude between 0-150m below sea levels to ensure warm temperatures for proper growth.

- Heavy rainfall of about 1500mm spread over 9 months or with use of irrigation especially during the planting period.
- Deep and well drained fertile alluvial soils for the growing of the sugarcane.
- Abundant and cheap labour force especially during the planting, weeding and harvesting periods.
- Gently sloping landscape for easy drainage of water in the soil.

2. **Pyrethrum:** This is a white flowering plant which contains a chemical substance used in insecticides. Mainly grown in high altitude areas e.g. in Kenya along the slopes of Mt. Kenya, Aberdare ranges, Kikuyu land, and slopes of Mt. Kilimanjaro, Arusha, Mt. Meru, Mbeya and Usambara ranges and Southern highlands in Tanzania.

Conditions for its growth

- Fairly cool and moist conditions for plant growth.
- High altitude of about 1000m to 1800m above sea level to ensure cool conditions.
- Well drained and fertile loam soils for proper plant growth and high yields.
- Heavy and reliable rainfall of about 1500mm per annum for high yields of the crop.
- Cheap and abundant labour especially during the harvesting period.
- Well developed transport routes linking to industries since it's grown in highland areas.
- Extensive land for large scale growing to ensure high output.
- High humidity all year round for luxuriant growth of the crop.
- Abundant sunshine for ripening and harvesting of the crop.
- Supportive government policy to encourage plantation agriculture.
- Gently sloping landscape for easy movement of the workers.
- Ready market for the crop which is both local and international e.g. in China.

3. **Coffee:** This is the chief exchange earner crop of Uganda but Kenya is the biggest producer in East Africa. There are two types of coffee;

- **Arabica coffee** mainly grown on the slopes of mountain Elgon, Rukungiri, Kabarole, Kabale, Aberdare ranges, Mt. Kenya, Kilimanjaro slopes, Mt. Usambara and Mt. Meru near Arusha and Moshi.
- **Robusta coffee** mainly grown along Lake Victoria basin covering districts like Mukono, Mityana, Masaka and Rakai in Uganda. It's also grown in Bushenyi, Nebbi, Kapchorwa, Masindi, Hoima, Busia and Fort Portal. In Tanzania, it's grown around Bukoba and in the southern highlands.

Conditions for the growth of coffee

- ✓ Fertile and well drained soils i.e. alluvial for Robusta and Volcanic for Arabica for growing the crop.
- ✓ High altitude of about 1500 – 2300m for Arabica and low altitude of about 1000-1500m for Robusta.
- ✓ Generally average/moderate temps not exceeding 25°C for proper maturity of coffee.
- ✓ Heavy rainfall between 1000mm – 1500mm of rainfall needed during the planting season.
- ✓ Protection from strong winds by practicing agro-forestry.
- ✓ Alternate spraying to control pests and diseases e.g. the coffee berry.
- ✓ Cheap and abundant labour needed especially during the harvesting season.
- ✓ Adequate capital needed for buying fertilizers, pesticides and farm implements.
- ✓ Very hot temperatures of about 27°C for drying of the coffee.
- ✓ High humidity which ensures heavy rainfall total for proper growth.
- ✓ Presence of extensive and gently sloping land for the growing of the crop.
- ✓ Availability of ready market both local and international.

Uses of coffee

- Used as a beverage for drinking after processing.
- Coffee husks are a good source of manure used to improve soil fertility.
- Coffee husks and wood are used as fuel for cooking in rural areas.
- Coffee husks are also used as litter in poultry shelters.
- Coffee stems are used as building materials e.g. in mud houses.
- Used as a herbal medicine especially in Buganda and Bunyoro.
- Coffee is also used in the manufacture of gun powder for making bullets.

PROBLEMS FACING COFFEE PRODUCTION IN EAST AFRICA

- Pests which destroy large parts of farms leading to losses e.g. termites.
- Diseases which lead to poor quality output such as coffee wilt disease and coffee berry disease.
- Limited land for coffee plantations due to ever increasing population.
- Soil exhaustion due to monoculture leading to low and poor quality yields.
- Competition with other coffee producing countries like Brazil and Ivory Coast leading to inadequate market.
- Low prices and unstable coffee prices leading to price fluctuation on the world market which demoralizes the farmers.
- Prolonged drought and hailstorms which destroy coffee flowers leading to low output.
- Competition with other beverages e.g. tea, cocoa and vanilla which reduces demand.
- Dangerous animals e.g. snakes, wasps and bees which attack the workers hence scaring them away.
- Inadequate storage facilities which leads to losses due to rotting of the coffee and destruction by pests.
- Coffee has a long gestation period of about 3½ years until the first harvest which also demoralizes the farmers.
- Shortage of extension workers to train people on how to attend to coffee properly.
- Post harvest losses also demoralize the farmers e.g. theft which leads to losses for the farmers.
- Poor means of transport leading to market centers leading to delays in delivery.

4. **TEA:** It's obtained by plucking, drying and curing the young leaves of the shrub tree. In Kenya, it's grown around Kericho and Limuru. In Tanzania, it's grown around Iringa and Mbeya, Southern highlands and on slopes of Mt. Kilimanjaro. In Uganda, it's grown around Lake Victoria regions in Lugazi at Kasaku Tea estates, Mityana, Bushenyi, Fort Portal and Kigezi. Harvesting takes about 3-4 years after planting.

Conditions for tea growth

- Warm but not exceedingly hot climate for proper maturity of the crop.
- Fairly heavy rainfall of about 1500mm which is well distributed over the growing period.
- Deep, acidic and well drained fertile alluvial Soil for the growing of the crop.
- Protection from strong winds by practicing agro-forestry.
- Alternate spraying to control pests and diseases e.g. leaf rust.
- Cheap and abundant labour needed especially during the harvesting season.
- Adequate capital needed for buying fertilizers, pesticides and farm implements.
- Careful pruning and regular hoeing to kill weeds.
- Availability of ready market both local and international to buy the crop.

Problems facing Tea production

- Competition with unwanted weeds for plant nutrients leading to poor quality produce e.g. couch grass.
- Pests e.g. yellow tea termites and aphids which destroy the crop leaves leading to losses.
- Diseases e.g. root fungus disease which leads to poor quality output.
- Inadequate capital yet expensive machinery is used in tea processing.
- Scarcity of labour to do plucking during the harvesting period.
- Competition with other beverages such as Coffee, Vanilla and Cocoa which reduces market for tea.
- Limited land for tea plantations due to ever increasing population.
- Soil exhaustion due to monoculture leading to low and poor quality yields.
- Competition with other tea producing countries like Brazil and Malaysia leading to inadequate market.
- Unstable tea prices leading to price fluctuation on the world market which demoralizes the farmers.
- Natural hazards e.g. hailstorms which destroy large parts of plantations leading to low output e.g. at Kericho.
- Dangerous animals e.g. snakes, which attack the workers hence scaring them away.
- Inadequate storage facilities which leads to losses due to rotting of the tea and destruction by pests.
- Tea has a long gestation period of about 3 to 4 years until the first harvest which also demoralizes the farmers.

5. **Sisal:** The crop can be grown in most parts of East Africa including those with low and unreliable rainfall and poor sandy soils. Tanzania is the major producer and it's grown mainly along the coast near Tanga, Lindi and Dar-es-salaam. In Kenya, it's grown along the coast in near Mombasa, Masai land and near Nakuru. Used for making sacks and ropes.

Conditions for sisal growing

- ❖ Needs constantly hot temperatures above 20°C to grow well.
- ❖ Grows well at an altitude of about 900-1500m above sea level.
- ❖ Requires an annual rainfall of about 650mm needed during the planting season and can also tolerate drought.
- ❖ A long dry season for harvesting the crop.
- ❖ Requires moderately fertile sandy-loamy soils for growing the crop.
- ❖ A large labour force needed especially during the planting and harvesting season.
- ❖ Extensive and flat landscape because the crop can't be grown alongside other crops and needs a lot of spacing.
- ❖ Availability of ready market both local and international to buy the crop.

Problems faced in sisal production

- It's affected by diseases such as Honey dew and leaf blight which lead to poor quality output.
- Weather changes e.g. heavy rains lead to rotting of the stems hence losses for farmers.
- The crop is thorny which makes it difficult to harvest.
- Requires a lot of capital investment to buy farm equipment e.g. gum boots and gloves.
- Competition from synthetic fibres e.g. nylon and polythene which reduces market for sisal products.
- Soil exhaustion due to monoculture leading to low and poor quality yields.
- Scarcity of labour especially during the harvesting period.

6. **Tobacco:** It's a commercial non-food plant which is consumed by smoking and by chewing. It's used in the manufacturing of cigarettes. It's widely grown in the west Nile region of Uganda e.g. Arua, Adjumani, Nebbi, Yumbe and Moyo. Other areas where it's grown in Uganda include; Kiryandongo, Nakasongola, Kigezi, Bushenyi, Wakiso, Mubende, Masindi, Oyam and in Soroti. In Tanzania, it's grown around Urambo area within the Miombo woodlands, Tabora, Songea and Iringa. In Kenya, it's grown in Kikuyu land e.g. Nyeri and Nyahururu and also near Eldoret, Kitale, Nakuru and Limuru.

Conditions for growth

- ✓ Warm temperatures of between 13-27°C for proper maturity of the crop.
- ✓ An average altitude of between 900-1500m above sea level for proper growth.
- ✓ Light and well-drained fertile sandy-loamy soils for the growing of the crop.
- ✓ Moderate rainfall of about 380-500mm needed in the first 3½ months for the growing of the crop.
- ✓ Warm and moist conditions during the ripening and harvesting period.
- ✓ Gently sloping and extensive land for growing the crop.
- ✓ Abundant and cheap labour force needed for planting, weeding, spraying and harvesting of the crop.
- ✓ Protection from strong winds by practicing agro-forestry.
- ✓ Alternate spraying to control pests and diseases e.g. aphids and leaf rust.
- ✓ Adequate capital needed for buying fertilizers, pesticides and farm implements.
- ✓ Presence of ready market which is both local and international to buy the crop.

Problems facing Tea production

- Competition with unwanted weeds for plant nutrients leading to poor quality produce.
- Pests e.g. aphids which destroy the crop leaves leading to losses.
- Diseases e.g. root fungus disease which leads to poor quality output.
- Inadequate capital yet expensive machinery is used in tobacco processing.
- Scarcity of labour to do the plucking during the harvesting period.
- Competition with other countries producing cigarettes e.g. Marlboro and Rex from USA.
- Limited land for tobacco plantations due to ever increasing population.
- Soil exhaustion due to monoculture leading to low and poor quality yields.
- Unstable prices leading to price fluctuation on the world market which demoralizes the farmers.

- Natural hazards e.g. hailstorms which destroy large parts of plantations leading to low output.
 - Dangerous animals e.g. snakes, which attack the workers hence scaring them away.
 - Inadequate storage facilities which leads to losses due to rotting and destruction by pests.
7. **Rice:** in Uganda, it's grown in Pallisa, Namutumba, Bugiri, Manafwa and Iganga in eastern Uganda. Upland rice does not require a lot of water and so it's grown in Wakiso, Kayunga and Mukono districts. It's also grown at Kibimba rice scheme, Doho rice scheme, and Olwenyi rice scheme near Lake Kyoga. In Kenya, it's grown in the Nyanza Province e.g. Bungoma and near Mumias in western Kenya. Rice growing is also supervised on irrigation schemes e.g. Mwea-Tebere, Ahero and also grown by peasants on banks of River Tana. In Tanzania, rice is grown at Kilombero irrigation scheme, southern shores of Lake Victoria e.g. at Bukoba, southern shores of Lake Malawi, along river banks e.g. river Rufigi, river Pangani and river Wami.

Conditions for growth

- ❖ Heavy rainfall of about 1500mm per annum needed during the planting season for proper growth.
- ❖ Flooded conditions with a soil depth of over 25m and the water should not be always stagnant.
- ❖ Hot temperatures of over 20°C especially during the planting and harvesting season.
- ❖ Heavy clay-loamy soils with a high moisture and water retention capacity.
- ❖ Fertilizers particularly nitrogen, phosphorous and potassium to ensure soil fertility due to monoculture.
- ❖ Level ground surface to easily allow flooding during the growing period. It grows so well in deltas.
- ❖ Requires a lot of cheap labour to cultivate and harvest the crop.
- ❖ High capital investment to buy fertilizers, land and farm equipment e.g. combined harvesters.
- ❖ Proper storage facilities should be availed to reduce destruction by pests e.g. rice weevils.
- ❖ Extensive landscape because the crop can't be grown alongside other crops.
- ❖ Well developed transport routes linking to stores and industries because the crop is grown in swampy areas.

Problems experienced by rice farmers

- Pests e.g. rice weevils destroy the stored rice leading to losses for the farmers.
 - Diseases e.g. rice blast attack the crop leading to poor quality output.
 - Loss of soil fertility due to practice of monoculture.
 - Threat of snakes that attack and kill the farmers.
 - Weather failure such as drought which leads to stunted growth of the crop.
 - Gazzetting of wetlands for ecological reasons e.g. tourism has reduced land for rice growing.
 - Water borne diseases e.g. bilharzia and cholera attack the farmers hence reducing labour force.
 - Competition from other rice producing countries e.g. Pakistan and Vietnam which reduces market for local rice.
 - Poor transport facilities leading to markets, stores and industries hence delaying deliveries for processing.
 - Inadequate capital for buying farm implements and fertilizers.
 - Poor storage and packaging facilities which leads to attacks from pests e.g. rice weevils.
 - Birds are a common threat because they destroy rice fields leading to losses.
8. **COTTON:** in Uganda. It's grown in Gulu, Lira, Soroti, Tororo, Oyam, Dokolo, Amolatar, Kaberamaido, Iganga, Kasese, Apac and Kamuli. In Kenya, it's grown in the Nyanza province near Kisumu and Bungoma. In Tanzania, it's grown near Tabora, Kondo region and in Sukuma land.

CONDITIONS FOR GROWING OF COTTON

- Alternating wet and dry season for growing and harvesting respectively.
- Relatively flat or undulating landscape for mechanised farming.
- Warm or Hot temperatures above 20°C for ripening and harvesting of the crop.
- Fairly deep and fertile black loamy soils for the growing of the crop.
- Moderate to light rainfall of about 510mm needed during the planting season.
- Large supplies of labour for planting and picking/harvesting of the cotton.
- Large amounts fertilizers to enrich the soil with favourable nutrients.
- Proper storage facilities in form of ginneries to reduce losses due to cotton stainers.
- Adequate capital used for buying farm implements e.g. hoes and fertilizers.
- Well sheltered from strong winds by practicing agro-forestry.

Problems facing cotton farming

- Pest e.g. cotton boll weevils and cotton stainers which destroy large parts of farms leading to losses.
- Cotton diseases e.g. leaf rust also lead to poor quality output.
- Political instability especially in northern Uganda that disrupted cotton cultivation for a very long time.
- Climatic hazards like flooding due to heavy rains or hailstorms that destroy large parts of farm lands.
- Collapse of cotton ginneries and factories which reduces market for cotton.
- Inadequate storage facilities hence loss of cotton.
- Poor transport facilities linking to market centres.
- Competition with synthetic fibres like silk and polyester which reduces cotton demand.
- Inadequate labour force especially during the harvesting period.

Steps taken to solve the above problems

- ✓ Establishment of cotton ginneries to create market for cotton.
- ✓ Development of transport routes linking to market centres.
- ✓ Application of fertilizers to increase land productivity.
- ✓ Improved political stability to ensure that farmers are settled down to cultivate cotton.
- ✓ Application of irrigation farming to control weather failures e.g. prolonged drought during the planting season.
- ✓ Research to develop improved cotton varieties which give off high yields.
- ✓ Spraying to control pests and diseases.

Uses of cotton

- ❖ Used to make animal feeds e.g. cattle cake.
- ❖ Cotton seeds are used for extraction of oil for cooking.
- ❖ Used for manufacture of textiles and garments.
- ❖ Cotton wool is used for dressing wounds in hospitals.
- ❖ Cotton seeds are crushed and used to make soap.

9. **Oil palm:** This is grown extensively in Lake Victoria islands such as Kalangala and Bugala islands by the BIDCO oil company. From oil palm, edible oil is extracted and used for cooking purposes.

Conditions for oil palm growth

- Heavy and well distributed rainfall of about 2030mm per annum for proper growth.
- Constantly hot temperatures of over 20°C and plenty of sunlight for proper maturity.
- Deep and well drained alluvial soils for growing the crop.
- Cheap and abundant skilled and semi-skilled labour for growing and harvesting the crop.
- Develop quick transport network linking to processing factories.
- Relatively low altitude with warm conditions for proper growth.
- Large sums of capital for buying farm implements and fertilizers.
- Constant application of fertilizers to maintain soil fertility.
- Gently sloping landscape which favours use of machines.
- Presence of ready market which is both local and international.

Problems faced in oil palm production

- Diseases e.g. freckle and blast which lead to poor quality output.
- Climatic hazards like prolonged drought which leads to delayed growth of the crop.
- Inadequate storage facilities hence destruction of the seeds.
- Poor transport facilities linking to market centres.
- Competition with other sources of oil e.g. simsim, cotton and sun flower which reduces market for palm oil.
- Inadequate labour force especially during the harvesting period.
- Low level of technology e.g. climbing trees with pangas to harvest the crop.
- Soil exhaustion due to monoculture leading to low output.
- Fluctuation of world prices which demoralizes farmers hence loss of interest.

Effects of growing the above crops on environment

- ❖ They have led to deforestation when vegetation is cleared to create farmland which results into desertification.
- ❖ There has been displacement of people to establish big plantations leading to land disputes.

- ❖ Deforestation has hindered development of tourism by destroying habitats of wildlife which reduces government revenue.
- ❖ Deforestation has also affected the water cycle by reducing the rainfall amounts.
- ❖ Plantations have led to easy multiplication of pests which lead to poor quality output.
- ❖ Soil has been compacted together especially where machines have been used making it hard to plough such land.
- ❖ Monoculture has led to soil exhaustion hence leading to soil erosion and loss of soil fertility.
- ❖ Pesticides and insecticides have led to air pollution and some are washed down to water sources e.g. rivers hence destroying aquatic life like fish.
- ❖ There has been loss of bio-diversity by destroying habitats for bees, monkeys, birds and snakes.
- ❖ Plantations have attracted large population which has resulted into land fragmentation, high crime rates and pollution.
- ❖ There has been swamp reclamation as a result of establishing farms e.g. rice and sugarcane farms.
- ❖ Organic materials for soil formation e.g. leaves are destroyed by clearing vegetation.
- ❖ There has been destruction of the scenic beauty of the landscape by clearing vegetation.
- ❖ Wind speed increases when trees are cut leading to wind erosion and destruction of farms by strong winds.

Importances of growing the above crops to economic development

- Have led to industrial development hence diversifying the economy.
- They have provided employment opportunities hence improving peoples' standards of living.
- Government earns revenue through taxes used for developing infrastructures like roads.
- Government also earns foreign exchange through exportation of the by-products e.g. cotton lint.
- Roads have been developed which has improved on transport in the areas.
- These crops have put idle land to good use e.g. swamps and hills.
- Plantations are used for research and study purposes by students on field work.

MARKETING GARDENING

- ❖ This is the production of vegetables, fruits and flowers for sale in nearby towns and cities.
- ❖ It's mainly carried out near towns due to readily available market in towns.
- ❖ Crops grown include: tomatoes, Onions, carrots, apples, pineapples, cabbages, oranges, beans etc...
- ❖ In E.Africa, it is highly developed in Kenya and particularly in Nairobi.
- ❖ Most of the market garden centers supplying Nairobi are found in Limuru, Kiambu and Kinango plateau.
- ❖ Other areas where market gardens are found are Machakos, Baringo district, Kakamega, Eldoret, Kitale, Mombasa and around Kisumu.
- ❖ It's also important around Arusha, Moshi, Bukoba, Dodoma and Dar-es-salaam in Tanzania.
- ❖ In Uganda, it's common around Kampala in places like Mukono, Entebbe, Wakiso, Kayunga, Mpigi and also in Jinja.

Factors favouring market gardening

- ✓ Moderately cool climate for the growing of vegetables, flowers and fruits.
- ✓ Fertile and well drained soils for the growing of the crops.
- ✓ Large and ready market for the produce provided by the people in the city.
- ✓ Availability of adequate capital to invest in buying farm equipment.
- ✓ Presence of well developed transport network like airports and roads for delivering goods since they are perishables.
- ✓ Advancement in science and bio-chemical technology for better yields e.g. application of fertilizers.
- ✓ Presence of abundant skilled labour force to work on the farms.

Importance of market gardening

- Source of food to the non-agricultural urban and industrial population.
- Source of foreign exchange through crop exports to Germany, United Kingdom and France e.t.c.
- Provides employment to many people hence improving their standards of living.

- Provides flowers required for house decorations and functions e.g. Nsimbe Estates in Mpigi and Rose Bud at Entebbe.
- Source of raw materials for industries producing food stuffs, cosmetics and perfumes from aromatic herbs.
- Leads to development of infrastructures e.g. schools and roads that have led to urbanisation.
- Helps in economic diversification which ensures constant capital flow for government.
- Government earns revenue through taxes which is used for developing infrastructures like roads and hospitals.
- Leads to development of research facilities which boosts agricultural sector e.g. at Kawanda Research Station.
- Leads to development of transport routes e.g. feeder roads leading to easy movement of goods and services.

N.B. East Africa's exports are mainly dominated by agricultural commodities e.g. coffee, tea, tobacco, sugar cane, oil palm, cotton, pyrethrum, flowers and fruits.

Dangers of over depending on the exportation of agricultural products

- Agricultural products are prone to climatic hazards e.g. hailstorms and long drought cause fluctuation of products for export.
- Pests attack the crops leading to reduction in quantity for export which reduces foreign exchange earnings.
- Disease outbreaks also attack the crops leading to poor quality output which reduces market demand.
- They are perishable and therefore require air transport which is expensive to transport to foreign markets for export.
- Agricultural products are bulky and therefore difficult to handle for export.
- Price fluctuations on the world market cause unstable export earnings hence reducing government earnings.
- Agricultural products fetch low prices on the world market which discourages farmers from growing crops for export.
- Losses due to poor storage facilities which reduce on the quality and quantity for export.
- Agricultural products are seasonal and therefore can't be relied on for constant supply for export.
- Most farmers are reluctant or have inadequate capital to adopt modern agricultural methods for export production.
- Most agricultural areas are inaccessible which limits quick delivery for exportation.

Steps taken to solve the problems of over dependence on agricultural products for exportation

- ✓ Encouraging government to promote economic diversification to offer an alternative to the agro-based economy.
- ✓ Liberalisation of the economy to encourage private investment in the economy to foster economic development.
- ✓ Diversification of the export sector and encourage exportation of other commodities e.g. timber, fish and minerals.
- ✓ Developing export promotion industries to export manufactured goods with high market demand.
- ✓ Promotion of tourism as an invisible export to bring in more foreign exchange for national development.
- ✓ Promotion of exportation of services e.g. banking, transport, labour, education to widen tax base for government.
- ✓ Educating and sensitizing the masses about the dangers of over reliance on agriculture and offer alternatives for survival.
- ✓ Widening the export market base by investing in market research and creation of new trade partners.
- ✓ Reviving co-operative societies to improve on marketing of agricultural products for export.
- ✓ Encouraging scientific research to improve on the quality and quantity of agricultural exports.
- ✓ Improving handling and packaging of perishable agricultural export crops through reviving marketing boards and co-operatives.
- ✓ Using pesticides and herbicides to control pests and diseases to improve on quality and quantity of export crops.
- ✓ Exporting art and craft products to offer an alternative export item.

MINING IN EAST AFRICA

- Mining is the extraction of natural resources from the earth's crust for economic use.

Types of minerals

- **Metallic minerals:** These include iron ore, gold cobalt, copper, tin, wolfram, tungsten, zinc, manganese e.t.c.
- **Non-metallic minerals:** These include; petroleum, phosphates, soda ash, sand, clay, Gypsum, mica, water, coal, e.t.c

Factors that have favoured mining in East Africa

- Presence of a variety of mineral deposits which are exploited for over 20 years e.g. limestone in Tororo and Hima in Kasese, Diamond in Mwadui plug at Shinyanga and Soda ash from Lake Magadi.
- Availability of adequate capital for investment in mining operations mainly provided by foreign investors e.g. Tullow oil.
- Presence of abundant skilled and unskilled labour force for working in the mineral processing firms.
- Presence of ready market which is both local and international e.g. Japan, China and USA.
- Availability of well developed transport facilities linking the mineral zones to processing plants e.g. railways, roads e.t.c.
- Supportive government policy to encourage mining operations e.g. through constructing transport and communication lines.
- Availability of cheap hydro electric power and other energy sources like solar energy which is used for running machines in the sector.
- Adequate supply of food from the neighboring communities to ensure continuity of the activity.
- Most minerals in East Africa are found near the surface hence making it easy and cheap to exploit.
- Improved political stability which has attracted foreign investors to invest in mining operations.

Importance of mining

- ❖ Governments earn foreign exchange used for national development through exportation of minerals to other countries.
- ❖ Governments earn revenue by taxing the workers within the mining sector used for development of infrastructure e.g. roads.
- ❖ It has led to the development of urban centres e.g. Tororo, Kasese, Mombasa and Kakamega hence promoting regional balance.
- ❖ Creation of employment opportunities for the people which boosts their standards of living e.g. engineers.
- ❖ It leads to development of infrastructures e.g. schools and hospitals which lead to urbanisation.
- ❖ Improvement of international relationship through trade which promotes world peace e.g. between Japan and Uganda.
- ❖ Leads to diversification of the economy which increases government revenue and ensures constant capital inflow.
- ❖ It leads to development of industries that process the minerals leading to economic diversification e.g. Tororo cement industry.
- ❖ It leads to development of agriculture through provision of market for food from neighbouring communities e.g. in Kasese.
- ❖ Roads and railway lines are constructed which lead to easy movement of goods and services.

Environmental problems due to mining

- It leads to soil erosion especially in highland areas where trees are cleared leading to soil infertility.
- Mining also leads to landslides in highland regions which destroy human property and life.
- It leads to air pollution during mineral processing especially limestone e.g. at Tororo.
- Leads to deforestation especially when trees are cut to expose the minerals.
- Open cast mining leaves behind large depressions/pits which in turn become mosquito breeding grounds.
- Mining also leads to water pollution which destroys habitats for aquatic animals e.g. copper pyrites are deposited in the wetlands of Lake George and Lake Edward.

- Mining causes noise pollution because of the explosives used to break rocks e.g. stone quarrying in muyenga.
- Mining also leads to destruction of land which could have been used for agriculture e.g. by depositing rock debris after rock blasts.
- Mining also leads to swamp reclamation hence destructing the water cycle e.g. quarrying of clay and sand.
- Mining also leads to silting of river valleys which causes floods.
- It leads to destruction of natural beauty by leaving behind large pits.
- It has led to loss of property through displacement of people near mining areas.
- Mining is risky it has involved suffocation of miners underground or burying them underground.
- It has led to neglect of agriculture which leads to outbreak of famine.

METHODS OF MINING

1. **Opencast mining:** This is the cheapest method. It is employed when the minerals occur close to the surface of the earth. It involves removing off of the top soil layer lying over the mineral deposit and dumping it nearby. Opencast method is used to mine surface minerals e.g. diamond, coal, iron ore, copper and quarrying of rocks such as limestone, gravel and clay for brick making.

2. **Underground mining:** This is used when the mineral is deep underground. It involves sinking vertical shafts, into the earth's crust to reach the mineral ore.

There are four (4) major types of underground mining methods namely;

- (a) **Drift or Adit method:** This involves digging horizontal tunnels along a hill to reach the mineral. It's the method which was used to extract copper from Kileleshwe mines in Uganda.
- (b) **Shaft method:** This is used when the mineral occurs in very steeply inclined rocks. It involves sinking vertical shafts. From the vertical shafts, horizontal tunnels are dug towards the direction of the minerals. Explosives are usually used to blast the mineral bearing rock and then transported along the tunnel to the shaft by light railway or conveyor belts. It is then brought to the surface in a type of lift called a Cage which moves up and down the shaft.
- (c) **Solution method:** This is used for minerals which can dissolve in water e.g. salt, potash or sulphur. Pipes with superheated steam or water are drilled down the mineral deposit. The mineral dissolves into the water and is then pumped out to the surface. At the surface, the water is evaporated and the mineral extracted.
- (d) **Drilling method:** This is used in the exploitation of petroleum and natural gas which are found in sedimentary rocks. The deposits are reached by boring wells. The petroleum or gas is then brought to the surface either under its own pressure or by pumping. It's the method which is to be used to extract petroleum from Lake Albert basin in Uganda.

N.B. 1. Saucer placer mining method (alluvial mining) is used for minerals that occur in alluvial deposits such as gold, and tin e.g. in Karamoja, Busia and Pokot in Kenya.

2. Dredging: This is a much more advanced form of placer mining. This is applied to mine soda ash (Trona) from Lake Magadi in Kenya.

Major minerals in East Africa, mining method used and products from the minerals

Minerals.	Country.	Area mined.	Mining methods.	Products
Diamond	Tanzania	Mwadui plug	Open cast	Jewellery and strong drilling equipment
Copper	Uganda	Kilembe	Open cast	Electric cables, coins/tokens, jewellery
	Kenya	Macalda	Adit	
Gold	Tanzania	Musoma and Geita	Open cast / Adit	Jewellery
	Kenya	Kakamega	Open cast / Adit	
	Uganda	Bushenyi and Karamoja	Saucer placer and Open cast / Adit	
Soda ash (Trona)	Kenya	Lake Magadi	Dredging	Glass, soap, salt, aluminium, detergents
Lime stone	Uganda	Hima and Tororo	Open cast	Cement and lime for building
	Kenya	Bamburi and River Athi	Open cast	
	Tanzania	Tanga and Wazo hills	Open cast	
Salt	Uganda	Lake Katwe	Open cast	Salt
	Kenya	Lake Magadi	open cast	
Phosphate	Uganda	Tororo	Open cast	Fertilizers
	Tanzania	Manjingu hills	Open cast	
Flourspar	Kenya	Kakamega & Kerio valley	Open cast	Tooth paste, sulphuric acid, frying pans
Oil	Uganda	Lake Albert	Drilling	Petroleum, diesel, kerosene/paraffin and plastics

N.B. other minerals of importance in East Africa include;

- i. **Coal** for making of tar and fuel.
- ii. **Iron ore** for the manufacture of steel products e.g. iron bars, iron sheets and wire mesh.
- iii. **Cobalt** from Kasese is used in manufacture of jet engines and high speed cutting tools.
- iv. **Mica** from Machakos and Embu is used in manufacture of paints.
- v. **Gypsum** from Garissa and Malindi is used in the manufacture of chalk and cement.

Problems facing the mining sector in East Africa

- Inadequate capital for the mining process which is very expensive.
- Minerals are non-renewable resources and will get exhausted with time e.g. copper was exhausted at Kilembe.
- Poor transport networks making mineral zones very difficult to reach.
- Political instabilities especially in Uganda e.g. ADF rebels who destabilized Kasese affected investment in copper mining.
- Some minerals are expensive to exploit because they are buried deep underground e.g. gold in Bushenyi.
- Shortage of skilled man power to undertake the mining activities leading to hiring of expatriates who are very expensive.
- Inadequate market for East Africa's minerals because they are of poor quality.
- There is limited research and exploration to discover new mineral zones.

- Some minerals are available in very small quantities and therefore not economically viable e.g. gold in Karamoja.
- Most of the mining companies are owned by foreigners who normally take profits back to their home countries.
- When the minerals are exhausted, the towns which had developed turn into ghost cities with problems of unemployment e.g. Kilembe.
- Many of the towns e.g. Kakamega which grew up because of mining are faced with problems of congestion and crimes e.t.c.

Solution to the above problems

- ✓ Government should seek aid and grants from development countries to widen the capital base.
- ✓ Investments should be made in research and exploration to get new mineral zones.
- ✓ International advertisements should be done to widen market for local minerals.
- ✓ Government should improve transport facilities in the mining areas e.g. upgrading roads from murram to tarmac.
- ✓ Political instability should be encouraged to attract more foreign investors.
- ✓ The government should encourage on-site mineral processing to produce high quality products.
- ✓ New courses should be introduced at different learning institutions to produce enough skilled labour force.
- ✓ Diversification of the economy to reduce dependence on mining.
- ✓ Government should carry out market research to get new markets for East Africa's minerals.

Copper mining at Kilembe

- Copper was the major mineral mined at Kilembe. It was found together with cobalt.
- Due to sharp decrease of world prices and decrease of copper deposits, the copper mine was closed down in 1975.
- Copper was mined using the Adit method and taken to Jinja by railway for smelting.
- From there, it was exported to many countries like Japan, Britain and France.
- Electricity to process the copper was obtained from the Owen Falls Dam at Jinja and Mobuku power station on R. Mobuku.
- Water used in the mines was chiefly obtained from River Nyamwanba and River Mobuku which originate from the Rwenzori Mountain.

Benefits of copper mining to the economy of Uganda

- ✓ It stimulated the growth and development of Kilembe and Kasese towns.
- ✓ The need to exploit copper from Kilembe led to the construction of Uganda railway which today promotes transport and trade.
- ✓ The copper mine employed over 5000 workers which improved their standards of living.
- ✓ A lot of foreign exchange was earned through its exports leading to national development.
- ✓ Facilitated the development of Mobuku power station which provided electricity to the mine and parts of Kilembe and Kasese town.
- ✓ Stimulated development of agriculture for example Mobuku irrigation scheme was established to supply foodstuff to miners.
- ✓ It stimulated the development of other activities in the area e.g. fishing on Lake George which diversified the economy.
- ✓ It promoted international relationships between Uganda and Japan which boosted peaceful co-existence.

N.B. Though there is no copper production at Kilembe at this moment, in 2000 the Kasese cobalt plant was opened. It's an investment owned by Uganda, France and Australia exploiting cobalt which is got from copper pyrites at Kilembe.

DIAMOND MINING IN TANZANIA (MWADUI)

Diamonds are mined at Williamson Diamond mines at Mwadui located 27km from Shinyanga town.

Formation of diamond: The diamonds at Mwadui are found in a Kimberlite rock which was formed in an intrusive rock of Magma which solidified in a Vent or pipe to form a volcanic plug. Later, this intrusion was exposed by erosion.

Mining of diamond: Opencast method is used because the mineral bearing rock is found just below the surface of the earth. Heavy excavators scrap off the surface of the earth hence exposing the ore bearing rocks. These rocks are then loaded on to waiting trucks and then taken to the factory where the rocks are crushed to small sizes.

Processing of diamond

- From the mining zone, the ore bearing rocks are taken by trucks to the crushing plant where the rocks are crushed to small sizes and then poured on a conveyor belt which transports it to the treatment plant.
- At the treatment plant, the ore is passed through separators. The diamond and some other heavy substances because of being dense, sink to the bottom while the remaining materials float as wastes.
- For further cleaning, the diamonds are further passed over belts covered with grease to which they stick. The wastes are removed electrically.
- The diamond is then cleaned to remove all the grease and it's then ready for use e.g. making jewellery.

Factors favouring the development of diamond mining at Mwadui

- The diamonds are found near the earth surface hence cheap to exploit using open cast method.
- Diamonds at Mwadui are found in large deposits hence economic to mine.
- Mwadui diamonds are of high quality and on high demand on the international market.
- The landscape is generally flat hence easy to extract the minerals.
- Easy accessibility due to the presence of transport network by the railway and roads.
- Availability of adequate capital for investment provided by both the Williamson mining company and government.
- Nearness to agricultural land which provides foodstuffs to the workers.
- Availability of abundant skilled manpower both local and foreign expatriates to work in the mines.
- Presence of a variety of energy sources e.g. hydro electric power used in mining and processing minerals.
- Availability of modern technology used in the mining operations.
- Supportive government policy which encourages mining e.g. through investment and market research.

Importances of diamond mining at Mwadui

- ✓ The mine provides employment opportunities to many people hence improving their standards of living.
- ✓ It has led to the development of Mwadui town with accommodation, recreational and commercial facilities.
- ✓ The mining company constructed a dam which provides electricity to Shinyanga district.
- ✓ Facilitated development of infrastructures like roads, schools and hospitals which provide social services.
- ✓ The mining company trains its own labourers in mining related activities hence leading to skills acquisition.
- ✓ The mining company established reliable water supply to Mwadui town and neighbouring areas.
- ✓ Government earns revenue through taxes used for national development e.g. building roads.
- ✓ Through exports, government earns foreign exchange used for national development e.g. building hospitals.
- ✓ Facilitated development of industries which have led to economic diversification.
- ✓ Agriculture has been developed in the area due to demand from the miners.

FISHING IN EAST AFRICA

- Fishing is the extraction of aquatic life. It involves catching fish and other aquatic life like shrimps, lobsters and crabs e.t.c.

Fishing grounds in East Africa: Fishing is carried out in fresh water and marine water bodies.

- Fresh water bodies include rivers, lakes, ponds and swamps.
- Marine fishing is done in salty water grounds like the Indian Ocean and the Mangrove swamps.

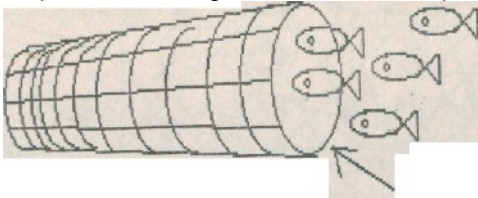
Types/species of fish caught in East Africa

- ❖ There are those that are found close to the surface (pelagic fish) of the lake or ocean. These include Tilapia, Nile perch, Dagaa, Haplochromis in fresh water and Mackerel, Sardines, Anchovy in marine fisheries.
- ❖ There are those that are found deep in the water (demersal fish) or at the bottom (crustacean fish) e.g. shrimps, crabs and lobsters in marine fisheries.

Fishing methods used in East Africa

These are either traditional or modern methods;

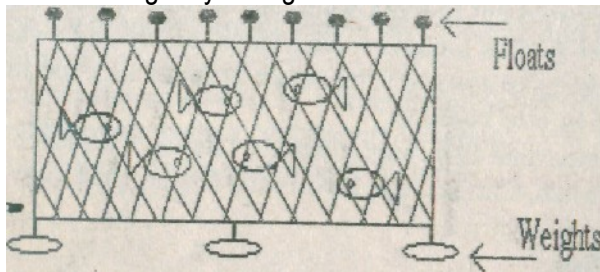
(1) **Traditional Methods** are mainly used for small scale fishing mainly for home consumption and a little surplus for sale e.g. Hooks, Basket traps, Spears, use of arrows.



E.g. **used of a basket trap:** A fisherman gets into a boat/canoe that is stationed in the water. He uses a cone shaped basket which is placed in swiftly moving water e.g. along rivers or a stream. When the fish enters the basket, its trapped and then scooped out of the water into the boat.

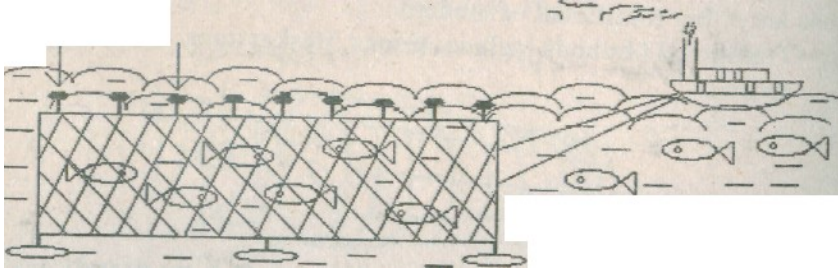
(2) **Modern Methods** are mainly used for large scale or commercial fishing.

- ❖ **Gill Netting:** This is the most used method for commercial fishing in East Africa. It involves laying a Net vertically in the water. The Net is held vertically by floats on top and weights at the bottom. The nets are left in the water for some time and when the fish try to swim through the net, they are caught by their gills and fins in the net. The Net is then pulled out of the water.

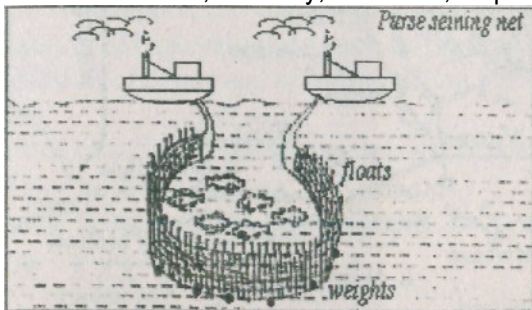


Gill netting is commonly used on Lake Victoria to catch Tilapia. It's divided into two methods which are;

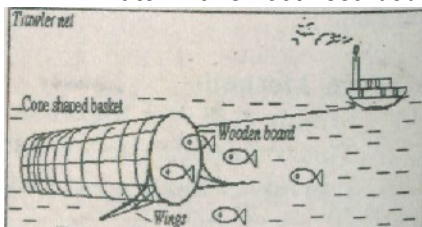
- (i) **Beach seining:** this method involves nets being operated from the shore/beach. A fisherman in a canoe/boat stretches the net into the water to encircle a shoal of fish near the shoreline. The nets have weights at the bottom and floats on top to keep them vertical in the water. The fishermen pull the net from both sides and the fish catch is poured at the beach. Used to catch tilapia, cat fish and silver fish.
- (j) **Drift netting:** This involves use of a much bigger net which is connected to a moving boat called a drifter. The net is held vertically in water by floats on top and weights down. The fish try to swim through the net and are trapped by their gills as a motor boat slowly moves the net. Used to catch anchovy and sardines on the Indian Ocean.



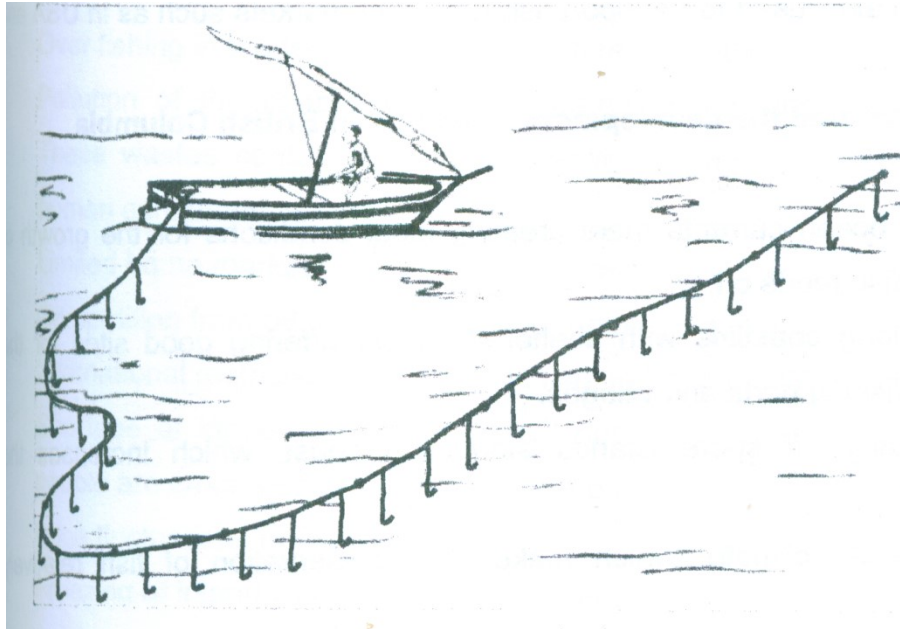
- ❖ **Purse seining net method:** this involve the use of two boats called seine boats. The net is laid out in a circle to surround a shoal of fish attracted by an echo sounder. At the bottom of the net there are rings attached through which the ropes pass. Once the Net has been laid in a circular pattern the ropes are pulled so as to close the bottom of the net to make it bag-shaped to trap all the fish it has surrounded. The Net is then drawn into a boat and the fish is removed. Used to catch sardines, anchovy, mackerel, tilapia and bagrus.



- ❖ **Trawler method:** this involves use of a trawl net dragged by a boat called a trawler. The net forms a wide cone shaped bag whose mouth is kept open by wooden otter boards. The Trawl is pulled along the sea bed by a boat and fish is trapped inside the bag along its way. The net is dragged in water with smooth sea beds. It's used to catch fish such as cod, sardines, mackerel and anchovy.



- ❖ **Long Lining:** In this method, a long rope which has floats and hundreds of baited hooks is set vertically in the water. The rope is pulled by a boat and it's sunk deep in rocky waters where the nets can be damaged. The fish is caught as it struggles to eat the bait on the hook. Fish species caught with this method include Nile perch (fresh water) and cod (marine fisheries).



- ❖ **Lampara method/ lamp attraction method:** It is where bright lights (Lamps) are used to attract fish at dark nights and then trapped. The lamp is held over a floating object e.g. a rock. Fish is attracted to the light and a scoop net is used to trap a shoal of fish. This method is used to catch small fish like Dagaa from Lake Tanganyika, haplochromis from Lake Kyoga, Silver fish from Lake Victoria and sardines in the Indian Ocean.
- ❖ **Lobster trap:** a metallic cage is put in water. Inside the cage, there is bait which attracts the fish. The fish enters the cage to eat the bait and once it enters the cage, it can't come out. The trapped fish is then removed from the cage by divers. Cages are used in rocky water to trap sea animals that near the sea bed e.g. lobsters, oysters, shrimps and crabs.

Fish preservation methods used in East Africa

Most fish caught is consumed when it is still fresh. However some preservation methods are employed that include:

- Simple/traditional methods for small scale like smoking, sun drying (most common), salting, frying and cooking.
- Modern methods for large scale companies like refrigeration (icing) and fish canning/tinning. In Uganda, such methods are applied by fish processing industries like Masese fisheries, Samaki fisheries, Ngege Uganda Ltd and Gomba fisheries. Most of the fish processing industries are developed near Lake Victoria.

Marketing of fish in East Africa

Some fish is consumed locally but some is exported to Asian and European countries e.g. Japan, China, India, Germany, Britain, France, Netherlands and Belgium.

Factors favouring development of the fishing industry in East Africa

- Availability of enough fishing grounds such as Lake Victoria, Kyoga, Tanganyika and Indian Ocean.
- Availability of high value fish species such as Tilapia and Nile perch with high market demand.
- Introduction of better and effective fishing methods such as the use of gill nets.
- Introduction of better fishing vessels such motor boats fitted with engines which are used for fishing.
- Presence of abundant plankton (food for fish) which has led to fish multiplication in large numbers.
- Improved transport network linking fishing grounds to market centers.
- Availability of ready market for fish which is both local and international e.g. fish processing industries, local people and neighbouring D.R.C.
- Indented nature of fishing grounds which are favourable for development of fish landing sites e.g. Kasenyi and Majanji on Lake Victoria.
- Introduction of fish corporations which teach better the fishermen new and modern fishing skills.
- Political stability especially along Lake Victoria which has attracted foreign investors e.g. Japanese and Indians.
- Availability of adequate capital for investment e.g. buying boats and engines.
- Supportive government policy which encourages investment in fishing activities e.g. through market research and road construction.

IMPORTANCE OF THE FISHING INDUSTRY

- ✓ Provision of employment opportunities to fishermen hence improving their standards of living.
- ✓ Source of food rich in proteins to the population.
- ✓ Source of foreign exchange through fish exports used for infrastructural development e.g. roads.
- ✓ Promotes economic diversification thereby increasing income flow and reduces dependence on agriculture.
- ✓ Facilitates development of fish processing industries which provide more jobs e.g. Masese and Gomba fisheries.
- ✓ Source of government revenue through taxation used for development of schools and hospitals.
- ✓ Stimulates development of other sectors like poultry through providing feeds e.g. silver fish (Mukene).
- ✓ Facilitates development of infrastructures such as roads, markets and training institutions which leads

to provision of social services.

- ✓ Has facilitated growth of towns leading to regional balance e.g. Dar-es-salaam, Kisumu and Bukoba.
- ✓ Promotes tourism through game fishing e.g. at Malindi.

PROBLEMS FACING FISHING IN EAST AFRICA

- Limited capital to modernize the fishing industry.
- Most of the fishing grounds like Lake Albert and Turkana are in remote areas which are inaccessible.
- Limited market for fish due to low income or cultural norms e.g. among the Bahima.
- Limited fish species of commercial value which reduces international demand.
- Over fishing and indiscriminate fishing through use of beach seining method which leads to catching of young fish.
- Excessive high temperature creates preservation difficulties.
- Political instability especially in Uganda which has scared away foreign investors.
- Threat of crocodiles especially on Lake Kyoga which scare away fishermen.
- Poor transport network linking to fishing grounds which leads to delays in delivery.
- Water hyacinth especially on Lake Victoria and Kyoga chokes fish to death.
- Competition with other fish producing countries like Norway Japan which leads to inadequate market.
- Un-desirable fishing methods like fish poisoning which causes health risks to the local people.
- Inter- territory conflict since some of the fishing grounds are found at borders e.g. Lake Albert, Lake Victoria, Tanganyika and Lake Malawi.
- Reduction of Tilapia due to presence of Nile perch which eats them away.
- Some fishing grounds are too deep and hence doesn't favour fish multiplication.
- Water pollution by industries e.g. Nile breweries which causes death of the fish.
- Post fishing losses e.g. theft of their nets and fish catch.

STEPS THAT HAVE BEEN TAKEN TO SOLVE PROBLEMS FACING FISHING

- ❖ Formation of ministry of fisheries to control fishing activities in the country.
- ❖ Formation of fishing cooperatives for advice, loans and easy marketing.
- ❖ Educating the public about the value of the fish as a source of proteins and vitamins to increase its market.
- ❖ Removal of the water hyacinth by using chemicals to provide enough oxygen for the fish.
- ❖ There is construction and rehabilitation of road networks linking to fish grounds to improve fish deliveries.
- ❖ Treatment of sewage and industrial wastes to reduce water pollution.
- ❖ Setting strict laws prohibiting illegal fishing methods like poisoning and indiscriminate nets to protect the young fish.
- ❖ Introduction of modern fish preservation methods like freezing and canning by extending power to rural areas.
- ❖ Regular police patrols to reduce theft on water bodies.
- ❖ Introduction of commercial and high value fish species e.g. Nile Perch which have large market.
- ❖ Increased importation of fishing facilities such as motor boats and motor engines to increase efficiency.
- ❖ Construction of on-site fish processing plants e.g. Masese in Jinja and at Ggaba near Kampala to prevent fish from going bad.
- ❖ Artificial rearing of fish in ponds to reduce depletion of some species e.g. at Kajjansi and Entebbe.

Effects of fishing on the environment

- Smoking of fish and construction of boats requires timber which leads to deforestation.

- Fishing exposes fishermen to Tsetse flies and Bilharzia disease.
- Smoking of fish leads to atmospheric pollution which spreads human diseases like flu.
- Fishing leads to growth of towns which leads to high crime rates, unemployment and poor sanitation.
- Fishermen are exposed to dangerous water animals e.g. crocodiles on Lake Kyoga.
- Some fish which were introduced such as the Nile perch eat away other species like Tilapia.
- Poor fishing methods like use of poison may lead to health problems for humans.
- Processing industries that are constructed near water bodies have led to pollution due to dumping of wastes in the water bodies.

FISHING IN UGANDA

In Uganda, fishing is developed on Lakes, rivers and swamps. Lake Victoria is the most important fishing ground, followed by Lake Kyoga and Albert, Edward and George. The most common fish caught are Tilapia, Nile perch and Haplochromis.

- ❖ **FISHING ON LAKE VICTORIA:** a number of fishing Villages / ports developed on the Lake including Gomba, Bukakata, Kasenyi, Luzira, Kibanga, Kasensero, Jinja, Majanji, and Masese. Major fish species caught include tilapia, Nile perch and silver fish.
- ❖ **FISHING ON LAKE KYOGA:** This is the second important fishing ground. It's too shallow. Haplochromis, Tilapia and Nile perch are the most common fish caught. Others are Mud fish and Cat fish e.t.c. The lake is characterized by floating Islands of water Hyacinth and a big number of crocodiles which limit fishing. A number of fishing villages/ports developed including Lwampanga, Kachung and Nabyeso. Salting, smoking, sun drying and freezing are used in preserving fish.
- ❖ **FISHING ON LAKE ALBERT:** This is the third most important fishing ground. Tilapia, Nile perch are the most important fish caught. Fishing villages/ports on Lake Albert are:- Butiaba, Wanseko, Biseruka, Buliisa, Buhuka, Ntoroko, Ndaiga and Panyimur. Salting and smoking are mainly used to preserve fish.
- ❖ **FISHING ON LAKE EDWARD AND GEORGE:** Fish caught include, Tilapia, Clarias, Bagrus protopterus e.t.c. They presence of salt from Lake Katwe facilitates the use of salt to preserve fish though smoking is also applied. One of the problems facing fishing here is that Lake Edward is too deep, the area is infested with Tsetse flies, remoteness, poor transport facilities and fish smuggling to Democratic Republic of Congo. Major fishing ports are Rwenshama on Lake Edward and Magyo on Lake George.
- ❖ Fishing is also carried out in swamps e.g. lung fish and mud fish got from swamps along rivers like Katonga and Kagera.

FISHING IN KENYA

- ❖ Fresh water fishing grounds in Kenya include; - Lake Victoria, Lake Baringo, Lake Turkana, River Athi, Tana and Galana, fish ponds at Nyanza, in the central and western provinces at Homa bay.
- ❖ Marine fishing grounds are centered only at the coast. These include: - Malindi fisheries, Lamu, Mombasa and the South Coast fisheries. Today, Kenya is the leading exporter of fish products in East Africa. Such products include:- Fresh or Frozen fish, Fish meal, Fish oil, Canned fish, Salted, smoked and dried fish.
- ❖ Some lakes in East Africa are too salty to contain fish. Such Lakes are barren, they include: - Magadi, Elmenteita and Natron e.t.c.

FISHING IN TANZANIA

- ❖ Fresh water (Inland fisheries) include: Lake Victoria, Lake Tanganyika, Lake Rukwa and Rivers

like Rufigi, Pangani, Malagarasi and Ruvuma. Fish caught are Tilapia, and Nile perch from Lake Victoria. Others are Bagrus, Haplochromis.

- ❖ Bukoba, Mwanza and Musoma on Lake Victoria are the major fishing ports.
- ❖ Lake Tanganyika is the second important fishing ground. Its popularity known for a small kind of fish called Dagaa which are caught by use of bright lights at night (Lampara method). The fish are attracted to fish traps by artificial light and then scooped out. Other fish caught are Bagrus and Clarias. Kigoma is the major fishing port along the lake.
- ❖ Marine fishing is confined to the coast along the Indian Ocean, Mangrove Swamps and river estuaries. A lot of marine creatures like Shrimps, Oysters, crabs, Lobsters, Sardines and Herrings are caught. However, Marine fishing is not fully developed due to inadequate capital poor fishing equipment. Important fishing ports along the coast are: Mtwara, Lindi, Tanga and Dar-es-salaam.

Uses of fish

- Provision of food rich in proteins.
- Fish bones can be used for making buttons.
- Used for making cosmetics and soap.
- Used for making animal feeds like chicken feeds.
- Fish fats can be used for making edible cooking oil.
- Fish bones and scales can be crushed to make fertilizers.
- Used in the making of drugs/medicine.
- Fish skin can be used as a leather material for making shoes, bags and belts

TRANSPORT AND TRADE IN EAST AFRICA

- ❖ Transport is the movement of people and goods and services from one place to another.
- ❖ There are four types of transport systems in East Africa.
 - Land transport where people use; roads, railways, human portorage & animals.
 - Air transport
 - Water transport
 - Pipeline transport

1. RAILWAY TRANSPORT

- This is mainly developed for the purpose of transporting bulky commodities. In east Africa, there are 3 major railway lines;

- i) Kenya-Uganda railway
- ii) Tanzam-Tazara railway.
- iii) Central Tanzania railway (Dar-es-salaam-Kigoma railway)

ADVANTAGES

- ✓ It's cheaper compared to road transport.
- ✓ Cheapest means to transport bulky commodities over long distances.
- ✓ It's not affected by traffic congestion.
- ✓ It's very convenient since it has specific time schedules.

DISADVANTAGES

- It's generally slow compared to air and road transport.

- Rails are expensive to build and maintain.
- It's not flexible because it cannot be used where rails don't exist.
- Rails are almost restricted to generally flat land surfaces.

ROLE OF RAILWAY TRANSPORT TO ECONOMIC DEVELOPMENT OF EAST AFRICA

- ❖ Promotes cross border trade between the East African countries hence increasing revenue.
- ❖ Promotes regional co-operation amongst the East African countries which promotes peace.
- ❖ Provides government with revenue through custom duties for national development.
- ❖ Provides employment opportunities e.g. engineers, police officials hence improved standards of living.
- ❖ Promotes industrial growth through the distribution of industrial goods to market centers.
- ❖ Promotes agriculture through linking farms to market centres.
- ❖ Open up remote areas for development leading to regional balance e.g. southern Tanzania.
- ❖ Facilitates movement of labour force through passenger transportation.

N.B. railway transport has greatly declined in Uganda due to vandalisation/theft of rails especially the route from Kampala to Kasese.

2. ROAD TRANSPORT

- It's the most common means of transport.

ADVANTAGES

- ✓ It's the most flexible means i.e. can connect to all areas and offers a wide range of alternatives e.g. bicycles, cars, Lorries e.t.c.
- ✓ It's faster than railway transport.
- ✓ It's the best to transport bulky commodities over short distances.
- ✓ Roads are cheaper to construct than airports and railways.

DISADVANTAGES

- Relief features like hills and swamps make road construction very difficult.
- Traffic congestion is very common on roads leading to delays.
- Accidents are more common on roads than any other means of transport leading to loss of lives.
- Poor road surfaces due to poor workmanship is the major problem faced by roads.
- The roads require constant maintenance which is expensive.
- It is affected by insecurity in terms of highway robbers leading to losses.
- Dry weather roads are affected by heavy rainfall making them impassable.

Role of road transport to economic development

- ❖ It has helped in development of fishing by linking landing sites to market centers.
- ❖ Promotes agriculture by linking rural areas to urban markets.
- ❖ Promotes cross border trade between the East African countries hence increasing revenue.
- ❖ Promotes regional co-operation amongst the East African countries which promotes peace.
- ❖ Provides government with revenue through custom duties, road licenses and driving permits for national development.
- ❖ Provides employment opportunities e.g. engineers, police officials hence improved standards of living.
- ❖ Promotes industrial growth through the distribution of industrial goods to market centers and transportation of raw materials.
- ❖ Promotes tourism by connecting to all tourist sites in the remote areas.
- ❖ Facilitates easy exchange of ideas necessary for national development.
- ❖ Helps to diversify the economy by promoting several activities e.g. lumbering and fishing which ensures high capital inflow.

- ❖ Promotes linear settlement pattern along roads which leads to urbanisation and its advantages e.g. setting up of schools.

3. AIR TRANSPORT

- Most important airports in East Africa are;
 - Entebbe international airport in Uganda.
 - Jomo Kenyatta/Embakasi in Nairobi and Mombasa airport in Kenya.
 - Dar-es-salaam, Arusha and Moshi in Tanzania.

N.B. Jomo Kenyatta/Embakasi airport in Nairobi is the most important and has got the most connections and busiest schedules in East Africa.

ADVANTAGES

- ✓ It's the fastest over long distances especially across borders.
- ✓ It's very comfortable and less tire some.
- ✓ It's suitable for carrying high value commodities e.g. drugs, army weapons, computers and optical items e.g. watches.
- ✓ It's the best for transporting perishable goods/commodities e.g. flowers, fish and vegetables.
- ✓ It's not affected by traffic congestion.
- ✓ It's always on strict time schedule hence reducing delays.
- ✓ Doesn't require construction of the path ways/routes for aero planes.

DISADVANTAGES

- It's the most expensive.
- In case of an accident, chances of survival are very minimal.
- It's not flexible because it's not readily available in all areas.
- It's not effective in transporting bulky goods/ commodities.
- It's affected by poor weather e.g. fog leading to accidents.

ROLE OF AIR TRANSPORT IN ECONOMIC DEVELOPMENT

- ❖ It helps to promote tourism by transporting foreign tourists.
- ❖ It promotes international relationships which ensures world peace.
- ❖ It promotes international trade which increases government revenue for national development.
- ❖ Through international trade, it helps to promote agriculture which is the major activity in East Africa.

4. WATER TRANSPORT

- This is the cheapest means of transport. It takes place on inland lakes and rivers and on the Indian Ocean.

N.B: River Nile is not used for water transport in Uganda because it's not navigable due to many waterfalls and rapids e.g. Bujagali, Owen falls, Rippon falls and Karuma falls.

N.B: A number of ports have been developed on major water bodies to ease water transport e.g. of inland ports include;

- Lake Victoria has got several ports which include: Musoma, Kisumu, Port bell (Luzira), Mwanza, Bukoba, Majanji and Kasensero.
- Lake Albert has got: Butiaba, Wanseko, Buliisa, Ndaiga, Panyimur and Ntoroko.
- Lake Edward has got Rwenshama.
- Lake Kyoga has got Kachung, Lwampanga and Nabyeso.
- Lake George has got Magyo.
- Lake Tanganyika has got Kigoma.
- Coastal Ports include: Mombasa, Dar-es-salaam, Tanga, Malindi, Lamu, Mtwara and Lindi.

ADVANTAGES OF WATER TRANSPORT

- ✓ It's the cheapest.
- ✓ It's not affected by traffic congestion.
- ✓ Water ways are naturally available hence saving costs of construction.
- ✓ It can be used to transport bulky commodities e.g. timber.
- ✓ It connects distant areas e.g. islands.

DISADVANTAGES

- It's only restricted to areas with only lakes and rivers i.e. not flexible.
- Accidents in water due to strong waves and poor visibility claim many lives.
- The water hyacinth and papyrus hinder navigation.
- Some rivers are seasonal and can't be used during the dry period e.g. river Mayanja.
- Water transport is very slow compared to road transport.
- Many rivers are not navigable because of waterfalls and rapids e.g. river Nile.

Role of water transport in economic development

- ❖ Promotes fishing due to easy movement on water bodies.
- ❖ Promotes agriculture by linking agricultural islands to market areas e.g. Kalangala.
- ❖ Promotes lumbering by helping in the distribution of timber products.
- ❖ Promotes cross border trade between the East African countries hence increasing revenue.
- ❖ Promotes regional co-operation amongst the East African countries which promotes peace.
- ❖ Provides government with revenue through custom duties for national development.
- ❖ Provides employment opportunities e.g. engineers, patrol officials hence improved standards of living.
- ❖ Promotes industrial growth through the distribution of industrial goods to international market centers.
- ❖ Promotes tourism by connecting to all tourist sites in the island areas e.g. Kalangala.

5. PIPELINE TRANSPORT

- This involves the transportation of gases, water and oil using pipes. It is highly used in urban centres for transporting domestics and industrial water through pipes e.g. water used in Kampala is mostly transported by pipelines from Ggaba on the shores of Lake Victoria.
- Pipelines are also used in transporting oil (petroleum) from Mombasa to Eldoret via Nairobi.
- Another pipeline was constructed from Dar-es-salaam to Kapiri-Mposhi in the Zambia copper belt to transport oil.

Advantages of pipeline transport

- ✓ It is a cheaper means of transporting liquids and gasses.
- ✓ It can be used to transport large volume of liquids and gasses at a single time.
- ✓ It is more reliable since it can even be used in politically unstable regions.
- ✓ It does not pollute the environment unlike roads and railways.

FACTORS INFLUENCING THE DISTRIBUTION OF MAJOR TRANSPORT NETWORKS IN EAST AFRICA

- Government policy whereby it can be for political or economic reasons. Areas that are economically viable will encourage government to construct roads and railways to exploit the resources.
- Regions with abundant economic potential e.g. mining centers tend to have more roads and railway lines compared to unproductive areas.
- Areas which are urbanized and are densely populated always have more transport routes than sparsely populated areas.

- Climate whereby areas with heavy rainfall tend to have better roads since they are affected by floods than in areas with dry conditions. However, areas which receive heavy rainfall will also make road construction very difficult due to soft ground.
- Relief whereby steep areas make road and railway construction very difficult compared to low lands and flat areas which make road construction very easy.
- Drainage whereby areas with poor drainage e.g. swamps are avoided during road construction while well drained areas e.g. gentle slopes make it easy for road and railway construction.
- Areas with dense vegetation cover e.g. tropical rain forests will discourage road and railway construction while areas with savannah vegetation will attract road and railway construction. However government will always construct roads leading to forests so as to develop lumbering activities.
- Areas with water bodies like lakes and rivers will discourage road construction but instead lead to development of water transport.
- Flat areas also attract construction of airports compared to hilly areas which discourage construction of airports and airfields.
- Areas with fertile soils will attract large population which leads to construction of roads and railways unlike areas with infertile soils.
- Areas with tourist attractions will attract roads and airfields to ease movement of tourists unlike areas without major tourist attractions.
- Availability of capital: where there is enough capital for construction of transport means, government will always develop them than when there is inadequate capital for road construction.

Effects of transport on the environment

- Pollution from vehicles emitting fumes and oil spills from ships into water bodies.
- Smoke and smog have caused poor visibility.
- Creation of barren lands where rocks have been excavated e.g. along river channels.
- Increased temperatures/Global warming due to gas emissions.
- Loss of bio-diversity i.e. migration of water animals and bird species due to pollution.
- Destruction of forests and swamp reclamation to create land for roads and railways.
- Displacement of many people due to the need to expand roads and railway lines.
- Encroachment on land for other land uses like fishing, forestry and agriculture.
- Destruction of scenic beauty of landscape by removing vegetation and rocks.
- Land degradation e.g. through stone quarrying which leaves behind pits that are breeding grounds for mosquitoes.

Problems facing the transport sector in East Africa

- Inadequate capital to establish and improve the transport and communication networks.
- Inadequate skilled manpower to help in the construction of transport and communication networks.
- Low levels of technology used to construct transport and communication lines.
- Steep relief in mountainous regions which makes it expensive to construct roads and railways.
- Physical barriers e.g. rivers, forests and deserts make the construction of transport lines very difficult.
- Harsh climatic conditions e.g. heavy rains lead to floods hence making roads impassable while mist and fog hinder air and water transport.
- Political instability e.g. wars make road construction very difficult and also during the wars, roads and railway lines are destroyed.

- Corruption and embezzlement of funds by ministry of transport and communication officials hence leading to poor roads.
- Poor government policies whereby roads, waterways and airfields are only constructed in areas where prominent politicians come from and other areas are neglected.
- Differences in political ideology whereby countries impose strict restrictions and deny easy access to sea ports by land locked countries e.g. Uganda.
- Areas with clay soils have made road construction very difficult and expensive.
- It's very expensive to compensate people incase their land is to be taken by government to expand existing roads.

Solutions to the above problems

- ❖ Securing loans and grants from World Bank and developed countries to provide more capital for investment in transport development.
- ❖ Hiring expatriates who can construct modern and better roads and railways.
- ❖ Encourage training of local personnel to ensure enough skilled labour.
- ❖ Importation of modern tools and technology for constructing of modern roads and railways.
- ❖ Construction of tunnels and use of cable cars to be used in areas with steep relief.
- ❖ Flushing out rebels and strengthening security to create peace which attracts investment in the transport sector.
- ❖ Fighting corruption by strengthening government organs e.g. police, parliament and Inspector General of Government (I.G.G).
- ❖ Ensuring balanced regional development and encourage equal resource exploitation for national development.
- ❖ Formation of regional blocks e.g. East African Community (E.A.C) to remove borders restrictions.

TRADE IN EAST AFRICA

- ❖ Trade is defined as the buying and selling of goods.

Characteristics of trade within East Africa

- There has always been a considerable amount of trade between the East African countries.
- They have supplied each other with goods, which they cannot themselves produce.
- Until recently, Kenya was the largest supplier since it had developed many industries in Nairobi, Nakuru and Mombasa.
- Kenya supplied Uganda and Tanzania a lot of manufactured goods and chemicals.
- In return, she imported food especially maize and Tobacco from Uganda and food, oils and manufactured goods from Tanzania.
- Kenya also imports electricity from the Nalubale power station formerly Owen falls dam power station but this is likely to decrease once Kenya expands her own power station at Seven forks dam on river Tana.
- The quantity of goods Kenya imports from Uganda and Tanzania are less than what it exports to the two countries.
- This has forced Uganda and Tanzania to put in place tariff barriers on many imported goods from Kenya, so that their own young industries can develop.
- Today these countries can export manufactured goods to Kenya as well.

The main export commodities of the East African countries

1. **KENYA:** The main export Commodities from Kenya are coffee, tea, pyrethrum, maize, hides and skins ,wattle, soda ash, sisal, cement, vegetables, cotton and fuel. Most of the agricultural produce of the country are exported. The fuels exported are the refined petroleum products like petrol, diesel, paraffin

which are re-exported from the refinery at Mombasa.

2. **TANZANIA:** Tanzania's exports include: Coffee, cotton, diamond, sisal, cloves, Cashew nuts, Tea, Tobacco, Pyrethrum, Copper, hides and skins, meat and fuel from the refinery at Dar-es-salaam.
3. **UGANDA:** Uganda's exports include: coffee, Cotton, Cobalt, Gold, Tobacco, Sugar, Hides and skins, vegetables and animal feeds.

N.B:

- Agricultural produce constitutes a big percentage of total exports while manufactured goods, machinery, fuels, chemicals, crude materials like oil for processing constitute the biggest percentage of the imports into the region.
- Such a trend implies a low level of industrialisation and agricultural dependence.

Steps taken to encourage export trade and reduce import trade

- ✓ The three countries are building manufacturing industries (export promotion industries) to enable them stop importing manufactured goods.
- ✓ Heavy duties (taxes) are levied on imported manufactured goods to discourage their demand on the local market as well as protect the local infant industries.
- ✓ Foreign investors are attracted to set up big industries in the region by giving them tax holidays.
- ✓ Tax holidays are also given to infant industries to enable them to start producing goods locally.
- ✓ Formation of regional blocks e.g. East African Community (E.A.C) to encourage cross-border trade without many restrictions.
- ✓ Carrying out extensive market research to diversify the markets and create more demand abroad for locally made items.
- ✓ Increased advertisements through international media to create awareness about East Africa's products which increases demand.
- ✓ Ensuring political stability which has attracted more foreign investors to set up industries in East Africa.
- ✓ Encouraging economic diversification by government to reduce dependence on agriculture and encourage industrial development.

N.B: the three countries are trying their best to develop both visible trade and invisible trade.

- Visible trade is the trade in imports and exports of tangible products like agricultural and manufactured goods.
- Invisible trade refers to the trade in services such as tourism, health, labour and education.

Benefits of trade in East Africa

- ❖ Trade has stimulated the growth of industries which lead to economic diversification.
- ❖ It leads to development of transport facilities, financial institutions like banks and insurance companies which lead to urbanisation.
- ❖ Agriculture has been largely modernized which has ensured increased supply of food.
- ❖ Trade has led to regional co-operation which has boosted peace in the region.
- ❖ Government earns revenue through taxes and tariffs across borders which it uses for national development.
- ❖ Trade has encouraged full resource utilisation which has ensured constant capital inflow.
- ❖ Ideas have been exchanged through trade relationships which has boosted national development.
- ❖ Government is able to earn foreign exchange through export trade which is used for developing infrastructures e.g. roads.
- ❖ It has encouraged exploitation of natural resources even in remote areas which also leads to regional balance.
- ❖ Through international trade, East Africa is able to acquire commodities that it doesn't produce e.g. drugs, cars and computers.

- ❖ Expatriates are hired from developed who trained local people hence leading to skill acquisition by the locals.
- ❖ Employment opportunities have been created through trade leading to improved standards of living.

Factors that encourage inter-state trade/international trade in East Africa

- Differences in natural endowments especially raw materials e.g. Uganda has more agricultural raw materials but less high value minerals.
- Specialisation also leads to inter-state trade e.g. Uganda has specialised in agricultural exports while Kenya produces more manufactured goods.
- Differences in levels of development e.g. Kenya has a highly developed industrial sector than Uganda and Tanzania.
- Presence of developed means of transport e.g. roads and railways which help to promote cross-border trade.
- Outbreak of political unrest in one country reduces her level of production hence leading to international trade e.g. Uganda.
- Formation of the East African Community which encourages peaceful trade relationships among the member countries.
- Outbreak of natural disasters in one country can also lead to international trade to get essential goods like basins, mattresses and blankets e.g. Bududa landslides.
- Differences in climate also lead to inter-state to get food e.g. Uganda provides a lot of maize to Kenya.
- The need to earn government revenue through customs duty and trade licenses also leads to inter-state trade.
- The need to dispose of surplus produce also leads to inter-state trade in a bid to create market for the produced items.

INDUSTRIALISATION IN EAST AFRICA

- ❖ Industrialisation is a process through which countries increasingly become involved in the production of manufactured goods.
- ❖ Manufacturing is the processing and changing of raw materials into a new product.
There are three types of industries in East Africa:
- **Primary industries:** These are also called extractive industries. They include: Quarrying, Fishing, Lumbering, Mining, Agriculture e.t.c. They are the most dominant industries in East Africa. They mainly provide raw materials.
- **Secondary industries:** These are industries that turn raw materials into consumer or finished goods. They include: sawmilling, textiles, Steel rolling mills, chemical industries e.t.c.
- **Tertiary industries:** These are industries involved in providing services. These include: Transport and communication, Health, Education, Banking, Insurance and Tourism.

NB: Most of industries in East Africa are located in towns or cities.

- A site of a town is the land on which a town stands.
- The situation of a town or city shows its wider position and links with other places.

Industrial cities in East Africa

Industrial Town		Industries
1.	Kampala	Grain milling, breweries, beverages, steel rolling, cigarette making, fish processing, textile, motor engineering, plastics, printing and publishing, chemical industries and pharmaceutical.
2	Jinja	Grain milling, textile, motor engineering, printing and publishing, food processing, soft drinks and beverages, breweries, paper making, sugar refining and fish processing.
3.	Mukono	Breweries, fish processing, Printing and publishing, tea processing, saw milling and food processing.
4.	Mbale	Beverages, pulp and paper, printing and publishing, leather tanning, coffee processing, confectionaries.
5.	Nairobi	Pharmaceuticals, car assembly, chemicals and plastics, foot wear, cigarette making, breweries, food processing, grain milling, printing and publishing and grain milling.
6.	Mombasa	Cement factory (Bamburi), car assembly, oil refining, ship building and repair, food processing, soft drinks and beverages.
7.	Dar-es-salaam	Printing and publishing, ship building and repair, oil refining, grain milling, soft drinks and beverages, food processing and motor engineering.
8.	Port Mtwara	Chemical industries, salt works, saw milling, ship repairs, food processing and printing and publishing.
9.	Kisumu	Cement making, textiles, food processing, motor engineering and printing and publishing.
10.	Kasese	Chemical industries, cement making, food processing, lime works and mattress manufacture.

N.B. other industrial towns in East Africa are: Arusha, Nakuru, Thika, Moshi, Mbeya, Tabora, Mwanza, Kigoma, Mbarara, Tororo, Tanga and Eldoret.

Factors/conditions that have influenced the development of industries in East Africa

- ✓ Presence of abundant supply of power for running machines e.g. thermal, solar and Hydro electricity.
- ✓ Presence of a variety of agricultural and mineral raw materials for processing into finished products e.g. limestone and coffee.
- ✓ Presence of enough skilled and unskilled labour force to work in the industries e.g. engineers.
- ✓ Efficient transport network by road, rail and water for transporting raw materials to industries and manufactured goods to markets.
- ✓ Availability of ready market for the manufactured goods which is both local and international e.g. Southern Sudan.
- ✓ Availability of abundant water used as a raw material or for washing and cooling machines e.g. in breweries and soft drinks factories.
- ✓ Industrial inertia where industries are concentrated in areas where others exist so as to share mechanics, roads, security and electricity.
- ✓ Supportive government policy that encourages investment in industries e.g. allocating certain areas for industrial development e.g. at Namanve.
- ✓ Wide publicity due to effective advertisement for industrial products which has created high demand e.g. through television and radio adverts.

- ✓ Availability of modern technology used in the manufacturing industries e.g. use of computers.
- ✓ Availability of adequate capital to invest in industrial development from local and international sources.
- ✓ Improved political stability which has attracted foreign investors to set up industries in East Africa.
- ✓ Presence of adequate and extensively flat land for industrial establishment e.g. at Namanve, Kyambogo and Nakawa.

Benefits of industrial development

- Created employment opportunities to workers hence improving their standards of living e.g. engineers.
- Provided cheap manufactured goods which are essential to the people e.g. furniture, cement and plastics.
- Industries are a source of government revenue through taxation used for development of infrastructures e.g. roads.
- Industrial goods are exported to earn government foreign exchange used for national development e.g. setting up hospitals.
- Facilitates development of infrastructures like roads, schools and hospitals which provide social services to the people e.g. education and health.
- Industries lead to economic diversification for an increased income in flow for government and reduces dependence on agriculture.
- Industries lead to exploitation of natural resources like agriculture and minerals which leads to self sufficiency.
- Industries promote international relationship between East Africa and her trade partners which promotes world peace.
- Infrastructures developed in industrial cities have led to growth of urban centers e.g. Kampala, Nairobi and Dar-es-salaam.
- Industries have stimulated agricultural development by providing market for farm raw materials e.g. milk, wheat, cotton and tea.
- Industries are used as research and study centers for students on field work which widens the scope of knowledge.
- People have acquired skills through job training in industries which they use for survival e.g. operating machines.

Limitations to industrial development in East Africa

- ❖ Low market for domestic industrial goods due to competition with high quality and low priced goods from developed countries like Britain, Japan and U.S.A.
- ❖ Inadequate capital for investment in establishing and managing industries.
- ❖ Shortage of skilled labour force to work in industries like Technicians and Engineers.
- ❖ Political instabilities especially in Uganda which led to closure of some industries e.g. Gulu foam for making mattresses.
- ❖ Poor transport facilities which hinder quick transportation of raw materials and manufactured goods.
- ❖ Irregular electricity supply to run industries due to frequent load shedding which brings activities to a standstill.
- ❖ Unfavourable government policies which discourage industrial development e.g. heavy taxes imposed on industries.
- ❖ East Africa lacks some raw materials for heavy industries which leads to dependence on

importation e.g. iron ore and petroleum.

- ❖ Most industries are owned by foreigners who don't re-invest their profits within East Africa leading to slow growth of industries.

Solutions to the above problems

- Government should seek aid and grants from development countries to widen the capital base for industrial development.
- Investments should be made in research and exploration to get new sources of raw materials.
- International advertisements should be done to widen market for locally manufactured goods.
- Government should improve transport facilities in the industrial areas to ensure high output e.g. upgrading roads from murrum to tarmac.
- Enforcing security to ensure political stability which attracts more foreign investors.
- The government should encourage research to produce high quality products that have market demand.
- New courses should be introduced at different learning institutions to produce enough skilled labour force to work in industries.
- Diversification of the economy to reduce dependence on manufacturing industries e.g. tourism.
- Government should carry out extensive market research to get new markets for East Africa manufactured products.

Effects of industrial development on environment in East Africa

- Atmospheric pollution through industrial fumes and dust especially by the cigarette making, cement making and textile industries.
- Noise pollution by industrial machines.
- Water pollution through disposal of industrial wastes in water bodies e.g. Lake Victoria.
- Encroachment on swamps which distorts the water cycle because swamps help in filtering water.
- Clearing of forests like at Namanve and Mabira for industrial space which leads to desertification.
- Destruction of habitat for wild animals and birds through deforestation and swamp reclamation.
- Led to increase in value of land which has limited land for expansion of settlements.
- Development of slums with their associated evils like prostitution e.g. in Kibera near Nairobi and Katwe near Kampala.
- Construction of many buildings and tarmac roads has led to increase in world temperatures which leads to global warming.
- They have promoted rural-urban migration which has reduced food production in villages leading to food insecurity.
- Industrial fumes have led to formation of acid rains near towns which don't support crop growing.
- Through deforestation, rainfall totals have greatly reduced which has led to long dry spells and drought.

CHARACTERISTICS OF INDUSTRIES IN EAST AFRICA

- They mainly use Hydro Electric Power as the source of energy.
- They are mainly set up near the power source e.g. Jinja, Kampala and Nairobi.
- They are mainly owned by foreigners e.g. Madhvani industries.
- Most industries are labour intensive i.e. use more of human labour force than machines.
- They produce low quality goods which are less demanded internationally.
- They are on small scale because of low market base.
- They use out-dated machinery which leads to poor quality products.
- Most industries are extractive (primary) and hence produce raw materials.
- They mainly produce for the local market and very little is exported.

ENERGY IN EAST AFRICA

- ❖ Energy can be defined as the power used to drive machines. It can be classified into two;
 - (a) **Renewable sources of energy:** This is the source of energy which can be tapped at any time without reducing the amount available for future use. It includes: Hydro electricity, Solar, Biogas and wind energy.
 - (b) **Non Renewable sources of energy:** These are sources of energy which can be used up. They include: Natural gas, Petroleum, Coal and Uranium.

Production of Hydro electricity power

- This is the most used source of energy in East Africa especially for large-scale industries.
- It's also used in lighting houses and for communication.
- It is generated through construction of dams along a waterfall on a river e.g. Owen falls dam and Bujagali dams on river Nile (Uganda), seven folks dam on river Tana (Kenya) and Hale power project on river Pangani (Tanzania).

Factors favoring construction of Hydro electricity dams

- Constant supply of water from a river used for running the turbines.
 - A steep gradient along the river with a waterfall and rapid running water for the establishment of the dam.
 - Presence of strong and hard basement rocks for supporting the dam.
 - Presence of a narrow gorge through which a river flows to increase the speed of water.
 - Large amounts of capital for investment in dam construction e.g. buying turbines.
 - Availability of enough skilled labour force to construct the dam.
 - Plenty of building materials like cement, sand and hardcore stones used for constructing the dam.
 - Enough land which should be flat enough to allow the flooding of the river after the dam has been constructed.
- Ready market for the electricity to be produced both local and international e.g. homes and industries.
 - Supportive government policy of investing in dam construction to ensure supply of electricity.
 - Presence of advanced technology used in the construction of the dam e.g. use of excavators.
 - Efficient transport network by railway to transport machinery and other raw materials used in dam construction.

Importance of dam construction

- ✓ Generation of Hydro electricity for domestic and industrial use.
- ✓ Water reservoir that is created behind the dam provides water for irrigation purposes.
- ✓ Creates employment opportunities to engineers and technicians hence improved standards of living.
- ✓ Helps to control river flooding and its effects like destruction of property e.g. along River Tana and River Nile.
- ✓ Stimulates the growth of towns due to establishment of industries.
- ✓ Creates a fishing ground along the reservoir behind the dam which provides food.
- ✓ Dams are tourist attractions which promotes tourism hence earning government a lot of foreign exchange.
- ✓ Dams are used for study purposes e.g. geography students and engineering studies which expands knowledge.

Effects of dam construction

- Destruction of natural beauty of the landscape e.g. waterfalls.
- Flooding of the area behind the dam during the construction process.

- Outbreak of water borne diseases like bilharzia due to the water reservoir behind the dam.
- Many workers usually drown along the river during the process of dam construction.
- Interference with aquatic life when water is blocked which reduces fish multiplication.
- Deforestation is carried out to get timber used during the process of dam construction.
- Industrial cities that grow near dams are faced with pollution and congestion.

Advantages of Hydro electricity

- It is a renewable source of energy and can be used for a very long time.
- It doesn't pollute the environment.
- Can be put to several uses e.g. lighting, running machines and communications.
- Easy to control and use through switches.

Disadvantages

- It's very dangerous when mishandled and leads to deaths through electric shock.
- It is expensive to use in terms of electricity bills.
- It's expensive to transmit through long distances.
- It needs constant maintenance and repairs e.g. replacing rotten poles and old transformers.
- Requires highly skilled manpower to maintain and do repairs.
- Leads to destruction of property in case higher voltage is transmitted.

- Other falls in Uganda which can be used to generate Hydro electricity are: Sipi falls on River Sipi on Mt. Elgon and Kabalega falls on Victoria Nile.
- The Seven Forks H.E.P Project in Kenya is located along River Tana with a number of dams which include: Masinga, Kamburu, Kindaruma and Gitaru.
- Other dams producing electricity in Tanzania are Wami II dam and Wami I dam on river Wami and Mtonga dam on River Ruvuma.

URBANISATION IN EAST AFRICA

- ❖ About 30% of East Africa's population lives in urban centers.
- ❖ The rapid growth and development of these ports and towns in the recent years has been as a result of rural-urban migrations where capital cities have become primary destinations for majority migrants.
- ❖ The major urban centers in East Africa are Kampala, Nairobi and Dodoma which are capital cities.
- ❖ Port cities that have developed into urban centers are Kisumu, Mwanza, Bukoba, Musoma, Jinja, Mombasa, Dar-es-salaam, Kigoma, Tanga and Mtwara.
- ❖ Other urban centers in East Africa include: in Uganda there is Mbale, Kasese, Mbarara, Tororo, Gulu, Soroti, Lira, Masaka, in Kenya there is Thika, Eldoret, Nakuru, Kitale, and in Tanzania there is Mbeya, Songea, Tabora, Shinyanga, Makumbako, Kilosa, Ifakara, Arusha and Moshi.

Factors that have favoured the development of urban centers in East Africa

- The abundant supply of clean and fresh water for domestic and industrial use e.g. Kampala, Nairobi and Mbale.
- Availability of large tracts and vast land for the establishment of the urban center.
- Relatively flat and gently sloping land for establishment of the urban center e.g. Kampala and Nairobi.
- Historical factor whereby most towns developed as a result of early contacts with colonialists and Arabs for trade e.g. Mombasa, Nairobi and Kampala.
- Presence of a rich and productive agricultural hinterland for industrial development e.g. Mbale, Soroti, Nairobi and Kampala.
- Supportive government policy for developing the urban center e.g. in Tanzania, the capital city was transferred to

Dodoma from Dar-es-salaam.

- The presence of many industries which provide jobs that have attracted many people into the cities e.g. Jinja, Nairobi, Mombasa and Kampala.
- Cool and conducive climate which is favourable for human survival e.g. Nairobi, Mbale and Kampala.
- Presence of improved and better security which attracts large population e.g. Nairobi, Kampala, Gulu and Mbale.
- Presence of well developed and modern transport network which eases movement of goods and services e.g. roads and railways.
- The large population size has provided cheap labour and large market hence boosting industrialisation.
- Availability of large sums of capital for investment e.g. buying land and putting up infrastructure e.g. roads.
- Constant supply of cheap and abundant power for use in the urban centers e.g. in industries and homes.
- Presence of a variety of better amenities which attract large population size e.g. schools, hospital, theaters and tall buildings.
- Central location which makes the towns accessible from all parts of the country e.g. Kampala, Nairobi and Dodoma.

Functions of urban centers

- ✓ They serve as administrative centers e.g. with government offices like Parliament, Ministries and Non Governmental Organisations.
- ✓ They provide educational services to people e.g. in schools, universities and colleges.
- ✓ They provide recreational and leisure services to people e.g. in theaters, cinemas, stadiums and concert halls.
- ✓ They serve as tourist centers which earn government foreign exchange e.g. Kasubi tombs in Kampala and Fort Jesus at Mombasa.
- ✓ They serve as commercial and trading centers with many businesses e.g. in shopping malls, supermarkets and forex bureaus.
- ✓ They provide residential services to the people for accommodation e.g. in the tall buildings found in these towns.
- ✓ They are industrial centers which provide jobs to the people e.g. Dar-es-salaam, Kampala, Mombasa, Nairobi and Jinja.
- ✓ They provide financial and banking services which boost trade e.g. credit micro-finance institutions, central banks and ware houses.
- ✓ They provide transport service by having major transport terminals e.g. railway and road terminals in Kampala, Nairobi and Dodoma.

Effects of urbanisation on the environment

- Destruction of vegetation due to increased competition for land for industrial development and settlement.
- Loss of vegetation cover has accelerated soil erosion and siltation of water bodies.
- Loss of vegetation has led to changes in micro climate e.g. reduced rainfall totals.
- Loss of vegetation cover has also increased flooding e.g. in Kampala.
- Loss of habitats for wildlife e.g. crested cranes, snakes and birds due to destruction of vegetation.
- Loss of bio-diversity e.g. death of wild animals like frogs through destruction of swamps and forests.
- Water table is lowered due to loss of vegetation leading to water crisis.
- Increased human settlement has brought about increased waste which leads to poor sanitation and easy spread of diseases.
- Domestic and industrial wastes have led to increased air, water and land pollution.
- Swamp reclamation due to shortage of land for settlement and industrial development e.g. Kampala.
- Increased demand for building materials has led to destruction of vegetation and environmental degradation e.g. blasting of rocks.

- Concentration of buildings and concrete surfaces has led to increased heat hence global warming.
- Presence of too much dust and smoke in urban centers increase the formation of acid rains which don't support farming.
- Creation of green belts has created good scenic beauty of the environment e.g. constitutional square in Kampala.
- Quarrying for sands and concrete rocks creates pits and depressions which act as breeding grounds for mosquitoes and snails.
- Noise pollution from vehicles and recreational facilities e.g. concert halls.
- Increased surface run-off in times of heavy rains which leads to soil erosion.

Steps being taken to solve the environmental effects above

- Setting anti-pollution laws to reduce pollution e.g. treating industrial wastes.
- Attracting many Non-Governmental Organisations to teach people about environmental conservation.
- Encouraging urban planning efforts to streamline land use and reduce destruction of vegetation e.g. avoid settlements in swamps.
- Constructing high-rise or storied buildings to utilise available space and reduce competition for land.
- Introducing urban-rural strategies to stop rural-urban migration e.g. construction of roads, hospitals and schools in villages.
- Improvement of drainage channels within urban centers to reduce poor sewage disposal and water pollution.
- Encouraging the use of less pollutant energy e.g. Hydro electricity and bio-gas to reduce demand for wood fuel and charcoal.
- Planting greenbelts to improve on the climate of the towns e.g. lowering heat levels.
- Filling in pits and depressions after quarrying to destroy breeding grounds for mosquitoes.
- Mass sensitization of people in the city about environmental conservation.
- Setting strict laws to ensure urban hygiene e.g. heavy fines for dropping litter and rubbish anyhow.
- Using alternative building materials to reduce demand for timber e.g. glass and metal.