

GEOGRAPHY OF EAST AFRICA.

LOCATION, COMPOSITION AND PHYSICAL REGIONS.

East Africa is made up of three countries Uganda, Kenya and Tanzania (Tanganyika mainland and Zanzibar Island).

POSITION:

East Africa lies astride the Equator (0° C) which divides it into two that is to say the Northern hemisphere and southern hemisphere.

The East African region is located between $4\frac{1}{2}^{\circ}$ North and $12\frac{1}{2}^{\circ}$ south of the Equator and between longitudes 29° East and 41° East of the Greenwich.

East Africa is bordered by South Sudan and Ethiopia in the North, Democratic Republic of Congo in the West, Rwanda and Burundi in the Southwest and Mozambique in the Southeast, Somalia in the Northeast and the Indian Ocean in the East.

SIZE:

East Africa has a geographical entity has an area of 1,766,893 km², with Uganda having a total area of 241,039 km², Kenya with a total area of 585,650 km² and Tanzania with 945,203 km².

COMPOSITION:

Basically, East Africa has three major races include Africans who form 98% of the total population including the Bantu, Nilo-hamites, Nilotics and the Hamites. The Asians who came from the Indian sub-continent and the Europeans who came from Europe.

These two formed 2% of the total population of the regions.



THE RELIEF REGIONS OF EAST AFRICA.

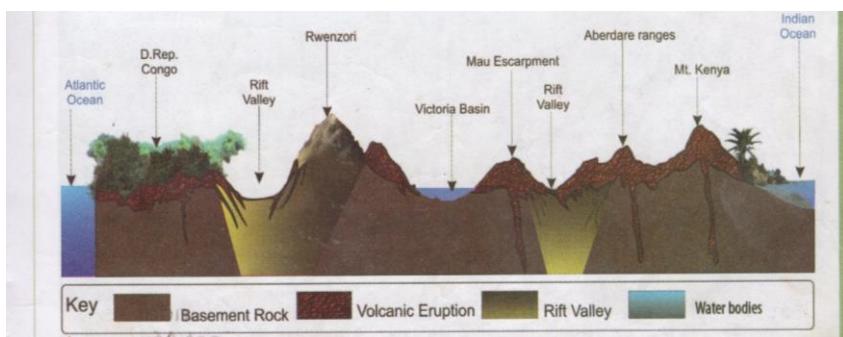
RELIEF;

This refers to the general appearance of the landscape.

The landscape of east Africa is divided into five major relief regions that is to say:-

- The coastal plains. -The Eastern plateau/Nyika plateau. -The central or lake plateau.
- Highlands. -Rift valleys.

A CROSS SECTION OF THE RELIEF OF EAST AFRICA.



a) THE COASTAL PLAINS.

The coastal plains is a narrow low lying area at the East African coast extending from the sea level up to 250m above sea level.

The coastal plains covers a wide area extending to about 160km in land but narrow in the Centre and the south covering 80km wide.

The coastal plains stretches from around river Tana in Kenya to river Ruvuma in Tanzania. It is characterized by:-

- Fairly deposit of sand and silt deposited by the action of sea waves.
- Coral reefs that are built up by sea animals called polyps. When the sea animals die, their remains are deposited on the sea bed and pile up to form rocks called coral rocks.
- It is built up by sedimentary rocks composed of deposits of sand, silt and coral, deltas are formed at mouths of rivers as they flow into the sea and rias which are drowned river valleys formed when valleys which were previously at sea level were submerged due to rise in the sea level.
- The coastal landscape is crossed by several streams and rivers which pour in the Indian ocean for example R.Tana,R.Athi,R.Galana in Kenya and R.Pangani,R.Rufiji and R.Ruvuma in Tanzania.
- It has many coastal features due to wave action that is to say, erosional and depositional emergence and submergence features such as cliffs, stacks, lagoons, bays and tombolos.

It comprises of mainly mangrove forests, marshes, bog and swamps.

The climate is hot and humid with temperatures ranging between 28°C to 30°C and there is heavy rainfall ranging from 1000-1500mm.

The major activities carried out in the coastal plain belt include:-

Fishing, industrialization, tourism, urbanization, lumbering and shipping.

b) THE EASTERN/ NYIKA PLATEAU.

This is a fairly open or flat land scape which extends from where the coastal plain stops.

The altitude of the plateau gradually extends in land towards the west 250-1100mm above sea level.

It occupies Eastern Kenya and Eastern Tanzania. The Eastern plateau is also called the Nyika plateau.

Characteristics of the Eastern/Nyika plateau.

- Very old rocks much of these have been changed by heat and pressure in the Earth crust (metamorphic rocks)

- Some of the basement rocks were covered with lava due to Vulcanicity.

- A number of rivers dissect the plateau forming deep valleys as they flow from the high lands to the coast foreexample Rivers Tana, Athi, Galana, Rufiji, Ruvuma and Pangani.

- It contains a uniform flat land scape with scattered or isolated hills known as inselbergs and erosional surfaces known as pedi-plains examples include; Taita hills, Marsabit, Voi kitui (Kenya) and Ngeta in Northern Uganda.

- It is characterized by low rainfall ranging between 250mm-500mm, hot temperatures ranging between 27°C to 30°C.

- It contains poor shrub vegetation comprising of scattered trees and short grass because of low rainfall.

- Most of the national parks and wild life reserves are found in this area foreexample Tsava, Meru, Marsabit National parks in Kenya, Mkomazi, Selous and Mikumi in Tanzania.

C) THE RIFT VALLEYS.

This is a wide elongated depression or trough on the earth's surface borded by steep slopes or escarpments.

The floor of the East African rift valley is not uniform and it is at a height of about 300-1800m above sea level.

It begins from the middle East in Jordan and passes through the red sea, Ethiopia, Kenya, Tanzania to Malawi where it makes a junction and extends through Tanzania again, Burundi, Rwanda and fades out in Uganda (Western) North of lake Albert.

The rift valley has two branches that is to say the Western and Eastern branch.

THE WESTERN BRANCH.

It stretches from Lake Malawi in Tanzania and runs through lake Tanganyika, Rwanda, Burundi and Uganda.

A number of lakes are found in this branch foreexample Lakes Albert, George, Edward, Tanganyika, Rukwa and Malawi and Nyasa shared by Tanzania and Malawi.

THE EASTERN BRANCH.

It stretches from Lake Malawi in southern Tanzania and runs from North and central Tanzania and central Kenya to Northern Kenya around lake Turkana.

The Eastern branch covers lakes like Turkana, Baringo, Naivasha, Nakuru, Elementaita, Magadi, Natron, Ewaso and Manyara.

In some places, the Eastern arm of the rift valley floor has volcanic cones like Suswa, Langoroti, Lengai and Menengril.

The activities carried out include;

- It contains volcanic and alluvial soils which support agriculture.
- Most areas are cool and wet except those areas which are in the rain shadow.
- The rift valley landscape forms tourist attraction sites hence favouring tourism.
- Wild life conservation is carried out in some parts for example Queen Elizabeth and Murchison falls in Uganda, Aberdare national park in Kenya Ruaha and Serengeti in Tanzania.

d) THE CENTRAL AND LAKE PLATEAU.

This is located in the Centre of East Africa and that's why it's called the central plateau.

It is also called the lake basin plateau because it covers the greatest lakes of Victoria, Kyoga and Mburo.

The height of the region is between 1000-1500m above sea level.

It lies between the Eastern and Western branches of the rift valley.

It covers much of Uganda and a small part of Western and Northern Tanzania.

Characteristics.

- The landscape of the central plateau is flat with isolated hills.
- The central plateau is in a high altitude and gently sloping from the South.
- The plateau is comprised with metamorphic and sedimentary rocks overlying the old basement rocks.
- The central plateau is composed of flat topped lateritic capped hills and flat bottomed valleys dominated by papyrus swamps.
- The plateau is not uniform that is the Western and Eastern plateau where up lifted and central plateau down warped forming shallow, depression occupied by lake Victoria and lake Kyoga.
- The plateau is crossed by many streams and rivers such as river Kafu and Kagera.
- It experiences a wet and hot climate (equatorial climate).

Activities.

- The wet and hot climate favours the growth of tropical rainforests hence lumbering and forestry is carried out.
- It is a fertile region hence favours most of the activities like farming, tourism, mining and settlement.

e) THE HIGHLANDS OF EAST AFRICA.

This is composed of high mountains most of which are volcanic and some are block in nature of formation.

The high lands of East Africa rise above the general level of the plateau. The high lands constitute the highest point in East Africa. Mountains vary in heights and shapes and these include;

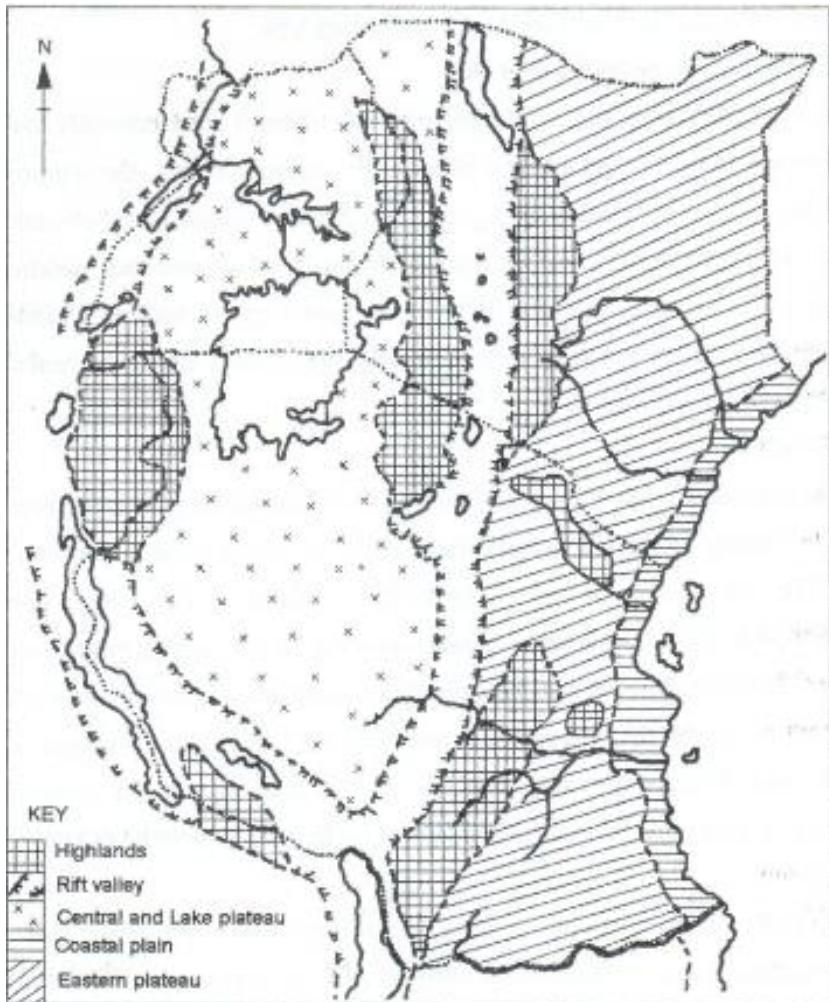
UGANDA	METRES	KENYA	METRES	TANZANIA	METRES
Mt.Rwenzori	5110	Mt.Kenya	5199	Mt.Kilimanjaro	5895
Mt.Mufumbira	4510	Mt.Aberdare	3906	Mt.Meru	4566
Mt.Elon	4321	Mt.Chephotet	3369	Mt.Rungwe	2942
Mt.Muhavura	4127	Mt.Mau	3047	Mt.Chuluhangi	2433

Mt.Moroto	3084	Mt.Lol dian	3016	Mt.Mbeya	2826
Mt.Kadam	2064	Mt.Mathew ranges	2376	Mt.Uionguro	2646
Mt.Napak	2537	Mt.Chyulu ranges	2188	Mt.Ushombero	2526
Mt.Singiro	2772	Mt.Kericho ranges		Mt.Usambara	2300

Characteristics.

- They receive heavy rainfall which is reliable (1500-2000mm) except in the rain shadow (lee ward side) of the mountains.
- They receive relatively cool temperatures which change with height of land above sea level.
- They contain fertile volcanic soils.
- Highlands have some of the highest population densities while the lower plateau are sparsely populated.
- Many rivers radiate from these mountains for example rivers Manafwa, Sipi, Mpologoma from Mt.Elon, river Mubuku from Mt.Rwenzori.

A SKETCH MAP OF EAST AFRICA SHOWING RELIEF REGIONS.



ROCKS IN EAST AFRICA.

A rock is an aggregate of minerals.

In East Africa there are three types of rocks;

1. Igneous rocks.
2. Sedimentary rocks.
3. Metamorphic rocks.

IGNEOUS ROCKS.

Igneous rocks are fire formed rocks.

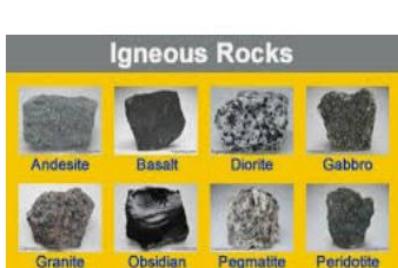
Igneous rocks are formed when molten rock (magma) under intense heat and pressure beneath the Earth crust is ejected out through crack/vent/lines of weakness onto the surface or within the earth crust.

The magma or molten rocks cools to form igneous rock. When magma comes out of the Earth crust, it is called lava.

When magma solidifies on the Earth surface extrusive or volcanic rocks are formed. They cool and solidify quickly in the open air and so they are fine grained for example basalt, sometimes or are glassy in appearance for example obsidian and some are spongy pumice. Other volcanic rocks include Rhyolite and Andesite.

Sometimes magma solidify deep within the Earth crust to form intrusive / plutonic / Abyssal rock. They cool slowly and minerals are coarsely crystallized for example granite, diorite, gabbro, peridotite, quartz and obsidian.

Magma may also solidify near the surface of the Earth crust to form Hypabussal rocks for example diorite, Granophyre, quartz, trachyte.



Characteristics of Igneous rocks.

1. They are fire formed.
2. They are crystallized rocks, crystalline rocks.
3. They are formed as a result of cooling and solidification of magma.
4. They don't have fossils.
5. They are hard and resistant to erosion.
6. They have large crystals when formed deep under the ground.
7. They are fine grained when formed on the surface for example basalt.
8. Some igneous rocks are spongy and glassy in appearance.

SEDIMENTARY ROCKS.

Sedimentary rocks are laid down and are stratified (layered).

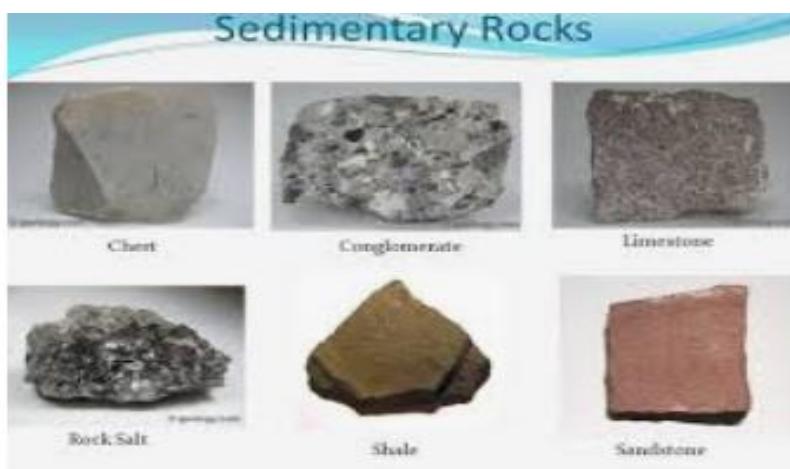
Sedimentary rocks are formed when rocks are broken down by weathering, eroded, transported by wind and water and finally deposited in layers and later compacted or cemented to form sedimentary rocks.

Sedimentary rocks can be formed by mechanical, organic or chemical processes.

1. Mechanically – Sedimentary rocks are formed when pre-existing sediments are broken down, eroded and transported and deposited in layers which compacted to form a hard rock for example clay, shale, gravel, mud stone, silt, sandstone and conglomerate.

2. Organically – These are formed from the remains of dead animals and plants which are later laid down and compressed to form a rock for example chalk, limestone, coral reefs and coal.

3. Chemically – these are formed by the evaporation of water to form stones containing minerals. The minerals are then compacted to form a rock for example salt (edible), dolomite, Gypsum, potash, hematite, and limonite.



Characteristics of sedimentary rocks.

1. They are layered (stratified).
2. The layers are separated bedding planes.

3. They contain fossils (remains of dead plants and animals).
4. They are non – crystalline.
5. They are laid down rock wastes.
6. They are made up of sediments.
7. Some are porous / permeable.
8. Some are soft.

METAMORPHIC ROCKS.

These are changed rocks. They are formed when the pre-existing rocks (Igneous and sedimentary) are subjected to intensive heat and pressure causing change in the physical and chemical composition of the original rock for example

Original Rock	Changed Rock (metamorphic)
Limestone	Marble
Clay	Slate, schist, slate, shale
Granite	Gneiss
Sand	Quartzite
Coal	
Graphite	





Characteristics of metamorphic rocks.

1. They are changed rocks due to heat and pressure.
2. Their chemical and physical composition are different from original rock.
3. They are brittle rocks.
4. They are compacted rocks due to pressure and heat.
5. They contain precious minerals like diamond and marble.
6. They form the basement with the continental crust.

IMPORTANCE OF ROCKS TO THE PEOPLE OF EAST AFRICA.

1. Rocks contain valuable minerals such as copper, gold diamond thus promoting the mining industry in East Africa.
2. Sedimentary rocks contain oil and natural gas which are sources of energy or fuel used in industries to run industries and for lighting.
3. Rocks provide building materials for construction purposes forexample granite.
4. Rocks especially sedimentary and igneous provide fertile soils for agriculture thus providing food to the growing population.
5. Rocks give rise to soil formation which also promote agriculture or vegetation growth.
6. Rocky areas and rock out crops provide beautiful scenery for tourism thus countries earning foreign exchange.
7. The coral reefs shelter harbors from strong waves forexample Dar-es-salaam and Mombasa port.
8. Rocks hold underground water and thus sources of water to man.
9. Rocks are sources of medicine forexample lime clay.
10. Rocks are grounds for research by students at higher institutions doing geology.
11. Rocks are raw materials to industries forexample clay and limestone for making cement.
12. They are sources of income to the local people forexample the miners thus improving on their standards of living.
13. They also lead to the provision of employment opportunities especially in the mining and quarrying industries.

14. Rocks are used for decoration purposes.

NEGATIVE CONTRIBUTIONS OF ROCKS (PROBLEMS EXPERIENCED BY PEOPLE LIVING AROUND ROCKS).

1. Rocks provide homes for wild animals which are dangerous to man and his property.
2. Promote soil erosion and landslides leading to destruction of crops and property.
3. They are barriers to transport and communication routes thus being expensive to construct.
4. Porous rocks lead to water shortage in some areas of East Africa.
5. Hinder settlement and agriculture because it's expensive to construct houses and to use mechanization respectively.
6. Some rocks when weathered laid to the development of poor sandy soils for example granite rocks which do not support agriculture.
7. Coral reefs hinder fishing and water transport because they destroy water vessels.
8. Rocks form mountains hindering settlement and other activities because of very low temperatures, steep slopes and aridity on the lee ward side.

Questions

1.
 - a) Differentiate between sedimentary and igneous rocks
 - b) Describe the process which led to the formation of:-
 - (i) Sedimentary
 - (ii) Igneous rocks in East Africa
 - c)
 - (i) Explain the benefits of rocks to East Africa
 - (ii) Outline the problems faced by people living in areas where either Sedimentary or igneous rocks are found.
 - d) Name any one area of East Africa where each rock is found.
2.
 - a) Name any three types of rocks found in East Africa
 - b) Describe the characteristics of any two types of rocks named in (a) above
 - c) For any type of rock named in (a) above, describe the processes which led to its Formation.
 - d) Explain the importance of rocks to the people of East Africa

PHYSICAL FEATURES OF EAST AFRICA.

LAND FORMS EVOLUTION IN EAST AFRICA (FEATURES).

They are a result of a number of processes. These processes modify the landscape to produce a number of land forms or features.

These processes are categorized into two.

- a) Endogenic processes which originate from deep within the Earth Interior include:-
-Faulting.

- Vulcanicity.
- Folding.
- Earth quakes.
- Warping.

These processes are referred to as Earth movements or Tectonism.

- Exogenic processes which operate close to the surface of the earth. They include: -
- Weathering.
- Deposition.
- Mass wasting.
- Erosion.

FAULTING AND LANDSCAPE.

Faulting is the fracturing / cracking / breaking of rocks resulting to displacement. This displacement may be vertical lateral or horizontal.

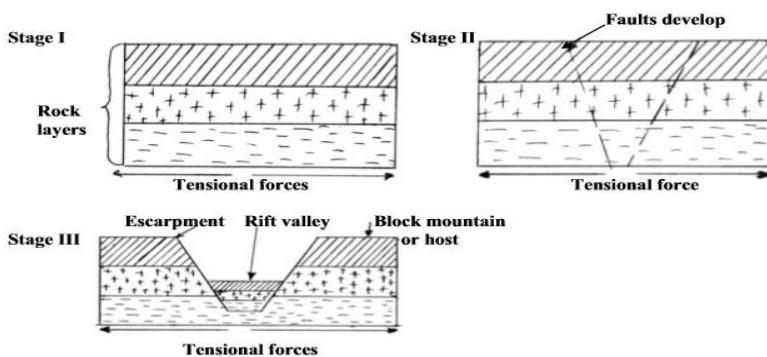
Faulting leads to the breaking of rocks, these cracks are called faults. These are three types of faults.

1. Normal faults.
2. Reversed faults.
3. Tear faults.

Faulting is caused by two forces.

1. Tension force.

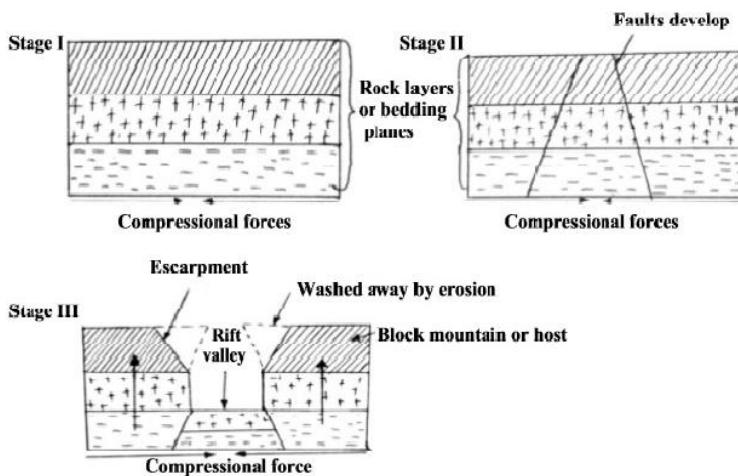
These areas pull the earth crust in opposite direction leading to the formation of normal faults. This is followed by the pulling apart of adjacent blocks where the central block is forced to sink under its own weight leading to a depression called a rift valley.



2. Compression forces.

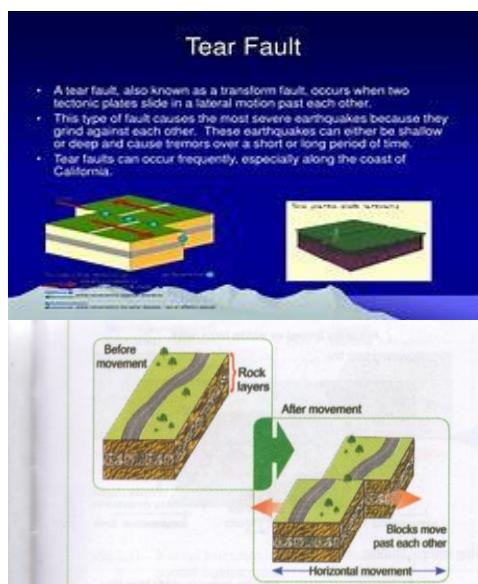
These are forces within the earth's crust pushing in the same direction or act towards each other leading to the formation of reversed faults.

This is followed by the movement of the adjacent blocks (outer blocks) towards the Centres forcing them to over ride the central block to form a trough known as a rift valley.



Tear faults.

Is a fault occurring in the rocks above a low angle thrust fault and striking.



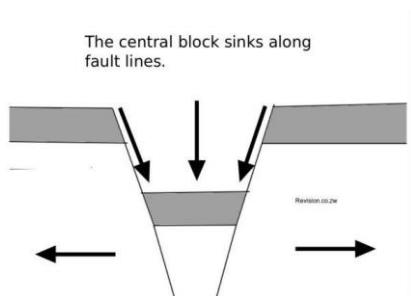
Land forms due to faulting.

In East Africa faulting has led to the formation of the following land forms.

- Block mountains (Horsts). - Rift valleys.
- Escarpments / fault scarp. - Rift valley lakes.
- Fault guided valleys / rivers.
- Fault line scarps. - Graben.

Fault guided valley.

This is a river or stream following a fault line for example River Aswa, River and Ngiro, River.



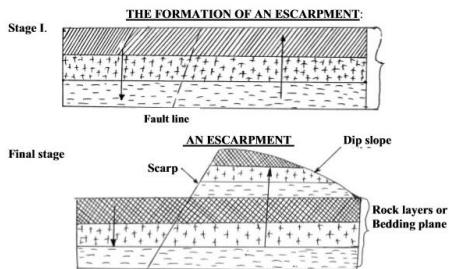
Escarpe / fault scarp

This is a steep slope formed when one slab or block of land slips/ falls downwards relative to the other.

They are normally seen at the side of the Rift Valley.

Examples of escarpments in East Africa include:-

- Butiaba (Uganda)
- Mau
- Aberdare } Kenya
- Nandi
- Ruaha } (Tanzania)
- Iringu }



RIFT VALLEY.

It is an elongated depression with fault scarps on either sides.

The East Africa Rift Valley is divided into two that is to say the Eastern arm which runs through Kenya and Tanzania. It contains numerous lakes like Eyasi, Manyura, Nakuru, Naivasha, Elementeita, Magadi, Baringo, Turkana, Natron and Hannington.

The western arm is deep and rugged and it contains five large lakes which include Albert, George, Edward, Tanganyika and Rukwa.

NB: The deepest Lake is Tanganyika.

Most Rift Valley lakes are salty because they don't have inlets and outlets.



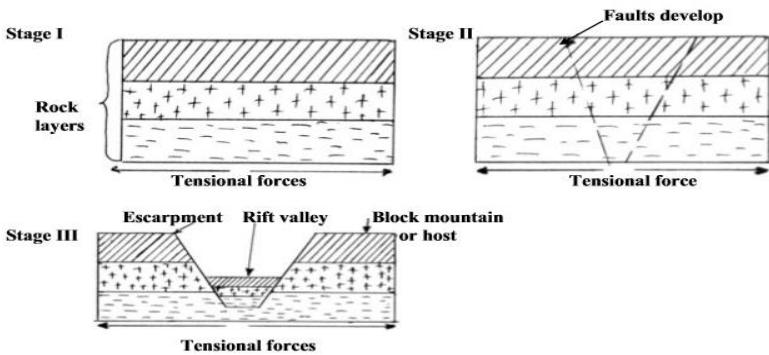
A SKETCH MAP OF EAST AFRICA SHOWING THE RIFT VALLEY AND ALL THE LAKES.



These are many theories put forward to explain the formation of the Rift Valley for example;

1. Tension forces.

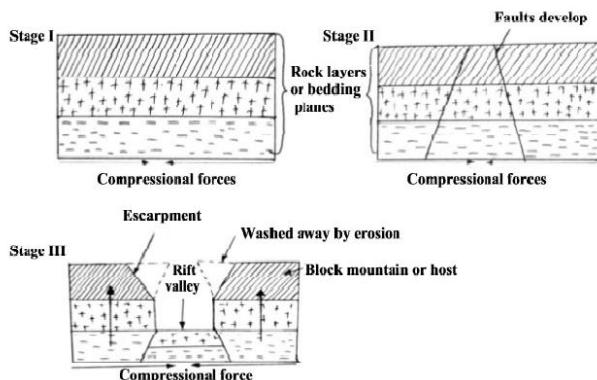
Convectional currents within the Earth crust cause, tensional forces which leads to the formation of parallel normal faults pulling in different directions making the middle block to slip down. Continuous tension makes the middle block to subside to form a Rift Valley.



2. Compressional forces.

Convectional currents within the earth crust cause compressional forces which lead to the formation of reversed parallel faults. Continuous compression, force the side blocks to rise up and a trough was developed to form a Rift valley.

The overhanging sides of the Rift valley are washed back by erosion.



BENEFITS / IMPORTANCE OF THE RIFT VALLEY TO THE PEOPLE OF EAST AFRICA.

1. The Rift Valley promotes tourism and thus a source of foreign exchange which is used to develop other sectors like agriculture for example Lake Nakuru is the world's biggest flamingo attraction.
2. The Rift valley contains a number of lakes such as Tanganyika and Albert. These lakes are sources of fish (food) to the people of East Africa which improves on their diet.

3. The Rift Valley is a source of salt to the people of East Africa for example Lake Magadi and Lake Katwe.
4. The Rift valley lakes such as Naivasha, Tanganyika and Edward modify climate through formation of convectional rainfall which supports agriculture.
5. The Rift Valley lakes further provide water for domestic like washing and cooking, industrial for cooling machines and irrigation purposes to support the growth of crops.
6. Rift valley lakes promote water transport thus easy movement of goods and services.
7. The Rift valley acts as an international boundary for example the western arm is a boundary between Uganda and Congo.
8. The Rift valley provides employment to many people in East Africa for example miners, researchers thus improving on their standards of living.
9. Ground for re-creation for example swimming, sun bathing which attract tourists thus foreign exchange
10. The Rift valley is also a ground for livestock rearing and wild life conservation.

PROBLEMS FACING THE PEOPLE LIVING ALONG THE RIFT VALLEY.

1. Water in the Rift valley lakes is salty and thus not fresh for human consumption.
2. Soil erosion and landslides due to the steep slopes along the Rift valley causing destruction of crops and property.
3. Pests and diseases for example tsetse flies which spread sleeping sickness to people and Nagana to animals leading to poor quality animals and death.
4. Steep slopes hinder human settlements because construction is difficult and expensive.
5. Earth quakes and aridity because these regions are within tectonic plates leading to destruction of property and death.
6. Poor transport and communication network because of the steep Rift valley slopes leading to remoteness in these areas.

RIFT VALLEY LAKES.

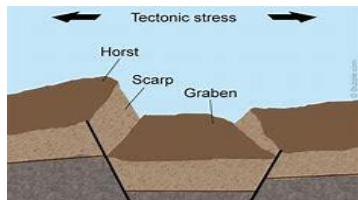
These are lakes formed within the Rift valley flop.

NB: Rift valley lakes / Graben lakes are formed due to secondary faulting within the Rift valley flop. These basins are then filled with water to form Rift valley or Graben lakes for example L. Tanganyika, Albert, George, Turkana and Naivasha.

Note: Explain the processes that led to the formation of Rift valley lakes

1. Rift valleys are formed by faulting.
2. They were formed by either tensional or compressional forces (explain the formation of the Rift valley).
3. Basin within a Rift valley was formed by secondary faulting which was filled by water to form a lake.

Grabens are depressions within the Rift valley that when filled with water, they become Rift valley lakes.



HORST/ BLOCK MOUNTAIN.

A block mountain is an upland bounded by fault scarps in one or both sides.

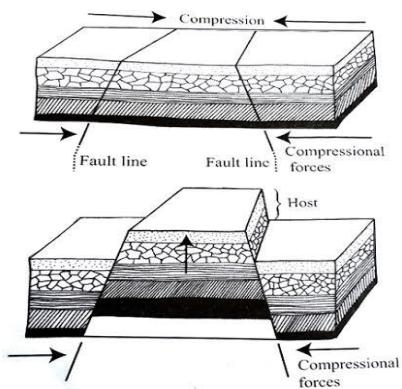
Formation of Block Mountains.

Block Mountains are formed by either compression or tensional forces.

1. Compressional forces.

Compressional forces acted on a stable block of land pushing towards the centre leading to the formation of reversed faults.

Continued pressure forced the middle block to be uplifted to form a block mountain. The side blocks remained stable.



2. Tensional forces.

Tensional forces acted on a stable block of land leading to its formation of normal faults. Continued tension leads to sinking /subsiding of the side blocks to form a block mountain.

Examples of Block Mountains in East Africa include

Rwenzori (Uganda)

Mountain Mathias (Kenya)

Mountain Usambara

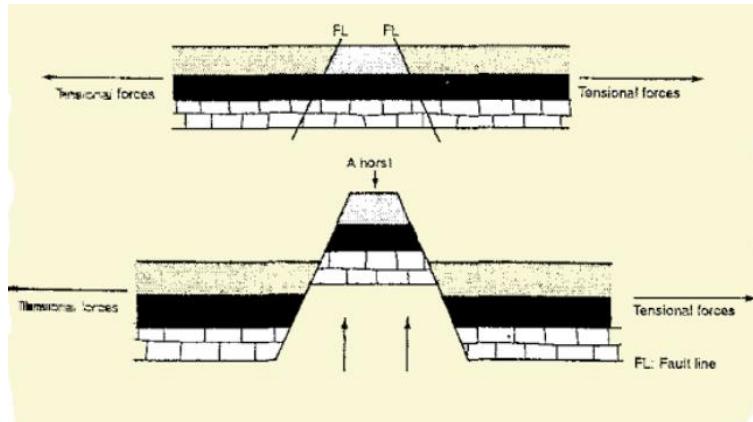
Mountain Mbeya

Mountain Uluguru

Mountain Mahenge

} Tanzania

N.B: Mount Rwenzori is the highest block mountain in Africa.



IMPORTANCES OF BLOCK MOUNTAINS.

1. Mountains are tourist attractions and thus sources of foreign exchange for development.
2. Sources of minerals for example copper and cobalt in Mountain Rwenzori thus development of the mining sector.
3. Mountains promote the development of forestry on either slopes for example Mt. Elgon forest reserve which modify climate.
4. They also provide building materials in form of sand, clay and stones thus construction activities.
5. They promote wild life conservation for example Mt. Rwenzori National Park thus boosting the tourism industry.
6. Mountains in East Africa modify climate through formation of orographic rainfall thus boosting agriculture.
7. They attract dense settlement because of gentle slopes, fertile soils, heavy rainfall and low temperatures.
8. They act as water catchment areas that is to say forming sources of rivers in East Africa for example Nyamwamba River on Mt. Rwenzori, River Manafwa on Mt. Elgon.

9. They act as international boundaries for example Mt. Rwenzori on Uganda and Democratic Republic of Congo and Mt. Elgon between Uganda and Kenya.
10. Mountains promote research and scientific study to students at higher institutions of learning.
11. They promote Agriculture due to deep fertile soils and heavy rainfall thus providing food to the growing population.
12. Mountains are sites for telecommunication gadgets boosting the communication centres.
13. Mountains promote re-creation as on Mt. Rwenzori where there is Mountain climbing which attracts foreign exchange used to develop other sectors like agriculture.

PROBLEMS FACED BY PEOPLE LIVING IN THE HIGHLAND AREAS OF EAST AFRICA.

1. Landslides which destroy lives and property.
2. Pest and diseases as the montane forests act as breeding grounds for disease vectors like tsetse flies.
3. Poor transport network due to steep relief which makes construction difficult and expensive.
4. Soil erosion on steep slopes which interfere with agriculture.
5. Volcanic eruption which also destroy lives and property.
6. Mountains act as hiding grounds for wrong doers (rebels) causing insecurity.
7. Wild animals like snakes and lions which discourage human settlements.
8. Low temperatures which limit human settlement.
9. The steep slopes limit accessibility causing remoteness in those areas.
10. The lee-ward side discourages agricultural activities and settlement.

THE SOLUTIONS TO THE ABOVE PROBLEMS.

1. Terracing to control surface run off.
2. Contour ploughing to hold the soil particles and reduce on the speed of running water.
3. Growing of cover crops to protect the soil from heavy rains.
4. Afforestation to control soil erosion.
5. Re-afforestation to control erosion and to hold the soil particles together.
6. Mulching to add fertility to the soil.
7. Resettlement of population to reduce on encroachment.
8. Mass education and awareness to protect the highland areas by use of proper farming methods like afforestation and contour ploughing.
9. Spraying of pests to control the breeding of disease vectors.
10. Construction of winding roads to access the area.
11. Improving on security to attract more tourists.

VULCANICITY / VULCANISM.

Vulcanicity is the process by which molten rock (magma) and materials in solid, liquid and gases from the interior of the Earth are intruded into or extruded onto the surface of the earth through lines of weakness.

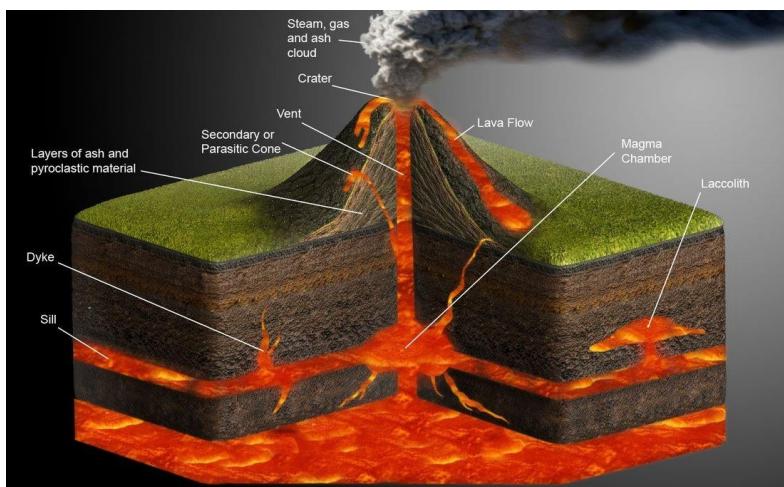
Vulcanicity on the other hand is a process by which molten rock (magma) is extruded or poured on the surface of the earth.

Origin of Vulcanicity.

The molten rock (magma) is in a semi-solid plastic form. This is due to the following:-

1. Great pressure exerted by the over lying laid rocks.
2. Great heat beneath the earth crust due to friction of the tectonic plates.

NB: Convectional currents within the earth crust cause tensional and compressional forces which in turn create lines of weakness through which molten rock flows in and on to the earth.



When magma erupts on the earth surface it is called Lava.

There are three types of lava.

1. Acidic lava.

This solidifies rapidly and flows for short distances. It is very acidic.



2. Basic lava.

Takes a long time to solidify and thus flow for long distances.



3. Intermediate lava

This contains the characteristic of both acidic and basic lava.

LANDFORMS DUE TO VULCANICITY.

The landforms due to Vulcanicity in East Africa are categorized into two and they include. Extrusive volcanic landforms (magma comes on top) and Intrusive volcanic landforms (magma remains inside).

1. Extrusive volcanic landforms.

These are formed when magma is extruded on the land surface. They include the following.

- Volcanic mountains (volcanoes) foreexample Mufumbiro, Meru, Kenya, Kilimanjaro.
- Volcanic plugs (Neck / spine) foreexample Tororo rock, Mwadui volcanic plug in Tanzania.
- Explosion craters foreexample Katwe, Basoti, Nyanunuka.
- Calderas foreexample Meru, Longonot, menengai, suswa,Napak.
- Lava dammed lakes foreexample L. Bunyonyi, Mutanda in south western Uganda.
- Cumulo domes foreexample Nfumbi, Rurgwe.
- Lava plateau / plain foreexample Nyika plateau, Mau ranges and Yatta plateau.
- Hot springs foreexample Kitagata, Maji Moto, Kisiizi, Ssempaya.
- Geysers foreexample L. Bogoria and L. Hannington in Kenya.

- Fumeroles for example at the side of Nyamulagira.

VOLCANIC MOUNTAINS (VOLCANOES).

These are conical shaped features formed by cooling and solidification of magma on the surface of the earth through lines of weakness.

Formation of volcanic mountain.

A volcanic mountain is formed when magma flows through the vent or lines of weakness (through an eruption or explosion). The materials build and accumulate on the surface of the Earth in layers to form a volcanic mountain for example Kilimajaro, Moroto, Napak, Mufumbiro, Elgon, Kenya, Meru, Muhavura, Oldonyo – lengai.

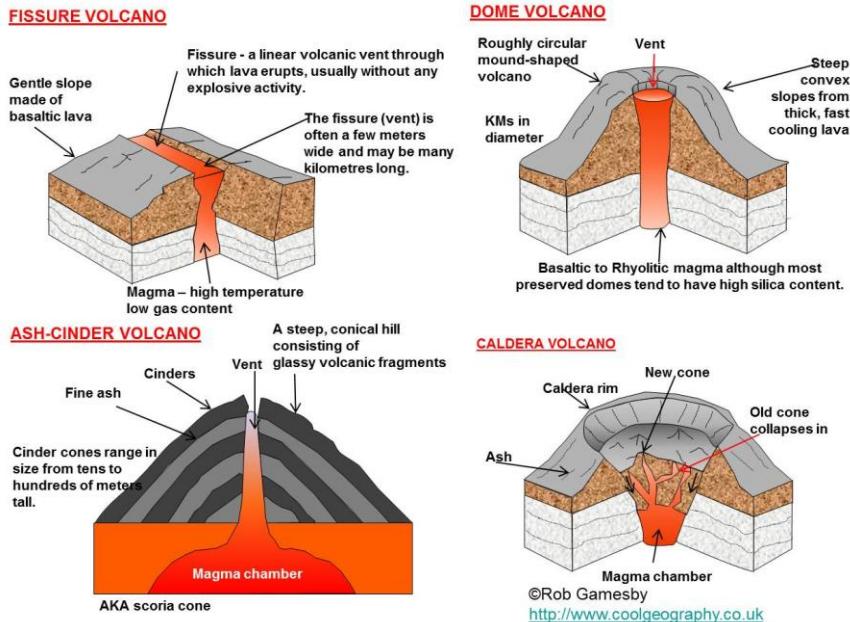
A SKETCH MAP OF EAST AFRICA SHOWING VOLCANIC AND BLOCK MOUNTAINS.



Volcanoes are of different types which include;
 Ash and cinder cones for example Elgon, Teleki and Suswa.
 Lava cones for example Longonot Meru.
 Composite cones for example Kilimanjaro, Muhavura.
 Dissected cones for example Mt. Kenya.

Basal domes forexample Mt. Nyamulangira.

Cumulo domes forexample Rungwe, Ntumbi.



Volcanoes usually pass three stages in their life cycle. In the beginning, eruptions are frequent and the volcano is active that is to say;

Active volcanic mountains.

They have rumbling sound forexample Mt. Mufumbiro, Muhuvura, Ol donyo – lengai, Meru, Nyamulangira and Nyiragongo.

Later eruptions become so infrequent that the volcano is said to be dormant (sleeping) forexample Kilimanjaro, Longonot (lava cone).

This is followed by a long period of inactivity Volcanoes which have not erupted in historic times are said to be extinct forexample Elgon (Ash & Cinder).

NB: Highlands of East Africa are mainly formed by the following processes;

- Folding.
- Faulting.
- Vulcanicity.
- Weathering and erosion.

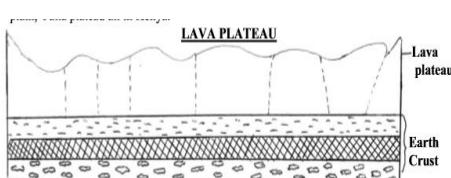
VOLCANIC PLUG / SPINE.

This is a cylindrical feature formed when acidic lava solidifies within the central pipe and the connecting deposit is eroded away and it becomes harder for example Tororo rock.



LAVA PLATEAUS / PLAINS.

This is an upland with a flat / gently sloping surface made of several layers of lava. It is formed when basic lava flows through lines of weakness through successive eruption for example Kisoro plains, Nyika plateau, Mau ranges, Laikipia plains, Kino plains and Valla plateau.



LAVA DAMMED LAKES.

These are lakes formed when basic lava blocks a river valley for example Lakes like Mulehe, Bunyonyi and Mutanda.



HOT SPRINGS, GEYSERS AND FUMEROLES.

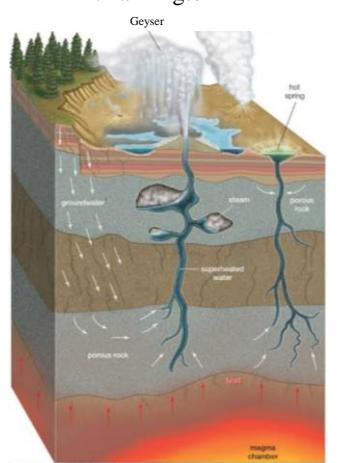
Rain water and water from beneath seep through rocks and collect in underground reservoirs.

During passage, it comes into contact with heated volcanic rocks and later emerge into the Earth surface due to great pressure as:-

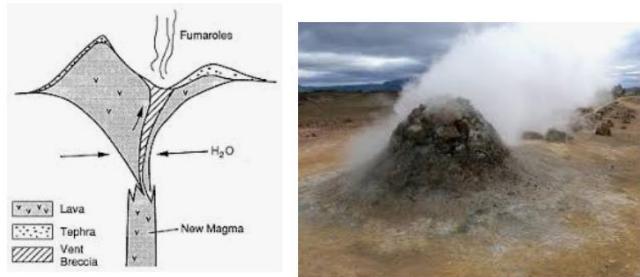
- a) A stream or hot spring for example Kitagata, Kisiiizi, Sempaya and Maji moto.



- b) At regular intervals. (This is called a geyser) for example near L.Baringo and L.Hannington



- c) As hot gases or steam (This is called a fumerole) for example at the sides of Nyamulangira and Longonot mountains.



EXPLOSION CRATERS.

These are shallow flat flowed depression surrounded by a low rim of pyroclastic (particles). It is formed when an eruption of gases, explodes and punches a hole in the ground. The ash and dust thrown up will fall back.



CALDERAS.

Calderas are formed in two ways; -

- a) Violent eruption which destroys the top of the volcano.

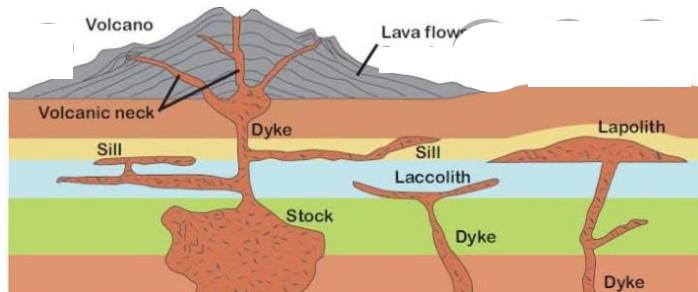
- b) It's also formed by a process known as cauldron subsidence of the top of the volcano following a volcanic eruption. For example Meru, Menengai, Ngorongoro, Napak, Langonot and Suswa.



INTRUSIVE VOLCANIC LANDFORMS.

(Plutonic / Abyssal)

These are formed when magma cools and solidifies beneath the Earth crust. These landforms include; Batholith, Sills, Dykes, Laccolith and Lopolith.



BATHOLITH.

This is a huge mass of magma formed at great depth for example Mubende batholith.



SILL.

This is a sheet of magma lying along the rock strata or layers. It is a horizontal sheet of magma near Mombasa In Thinka.



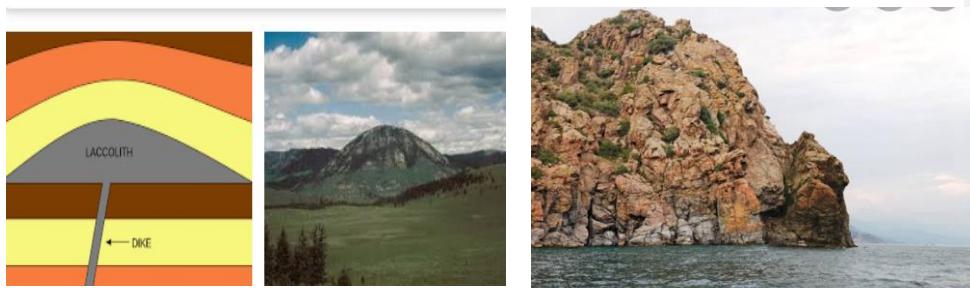
DYKE.

This is a vertical or inclined sheet of magma. Magma cuts across the rock strata or layers for example Osukulu hills in Tororo.



LACCOLITH.

This a dome shaped mass of magma almost at the surface of the Earth for example Near Voi in Kenya.



LAPOLITH.

This is a large soucer shaped intrusion body. The soucer shape is due to the weight of the Earth crust.



BENEFITS / IMPORTANCE OF VULCANICITY.

Vulcanicity has led to a formation of a number of landforms.

These landforms are important in East Africa in the following ways;

POSITIVE IMPORTANCE.

1. The diversity of volcanic features like volcanic mountains, cumulo-domes and lava plateaus promote tourism and thus earn alternative source of foreign exchange.
2. Lava plateaus and lower slopes of volcanic mountains are favourable for agriculture because of fertile volcanic soils and heavy rainfall.
3. Volcanic landforms are sources of minerals forexample diamonds from volcanic plugs, Limestone from the Tororo plug.
4. They provide man with building materials forexample granite.
5. Sills and dykes provide favourable sites for waterfalls where Hydro Electric Power is generated forexample Thika falls.
6. Hot springs are sources of geo-thermal power forexample around L.Nakuru and Bogoria and they are used for natural medication(contain sulphur good for the skin)
7. Volcanic landforms forexample volcanic mountains are sources of rivers which provide water for domestic, Industrial and Irrigation purposes forexample R. Sipi and manafwa from Mt. Elgon.
8. Explosion craters are sources of salt forexample L. Kwate.
9. Volcanic landforms are habitats for wildlife especially the volcanic mountains.
10. Volcanic mountains like Kilimanjaro and Elgon modify climate through formation of relief rainfall.
11. They are grounds for research and scientific study by students studying zoology and geology in higher institutions of learning.
12. Volcanic mountains like Elgon act as an international boundary between Uganda and Kenya.
13. Volcanic mountains promote forestry on their gentle slopes forexample Mt. Elgon forest reserve.
14. Lava dammed lakes like Bunyonyi and Mulehe provide water for domestic, Industrial and Irrigation purposes.

NEGATIVE IMPORTANCE (PROBLEMS EXPERIENCED BY PEOPLE LIVING AROUND VOLCANIC MOUNTAINS).

1. Danger of wild animals which discourage settlements.
2. Landslides and soil erosion due to steep slopes which lead to destruction of crops and property.
3. Pollution of the environment.
4. Risk of earthquakes due to eruption.
5. The upper slopes are too steep and cold for human use as well as settlement.
6. Danger of secondary eruption leading to loss of lives and property.
7. Difficulty to construct transport network due to steepness.
8. Volcanic mountains are infested with tsetse flies which are disease vectors.
9. Aridity on the lee-ward side due to the rain shadow effect.

MEASURES THAT CAN BE TAKEN TO SOLVE THE ABOVE PROBLEMS.

1. Construction of winding roads to ease accessibility.
2. Planting of trees on steep slopes to control soil erosion.
3. Spraying with insecticides especially in the forests to control the disease vectors.
4. Application of soil erosion control measures like Terracing, Contour Ploughing, Strip Cropping, Inter cropping.
5. Irrigation farming on the lee ward side of mountains to provide food to the growing population.
6. Carrying out agro-forestry to stabilize farming.
7. Application of farm yard manure to increase the water retention capacity of the soil.

INFLUENCE OF VULCANICITY ON AGRICULTURE.

Positive.

- Production of fertile volcanic soils which support plant growth.
- Orographic rainfall for the growth of perennial and Variety of crops can be grown.

Negative.

- Aridity on the lee-ward side require irrigation.
- Young volcanic soils are prone to soil erosion and Porous volcanic soils are too fragile for continuous agricultural production.

STEPS THAT SHOULD BE TAKEN TO IMPROVE ON AGRICULTURE.

- Irrigation farming on the lee ward side and during the dry season.
- Agro forestry.
- Terracing.
- Application of farm yard manure.

- Intercropping to provide cover crops for the fragile soils.

INFLUENCE OF VULCANICITY ON CLIMATE.

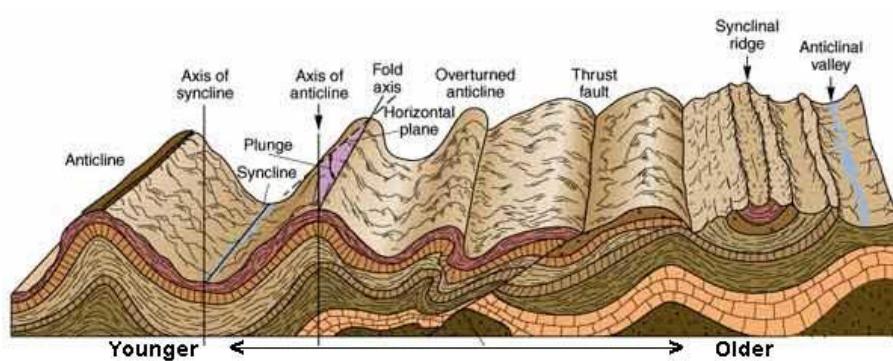
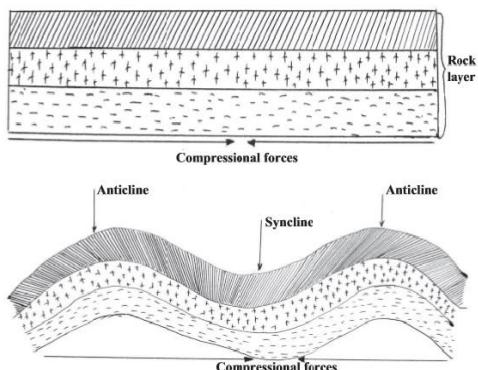
- Influences rainfall on the wind-ward side.
- Rain shadow effect on the lee-ward side.
- Aspect include the East and West facing slopes receive abundant sunshine.
- Vulcanicity has created highlands on which there is climate modification.

FOLDING.

Folding is the bending of soft young sedimentary rocks due to compressional forces.

Folding results into the formation of anticlines (hills) and synclines (valleys)

Folding can be seen around Kigezi, Buganda hills and Bukoba sand stone hills.



WARPING.

Warping is the formation of the earth crust over a considerable area as a result of compressional force.

Warping in East Africa has resulted into up and down warping of the earth crust.

Warping in East Africa has also led to the general subsidence of central Uganda forming lakes like Lake Victoria and Kyoga and also reversed the flow of rivers for example Kafu, Katonga and Kagera.

EARTHQUAKES.

An earth quake is a violent tremor of the earth. Earth quakes begin from the focus and the point above the focus as the epicenter

Earthquakes are often caused by collision of tectonic plates which cause vibrations within the crust, it may also be caused by the movement of magma beneath the earth crust and man's activities.

The intensity of an earth quake is measured by an instrument called seismograph which is equipped with Richter scale to indicate the intensity of the earth quake.

In East Africa Earthquakes are common along the Rift Valley.

GLACIATION IN EAST AFRICA.

Glaciation is a process of glacier formation and accumulation.

A glacier is a mass of ice flowing down slope. In East Africa, glaciers are found on the mountains of Mt. Rwenzori, Kenya and Kilimanjaro.

The level above which there is perpetual snow cover is called a snow line.

Glaciers perform three major roles which include erosion, transportation and deposition.

GLACIAL LANDFORMS.

Glacial landforms are categorized into two:-

- i. Glacial erosional landforms.
- ii. Glacial depositional landforms.

GLACIAL EROSIONAL LANDFORMS.

Glacial erosional landforms are produced by two major processes which include;

a) Plucking.

This is the tearing away of blocks of rocks by a glacier due to the presence of a crack.

b) Abrasion.

This is the wearing or polishing away of rocks by a glacier.

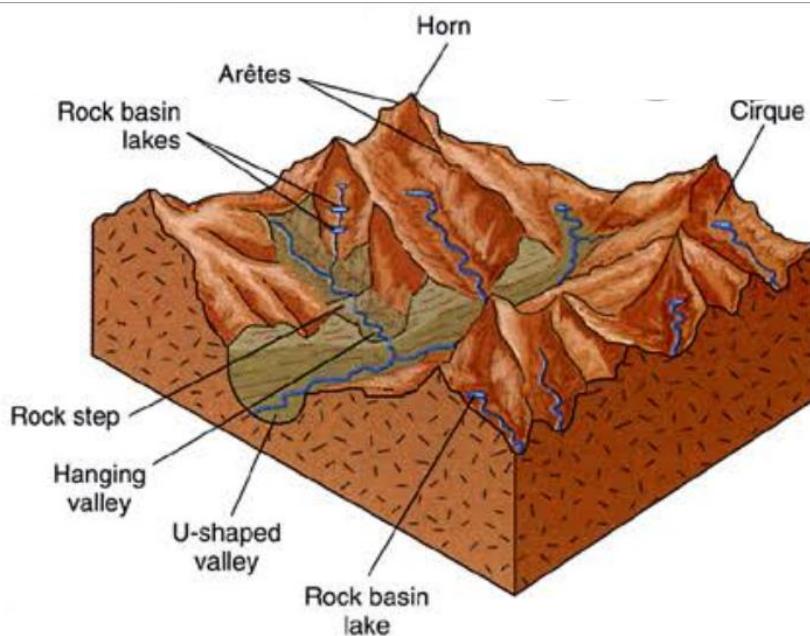
Other erosional processes include:-

- Freeze and thaw.
- Basal sapping.

The above processes have led to the formation of glacial erosion landforms on mountains like Rwenzori, Kenya and Kilimanjaro.

These landforms include the following;

- | | | |
|-------------------|--------------------------|--------------------|
| • Corrie /cirque. | • Pyramidal peaks/horns. | • Truncated spurs. |
| • Arêtes. | • Hanging valleys. | • Crag and tail. |
| | | • Roche montanee |



1. CORRIE / CIRQUE / CORM.

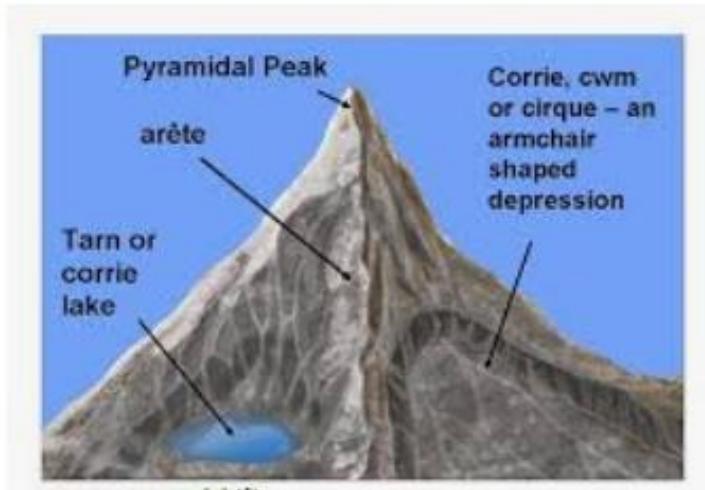
A corrie is a steep sided rock basin (arm-chair) formed by glacial erosion on the side of a mountain.

It is formed when water freezes into the cracks in a rock and later breaking into particles.

NB:

If a corrie contains water, it is called a glacial lake or a tarn.

Examples of tarns in East Africa include Lake Teleki, Lac du speke, Lac Catherine, L.Baker, L.Speke and Tyndoll.



2. ARETE.

An arête is a narrow steep sided rock ridge or knife-edge like ridges separating two cirques for example Arete radiating eastward down to Mugusu valley.



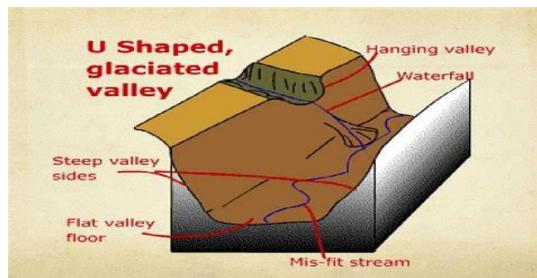
3. PYRAMIDAL PEAK / HORN.

This is a pointed peak formed where three or more arêtes meet.
It is formed by back wall recession.



4. U-SHAPED VALLEY.

This is a broad valley with a flat bottom. Originally it was a small valley but widened by processed plucking and abrasion for example Mugusu, Bujuku and Teleki valley.

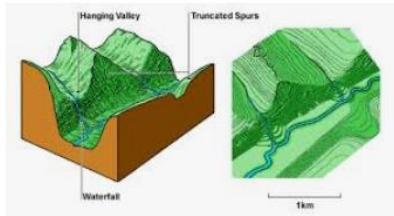


5. HANGING VALLEY.

A hanging valley is formed when a small tributary joins a major stream of glacier. The major stream erodes its valley faster than its tributary thus deeper than the tributary valley.

This makes the tributary valley to remain hanging up as a hanging valley.

NB: The hanging valley will then pour its water into the main valley to form a water fall for example Speke glacier joining Bujuku valley.



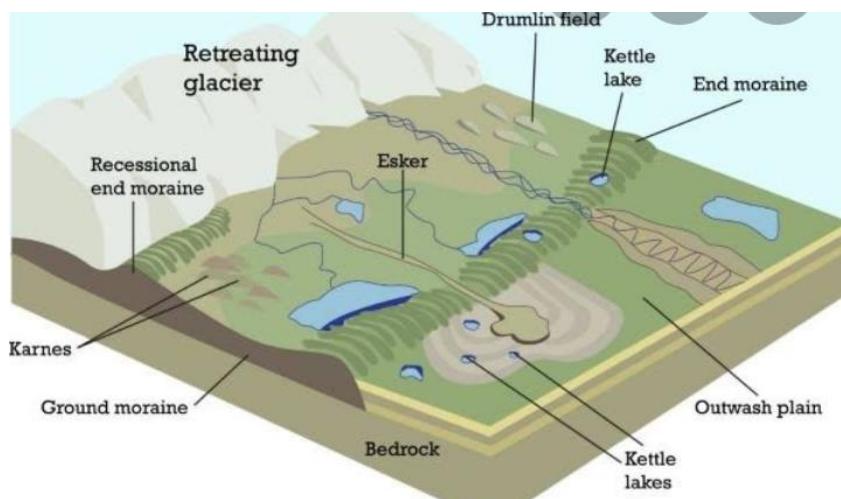
GLACIAL DEPOSITION LANDFORMS.

The deposit or load carried by a glacier is known as moraine which can be;

- a) Lateral/side moraine.
- b) Dorsal (top).
- c) Medial (middle) moraine.
- d) Ground (bottom).
- e) Terminal (end) moraine.

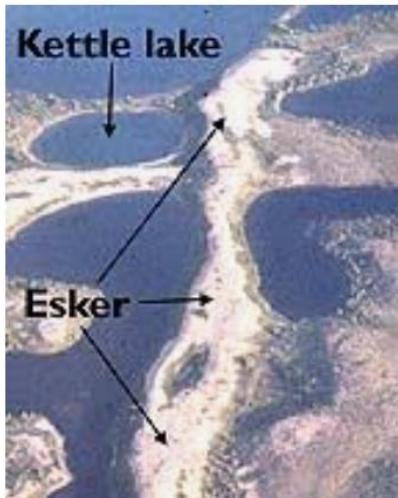
Glacial deposition landforms include the following

- | | | |
|-----------|------------------|------------------|
| - Drift | - Eskers | - Kettle holes |
| - Erratic | - Kames | - Moraine dammed |
| | - Out wash plain | |



ESKERS.

It is a long winding stick sided ridge lying parallel to the direction of the ice movement foreexample river Nithi guge valley, Mobuka valley.



KAMES.

This is an irregular undulating mounds of bedded sands and gravel deposited randomly.



KAME TERRACE.

A narrow flat topped like range of sand gravel along the valley sides foreexample Kamusoso valley on Mt. Rwenzori, Hobley valley on Mt. Kenya.

**Erratic.**

Boulders transported by moving ice for a long distance & deposited for example Nithi valley, Bujuku, Kamusoso valley.

**Till plain.**

This is an extensive area of glacial till landscape formed when moving ice transport boulders and they cover former hills and valleys for example Teleki valley, Mobuku valley.

**Drumlins.**

These are elongated hills formed when fragments of brown moraine are compressed by ice movements for example Teleki valley.



Outwash plains.

A wide gently sloping plain of gravel, sand, clay and silt for example Kibo and Mawenzi on Mt. Kilimanjaro and Mobuku and Bujuku valleys on Mt. Rwenzori.



Moraines.

Unconsolidated glacial deposits made up of boulders, clay, silt & sand.



Kettle holes.

These are circular holes in glaciated areas formed when blocks of ice are detached leaving behind circular depressions for example Mahoma kettle hole on Mt. Rwenzori.



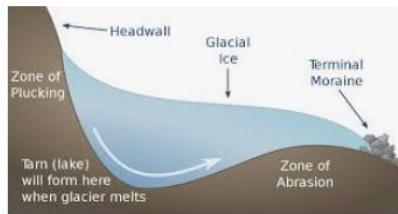
Moraine dammed lakes.

Lakes formed when moraine blocks a river valley or stream.



NB: the lakes formed due to glaciation include the following:-

- Tarns lakes.



- Ribbon lakes



- Moraine dammed lake.

Glacial denudation features

- Inselbergs.
- Plains.
- Tors.

REASONS WHY GLACIERS IN EAST AFRICA ARE LIMITED TO MOUNTAINS KILIMANJARO, RWENZORI AND KENYA.

Glaciers are limited in East Africa because of the following:-

1. Many parts of East Africa have low altitudes that is to say below 3000m above sea level.
2. East Africa lies astride the equator where temperatures are high for glacial accumulation.
3. There is influence of global warming.
4. Deforestation.
5. Influence of Vulcanicity that is to say Vulcanicity is associated with high temperatures affecting glacial accumulation.
6. Large scale industrialization that is to say industries emit carbondioxide into the atmosphere which raises temperatures affecting glacial accumulation.
7. The rain shadow effect especially on the lee ward side of mountains which doesn't allow the formation of glacier.
8. East Africa does not experience winter conditions.

IMPORTANCE/ADVANTAGES OF GLACIATION IN EAST AFRICA.

1. Promotes research and scientific study.
2. Glacial landforms such as arête and pyramidal peaks are tourist attraction thus source of foreign exchange.
3. Glacial areas are sources of lakes and rivers which provide water for domestic, Industrial & Educational purposes forexample river Mobuku on Mt. Rwenzori which provides water to Mobuku irrigation scheme.
4. Moraines provide fertile soils for Agriculture.
5. Hanging valleys are used for Hydro-electric power generation.
6. Glaciations promote fishing in the lakes forexample Tarns, Ribbon lakes, Moraine dammed lakes.
7. Glaciations also leads to the provision of construction materials especially the boulders.
8. U- Shaped valleys provide natural route ways.
9. Glaciations promotes sports and re-creation forexample skiing on Mt. Rwenzori.
10. Provides employment to a number of people in East Africa forexample the fishermen and tour- guides thus improving on their standards of living.
11. Glaciations has led to the development of infrastructure forexample roads connecting to tourist sites.

DISADVANTAGES OF GLACIATION.

1. Promotes soil erosion and landslides which may lead to the destruction of property and lives.

2. Formation of out wash plains which contain fertile soils for Agriculture.
3. Leads to cold temperatures discouraging settlements on Mountain slopes.
4. Glaciated areas sometimes turn into many small lakes thus making the area to be a waste land.
5. Melting of glaciers may cause flooding of rivers which destroys lives and property.

COASTAL EROSIONAL AND DEPOSITION FEATURES.

COASTAL TERMS.

COAST.

It is that broad area where the sea or lake comes into the contact with the land.

SHORE.

This is that area near the coast lying between the higher and the lowest water levels.

BEACH.

This is an accumulation of deposits (sand, shingles.).

WAVES.

These are oscillations on the surface of the water body. These waves move up and down to create troughs and crests.

Waves are caused by the following:

1. Wind duration.
2. Catastrophic events like earthquakes.
3. Effects of moving objects in water foreexample ships large and sea animals.
4. Wind velocity and fetch (distance travelled by waves on the water surface)

Waves are of two types:

1. Destructive waves (storms).

These destroy the coastal lands.

2. Constructive waves (gentle waves).

They build on the coastal land or beaches.

NB:

Swash- is when water runs up on the shores sweeping materials forward on the slope.

When water is exhausted the water runs back to the sea under the influence of gravity, this is called a back wash.

LANDFORMS OR FEATURES DUE TO WAVE ACTION.

Wave action along the coast results in the formation of two types of landforms that is to say;

- A. Wave erosional landforms.
- B. Wave depositional landforms.

WAVE EROSIONAL LANDFORMS.

These landforms are brought about by the following process

1. Abrasion or corrosion.

The load in form of boulders, pebbles and sand are hurled against the shore line by the waves.

2. Hydraulic Action by the waves.

This is the wave force heating against the shore line by compressing air in areas of weakness.

3. Corrosion/Solution.

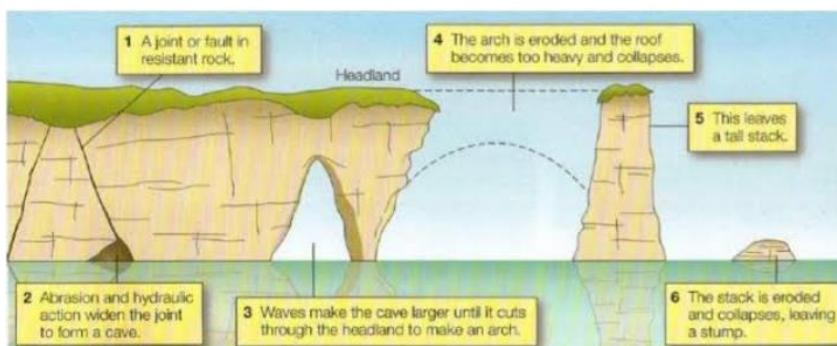
This is the solvent action of waves on soft rocks like limestone.

4. Attrition.

The load carried by the waves are broken to successive smaller particles by hitting each other as they move.

The wave erosional landforms therefore include the following:-

- Bays /Inlets /Caves.
- Headlands /Cape.
- Cliffs.
- Inlets /Geos.
- Stacks /Chimney.
- Arches.
- Stump.
- Blowhole.



Headland & Bay.

Headland is a piece of land projecting into a water body. A Bay on the other hand is an indentation of the coastal lands by water.

Formation.

On exposed coasts, the continued action of waves on rocks of varying resistance causes the coast line to be eroded irregularly. This is pronounced where hard rocks like granite occur in alternate bands with softer rocks. The softer rocks are eroded back to form bays, inlets or caves for example Murchison and Kibanga bays on Lake Victoria. The harder resistant rock persists to form headlands or promontories or caves for example Kibanga headlands on L.Victoria and Watamu on the Kenyan coast.



CLIFFS AND WAVE CUT PLATFORM

A cliff is a steep rock face along the coast.

Cliffs are formed when waves cut a notch (small opening) on the coastal land by abrasion hydraulic action and solvent action of waves.

Repeated wave action will enlarge a notch transforming it into a steep slope called a cliff.



A wave cut platform is a bench like feature sloping sea-wards below the cliff. It is formed when the cliff recedes (erodes backwards) leaving behind a gentle sloping platform called wave cut platform.



Caves, Blow Holes and a geo (Inlet).

A cave.

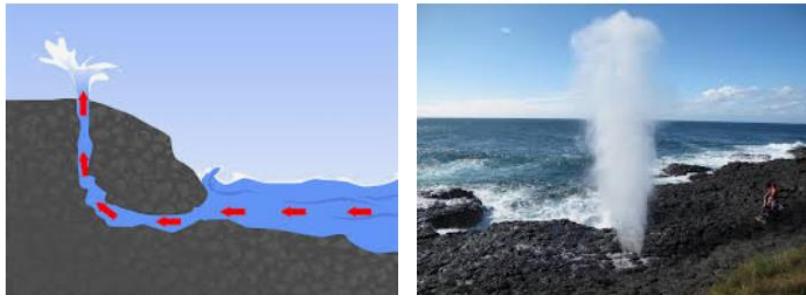
A cave is a cylindrical tunnel drilled through the cliff or headland by wave erosion.
The breaking of waves compress air in areas of weakness like faults enlarging it to form a cave.



A BLOW HOLE.

It is a vertical shaft above the cave.

Splashing of waves against the roof of a cave may enlarge the joints when compressed air is trapped. A natural shaft is thus formed which may eventually pierce through to the surfaces. This is called a blow hole.



A Geo is a narrow sea inlet formed when the roof of the arch collapses.

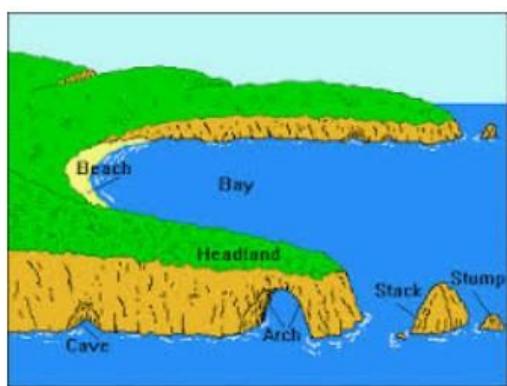


Arches, Stacks and Stumps

An arch is a raised bridge like feature above a passage drilled through a headland. It is formed when two caves approach one another from either sides of a headland and unite or join.

The roof of this arch may collapse leaving a piece of land detached at a sea or lake to form a stack

These stacks may be worn down by wave erosion to form a small related landform called a stump.





LANDFORMS DUE TO WAVE DEPOSITION.

Materials along the coast are transported by long shore drift and deposited along the coast to form wave depositional landforms.

These landforms include beaches, sand bars, Spits, Cuspate foreland, Tombolos and Mud flats.

A BEACH.

A beach is a coastal accumulation of sand and shingle (small rounded stones) on the shore or coast. Examples of beaches in East Africa include: - Mombasa beach, Gaba beach, Lutembe beach, Lido beach, Imperial beach, Nyali beach.



SAND BAR.

This is an elongated ridge of sand or shingle running roughly parallel to the coast.



SPITS.

This is a low narrow ridge of pebbles or sand joined to the land at one end with the other terminating in the sea or Lake Forexample Tonya spit on L.Albert, Nabugabo spit on L.Victoria.



CUSPATE FORELAND.

This is a large triangular deposit of sand and shingle projecting sea wards.



TOMBOLO.

This is a spit which grows at the coast linking an island to the coast for example Bukakata tombolo on L.Victoria.



MUD FLATS.

This is a flat form of mud composed of silt or alluvium formed along gently sloping coasts especially in bays, estuaries and delta.



EUSTATISM /EUSTATIC MOVEMENTS.

Eustatism refers to changes in the sea level which may be positive involving a rise in sea level or negative involving a fall in sea level relative to the coastal land.

The changes in the sea level may be caused by the following:-

1. Increased precipitation (rainfall) and desiccation (drought).
2. Glaciations (freezing) and deglaciation (melting).
3. Increase in temperature will lead to a rise in sea level because water expands when heated from beneath.
4. Tectonic movements for example uplift of the coastal land down warping of the coastal lands. Expansion and contraction of ocean basins.
5. Sedimentation of materials into ocean basins.

LANDFORMS DUE TO SEA LEVEL CHANGES.

Sea level changes have led to the formation of two types of landforms that is to say;

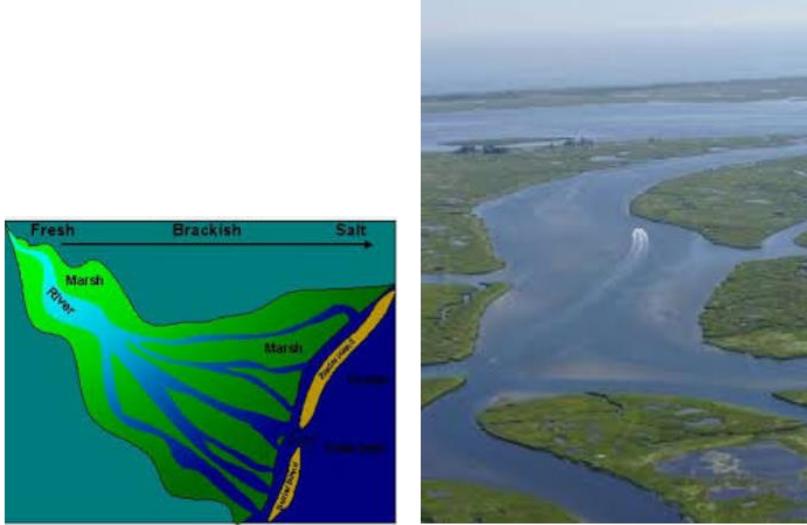
a). **Submergence coasts.**

These landforms are formed when there is rise in sea level and these include;

1. **Hord** – Narrow sea inlet (Not found in East Africa) filled with water during deglaciation.
2. **Ria/Creek** – This is a drowned river valley formed due to a rise in sea level for example Kilindini harbor, Port Tudor, (Mombasa) Mtwapa and Kilifi creeks (Dar-es-salaam)

3. **Estuary**

This is a wide shallow drowned river mouth formed as a result of a rise in sea level for example R.Rufiji and R.Mwachi.



4. Dalmatian /Longitudinal coasts.

These are highlands running parallel to the coast due to a rise in sea level for example Islands of Pemba, Mafia and Zanzibar and Chake –Chake.



b). Emergence Coasts or Landforms.

These are formed when there is a fall in sea level. They lead to the exposure of the formerly submerged landforms.

Such landforms include:-

1. Raised beach (Former beach).
2. Raised cliff (Former cliff).
3. Raised terrace (Former wave cut platform).

CORAL REEFS.

A coral reef is a limestone rock made up of skeletons of tiny marine organisms called polyps. These skeletons contain calcium carbonate [CaCO₃] that when polyps die their skeletons accumulate on the continental shelf to form white coral limestone rocks.

Coral reefs occur on the East Africa coast especially at Bamburi-Mombasa.

CONDITIONS OR FACTORS FOR CORAL GROWTH.

1. The ocean waters must be warm between 20-30°C which provides ideal warmth for the growth of polyps.
2. The water must be salty. This provides calcium salts to cement the skeleton bones of the dead polyps.
3. There must be an environment of water which is calm.
4. The water should be shallow in order to allow enough light and heat to penetrate in to the water.
5. There should be presence of polyps or marine organisms.
6. Presence of a continental shelf on which the corals grow from.
7. The water should be clear, clean and oxygenated.
8. Absence of strong currents to interfere with coral reef accumulation.

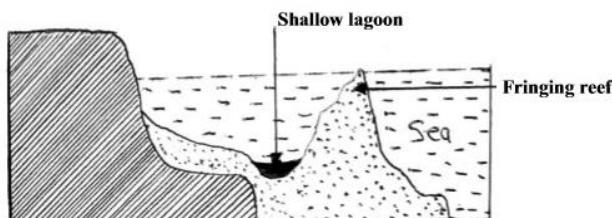
TYPES OF CORAL REEFS.

There are three types of coral reefs that is to say;

1. Fringing reef.

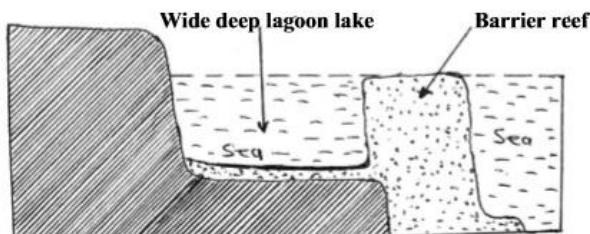
This is a coral platform up to 1km wide, joined to the coast or separated from a shallow lagoon.

lake.



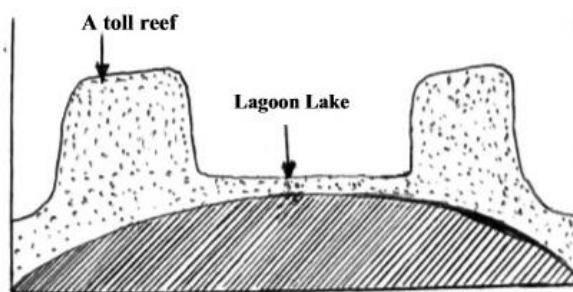
2. Barrier reef.

This is a coral platform separated from the coast by a wide and deep lagoon.



3. An Atoll.

This is a circular coral reef or a ring of coral surrounding a fairly deep lagoon.



ECONOMIC IMPORTANCE OF CORAL REEFS TO MAN IN EAST AFRICA.

1. Coral reefs provide man with raw materials for the manufacture of cement.
2. Coral reefs are tourist attractions and thus alternative sources of foreign exchange.
3. They protect the ports from direct wave attack for example port Mombasa.
4. Coral reefs are sources of minerals for example petroleum.
5. Lagoons within the coral reefs provide grounds for recreation for example swimming and sun bathing.
6. The lagoons also provide water for domestic, industrial and irrigation purposes.
7. Coral reefs promote industrial development for example the Bamburi cement factory in Mombasa hence providing employment opportunities to the growing population.
8. Coral reefs provide employment to many people for example miners, industrial workers and researchers thus improving on their standards of living.
9. Coral reefs are sources of fertile soils for agriculture especially the growing of cloves and coconut.
10. They are grounds for research and scientific study by students studying geology at higher institutions of learning like universities.
11. Coral reefs restrict the movement of dangerous marine animals from attacking swimmers and fishermen.
12. Coral reefs are platforms for port development.

PROBLEMS /DISADVANTAGES OF CORAL REEFS.

1. Hinder fishing by tearing the fish nets and navigation forexample fringing and barrier reefs.
2. The lagoons are breeding grounds for mosquitoes and snails which spread malaria and bilharzia to people respectively.
3. Some coral reefs lead to the formation of poor and infertile soils which are not suitable for agriculture.
4. Industries related to coral reefs like the Bamburi cement factory pollute the environment.
5. Quarrying of limestone leads to environmental degradation.

RIVERS AND RIVER SYSTEMS IN EAST AFRICA.

A river is a body of water flowing over the land surface through a definite channel or a linear direction.

There are three forms of rivers that is to say:-

1. **Permanent rivers.**
2. **Seasonal rivers.**
3. **Ephemeral rivers.**

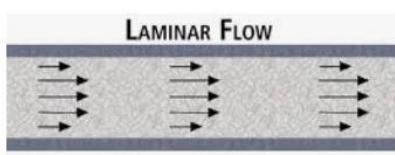
- A place or point where a river begins is called **a source** which can be a spring, glacier, swamp, lake and a place or point where it ends is called **a mouth**. It can be a swamp, sea, ocean, lake.
- The junction of two or more rivers is known as a **river confluence**.
- When a small river or a stream joins a major river is called **a tributary**.
- The area drained by a river and its tributaries is called **a river basin or a catchment area or a drainage basin** forexample Lake Victoria basin.
- An area of a higher land that separates two or more basins is called **a river divide or a water shed or water parting**.
- The main river and all its tributaries together form **a river system**.
- A **river regime** is a seasonal variation of water volumes.
- The materials carried by a river are known as **load**.
- A **river competence** is a measure of the ability of a river to carry its load.

NATURE OF FLOW.

The water in a river flows in two ways;

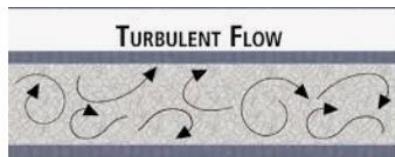
1. **Laminar flow.**

This is a smooth flow of a river over its base bend bed.



2. Turbulent flow.

A river flows in a circular or rough manner because of flowing over a rough bed.



WORKS OF THE RIVER.

A river performs three basic functions namely;

1. Erosion.
2. Transportation.
3. Deposition.

River Erosion.

It involves the following processes;

1. Attrition.

A process by which the load itself is broken down because the rock fragments are in motion and colliding with each other.

2. Corrosion /Abrasion.

This is the wearing away of the sides and bed of the river channel by the load.

3. Solution.

Soluble minerals dissolve in water and are carried away in solution.

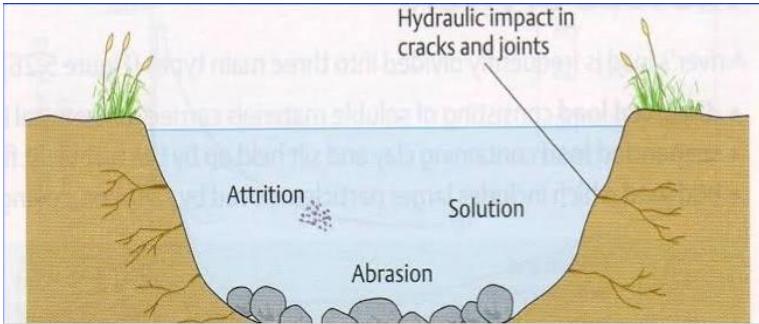
4. Hydraulic Action.

This is the mechanic source of moving water which is able to remove loose materials such as gravel, sand and silt.

River erosion operates in three ways:-

- a) Head ward erosion (lengthens the valley).
- b) Vertical erosion (Deepens the valley).
- c) Lateral erosion (Widens the valley).

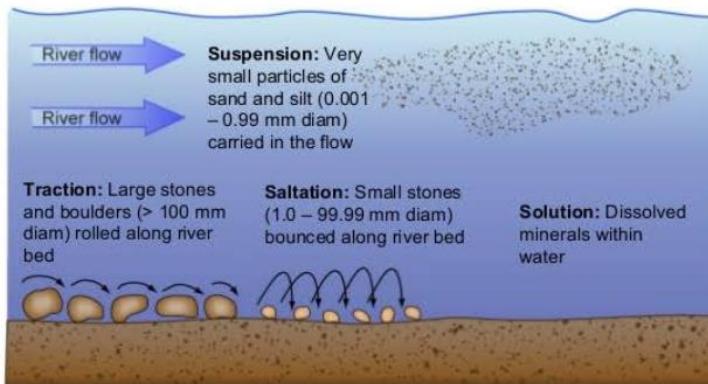
NB: The lowest point to which a river can erode its bed is called Base level.



River Transport.

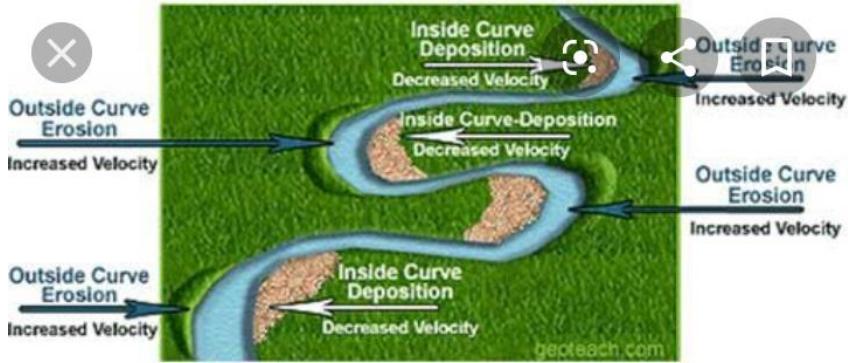
A river transports its load in four major ways / processes that is to say;

1. Traction:
This is the dragging /rolling of large materials on its bed forexample pebbles.
2. Saltation:
This is bouncing of small particles on its bed.
3. Suspension :
This is the transportation of life particles held in water (suspended) forexample silt and mud.
4. Solution:
Small particles are dissolved in water and then transported forexample lime stone.



River Deposition

A river deposits its load when its energy to carry has greatly reduced. The materials deposited by a river are called **alluvium**.

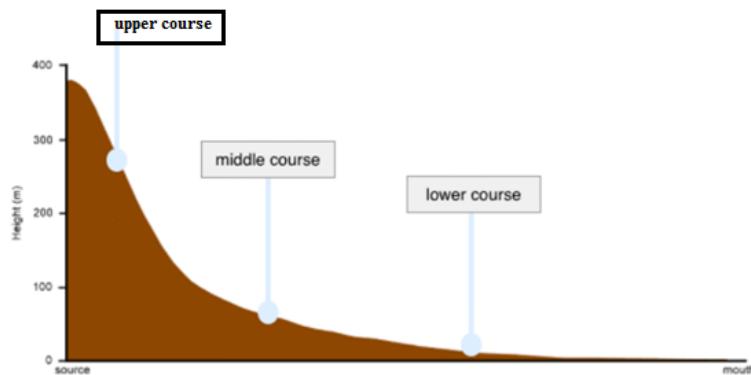


River Profile.

A river profile is a measured slope of a river along its base bed and surface from the source to the mouth. It's a cross-section of a river from its source to the mouth.

A river profile has three stages:-

1. Youthful /Torrent /Source /Upper stage.
2. Mature /Middle /Valley stage.
3. Old /Senile / Mouth / Flood plain.



Youthful Stage.

This is a stage where a river originates in East Africa, the following rivers are in their youthful stages:-

- R. Mobuku
- R.Nile at Bujagali
- R.Manafwa.
- R.Nyamwamba
- R.Sironko.

Characteristics of the youthful stage.

- The gradient is very steep.
- The water speed is very fast.
- Vertical erosion is dominant.
- No deposition.
- The valley is very narrow.
- Small volume of water.

The flow of water is turbulent (rough).

The major features or landforms in this stage include the following:-

-Waterfalls. - Rapids. - plunge pool. - V-shaped valley.
-Gorges. -interlocking spurs. -pot holes.

Waterfall.

A waterfall is a mass of water falling from a higher level to a lower level. Waterfalls are formed in the following ways:-

- a) When a resistant rock lies across a river.
- b) When a river falls across a fault line.
- c) When a river falls across the edge of a plateau.
- d) Where a river enters a hanging valley.
- e) When a river enters a cliff.

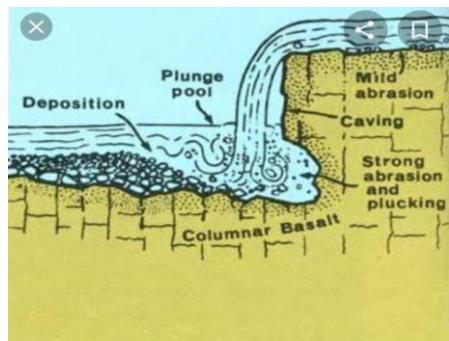


Examples of waterfalls in East Africa.

- Sezibwa falls
- Karuma falls
- Sipi falls
- Adamson
- Thinka falls

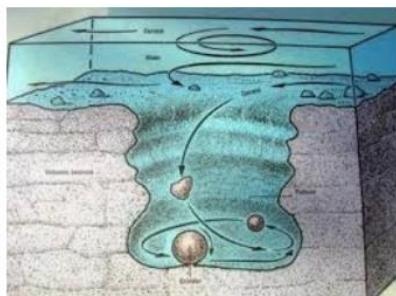
Plunge Pool.

This is a depression at the bottom of a waterfall. Plunge Pools are formed by hydraulic action and abrasion.



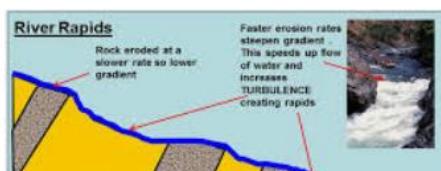
Pot Holes.

These are circular depressions on the river bed. They are formed when pebbles are carried by a swirling river cut circular depression in the river bed.



Rapid.

A section of rough, fast flowing water in a river channel. It's formed where a waterfall has been eroded.





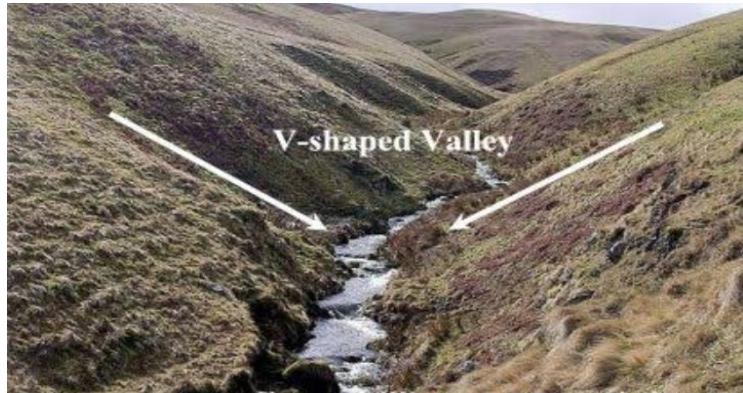
A Gorge (Canyons/Ravine).

This is a deep narrow valley with high vertical banks resulting from vertical erosion



V-Shaped Valley.

These are formed by vertical erosion and they are pronounced in valleys with beds less resistant than those on the sides of the valley.

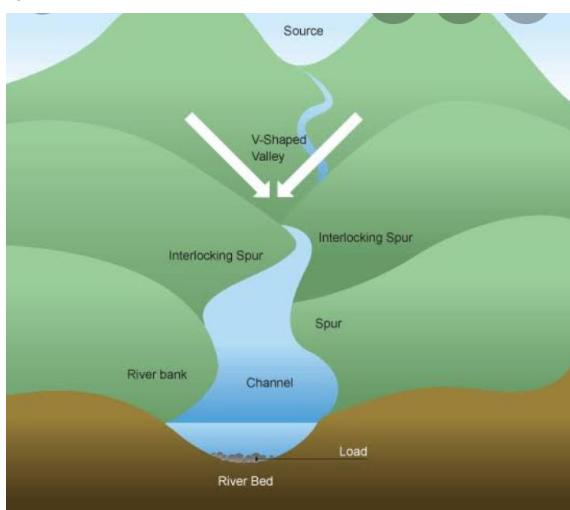


Interlocking Spurs.

Vertical erosion rapidly deepens the valley. The river twists and turns around obstacles of hard rock erosion is pronounced on the concave banks of the bends and these ultimately causes spurs (land projections) which alternate on each side of the river to interlock (Interlocking Spurs)

Interlocking spurs can be seen on the following rivers:-

- Semiliki. -Ruvuma.
- Mobuku.
- Nyamugasan.





MATURE /MIDDLE STAGE /VALLEY STAGE.

This is the middle stage in the river profile.

Characteristics of this stage.

1. The gradient is more gentle.
2. Lateral erosion is dominant.
3. River meanders begin to form.
4. The valley flow is wide.
5. The speed of water is relatively slow.
6. Deposition begins to take place.
7. The valley has a U-shaped section.

The landforms in this stage include:

- | | |
|-----------------------|--------------------|
| - U-shaped valleys. | - Meanders. |
| - River cliffs /Bluff | - Slip off slopes. |

1. U-Shaped Valley.

This is an original valley which has been widened by lateral erosion.



2. Meander.

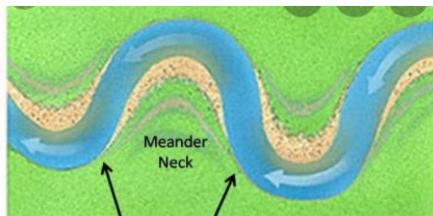
It's a current bend of a river channel.

It is formed by an alternate undercutting and deposition at the concave and convex banks of a river channel respectively.

NB: The concave bank because of rampant erosion, a river cliff or bluff is formed while on a convex bank deposition is dominant leading to a formation of slip off slope.

Rivers with meanders in East Africa include the following:-

- R.Rwizi - R. Mpanga - R.Manafwa - R.Ngaila - R.Kagera



Continual erosion on these two outside bends means the meander neck gets narrower



Rio-cauto-cuba | Lanka Views

3. OLD STAGE/THE SENILE STAGE.

This is a stage where the river is about to reach its destination.

Characteristics of old stage.

1. The gradient is more gentle or flat.
2. There is much deposition.
3. The river flows in a wide flood plain.
4. The river carries a load consisting of majorly silt.
5. The water is very slow and gentle.
6. Meanders and ox-bow lakes begin to develop.

Rivers in this stage include the following:-

- R.Rwizi,R.Moroto,R.Malaba,R.Nyanda,R.Tana and R.Athi.

The landforms in this stage include the following:-

- | | |
|------------------|-------------------------|
| - Ox-bow lakes. | - Braided channels. |
| - Meander scars. | - Diferred tributaries. |
| - Flood plains. | - Deltas. |
| - Levees /bums. | |

Ox – bow lakes.

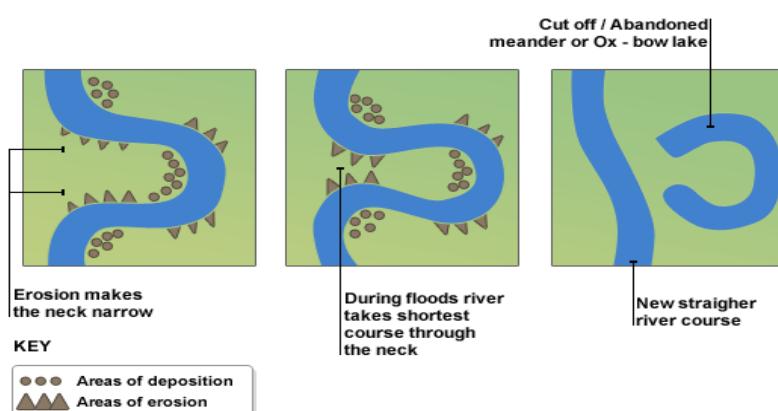
An ox-bow lake is a crescent shaped final section of once pronounced meander but now cut off from the main stream.

Ox – bow lakes are formed in the flood plains with meanders which are very sharp that only a narrow neck remains.

During flooding, the narrow neck is broken through and the river bypasses the meander cutting off by deposition to form an ox-bow lake

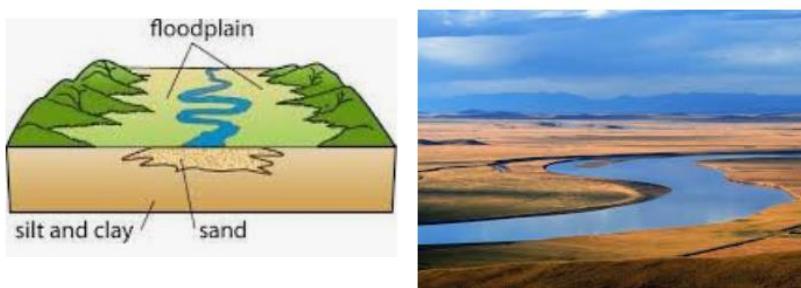
When an ox-bow lake is filled with alluvium, it dries out leaving behind a meander scar.

Ox – bow lakes can be seen along the following rivers; Nzoia, Rufiji, Tana, Rwizi Kilombero.



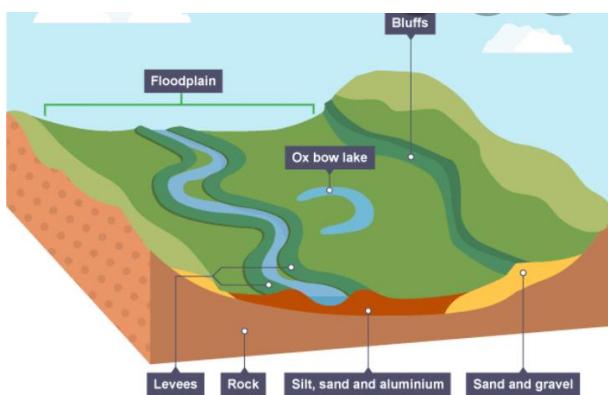
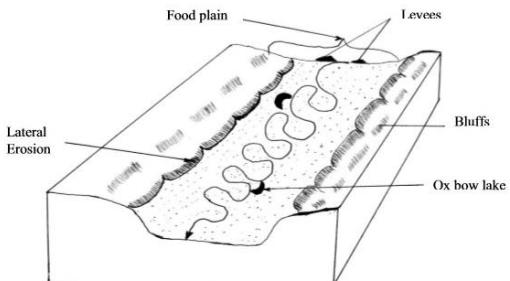
Flood Plains.

This is an area of land at the sides of the river which is susceptible to the periodic erosion.



Levees /bums.

When a river is in the flood plain, it deposits most of its load close to the river sides forming embankments called levees/bums.



Braided channels.

A braided channel is a wide shallow channel in which a river divides and sub divides in a series of minor channels separated by islands of alluvium.

Braided channels can be seen on the following rivers Rufiji, Nzoia, Valo, Nyando, Sondú, Kilombero and Tana.



Deferred tributaries and confluence.

A deferred tributary is one which flows parallel to the main river for several kilometer before joining the river due to the levees.

The confluence at which the tributary joins the main river is called deferred confluence.



DELTA.

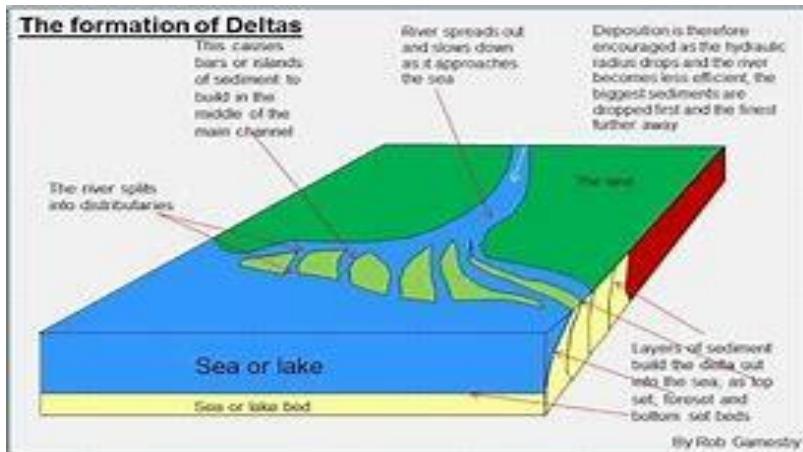
A triangular low lying swampy plain which gradually is colonized by vegetation.



The growth of a delta interferes with the flow of the river causing the river to split up into several separate channels called distributes foreexample R.Rufiji

Stages in the formation of a delta.

1. The river reaches the coast and deposits sediments.
2. The river is obstructed by sediments and branches into distributaries to discharge more sediments brought down.
3. The delta takes a characteristic fan shape extending sideways and sea wards.



Conditions for Delta formation.

1. A river must have a large amount of silt load.
2. The velocity of the river must be sufficiently low to allow most of its silt load to be deposited in the river mouth.
3. The river's silt load must be deposited faster than it can be removed by the action of tides and currents.

Types of deltas

There are three basic types of deltas

1. Arcuate Delta.

This delta consists of both coarse and fine sediments and it has the shape of an inverted cone crossed by numerous distributaries for example Nile Delta, Niger Delta.

2. Birds' Foot Delta.

This delta consists of very fine materials and it has a few long distributaries like the foot of a bird examples can be found on River Omo flowing into Lake Turkana and River Nyando.



3. Estuarine delta.

NB: landforms as a resultant of river action therefore can be categorized into two

1. Erosional landforms.

They include the following:-

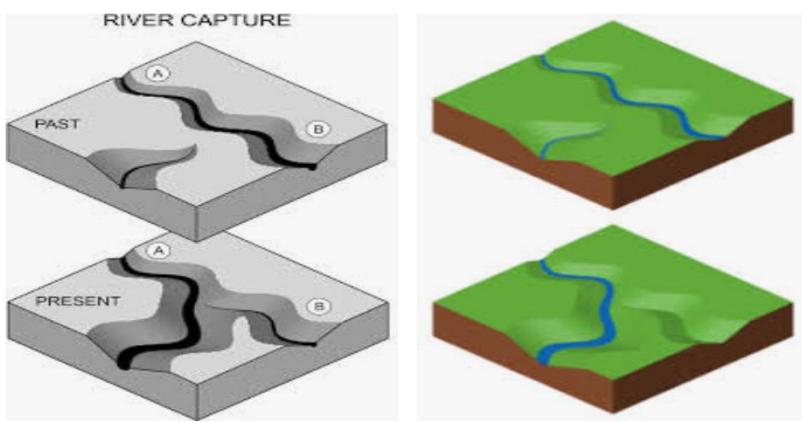
- V-Shaped valley - Interlocking spurs
- Waterfalls - Cliffs or bluffs
- Plunge pools - U – shaped valleys
- Rapids

2. Depositional landforms.

- Meanders. - Ox-bow lakes. - Meander scars.
- Flood plain. - Levees or bums. - Deltas. - Alluvial fan.

RIVER CAPTURE.

It is the diversion of part or whole of a river into a system of another adjacent powerful river able to erode its valley or rapidly than its neighbour.



The following conditions must be in place for river capture to take place.

1. The pirate river must have more water than its neighbour.
2. The pirate river should flow over easily over eroded rock.

River capture happens when one river with a big erosive floor/power elongates its basin at the expense of a weaker one.

The powerful river erodes backwards (head ward erosion) and eventually capturing the flow of a weak river.

NB: the bend at which piracy occurs is called elbow of capture. The captured stream is called misfit or beheaded stream. The valley below the elbow of capture is called wind or drys.

RIVER REJUVENATION.

It is a renewed erosive activity of a river.



It may be caused by the following.

1. Earth movements of uplift
2. Down warping
3. Tilting
4. Lowering of the sea level.

5. Increase in the stream volume due to increased rainfall.
6. Decrease in the load that a river is carrying.

River rejuvenation has led to the formation of a number of land forms in East Africa. These landforms include:-

1. River Terrace /rejuvenation terrace.

This is a step or bench like feature formed on a side of a river after the river has renewed its erosive power or activity.



2. Valley – in – valley.

This is a new valley created within an old valley after rejuvenation.



3. Incised meander.

This is a curve or bend of a river that has been deeply cut vertically (Incised) after rejuvenation. Incised meander can be of two type that is to say:-

a) Entrenched meander.



b. Ingrown meander.



4. Knick point /Rejuvenation head.

This is a break of a slope in the long profile of a river caused by renewed erosive activity. knick points are good sites for the generation of hydroelectric power.



DRAINAGE PATTERNS.

A drainage pattern is a plan/design/layout by a river and its tributaries. It's how a river & its tributaries are arranged on the Earth surface.

TYPES OF DRAINAGE PATTERNS.

1. Trellis/Rectangular pattern.

The tributaries joined the main stream at more or less right angles.

It develops in areas with heterogeneous rocks and faulted area for example R. Aswa.

2. Dendritic drainage pattern.

It looks like a tree trunk and its branches. They develop in areas with homogeneous rocks and a gentle slope like R. Athi, R. Nyando, R. Ruvuma and R. Panagani.

3. Radial drainage pattern.

Rivers flow from a central point (highlands) downwards in many directions for example R. Manafwa, R. Sipi on Mt. Elgon.

4. Parallel drainage pattern.

The rivers flow parallel to each other for a long distance. For example R. Mayanja and R. Kato.

5. Centripetal drainage pattern.

Rivers converge into a central point from all directions where they pour their water examples of such rivers include Molo, Olmukutan, Olarabel on lake Baringo.

6. Barbed/Hooked drainage pattern.

Tributaries flow in the opposite direction of the main river before joining at acute angles for example Rivers Katonga, Kagera, Rwizi and Kafu.

7. Angular drainage pattern.

Rivers join at sharp angles and are arranged in series of curves around a basin.

8. Braided drainage pattern.

Rivers divide and subdivide in series of interconnecting minor channels separated by sand banks.

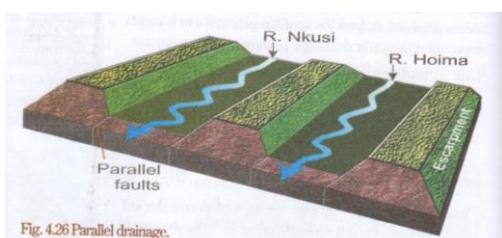


Fig. 4.26 Parallel drainage.

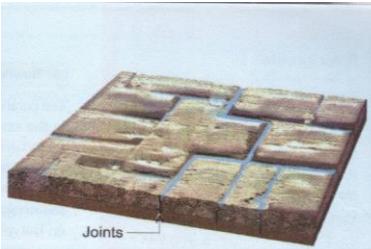


Fig. 4.23 In rectangular or trellis drainage pattern, tributaries join the main river at perpendicular or right angles.



Fig. 4.24 In radial drainage pattern, river radiate from one common point and flow into different directions.

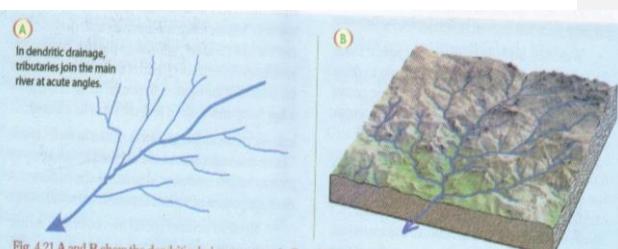
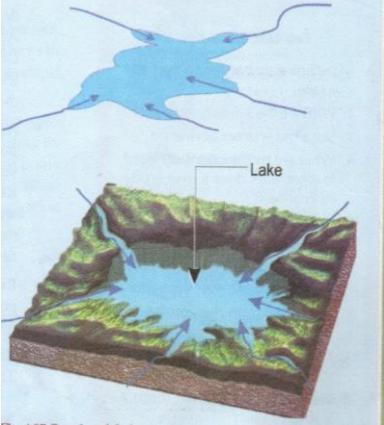
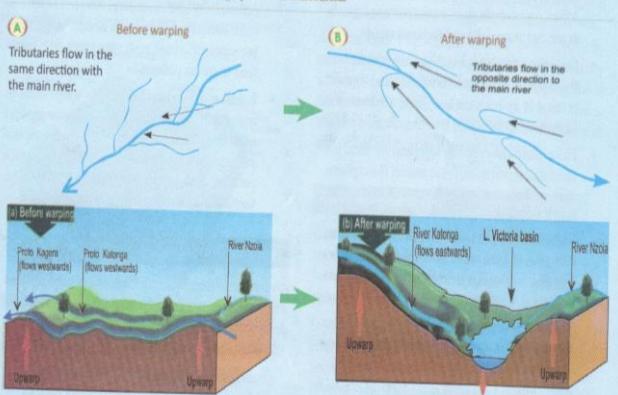


Fig. 4.21 A and B show the dendritic drainage pattern in East Africa.



LAKES IN EAST AFRICA.

A Lake is a body of water occupying a hollow or depression on the earth surface.

Lakes can be small or large, temporary or permanent, fresh or salty.

Examples of lakes in East Africa include; Victoria, Kyoga, Tanganyika, Naivasha, Rukwa, Nakuru, Turkana, Malawi, Magadi, Albert, Edward, George.

CLASSIFICATION OF LAKES ACCORDING TO ORIGIN OR FORMATION.

1. TECTONIC LAKES.

They are formed as a result of earth movement and they include the following:-

a. RIFT VALLEY LAKES:

These lakes were formed by faulting caused by tensional or compressional forces that caused fracturing of the earth crust.

Forces pushed sideways the side blocks while the central blocks sunk forming a rift valley

A basin (hollow or depression) in the rift valley was formed due to secondary faulting.

The basin was then filled with water to form a rift valley lake or Graben for example Lakes like Natron, Albert, Turkana and Magadi.

NB: Rift valley lakes don't have swampy vegetation. These are long, deep and narrow. They have salty water because they have inlets and no outlets.

Both down warping and upward processes led to the formation of troughs and ridges (rims)

Warping was caused by earth movements

Warping led to reversed drainage of rivers which filled the basin leading to the formation of a lake for example R. Kafu, R. Katonga, R. Nzoia and R. Kagera to form L. Victoria.

Examples of these lakes are L. Kyoga and L. Victoria.

These lakes have a swampy vegetation along their shores, have fresh water and they have many islands.

Questions.

a) Draw a sketch map of East Africa and on it mark and label lakes Victoria,

Tanganyika, and Magadi. Rivers: Kafu, Athi and Rufiji

b) Describe the processes which led to the formation of any one lake above.

c) Explain the economic benefits of lakes to East Africa.

d) Outline the problems facing the use of water sources to East Africa.

2. VOLCANIC LAKES.

These lakes are formed as result of volcanic activities forexample Caldera lakes which are formed on extinct mountains forexample Ngorongoro.

3. EXPLOSION CRATES.

These lakes are circular and occupy small areas forexample L.Katwe.

4. LAVA DAMMED LAKES.

These are formed when lava blocks a river valley forexample L. Mulanda, L. Munyonyi, L. Mulehe, L. Kivu, L. Butale.

5 EROSION LAKES.

These are formed by erosion activities forexample glacial lakes like L. Michealson, L. Teleki, Bujuku, Lake Catherine, L. Stanley, Lac du Speke, Kelle lake, L. Mahoma (Mt. Rwenzori) L. Etlis (Mt. Kenya).

6. DEPOSITIONAL LAKES

a) Ox-bow lakes forexample Rwizi, Tana, Nzoia, Mara, Valla, Nyando.

These are formed by River deposition.

b) Lagoons forexample Nabugabo. These are formed by wave deposition

c) Moraine dammed lakes forexample L. Tyndall, L. Ctris).

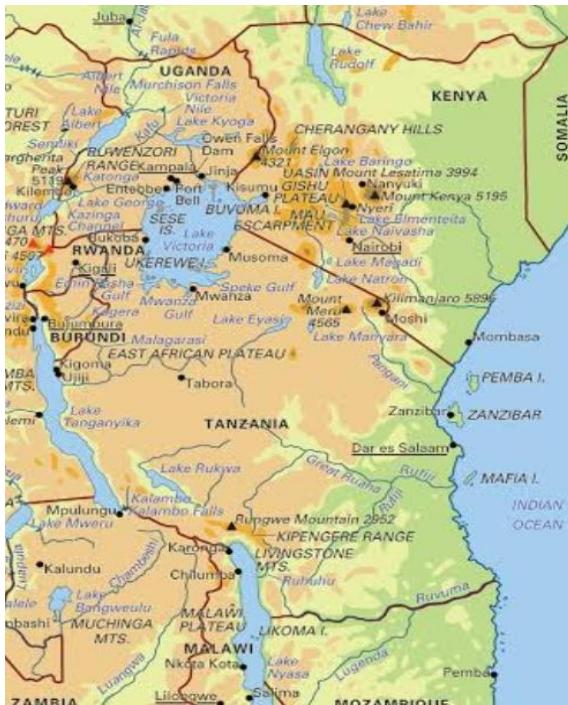
7. MAN MADE LAKES forexample

a) Valley dams forexample Owen falls dam.

b) Mining holes forexample L. Kajansi, L. Kibimba.

c) L. Kabaka which connects Lubiri to L. Victoria.

SKETCH MAP OF EAST AFRICA SHOWING MAJOR LAKES AND RIVERS.



IMPORTANCE OF LAKES AND RIVERS IN EAST AFRICA.

1. Rivers and Lakes provide water for irrigation purpose forexample L. Victoria River Kilombero and River Nile hence encouraging agriculture.
2. Rivers and Lakes promote tourism in East Africa thus earning an alternative source of foreign exchange.
3. Rivers and Lakes are sources of fish to the people of East Africa thus improving on their diet forexample L.Victoria,Kyoga, Nile and Tana.
4. They provide water both for domestic like washing and cooking and industrial purposes for cooling of machines as well as a raw material.
5. Rivers and Lakes promote navigation forexample water transport on L. Victoria.
6. Rivers and Lakes promote interstate cooperation.
7. Rivers and Lakes modify climate of the surrounding areas by forming convectional rainfall through evaporation like L.Victoria, R.Nile and R. Pangani.
8. Rivers and Lakes help in the generation of hydroelectricity power forexample L.Victoria and R.Nile which is used for lighting and running of machines in industries.
9. They are grounds for research and scientific study.
10. Rivers and Lakes provide employment opportunities for many people in East Africa forexample researchers, fishermen thus improving on their standards of living.
11. Rivers and Lakes are dumping ground for both domestic and industrial wastes.

12. Rivers and Lakes promote Agriculture because of the fertile alluvial soils.
13. Rivers and Lakes act as International boundaries like Victoria and Ruvuma.
14. Rivers and Lakes are grounds for recreation like boating riding, swimming and sun bathing.
15. Rivers and Lakes are habitats for fish and other aquatic life.
16. They are sources of government revenue through taxation and foreign exchange.
17. Lakes provide building materials in form of sand and clay.
18. They are grounds for mining like sand mining in river Manafwa.

PROBLEMS FACING THE USE OF WATER RESOURCES IN EAST AFRICA.

1. Presence of storms and waves which interfere with navigation and also lead to loss of lives and property.
2. Presence of water weeds which interferes with navigation and fishing activities.
3. Negative attitude of some people towards fishing.
4. Shallowness of some lakes for example Kyoga and Victoria which hinders movement of large water vessels
5. Steep escarpments in some parts of the Rift Valley making rift valley lakes like Albert, Tanganyika inaccessible.
6. Seasonality of some lakes which interfere with navigation and fishing.
7. Flooding that paralyses other activities in East Africa like Agriculture and settlement.
8. Water pollution by industries which deposit their industrial wastes in to the water bodies leading to death of aquatic life.
9. Diseases like malaria and bilharzia caused by mosquitoes and snails that live around and in water bodies.
10. Swampy shores of some lakes like Victoria making accessibility difficult.
11. Presence of waterfalls and rapids which make navigation difficult.
12. Low levels of technology to be used for example use of primitive methods like poisoning which leads to death of immature fish and other aquatic animals.
13. Presence of predators and pirates which are a threat to marine life.
14. Poor fishing methods like poisoning which leads to death of other aquatic animals.

PROBLEMS FACED BY THE PEOPLE LIVING AROUND RIVERS AND LAKES.

1. Flooding which destroy property and lives for example flooding of river Nyamwamba destroyed Kasese hospital.
2. Accidents caused by strong waves leading to death and loss of property.
3. Pollution by industries which deposit their wastes in Lakes and rivers leading to death of aquatic life.
4. Diseases like bilharzia caused by snails and malaria caused by mosquitoes that breed in the swampy areas around lakes and rivers.
5. Soil erosion and landslides that lead to destruction of lives and property.
6. Unfavorable Climatic conditions like heavy rains around lakes and rivers causing floods that lead to loss of lives and property.
7. Presence of protruding rocks for example rock out crops which destroy the nets during fishing.

8. Many rivers are seasonal which puts fishing and navigation at a standstill.

QUESTIONS:

1. a. Draw a sketch map of East Africa and on it mark and label;
 - i) Lakes; Victoria, Tanganyika, and Magadi
 - ii) Rivers; Kafu, Athi and Rufiji.
- b) Describe the processes which led to the formation of anyone lake mentioned in (a) (i) above.
- c) Explain the economic benefits of lakes in East Africa.
- d) Outline the problems facing the use of water resources in East Africa.

THE SOILS OF EAST AFRICA.

DENUDATION.

Denudation is the wearing down of the Earth crust.

It involves the following processes:-

1. Weathering
2. Transport (Mass wasting and erosion)
3. Deposition

WEATHERING.

Weathering is the breaking or shattering of rocks on site (In Situ).

It's also the loosening, decay and break up of rocks into smaller fragments.

TYPES OF WEATHERING.

There are three types of weathering and they include;

1. PHYSICAL OR MECHANICAL WEATHERING.
2. CHEMICAL WEATHERING.
3. BIOLOGICAL OR ORGANIC WEATHERING.

1. PHYSICAL WEATHERING.

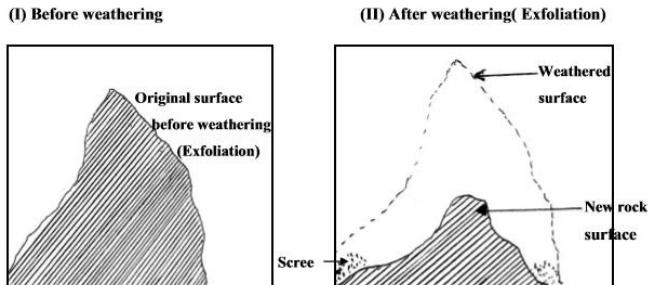
The breaking of rocks into increasingly smaller particles without causing any chemical change in the rock.

The processes of physical weathering include the following:-

a. Exfoliation (Onion Weathering).

During day time rock surfaces expand and during night rock surfaces contract. Repeated expansion and contraction due to temperature changes will lead to the peeling off of rock surfaces and expansion of rock joints leading to disintergration. This leads to the formation of a smooth rounded dome called an exfoliation dome. Forexample Soroti rock, Kachumbala, Mubende hills, Kalongo hills, Kongwa and Akia hills.

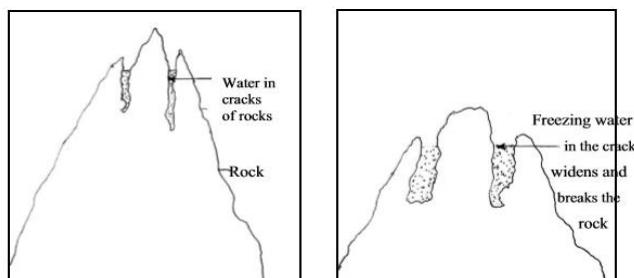
Exfoliation is common in the dry areas of East Africa.



b. Frost action /Frost shattering.

During day, water collects in the cracks between the rocks. During night when temperature fall the water freezes into ice and its volume increases. This exerts pressure leading to the breaking up of rocks.

This type of weathering is common on mountains like Kenya, Rwenzori and Kilimanjaro.



c. Rock Disintegration (Crystal Growth).

This is caused by enlargement of salt crystals between rock grains when the crystals are moistened. Heating and cooling and occasional damping cause physical expansion of salt particles creating stress and loosening surface grains. This type of weathering is common in North Eastern Kenya foreexample L.Magadi and L.Katwe.

d. Pressure Release (Uncalculating/un loading).

This occurs where the rock mass has been exposed by the removal of the over lying rock bed. The gradual release of pressure causes the rocks particularly granite to expand leading to the breakup of rocks.

e. Block Disintegration.

This takes place in well jointed rocks, alternate expansion and contraction widens the rock joints and the rock will eventually break into smaller blocks along the widened joints. This type of weathering is common in the desert and semi-desert areas of East Africa like Kachumbala in Teso Eastern Uganda and Akia in Northern Uganda.

f. Granular weathering.

This break down is due to different minerals when a rock minerals expand and contract at different rates and times causing stresses and eventual break down of rocks.

g. Alternate Wetting and Drying (Slaking).

Alternate wetting and drying of rocks leads to contraction and expansion of rocks leading to break up. It is common in the coastal areas of East Africa.

2. CHEMICAL WEATHERING.

Chemical weathering is the decomposition or decay of rocks due to chemical reaction that takes place between the rock minerals, Water and certain atmospheric gases like oxygen, hydrogen and carbondioxide.

The processes that lead to chemical weathering include the following:-

1. Hydrolysis

The reaction between water and mineral elements in rocks like granite. It's a major process in the decomposition of feldspars.

2. Oxidation

It's that reaction that occurs when additional oxygen is taken up by a mineral compound. Oxidation makes iron to rust and this leads to decay and eventually break down.

Ferrous oxide reacts with oxygen to form hematite.



Iron oxygen hematite.

3. Solution

This is the dissolving of rocks and carried away in a solution form by rain water forexample salts.

4. Hydration

A process by which certain minerals absorb water and expand causing internal stress and fracturing of the rock forexample gypsum.

5. Carbonation

A reaction between rocks containing limestone and rain water to form a weak carbonic acid which eats away the rock.



Calcium carbonate + Water + Carbondioxide Calcium bicarbonate

Carbonation leads to the formation of Kaarst Scenery forexample Stalactites and stalagmites, Grikes and Clint.

Water in limestone areas like Eastern Uganda, the coastal areas and then Nyakasura in the Rwenzori regions carry calcium water and when it evaporates, it leaves behind solid calcium carbonate (stalagmites). As moisture drips, calcium is deposited to form stalactites.

NB;-Chemical weathering is common in the coastal areas of East Africa, shores of Lake Victoria and highlands above 200m above sea level.

3. BIOLOGICAL OR ORGANIC WEATHERING.

It is the breakdown or decomposition of rocks by living organisms.

This can take the form of chemical or organic weathering.

The processes of biological weathering include:-

1. Respiration of vegetation and soil organisms which raises the levels of vegetation and carbon dioxide.
2. Burrowing and churning animals like rabbits, earthworms, termites cause rocks to break.
3. Influence of human activities like stone quarrying, road construction, rock dredging for port development and Industrial activities thus exposing the rocks to weathering.
4. The growing of plant roots through the rocks widen the rocks and they crack.

FACTORS INFLUENCING THE RATE AND CHARACTER OF WEATHERING IN EAST AFRICA.

1. Climate (Rainfall and Temperature).

Equatorial areas because of high temperatures and rainfall promote chemical weathering because of the presence of water.

Arid and semi-arid areas have low cloud cover, low rainfall and high temperatures, thus promoting physical weathering.

Indirectly climate influences the growth of vegetation which promotes biological weathering.

Rainfall influences weathering through the intensity of falling on rocks.

2. Parent Rock (Nature of the original Rock).

This is the rock which is broken down and influences weathering through its characteristics for example brightly coloured rocks are less weathered physically compared to dark coloured rocks which absorb a lot of sunlight leading to expansion during day and at night the same rock contracts.

The texture of rocks will also influence weathering. Coarse rocks break faster than fine grained rocks because the expansion and contraction capacities of coarse rocks are greater than fine grained rocks.

Soft rocks are weathered faster compared to hard rocks.

3. Relief (Topography).

Relief determines the rate and time of weathering because it determines the speed at which weathered materials are quickly removed.

Weathering therefore is faster in steep slopes and slow in gentle slopes because of flooding and weathered materials (debris).

4. Time.

The longer the time taken for weathering process to operate, the deeper the weathering and the shorter the time the shallower the weathering.

5. Biological (living organisms).

Plants and animals influence the rate of weathering especially in the humid, tropical, equatorial areas. When they die, they decompose to form humic acid which breaks the rocks when they come into contact.

6. Man's activities.

Like stone quarrying, mining, road construction, bush burning, agriculture are responsible for weathering.

IMPORTANCE OF WEATHERING.

POSITIVE.

1. It leads to the formation of soils and thus boosting agriculture.
2. It leads to the formation of different landforms like tors, exfoliation domes, earth pillars. These landforms are tourist attractions and hence sources of foreign exchange.
3. Weathering also leads to the exposure of minerals that is to say promoting the mining industry.

NEGATIVE IMPORTANCE.

4. It promotes mass wasting and soil erosion. These are destructive to man as well as his crops.
5. The karst scenery is barren and thus not suitable for agriculture.
6. Weathering destroys buildings.
7. Weathering hinders agricultural mechanization.

SOIL.

Soil is a weathered layer of parent rock covering the Earth's surface which sustains plant growth.

It is a natural accumulation of unconsolidated particles and organic matter (humus) that covers the Earth's surface and forms the supporting medium of plant growth.

It is formed when rocks are weathered into tiny particles for example loam, clay and alluvial.

The importance of soil to man.

1. Soil promotes Agriculture because it forms the supporting medium for plant growth.
2. Soil forms a basis for research and scientific study.
3. They are sources of minerals like gold.
4. Soil provides employment to a number of people leading to earning of income for example builders, brick makers and miners.
5. Soil form a platform for construction (settlement).
6. Soil provides building materials to man for example sand.

7. Soil promotes industrial development by providing raw materials to industries like tiles industries and ceramics industries.
8. Soils are used for decoration purposes.
9. Soils modify climate through formation of rainfall.

The composition of soils.

Soil has the following contents/composition.

1. Inorganic Matter (minerals)-plant food.
2. Organic Matter (humus)-adds colour, fertility of the soil.
3. Water-used by living organisms.
4. Living organisms-Air provision.
5. Air.

SOIL TERMS.

1. Soil texture.

This is the physical size of soil particles.

2. Soil PH.

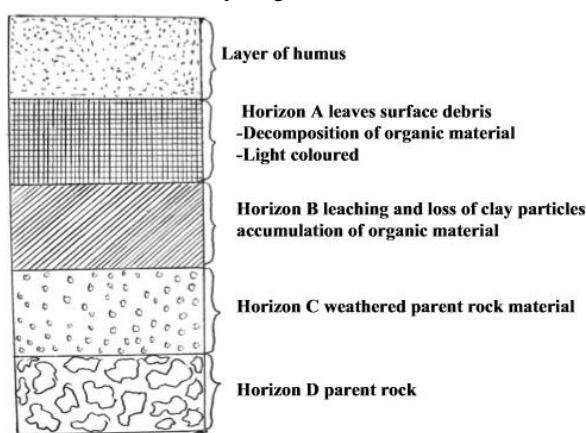
This is the degree of acidity and alkalinity of the soil.

3. Soil structure.

4. Soil profile and soil Horizon.

Soil profile is the vertical section through the soil to underlying solid rock.

Soil horizon is the horizontal layering of the soil.

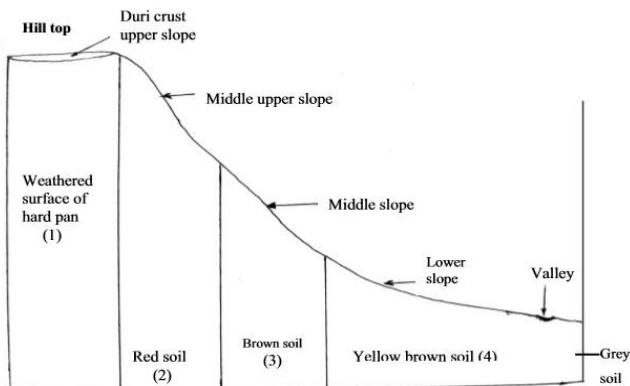


5. Soil catena.

This is the arrangement of soils down slope

or The horizontal sequence of soils along the slope.

THE STRUCTURE OF SOIL CATENA



NB: Its formation is influenced majorly by relief.

6. Leaching.

This is the removal or washing down of soluble minerals like aluminium and silica from the upper layer to the deeper layer of the soil.

Leaching is responsible for the formation of laterites (murrum soils) which are useful for road construction and brick making.

7. Elluviation.

This is the movement of solid materials in solution/suspension from one place to another in the soil.

8. Illuviation.

This is the precipitation and accumulation of leached and elluviated materials from the B horizon in the soil profile.

FACTORS INFLUENCING SOIL FORMATION.

1. Parent rock.

This is the rock material that breaks down to form soil particles (regolith). Soft rocks like limestone are weathered quickly to form deep soils while hard rocks like granite weather slowly to form thin soils.

The colour of the rock will also determine whether the soils will be deep or thin soils. Course grained parent rock gives rise to deep soils while fine grained soils give rise to shallow soils.

2. Climate (Temperature and Rainfall).

Rainfall leads to flooding which speeds up the rate of weathering. The intensity of rain falling on rocks will also influence soil formation. Temperature changes further will influence soil formation.

Climate also influences the growth of vegetation which adds on humus in the soil.

3. **Living Organisms.** Burrowing and churning animals like rabbits, earthworms, termites which form cracks in the rocks.

The vegetation provides humus which is a very important aspect in the soil.

Man through his activities may also influence soil formation for example construction, deforestation, mining, industrialization, agriculture.

4. **Relief.**

Steep slopes form shallow or thin soils because of excessive run off which prevents deep weathering while gentle slopes form mature soils because the rate of removal of soil is the same with rate of deposition.

Valley relief promotes water logging and leaching leading to poor soils.

5. **Time.**

Rocks which have had a long time of operation on the soil formation form mature soils while those that have less time tend to be shallow and immature.

SOIL EROSION IN EAST AFRICA.

Soil erosion is the removal or washing away of the top soil by agents like running water, wind, moving ice and animals.

Types of soil erosion:

In East Africa there are three types of erosion

1. **WIND EROSION:**

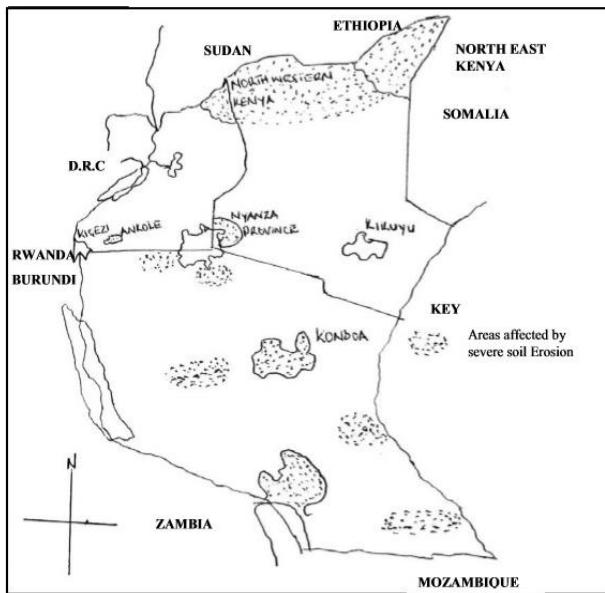
This type of erosion is experienced in the following areas Machakos (Kenya), Northern Uganda (Kilimanjaro), Northern Kenya (Turkana), Nyanza Province (Kenya) Ankole Masaka, Kondoa (Tanzania)

The Kondoa district in central Tanzania experiences severe soil erosion in East Africa.

2. **BIOLOGICAL / ORGANIC EROSION:**

3. **WATER EROSION:**

A SKETCH MAP OF EAST AFRICA SHOWING AREAS AFFECTED BY SOIL EROSION.



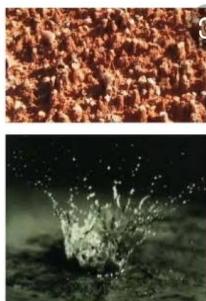
The following are the processes of water erosion.

i. Splash erosion.

Which is the impact of rain drops directly on the soil.

1. Splash Erosion

- Splash erosion is the first stage of the erosion process. It occurs when raindrops hit bare soil. The explosive impact breaks up soil aggregates so that individual soil particles are 'splashed' onto the soil surface.



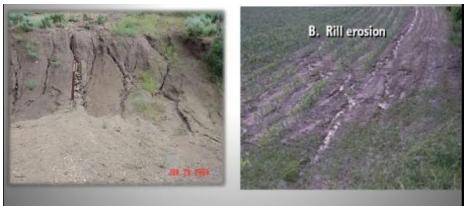
ii. Sheet erosion.

This is the uniform removal of top soil by water



iii. Rill erosion

Un even removal of the top soil by water.



iv. Gully erosion

This is the deep cutting of the grooves on the land by water. It's the common type of erosion in the Kondoa district (Tanzania). Running water is by far the most important, wide spread and destructive as far as erosion is concerned in East Africa.



In East Africa Soil erosion is common on highlands, the East Africa Rift Valley, mining areas and areas with heavy rainfall.

Soil erosion by glacier is expanded on the following mountains; Kenya, Kilimanjaro, and Rwenzori.

CAUSES OF SOIL EROSION IN EAST AFRICA.

Physical causes or Natural causes.

1. Relief – steep slopes such as the slopes of Mt. Elgon, Kilimanjaro promote soil erosion especially if there is no vegetation and there is heavy rainfall.
2. Heavy rainfall on steep slopes foreexample Kigezi in South Western Uganda
3. Constant occurrence of drought which leaves the land bare for agent of erosion foreexample North Eastern Uganda, Northern Kenya and Central Tanzania.
4. Earth quakes which form cracks making the rocks weak.

Human factors / causes of soil erosion.

(Accelerated caused by man's activities)

1. Monoculture i.e. the growing of one crop over and over again leads to soil deterioration and then soil erosion.
2. Deforestation – cutting down of trees on steep slopes leaves the land bare for agents of erosion foreexample Kigezi highlands, Kenya highlands and Mt. Elgon.
3. Over cropping without a period of rest like the Kenyan highlands, Kigezi highlands, and slopes of Mt. Kilimanjaro.
4. Overgrazing by the pastoralists resulting from keeping too many animals for the available pastures foreexample Karamoja lands, Masai and Turkana lands.
5. Ploughing the land up and down the slope without use of natural manures.
6. Burning of grass by the pastoralists and shifting cultivators also leaves the land bare to agents of erosion.
7. Increase in population leading to over use and misuse of the land.
8. Cultivation on steep slopes exposing the land to agents of erosion.
9. Open cast mining which leaves behind big ditches.

EFFECTS OF SOIL EROSION.

2. Loss of soil fertility and thus decline in crop production.
3. Soil erosion pollutes the environment through the dust caused by wind erosion.
4. Gully erosion interferes with agricultural mechanization.
5. Erosion leads to over flooding of rivers due to constant deposition of silt.
6. It leads to death of animals due to lack of pastures.
7. It also leads to famine due to decline in crop production.
8. Soil erosion also leads to the death of aquatic life due to deposition of silt.
9. It leaves the soils bare for further erosion.
10. It leads to growth of poor vegetation thus leading to high temperature and low rainfall (drought).
11. It leads to the destruction of the environment foreexample gully erosion.
12. It leads to the formation of landforms foreexample inselbergs and volcanic plugs thus promoting tourism.

SOIL CONSERVATION METHODS / MEASURERS TO REDUCE SOIL EXHAUSTION AND EROSION.

1. Contour ploughing especially on hilly areas.
2. Crop rotation to maintain soil fertility.
3. Controlling over grazing and bush burning in pastoral areas.
4. Family planning control measures to reduce pressure on land for example in Kabale and Kenya highlands.
5. Afforestation and Re-afforestation to act as wind breakers and to control the speed of running water.
6. Educating the people about dangers of soil erosion through media for example newspapers and radios.
7. Carrying out mulching and inter-cropping to conserve the soils.
8. Terracing. This is the most effective measure against soil erosion on hilly or mountainous areas.
9. Application of fertilizers to improve on the soil structure.
10. Planting of cover crops like pumpkins, beans, potatoes, water melon to protect the soil from heavy rainfall.
11. Agro-forestry – planting of selected trees along the crops.
12. Strip cropping which is the growing of crops in strips along the slope altering with grass.
13. Digging of pits along hill sides. This is practiced by the Umatengo of South Eastern Tanzania.

MASS WASTING OR MASS MOVEMENT.

Mass wasting is the downhill or down slope movement of materials under the influence of gravity. It is the creeping, flow sliding or falling of rocks and weathered materials under the influence of gravity.

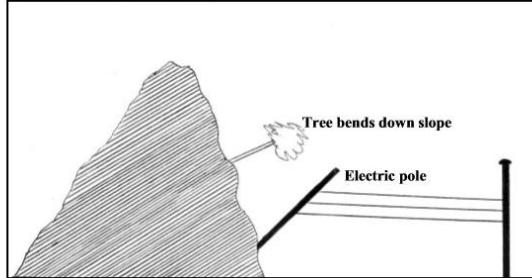
NB: Mass wasting in East Africa is common on highlands or mountains like Elgon, Kilimanjaro, Kenya and Rwenzori. Cliff mining holes, rift valley sides (escarpments), quarries and others.

A. THE SLOW FLOWAGE (CREEP).

These include the following:

1. Soil creep: This is a slow movement of fine and unconsolidated materials on gentle slope caused by alternate cooling and heating or wetting and drying.
2. Solifluction: this is a slow movement of solid gravel and weathered saturated materials over frozen grounds.

SOIL CREEP ALONG A SLOPE



B. RAPID FLOWAGE TYPES (LANDSLIDES).

These include the following:

1. Slumping: This is the fast movement of debris and rock wastes over steep slope.
2. Rock slide: This consists of a bedrock wash sliding on a flat surface either on a fault plane, bedding plane or joint plane
3. Rock fall: This is a fast movement of materials over a steep slope.
4. Mudflows: This is a rapid movement of mud, gravel and unconsolidated materials, super saturated and flowing over a steep slope.
5. Earth flows: This is a rapid down slope movement of water saturated materials against a steep slope.
6. Landslides: This is a fast movement of weathered materials over a steep slope.

CAUSES OF MASS WASTING.

1. Heavy rainfall along steep slopes.
2. Earthquakes and volcanic eruptions.
3. Nature of the rock for example fault plane, joint plane, bending plane.
4. Mining activities which cause heavy vibrations.
5. Deforestation, overgrazing along slopes.
6. Nature of the slope i.e. steep slope.
7. Overloading of materials along the slope.
8. Nature of the soils.

EFFECTS OF MASS WASTING.

1. Loss of lives and property.
2. It blocks roads and also destroys bridges.
3. Displacement of people which calls for expensive resettlements.
4. Destruction of agricultural land.
5. Damming or blocking of rivers to form lakes for example L. Mbak (Tanzania).
6. Destruction of the landscape/scenery.
7. Destruction of forests (bio-diversity) for example Mt. Elgon

MEASURERS OR SOLUTIONS.

1. Afforestation and re-afforestation along steep slopes.
2. Evacuation or displacement of people during rainy season.
3. Carrying out practices like terracing contour ploughing, mulching.
4. Controlled grazing by having manageable number of animals.
5. Prohibit agriculture on steep slopes.
6. Controlled grazing on slopes and massive education and awareness.

WEATHER AND CLIMATE.

Geographically weather refers to the state of the atmosphere.

It may also refer to the total condition of a place studied and recorded for a short period of time whereas climate is the total condition of a place studied and recorded for a long period of time. The difference between these two terminologies is just time.

These elements of weather include the following;

Element.	Instrument.
Pressure	Barometer
Humidity	Hygrometer
Rainfall	Rain gauge
Sunshine	Sunshine recorder or Campbell stokes
Temperature	Maximum and Minimum thermometer or six's thermometer
Cloud Cover	Observation
Wind speed	Anemometer
Wind direction	Wind Vane or Weather sock
Visibility (mist and fog)	Observation

The measurement and recording of elements of weather are done in a weather station.

A weather station therefore is a place where all elements of weather are measured and recorded.

NB: 1. Atmospheric pressure is the force exerted on the Earth surface by the weight of the atmosphere.

2. Temperature Inversion is the increase in temperature with increase in altitude.
3. Temperature inversion is the higher you go the cooler/warm it becomes.
4. Environmental lapse rate – This is the decrease in temperature with increase in altitude.

MEASUREMENTS AND RECORDS OF WEATHER ELEMENTS.

The activities of measuring and recording weather elements are done at a weather station.

A weather station is a place where all elements of weather are measured and recorded.

At a weather station there is a Stevenson screen. This screen contains four thermometers which are hung on a frame in the Centre. These thermometers include;

- (i) Maximum thermometer.
- (ii) Minimum thermometer.
- (iii) Wet bulb thermometer.
- (iv) Dry bulb thermometer.

The screen is built in such a way that the shaded temperature of air can be measured without any external influence to disorganize the internal conditions.

A Stevenson screen is a wooden box with four (4) sides which are louvered. The louvers are used to allow free entry of air. The roof of the Stevenson screen is made of double boarding to prevent the sun's heat from reaching the inside of the screen and the insulation is further improved by painting the outside white.

THE STRUCTURE OF THE STEVENSON SCREEN.



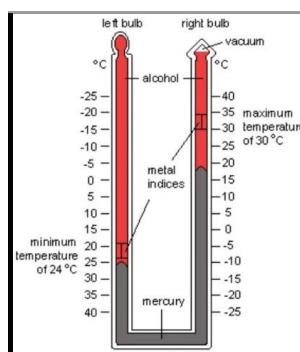
QUESTIONS:

- (a) Define weather.
- (b) Give the difference between weather and climate.
- (c) List down the four thermometers contained in a Stevenson screen.
- (d) Outline the elements of weather.

HOW TO MEASURE MAXIMUM AND MINIMUM TEMPERATURE.

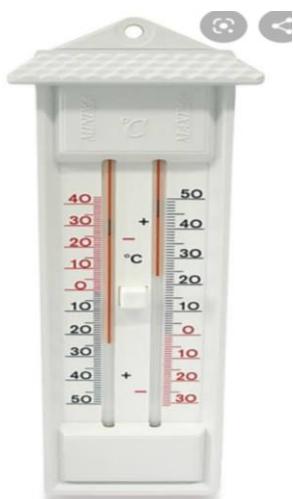
Maximum temperature can be obtained using either a maximum or a six's thermometer. Likewise the minimum temperature can also be obtained using a minimum or a six's thermometer.

THE STRUCTURE OF A MAXIMUM THERMOMETER.



The structure above shows how a maximum thermometer looks like. It tries to explain that when temperature rises, mercury expands and pushes the index along the tube and when temperature falls, mercury contracts but the index remains behind. Here the maximum temperature is obtained by reading the scale at the end of the index, which was in contact with the mercury. In the diagram above, the readings were 30⁰C (86⁰F). The index is then drawn back to the mercury by a magnet.

THE STRUCTURE OF A MINIMUM THERMOMETER.



The explanation to the minimum thermometer is that when temperature falls, alcohol contracts and its meniscus pulls the index along the tube and when temperature rises, the alcohol expands but the index remains in the position it was pulled. Therefore, the minimum temperature is obtained by reading the scale at the end of the index, which is nearer the meniscus as shown above. The difference between the maximum and minimum thermometer is that;

- (i) A maximum thermometer measures the highest temperature where as a minimum thermometer measures the lowest temperature.
- (ii) A maximum thermometer uses mercury where as a minimum thermometer uses alcohol.

The similarities of the two thermometers are;

- (i) They both have glass tubes.
- (ii) They both use metal index.

A SIX'S THERMOMETER.

This thermometer is the combination of the two thermometers, the maximum and the minimum thermometer. It measures both the minimum and the maximum temperatures. When temperature rises in the left hand limb of the six's thermometer, alcohol expands and pushes mercury in the right hand limb and contract in the left hand temperature falls. The maximum temperature will be read from the scale on the right hand limb and the minimum temperature will be obtained from the scale on the left hand limb.

THE STRUCTURE OF A SIX'S THERMOMETER.



QUESTIONS:

- (a) What is a Six's thermometer?
- (b) List down the differences between a six's thermometer and the minimum thermometer.
- (c) Give two characteristics of a six's thermometer.
- (d) Of what importance is a six's thermometer?

HUMIDITY OF THE AIR.

Humidity refers to the amount of water vapour in the air (atmosphere).

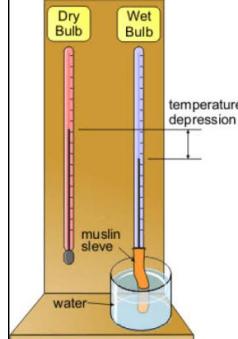
Humidity of the air depends upon temperature. When temperature falls, air becomes saturated and it cannot hold much water vapour. Below are two types of humidity.

- (i) **Relative humidity:** This is the amount of water vapour present in the atmosphere (air). It is a ratio between the absolute humidity of a given mass of air and the maximum amount of water vapour it can be held at the same temperature. When temperature falls, the relative humidity becomes 100% saturated.
- (ii) **Absolute humidity:** This is the actual amount of water vapour in a given volume of air at a given temperature.

MEASUREMENT OF HUMIDITY.

Humidity is measured by an instrument called **HYGROMETER**. This instrument consists of two thermometers and these are the wet bulb and the dry bulb thermometers. The bulb of one thermometer is wrapped in a piece of muslin which is dipped into a container of water. This thermometer is called the wet bulb thermometer whereas the other which is neither wrapped nor dipped in water is called the dry bulb thermometer. When the air is not saturated, water evaporates from the muslin and this cools the wet bulb and causes mercury to contract. Here the bulb of the dry bulb thermometer is not affected at all, so the two thermometers show different readings and that the wet bulb thermometer will always have low readings.

A SIMPLE HYGROMETER.



The above two thermometers show different readings because when air is saturated we expect no evaporation and hence no cooling. It should be noted that when the two thermometers show no difference in readings we say the air is saturated and when they show a small difference we say the humidity is high and when they show a very big difference we say humidity is low.

QUESTIONS.

- (a) What is a six's thermometer?
- (b) List down the differences between a six's thermometer and a minimum thermometer.
- (c) What is humidity?
- (d) What do you understand by air being saturated?
- (e) What instrument is used to measure humidity?
- (f) What differences are there between humidity and relative humidity?

ATMOSPHERIC PRESSURE AND ITS MEASUREMENTS.

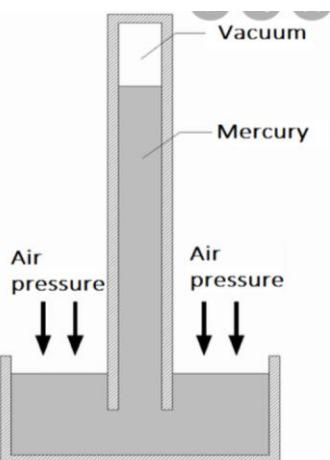
Air has weight and it exerts pressure on the earth's surface. Pressure varies with temperature and altitude. Pressure is one of the elements of weather and it is measured by an instrument called a **barometer**.

Barometers are of two principle types and these are;

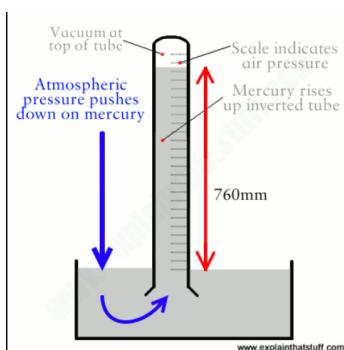
- (i) **Mercury Barometer**
- (ii) **Aneroid Barometer**

Pressure as an element is measured and read in millibars as units and 1mm is equivalent to 1.3 millibars.

A MERCURY BAROMETER



THE STRUCTURE OF THE ANEROID BAROMETER.



Any fall in pressure is noticed when the lever mechanism carries the change to the pointer which moves across the graduated scale as shown above. The atmospheric pressure recorded is also drawn on a map by **Isobars**.

QUESTIONS:

1. Which one of the following is not an element of weather?
(a) Sunshine (b) cloud cover (c) altitude (d) rain (e) fog?
2. Maximum and minimum temperatures are obtained from an instrument called;
(a) Barometer (b) a six's thermometer (c) Anemometer (d) Hygrometer.
3. The following statements are correct except;
(a) Maximum and minimum temperatures are measured by a Six's thermometer. (b) Atmospheric pressure by anemometer (c) Wind direction is by anemometer (d) Humidity of air is by a hygrometer.

WIND SYSTEM.

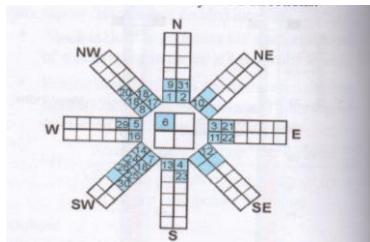
Wind is a vertical or horizontal air current blowing from a region of high pressure to a region of low pressure and moves in different direction given the prevailing circumstances. The direction of wind is measured by a wind vane. A wind vane consists of a rotating arm pivoted on a vertical shaft. The arrow of a wind vane always points in the direction from which the wind blows.

A WIND VANE.

The speed of the wind is measured by an instrument known as **Anemometer**. Anemometer has three or four horizontal arms pivoted on a vertical shaft. It has metal caps which are fixed to the end at the arm which rotate when there is wind.



At a weather station, the direction of wind is recorded by a **wind rose**. A wind rose consists of an octagon of which each side represents a cardinal point. Rectangles are drawn on each side and whenever there is wind, a line is drawn across the rectangle representing the direction from which the wind was blowing and this is done for one month.



The main function of a wind rose is to record wind direction for a specific place. A simple wind rose is shown in the diagram above. The number of days when there is no wind is recorded in the circle that is in the Centre of the octagon. In the diagram above it was five (5) days with no wind.

SUNSHINE

Sunshine can be referred to as the heat and light which radiate from the sun.

It is one of the elements of weather.

The factors which affect the amount of sun shine received in an area depend on the latitude and position of the earth in its revolution around the sun. The number of hours of sunshine a place receives is measured by using a **sensitized card** which is graduated in hours and on which the sun's rays are focused. On a map, areas with the same amounts of sun shine or intensity of sun heat are shown by lines called **Isohels** and the intensity of heat is measured by a Sun shine recorder or a Campbell – stokes apparatus.

THE STRUCTURE OF A SUN SHINE RECORDER.



RAIN FALL

Rainfall is one of the elements of weather. It is measured by an instrument called a rain gauge. Water droplets fall down on the earth's surface under the influence of gravity. The water droplets are formed due to the condensation of water vapour. The dust and small particles attach themselves to form water droplets before they fall onto the earth's surface.

HOW RAIN FALL IS MEASURED:

Rainfall is measured by an instrument called a rain gauge. Rain falling in the funnel trickles into the jar below and at the end of a 24-hour period, the amount of water collected is poured into a measuring cylinder. The readings are always obtained from the measuring cylinder. Rainfall is measured in millimeters or inches.

POSITION OF THE RAIN GAUGE:

A rain gauge must be placed in an open place so that no run off from buildings or trees enters the funnel. It must be sunk into the ground for about 30cm above the ground level. This prevents rain from splashing into jar from the ground. It also prevents sun's rays from causing excessive evaporation of the water already collected in the jar.

THE STRUCTURE OF THE RAIN GAUGE.

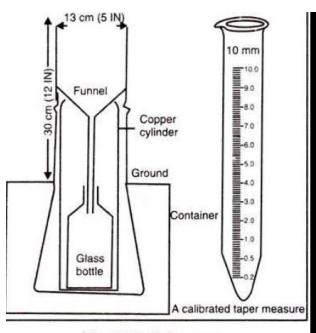


Fig. 2.13: Rain gauge



A MEASUREING CYLINDER.



TYPES OF RAIN FALL.

Rainfall is moist air mass which rises in the air, cools down and condenses into water droplets due to the prevailing conditions and then later falls from the air in small droplets of water. There are three major types of rainfall and these are;

- (i) Convectional rainfall.
- (ii) Relief rainfall (orographic rain fall).
- (iii) Frontal rainfall (cyclonic or depression rainfall).

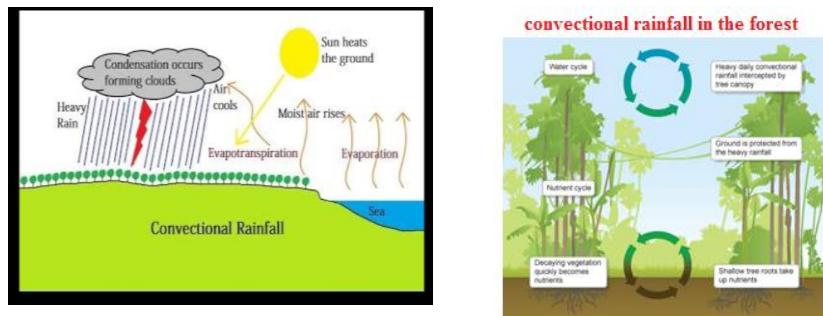
(i) Convectional rainfall:

This type of rainfall is formed after the moist air masses converge at low temperature zones called inter-tropical convergence zone (I.T.C.Z.). Then after convergence, air ascends in the atmosphere, the rising air mass condenses. When it reaches the dew point temperature, it forms water droplets which come back on the earth's surface as rain. This type of rainfall is very

common in areas where there are vegetation cover and water bodies. When these two sources are subjected to intensive heat from the sun, water vapour from them evaporates into the atmosphere where it cools and condenses to form water droplets which come on the earth as rain.

THE FORMATION OF CONVECTION RAINFALL.

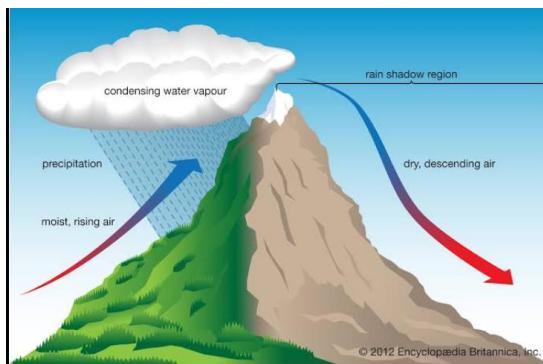
In East Africa as a whole and Uganda in particular, this type of rainfall is commonly received in areas around lakes, rivers and forest regions most especially in the equatorial forest areas and around Lake Victoria



(ii) Relief rainfall (Orographic rainfall):

This type of rainfall is formed when the warm moist air from the Earth rises into the atmosphere. This moist air is forced to rise into the atmosphere by mountains, forests, tall buildings. In case of a mountain, heavy rainfall will be received on the windward side while the Leeward side or the rain shadow slope will remain dry. In Uganda this type of rain is very common in highland areas of Kabale, Kigezi.

THE FORMATION OF RELIEF RAINFALL (OROGRAPHIC RAINFALL).

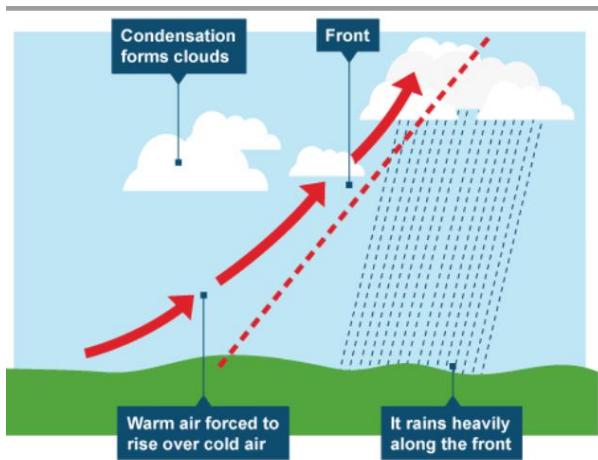


(iii) Frontal (Cyclonic or Depression Rainfall):

This type of rainfall is formed due to meeting and mixing of different air masses of different origins of the world. For example some originate from the tropics others from the temperate regions. When the two air masses of different origin meet and mix, the cold ones and dense ones at the same time force the warm ones which are light to descend in the air where condensation of water vapour takes place to form water droplets which come back on the Earth as rain.

THE FORMATION OF FRONTAL RAIN FALL.

This type of rainfall described above is commonly received in flat land areas but experience air masses of different origin, the warm and the cold ones. On a map, areas which receive the same amounts of rainfall are indicated by lines called **Isohyets**.



CLOUDS.

Clouds are masses of tiny water droplets which float in the air at different heights. Clouds are formed due to condensation of water vapour at the dew point temperature in the atmosphere to form water droplets which finally fall on the earth's surface as rain. Clouds are named according to their mode of formation for example relief clouds, convection clouds, frontal clouds, turbulence clouds.

TYPES OF CLOUDS.

Clouds are of many types and they are classified according to their appearance or form and height (altitude). Here below are the four major classifications of clouds:

- (i) High clouds (ii) Medium clouds (iii) Low clouds (iv) Clouds of great vertical extent.

- (i) **High Clouds:** These clouds are found between 6000 – 12000 metres high. Such clouds include cirrus, cirrocumulus and cirro-stratus clouds.
- (ii) **Medium Clouds:** These clouds are found between 2100 to 6000 metres and they include altocumulus, altostratus.
- (iii) **Low clouds:** These are found below 2100 metres. They include stratocumulus, Nimbostratus, stratus.
- (iv) **Clouds of Great vertical extent:** These are found between 1500 to 9000 metres. These include cumulus, cumulonimbus. The cumulonimbus clouds are the ones which bring rain. The areas of the same clouds are joined or shown by lines called **Isonephhs**.

HOW CLOUDS ARE MEASURED.

The clouds of great heights may be determined using balloons which are hydrogen filled and then released in the air. The balloons ascend and keep on expanding and then consequently burst on reaching the thick clouds. Through this process, the distance from the ground to the clouds can be determined since the balloons are filled with self-recording meteorological instruments. The amount and nature of clouds are expressed in “**Okta**”. This is the proportion of the sky covered by clouds. The study of climate is done by the meteorologists.

TEMPERATURE CALCULATIONS.

- (a) **The mean daily temperature** is obtained by adding up the daily maximum and the daily minimum temperatures and then divided by two. The formula for this is as follows:

$$\frac{\text{Daily maximum temperature} + \text{Daily minimum temperature}}{2}$$

- (b) **The daily temperature range:** This is obtained by subtracting the minimum daily temperature from the maximum daily temperature.

$$\text{Daily maximum temperature} - \text{daily minimum temperature}$$

- (c) **The mean monthly temperature:** This is obtained by getting the sum of the mean daily temperature for one month and then divided by the number of days in that given month.

$$\frac{\text{Mean daily temperature for one month}}{\text{Number of days in one month}}$$

- (d) **The mean annual temperature:** This is obtained by getting the sum of the mean monthly temperature of one year and then divided by the number of months in the year (12)

$$\frac{\text{Sum of the mean monthly temperature in one year}}{\text{Number of months in one year (12)}}$$

But with mean annual rainfall we get the sum and divide by one.

- (e) **The annual temperature range:** This is calculated by getting the lowest mean monthly temperature and then subtract it from the highest mean monthly temperature.

Forexample: Highest mean monthly temperature - lowest mean monthly temperature.

QUESTIONS:

1. The daily maximum temperature of Kampala has always been calculated as 25°C and its minimum daily temperature has been 15°C . Calculate the mean daily temperature of Kampala.
2. The daily maximum temperature of Soroti was given as 32°C and its daily minimum temperature as 22°C . Calculate Soroti's daily temperature range.
3. The year 1998 had 120°C as the highest mean monthly temperature and 84°C as the lowest mean monthly temperature. Calculate the annual temperature range of the year 1998.

READING CLIMATIC TABLES.

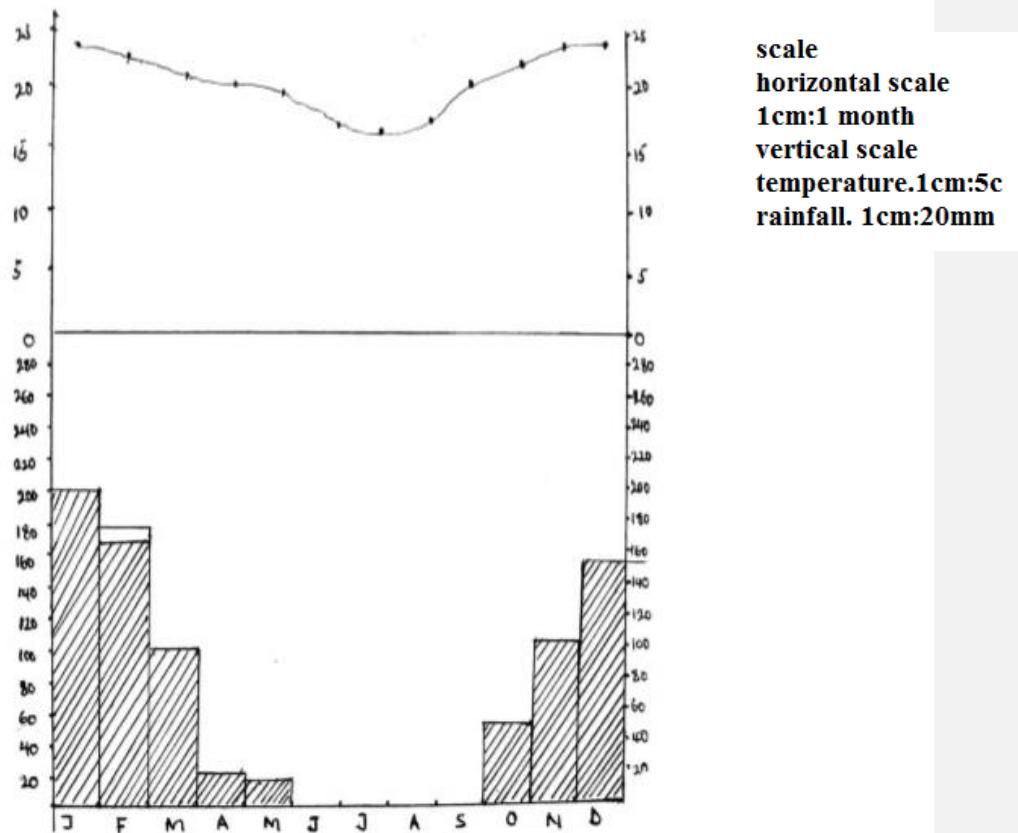
A Climatic table usually consists of rainfall and temperature figure for any given station representing a given climatic region. Look at the station A in the climatic table.

Station A:

MONTH	J	F	M	A	M	J	J	A	S	O	N	D
TEMP °C	24	23	22	21	20	18	17	18	20	23	24	24
R/F(mm)	200	175	100	25	20	-	-	-	-	50	100	175

One can use the above climate table to draw a bar graph or a line graph or a combined bar graph showing rainfall and temperature at the same time.

A COMBINED BAR AND GRAPH SHOWING CLIMATE OF STATION A



The interpretation of this graph above is that this station A receives two rain seasons and one long dry spell. These two rain seasons are commonly known as double maxima and where there is only one rainy season, this is referred to as single maxima.

QUESTIONS:

Study the climatic table below and answer the questions that follow:-

1. (a) Draw a combined bar graph to represent the information given in the table above.
 - (b) State the month with the;
(i) Highest amount of rainfall (ii) Least amount of rainfall
 2. Use the table above to calculate the;
(i) Mean annual temperature (ii) Annual temperature range
3. Explain the meaning of the following terms
- (i) Double maxima.
 - (ii) Single maxima.

FACTORS AFFECTING TEMPERATURE OF A GIVEN PLACE.

The temperature of a place depends on some or all of the following factors;

- (i) Latitude.
- (ii) Altitude.
- (iii) Ocean currents.
- (iv) Distance from the sea.
- (v) Winds.
- (vi) Cloud cover.
- (vii) Aspects.
- (viii) Amount of dust and other impurities in the air.
- (ix) The lengthy of the day.

(i) **Latitude:** Different parts of the world receive different amounts of Sun's insulation (heat). This is done due to geographical location. The location determines the time of the day light and the distance traveled through the atmosphere by the sun's rays and that areas around the equator receive or experience high temperatures and temperatures decrease from the equator to pole wards as shown in the diagram below:

The above diagram explains that temperature at area B is very high than at area A. This is because of the latitudinal location. This means that temperature at pole wards are very low than at the equator.

(ii) **Altitude:** It is geographically believed that the sun's rays heat the earth's surface which in turn the earth's surface heats the atmosphere. The heat escaping back in the atmosphere is prevented by water vapour and dust in the air. Temperature decreases with altitude as one ascends in the air. This can be illustrated as follows:

(iii) **Ocean currents:** These usually affect the temperature of the area especially those along the coastal regions where they blow to. Warm and Cold Ocean currents usually raise or lower the temperature of the land surface they blow to. For example, the warm ocean currents which blow polewards carry tropical warmth into the temperate regions (higher latitudes) and these raise the temperature of the higher latitudes. At the coastal regions, the influence of the Ocean currents is much felt at the coast as shown in the diagram.

(iv) **Wind:** In temperature latitudes, prevailing winds from the land lower the winter temperature but raise the summer temperature. In tropical latitudes, the on shore winds change the temperatures of the coastal belts. So the effect of the wind is to carry the temperature of the place where they are moving from to areas they are blowing.

(v) **Cloud cover and Humidity:** The work of the clouds in this case therefore, is to reduce the amount of solar radiation reaching the earth's surface and at the same time the amount of earth radiation leaving the earth's surface. Whenever there are no clouds, skies are clear both types of radiation are at their climax.

(vii) **Aspects:** The influence of aspect on temperature is noticeable in temperate latitudes and these are areas of pole wards. In tropics the mid-day sun is always high in the sky and aspect is of little importance. In the Southern hemisphere, the north facing slopes are warmer than the South facing slopes while as in the northern hemisphere the south facing slopes are warmer than the north facing slopes.

THE EFFECT OF ASPECT ON TEMPERATURE

QUESTIONS:

- Outline the factors affecting temperature of any given area.
- With the help of diagrams, explain the factors affecting temperature of any given place.

MOISTURE IN THE ATMOSPHERE: All air contains moisture even that of dry hot desert. Air exists in the atmosphere in three (3) forms and these are;
(i) Solids in ice crystal form (ii) Liquids in water form (iii) Gases in water vapour form.
Moisture reaches the atmosphere by the process called **evaporation**. This takes place from water surfaces, vegetation, and damp surfaces such as wet clothes.

FACTORS AFFECTING EVAPORATION.

Evaporation is affected by three major factors and these are;

- Temperature of the surface (ii) Relative humidity (iii) The nature and speed of wind.

(I) **Temperature of the surface:** The warmer the surface for example Lakes, Rivers, Seas, the greater the rate of evaporation and the lower the temperature the lesser the rate of evaporation. This means evaporation will be high when the temperature of the surface is also high.

(II) **Relative humidity:** When the air is damp i.e. when the percentage of humidity is high, there is less evaporation taking place but when the relative humidity is low, the rate of evaporation increases.

(III) **The nature and speed of wind:** There is greater evaporation in the moving air than in the air which is still and when the wind is dry and warm, has greater capacity to pick moisture from open water surfaces.

Whatever ascending air from the earth's surface into the atmosphere contains heat. This heat is normally given off when air reaches the dew point temperature and cools down (condense). The heat given off when this condensation process takes place is called Latent heat.

QUESTIONS.

1. List down the three forms in which air exists in the atmosphere.
2. Explain the process by which moisture reaches the atmosphere
3. Mention any two places where evaporation can take place
4. Outline the factors which affect evaporation.

CONDENSATION.

Condensation refers to the formation of water droplets when air has cooled down beyond its dew point temperature.

There are two (2) ways by which condensation can take place and these are;

- (i) Cooling of water vapour to form water droplets.
- (ii) When more water vapour is put into the atmosphere.

CAUSES OF CONDENSATION;

(i) Condensation will take place when radiation of air from the earth's surface on the clear nights encourages water to move into the atmosphere.

(ii) Another most important cause of condensation is the horizontal movement of air over cold surfaces. This encourages condensation to take place

(iii) The mixing along the margins of two air currents of different origins and characteristics. This for example air currents originating from temperate regions mix with those from the tropics.

(iv) The movement of air from warmer latitudes to cooler latitudes. This encourages condensation to take place.

(v) By far the most important is ascent. Condensation cannot take place in pure air but rather in impure air which contain dust particles which form the nuclei on which water droplets are built. When water droplets condense in the air to certain critical size they may fall to the earth in the following forms of precipitation:

- | | |
|------------|------------|
| (i) Rain | (iv) sleet |
| (ii) Snow | (v) Ice. |
| (iii) Hail | |

QUESTIONS:

1. The formation of water droplets when air condenses beyond its dew point temperature is called.
2. List down three causes of condensation?
3. Briefly explain one circumstance where condensation cannot take place.
4. List down three forms in which precipitation can be received on the earth's surface from the atmosphere?

TEMPERATURE CHANGE IN VERTICAL AIR CURRENCY.

When an air mass rises in the atmosphere, it becomes cooler when it ascends in the atmosphere and it becomes warmer when it sinks down in height. The process by which air moves vertically and passes through layers of different pressure is known as adiabatic whereas the transfer of heat by the air masses between the lowest air layer and the warmer one is called non adiabatic. Dry adiabatic lapse rate: This refers to the fall of temperature in the rising air by 10°C for every 1000 metres of ascent while a fall in temperature by 6°C for every 1000 metres of ascent is called Wet adiabatic lapse rate. In this respect there is also environmental lapse rate which is a fall in temperature at a given place at a given time. This varies according to the surroundings.

QUESTIONS:

1. Explain the process by which air moves vertically and passes through layers of different pressure zone.
2. What is meant by the term non adiabatic
3. Give the difference between adiabatic and dry adiabatic lapse rate.
4. What geographical term can be used to refer to a fall in temperature as one ascend in the air by 10°C every 1000m.

FOG FORMATION AND EXTREME STABILITY.

Extreme stability leads to the formation of fog. When condensation takes place, it produces visibly small water droplets which obscure the surface and this is what is commonly known as fog.

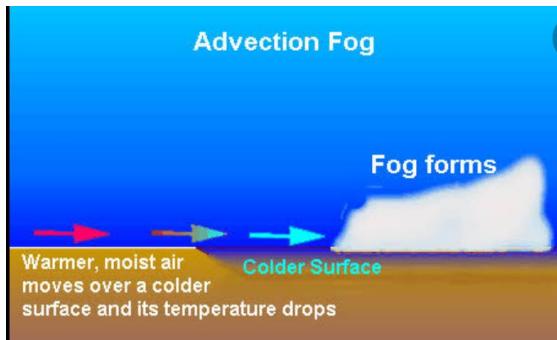
There are many types of fog commonly experienced due to the prevailing climatic conditions responsible for their formation and these are;

- | | |
|---------------------|------------------|
| (i) Advection fog. | (iv) Frontal fog |
| (ii) Radiation fog. | (v) Mixing fog |
| (iii) Steam fog | |

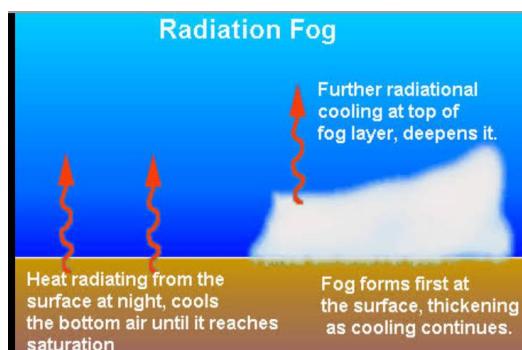
(i) Advection fog: This type of fog is formed when the warm moist air passes over cold surfaces of land, water or when the cold air passes over the warm surfaces. This type of fog occurs mainly along the coastal region. It may extend few kilometers inland.

THE FORMATION OF ADVECTION FOG

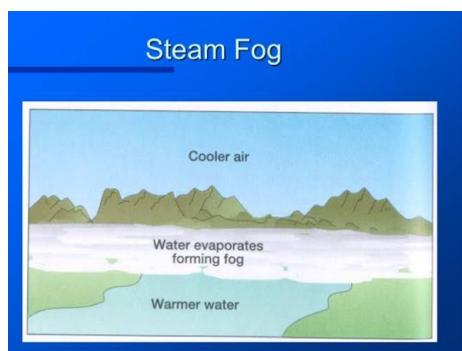
The diagram above explains that when warm moist air passes over the cold surface of say water or land, the warm air is cooled down and forms advection fog.



(ii) **Radiation fog:** This type of fog normally occurs on land especially at night and it disappears during the day when temperature rises. It is formed when still moist air is cooled down through coming into contact with colder surfaces.



(iii) **Steam fog:** This is formed when cold air is transferred over a warm surface and as it passes over, the air becomes saturated. The condensed air appears in form of steam. This brings about what is commonly known as steam fog and at times it is referred to as arctic sea smoke.



(iv) **Frontal fog:** This type of fog is formed when rain falls into the stable cold air which is ahead of the warm front. Here the falling rain raises the dew point temperature until this fog is formed. When the falling moisture is carried upwards by turbulence or convection and condenses to form stratus, cumulus or strato cumulus clouds.



EFFECTS OF FOG TO THE ENVIRONMENT.

1. Fog obscures the ground and since people cannot see properly, this affects many transport activities in very many parts of the world where it occurs.
2. The chilling conditions and too much coldness caused by fog affect agricultural activities. In Kabale where it is very common, people wake up very late because of coldness.
3. The effect of fog in some parts of the world is responsible for drought because fog is low clouds which do not bring rain at all.
4. Fog is responsible for air borne diseases such as cold pneumonia, influenza. Which are favoured by coldness.
5. In some areas fog supports agricultural activities because fog does not favour frost formation.

HOW TO DRAW A PIE-CHART.

A pie chart is a circle which is 360° . To put any figure on a pie-chart first convert it to degrees as below: Land use types in the Democratic Republic of Congo 1991 – 1993.

LAND USE TYPES	LAND AREAS (000) HECTARES
Crop land	7,893
Permanent pasture	15,000
Forest and Wood land	173,860
Others	29,952
Total	226,705

If this information was to be put on a pie-chart, one would first of all convert these figures to degrees as follows then after a pie-chart is drawn.

$$\text{Formula } \frac{t}{\text{Total}} \times 360^\circ = \frac{t}{\text{Total}} \times 360^\circ$$

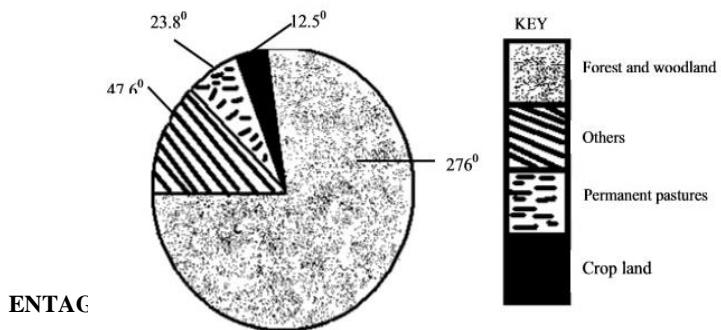
$$\text{Cropland: } \frac{7,873}{226,705} \times 360^\circ = 12.5^\circ$$

$$\text{Permanent pasture: } \frac{15,000}{226,705} \times 360^\circ = 23.8^\circ$$

$$\text{Forest and woodland: } \frac{173,860}{226,705} \times 360^\circ = 276^\circ$$

$$\text{Others: } \frac{29,952}{226,705} \times 360^\circ = 47.5^\circ$$

A PIE-CHART SHOWING LAND USE IN D.R.C (1991 – 1993)



Land use type in Netherlands. Study it and answer the questions that follow

LAND USE	AREA OCCUPIED (HECTARES)
Farm land	21,500
Residential	7,740
Wool land reserves and recreation	10,750
Canals, dykes and roads	301
Total land use	40,291

If the figures in the table above were to be converted to percentages, one would follow the formula below;

$$\text{Percentage} = \frac{\text{t}}{\text{Total}} \times 100\%$$

Total

$$\text{Farm land: } \frac{21,500}{40291} \times 100\% = 53.3\%$$

$$\text{Residential: } \frac{7,740}{40291} \times 100\% = 19.2\%$$

$$\text{Woodlands, reserves and creations: } \frac{10750}{40291} \times 100\% = 26.6\%$$

$$\text{Canals, dykes and roads: } \frac{301}{40291} \times 100\% = 0.7\%$$

QUESTIONS:

1. Study the table below showing Uganda's population living in urban areas (1991) and answer the questions that follow:

REGIONS	URBAN POPULATION
Central	1,200,000
Eastern	320,000
Northern	170,000
Western	220,000
Total	1,910,000

Source: Adapted from the Republic of Uganda 1996 statistical abstract M.F.E.P July 1996 P.15

- (a) Draw a pie-chart to show the population of the urban centres living in each region.
- (b) Explain the factors which have led to the development of urban centres in East Africa.
- (c) Describe the problems resulting from the development of urban centres in East Africa
- (d) Identify the solutions to the problems already shown in (c) above.

5. Study the table below showing livestock production for selected districts and answer the questions that follow:

DISTRICT	LAND AREAS (KM ²)	GRAZING AREA (KM ²)	PERCENTAGE GRAZING AREA
Mbarara	9,906	9,064	91.5
Masindi	8,406	7,734	—
Luweero	8,539	7,728	90.5
Kotido	13,208	12,349	93.5
Moroto	14,113	13,196	—

- (a) Calculate the percentage grazing area for districts of;
 - (i) Masindi
 - (ii) Moroto
 - (b) Draw a bar graph to show the percentage grazing areas for the selected districts.
 - (c) Explain the factors which have favoured livestock farming in anyone district given in the table above.
 - (d) (i) Describe the problems facing livestock farming in any one district chosen in (c) above.
 (ii) Outline the steps being taken to solve the problems in (d)(i) above.
3. Study the table below showing oil palm production in tones for selected countries in Africa and answer the questions that follow:

COUNTRIES	TONNES
Sierraleon	50
Cameroon	84
Ivory coast	135
Zaire (D.R.C)	175
Nigeria	630

Source: Adapted from R.G White Africa New Edition

- (i) Draw a bar graph to represent the information in the table above.
- (ii) State the two observations about oil palm production in Africa revealed by the graph and the table above.
- (iii) Describe the natural conditions favouring oil palm production in any one of the selected conditions in the table above.

CLIMATE TYPES AND REGIONS OF EAST AFRICA.

Broadly speaking the climate of East Africa can be categorized into three major types

1. Equatorial climate.
2. Tropical climate or Savannah.
3. Semi desert and desert climate.

EQUATORIAL CLIMATE.

The equatorial climate in East Africa has been modified due to altitude and water bodies to increase the following types.

- a) Equatorial lake shore type (True Equatorial Climate).

This type of climate is found around L. Victoria region

- b) Modified Equatorial types.

This is found around the plateau and highlands.

- c) Coastal Tropical Type, which is along the East African coast.

Equatorial climate region therefore extends from Lamu in Kenya to Tanga area south of R. Pangani in Tanzania, along L. Victoria basin (Buganda), Nyanza province – Bukoba.

Characteristics of Equatorial Climate.

1. Heavy rainfall of between 1500 – 2000 mm well distributed throughout the year.
2. High/Hot temperatures between 21 – 27°C.
3. High humidity throughout the year of 80%.
4. High cloud cover.
5. Double maxima (peaks) of rainfall.
6. Small annual range of temperature of between 2 – 5°C.
7. Rainfall is mainly convectional.
8. No distinct dry season is experienced in this climate.

Bukoba in Tanzania

Month	J	F	M	A	M	J	J	A	S	O	N	D
Temp o c	21	21	21	21	21	21	20	21	21	22	22	21
Rainfall mm	147	158	249	356	315	86	48	86	107	132	161	193

Draw a suitable graph to represent the above data.

TROPICAL CLIMATE (SAVANNAH).

This type of climate is divided into two:

- a) Tropical Northern i.e. Northern Uganda and Central Tanzania.
- b) Tropical Southern i.e. Southern Highlands of Tanzania.

This type of climate in East Africa is extensive covering North, Eastern and Western Uganda. Most of Tanzania especially the southern parts and South West Kenya.

Characteristics.

- High/Hot temperatures throughout the year between 25 – 30°C.
- It experiences one maximum peak of rainfall.
- Moderate rainfall of 750 – 1000 mm per annum.
- Moderate temperature range going up to 10°C (5-10°C)
- Mean annual temperature is high i.e. 21 °C.
- Wet season alternates with dry season.

Gulu in Uganda

Month	J	F	M	A	M	J	J	A	S	O	N	D
Temp o c	24	25	24	23	23	22	21	22	22	22	22	23
Rainfall mm	10	51	89	170	211	145	155	216	170	160	96	43

Draw a suitable graph to represent the above data.

NB: The economic activities carried out in this climatic region include:

Bee keeping, charcoal burning, wild life conservation, fruit gathering, growth of annual crops like millet, sorghum, maize.

SEMI DESERT AND DESERT CLIMATE.

This region stretches to North Eastern Tanzania, Eastern and Northern Kenya to North Eastern Uganda (Karamoja), Ankole- Masaka corridor.

Characteristics of this climate:

1. High temperatures of about 30°C (Hot temperatures).
2. Very little rainfall ranging from 325-620mm per annum.
3. Rainfall is unreliable.
4. Daily/Diurnal range of temperature is very large.
5. Low humidity.
6. Mean annual temperature is high.

NB: The common type of vegetation include scrub, thicket and thorny bushes, Cacai, Euphorbia.

MONTANE / SUB TROPICAL CLIMATE (Cool High Climate).

This type of climate is limited to the highland areas of East Africa for example Kenya highlands, Rwenzori, Elgon, and Kilimanjaro.

Characteristics.

1. Heavy rainfall of over 2000mm.
2. Receives orographic / relief rainfall.
3. Low temperature due to high altitude.
4. Low humidity due to low temperatures.
5. Dense cloud cover due to the high condensation resulting from low temperatures.

SKETCH MAP OF EAST AFRICA SHOWING THE CLIMATIC TYPES /RAINFALL PATTERN.



FACTORS INFLUENCING THE CLIMATE OF EAST AFRICA.

1. Relief / altitude.
2. Latitude / Distance from the Equator.
3. Influence of winds like the North Eastern and South Eastern trade winds.
4. Distance from water bodies
5. Vegetation cover
6. Cloud cover
7. Man's activities forexample industrialization, deforestation
8. Influence of the ITCZ (Inter Tropical Convergence Zone)
9. Ocean currents / sea and land breezes
10. Influence of aspect i.e. direction in which the land faces the sun.

RAINFALL DISTRIBUTION IN EAST AFRICA.

Rainfall is water vapour but it takes the form of tiny drops of water.

For rainfall to form, the following conditions must be met.

- a) Air must be saturated.
- b) Air must be cool.
- c) Air must contain small particles like dust to act as nuclei for rainfall formation.
- d) Rainfall in East Africa is unevenly distributed, some areas receive heavy rainfall while others receive low or moderate rainfall.

In East Africa there are three types of rainfall.

1. Convective rainfall forexample along Entebbe, Kampala, Mwanza, Bukoba.
2. Orographic/relief rain fall forexample around Elgon, Rwenzori,Kilimanjaro,Kenya.
3. Cyclonic/ frontal rain fall forexample around the equator (not common).

Climatic calculations.

1. Mean daily temperature (MDT) = $\frac{\text{MAX} + \text{MIN}}{2}$
2. Daily range of temperature = highest temperature-lowest temperature.
3. Mean monthly temperature = $\frac{\text{sum of daily temperature of 1 month}}{\text{Numbers of days in that month}}$
4. Mean Annual temperature = $\frac{\text{Sum of mean monthly temperature for 1 year}}{12}$
5. Mean Annual Rainfall = $\frac{\text{Sum of mean monthly Rain fall for 1 year}}{1}$

THE FOLLOWING FACTORS AFFECT OR INFLUENCE RAIN FALL UNIT AND DISTRIBUTION.

1. Relief /Altitude.

High land areas receive more rain fall than low lands of lower plateau for example Kigezi Highlands, Kenyan Highlands, Elgon, Kilimanjaro and Meru.

NB: Most Highlands of East Africa Receive rain fall on the South East Slopes (effect of Aspect).

2. Winds.

The North East westerlies and the south east trade winds mostly affect rain fall distribution in East Africa.

3. Nearness to water bodies.

Areas near water bodies receive heavy rain fall than those far away from water bodies.

4. Man's activities like Deforestation, forestation and industrialization.

5. Vegetation.

Areas with dense forests receive heavy rain fall while areas with scanty vegetation receive / low rain fall.

NB: 1. Humidity is the amount of water vapour in the atmosphere

2. Relative humidity is the ratio of the actual amount of water vapour present in a given volume of air at a given temperature and atmospheric pressure, measured in percentage.

3. Absolute humidity is the total amount of water vapour that is actually present in a given volume of air at a given temperature and atmospheric pressure.

Lines on maps showing equal places with;

1. Temperature – Isotherms
2. Pressure – isobars
3. Rainfall – isohyets
4. Sunshine – isohels
5. Cloud cover – isonephs
6. Sea bed with equal depth – isobaths
7. Ocean with equal salinity – isohaline
8. Equal intensity of earthquake shokes – isoseismal.
9. Altitude – contours.

VEGETATION OF EAST AFRICA.

Vegetation refers to all plant life which includes trees, pastures and shrubs.

Vegetation can either be natural or artificial.

NB: East Africa is mostly covered by grass lands compared to forests.

MAJOR VEGETATION TYPES IN EAST AFRICA.

East Africa has the following major vegetation types.

1. Equatorial forests (Tropical rain forests).
2. Savannah vegetation.

Commented [M1]:

3. Desert /Semi desert vegetation.
4. Montane / Highland vegetation.
5. Mangrove forests.

SKETCH MAP OF EAST AFRICA SHOWING MAJOR VEGETATION TYPES IN EAST AFRICA.



EQUATORIAL FORESTS.

These forests are categorized into two i.e. lowland forests and highland or Montane forests.

a) Lowland forests.

These forests are found in the lowland areas of East Africa forexample Mabira, Bwindi Impenetrable, Kibale, Ssese forest, Budongo forest, Maramagambo, Kisii, Bugoma, Bukoba forests.



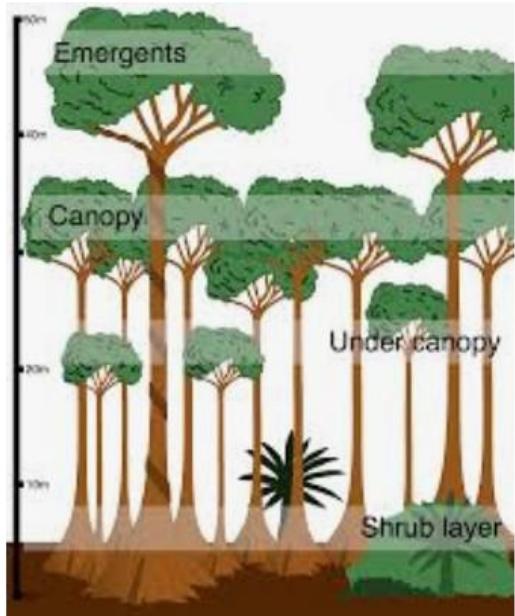
Their existence has been favored by the following factors.

1. High humidity.
2. Heavy rainfall of more than 1500mm per annum.
3. High temperatures of over of 27°C.
4. Low altitude of between 1000 – 1500mm above sea level.
5. Presence of deep fertile and well drained soils supporting their growth.

Characteristics of Equatorial Lowland Forests.

1. The trees are ever green throughout the year that is to say trees shed their leaves at different intervals.
2. The tree are not in pure stands i.e. they have many different tree species.
3. The trees take long to mature (50-80yrs).
4. The trees have broad leaves.
5. The forests have little or no undergrowth.
6. The trees are of hardwood species forexample mahogany, red wood, green heart, red heart, rose wood, ebony, iron wood.

7. The trees have thick canopies (layers) which are divided into three



8. Trees have buttress roots with numerous climbing plants.

b) Montane or Highland Forests.

They are found on the highlands of East Africa for example Rwenzori, Elgon, Kilimanjaro, Meru, Kenya.

The major tree species include; cedar, pod carp, Bamboo, Camphor.



Montane forests are favoured by the following factors;—

1. Heavy rainfall of over 1500mm per annum.
2. Cool temperatures modified by altitude.
3. Well drained fertile soils.
4. Limited man's interference.
5. Relatively high altitude of about 2500m above sea level.

Characteristics.

1. The trees are ever green.
2. They appear in pure stands.
3. Trees have small leaves.
4. They are characterized by a single canopy.
5. Trees are mainly of soft wood species.
6. The forests have thick cover of moss and tree ferns.

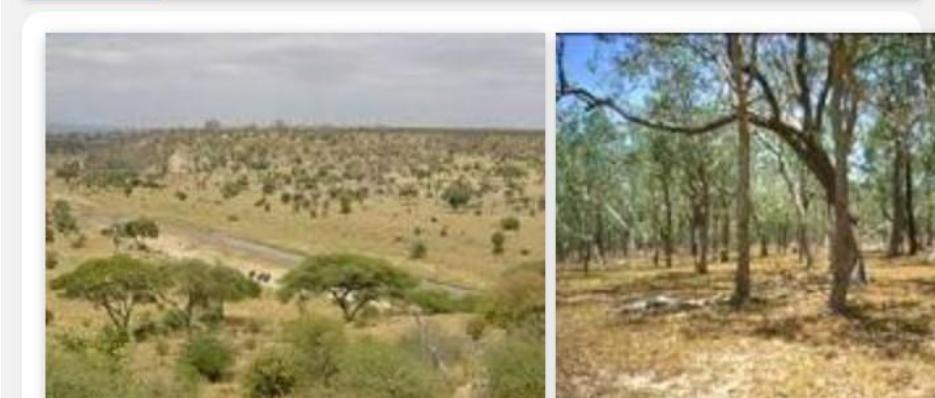
Economic Importance of Equatorial Forests.

1. Equatorial forests modify climate of the surrounding areas through evapotranspiration which leads to the formation of convectional rainfall.
2. Equatorial forests attract tourists because they harbor a number of wild animals of tourists' interest.
3. They are alternative sources of foreign exchange.
4. They provide employment opportunities to a number of people for example Lumber jacks, Forest rangers, researchers.
5. Equatorial forests help in controlling soil erosion by reducing the speed of running water.
6. They provide raw materials for industries such as saw mills, pulp and paper industries.
7. They provide construction materials like timber.
8. They provide grounds for research and scientific study.
9. They are sources of energy in form of fire wood, charcoal.
10. They provide man with a variety of fruits which are wild. (Wild fruits) and herbs.
11. They promote re-creation i.e. they provide grounds for picnics.
12. Provides a good scenery.

SAVANNAH VEGETATION.

It covers more than $\frac{1}{2}$ of East Africa. This type of vegetation is categorized into three;—
a) Savannah woodlands (Miombo)

They are found towards the equatorial forests in the following areas;—
Murchison falls National Park, Ntungamo, Mubende, some parts of Northern Uganda,
Central Tanzania, Rakai.



Savannah woodlands are favoured by the following conditions

1. High temperatures of between 27-30°C.
2. Moderate rainfall between 760-1000mm per annum.
3. Fairly fertile and well drained soils.

NB: The main economic activity is bee keeping.

Characteristics.

1. The trees are umbrella shaped.
2. Trees are deciduous and are thorny.
3. They have long tap roots.
4. The trees form the continuous cover i.e. short and scattered.
5. They store water in their trunks to be used during the dry season.
6. The trees are drought and fire resistant.
7. They have thick barks with small leaves to control transpiration for example baobab, Acacia.

b) Savannah Grasslands.

They are found in areas with 750-1000mm of rainfall and in the following areas, Nyika, Tsavo National Park, Bukoba, Central Tanzania, Eastern Uganda.

They are favoured by the following;

1. Moderate to heavy rainfall (750-1000).
2. Fairly high relative humidity.
3. High temperatures of between 28-30°C.
4. Fairly fertile soils.
5. Low lying gentle relief.
6. Alternating wet and dry seasons.

Characteristics.

1. They are composed of mainly grass with scattered trees. Major activities include animal conservation and nomadic pastoralism.
2. The trees are short, scattered and are umbrella shaped.
3. The trees are also deciduous in nature.
4. The trees are resistant to drought.

The major species of grass include elephant grass, spear grass, and tussock grass.

Dry Bush Savannah.

They are found in areas which receive rainfall of between 250-500mm and majorly occupied by nomadic pastoralists for example North Eastern Uganda, Ankole- Masaka dry corridor, Northern Tanzania and Kenya as well as the floor of the Western Rift valley.

Factors which favour it include; -

1. High temperatures.
2. Low rainfall of between 250-500mm.
3. Low humidity.
4. Fairly fertile soils.

Characteristics.

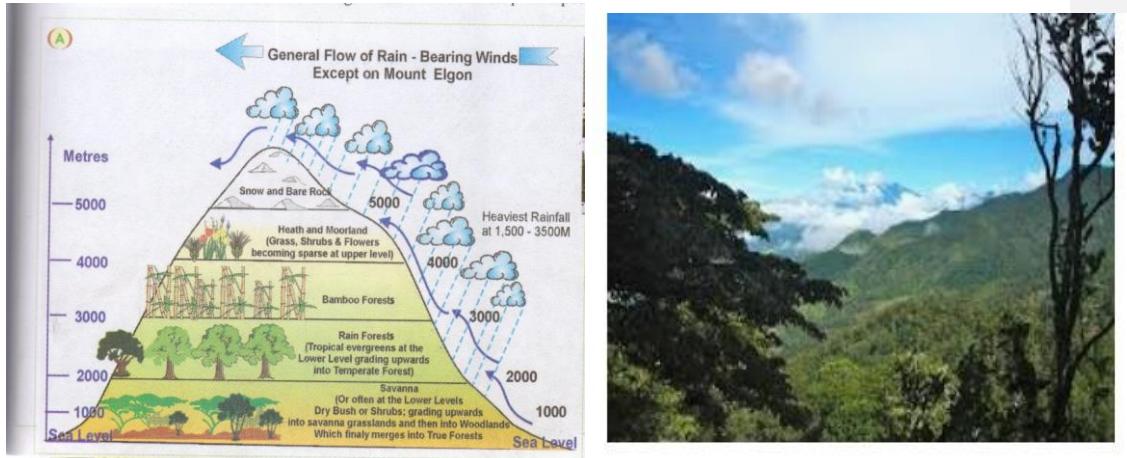
1. Scanty Vegetation and scattered, some areas have bare ground.
2. The trees are thorny with few leaves.
3. They have long tap roots.
4. The leaves and stems are waxy.

Importance of Savannah Vegetation.

1. It promotes Agriculture especially cattle rearing because of abundant pastures.
2. The woodlands are sources of timber and other building materials.
3. Grounds for settlement because of the flat nature of the landscape.
4. The vegetation also controls soil erosion.
5. The vegetation promotes research and scientific study.
6. The savannah vegetation promotes bee keeping and hunting.
7. Used for wild life conservation which promotes tourism.

ALPINE /MONTANE VEGETATION.

This type of vegetation is found on the highlands of East Africa like Mt. Kenya, Elgon, Rwenzori, Kilimanjaro.



Semi Desert and Desert Vegetation.

This vegetation is found in the dry semi desert areas of East Africa like North Eastern part of Uganda (Moroto and Katido), Turkana land (Northern Kenya), Parts of Central Tanzania.



The following conditions favour their existence.

1. Poor sandy soils.
2. Hot temperature of over 30°C.
3. Very little and unreliable rainfall of about 250mm.
4. Low humidity.

Characteristics.

1. Trees are drought resistant.

2. They shed off their leaves during dry season.
3. They have woody stems.
4. Trees store water in their trunks.
5. Trees are very short and scattered.
6. The leaves are small and stems are thorny.

Desert vegetation promotes the following:-

1. Wild life conservation (game parks).
2. Pastoralism.
3. Hunting.

Swampy Vegetation and Mangrove Forests

Swampy vegetation occurs in areas with permanent swamps like Lake Victoria, Kyoga and along some rivers.

The Mangrove forests concentrate along the coastal area of East Africa because of the following factors.

1. Heavy rainfall.
2. High temperatures and humidity.
3. Low altitude.
4. Deep fertile soils.
5. Salty and muddy water.

Characteristics.

1. The trees have short trunks with broad leaves.
2. They are evergreen because of too much water.
3. Some trees have twisted trunks and are of hard wood.
4. They have aerial roots.

FACTORS INFLUENCING VEGETATION DISTRIBUTION IN EAST AFRICA.

1. Climate.

Abundant rainfall which is well distributed throughout the year and high temperatures give rise to equatorial forests. Moderate rainfall throughout the year give rise to savannah vegetation while areas with low and unreliable rainfall influence the growth of semi desert vegetation.

2. Relief /Topography /Altitude.

On steep slopes soils are thin and water drainage is rapid giving rise to stunted vegetation while areas which are gently sloping and flat, soils tend to accumulate favouring the development of forests while in valleys soils are water logged leading to swamp vegetation.

3. Soils.

Deep and fertile soils support dense equatorial forests while soils with moderate fertility support savannah. Thin, immature and infertile soils support stunted vegetation while damp coastal soils influence the growth of mangrove forests.

4. Biotic Factors.

Pests such as locusts, wood peckers lead to destruction of grass and trees respectively. Wild animals also lead to the destruction of vegetation cover.

5. Latitude.

Areas near the equator have tropical rain forests because of heavy rainfall and high temperatures.

6. Drainage.

Well drained areas are characterized by vegetation ranging from savannah to equatorial forests while poorly drained areas favour swamp vegetation.

7. Anthropic Factors (Man).

In many parts of East Africa man has destroyed vegetation through his activities like deforestation, mining, agriculture, industrialization, road construction, changing thick forests into savannah, semi desert and then shrub. However, man in some areas has tried to develop vegetation through afforestation, re-afforestation, gazetting more forest reserves, restricting encroachers, educating the masses about the importance of forests.

FORESTRY INDUSTRY IN EAST AFRICA.

Forestry is the science of managing forest resources for human benefit like maintaining adequate supply of timber, wood production.

In East Africa the following are the types of forests:-

1. Tropical rain forests /Equatorial rain forests.

These occur in the low land areas of East Africa for example Mabira, Budongo, Bwindi impenetrable, Ssese forests.

2. Montane Forests.

These occur on the slopes of mountains like Elgon, Kilimanjaro, Kenya and Rwenzori.

3. Riverine Forests.

These occur along major rivers of East Africa for example R.Nile, Tana, Pangani.

4. Planted or Artificial forests.

These forests are planted by man and are majorly soft wood for example eucalyptus, pine.

Factors favouring the growth of forests or Development of the forestry Industry in East Africa.

1. Availability of heavy and reliable rainfall throughout the year favours the growth of equatorial forests.
2. Presence of high temperatures throughout the year favouring the growth of forests.
3. Availability of fertile soils to sustain the growth of forests.
4. Presence of a variety of trees species of high commercial value for example Mahogany, Iron wood, Muvule, Green heart.
5. Presence of a low population leading to vast land permitting the growth and development of forests.
6. Favourable government policies on forestry for example policies on afforestation and Re-afforestation, restricting encroachers, gazetting more forest reserves.
7. Availability of advanced and appropriate technology in forest exploitation for example power driven saws, tractors.
8. Presence of adequate and cheap labour both skilled and unskilled from within East Africa and abroad.
9. Availability of large market for forest related products especially timber.
10. Presence of advanced research in forest development.

THE CONTRIBUTION OF THE FORESTRY INDUSTRY IN EAST AFRICA.

1. The forestry industry in East Africa provides the people with timber for construction and furniture making for example beds, desks and tables.
2. The industry generates employment opportunities to the people of East Africa for example forest rangers, lumber jacks, drivers, charcoal burners hence generating income which improves on their standards of living.
3. Forests in East Africa modify climate through evapotranspiration leading to rainfall formation which supports plant growth.
4. The forestry industry provides raw materials for industrial development (saw mills).
5. The forestry industry generates revenue for the government through taxation of the people employed in the companies thus diversifying the economies of East Africa.
6. It diversifies the economy of East Africa and thus widening the tax base which is used to develop other sectors like agriculture.
7. It has promoted tourism in East Africa thus source of foreign exchange since they act as habitats for wild animals.
8. It promotes research and scientific study.
9. Promotes the development of infrastructure like roads, schools, hospitals leading to urbanization.
10. Forestry is also a source of income to the local people which has helped in the improvement of the standards of living of the people.
11. The forestry industry is a source of fuel in form of fire wood and charcoal used at home and industries.
12. It has led to the development of towns and urban centres in areas where the industries have been set up.
13. Forests also provide man with food in form of fruits, herbs and wild animals.
14. Source of foreign exchange through exportation of forest products to countries like USA, France and South Sudan.

15. The forestry industry has promoted trade and international relations.

PROBLEMS FACING PEOPLE LIVING AROUND FORESTS.

1. Pests like mosquitoes, tsetse flies that cause diseases like malaria and sleeping sickness to people.
2. Attacks by wild animals like lions and snakes endangering their lives.
3. Difficulty in clearing the forests for settlement, agriculture, and construction of transport routes due to inaccessibility.
4. The humid conditions interfere with man's activities like agriculture.

FACTORS LIMITING /HINDERING THE EXPLOITATION OF FORESTS IN EAST AFRICA.

1. The trees do not grow in pure stands that is to say they are scattered and therefore locating and exploitation of valuable trees becomes hard.
2. Tropical forests have buttress roots making them very difficult to cut.
3. Trees have climbing plants making it difficult to exploit them.
4. Presence of pests and diseases for example tsetse flies that transmit diseases like sleeping sickness to man.
5. Forests are dark, damp and impenetrable making exploitation and transportation difficult.
6. The trees take a long period of time to mature.
7. The rate of tree cutting exceeds replacements leading to deforestation.
8. Wild animals for example lions, tigers which are dangerous scare away man.
9. Presence of poor and inappropriate technology used for harvesting trees.
10. Insufficient capital to set up saw mills used for processing wood.
11. Absence of reliable transport to deliver timber to the market centres as well as processing centres.

PROBLEMS FACING THE FORESTRY INDUSTRY IN EAST AFRICA.

1. The valuable species are scattered all over the forest making their exploitation very costly as well as difficult and expensive.
2. Presence of wild animals like lions, leopards, snakes which scare away the workers.
3. Remoteness of the forested areas like poor accessibility of poor impassable roads making transportation difficult.
4. Inadequate machinery like saws leads to the use of crude materials like pangas and axes hence making felling process difficult.
5. Insufficient capital to modernize the forestry industry by using advanced technology.
6. Competition with other land uses especially agriculture for labour and land.
7. Pests and diseases which attack the trees reducing the quality and value.
8. Competition for market with other producing countries like Congo and Swaziland.
9. Political instability in the forested areas limiting the provision of labour.
10. Unfavourable government policies for example putting much emphasis on agriculture, industrialization other than forestry.
11. Fire outbreaks during dry seasons caused by careless smokers also lead to the destruction of the forested land.
12. Illegal cutting down of trees by encroachers.

NB: In East Africa the forest cover is declining because of the following;

1. Population increase as trees are cut down for settlement and agriculture.
2. Need for firewood and charcoal for cooking.
3. Need for timber for construction.
4. Clearing of trees for infrastructural development like road construction.
5. Industrial expansion.
6. Encroachment for agriculture.
7. Increase in the number of wild animals that attack man and destroy crops.
8. Need for land for settlement due to the growing population.
9. Fire outbreaks by careless smokers and shifting cultivators.
10. Cutting down of trees to control tsetse flies which transmit sleeping sickness to human and Nagana to animals.

EFFECTS OF DEFORESTATION ON THE ENVIRONMENT OF EAST AFRICA.

1. Loss of valuable wood.
2. Decrease in wood fuel.
3. Reduction in the water table.
4. Increased global warming due to removal of trees that absorb carbondioxide.
5. Accelerated landslides due to removal of protective soil cover and removal of soil binding roofs.
6. Deforestation interferes with the water cycle that is to say micro-climate, changes/reduces rainfall.
7. Siltation of river basins leading to floods/pollution of water/drying up of streams.
8. Destruction of wildlife habitat leading to unbalanced eco-system.
9. Creation of Bad Lands that is to say gullied lands which are useless for any activity.
10. Destruction of valuable tree species/extinction of valuable plants forexample medical plants.
11. Destruction of the natural beauty of the environment through forest clearance.

CONSERVATION AND MANAGEMENT OF FORESTS.

- The East African governments are doing the following to improve upon the forestry industry.
 1. Carrying out afforestation and re-afforestation programmes.
 2. Controlling excessive lumbering by banning timber exports.
 3. Encouraging family planning to control population growth and thus reduce pressure on forests.
 4. Encouraging the use of alternative energy sources like solar, Bio gas and power.
 5. Carrying out research in forest management to get fast growing trees and a way of controlling pests and diseases that attack trees.
 6. Educating people about the importance of forests through the mass media like radios and televisions forexample NTVU, NBS, Bukedde.
 7. Training and deployment of forest rangers to guard and protect the forest.
 8. Planting of exotic trees which mature faster forexample eucalyptus and pine.

9. Establishing or gazetting more forest reserves.
10. Introducing energy saving stoves.
11. Introducing strict legislation or rules on deforestation.
12. Licensing of tree cutters to reduce on illegal cutting down of trees.

FORESTRY IN TANZANIA.

The main catchment forest in Tanzania are on the slopes of Mt. Kilimanjaro, Usambara, Meru, Uluguru, Tukuyu forests also exist in Iringa and Tanga regions. The main objectives for the development of forests in Tanzania include; -

1. To protect the water catchment areas.
2. To provide forest products sufficient to meet the country's requirements.

FORESTRY IN KENYA.

Forests form one of Kenya's important resources and in Kenya there are both indigenous and exotic soft woods.

Examples of forest reserves include; -

1. Western province on Mt. Elgon and Kakamega.
2. Rift Valley Province (Mau ranges, Nandi Ranges, Mathew ranges, Loroghi)

Aberdare.

3. Eastern slopes of Kenya, Slopes of Mt Kenya, Marsabit, at the coast, Shimba hills, Ara buku, Sikoke.

The conservation of forests in Kenya has the following major objectives.

- 1- To maintain and improve the climatic and physical conditions of the country
- 2- To conserve and then regulate water supplies by protecting the catchment areas.
- 3- Conserve the soil through prevention of desertification and soil erosion.
- 4- To control and maintain the country's supply of timber and other forest products.

The paper manufacturing industry in Kenya is at Webuye (W. Kenya).

FORESTRY IN UGANDA.

The major forests include, Mabira, Budongo, Semiliki; Maramagambo, Kibale, Bugoma, Bwindi Impenetrable, Ssese forests, Mt. Elgon. Edunya, Lenda, "Ngahinga, Zoka, Itwara.

Planted forests in Uganda make up 22%, these plantations are based on pines and the eucalyptus for example Lendu (W. Nile), Abera (Gulu) Mafuga (Kabale) Kateera (Kiboga), Agwatta (Lira), Mutai (Jinja)

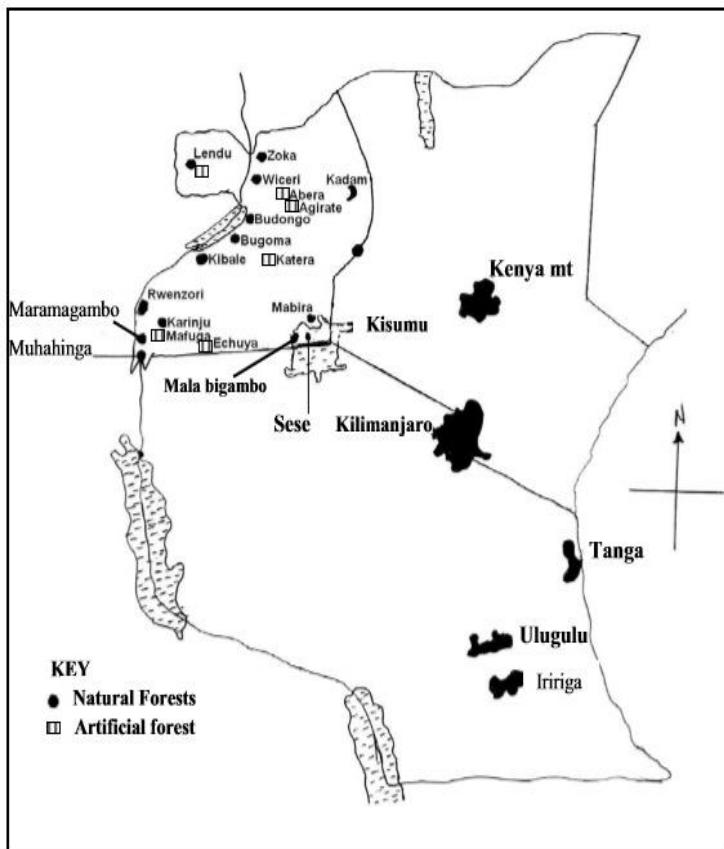
The reason for more establishment of forest plantations was due to the high demand of Industrial wood, wood fuel, and poles for building and construction as well as for power distribution (electricity)

Major Tree species.

Indigenous Species

East Africa (color) Softwood	East Africa Comphor
Pods	Sandal wood
Muvule	Mukinduri
Muhgu	Muringa
Cape chest nut	
Elgon Olive	Kei appl
Soft wood	
Eucalyptus	

SKETCH MAP OF EAST AFRICA SHOWING FOREST DISTRIBUTION.



Distribution of forests in Uganda.

Distribution of forests in Kenya and Tanzania

A- Lendu	F- Semiliki	K- Maramagambo	P- Ssese
B- Zoka	G- Rwenzori	L- Bwindi	Q- Mabira
C- Budongo	H- Kosyahia Kitomi	M - Kibale	R - Elgon
D- Bugoma	I - Mafuga	N - Mgahinga	

POPULATION IN EAST AFRICA.

Population refers to the number of people in a given area at a particular time. This is established during a census (counting of people), which is normally done after every ten years because it's

expensive. The counting of people helps the government to plan for the social services like schools, hospitals and roads.

TERMS RELATED TO POPULATION.

Over population.

This is when the number of people exceeds the available resources given the available technology.

Under population.

This is when there are fewer people than the available resource given the available technology.

Optimum Population.

This is when the number of people is in balance or equal to the available resources.

Population Density.

This is the number of people per unit area.

$$\text{Population Density} = \frac{\text{Total population } x \text{ people /Kms}}{\text{Land area}}$$

Birth Rate.

This is the number of children born in a year per thousand of the total population.

Death Rate.

This is the number of people who die in a year per thousand of the total population.

Population growth rate.

This is the natural increase in population.

Infant mortality rate.

This is the number of newly born babies who die every year per thousand of the total population.

Life expectancy.

This is the average age most people are ought to live in a given area.

POPULATION DISTRIBUTION IN EAST AFRICA.

This is the way people are spread across the earth's surface.

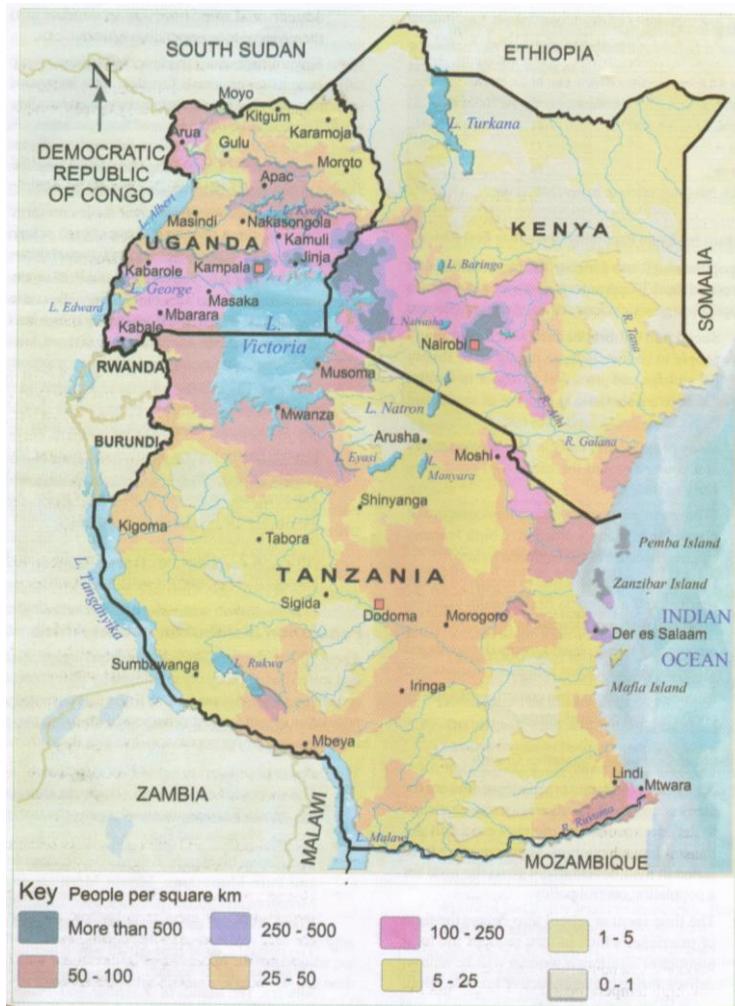
This can be described as dense, moderate and sparse.

The densely populated areas of East Africa include the mining areas, mountainous areas for example Mt. Kilimanjaro, Elgon, Rwenzori and the shores of L. Victoria, coastal areas including islands of Zanzibar and Pemba, as well as towns like Kampala, Jinja, Mbale, Nairobi, Kisumu Dar es Salaam.

The sparsely populated areas of East Africa include, Karamoja, central Tanzania, North East Kenya, Kitgum, Wajiri, Marsabit, Rukwa, Sigida, and Tabora.

The moderately populated areas in East Africa include Northern Uganda, West Nile, Central Kenya, parts of Western Uganda as well as towns like Hoima, Gulu, Lira, Michakos, Kituli, Tanga, Mlogoro, Mtwara

A SKETCH MAP OF EAST AFRICA SHOWING POPULATION DISTRIBUTION.



FACTORS INFLUENCING POPULATION DISTRIBUTION IN EAST AFRICA. Physical factors /Environmental Factors.

1. Soils

.Areas with fertile soils like mountainous areas of East Africa like Elgon, Rwenzori and Kilimanjaro have a dense population because they favour agriculture while areas with poor infertile soils have a sparse population because these areas can't sustain agriculture forexample Karamoja, North Eastern Kenya and Central Tanzania.

2. Climate (most important factor).

In East Africa this is the most important factor for population distribution. Areas with heavy and reliable rainfall with moderate temperature attract dense population like the coastal areas, areas around L. Victoria and highland areas while areas with high temperature and an unreliable rainfall have sparse population forexample Northern Kenya, North Eastern Uganda, Central Tanzania.

3. Relief.

The wind ward sides of mountains with gentle slopes have dense population because of the heavy rainfall and fertile soils which support agriculture and encourage settlement while the lee ward sides are sparsely populated because they are dry which discourages agriculture.

4. Drainage.

Well drained areas have dense population like the shores of L. Victoria while poorly drained areas have sparse population forexample the swampy areas harbour pests which transmit diseases.

5. Vegetation.

Forested areas have sparse population because of the presence of wild animals and pests and it's also difficult to clear the thick vegetation for settlement and agriculture. However areas with moderate vegetables attract dense population because it's easy to clear for settlement and agriculture.

6. Pests and Diseases.

Areas which are infested with pests which can transmit diseases like miombo woodlands of Tanzania discourage settlements thus a sparse population while areas which are pest free encourage settlement thus a dense population.

7. Mining Activities.

Provide Availability of many employment opportunities forexample Mombasa and Shinyanga thus attracting a dense population.

Industrialization.

Industrial areas of East Africa attract dense population because of better social services and employment opportunities forexample Kampala, Jinja, Nairobi, Dar-es-salaam.

Government Policy

.The government may also influence population distribution through establishing national parks, game reserves leading to sparse population, establishment of industries in some areas leading to dense population forexample Jinja.

Historical Factors.

Areas around former kingdoms like Buganda and Nyamwezi have dense population while either parts like Bunyoro and Central Tanzania are sparsely populated because of slave trade.

Political Atmosphere/Climate.

Areas with stable political climate like central Uganda, the coastal areas and urban centres have dense population while politically unstable areas like Northern Uganda have sparse populations.

POPULATION GROWTH.

Population growth is the natural increase of the number of people in an area.

The reasons for the rapid population growth in East Africa include;

- 1- High fertility rates among the women, on average a woman is capable of giving birth to seven children in her life time.
- 2- High birth rates and decline in death rates as a result of improved standards of living.
- 3- Illiteracy among the people leading to ignorance about family planning methods.
- 4- Improved medical and health services leading to low death rates.
- 5- Influence of polygamy practiced by the Muslims who marry up to four women and they all produce children.
- 6- Early marriages lengthening the productive life span of women.

EFFECTS OF RAPID POPULATION GROWTH.

Positive effects.

- 1- Large population provides labour for full utilization of resource.
- 2- It provides enough man power for defensive purposes.
- 3- Large population provides a large tax base thus high revenue for the government.
- 4- It encourages competition and innovation among the people.
- 5- Large population provides market for both industrial and agricultural products.
- 6- Large populations is a measure for development, it shows that a country has well developed social infrastructure like hospitals.
- 7- It leads to urbanization.

Negative Effects.

- 1- Promotes unemployment. The government may not provide the necessary employment opportunities for a large population.
- 2- A large population leads to overcrowding (congestion) and easy spread of diseases like cholera.
- 3- A large population leads to shortage and congestion of social services by the people for example schools and hospitals.

- 4- It encourages land shortage, land fragmentation and land disputes.
- 5- A large population leads to shortage of accommodation leading to the development of slums with their associated problems like poor sanitation, high crime rates and easy spread of diseases.
- 6- It increases the levels of crime because of shortage of jobs.
- 7- Rapid population growth leads to high dependency burden.
- 8- It leads to juvenile delinquencies with associated problems like drug addition, alcoholism.
- 9- Over exploitation of resources more so labour.

Effects of Large/Dense Population on the environment.

- 1- It promotes deforestation because people demand land for agriculture and settlement.
- 2- Pollution of the environment due to poor sanitation in slum areas.
- 3- Easy spread of diseases because of the poor sanitation and moral decay.
- 4- Landslides and soil erosion caused by land fragmentation and poor methods of farming.
- 5- Land fragmentation leading to poor yields and famine.
- 6- Swamp reclamation because of limited land for settlement and agriculture.
- 7- Over exploitation of resources leading to their depletion.
- 8- Soil exhaustion due to over cultivation.

Solutions to the above problems.

- 1- Soil erosion control measures like terracing crop rotation, contour ploughing.
- 2- Afforestation and re-afforestation programmes.
- 3- Treating/recycling of industrial wastes.
- 4- Education of the masses.
- 5- Application of fertilizers to improve on soil fertility.
- 6- Enforcing strict laws against swamp reclamation.
- 7- Improving medical and health facilities.

LOW/SPARSE POPULATION.

Causes.

- 1- Presence of pests and diseases for example tsetseflies in Bunyoro, Ankole, Masaka corridor.
- 2- Political instability like in Northern Uganda
- 3- Influence of immigration.
- 4- Presence of poor infrastructure like roads and schools.
- 5- Limited employment opportunities.
- 6- Poor infertile soils which can't sustain Agriculture.
- 7- Low and unreliable rainfall and high temperatures.
- 8- Influence of slave trade especially in Southern Tanzania.

Effects of low population.

Positive effects.

- 1- Leads to low levels of unemployment. Many people will be assured of what to do.
- 2- Social services will be enough for the population.
- 3- Encourages large scale farming and Agricultural mechanization.
- 4- More land will be unutilized for future development.
- 5- Reduces the rates of the crimes like stealing.

Negative Effects.

- 1- Shortage of manpower leading to underutilization of resources.
- 2- Low tax base thus low revenue for the government.
- 3- Lower levels of economic development because of low investments.
- 4- Shortage of labour for defensive purposes.
- 5- Small market for industrial and agricultural products.
- 6- It is an economical to develop social services.
- 7- Leads to social and economic dependency on other countries especially the developed.
- 8- It doesn't encourage innovation and competition.

POPULATION MIGRATIONS IN EAST AFRICA.

Migration refers to movement of people from one place to another with an aim of settling there. There are two main categories of population migration experienced in East Africa:

- International migration.
- internal migration.

International migration.

This is when people move across borders either into East Africa (immigration) and moving out of East Africa (emigration) with the hope of settling.

East Africa receives immigrants from Democratic Republic of Congo, Rwanda, Sudan, Somalia, Asia and Europe. And East Africa has also experienced emigration.

CAUSES OF EMIGRATION.

- To seek political asylum by fugitives and running away from political persecution.
- People leave East Africa to other countries to seek for employment opportunities.
- Seek for better medical facilities.
- Search for better education opportunities.
- Need for better investment opportunities.

CAUSES OF IMMIGRATION.

- Search for employment foreexample the Asians in Kampala.
- Love for adventure.
- Investments foreexample Madhivani in Jinja.

Internal migration.

This refers to movement of people from one place to another within the boundaries of individual countries.

Internal migrations include:

- Rural-rural migration.
- Rural-urban migration.
- Urban-rural migration.
- Urban-urban migration.

Rural-rural migration.

Many tribes have moved to one part of the country to another and settled there for example people from Bugisu to Busoga.

Causes of rural-rural migration.

- Land shortages have made people to move from their villages to other villages where land can be acquired.
- Search for employment where they expect to get jobs.
- Cattle rustling among the pastoral communities for example the karamojongs and Masai.
- Cultural practices that scare away people for example circumcision among the bagisu.
- Soil exhaustion forcing people to move to areas with fertile soil.
- Family conflicts forcing one family to move to another village.

Effects in recipient areas.

Positive.

- It creates market for goods.
- Provision of cheap labour.

Negative.

- Encroachment on marginal land.
- Land fragmentation due to the increasing population.

Rural-Urban migration.

This refers to the movement of people from villages to towns. The causes of Rural-Urban migration are **PUSH** factors in the villages and the **PULL** factors in towns.

CAUSES.

Pull factors.

- Availability of employment opportunities which attract people to towns.
- Security also attracts people to towns because of different security services.
- People move to towns to take part in trade and commercial opportunities.
- Availability of better amenities in towns.
- Family ties have also influenced people to move to towns to live with their relatives.

Push factors.

- Limited employment opportunities in villages.
- Cultural practices which scare away people for example circumcision.
- Land disputes force people to move to towns.
- Loss of soil fertility due to over cultivation.
- Limited social services like medical centers, piped water and schools.
- Natural hazards like landslides, floods, drought and el -nino which displace from villages.

Effects of rural-urban migration to the recipient towns.

Positive.

- Provides local revenue to the area.

- Cheap labour is provided.
- Improved infrastructure.
- Security is boosted by a large number of people.

Negative.

- It leads to creation of slums with associated evils like prostitution.
- Easy spread of diseases like cholera, typhoid and cough due to overcrowding and poor sanitation.
- Food shortage due to the growing population.
- Urban unemployment and underemployment.
- Shortage of land for settlement and agriculture.
- Pressure on social services for example health.
- High government expenditure to provide social services to the people.
- It leads to encroachment on marginal land like forests and wetlands.

Effects of rural-urban migration on the donor areas (origin).

Positive.

- Reduction of population pressure on land.
- Reduction in incidences of land conflicts.

Negative.

- Reduction in the market for goods and services offered in the rural areas.
- Low agricultural output as a result of energetic people moving away from villages.
- Underutilization of resources.

Urban –Urban migration.

This is the movement of people from one town to another with the aim of staying there.

Causes.

- Search for employment
- To access better social services like health care and education.
- Look for towns with better trade opportunities.
- People move to other towns because of transfer of services.
- Insecurity has also influenced people to move to other towns.

Effects to recipient town.

- Cheap labour is provided to recipient areas.
- Security is boosted by the large population.
- Improved infrastructure because the government is compelled to provide piped water, education and power to the large population.

Urban-Rural migration.

This is the movement of people from towns to villages with an aim of staying there.

Causes.

- Retirement after a long service in public service one may choose to go back to villages.
- High costs of living in towns.
- Loss of jobs as a result of retrenchment and demobilization of civil servants forces people to go back to villages with their families.
- Political persecution forcing people to leave towns.

Effects for both the recipient areas under rural-rural migration.

- Generation of revenue.
- Exploitation of resources in rural areas.
- Reducing of pressure on resources in urban areas.

AGRICULTURE IN EAST AFRICA.

Agriculture is the growing of crops and rearing of animals. In East Africa Agriculture is important in the following ways;

1. It is a source of food to the people of East Africa for example Bananas, millet, potatoes, meat, milk and egg thus improving on people's diet.
2. It has led to the provision of employment opportunities to the people of East Africa for example farmers thus improving on their standards of living.
3. It is a source of income to the farmers which has helped in the raising of standards of living after the sale of the output.
4. It has diversified the economy of East Africa and thus widening the tax base.
5. It is a main source of raw materials for the Agro based industries in East Africa examples of raw materials include, skins, cotton and coffee.
6. It has led to the generation of government revenue through taxation of the farmers, Industries and companies which is used for construction of infrastructure like roads.
7. It has led to the development of important infrastructure like hospitals, roads, schools and banks.
8. It has promoted trade and international cooperation between the three East African countries and other countries like China and USA.
9. It has promoted research and scientific study in East Africa.
10. It has led to industrial development for example maize mills, breweries, bakeries and Meat Packers hence providing employment opportunities to the people of East Africa.
11. It has led to the generation of foreign exchange through the exportation of products to other countries like France, U. K and Japan hence diversification of the economy.
12. It has promoted tourism in East Africa for example tourists come to see the different farming practices like pastoralism thus inventing better farming techniques.
13. Development of towns and ports where trade is carried out.
14. It has led to the provision of market to other industries for example those that manufacture fertilizers, chemicals, Agriculture machinery.

TYPES OF AGRICULTURE IN EAST AFRICA.

- 1- Subsistence farming.
- 2- Rotational bush fallowing.
- 3- Nomadic pastoralism.
- 4- Plantation farming.
- 5- Irrigation farming.
- 6- Mixed Farming.
- 7- Horticulture is the growing of flowers, vegetables and fruits for urban areas.

A SKETCH MAP OF EAST AFRICA SHOWING MAJOR CROPS GROWN



i. Traditional/subsistence farming systems mostly practiced in East Africa include nomadic pastoralism, shifting cultivation, bush fallowing and free range system.

ii. Modern systems include plantation farming, market gardening, irrigation farming, cattle ranching and poultry farming.

a) **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.

1. **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.

1. Scientific methods of farming are not used like application of fertilizers.
2. It employs only family labour because it's on small scale.
3. Traditional tools like hoes, pangas, digging sticks, axes and fire are used.
4. Food crops are mainly grown for home consumption for example potatoes, cassava, maize and sweet potatoes.
5. Farming is carried out on a small scale hence low output.
6. Farmers keep on moving from one place to another once soil has lost fertility and they don't come back.
7. Farmers do not set up permanent houses because they keep on moving from one farm to another.
8. Farming is practiced in sparsely populated areas with no permanent ownership of land since land is communally owned.

ADVANTAGES OF SHIFTING CULTIVATION.

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

DISADVANTAGES OF SHIFTING CULTIVATION.

1. Low output is realized due to operation on a small scale.
2. Soil erosion is always experienced especially after bush burning and clearing.
3. Areas where shifting cultivation is carried out are always underdeveloped.
4. It can't be carried out in areas with dense population since it involves movement from one farm to another.
5. It leads to deforestation which retards the growth of the forestry industry.

2. 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 Kondoa district (Miombo woodlands among the Wagogo people).

CHARACTERISTICS OF BUSH FALLOWING.

1. Farmers settle in one place but they keep on rotating fields around the same homestead.

2. There is permanent ownership of land.
3. Food crops are mainly grown but of recent some cash crops have been introduced forexample vanilla, cocoa in Mukono.
4. Traditional tools are used forexample hoes, pangas and digging sticks
5. There is construction of permanent houses because farmers don't move around.
6. Some scientific methods are used forexample application of fertilizers to improve on soil fertility.
7. The rotation of fields depends on the size of the land owned and the population density in that area.
8. Family labour is mainly used since it's readily available.
9. Little capital is invested by the cultivators.

ADVANTAGES OF BUSH FALLOWING

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

DISADVANTAGES OF BUSH FALLOWING

1. It depends on nature and which results into low crop yields in case of low rainfall and hot temperatures.
 2. With the increasing population in East Africa, the demand for land has gone high and bush fallowing stands higher chances of dying out.
 3. It's a backward farming system which is not economically viable because it's mainly food crops which are grown.
 4. 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 or disappearing.

NOMADIC PASTORALISM.

This is a primitive farming system where by pastoralists move from one place to another together with their animals in search for water and pasture.

It is mainly carried out by the Turkana, Karamojong, Kikuyu, Kalenjin, Galla, Boran.

These people also carry out what is commonly known as transhumance. Transhumance is the seasonal movement of nomads with their animals from low lying areas to higher altitudes following the rain regimes.



SKETCH MAP OF EAST AFRICA SHOWING THE MAJOR POSTORAL AREAS.



Characteristics of Nomadic Pastoralism.

- 1- The nomads move from one place to another in search for water and pastures.
- 2- The animals kept are normally underweight.
- 3- The animals kept are for subsistence purposes.
- 4- Nomads graze their animals communally.
- 5- The animals are resistant to pests, disease, drought and long distances.
- 6- They are confined two dry areas of East Africa.
- 7- Animals are kept for prestige.
- 8- They overstock and overgraze.
- 9- Nomads have no permanent settlement.
- 10- They burn grass as they move with their animals.
- 11- Nomads keep large herds of local poor breeds forexample Zebu, Ankole cattle and Sangai.

The Nomads of East Africa keep large herds of cattle for the following reasons.

- 1- For paying bride price forexample among the Karamojongs.
- 2- For prestige among the communities.
- 3- Source of food like blood, meat and milk.
- 4- Source of Income (Wealth) after selling the animals and animal products.
- 5- Culture and Tradition to keep large herds of animals.
- 6- For Insurance purposes.
- 7- Animals are sources of labour and transport forexample the oxen.
- 8- Animals provide energy in form of cow dung used for cooking.

FACTORS FAVOURING NOMADIC PASTORALISM (WHY NOMADIC PASTORALISM IS PRACTICED).

- 1- Presence of extensive land which permits the Nomads to move freely with their animals.
- 2- Presence of sparse population in these areas giving more land for pastoralism.
- 3- High temperatures and low rainfall that has favoured Nomadic Pastoralism. This leads a shortage of water and pasture forcing the Nomads to move from one place to another in search for water and pasture.
- 4- It is also favoured by their culture or tradition of keeping large herds of animals.
- 5- Presence of infertile soils in these areas which do not support crop growing but livestock rearing.
- 6- High incidence of animal pests and diseases forexample tsetse flies, ticks, Nagana, East Coast Fever, foot and mouth diseases thus leading to poor quality animals and sometimes death.
- 7- Remoteness of pastoral areas has led to persistence of Nomadic Pastoralism.
- 8- Negligence by government which doesn't give support to nomadic pastoralists.
- 9- Flatness of the area which enables the animals to move easily.
- 10- Nomads depend on their animals for their livelihood.
- 11- Presence of extensive pastures (Savana grasslands) that animals feed on.

12- Presence of local breed which are resistant to pests, diseases and long distances.

THE MASAI OF KENYA AND TANZANIA.

These are Nomadic pastoralists found in Kenya and Tanzania and they practice transhumance that is to say Movement with their animals in relation to seasons.

They keep goats, sheep, cattle and donkeys for transport, they keep animals purposely for meat, milk, prestige and wealth.

Their major areas are Narok and between L. Natron and Manyara. These areas experience high temperature of 27°C and rainfall of 500mm per annum.

The vegetation is mainly savannah grasslands with scattered trees.

The warriors are known as Maran, their settlement is called Manyatta or Kraal. (Enkang) They have simple temporal houses made of mud and sticks and the animals and people are protected by thorny bushes.

PROBLEMS FACED BY NOMADS IN EAST AFRICA.

Physical /Environmental problems (not by their own making).

- 1- Prolonged droughts which leads to shortage of water and pasture leading to death of animals.
- 2- Pests and diseases foreexample Rinder pest, foot and mouth, anthrax Nagana, ticks, tsetse flies that affect the quality of the animals.
- 3- Wild animals which attack both the animals and nomads foreexample Hyenas, lions and Snakes which endanger the lives of the animals.
- 4- Poor breeds of animals which lead to production of poor quality products.

Man-made problems (Problems due to own making).

- 5- Overstocking which leads to overgrazing thus soil erosion.
- 6- Constant famine because the Nomads don't grow crops.
- 7- Cattle rustling which leads to loss of lives and property.
- 8- Lack of veterinary services because of government negligence.
- 9- Insecurity in these areas given the sparse population.
- 10- Long distances moved by animals in search for water and pastures leading to death and loss of weight.
- 11- Inadequate transport network (remoteness) that the nomads can't transport their products to markets.
- 12- Limited market for their products because of the poor quality products and the low population.
- 13- Limited capital to improve on their animal husbandry because the animals kept are for home consumption.
- 14- Communal grazing by the Nomads leads to easy spread of animal diseases.
- 15- Burning of pastures as they move which leads to growth of hard and unpalatable pastures.
- 16- Ignorance (illiteracy) among nomads that they prefer quantity than quality.

Measures being taken to solve the problems faced by Nomads.

- 1- The government is educating the nomads to improve on their livestock.

- 2- Cross-breeding is being encouraged between the local and exotic breeds to improve on the quality of the animals.
- 3- Planting of better and fast growing pastures for the animals like Alfal and Hey.
- 4- The government is improving on security of the neighbouring areas especially Karamoja and disarming the Nomads.
- 5- Spraying with pesticides to control the pests and diseases that attack the animals.
- 6- They are encouraged to grow some crops to control famine especially Sorghum, maize and millet.
- 7- The government has also extended veterinary services to the pastoral areas.
- 8- Water supply has also been improved by constructing boreholes, valley dams, and water holes.
- 9- Feeder roads have been constructed to help the nomads to transport their products to markets and to the processing centres.
- 10- Loans have also been extended to the Nomads to help them improve on their animal husbandry.
- 11- In some parts like Mbarara the government has established industries to provide markets to their products as well as processing their products.
- 12- The Nomads have also been advised to reduce on the number of the animals in order to improve on quality and to control overstocking and overgrazing.
- 13- The government has also imposed quarantine measures to control spread of diseases.
- 14- Local markets have been improved so that the nomads may sell off some of their animals.
- 15- Nomads are also being encouraged to establish ranches where modern farming methods can be carried out for example paddocking and artificial insemination.

EFFECTS OF NOMADIC PASTORALISM IN THE ENVIRONMENT.

Negative effects.

- 1- Soil texture is destroyed leading to soil erosion.
- 2- Vegetation is also destroyed during dry seasons when there is extensive fires.
- 3- Nomadism accelerates the extension of desert lands.
- 4- Grass is also destroyed.
- 5- The Eco-system is also destroyed by nomadism.
- 6- It also leads to soil exhaustion as a result of erosion.
- 7- Pollution of environment through the dust as the animals move.

Positive Effects

- 1- Vegetable burning improves on soil fertility (ash)

RANCHING IN EAST AFRICA.

This is the keeping of livestock purposely for meat. Ranches in East Africa include;

- | | |
|--------|---|
| Uganda | - Ankole Masaka Ranching Scheme |
| | - Aswa Ranching Scheme |
| | - Buruli Ranching Scheme |
| | - Kisozi Ranching Scheme |
| Kenya | - Kaputei Ranching Scheme - Kenya highlands |

- Karuma Ranching Scheme
 - Ol-Kalour Ranching Scheme
- Tanzania - Kongwa Ranching Scheme
 - Mt. Kilimanjaro
 - Southern Highlands.



Characteristics of Ranching.

- 1- Animals are kept for commercial purpose.
- 2- They specialize on the rearing of one type of animal.
- 3- They employ scientific methods of animal rearing like cross breeds, artificial insemination, and use of machines.
- 4- Animals on ranches are grazed on natural pastures.
- 5- Ranches are confined in dry areas of East Africa as well as areas of sparse populations.
- 6- The movement of the animal is restricted by fencing and paddocking.
- 7- They have permanent water source and well developed transport network.

FACTORS WHICH HAVE FAVOURED THE ESTABLISHMENT OF RANCHES IN EAST AFRICA.

Physical factors include;

- 1- Presence of vast land for the establishment of ranches.
- 2- Availability of natural pastures for the animals to feed on.
- 3- Presence of a sparse population favouring the establishment of large ranches as well as permitting free movement of animals.
- 4- Presence of good breeds of animals such as Hereford, Boran, Aberdeen Angus.
- 5- Presence of infertile soils which don't permit/allow crop growth and thus encouraging ranching.
- 6- Availability of permanent water sources for the animals for example rivers, lakes and dams.

Human Factors ;

- 1- Presence of advanced technology and research.
- 2- Favourable government policy of promoting livestock rearing.

- 3- Presence of a large market for meat both in East Africa and abroad.
- 4- Availability of a large capital based provided by the government and financial institutions in form of soft loans.
- 5- Presence of reliable means of transport enabling the transportation of meat to markets and processing centres.
- 6- Availability of a large supply of labour both skilled and unskilled provided by the locals.
- 7- Political stability giving the farmers ample time to look after the animals.

Ankole Masaka Ranching Scheme.

The scheme is located at the border of Masaka and Mbarara district.

The area was originally occupied by the Bahima but later they abandoned because of rinder pest and Nagana.

Problems facing Ankole- Masaka Ranching Scheme.

- 1- Pests like tsetse flies and diseases like Nagana leading to poor quality animals and animal products.
- 2- Poor breeds of animals which take long to mature and give low products.
- 3- Infertile soils leading to the growth of poor pastures that the animals feed on.
- 4- Political instability within the area leading to death of people and animals.
- 5- Overgrazing promotes soil erosion and exhaustion.
- 6- Harsh climatic conditions leading to scarcity of water and pastures.
- 7- Growing of poor quality pastures which are not eaten by the animals.

Importance of the Scheme.

- 1- It has promoted research into better animal rearing methods.
- 2- Livestock rearing skills have been taught to the people like crossbreeding, fencing, spraying and dipping.
- 3- A market has developed at Sanga and this has promoted trade in the area.
- 4- Tsetse flies have been wiped out and ticks have also been reduced.
- 5- The scheme has led to generation of employment opportunities to surrounding people.
- 6- It has led to generation of revenue to government through taxation of scheme employees hence improving on their standards of living.
- 7- A major source of income to the local farmers enabling them to improve on their standards of living

IMPORTANCE OF LIVESTOCK REARING IN EAST AFRICA.

- 1- The livestock industry provides man with food in form of meat, milk and blood thus improving on their diet.
- 2- It has led to the generation of employment opportunities to the people of East Africa both the skilled and unskilled like the herdsmen who look after animals.

- 3- It is a source of income to the people, enabling them to improve on their standards of living.
- 4- It has led to the generation of revenue to the government through taxation of the farmers that is used to develop other sectors of the economy like the agriculture sector.
- 5- It has led to diversification of the economy of East Africa leading to widening of the government tax base.
- 6- It has also led to urbanization for example Mbarara, Tooro, Eldoret, Mandera.
- 7- It has promoted research in East Africa.
- 8- It has created market for industries like animal feeds.
- 9- Development of industries like creameries, Meat packers, leather and tanning industries.
- 10- Development of infrastructure like roads, hospitals and research centres used for further development of the economy like construction of roads.
- 11- Promoted tourism and thus earn alternative source of foreign exchange.
- 12- Animals provide man with products like hides, skins and bones.
- 13- Source of prestige and labour among some societies like the karamojong and Masai.

PLANTATION AGRICULTURE/ ESTATE FARMING IN EAST AFRICA.

Plantation Agriculture is the growing of one cash crop on a large scale using scientific methods. In East Africa cash crops include tea, sisal, pyrethrum, coffee, pineapples, rice, cotton, cloves and sugarcane. Most of these crops are perennial.

CHARACTERISTICS OF PLANTATION AGRICULTURE.

- 1- Farming is done on a large scale that is to say Over 100 hectares of land.
- 2- Farming is highly mechanized involving use of machines like tractors, combined harvesters and bull-dozers.
- 3- Plantations in East Africa are owned by foreigners especially Indians, Americans and Europeans.
- 4- The crops grown are for commercial purposes.
- 5- Processing of the crop is done within the plantation.
- 6- They specialize on the production of either one crop.
- 7- Plantation Agriculture results into a high output because of increased mechanization.
- 8- Farming is scientifically managed involving record keeping, use of fertilizers, research.
- 9- Plantations have well developed infrastructure like roads, include hospitals, banks.
- 10- Plantations employ a large number of people.

FACTORS WHICH HAVE FAVOURED THE ESTABLISHMENT OF PLANTATIONS.

- 1- Favourable climatic conditions that is to say heavy rainfall, high or low temperatures depending on the crop and high humidity.
- 2- Availability of extensive land for the establishment of large farms and infrastructure.
- 3- Presence of fertile well drained soils to support the growth of the crop.

- 4- Presence of a flat, gentle landscape for easy mechanization and establishment of transport network.
- 5- Availability of a large capital base provided by foreigners and even the government for purchasing farm equipments and paying workers.
- 6- Presence of abundant labour supply that is to say skilled labour provided by foreigners and unskilled labour provided by the local people.
- 7- Presence of reliable and ready transport network for the transportation of the products to the market and processing centres forexample roads and railways.
- 8- The favourable government policies of attracting investors, leasing of land to the investors and maintaining political stability.
- 9- Presence of a wide market for the products provided by the growing population both in East Africa and abroad in countries like USA and UK.
- 10- Presence of sparse population to permit large scale farming since plenty of the land is left idle.
- 11- Presence of abundant power for processing the crop forexample electricity and bio gas.
- 12- Advanced and appropriate technology inform of machines like tractors, water sprinklers for irrigation.

ADVANTAGES OF PLANTATION FARMING.

- 1- Plantation Farming provides employment to a number of people in East Africa forexample drivers, cultivators, machine operators earning them income.
- 2- Plantations have led to the generation of government revenue through taxation of workers and companies hence leading to diversification of the economy.
- 3- Plantations are sources of raw materials to industries which process their crops like tea processing industries and sugar refineries.
- 4- It has led to the generation of foreign exchange through the exportation of the crop to USA, France and India which is used for the development of other sectors of the economy like tourism and agriculture.
- 5- Plantations have also lead to the development of infrastructure like roads, schools, hospitals, housing estates.
- 6- Plantations in East Africa have also led to the development of towns forexample Kisumu, Lugazi, Jinja, Kericho.
- 7- Plantations have diversified the economy of East Africa thus widening the government tax base.
- 8- Plantations have promoted tourism and thus another alternative source of foreign exchange to the economy.
- 9- Plantations have promoted research and scientific study leading to high quality and output.
- 10- Plantations are sources of income to the people employed, thereby helping them to improve on their standards of living.
- 11- Plantations have promoted trade and international relations with the trading partners.
- 12- Plantations have provided market for industrial products like farming equipments.
- 13- Plantations provide people with products forexample sugar, coffee.

- 14- It has promoted industrial development in East Africa for example sugar refineries in Kakira.
- 15- The people employed on plantations acquire skills related to Plantation farming.
- 16- People in East Africa have engaged in out growers' scheme. Out growers are the farmers who grow the same crop as that on the plantation.
- 17- People process their products before exporting thus increasing the products value.

Disadvantages of Plantation farming.

- 1- It is expensive to maintain and establish because of the high investment involved for example buying land, farm equipments and paying the workers.
- 2- People practice monoculture which leads to soil erosion and exhaustion.
- 3- Repatriation of profits because they are owned by foreigners.
- 4- It is associated with over production which leads to price fluctuation.
- 5- Plantation farming displaces a number of people in East Africa calling for expensive resettlement.
- 6- There is easy spread of diseases because of growing the same crop on the same pieces of land.
- 7- In case of any natural disaster like drought and pest invasion, heavy losses are incurred.
- 8- Plantation farming leads to a decline in food production which may lead to famine.
- 9- Plantations require a lot of labour which is expensive to maintain like providing accommodation, medication and education.
- 10- The crops take long to mature leading to redundancy on the farm.
- 11- Plantations are associated with strikes because of low wages and poor working conditions among workers.

Examples of Plantations in E. Africa include;

- 1- Kilombero Sugar Plantation (Tanzania)
- 2- Kakira Sugar Works (Uganda)
- 3- Lugazi Sugar Corporation (Uganda)
- 4- Mumias Sugar Plantation (Kenya)
- 5- Kinyara Sugar Plantation (Uganda)
- 6- Kericho and Limuru Tea Plantation (Kenya)
- 7- Sisal Plantation (Tanga, Tanzania)

SUGARCANE GROWING IN EAST AFRICA.

The crop is grown in the following areas of East Africa.

Uganda. - In the shores of L. Victoria (Kakira and Lugazi)
 - Kinyara (Masindi)
 - Sango – Bay (Rakai)

Kenya - Coastal Province
 - Nyanza (Kisumu and Kano Plains)

- Tanzania
- Moshi
 - Kilombero Valley
 - Bukoba
 - Mwanza
 - Morogoro



Conditions for Growth.

- 1- High rainfall of over 1500mm or irrigation water.
- 2- Temperature of about 20°C .
- 3- Fertile alluvial soils.
- 4- Altitude of 1500m above sea level.
- 5- Flat or undulating low lands for easy mechanization.
- 6- Presence of a dry and warm season for ripening and harvesting.
- 7- Presence of reliable and quick means of transport and large market.
- 8- Presence of cheap labour supply for cutting/harvesting.
- 9- Large capital base.

CULTIVATION.

The areas are cleared using machinery like tractors. Canes for planting are selected, chopped into 40mm long, the pieces are then dipped into fungicide solutions. After treatment, they are planted in 1.5m apart. While growing, weeding and spraying are very important. Harvesting begins after 1 or 1 ½ years and it is done using pangas.

It is then loaded on Lorries, tractors or small wagons to factories.

Processing.

At the factory, the canes are weighed, chopped and crushed after which the juice is treated with lime, and sulphur then heated and clarified, boiled and the crystals are separated from the molasses.

N.B: Molasses is dark brown used for making alcohol (Waragi) and the residue is used as animal feeds.

The sugar crystals are then dried, graded, stored and then transported to the consumers.

Use of Sugar.

- 1- Making of alcohol.
- 2- Used as food.
- 3- For sweetening medicines.
- 4- Making paper boards, chemicals, animal feeds.

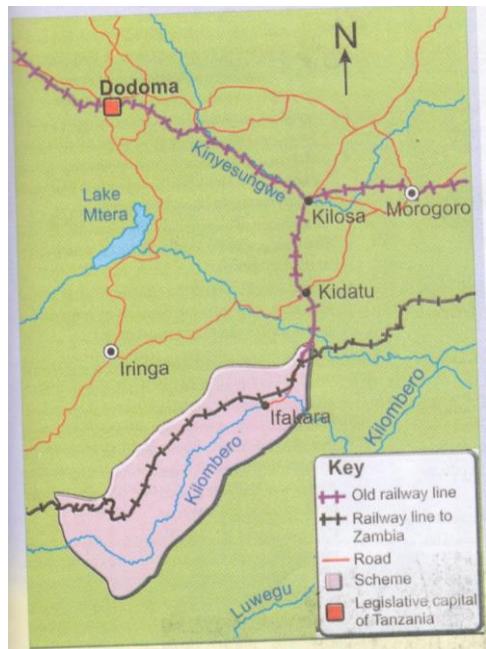
KILOMBERO SUGAR PLANTATION.

It is located in central Tanzania between rivers Ruaha and Kilombero. It is owned by SU.D.E Co (sugar development Cooperation) water for irrigation is provided by the Great Ruaha and the method for irrigation is overhead sprinkler.

AIMS FOR THE ESTABLISHMENT OF KILOMBERO SUGAR PLATATION.

- 1- To provide sugar for home, consumption and exports.
- 2- To open up the remote areas of Kilemboro for development.
- 3- To provide employment to the local people.

MAP OF KILOMBERO VALLEY IRRIGATION SCHEME.



FACTORS WHICH HAVE FAVOURED THE ESTABLISHMENT OF KILOMBERO SUGARCANE PLANTATION.

- 1- Availability of large supplies of water for irrigation provided by the great Ruaha River.
- 2- Presence of a gently sloping land permitting free movement of Water for irrigation, use of machinery and easy construction of transport network.
- 3- Availability of fertile- Alluvial soils in the valley favouring the growth of sugarcane.
- 4- Presence of heavy rainfall of over 1500mm and high temperatures of over 20⁰c which also favour the growth of high quality sugarcane.
- 5- Presence of a sparse population in the region giving room for the establishment of the plantation.
- 6- Availability of a reliable and ready transport for the transportation of sugarcane to processing centres and to markets foreexample the roads and railways (Tazara railways)
- 7- Presence of wide market for sugar both in Tanzania and abroad.
- 8- Favourable government policy of developing this area of Tanzania as well as financing the plantation.
- 9- Presence of a large capital base provided by the government for purchasing machinery and payment of employees.
- 10- Presence of vast lands with lowlands for the establishment of large plantations.
- 11- Availability of large supply of labour both skilled and unskilled.
- 12- Presence of advanced technology used in clearing the land as well as processing the crop.
- 13- Advanced research to improve on the quality of the sugar canes and sugar.

KAKIRA SUGAR WORKS, (UGANDA).

It is located at the shores of Lake Victoria along Jinja- Iganga high way. It is owned by the Madhvani family. Water for Irrigation is obtained from L. Victoria and the method for irrigation is overhead sprinkler.

N.B: Factors for development are the same as those of Kilombero Sugarcane Plantation.

Problems facing sugarcane growers in East Africa.

- 1- Pests like grasshoppers and diseases like yellow wit.
- 2- Shortage of labour for cutting the cane.
- 3- Soil erosion and exhaustion due to monoculture.
- 4- Price fluctuation on the world market.
- 5- Fire out breaks during the dry season caused by careless cigarette smokers.
- 6- Inadequate capital to purchase machinery and to pay the workers.
- 7- Competition from other sugar producing countries foreexample Cuba, Brazil, Malaysia.
- 8- Competition from sugar beet.

SISAL GROWING IN EAST AFRICA.

Sisal is grown for its sharp leaves which when crushed yield a coarse fibre. It is a cheap commercial crop in East Africa.

In Tanzania, it is grown around Usambara mountains, Morogoro,Kilosa, Lindi, Arusha, Mtwara. The leading area is Tanga.

N.B: However due to price fluctuations sisal and dates have been turned into horticulture, dairy farms, cattle ranches.

In Kenya sisal is grown in Muranga, coastal areas and fringes of the Kenya highlands.

In Uganda, sisal has never been an important commercial crop because of climate.



Conditions for the Growth of sisal.

- 1- It requires a wide range of soil conditions like those derived from the coral limestone.
- 2- High temperatures of between 25- 30°C.
- 3- Rainfall of about 750mm per annum.
- 4- Plenty of sunshine.
- 5- Gentle and flat land favourable for mechanisation.
- 6- Altitude of between 0 – 180m above sea level.
- 7- Quick and cheap transport network.
- 8- Large manual labour.

CULTIVATION.

- 1- The bulbils/suckers are planted in nurseries and after 9 months,
- 2- They are transplanted into fields. Weeding and harvesting are done by knives.

PROCESSING

After harvesting the leaves are taken to factories where the fiber is exposed by stripping using a machine called Decorticator. The fiber is washed, dried, bleached in the sun, brushed graded and baled and exported.

Uses of Sisal.

- 1- For making sacks, mats, carpets, fibers, strings, drugs (cortisone, (a pain killer)
- 2- The new use for making pulp and paper and its factory is a Tanga.

Problems facing sisal farmers.

- 1- Shortage of labour.
- 2- High costs of machinery.
- 3- Price fluctuation on the world market.
- 4- Pests and diseases.
- 5- Soil erosion and exhaustion due to monoculture.
- 6- Competition from artificial fibers like silk, nylon.

CLOVE GROWING IN EAST AFRICA.

Cloves in E. Africa are grown in Zanzibar (the largest producer in the World). Pemba islands. In Zanzibar and Pemba, the crop is grown in the Western parts of fertile soils and heavy rainfall.

Clove growing areas of Zanzibar and Pemba.



Conditions for growth.

- 1- Heavy rainfall of between 1500 – 2000mm per annum.
- 2- High temperatures of 27°C .
- 3- Flat and gentle land.
- 4- Deep, fertile and well drained soils.
- 5- High humidity.
- 6- Dry picking season.
- 7- Availability of abundant labour for harvesting.
- 8- Shelter from dry winds.

Problems Facing the Clove Growers.

- 1- Soil exhaustion due to monoculture
- 2- Insufficient labour for harvesting
- 3- Price fluctuation on the world market.
- 4- Competition from other producing countries especially Madagascar
- 5- Pests and diseases.

However some of these problems are controlled by digging up of infected trees and replacing them with new ones.

Uses of cloves.

- 1- For spicing food and cigarettes
- 2- For making cooking oil, soap, perfumes, flavoring medicines, cosmetics, chocolates, and sweets.

PYRETHRUM GROWING IN EAST AFRICA.

Pyrethrum is a white flowering plant which contains a chemical substance used for making insecticides.

It is a commercial crop grown around the Kenyan highlands, Mt. Meru, Mbeya, and Arusha in Tanzania.



Conditions for the Growth.

- 1- Low temperatures of below 15°C at bud formation time.
- 2- Altitude of over 2000m above sea level.
- 3- Heavy and well distributed rainfall of between 1000 – 1250mm.
- 4- Rich, well drained volcanic soils.
- 5- Abundant labour for picking.
- 6- A fairly cool and moist conditions.

Cultivation and processing

The seeds are planted in nurseries after which transplanted in major fields in rows, weeded and mature in one year. It is picked every two- three weeks in the flowering season for up to four years. Pyrethrum is grown on small farms and on some large farms.

Flowers are dried in the sun, packed in sacks and sent to factories for extraction of pyrethrums for use in insecticide.

N.B. The Biggest factory is in Nakuru. It is exported to U.S.A and Britain.

Problems.

- 1- Soil Exhaustion because of monoculture.
- 2- Shortage of labour.

- 3- Pests and diseases.
- 4- Competition from synthetic insecticides.

However the above problems are solved by application of fertilizers, spraying, limited production of pyrethrum, banning of synthetic/chemical insecticide

Uses of Pyrethrum.

- 1- Making of insecticides, perfumes, herbs and proteins for animals.

TEA GROWING IN EAST AFRICA.

Tea is a major plantation crop in East Africa obtained by plucking, drying and curing.
In Uganda, it is grown in the forested areas; Lugazi (Kasaku and Luwala), Mityana, Kabarole, Bushenyi, Mubende, Luwero, Masaka, Kigezi, Buhweju.

In Kenya, it is grown in Kericho, Limuru, Kisii, Nyeri, Kakamega, Nandi hills, Embu, Meru, Kiambu, and Muranga.

In Tanzania it is grown in Bukoba, Rungwe, Iringa, Tanga (South and Western part of Usambara Mountains), Mbeya, slopes of Mt. Kilimanjor. South highlands (Tukuyu, Njombe and Mufundi).



Conditions for growth.

- 1- Low temperatures of 13°C.
- 2- Gently sloping land.
- 3- Altitude of between 1000 – 2000m above sea level.

- 4- Heavy rainfall of between 1000 – 2000mm.
- 5- Acidic, damp, deep, well drained soils.
- 6- Abundant labour for weeding and harvesting.
- 7- Constant pruning, weeding and application of fertilizers.
- 8- Constant spraying against pests and diseases.
- 9- Quick and reliable means of transport and ready market.
- 10- Machinery for processing the leaves.

N.B: Tea pickers normally use stick leaves while plucking to keep the activity at one Level.

Cultivation.

There are four methods of growing.

- 1- Leaf cuttings and planted in Nurseries after which transplanted in rows.
- 2- Seeds are planted in nurseries and after two years transplanted in the main estate in rows.
- 3- Once on estates, constant weeding and pruning is done because the more the branches, the more the shoot and thus high production.
- 4- During harvesting, two leaves and a bud are plucked and taken to the factory.

Processing.

The plucked leaves and the buds are carried to the factories on heads, bicycles, pickups, tractors and lorries. Tea must be processed within the first 24 hours.

On reaching the factory, it is weighed and passed through withering lofts where hot air is blown to remove moisture and making the leaves soft.

The leaves are put on rollers where they are cut into small pieces, allowed to ferment for two hours where it turns brown to acquire the taste/flavour of tea.

Tea is then graded, weighed, packed and sealed for sale/ export.

N.B: Forests/trees are normally planted near tea estates to perform the following;

- 1- Control soil erosion.
- 2- They are wind brakes.
- 3- They provide shade.
- 4- Rainfall formation.
- 5- Source of energy (firewood) for drying the tea.

Tea growing in Kericho. (Tagabi Tea Estates.)

Kericho is the main tea growing area in Kenya and East Africa as a whole. The main growing areas are the gentle slopes of Mau Escarpments.

At Kericho tea is grown under three main categories.

- 1- Large scale estates owned by rich companies like Brooke Bond Tea Company.
- 2- Small scale growing but with assistance from the Kenya Tea Development.
- 3- Production on cooperative basis owned by the cooperatives.

Tea growing in Kericho was encouraged by the following factors.

- 1- Heavy rainfall of over 2000mm per annum.
- 2- Altitude of 1800m above sea level.
- 3- Presence of fertile and slightly acidic soils.
- 4- Availability of extensive land for the establishment of estates.
- 5- Presence of abundant labour from the Nyanza province.
- 6- Large supply of water for processing the tea from lake Naivasha.
- 7- Availability of machinery like tractors.
- 8- Well-developed transport network.
- 9- Ready market provided by the dense population.
- 10- Supportive government which gives support and allows foreign investors.

Tea from Kericho is exported to the Middle East, Netherlands, Canada, Germany, US.A, and Britain.

N.B: The major problem facing tea growers in Kericho is severe hailstorms. This is the only place in the world where hail storms fall at all seasons.

Problems facing Tea Growers.

- 1- Competition from other producing countries like Sri-Lanka.
- 2- Pests and diseases leading to low quality.
- 3- Rain during the picking season.
- 4- Competition from other beverages like coffee.
- 5- Soil exhaustion due to monoculture.
- 6- Over production leading to price fluctuation in the world market.
- 7- Inefficient labour for packing.
- 8- Inadequate transport facilities.

Solutions

- 1- For soil exhaustion: application of fertilizers.
- 2- Competition: improving on the quality.
- 3- Pests and diseases: spraying using chemicals.
- 4- Shortage of labour: mechanization.
- 5- Weeds: Constant pruning
- 6- Hailstorms, use of aircrafts to spray silver iodide and hail storm suppression scheme.

Uses of Tea.

- It is a Beverage.
- 1- It is used as a drug.

TOBACCO GROWING.

It is grown on small scale (Small holders because it is done by peasants). In Kenya, it is grown in Kipei, Kisii and Embu.

In Uganda, it is grown in West Nile (Arua), Kitgum, Kabarole, Bushenyi, Gulu, Bunyoro, North Kigezi.

There are two varieties of tobacco grown in Uganda;

- a) Fire cured, which requires fire for drying. Mostly grown in Arua.
- b) Flue cured which requires wind for drying. Mostly grown in Kabarole.



Conditions for its Growth.

- High temperatures of about 22°C.
- Well drained soils.
- Rainfall of about 500 – 600mm during the growing season.
- Altitude of between 1000 – 1200m above sea level.
- Abundant labour for weeding and harvesting.
- Constant attention.

N.B: Tobacco is an annual crop and it is grown with rotation in other crops because it exhausts the soil quickly.

Cultivation.

Tobacco is planted in nurseries and after two months its transplanted to fields. Where weeding and addition of fertilizers are necessary.

The curing plants of tobacco are called burns.

Processing/Curing

There are two types of curing namely;

- (a) Flue curing: leaves are hanged in an enclosed or heated room to limit the dangers of moisture which can make the leaves go bad.
- (b) Fire curing: This involves hanging of leaves on fire until the leaves turn yellow/brown.

Problems facing Tabaco Growers.

- 1- Pests and disease.
- 2- Shortage of labour for weeding and harvesting.
- 3- Drought and low rainfall and high temperature.
- 4- Price fluctuations in the world market.
- 5- Soil erosion and exhaustion because of monoculture.
- 6- Accidents especially in the burns.
- 7- Limited fire wood for processing.
- 8- Competition from other growing countries for example Cuba and Sri Lanka.
- 9- Reptiles especially snakes.
- 10- Poor transport network.
- 11- Shortage of capital.
- 12- Processing is time consuming.

Uses.

- 1- For making cigarettes.
 - 2- Medicine.
- B.A.T (British American Tobacco) limited is the soul buyer of tobacco in East Africa.

RICE GROWING IN EAST AFRICA.

Rice requires fertile soils with plenty of water. It is an annual crop. In Kenya it is grown in Mwea Tebere and Ahero Irrigation Scheme. In Uganda, it is grown in Kibimba, Palisa, Doho, the shores of L. Victoria, Kyoga and Olweny Irrigation Scheme in Lira.

In Tanzania it's grown in Mkomazi Rufiji, Usangu and shores of L. Malawi.



WATTLE GROWING IN EAST AFRICA.

Wattle trees are grown from their bark which yield on extraction used in tanning leather. It's a commercial crop and Kenya is the chief producer. It is mainly transported to India.

Wattle requires a fairly dry condition and the most producing area is Kikuyu land.



WHEAT GROWING IN EAST AFRICA.

Mainly grown in Uasin Gishu in Kenya.

They require fairly fertile soils, moderate rainfall and a warm and sunny ripening period.

Wheat growing areas in Kenya include; Kenya highlands, Eldoret, Meru central, Narok, Nakuru and the leading producer is UASIN GISHU.

In Tanzania it is grown in Arusha and mainly exported to Britain.



COTTON GROWING IN EAST AFRICA.

Cotton is a small holding crop and the chief growing areas are the shores of L. Victoria that is to say South East Mwanza, Nyanza Province in Kisumu and in Uganda its grown in areas of Lira, Gulu, Soroti, Kumi, Tororo, and Busoga, It is also grown along the East African coast.



Conditions for Growth.

- 1- Abundant labour for cotton picking.
- 2- Adequate capital to buy farm equipments.
- 3- Requires dry seasons for picking.
- 4- High temperature of not less than 25°c.
- 5- Rainfall of about 750mm.
- 6- Altitude of 1400mm above sea level.
- 7- Fertile and well drained soils.

Cultivation and Processing.

The land is ploughed and seeds are planted in rows of about 1 m apart. After germination, thinning, weeding and spraying are done.

Harvesting is done by hand. Sorting is then done to remove the unwanted fibres. Cotton is then packed and taken to the stores and finally to ginneries where the seeds and fibres are separated.

Problems Facing Cotton Growers.

1. Pests and diseases for example ball weevils and bacterial blight which lower the quality of cotton.
2. Unreliable rainfall during the growing seasons.
3. Inadequate labour for picking and sorting.
4. Competition with other cash crops like coffee.
5. Poor storage facilities leading to losses.
6. Price fluctuation at the world market due to over production.
7. Soil exhaustion due to monoculture.
8. Heavy rainfall during picking season leading to losses.
9. Competition from synthetic fibres like nylon, silk.
10. Poor transport in rural areas.

Uses of Cotton.

- | | |
|-----------------------|------------------------------------|
| - Making of cotton. | - Stuffing mattresses and pillows. |
| - Cotton fibre. | - Cotton wool used in hospitals |
| - Cattle feeds. | |
| - Cotton textiles. | |
| - Making cooking oil. | |

COFFEE GROWING IN EAST AFRICA.

In East Africa there are three varieties of coffee;

- a) Arabica Coffee: Grown in highland areas for example Mt. Elgon, Rwenzori, Kilimanjaro, Meru, Kenyan Highlands, Usambara.
- b) Robusta Coffee: this makes the best instant coffee and it does well around L. Victoria shores (Mwanza, Kisumu, Bukoba, and central Uganda).
- c) Clonal Coffee: this type of coffee is mostly grown in marginal areas like Nakasongola, Tororo, Sembabule, Gulu, Kitugum, Apac and Lira.



Product



Conditions for Growth.

- 1- Deep fertile and well drained soils as well as volcanic soils.
- 2- Moderate rainfall of 1000 – 1500mm.
- 3- Temperature of between 20 – 26°C for robusta, 19°C- 23°C for Arabica Coffee.
- 4- Altitude of 1000- 1200m for Arabica, 1000 – 1500 Robusta Coffee.
- 5- Adequate labour for picking the coffee beans.
- 6- Adequate capital to buy farm tools and pay workers.
- 7- Ready market for the coffee both at home and abroad.
- 8- Protection from winds.
- 9- Well-developed transport network that makes easy delivery of coffee to the processing centres.
- 10- Supportive government policy that provides soft loans to the farmers.

Cultivation.

Coffee is grown from seeds in nursery beds which also must be protected from the sun. Its transplanted after one year followed by weeding, spraying and addition of fertility. Coffee is ready for picking after three years and it is done by hand.

Processing.

There are two methods of processing;

- 1- Wet processing (Cherry wet processing) coffee is put in a tank of water for it to ferment and the pulp is removed. The beans are sun dried roasted graded and packed. This is mainly for Arabica Coffee.
- 2- Dry processing (cherry dry processing). The beans are sun dried then sent to hulleries for removal of pulp. It's then roasted, graded and packed.

Problems.

- 1- Price fluctuation at the world market due to over production.

- 2- Soil erosion and exhaustion due to monoculture.
- 3- Competition from other beverages like tea, cocoa and tea.
- 4- Inadequate labour for picking.
- 5- Difficulty in carrying out mechanization due to steepness in mountainous areas.
- 6- Poor transport in the rural areas causing delays.
- 7- Poor storage facilities leading to losses.
- 8- Competition from other countries like Brazil, Ethiopia
- 9- Pests and diseases for example Coffee berry borer and diseases like leaf root diseases and coffee wilt disease.

CONTRIBUTION OR IMPORTANCE OF CASH CROP GROWING TO THE ECONOMIC DEVELOPMENT.

- 1- Sources of foreign exchange after exploitation and exportation coffee and tea.
- 2- Cash crops have led to the development of infrastructure like roads, schools, hospitals.
- 3- They have promoted international trade thus cooperation.
- 4- They have provided employment to many people earning them income hence improving their standards of living.
- 5- They have led to urbanization for example Kericho.
- 6- They have led to research on how to improve on their quality and quantity.
- 7- Sources of food for example coffee and tea.
- 8- Provide raw materials for industrial development for example jaggery for sugarcane, ginnery for cotton.
- 9- Sources of government revenue through taxation thus economic diversification.
- 10- Sources of income to the peasants which leads to the improvement of their standards of living.
- 11- Diversified the economy like constructing industries.

PROBLEMS FACING AGRICULTURE IN EAST AFRICA.

- 1- Pests and Diseases leading to low yields.
- 2- Competition from the developed countries producing similar crops.
- 3- Poor breeds of crops and animals leading to low yields.
- 4- Price fluctuation at the world market due to over production.
- 5- Limited market because of poor products.
- 6- Political instability especially in Northern Uganda as a result of war.
- 7- Poor soils like clay and sand.
- 8- Poor technology that is to say many farmers still use traditional tools like pangas, hand hoes.
- 9- Climatic problems like high temperature, low rainfall and floods.
- 10- Shortage of labour for harvesting more so during the peak.
- 11- Poor storage facilities leading to poor quality products.
- 12- Poor transport network from the growing areas to markets.
- 13- Population increase which leads to shortage of land, land fragmentation and land disputes.

- 14- Poor relief which hinders mechanization of Agriculture
- 15- Illiteracy among farmers.
- 16- Limited research in the agricultural sector.

IRRIGATION AND RESETTLEMENT SCHEMES IN EAST AFRICA.

Irrigation is the artificial supply of water for growing crops. Irrigation schemes in East Africa were mainly established for resettlement purposes. However, other aims include;

- 1- To provide extra water to meet the rainfall shortages.
- 2- To improve on the soil conditions.
- 3- To control floods and increase production.
- 4- To ensure full production throughout the year.

FACTORS FAVOURING THE ESTABLISHMENT OF IRRIGATION SCHEMES IN EAST AFRICA.

- 1- Presence of flat land for easy mechanization as well as movement of water under the influence of gravity.
- 2- Presence of fertile alluvial soils.
- 3- Availability of extensive land for establishment of large irrigation schemes.
- 4- Presence of a permanent water source in form of rivers and lakes.
- 5- Presence of a large capital base for purchasing machinery as well as payment of workers.
- 6- Favourable government policies of maintaining political stability and attracting foreign investors.
- 7- Availability of ready and efficient transport network in form of roads and railways.
- 8- Presence of large supply of labour both skilled and unskilled.
- 9- Availability of ready and wide market.
- 10- Low and unreliable rainfall favouring irrigation farming.

Examples of Irrigation Schemes in East Africa.

Scheme	District	Source of Water	Crop
Uganda:			
Olweny Irrigation Scheme	Lira	Lake Kwania	Rice
Mobuku Irrigation scheme	Kasese Sebwe	River Sebwe Mobuku	cotton and vegetables
Sango Bay irrigation scheme	Rakai	L. Victoria	Sugarcane
Kibimba irrigation Scheme	Bugiri	L. Kibimba & R. Mpologoma	Rice

Scheme	District	Source of Water	Crop
Alera Irrigation Scheme	Apac	L.Kyoga	Rice and vegetables
Doho Irrigation Scheme	Buteleja	R. Manafwa	Rice
Ongom Irrigation Scheme	Lira	R. Owemerri	Citrus fruits
Kiige Irrigation Scheme	Kamuli	R. Nabigaga	Citrus Fruits
Ahero Pilot Irrigation Scheme	Kisumu	R. Nyando	Rice
Mwea Tebere Irrigation Scheme	Kirinyaga	R. Thiba and Nyamindi	Rice
Bunyala Pilot Irrigation Scheme	Busia	R. Nzoi	Rice
Galole/Hola Irrigation Scheme		R. Athi	Rice
Kibirigwi Irrigation Scheme	Kirinyaga	R. Sagana	Onions, Tomatoes, vegetables
Katiru Irrigation Scheme	Turkana	R. Turkwell	Maize
Taveta Irrigation Scheme	Taita- Tovela	Njoro Springs	Vegetables
Kibwezi Irrigation Scheme	Makuweri	R. Kiboko	Rice
Lari Irrigation Scheme	Tana River	River Tana	Vegetables
Pakere Irrigation Scheme	Morogoro	Great Ruaha	Sugarcane
Kilombero Irrigation Scheme	South Eastern Tanzania.	R.Kilobero	Sugarcane

AHERO PILOT IRRIGATION SCHEME.

The scheme is found in Western Kenya on R. Nyando in Kisumu. The major crop is rice and water for irrigation is from R. Nyando and R. Miriu drains the water from the scheme. The method for irrigation is furrow and the aim for the establishment was to taste the success of large scale irrigation.

Factors for the development include the following;

- 1- Presence of suitable fertile soils for the growing of rice.
- 2- Availability of large supplies of water for irrigation from R. Nyando.
- 3- Presence of large supplies of cheap labour both unskilled and skilled.
- 4- Presence of a flat land between R. Nyando and Miriu which allowed free flow of water under the influence of gravity and easy use of machines.

The A hero Rice Scheme.



Irrigation block

Main irrigation channels
And water intake

New Villages

Tracks
roads.

MWEA TEBERE IRRIGATION SCHEME.

The scheme is located on R. Tana. North East of Nairobi near the foot hills of Mt. Kenya. The major crop is rice and water for irrigation is obtained from the following areas; R. Thiba and Nyamindi.

The aims for establishment.

- 1- To make use of arid land
- 2- To resettle and employ the detainees (from Mau Mau)
- 3- To increase rice production in the country for self-reliance.

Conditions which have favoured the location of the project.

- 1- Presence of permanent water sources such as Rivers Tana, Thiba and Nyamindi.
- 2- The gently sloping landscape - Predominant plain on the lower slopes of Mt. Kenya allowing irrigation by gravity flow.
- 3- Presence of fertile black volcanic soils, red clay loams which support rice growing.
- 4- Low average unreliable rainfall of less than 750mm per annum.
- 5- Large and extensive tracts of land which are sparsely populated thus development of the project.
- 6- Favourable government policy of promoting irrigation projects in remote or marginal lands.
- 7- Proximity to communication lines for example the Nairobi – Nyeri Railway.

- 8- Availability of landless people who could be recruited to provide labour.
- 9- Availability of capital to purchase machinery and pay workers.
- 10- Ready market for the crops provided by the dense population.

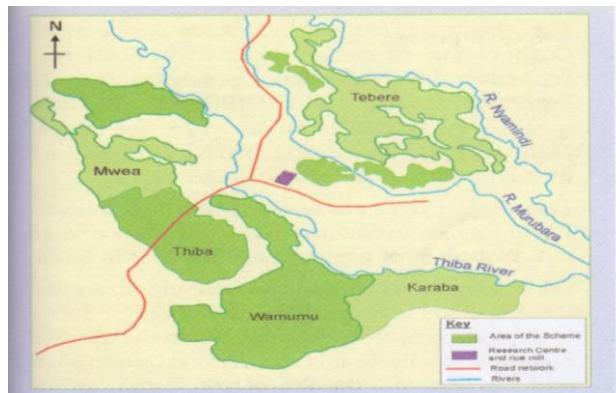
Explain the benefits of the Irrigation Project to the people of Kenya

- 1- Source of vital food like Rice.
- 2- Provision of employment to people hence earning them income.
- 3- Source of income to farmers which improves on their standards of living.
- 4- Resettlement of the population which was formerly landless.
- 5- Improvement in infrastructure for example roads, hospitals and schools.
- 6- Improvement in research.
- 7- Source of government revenue leading to economic diversification.
- 8- Establishment of processing industries.
- 9- Effective utilization of marginal lands.
- 10- Development of towns like Kisumu.
- 11- Farmers acquire modern farming techniques.

Outline the problems faced by farmers on the irrigation project.

- 1- Poor yields of rice.
- 2- Reduction in soil fertility.
- 3- Pests which destroy the crops.
- 4- The Problem of Weather conditions like cool temperatures, storms.
- 5- Price fluctuations leading to unstable farmers' income.
- 6- Silting of canals.
- 7- Limited capital.
- 8- Soil Exhaustion.

MWEA –TEBERE IRRIGATION PROJECT.



AGRICULTURE AND CHIEF COMMERCIAL CROPS IN EAST AFRICA.

Coffee	Cashew nuts
Tobacco	Rice
Sisal	Irrigation Project
Sugarcane	Pyrethrum
Tea	Cotton
River	
Coconuts.	

Measures/Solutions to the problems.

- 1- Regular spraying to control pests and diseases.
- 2- Application of fertilizers and farm manure to improve on soil fertility.
- 3- Regular dredging of canals to get rid of silt.
- 4- Building of embankments along the rivers to control flooding.
- 5- Encourage the farmers to form cooperatives to get more money.

N.B.

- 1- Galole/Hola is located on R.Athi East of Nairobi, Major crop is Rice and water for irrigation is from R. Athi. Other crops grown include g. nuts and sugarcane. The aim was to act as a model scheme by which an arid area could be developed.
- 2- The Kano plains pilot irrigation scheme (Kenya is located on the Kavirondo gulf out the shores of L. Victoria near Kisumu. The major crop is sugarcane and others include rice. The flood plains of the following rivers provide water for irrigation foreexample Nzoi, valla, Nyando and Sondu. The aim was to improve the farming system which was a substance and to improve food production to prevent famine.
- 3- **Lari Irrigation Scheme:** - This is a multipurpose irrigation scheme located on the Kenyan Highlands North West of Nairobi town. The major aim was to resettle the Kikuyu Farmers to grow pyrethrum and to rear dairy cattle.
- 4- **Yalla and Bunyala.** These schemes are found on the shores of L. Victoria on R. Yall. Major Crops include sugar cane and rice. The aim was to reduce population pressure on the Kano plains as well as to eliminate Malaria and Bilharzia.
- 5- **Mobuku Irrigation Schemes:** - This is a multipurpose irrigation scheme located on the slope of Mt. Rwenzori. The major crop is onions others include cotton, g.nuts, maize and vegetables and irrigation water is from R.Mobuku.

The major aim was to resettle people from over populated areas especially Bakonjo, Bakiga, Bwamba.

- 6- Doho Irrigation Scheme –The major crop is rice and it is found in Butaleja Water for Irrigation is from R. Manafwa.
- 7- Kibimba irrigation Scheme: - it's located in Bugiri district, major crop is rice and irrigation water is from R. Mpologoma and L. Kibimba.

Contribution of Irrigation Schemes to East Africa.

- 1- Schemes provide employment opportunities to many people in East Africa.
- 2- Source of food to man foreexample Rice, maize, onions and vegetables.
- 3- Sources of raw materials to industries foreexample agro based industries.
- 4- Sources of Income to the local people thus helping them to raise their standards of living.
- 5- The schemes promote research and scientific study in East Africa.
- 6- They promote the development of infrastructure like roads and railways.
- 7- Development of towns like Bugiri and Kisumu.
- 8- Schemes in East Africa are sources of government revenue through taxation of the people as well as the schemes themselves.
- 9- The employed people acquire skills on modern farming techniques.
- 10- Attract tourists leading to the development of the tourist industry.
- 11- Promote industrial development in East Africa thus leading to employment opportunities.
- 12- Resettlement of the population which was formally landless.
- 13- Generation of foreign exchange through the exportation of the crop
- 14- Diversification of the economy thus widening the government tax base.
- 15- Have promoted international trade and relations.
- 16- Have led to the effective utilization of marginal lands foreexample dry lands and swamps.

Problems facing Irrigation Schemes in East Africa.

- 1- Pests and diseases.
- 2- Monoculture which leads to soil exhaustion.
- 3- Over production leading to fluctuation on international markets.
- 4- Break down of machinery.
- 5- Inadequate labour force.
- 6- Limited land for expansion.
- 7- Shortage of water for irrigation because of drought conditions.
- 8- The schemes are expensive to establish and maintain due to inadequate capital.
- 9- Limited market for the crops.
- 10- Pollution of the environment by industries and tractors.
- 11- High evaporation rates leading to salinity of the soils.

12- Silting or blocking of canals.

SKETCH MAP OF EAST AFRICA SHOWING IRRIGATION SCHEMES.



MINING IN EAST AFRICA.

Mining refers to all attempts to extract valuable minerals both solid and liquid from the earth crust.

East Africa endowed with a number of minerals like diamond, copper, soda ash, salt, gold and iron.

Many of these minerals are in small quantities like gold in west Kenya, Coal in South Tanzania. However, the most important minerals in East Africa include diamond, copper and soda ash.

TYPES OF MINERALS IN EAST AFRICA.

There are three types of minerals.

1. Metallic Minerals: which include silver gold, copper, zinc, lead, tin, and aluminum.
2. Non-metallic minerals: Phosphates, caladium, salt, nitrates, potash, sulphur, mica and
3. Minerals which provide power like petroleum, natural gas, oil, uranium, and water.

A SKETCH MAP OF EAST AFRICA SHOWING MINING CENTRES.



METHODS OF MINING IN EAST AFRICA.

OPEN CAST METHOD.

This method is employed when the mineral occurs near the earth surface. The over lying soil is removed (stripped off) and dumped near by the mineral deposit. It is then removed by digging using picks and shovels and sometimes explosives are used, it is then loaded on tracks.

In East Africa, it is used for mining the following, copper, diamond, gold, phosphates and salt. This method destroys vegetation, soil profile and structure. It also leads to the creation of deep holes on the earth crust.



UNDERGROUND MINING/ADIT MINING.

This method is used when the mineral is on the hillside like copper on mountain Rwenzori.

Horizontal/inclined tunnels are dug in the hill site where the mineral occurs at the site of the mountain.

The roof of the tunnel is supported by steel or concrete beams to prevent it from collapsing.

The mineral bearing rock is blasted and transported to the surface by light railways or conveyor belts.

The methods is used in the mining of copper in Kilembe.

Disadvantages of Underground Mining

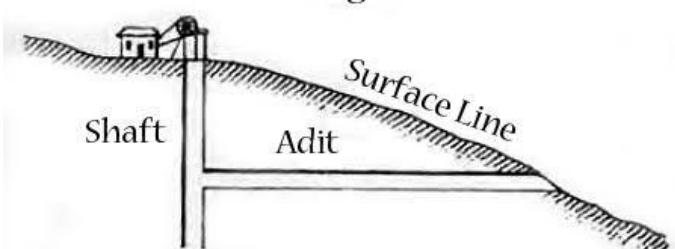
- Accidents due to collapsing of the mines.
- Pollution due to poor ventilation.
- High temperatures below the earth crust.
- High cost of mining
- Diseases, which affect the respiratory organs.

SHAFT MINING.

Vertical shafts are sunk into the earth crust to reach the mineral deposit. From these salts horizontal shafts are dug to reach concrete beams to prevent it from collapsing.

Light railways are used to transport the deposit through the shaft to the surface.

Fig 1



ALLUVIAL/ PLACER MINING.

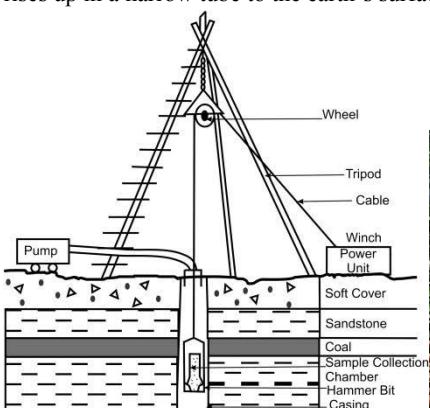
This method is used when the minerals appear as alluvial deposits. It involves mining of the alluvial deposits in a container. The mixture is rotated until light particles such as sand, mud and small stones are washed off leaving mineral particles such as gold, platinum and diamond.



DRILLING METHOD.

This method is used to extract liquids and fluids such as oil and gases for example oil on L. Albert.

A drill is sank deep using a derrick into the ground to reach the mineral. The mineral liquid rises up in a narrow tube to the earth's surface due to pressure differences.



DREDGING: sundering of the minerals like soda ash.

FACTORS FAVORING THE DEVELOPMENT OF MINING IN EAST AFRICA.

1. Presence of large deposits of minerals like gold petroleum limestone, soda ash that attract the government and foreign investors to come and exploit.

2. The occurrence to the minerals near the Earth surface making extraction easy and cheap using open cast method.
3. Presence of adequate supplies of power for processing and transporting of minerals for example Hydro Electric Power from Nalubaale and power project of petroleum.
4. Availability of adequate and reliable source of capital provided by the government and foreign investors to buy machinery and pay workers.
5. Presence of efficient and reliable transport network based on roads and railways that have facilitated the transportation of the minerals to processing centres.
6. Favorable government policies of attracting foreign investors and diversifying the economy.
7. Political stability in the mining areas to attract many foreign investors in the industry.
8. Presence of large supplies of water for processing the minerals provided by rivers and lakes like Victoria.
9. Availability of large supplies of labour both skilled and unskilled to work in the mining industry.
10. Presence of improved and appropriate technology enabling easy construction and transportation of the minerals.
11. Availability of a large and ready market both domestic and foreign.

DISTRIBUTION OF MAJOR MINERALS IN EAST AFRICA. MINERALS IN UGANDA.

The following are the major minerals in Uganda.

1. Copper and cobalt from Kasese (Kilembe).
2. Gold in Karamoja and Busia.
3. Phosphates and Limestone from Tororo.
4. Limestone from Hima.
5. Petroleum from L. Albert.
6. Asbestos from Tororo.
7. Salt from L. Katwe.
8. Tin, Iron Ore, wolfram Kigezi.

N:B: Copper in Uganda is a major mineral mined at the foot of Mountain Rwenzori on the steep and valley of River Nyamwamba.

MINING IN TANZANIA.

The minerals in Tanzania include diamond at Mwadui, Gold in Lramba-sekenke, Musarra Cooper and Coal Ruhuho valley, iron ore in Mbeya hills and liganga, Mica in Kilosa and Mpanda.

DIAMONDS MINING IN TANZANIA.

Diamonds are mined 20km from shinyanga at Mwadui, these diamonds are formed by the intrusion of magma solidified in a pipe to form a plug. The plug was later exposed by erosion and also scattered the diamonds. The diamond bearing rock is called Kimberlite. The method of mining is open cast or quarrying. The processing procedure includes separation, crushing, extraction and processing.

Uses of Diamond.

1. For making Jewellery.
2. For making drilling bits.
3. For making precision goods like watches.

FACTORS WHICH FAVORED DIAMOND MINING AT MWADUI IN TANZANIA.

1. Presence of large diamond deposits at Mwadui.
2. The deposits occur close to the earth surface making it easier and cheaper to mine.
3. The diamonds in Tanzania are dense, hard and repel water thus it is easy to extract.
4. The land is relatively gentle allowing easy construction of roads and railways as well as use of machines like tractors.
5. The diamonds in Mwadui are of high quality.
6. Adequate capital used for purchasing machines and paying workers.
7. Reliable transport used for transporting the minerals to the processing centres.
8. Large market both in Tanzania and abroad.
9. Abundant supply of labour provided by the local people.
10. Favorable government policies of injecting capital to the mining activities.

CONTRIBUTION OF THE MINING INDUSTRY IN EAST AFRICA.

1. It provides employment opportunities to many people like drivers, Engineers, researchers who earn income hence improving on their standards of living.
2. It diversifies the economy of East Africa and thus widening the government tax base.
3. The mining industry is the major source of foreign exchange through the exportation of major minerals like gold to France UK and U.S.A.
4. The industry has also led to the development of infrastructure like Roads and Railways that have facilitated the transportation of minerals to processing centers.
5. Mining has led to the development of industries in East Africa especially those processing the minerals forexample Tororo and Hima cement factories.

6. It has led to the development of towns associated with mining for example Kasese Shinganga, Mombasa.
7. It has promoted research and scientific study.
8. It has promoted tourism in East Africa and thus earn alternative source of foreign exchange.
9. It's also a source of income to the local people employed in the mining industry helping to improve their standards of living.
10. The mining population provides market for both agricultural and industrial products.

Effects of mining on the Environment.

1. Pollution of the Environment.
2. Displacement of many people calling for expensive resettlement.
3. Associated with accidents leading to death of many people.
4. Open cast mining leads to the creation of pits on the Earth surface.
5. Mining leads to urbanization with its associated problems like unemployment, high crime rate, prostitution and slum development.
6. If leads to loss of soil fertility.
7. Mining promotes landslides, which also leads to death of many people.
8. Underground mining promotes earth quakes because it weakens the rock strata.
9. Mining leads to a fall of the water table.

The above can be solved through.

1. Application of artificial fertilizers.
2. Spraying.
3. Resettlement of displaced people.
4. Carrying out forestation and re-afforestation.
5. Transforming mining holes into man-made lakes for fishing.
6. Deflection of the landscape can be solved by land filling.

CONDITIONS / FACTORS HINDERING/ LIMITING THE DEVELOPMENT OF THE MINING INDUSTRY IN EAST AFRICA.

1. Inadequate capital from mineral exploitation, transport and processing.
2. Inadequate supply of skilled manpower in the mining industry because of the problems associated with it like accidents and low pay.
3. Political instability in some mining areas like Karamoja and South Western Uganda.
4. Minerals in East Africa occur in small quantities for example tin, beryllium and gold.
5. Price fluctuation on international markets due to high production.
6. Inadequate supply of power for transportation, processing and extractions.
7. Small market for the minerals because of poor quality for example coal in South Tanzania.

8. Some mineral deposits are in remote areas for example coal in Tanzania, uranium in the south coast of Mombasa.
9. Minerals in East Africa are scattered making exploitation difficult and expensive.
10. Competition with other developed countries like Germany.
11. Limited research in the mining industry leading to low production.
12. Exhaustion of some of the minerals for example copper in Kasere.
13. Use of inappropriate technology like hoes.
14. Unfavorable government policies of favoring other sectors of the economy.

STEPS TAKEN TO SOLVE THE ABOVE PROBLEMS.

1. Maintaining political stability in the mining areas to encourage investors.
2. Diversification of the economy to include industries, Agriculture and Tourism.
3. Attracting foreign investors in the mining industry by providing concessions, maintaining political stability.
4. Privatization of the mines like Tororo and Hima cement.
5. Training more labour in the mining industry and paying them highly.
6. Establishing of industries to provide market for the minerals.
7. Construction of more Hydro Electricity power dams to provide power.
8. Increased research in mineral exploitation.
9. Extension of feeder roads and railways to the mining areas.

INDUSTRIALIZATION IN EAST AFRICA.

An industry is a working set up which produces goods and services that a community uses. Industries are very diverse and may include activities like mining, manufacturing, building and quarrying.

However, the word industries is often used to describe factories that change raw materials into finished goods. Most industries in East Africa are mainly concerned with processing Agricultural raw materials (Agro-based industries).

Industries therefore are categorized into four that is to say;

1. **Primary Industries.**

These are mainly extractive industries involving the exploitation of natural resources for example fishing, mining, quarrying and forestry.

2. **Secondary or Manufacturing industries.**

These process goods from primary industries into finished products. These industries are further divided into two:

- a) **Heavy industries.**

Deal with heavy or bulky raw materials and involve heavy capital investment for example engineering, ship building and heavy chemical industries

b) Light industries.

Use light and compact Materials and produce small and light cuticles forexample plastics, textiles, cosmetics, toilet articles, cigarettes and food processing.

3. Tertiary or Miscellaneous industries.

These involve provision of back up services forexample administration, banking, Insurance and entertainment.

4. Quaternary industries.

Involve provision of hi-tech and information services forexample universities.

Markets oriented industries, are those whose location is determined by market forexample breweries, milk processing, flour milling, bread making, fish processing and cigarette making.

Raw materials oriented industries. The location is determined by presence of raw materials forexample Hima, Bamburi and Tororo.

Import substitution industries. These industries provide goods which substitute for imports that is to say they make goods that would have been imported forexample sugar factories.

N: B: In this case therefore we are combined to manufacturing or secondary industries the processing of raw materials and semi processed materials into finished or more complex materials of great value that can be used by man.

The principal industries in East Africa.

Jinja Industries;

Textiles, food processing, steel rolling, mills, breweries matches, pulp and paper, printing and publishing, sugar processing, saw milling, manufacture of bicycle tyres, mattresses and soap.

Kampala- Industries;

Chemical processing, food processing, engineering, steel rolling, motor vehicle assembly, tobacco processing pharmaceuticals, leather tanning and textiles.

Nairobi industries;

Food processing, printing and publishing, railway and motor vehicle repair breweries textiles cigarettes, milk processing plastics.

Mombasa industries;

Food processing, steel works motor vehicle assembly, oil refinery, cement works, ship repair, manufacture of iron sheets, bottles and fertilizers.

Eldoret industries.

Metallurgical, Engineering, food processing, Textiles, leather tanning and tobacco.

Nakuru industries.

Cigarette Making, textiles, motor vehicle repair, insecticides making, food processing and sweaters.

Dar-es-salaam industries; Grain milling, meat packing, motor vehicle repair, sisal processing, cement manufacturing, plastics, breweries, sacs and bicycle assembling.

Tanga industries;

Cement manufactures, food processing, chemical engineering, Metallurgical and textiles.

A SKETCH MAP OF EAST AFRICA SHOWING INDUSTRIAL CENTRES.



1. Draw a sketch map of east Africa and on it mark and name
 - (i) Mountains, Rwenzori and Usambara.
 - (ii) Rivers; Tana and Pangani.
 - (iii) Industrial centers, Kisumu Songea and Arusha.
2. Name any 3 types of industries in any one industrial center in A (iii) above
Other industrial centers in East Africa include, Mbale, Mbarara, Morogoro and Songea Kisumu
3. Draw a sketch map of East Africa showing the major industrial.

CONDITIONS / FACTORS WHICH HAVE FAVORED THE DEVELOPMENT OF INDUSTRIES IN EAST AFRICA.

1. Presence of abundant supply of power to run the machines foreexample Hydro Electricity power from Nalubaale power plant, Hale and Seven folks dam and petroleum.
2. Availability of enough capital for investment provided by the government, World Bank private investors like Madhivan used for purchasing machines and paying workers.
3. Favorable government policy on industrialization which encourages investors to maintain political stability and tax reduction.
4. Accessibility by water, land and air to enable assembling of raw materials and distribution of finished produce.
5. Presence of abundant raw materials to feed the industries in the making of finished products foreexample minerals and Agricultural raw materials.
6. Existence of a large market both at home and abroad to consume the finished products.
7. Presence of large supply of labour both skilled and unskilled by foreigners foreexample Indians.
8. Presence of flat and vast land for the establishment and expansion of industries.
9. Presence of adequate and appropriate technology and research in industrial development.
10. Political stability which attract foreign investors as well as investment opportunities.
11. The influence of industrial inertia that is to say the ability of an industry to remain in a given place because of associated advantages foreexample raw materials, established infrastructure and experienced source of labour.

CONTRIBUTION OF INDUSTRIAL DEVELOPMENT IN EAST AFRICA.

1. Stimulates the development of infrastructure foreexample roads, schools, hospitals and railway lines.
2. Creates employment opportunities for the local population foreexample technicians, drivers and security guards.
3. Source of government revenue through taxation of the employees, the investors as well as goods in transit.

4. Generation of income for the local population helping them to improve on their standards of living.
5. Provision of consumer goods to the local population.
6. Sources of foreign exchange through the exportation of semi and finished products to other countries like U.S.A India and Egypt.
7. It has led to the development of urban centers because of many employment opportunities foreexample Jinja, Kampala and Nairobi.
8. Diversification of the economy and thus widening the government tax base.
9. Promotes international trade and co-operation between East Africa and her trading partners like South Africa, India and United Kingdom.
10. Further promotes research and scientific study in East Africa.
11. Reduced on the costs of importing finished products like shoes, sugar and cooking oil.
12. Provides market for Agricultural products like tea, pyrethrum cotton and sisal.
13. Promotes domestic tourism hence an alternative source of income.
14. The local population employed in these industries acquire skills related to industrial development.

PROBLEMS RESULTING FROM INDUSTRIAL DEVELOPMENT IN EAST AFRICA.

1. Increased struggle for land leading to land disputes.
2. Exhaustion of raw materials threatening the future of industries leading to unemployment.
3. Pollution of air water and land due to dumping of industrial wastes.
4. Urbanization and its related problems foreexample unemployment, high crime rates and slum development.
5. Increased land degradation that is to say reclamation of swamps deforestation, destruction of landscape.
6. Repatriation of profits by foreign investors because most of the industries are owned by foreigners.
7. Industrial accidents which led to loss of lives and property.
8. Displacement of the population calling for expensive resettlement.

PROBLEMS FACING INDUSTRIAL DEVELOPMENT IN EAST AFRICA.

(Factors hindering effective industrial development).

1. Political instability in some parts of East Africa scaring away potential investors.
2. Insufficient capital in the industrial center because of high costs of production.
3. Inadequate skilled man power to run the industries.
4. Inadequate technology and research limiting efficiency in production.
5. Shortage of industrial raw materials that is to say most of the minerals occur in small quantities and other are of low grades.
6. Unfavorable government policies that is to say putting much emphasis on Agriculture imposing high taxes on investors.
7. Inadequate land for industrial expansion and development due to the rapid population growth in East Africa.

8. Limited domestic market for industrial product because of poverty and low purchasing power.
9. Competition for market with development countries like Japan, China and United Kingdom.
10. Industrial accidents during production and transportation.
11. Poor and unreliable transport network affecting the delivery of raw materials and finished products.
12. Shortage of water for industrial development especially in Kenya.
13. Fluctuations in climate affecting the production and distribution of Agricultural raw materials like cotton, coffee and sugar.

STEPS BEING TAKEN TO PROMOTE INDUSTRIAL DEVELOPMENT IN EAST AFRICA.

1. Expansion of the East African community to widen the market for example Rwanda and Burundi.
2. Privatization of industries for efficient management and production.
3. Construction of more power projects to increase power supply for example Kiira dam and Nalubaale power projects as well as diversifying to other power sources like petroleum.
4. Construction of new roads and widening the existing ones to help the transportation of raw materials and finished goods to the market centres.
5. Encouraging foreign investors to come and invest in the industrial sector.
6. Restricting importation of manufactured goods which are locally produced that is to say encourage the development of import substitution industries.
7. Advertise to encourage consumption of locally manufactured goods.
8. Recycling of scrap to provide raw materials for the steel related industries.
9. Applying for financial support from international financial institutions like the World Bank.
10. Training of more manpower as well as carrying out research to improve on production and efficiency.
11. Encouraging the development of small-scale industries which are cost effective.

THE INDUSTRIES HAVE THE FOLLOWING ADVANTAGES.

1. Promote employment opportunities.
2. They require limited skilled man power.
3. They can be started anywhere.
4. They use very little raw materials.
5. There is minimal pollution on the environment.
6. They use locally produced raw materials
7. They generate revenue for the government through taxation.

FISHING IN EAST AFRICA.

Fishing is the hunting of aquatic lives from water bodies for example Fish, lobsters, crabs whales, shrimps and crocodiles. These water bodies are referred to as fishing grounds / fisheries.

There are two types of fisheries in East Africa;

a) **FRESH WATER FISHERIES;**

These involve fishing in the inland water bodies like swamps, ponds, rivers and lakes.

The major species of fish in the inland fisheries include Nile perch, Lungfish, catfish, Tilapia, mud fish, Bagrus and Dagaa.

The major inland water bodies in East Africa include:

1. Lake Victoria.

It offers the biggest catch and the main species include; Tilapia, Nile perch and Bagrus.

The major fishing method is gill netting and preservation methods include smoking, freezing and deep frying.

The landing sites include; Bukoba, Lambu, Dima, Bukakata, Gaba, Katosi, Masese, Majanj, Kasensero and Kasenyi

2. Lake Kyoga.

Is the most intensively fished lake in East Africa because it is shallow. Fishing is done by the Bakenyi using methods like fish traps, gill nets, baskets and angling.

The main fish species include Tilapia. The landing sites include Kayago, Kikarangene, Namansale, Lwampanga.

3. Lake Tanganyika.

The main type of fish caught is dagaa, the main fishing method is lampara and the major port is Kigoma.

4. Lake George.

It is the most productive lake in East Africa with many fish species like Nile perch, Tilapia, Mud fish and Bagrus because of dropping of hippos, which fertilize the water.

However, the main problem is presence of crocodiles the main landing sites include; Kasaka, Katunguru, Katwe and Kayanja.

N: B: the marketing of the fish is done by TUFMAC (The Uganda fish marketing cooperation).

5. Lake Turkana.

Fishing is attested by remoteness and lack of market. However it is important for sport fishing in East Africa as it applies to Lake Naivasha.

6. Lake Albert.

It is the most important fishing ground and the major ports or landing sites include Ntoroko, Butiaba, Wanseke and Tonya.

7. Lake Edward.

The major landing site is Rwenzururu

b) MARINE FISHERIES.

This fishing is carried out in salty waters like oceans and seas mostly produced in Kenya and Tanzania (Pemba and Zanzibar).

The major marine fish species include sardines cod mackerel, tuna, anchovy, Haddock and halibut.

Marine fish species are categorized into three;

1. Pelagic species

They live near the water surface for example sardines, mackerel, tuna and anchovies.

2. Demersal species.

These live and breed near the sea bed for example haddock, halibut and cod.

3. Crustaceous species.

These have external skeletons for example lobsters, shrimps, crabs, oysters and prawns.

A SKETCH MAP OF EAST AFRICA SHOWING MAJOR FISHING GROUNDS



TYPES OF FISH.

Mud fish.



Nile perch



Silver fish



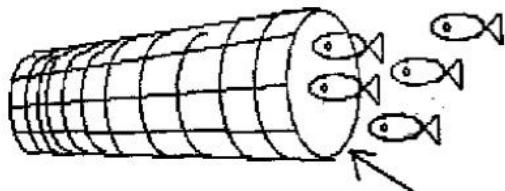
Tilapia fish



FISHING METHODS IN EAST AFRICA.

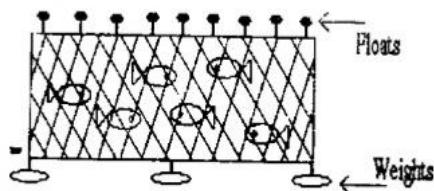
These are either traditional or modern methods;

1. Traditional Methods are mainly used for small scale fishing mainly for home consumption and a little surplus for sale forexample Hooks, Basket traps, Spears, use of arrows. Forexample use 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 forexample along rivers or a stream. When the fish enters the basket, it's 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.



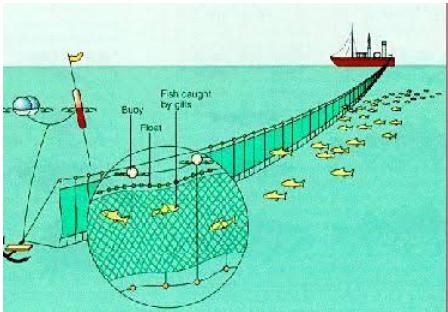
Gill netting is commonly used on Lake Victoria to catch Tilapia. It's divided into two methods which are;

(i) **Beach seining:** this method involves nets being operated from the shore/beach.

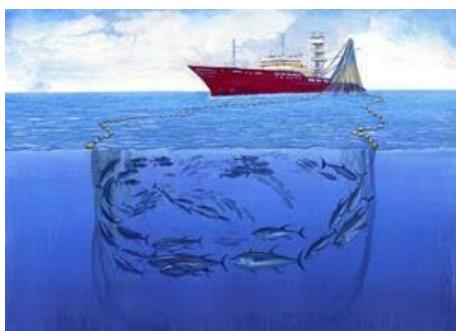
A fisherman in a canoe/boat stretches the net into the water to encircle a shoal of fish near the shoreline. The nets have weights at the bottom and floats on top to keep them vertical in the water.

The fishermen pull the net from both sides and the fish caught is poured at the beach. The method is used to catch Tilapia, Cat fish and Silver fish

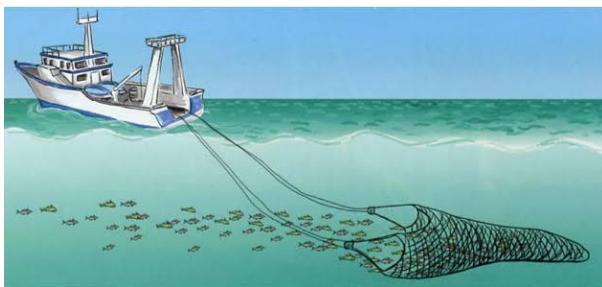
(j) **Drift netting:** This involves use of a much bigger net which is connected to a moving boat called a drifter. The net is held vertically in water by floats on top and weights down. The fish try to swim through the net and are trapped by their gills as a motor boat slowly moves the net. It is used to catch anchovy and sardines on the Indian Ocean.



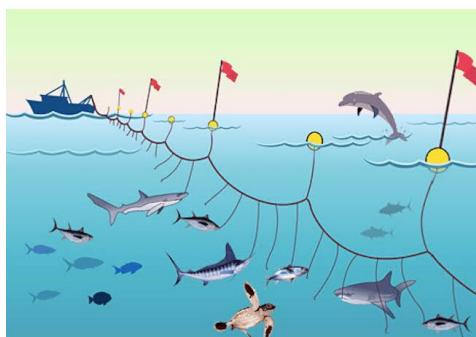
◆ **Purse seining net method:** This involves the use of two boats called seine boats. The net is laid out in a circle to surround a shoal of fish attracted by an echo sounder. At the bottom of the net there are rings attached through which the ropes pass. Once the Net has been laid in a circular pattern 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 not 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 for example 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 a 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 are near the sea bed for example lobster, 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 for example Japan, China, India, Germany, Britain, France, Netherlands and Belgium.

There are two major types of fishing methods in East Africa.

a) Commercial or modern methods of fishing

These include trawling, drifting, lobster traps long lining and purse seining.

b) Traditional or Primitive methods

These include gill netting, use of baskets, use of spear, bows and arrow, lampara (lamp attracting) using hooks and fish traps

N: B: Marine fisheries in East Africa are underdeveloped because of the following;

1. Presence of a narrow continental shelf affecting the multiplication of planktons and fish
2. High temperatures at the coast making the fish go bad easily and quickly.
3. The ocean flow covered by coral reefs which interfere with the fishing activities
4. Presence of a straight castling which is not suitable for the development of ports and fishing villages.
5. Inadequate capital to purchase the modern fishing equipment
6. Presence of strong ocean currents along the coast which discourage the use of small vessels
7. Limited fish species of a high commercial values.
8. Limited planktons at the coast because of the depth of the ocean
9. Presence of inappropriate technology that is to say the fishermen at the coast still use primitive methods like baskets.
10. Inaccessibility of some of the fishing grounds
11. Competition with developed counties like Norway and Japan.
12. The people along the coast making it very unpopular.

FISH PRESERVATION METHODS.



(a) Salting



(b) Icing



(c) Sun drying



(d) Smoking

- Freezing / Refrigeration

-Deep frying -

- Canning.

Uses of fish in East Africa.

- | | |
|-------------------------------|-----------------|
| 1. Animal feeds. | 5. Fertilizers. |
| 2. Food/ Sources of proteins. | 6. Medicine. |
| 3. Glue. | 7. Cosmetics. |
| 4. Soap. | |

Factors favoring the development of the fishing industry in East Africa.

1. Presence of extensive water bodies both fresh and salty forexample Lake Victoria, Tanganyika, Kyoga and Indian ocean
2. Presence of a large market both at home and abroad in countries like United Kingdom Japan and Canada.
3. Favorable government policy of providing loans to the fishermen, protection against foreign competition diversification of the economy.
4. Presence of improved preservation methods forexample refrigeration facilities like freezing and canning.
5. Abundant supply of labour both skilled and unskilled due to the dense population around lakes, rivers and the Indian Ocean.
6. Presence of a variety of fish species of a high commercial value like Nile perch, mackerel and Tilapia.
7. Availability of modern fishing gears inform of motorized boats.
8. Abundant supply of planktons due to the shallowness of the water bodies to support large shoal.
9. Availability of adequate capital provided by the government and foreign investors to purchases modern fishing gears.
10. Presence of a well-developed and reliable transport network for quick transportation of fish from fishing grounds to inland markets.
11. Presence of fish companies that offer support to the fisher men inform of providing nets, boat engines as well as market.
12. Existence of forests and forest products for making boats and providing firewood.
13. Presence of fish processing industries which provide market forexample Masese Fish Company and Gaba fish company.
14. The existence of an extensive, shallow continental shelf favoring the growth of planktons and subsequent multiplication of fish.

CONTRIBUTION/ IMPORTANCE OF THE FISHING INDUSTRY TO EAST AFRICA.

1. Fishing industry has provided employment opportunities to many people living at the cost and on islands as fishermen, processors and Transporters.
2. It has promoted research and scientific education in East Africa.
3. The fishing industry has also led to the improvement of peoples' diet.

4. The industry is also a major source of government revenue through taxation of the fishermen as well as the companies involved.
5. The fishing industry has diversified the economy of East Africa thereby widening the government tax base.
6. The industry has diversified the economy of East Africa thereby widening the government tax base.
7. It has led to the development of towns, ports and infrastructure like, roads ice plants and schools.
8. It is a source of income to the local population along the coasts and on lake shores forexample fishermen, fish mongers and transporters.
9. The fishing industry in East Africa has promoted trade and international relationships between East Africa and her trading partners like U, S.A.
10. The people employed in the fishing industry have acquired new and modern skills related to fishing.
11. It has promoted tourism forexample sport fishing.
12. It has led to the improvement of standards of living of the people.
13. The industry is also a major source of raw metals used in the manufacture of fertilizers, animals feeds, glue, medicine and cosmetics.

THE PROBLEMS ASSOCIATED WITH THE FISHING INDUSTRY.

1. Pollution of the waters by the oil spills of vessels and wastes from industries along the coast.
2. Deforestation because of the high demand for firewood and timber for smoking and boat making respectively.
3. Extinction of some fish species because of over fishing.
4. Accidents leading to loss of lives and property.
5. Conflicts over territorial water forexample Mijingo Island.
6. Urbanization with its related problems like unemployment high crime rates and slum development.

PROBLEMS AFFECTING THE DEVELOPMENT OF THE FISHING INDUSTRY IN EAST AFRICA.

1. Inappropriate technology in the fishing industry. The fishermen also use poor fishing gears forexample fish poisoning.
2. Inadequate capital to improve on the fishing activities leading to use of poor fishing methods.
3. Inaccessibility of some of the fishing grounds making the transportation of fish to the inland markets difficult.
4. Presence of predators like crocodiles and sharks in the oceans which feed on other aquatic lives.
5. Limited processing and preservation methods in East Africa leading to losses.
6. Presence of shallow areas of the East African coastline limiting the use of big vessels.

7. Pollution of the waters by domestic and industrial wastes which affects the metabolism of aquatic lives.
8. Competition for market with developed countries like Japan, Norway and Canada.
9. Profit repatriation by foreign companies thus developing their own countries.
10. Indiscriminate fishing leading to depletion of some of the valuable fish species.
11. Theft of nets, boats and boat engines.
12. Compact nature of the East African coast line limiting the development of landing sites as well as multiplication of fish.
13. Presence of water weeds which limit fish metabolism and movement of boats in the inland water bodies like L. Victoria.
14. Limited fish species of economic value.
15. Presence of shared water resources leading to uncultured fishing and disputes.
16. Limited government support leading to use of poor fishing and preservation methods.
17. Small market for fish and fish products foreexample in some cultures people don't eat fish hence limiting market.

STEPS BEING TAKEN TO SOLVE THE PROBLEMS AFFECTING DEVELOPMENT OF FISHING INDUSTRY IN EAST AFRICA.

1. Encouraging fish farming to reduce pressure on the existing water bodies as well as reducing over fishing.
2. Fishermen are being encouraged to form cooperatives to help them market their fish, fish products as well as obtain loans.
3. Removing water weeds mechanically and sometimes biologically.
4. Improving on the transport network by upgrading the existing roads linking landing sites to market centres and fish industries.
5. Fish processing industries have been set up to ensure that they are processed and exported.
6. Educating the fishermen on the dangers of over fishing, indiscriminate fishing and fish poisoning.
7. Fishermen are being issued with licenses to reduce indiscriminate fishing.
8. Restocking of the over fished water bodies like Kyoga and George.
9. Patrolling of the waters and landing sites to keep security.
10. Modernizing of the landing sites foreexample Kasenyi and Masese.
11. Broadening external markets through advertisements and exporting.
12. Provision of better fishing gears to the fishermen in form of motorized boats.
13. Promoting research on new species to maintain supply.
14. Establishment of storage facilities (ice plants) foreexample in Luzira and Masese.

WILD LIFE CONSERVATION AND TOURISM IN EAST AFRICA.

Tourism is a practice of traveling for purposes of leisure or relaxation, curiosity and study.
Tourism may be domestic or international.
Tourism therefore is an invisible export and a major source of foreign exchange in East Africa.
The development of tourism is based on the following tourist attractions;

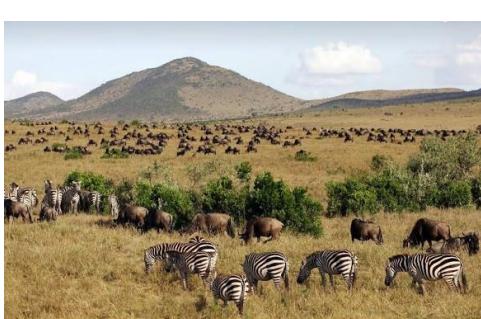
1. Landscape/ Relief.



2. Drainage features.



3. Wildlife (animals and vegetation).



4. Historical sites like Kasubi tombs and fort Jesus.



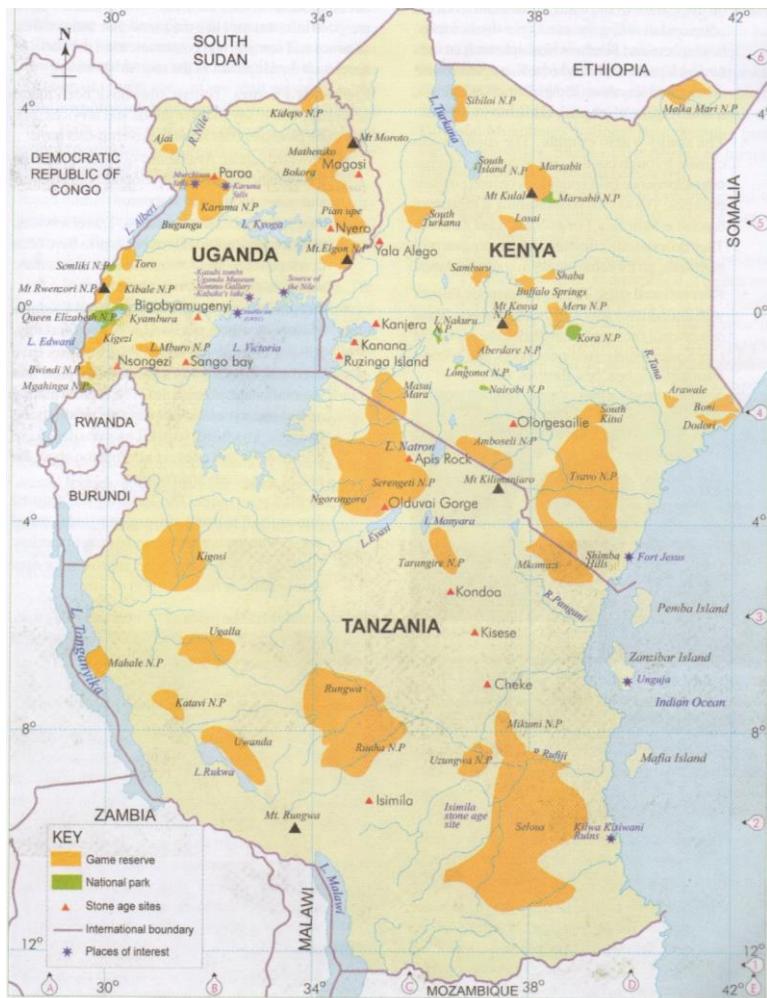
5. Culture heritage



Mention any three tourist attractions found in East Africa other than plants and animals.

- Mountains.
- Historical Sites.
- Rivers and Lakes.
- Culture.
- Rift Valley.

A MAP OF EAST AFRICA SHOWING NATIONAL PARKS AND GAME RESERVES.



CONDITIONS OR FACTORS FAVORING THE DEVELOPMENT OF TOURISM IN EAST AFRICA

EAST AFRICA. PHYSICAL FACTORS

1. Presence of a variety of wild life in East Africa inform of wild animals like Elephants, Snakes, Lions, Baboons and vegetation like Equatorial rainforests, Savannah which attract tourists for viewing, filming and photography.
 2. Presence of a conducive climate that promotes swimming and sun bathing these attract people from the temperate countries.

3. Presence of a beautiful scenery in form of volcanic mountains, Block Mountains, rift valley, plateau attracting tourists for viewing, Research and photography.
4. East Africa has a variety of drainage features in form of lakes, rivers and beaches. These attract tourists for rafting, swimming, sun bathing, fish sport.
5. Strategic location of East Africa at the coast making it accessible to international market.

HUMAN FACTORS.

1. Presence of improved accommodation facilities in the major cities and towns, game parks and game reserves for example hotels like Serena, holiday's apartments, motels and Inns with good accommodation, internet, power and good water.
2. The hospitality exhibited by the people of East Africa that dates back the colonial times. The hospitality is being shown in hotels, banks, and airports where people are welcoming with a good customer care.
3. Political stability which favours the development of the tourism industry provided by security agencies like Uganda police force and the Army.
4. Availability of adequate capital to invest in tourism related facilities like hotels, roads, lodges which is provided by the government and investors.
5. Presence of a large supply of skilled manpower in form of waiters, tour guides, and accountants who offer the necessary help to the tourists.
6. Increased and improved advertisements both at home and abroad through the media for example on Televisions like UBC, NTV and Bukedde, newspapers like New Vision and magazines.
7. Presence of reliable and adequate transport in form of roads, air and railway facilitating the movement of tourists to areas of their interest.
8. Favorable government policies on tourism for example protection of the wild life, attracting foreign investors in the industry and maintaining political stability.
9. Development of tour packages. They organize accommodation facilities, transport, meals and tour guides thus attracting tourists.
10. Presence of a variety of cultural attractions for example cultural dances, dressing code, traditional food and marriage ceremonies.
11. Availability of a variety of historical sites for example fort Jesus, Nyero rock paintings, Kasubi tombs.

Tourism in Kenya.

Of the three East African countries, Kenya has the most developed tourism industry because of the following factors;

1. Kenya is enrolled with the richest and largest animal population in the world mainly in the national parks like Tsavo, Amboseli, masaimara and Matindi National parks.
2. Presence of a variety of drainage features like lakes forexample Nakuru, Naivasha, Victoria and Rivers Tike Tana, Athi. These attract tourists for sport fishing, swimming and sun bathing.
3. Presence of adequate and reliable transport network based on roads, electrified railway lines and air making the tourist sites accessible.
4. Kenya has a stable political climate than Uganda and Tanzania.
5. The strategic location of Kenya at the coast in relation to international markets.
6. Presence of a variety of historical sites like fort Jesus, Vasco Da Gama and fort Gedi rain.
7. Availability of modern banking services, Kenya has more banks compared to other countries in East Africa forexample Baroda, Kenya Commercial bank, Standard Chattered.
8. Availability of sufficient and comfortable accommodation facilities inform of hotels, inns, holiday apartments with good services like the internet, swimming pool and different food types.
9. Favorable climate of Kenya that is to say it's sunny throughout the year promoting swimming and sun bathing.
10. Favorable government policies of advertising and maintaining political stability.
11. Availability of a strong capital base provided by the government as well as private investors.
12. Adequate skilled manpower trained in different institutions and universities.
13. Advertisements done on media forexample televisions, newspapers and radios.
14. Presence of a Variety of languages Spoken in Kenya forexample Arabic Kiswahili English.

N: B: Kenya's visitors come from U.S.A, U.K, Germany, India, Republic of South Africa, France, Uganda, Tanzania and Rwanda.

The most visited areas in Kenya include:

- Nairobi National Park.
- Tsavo National Park.
- Aberdare National Park.
- Fort Jesus (Mombasa).

TOURISM IN TANZANIA.

The major tourist attractions include;

The Wild Game in the National Parks like Serengti (The Largest and most attractive)
Arusha National park (The smallest with large number of elephants and black rhinos)
Ruaha National park.
Lake Manyara National Park.

The Game reserves include.

- Katavi Plains
- Gombe stream.
- Biharamula.
- Mkomazi.
- Selous.

Other attractions in Tanzania include;

Mountain Scenery. Lakes and Rivers.
Coastal features. Historical sites.

The major tourist activities in Tanzania include Sport-fishing, Mountain climbing, Swimming, sun bathing and diving.

TOURISM IN UGANDA.

The major attractions include:

1. Wild life in National parks, Games reserves and sanctuaries forexample mountain Rwenzori National park (Mountain Climbing).
Kidepo valley National park (Elephants, Uganda kob, Giraffes).
Queen Elizabeth National park (Boat riding and game viewing).
Bwindi impenetrable (Gorilla tracking).
Murchison falls (the largest, it has sport fishing and game viewing).
2. Water bodies forexample L.Victoria, R. Nile and falls Like Karuma. Bu Jagali.
3. Favorable climate.
4. Variety of Vegetation types like equatorial, savannah, montane and semi desert.
5. Favourable government policies which provides soft loans and a good political climate.
6. Hospitality of the people with a good customer care.
7. Rich cultural heritage with traditional wear, traditional food and cultural dances.
8. Historical sites forexample Kasubi tombs and Nyero Rock Paintings (Ngora district).

PROBLEMS FACING/ LIMITING THE TOURISM INDUSTRY IN EAST AFRICA.

1. Competition from developed countries as well as member countries in East Africa because of similar tourist attractions especially the wild game.
2. Poaching of the wild animals in the National parks leading to the extinction of animals foreexample the white rhinos.
3. Pests and diseases which attack the animals leading to death.
4. Inadequate capital to upgrade the tourist facilities like hotels and airports.
5. Political instability in some parts of East Africa like Northern Uganda scaring away the potential tourists.
6. Inadequate skilled personnel to manage the industry especially hotels, airports, banks, tourist sites.
7. Encroachment on the existing tourist potential sites like National Parks and games reserves because of rapid population increase.
8. Inadequate transport and communication networks making areas of tourist interest inaccessible foreexample Bundibugyo, Kidepo valley national parks and Bwindi.
9. Seasonal migration of animals from one place to another foreexample many elephants migrate from Queen Elizabeth national park to other game parks.

SOLUTIONS TO THE PROBLEMS.

1. Establishment of training institutions to impart skills on people to improve on the tourism industry.
2. Gazetting more national parks and game reserves.
3. Controlling pests and diseases through spraying.
4. Intensifying advertisements to encourage the culture of visiting the tourist sites by the local people.
5. Rehabilitation of the cultural sites and roads.
6. Encouraging the study of foreign international languages like French, Germany and Spanish.
7. Setting up of anti- poaching units.
8. Privatization of the tourist related industries like hotels.
9. Deployment of security personnel to maintain political stability in the tourist areas.
10. Banning trade of wild life like ivory.
11. Injecting more capital in the tourist industry.
12. Encouraging the development of private tour companies.

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 and Kitale.
In Tanzania there is Mbeya, Songea, Tabora, Shinyanga, Makumbako, Kilosa, Ifakara, Arusha and Moshi.

A SKETCH MAP OF EAST AFRICA SHOWING URBAN CENTRES.



FACTORS THAT HAVE FAVOURED THE DEVELOPMENT OF URBAN CENTERS IN EAST AFRICA

1. The abundant supply of clean and fresh water for domestic and industrial use for example in Kampala, Nairobi and Mbale.
2. Availability of large tracts and vast land for the establishment of the urban centers and future expansion.
3. Relatively flat and gently sloping land for establishment of the urban centers because construction is easy and cheap for example Kampala and Nairobi.
4. Historical factor whereby most towns developed as a result of early contacts with colonialists and Arabs for trade for example Mombasa, Nairobi and Kampala.
5. Presence of a rich and productive agricultural hinterland for industrial development for example Mbale, Soroti, Nairobi and Kampala.

6. Supportive government policy of developing the urban centers for example in Tanzania, the capital city was transferred to Dodoma from Dar-es-salaam.
7. The presence of many industries which provide jobs that have attracted many people into the cities for example Jinja, Nairobi, Mombasa and Kampala.
8. Cool and conducive climate which is favourable for human settlement and agriculture for example Nairobi, Mbale and Kampala.
9. Presence of improved and better security which attracts a large population for example Nairobi, Kampala, Gulu and Mbale.
10. Presence of well-developed and modern transport network which eases movement of goods and services for example roads and railways.
11. The large population size has provided cheap labour and large market hence boosting industrialization.
12. Availability of large sums of capital for investment for example buying land and putting up infrastructure for example roads.
13. Constant supply of cheap and abundant power for use in the urban centers for example in industries and homes to run the industries and for lighting.
14. Presence of a variety of better amenities which attract a large population size for example schools, hospitals, theaters and tall buildings (sky scrappers).
15. Central location which makes the towns accessible from all parts of the country for example Kampala, Nairobi and Dodoma.

FUNCTIONS OF URBAN CENTERS.

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

EFFECTS OF URBANISATION ON THE ENVIRONMENT.

1. Destruction of vegetation due to increased competition for land for industrial development and settlement.
2. Loss of vegetation cover has accelerated soil erosion and siltation of water bodies.
3. Loss of vegetation has led to changes in micro climate for example reduced rainfall totals.
4. Loss of vegetation cover has also increased flooding for example in Kampala.
5. Loss of habitats for wildlife for example crested cranes, snakes and birds due to destruction of vegetation.
6. Loss of bio-diversity for example death of wild animals like frogs through destruction of swamps and forests.
7. Water table is lowered due to loss of vegetation leading to water crisis.
8. Increased human settlement has brought about increased waste which leads to poor sanitation and easy spread of diseases.
9. Domestic and industrial wastes have led to increased air, water and land pollution.
10. Swamp reclamation due to shortage of land for settlement and industrial development for example Kampala.
11. Increased demand for building materials has led to destruction of vegetation and environmental degradation for example blasting of rocks.
12. Concentration of buildings and concrete surfaces has led to increased heat hence global warming.
13. Presence of too much dust and smoke in urban centers increase the formation of acid rains which do not support farming.
14. Creation of green belts has created good scenic beauty of the environment for example constitutional square in Kampala.
15. Quarrying for sands and concrete rocks creates pits and depressions which act as breeding grounds for mosquitoes and snails.
16. Noise pollution from vehicles and recreational facilities for example concert halls.
17. Increased surface run-off in times of heavy rains which leads to soil erosion.

STEPS BEING TAKEN TO SOLVE THE ENVIRONMENTAL EFFECTS ABOVE.

1. Setting anti-pollution laws to reduce pollution for example treating industrial wastes.
2. Attracting many Non-Governmental organizations to teach people about environmental conservation.
3. Encouraging urban planning efforts to streamline land use and reduce destruction of vegetation for example avoid settlements in swamps.
4. Constructing high-rise or storied buildings to utilize available space and reduce competition for land.
5. Introducing urban-rural strategies to stop rural-urban migration for example construction of roads, hospitals and schools in villages.
6. Improvement of drainage channels within urban centers to reduce poor sewage disposal and water pollution.
7. Encouraging the use of less pollutant energy for example Hydro electricity and bio-gas to reduce demand for wood fuel and charcoal.

8. Planting greenbelts to improve on the climate of the towns for example lowering heat levels.
9. Filling in pits and depressions after quarrying to destroy breeding grounds for mosquitoes.
10. Mass sensitization of people in the city about environmental conservation.
11. Setting strict laws to ensure urban hygiene for example heavy fines for dropping litter and rubbish anyhow.
12. Using alternative building materials to reduce demand for timber for example glass and metal

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 they include;

- | | |
|---|---|
| ➢ Land transport where people use; roads,
railways, human portage & animals. | ➢ Water transport
➢ Pipeline transport |
| ➢ Air transport | |

A SKETCH MAP OF EAST AFRICA SHOWING TRANSPORT ROUTES



1. RAILWAY TRANSPORT

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

- i) Kenya-Uganda railway

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

ADVANTAGES.

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

DISADVANTAGES.

- 1. It's generally slow compared to air and road transport.
- 2. Rails are expensive to build and maintain.
- 3. It's not flexible because it cannot be used where rails don't exist.
- 4. Rails are almost restricted to generally flat land surfaces.

ROLE OF RAILWAY TRANSPORT TO THE ECONOMIC DEVELOPMENT OF EAST AFRICA.

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

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

2. ROAD TRANSPORT.

It's the most common means of transport.

ADVANTAGES.

- 1. It's the most flexible means that is to say. can connect to all areas and offers a wide range of alternatives for example bicycles, cars, Lorries .
- 2. It's faster than railway transport.
- 3. It's the best to transport bulky commodities over short distances.
- 4. Roads are cheaper to construct than airports and railways.

DISADVANTAGES.

- 1. Relief features like hills and swamps make road construction very difficult.
- 2. Traffic congestion is very common on roads leading to delays.
- 3. Accidents are more common on roads than any other means of transport leading to loss of lives and property.

4. Poor road surfaces due to poor work man ship is the major problem faced by roads.
5. The roads require constant maintenance which is expensive.
6. It is affected by insecurity in terms of highway robbers leading to losses.
7. Dry weather roads are affected by heavy rainfall making them impassable.

ROLE OF ROAD TRANSPORT TO ECONOMIC DEVELOPMENT

1. It has helped in development of fishing by linking landing sites to market centers.
2. Promotes agriculture by linking rural areas to urban markets.
3. Promotes cross border trade between the East African countries hence increasing revenue.
4. Promotes regional co-operation amongst the East African countries which promotes peace.
5. Provides government with revenue through custom duties, road licenses and driving permits for national development.
6. Provides employment opportunities foreexample engineers, police officials hence improved standards of living.
7. Promotes industrial growth through the distribution of industrial goods to market centers and transportation of raw materials.
8. Promotes tourism by connecting to all tourists to tourist sites in the remote areas.
9. Facilitates easy exchange of ideas necessary for national development.
10. Helps to diversify the economy by promoting several activities foreexample lumbering and fishing which ensures high capital inflow.
11. Promotes linear settlement pattern along roads which leads to urbanisation and its advantages foreexample setting up of schools.

3. AIR TRANSPORT •

Most important airports in East Africa are;

- i) Entebbe international airport in Uganda.
- ii) Jomo Kenyatta/Embakasi in Nairobi and Mombasa airport in Kenya.
- iii) 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.

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

DISADVANTAGES.

1. It's the most expensive.
2. In case of an accident, chances of survival are very minimal.

3. It's not flexible because it's not readily available in all areas.
4. It's not effective in transporting bulky goods/ commodities.
5. It's affected by poor weather foreexample fog leading to accidents.

ROLE OF AIR TRANSPORT TO THE ECONOMIC DEVELOPMENT.

1. It helps to promote tourism by transporting foreign tourists.
2. It promotes international relationships which ensures world peace.
3. It promotes international trade which increases government revenue for national development.
4. 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 foreexample 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 foreexample inland ports include;

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

ADVANTAGES OF WATER TRANSPORT.

1. It's the cheapest.
2. It's not affected by traffic congestion.
3. Water ways are naturally availed hence saving costs of construction.
4. It can be used to transport bulky commodities foreexample timber.
5. It connects distant areas foreexample islands.

DISADVANTAGES.

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

ROLE OF WATER TRANSPORT IN THE ECONOMIC DEVELOPMENT.

1. Promotes fishing due to easy movement on water bodies.

2. Promotes agriculture by linking agricultural islands to market areas forexample Kalangala.
3. Promotes lumbering by helping in the distribution of timber products.
4. Promotes cross border trade between the East African countries hence increasing revenue.
5. Promotes regional co-operation amongst the East African countries which promotes peace.
6. Provides government with revenue through custom duties for national development
7. Provides employment opportunities forexample engineers, patrol officials hence improved standards of living.
8. Promotes industrial growth through the distribution of industrial goods to international market centers.
9. Promotes tourism by connecting tourists to all tourist sites in the island areas forexample Kalangala.

5. PIPELINE TRANSPORT.

- This involves the transportation of gases, water and oil using pipes. It is highly used in urban centres for transporting domestic and industrial water through pipes forexample water used in Kampala is mostly transported by pipe from Ggaba on the shores of Lake Victoria.
- Pipeline transport is 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.

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

FACTORS INFLUENCING THE DISTRIBUTION OF MAJOR TRANSPORT NETWORKS IN EAST AFRICA.

1. 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.
2. Regions with abundant economic potential forexample mining centers tend to have more roads and railway lines compared to unproductive areas.
3. Areas which are urbanized and are densely populated always have more transport routes than sparsely populated areas.
4. 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.
5. Relief whereby steep areas make road and railway construction very difficult compared to low lands and flat areas which make road construction very easy.

6. Drainage whereby areas with poor drainage foreexample swamps are avoided during road construction while well drained areas foreexample gentle slopes make it easy for road and railway construction.
7. Areas with dense vegetation cover foreexample 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.
8. Areas with water bodies like lakes and rivers will discourage road construction but instead lead to development of water transport.
9. Flat areas also attract construction of airports compared to hilly areas which discourage construction of airports and airfields.
10. Areas with fertile soils will attract a large population which leads to construction of roads and railways unlike areas with infertile soils.
11. Areas with tourist attractions will attract roads and airfields to ease movement of tourists unlike areas without major tourist attractions.
- 12. 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.

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

PROBLEMS FACING THE TRANSPORT SECTOR IN EAST AFRICA

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

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

SOLUTIONS TO THE ABOVE PROBLEMS

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

SOURCES OF POWER IN EAST AFRICA.

Energy is defined as power which can be used to drive machines.



SOURCES OF POWER.

Power is obtained from natural gas, sun (solar), water, wind, coal, earth's crust (geothermal), biomass, tides, uranium .

CLASSIFICATION OF ENERGY.

Energy is categorized into two:

Renewable sources of energy: These are sources of energy which can be used without getting exhausted in future. These include solar energy from the sun, wind energy from the wind.

geothermal which is generated from the earth's crust especially from Vulcanicity, hydro-electric power from running water, biomass from burning wood and agricultural waste.

Non-renewable sources of energy: These are sources which get used up or exhausted. These include natural gas, uranium, coal and petroleum (lignite or brown coal, bituminous and anthracite)

HYDRO ELECTRICITY POWER.

This type is generated by running water which drives turbines to generate power.

FACTORS FAVORING HYDRO ELECTRIC POWER PRODUCTION IN UGANDA.

1. Constant water supply from Lake Victoria which runs the turbines to produce electricity.
2. Strong foundation for dam construction.
3. Availability of space for water reservoir.
4. Presence of big power market in the industrial towns of Kampala and Jinja. This reduces costs of transmission of electricity.
5. Availability of market in the neighbouring countries like Kenya, Tanzania. In 1980, Uganda was producing 135 MW and could only use 80 MW and 30 MW were exported to Kenya.
6. Uganda has potential sources of power production at the following falls which are good sites for dam construction, Bujagali falls on Victoria Nile, Kabalega falls, Ssezibwa falls on river Ssezibwa in Mukono district, Nyagaki falls on Albert Nile in Nebbi district, Kaku falls on river Kaku in Kisoro district, Sippi falls on river Sippi on Mt. Elgon.

HYDRO ELECTRIC POWER PRODUCTION IN KENYA.

There are many dams in Kenya which have been constructed on river Tana. This river rises from Mt. Kenya and Nyandarua Mountains. Its major tributaries include Nyamindi and Thiba. The following are the major dams that have been constructed.

Masinga dam (40 MW) Kambaru dam (94 MW – 1975).
Gitaru dam (145 MW) Kindaruma dam (44 MW – 1968).

Other proposed sites in Tana basin include;

Kiambere.

Mutanga.

Grand.

Seven folks dam.

HYDRO ELECTRIC POWER PRODUCTION IN TANZANIA.

Hydroelectric power production in Tanzania takes place on river Pangani, river Ruvu and river Wami.

The following are the major dams which produce electricity in Tanzania

Mtonga dam on river Ruvu

Wami 1 and Wami 2 on river Wami

Grand Pangani on river Pangani

The three dams south of Pare on river Pangani.

GEOTHERMAL POWER PRODUCTION IN EAST AFRICA.

Geothermal power is generated from the earth heat where rain water enters the earth's crust and is changed to steam by heat from magma.

In the valley areas of East Africa, magma comes near the earth's surface through faulting and Vulcanicity.

There are several geothermal power sites in Kenya in the rift valley and these include Lake Bogoria geothermal field near Lake Bogoria north of Menengai crater, Eburru geothermal field south of lake Elementeita, Alkaria geothermal field near Mt.Longonot and south of lake Naivasha.

TRADE IN EAST AFRICA.

❖ Trade is defined as the buying and selling of goods and services for profit.

CHARACTERISTICS OF TRADE WITHIN EAST AFRICA.

1. There has always been a considerable amount of trade between the East African countries.
2. They have supplied each other with goods, which they cannot themselves produce.
3. Until recently, Kenya was the largest supplier since it had developed many industries in Nairobi, Nakuru and Mombasa.
4. Kenya supplied Uganda and Tanzania a lot of manufactured goods and chemicals.
5. In return, she imported food especially maize and Tobacco from Uganda and food, oils and manufactured goods from Tanzania.
6. Kenya also imports electricity from the Nalubaale 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.
7. The quantity of goods Kenya imports from Uganda and Tanzania are less than what it exports to the two countries.
8. 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.
9. 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 industrialization and agricultural dependence.

STEPS TAKEN TO ENCOURAGE EXPORT TRADE AND REDUCE IMPORT TRADE.

1. The three countries are building manufacturing industries (export promotion industries) to enable them stop importing manufactured goods.
2. 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.
3. Foreign investors are attracted to set up big industries in the region by giving them tax holidays.
4. Tax holidays are also given to infant industries to enable them start producing goods locally.
5. Formation of regional blocks for example East African Community (E.A.C) to encourage cross-border trade without many restrictions.
6. Carrying out extensive market research to diversify the markets and create more demand abroad for locally made items.
7. Increased advertisements through international media to create awareness about East Africa's products which increases demand.
8. Ensuring political stability which has attracted more foreign investors to set up industries in East Africa.
9. 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.

1. Trade has stimulated the growth of industries which lead to economic diversification.
2. It leads to the development of transport facilities, financial institutions like banks and insurance companies which lead to urbanization.
3. Agriculture has been largely modernized which has ensured increased supply of food.
4. Trade has led to regional co-operation which has boosted peace in the region.

5. Government earns revenue through taxes and tariffs across borders which it uses for national development.
6. Trade has encouraged full resource utilization which has ensured constant capital inflow.
7. Ideas have been exchanged through trade relationships which has boosted national development.
8. Government is able to earn foreign exchange through export trade which is used for developing infrastructures foreexample roads.
9. It has encouraged exploitation of natural resources even in remote areas which also leads to regional balance.
10. Through international trade, East Africa is able to acquire commodities that it doesn't produce foreexample drugs, cars and computers.
11. Expatriates are hired from developed countries who train local people hence leading to skill acquisition by the locals.
12. Employment opportunities have been created through trade leading to improved standards of living.

FACTORS THAT ENCOURAGE INTER-STATE TRADE/INTERNATIONAL TRADE IN EAST AFRICA.

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

FIELD WORK.

It is a study that involves students using the local environment as a laboratory to verify what is studied in classroom and read in text books.

It involves observation, recording, analysis and interpretation of the relationship between man and physical environment (geographical data).

Field work studies are a form of social enquiry into real - life situations. Field research therefore takes place in the "field" that is in natural setting, a setting that is not established for the purpose of conducting research.

Identifying the topic of study:

The topic must have the following characteristics:

- Short and precise.
- Emphasize "what" is studied and "where" that is to say the name of the area of study.
- Researchable and clear.
- Have a geographical relationship.
- Not ambiguous.

Examples include:

- i) The growth and development of Masese Fish landing site, Northern shores of Lake Victoria in Jinja District.
- ii) "The growth and development of Nylon Market and its influence on the surrounding areas in Namatala village, Industrial Division-Mbale municipality."

Formulating the objectives of the study:

The objectives should have the following characteristics:

- They should be specific (they should be clearly stated).
- They should be measurable (can be evaluated).
- The objectives should be focused and narrow in scope.
- They should be realistic, therefore achievable.
- They should be logical, do not start with future prospects, start with location, historical background and end with future prospects.
- They should be related to the topic of the study **BUT** they should not repeat the topic.

What should a student avoid when stating the objectives?

The students should avoid using words that are not measurable, for example:

- To assess.
- To know.
- To understand.

- To see.
- To examine.

Therefore, the student should use active verbs in order for the objectives to be measurable and correct. For instance;

- To find out.
- To identify.
- To investigate.
- To establish.

Each objective should also bear the **name of the area of the study** because each objective is independent of the other, for instance:

- To find out the location of Masese Fishing Landing site.
- To find out the historical background of Masese Fishing Landing site.
- To find out the conditions favouring fishing activities at Masese Fishing Landing site.
- To investigate the influence of fishing at Masese Landing site to the surrounding areas.
- To identify the problems faced at Masese fish landing site and the possible solutions.
- To find out the future prospects of fishing at Masese Fishing Landing site.

CHOOSING METHODS OF DATA COLLECTION:

The selection of the methods of the study depends on the information to be collected and basically the nature of the area of the study. Therefore, any method can be selected if it meets the criteria mentioned below:

They include the following:

- Observation
- Interviewing
- Questionnaire method
- Recording
- Sampling
- Map orientation
- Measurement

1. OBSERVATION METHOD:

How to present the observation method while answering questions.

Definition:

Observation is a method or a procedure where the researcher uses his eyes to study the different geographical phenomena in the field of study.

During the study we moved through the market stalls observing the different types of commodities sold in the market. Such commodities included tomatoes, dried fish and many others. We also moved to the raised land north of the market to observe the general nature of landscape and human activities. It was found out that south of the area is gently sloping, while the north has a flat raised landscape. The southern part was generally used for trading activities as a number of shops were sited.

Advantages of observation method:

- Observation provides information when other methods are not effective for instance in areas where there are no people to ask.
- It employs a less time consuming procedure of subject selection compared to sampling.
- Observation offers first-hand information without relying on reports made by other people.
- It approaches reality in its natural structure and studies events as they evolve.
- It is relatively cheap and does not involve the use of unique tools.

Limitations of observation:

- Observation cannot be employed when large groups or extensive events are to be studied.
- Observation cannot provide information about the past and future, for instance observation cannot explain the historical background of the area neither can it explain the future prospects of the area of the study.
- It is exposed to the observers' bias, selective perception and selection of memory that is to say it is subjective depending on the value of judgment of the observer.
- Observation is also affected by obstructions for instance tall buildings or vegetation, hills, fog, dust and many others.

How do you present the limitations to the observations made?

Explain your answer by mentioning **how you were limited, what limited you and what you wanted to observe.**

For instance:

Observation was limited by obstruction by the tall buildings on the eastern side of the market. For instance Ntake bakery buildings, we could not clearly observe other economic activities taking place in the surrounding areas.

2. INTERVIEWING METHOD:

How to present interviewing method while answering questions:

Definition:

Interviewing is a procedure where the researcher asks questions about a given topic of study and the respondent answers.

While in Nylon Market or at Masese fish landing site (use the appropriate name where your field work was carried out) we interviewed a number of market vendors or workers at the landing site using a list of guiding questions forexample:

Interviewer:

Briefly explain how the market was started?

Interviewee (Mr.Izaya):

The market was started by residents of Nyanza cell and the land was donated by the late Mwanika Denis who managed the market during its initial years of development.

Note:

You can use any questions as long as they are relevant to the topic and objectives of study.

Advantages of interview method:

- Flexibility; interviews can be adjusted to meet many diverse situations.
- High response rate is got; the presence of the interviewer gives the opportunity to the interviewee to discuss the participation in the study.
- Gives chance for the researcher or student to correct misunderstood questions by respondents while still in the field.
- Less patience and motivation are needed to complete than required by the questionnaire method.
- The interview method helps the students to interact with people.

Disadvantages of the interview method:

- Interview method is more costly and time consuming than other methods.
- Interview method is affected by possible bias associated with the interviewer.
- It is less effective than other methods especially where sensitive issues are discussed.
- Hostility from the respondents.
- Language barrier that is to say in most cases the students cannot easily communicate in local languages and the local people cannot understand English.

How to present limitations of interview method during the study:

Interviewing was limited by hostility from the vendors of Nylon market who insulted the students who could ask questions such as: how are you going to help us? We are tired of students.

Interviewing was limited by language barrier. Most of the workers at Masese Landing site could not communicate in any other language apart from Luganda that could not be understood by some students.

3. RECORDING METHOD:

Recording is a procedure where the researcher writes down information using stationery such as a pen and paper. However, other devices can be used to record down information especially where writing down of information is not effective.

Advantages of recording method:

- Students are in position to keep permanent records of information.
- Information is more organized when recorded than in other methods of data collection.
- Where drawings and tabulations are involved, it helps students to acquire skills that are to be used at later stages of academic hierarchy.
- It is used in other methods of data collection (it acts as a link between the different methods).

Limitations to the method of recording:

- It is affected by climatic conditions for instance recording on white paper during sunny days.
- The stationery may be lost either having been destroyed by rain or stolen.
- Stationery is expensive for students.

How do we present recording method while answering questions?

Forexample:

Describe how you used the following method to collect data while in the field of the study.

Recording:

- Approach.
- Define what recording is.

- Explain how you recorded the information.
- Give examples of the recorded information.

For instance a student may answer as follows:

Recording is where the researcher writes down information as got from the field of study. During recording, pens, pencils and papers were used to record down information as observed or interviewed from the field of the study. We recorded down the problems faced by the fish mongers at Masese fishing Landing site, which included; lack of modern equipments to preserve fish, limited capital to buy equipments. We also used tables to record data, for instance the types of fish species caught and major fishing methods used to catch fish.

A table showing fish and the major methods of catching fish at Masese Fish Landing site:

Fish species	Methods of fishing
Tilapia	Gill netting
Nile perch	Trawling

4. MEASUREMENT METHOD:

It is a method used to determine the quantity or size using special equipments or instruments. In other words, it is a method by which distance, areas, heights, weights and quantity are got or determined.

Short distances over a good teaming can be measured with a tape measure; longer distances can be measured by pacing.

Advantages of measurement:

- The method gives first-hand information to the students.
- Students also learn skills and the using of some tools as they physically carry out the measurements of distance and other objects in the field.

Limitations of the measurement method:

- Measurement is affected by inadequate tools in most cases the tools are not enough in order for each student to have hers or his own.
- Measurement is affected by lack of skills by students to use the tools especially where obsolete tools are used.
- Measurement is affected by physical obstructions for instance sudden rain, steep slope, buildings and many others.

5. SAMPLING METHOD:

Is a process where a portion or part of a whole is selected or used to represent a whole in the study.

Advantages of sampling:

- Sampling saves both resources and time. In many cases a complete coverage of the whole population is not possible because of the limited time and resources.
- Sampling provides first-hand information and in detail. Since the researcher has enough time to give to a few people, one can be asked for other information related to the topic and objectives of the study.
- Field work studies based on sampling are less demanding in terms of labour and requirements because they require a small portion of the population in the areas of study.

Problems of sampling:

- Lack of complete representation of the target population. For instance when a fish landing site is visited, many of the interviewed people may not be fish mongers and this may result into giving of wrong information.
- Bias in selection is common since in most cases students only interview people in the field who are interested in their study.
- There is a tendency of missing on important sub-groups especially in cases where simple random or incidental sampling is used; where students just go to the field and ask anyone who comes their way.
- Inadequate tools for example chemicals especially where testing of substances is required for example testing soil pH or water salinity.

6. SKETCH MAP DRAWING:

A sketch map is a layout of features as seen from above. It represents the location of the area as well as the relationship between different geographical phenomena.

Like any other map, a sketch map should have the following:

- A well elaborated title with the place name.
- Complete frame.
- A key/labels printed/written on the map.
- Compass direction showing the North point.
- Physical features must be shown by names.

- Land use types or man-made features must be given.
- Every writing has to be done in a horizontal order.

Steps followed while describing or explaining a given method:

- Identify the method (if it was not given).
- Define it.
- Explain how it was used (be brief here).
- Give examples from the field (information gained while using a given method).

Geographical significance/relationships of the field work study:

In explaining geographical significance of the field work study, a student is expected to state the findings of the study. The significance of the findings should be related to the topic and objectives of the study; however students should not repeat objectives in these findings.

The findings should be weighed against the existing geographical facts on the ground/area of the study. These may be relationships between:

- i) Physical and physical.
- ii) Physical and human.
- iii) Human and human.

For example: (Physical to physical)

Through observation we established that the gentle slopes north of Nylon market favoured the accumulation of deep fertile soils. Such soils are deposited there by surface run-off during the rainy season.

Through observation we established that lateritic rocks were found on Namatala flat topped hill because it's an area of maximum leaching and soil erosion exposed most of these lateritic rocks.

Through observation we found out that Namatala Swamp North west of Nylon market is located in Namatala Valley.

Human and human activities:

Through observation we established that Pallisa Road located to the south of Nyalon market influenced the location of Ntake Factory. This enables transportation of raw materials, manufactured goods and labour cheaply.

Through observation we established that Pallisa road found in the south influenced the location of Nylon Market that offers goods and services to nearby settlements.

Physical and human activities:

Through observation we established that the gentle slopes and valley south west Nylon market favoured settlement activities forexample BCU quarters and neighbouring communities are located in the gentle slopes and valley area.

Problems encountered during the field work study:

Students may give these problems depending on the methods used during the field work study while giving practical examples from the field and should be related to the topic and objectives of the study.

For instance if the topic is:

"A study of the growth and development of Nylon market in Namatala,Industrial division-Mbale municipiplality.

PROBLEMS:**Questionnaire:**

- All questionnaires which were posted got lost on the way. Therefore we were not able to find out the problems facing venders at Nylon market.
- Mr. Mukwata deliberately refused to inform us the influence of Nylon market to the surrounding environment.

Observation:

This refers to the art of obtaining information from the field by way of identifying geographical phenomenon using the eyes. The problems we established with it are; we failed to collect the other types of crops grown on the estate. This is because a hill obstructed us from seeing those crops.

Recording:

This involves the use of pens and pencils to write down information and draw sketch maps and diagrams from the field. We failed to record down the influence of Nylon market to the surrounding areas because it began raining soaking our papers so we could not record.

N.B:

The problems stated should be geographical and not personal forexample hunger, got tired, too expensive, boring.

FOLLOW UP ACTIVITIES/STAGES:

This is the activity done by the researcher when he or she comes from the field. The following steps are taken:

- Analyzing, interpreting and sorting out data that is to say sorting out the relevant data from irrelevant data.
- Polishing up the field sketches such as completion of sketch maps, panoramas, line transects and filling up the tables.
- Comparing information from different groups and come up with one accurate information.
- Final report writing showing what was included in the report for example the topic, objectives of the study among others.
- Distribution of copies of the report to stakeholders that is to say people with authority in the area of the study for example L.C.I chairman of the area.

PHOTOGRAPH INTERPRETATION.

Specific Objectives.

By the end of the topic the learner should be able to:

- (a) Identify types of photographs.
- (b) Describe parts of a photograph.
- (c) Estimate sizes of features appearing on photographs.
- (d) Draw sketches from photographs.
- (e) Identify and interpret features from photographs.

Content

- a.) Types of photographs.
- b.) Parts of a photograph.
- c.) Interpretation of photographs by estimation of actual sizes of features, sketching from photographs, studying and describing natural and human features and activities on photographs.

Photograph.

A photograph is an image or a picture of an object recorded by a camera on a light sensitive film or paper.

Types of Photographs

They are classified according to the viewpoint from which they were taken.

The classes are:

- Ground photograph
- Aerial photographs

Ground Photographs.

- These are photographs taken from the ground with the camera held level to the object.
- The person taking the photographs stands in a position where he can see the object directly in front of him/her.
- Objects far away from the camera are not always shown.
- The objects near the camera appear big and clear.
- An area hidden from the eye of the camera by an object is called **the dead ground**.
- Ground photographs are further classified into:
 - Ground general view.
 - Ground close up (particular view).
 - Ground oblique

Ground Close-up.

- The camera is focused on one major object, such as an animal, a crop or a car.
- This object may block out the other things behind it.
- Close ups are the most common types of photographs.





Ground close-up photographs.

Ground General View Photographs

- These photographs are taken with the camera held horizontal to the ground facing the area focused on.
- The objects in the photograph become progressively smaller as the distance from the camera increases.

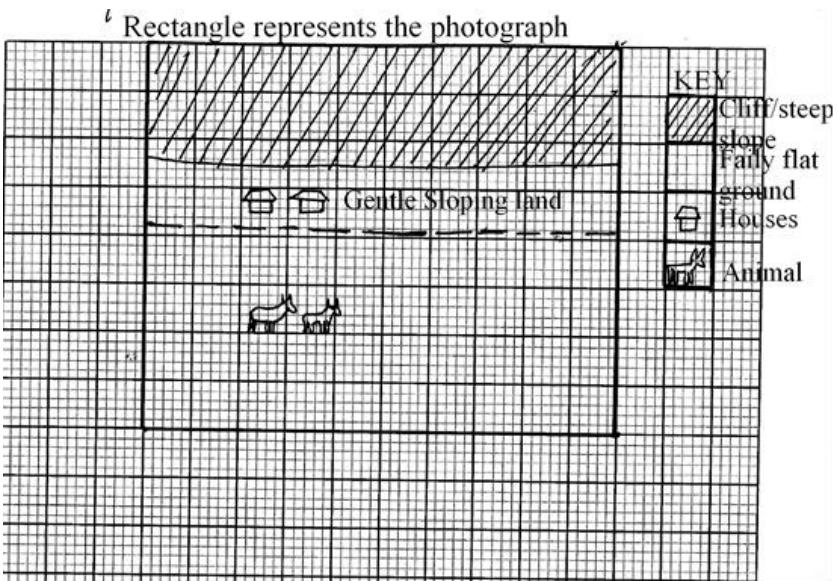
Examples

a.) Identify the activity on the photograph below.

b.) Name the type of photograph below.



c.) Draw a rectangle representation of the photograph



Example

Study the photograph below and use it to answer question (a)



- a) (i) Name the type of photograph shown above (1 mark)

- (ii) What time of the day was the photograph taken if the camera was held facing south?
(1mark)

- *Evening*

- (iii) Draw a rectangle measuring 16cm by 9cm to represent the area of the photograph. On it sketch and label the main features shown on the photograph
(5 marks)

MAIN FEATURES SHOWN ON THE PHOTOGRAPH



- (iv) Describe the landscape of the area represented by the photograph.
(3marks)

- *The land rises from the foreground towards the background*
- *The area covered with vegetation is slightly raised.*
- *The area in the background has bare rock surfaces/rock outcrops.*
- *The area in the foreground is gently sloping*

Ground oblique.

- This is taken while the photographer is standing on higher ground than the object.
- The camera is tilted downwards towards the object.
- Since it this photograph is taken from a raised point it tends to clearly bring out more details of features such as valleys and slopes.



Ground oblique photograph.

Aerial Photographs.

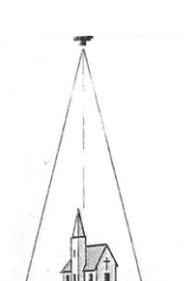
Photographs taken from the air using aircrafts, balloons, parachutes and sometimes satellites.

Types:

- i. **Vertical aerial photographs.**
- ii. **Oblique aerial photographs.**

Vertical Aerial Photograph.

- These photographs are taken from vertically above. The camera lenses focuses vertically on the area to be photographed.
- As a result, only the tops of features like hills, trees and buildings can be seen as shown in below.
- These types of photographs are used for making maps.



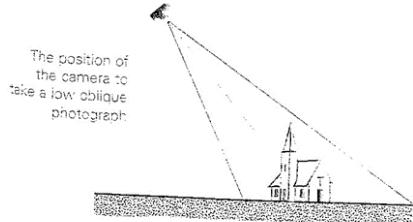
The position of the camera to take a vertical photograph



Oblique Aerial Photograph

- These are photographs taken from a low flying aircraft with the camera tilted at an angle and cover a relatively large area as shown in below.

- The objects nearer the camera are larger than those far away. Although these photographs are similar to ground oblique, they cover large areas and the features on them appear smaller and more obscure.



Parts of photograph.

For the purpose of location and interpretation of features, a photograph is divided into three main parts namely:

- Foreground:** This is the part nearest to the camera.
- Middle ground:** This is the part in the Centre of the photograph.
- Background:** This is the part farthest from the camera.

Each of these parts is sub-divided into left, middle and right as indicated in below.

Left Background	Middle Background	Right Background
Left middle ground	Middle middle ground	Right Middle ground
Left foreground	Middle Foreground	Right Foreground

INTERPRETATION OF PHOTOGRAPHS.

Estimating Actual sizes of Features on photographs

- Height of objects can be estimated by the use of other familiar objects shown in the photograph. For example, the height of a crop like tea can be estimated using a familiar object like an adult human being standing where the crop is growing.
- It is, however, not possible to accurately determine sizes of unfamiliar objects shown in a photograph.
- In photographs, images grow progressively smaller from the focal point outward, that is, from the foreground to the background.

Drawing a Sketch from a photograph.

To draw a sketch from a photograph, the following steps should be followed:

- Draw a rectangular or square frame preferably of the same size as the photograph.
- Identify the required features and plot them in the frame appropriately. Use clear simple lines and avoid unnecessary shading.
- Label the required features and give your sketch a title. Interpretation of Physical

INTERPRETATION OF PHYSICAL FEATURES AND HUMAN ACTIVITIES ON A PHOTOGRAPH.

- To interpret a photograph, it is important to study it in an orderly manner starting from the foreground through the middle of the background and then left to right.
- A photograph usually has different aspects of physical features such as hills, valleys, vegetation and drainage features as well as human-made features such as farms, bridges, roads and houses.

RELIEF.

- Major relief features which can be detected from a photograph include the slope, hills, plains, plateaus, ranges, escarpments and valleys.
- Several clues can be used to describe the relief of a given area in the photograph. These clues include:
- Hilly landscapes may be a likely indication of a highland area, while dissected landscape in a hilly area indicates that the place has undergone heavy erosion. Undulating or gently sloping landscape, on the other hand may indicate that the area has undergone little or minimal erosion or may be used as an evidence to show that the landscape is young of recent origin.

- The shape of hills can also give clues to the formation and age of such hills with smooth tops are a likely indication of young volcanic hills, which have been least affected by erosion. Rugged hills with protruding rock pillars, toes or plugs may indicate that the hills are old and have been heavily affected by erosion.
- The human activities taking place in a photograph can also give clues to the nature of the landscape. For instance, presence of irrigation activities may suggest that the area shown in the photograph is a plain or is gently sloping. Terraced landscape, on the other hand, indicates that the area represented in the photograph is steep and therefore vulnerable to erosion. Terracing is therefore meant to reduce or control soil erosion. Particular crops in a photograph can also suggest the relief of a place. For example, crops like tea indicate that the area covered in the photograph is a highland while presence of coconut plantations is evidence that the photograph represents a coastal area. Different human-made features in the farms can also give clues to the relief represented in a photograph. For instance, combine harvesters in a farm are likely indication of a plain or gently sloping terrain.
- The type of drainage in a photograph can also provide a clue as to the nature of relief in an area. For instance, the presence of swamps may suggest that the area is flat and hence waterlogged. A lake on top of a hill is a likely indication of a crater lake and can hence also be used as a clue to show that there has been volcanic activity in the area. Long narrow lakes with a valley stretch running parallel to the hills or ranges in the adjacent vicinity are likely indications of faulting. Different forms of communication lines can be used to interpret the landscape. For instance, a road between two hills can be an indication that the hilly area is characterized by passes. A winding railway is an indication of a rugged landscape.
- Vegetation types shown in a photograph can also be used as a clue. In the tropics, cone-shaped trees with thin leaves can be used as evidence to show that the photograph represents a highland area.

DRAINAGE.

- The common drainage features that may appear on photographs include rivers, lakes, oceans, swamps, ponds, wells, boreholes and irrigation channels. On a photograph, water surfaces generally appear brighter than the surrounding features like vegetation and can easily be identified.
- When interpreting drainage, the following guidelines may be used:
 - i. Rapids and waterfalls would indicate a river that is flowing through a hilly landscape or is in its youthful stage.
 - ii. Meanders indicate the middle stage of a river as the river enters less steep land or almost flat land. Some of the meanders may be cut-off from the main river and from ox-bow lakes (ox-bow lakes appear crescent shaped). The presence of a flood plain in a photograph is an indication that the river is in the old stage. The

presence of a delta may be identified by the river breaking into many channels before entering the sea.

Major rivers are joined by the tributaries. The main stream and all its tributaries form a river or drainage system. On some aerial photographs (especially those taken from near the ground surface), one may notice that drainage systems form different patterns on the surface. These depend on the general structure of that surface.

If part of a river is included in a photograph, one may determine the direction of flow by looking at the general relief. Rivers flow from higher ground (source) to lower ground.

VEGETATION.

To describe the vegetation type from a given photograph, the following aspects need to be taken into account:

- The type of vegetation: It is made of trees, grass, shrubs, swamps or thicket?
- The height and shape of vegetation, that is to say are the trees tall, short, cine shaped, umbrella shaped? Are the leaves broad, needle shaped or thorny? Are the stems bulky?
- Density of vegetation, that is to say are the trees close together or scattered? Is there any undergrowth?
- Vegetation species that is to say, is it one type of vegetation? Are they trees of the same species? Is it possible to name or identify some vegetation species? Is the vegetation planted by human beings or natural?

Using the information gathered from a photograph, it is possible to identify different vegetation types such as tropical rainforest grasslands, woodland vegetation, scrubs and desert vegetation. It is also possible to differentiate between natural and planted vegetation. Planted vegetation usually appears in rows (patterns) with little undergrowth and have the same tree species of similar heights.

CLIMATE.

Different aspects of climate may be detected from a photograph in the following ways:

a.) Temperatures.

These can be detected from the kind of agricultural activities practiced in the areas shown by the photograph. For example, the presence of sugarcane plantations would suggest high temperatures while the presence of tea and dairy farms would suggest cool temperatures. The manner in which the people in the photograph are dressed can also be used to describe the temperature experienced in an area. For example, people in a hot place will wear light clothes while those in cold areas will dress warm clothes.

b.) Rainfall.

Rainfall amounts received in an area can be detected from the kind of agricultural activities practiced. For example, dairy farming and the growing of crops like tea and coffee would generally suggest that in the area where they are grown is likely to have sufficient and reliable rainfall which is evenly distributed while short scrub or Bush land may be an indication of insufficient rainfall.

Human-made Features.

A wide range of human-made features may be recorded in photographs. These may include:

- **Settlement.**

This is shown in photographs by houses. The houses may be arranged in different ways to give settlement patterns. For example they may be grouped together to form nucleated patterns. Settlement is indicated by the presence of people, population distribution and density. Other indicators of settlement include social facilities such as schools, churches, health centers and playgrounds.

- **Agricultural Activities.**

These include both crop farming and cattle rearing. Crop farming is indicated by crops seen in the photograph, people preparing land for crop planning, weeding or harvesting. Cattle rearing is indicated by the animals shown in the photograph, vast grazing land, cattle dips and ponds.

It is important to note the factors that favor an agricultural activity and the evidence for each factor. These factors include:

- High rainfall.
- Gentle topography.
- Availability of water for irrigation.
- Good transport network.
- Availability of markets.
- Availability of labour.
- Livestock keeping may be favoured by availability of vast grazing lands
- Planted Forests
- Planted forests are common in photographs. They may be identified by their appearance. They are of similar height, species and appear in rows.
- Fishing
- Fishing is indicated by fishing vessels, people casting nets and fish traps.

- **Mining.**
 - This is indicated by a mine or quarry, people undertaking a mining activity or a mineral processing factory.
- Manufacturing
- This is indicated by factory buildings with large chimneys or people engaged in a processing activity like jua kali artisans.

AREA AND EVIDENCE.

Area where the photograph could have been taken.
The area should be specific and within East Africa.
It should not be a region.