South Sudan

Secondary Geography 1

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GEOGRAPHY
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Introduction to Geography

What is geography?

Geography is the study of the physical features of the Earth and its atmosphere, and of human activity as it affects and is affected by these, including the distribution of populations and resources and political and economic activities.

Branches of Geography

Human Geography:
Human geography deals with the study of people and their communities, cultures, economies and interactions with the environment by studying their relations with and across space and place.

Physical Geography: Physical geography deals with the study of processes and patterns in the natural environment like the atmosphere, hydrosphere, biosphere, and geosphere.

New words

Atmosphere
Atmosphere is a thin layer of gases that surrounds the Earth. It seals the planet and protects us from the vacuum of space.

Hydrosphere
A hydrosphere is the total amount of water on a planet.

Biosphere
Biosphere is the part of the Earth and its atmosphere in which living organisms exist or that is capable of supporting life.

Geosphere
The geosphere is the portion of the Earth system that includes the Earth's interior, rocks and minerals, landforms and the processes that shape the Earth's surface.

Importance of studying Geography

a. To be able to make sensible judgements about matters involving relationships between the physical environment and society.

b. To understand basic physical systems that affect everyday life (e.g. Earth-sun relationships, water cycles, wind and ocean currents).

c. To learn the location of places and the physical and cultural characteristics of those places in order to function more effectively in our increasingly interdependent world.

d. To understand the geography of past times and how geography has played important roles in the evolution of people, their ideas, places and environments.

e. To explain how the processes of human and physical systems have arranged and sometimes changed the surface of the Earth.

f. To appreciate Earth as the homeland of humankind and provide insight for wise management decisions about how the planet's resources should be used.

g. To recognize spatial distributions at all scales local and worldwide in order to understand the complex connectivity of people and places.

UNIT 1: LANDFORMS IN AFRICA

Introduction

What are landforms?

As you travel across the countryside, you are likely to see a variety of features such as mountains, plains and escarpments. These features are called landforms. They are a formed due to various processes which operate inside or on the surface of the Earth.

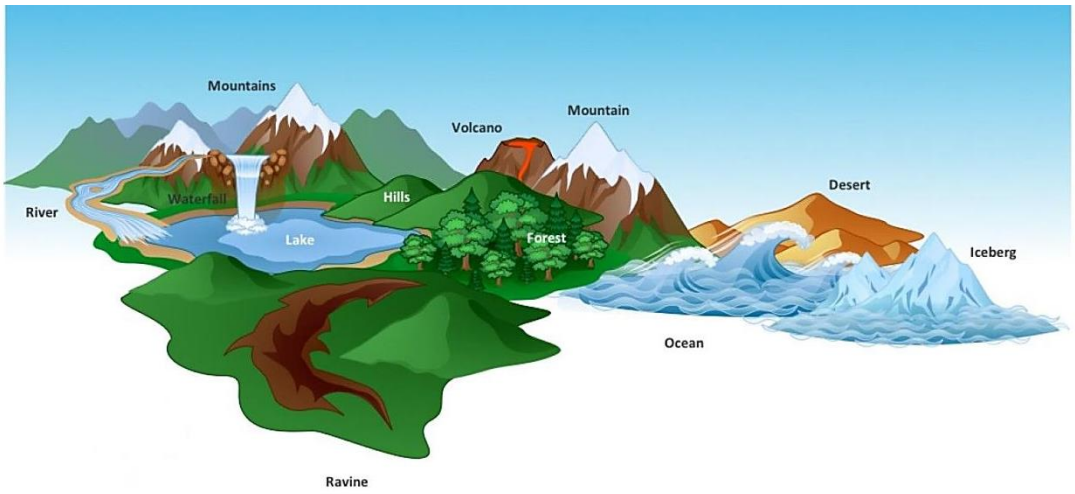


Figure 1.1 different types of landforms

The processes operating inside the Earth are intrusive land forming processes. The processes on the Earth surface are called extrusive land forming processes. They act on the features formed by the internal land forming processes and hence modify their physical appearances. Examples of these processes are **erosion**, **weathering** and **mass wasting**.

Internal land forming processes are caused by strong forces called tectonic forces which originate and operate in the interior of the Earth. These forces cause Earth movements. Formation of land forms by internal land forming processes is determined by:

1. Nature and age of Earth materials.

2. Type of movement involved.
3. Intensity and scale of movement involved.

The Structure of the Earth

The Earth is made up of four distinct layers:

1. The inner core is at the centre and is the hottest part of the Earth. It is solid and made up of iron and nickel with temperatures of up to 5,500°.C. With its immense heat energy, the inner core is like the engine room of the Earth.
2. The outer core is the layer surrounding the inner core. It is a liquid layer, also made up of iron and nickel. It is still extremely hot, with temperatures that are similar to the inner core.
3. The mantle is the widest section of the Earth. It has a thickness of approximately 2,900 km. The mantle is made up of semi-molten rock called magma. In the upper parts of the mantle the rock is hard, but below it the rock is soft and beginning to melt.
4. **The crust or the lithosphere** below it is the outer layer of the Earth. It is a thin layer between 0-60 km thick. The crust is the solid rock layer upon which we live.

There are two different types of crust: continental crust, which carries land, and oceanic crust, which carries water.

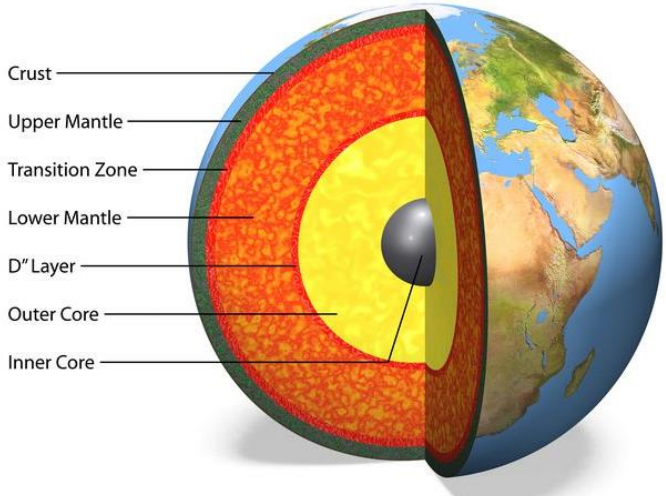


Figure 1.2 a cross section of the Earth.

Crustal Earth Movements

This is displacement of the Earth's crustal rocks. They are brought about by tectonic forces e.g. tensional forces (which operate along horizontal plane moving away from each other), compressional forces (which operate along horizontal plane moving towards each other), shear forces (which move past each other with unequal strength) and gravitational forces (which attracts things to the Earths Centre).

Types of Earth Movements

These movements are of two types : vertical movements and horizontal or lateral movements.

Horizontal Earth movements

What do you understand by horizontal Earth movements?

These are also called Orogeny and are more complex movements as they cause disturbance on the Earth's surface, sometimes beyond recognition.

Practical Activity

Orgarnize yourselves in groups, read and follow the following procedure to create a mimic of horizontal earth movements.

Requirements

a. Rubber band(elastic).
b. A piece of matress.

Procedure

1. Place the rubber band around the wider edges of the piece of mattress.
2. Release the rubber band.
   a. What happens to the surface of the piece of the mattress?
   b. Explain to your classmates how this compares to horizontal Earth movements.

Two types of forces are involved in horizontal movements. They are called Forces or Tension and Compression.Horizonatal movements are responsible for disturbing the horizontal arrangement of layers of rock.

This involves forces of compression and tension. Tension is the pulling force.
Compression is the force exacted on a body from directly opposite sides. Features formed due to horizontal Earth movements are:

a. Faults
b. Escarpments
c. Rift valleys
d. Basins
e. Tilt blocks
f. 7. Block mountains

Vertical Earth movements

The rise or a fall of a portion of the Earth surface is due to the vertical movements, these movements do not disturb the original lay down of the strata.
They cause uplift and subsidence. An uplift is when a part of the Earths crust raises in relation to surrounding portions.
On the contrary , subsidence is when the sinking of a part of the Earth's crust, relative to the surrounding portions takes place.
These Earth movements on a large scale build up continents and the features within them.

Vertical Earth movements result in the formation of the following features:

a. Raised cliffs.
b. Plateaus.
c. Tilt blocks.
d. Basins.
e. Rift valleys.
f. Fault scarps/escarpments.

Causes of Earth Movements

(a) Movement of magma within the Earth's crust.
(b) Gravitational force.
(c) Convectional Currents within Mantle.
(d) Isostactic adjustment.

Movement of Magma within the Earth's Crust

By the movement of magma with force pushing of crustal rocks occurs horizontally or vertically. When magma moves from its reservoir it results into either sudden or slow Earth movements where the crust of the Earth has shifted.

Gravitational force

When the gravititional force of the Earth pulls crustal rocks into the empty spaces left after magma escapes from the reservoir, Earth movements will take place.

Convectional Currents within Mantle

When convectional currents in the magma found within the mantle drag crustal rocks by friction.

Horizontal currents cause horizontal movements while vertical currents cause vertical movements.

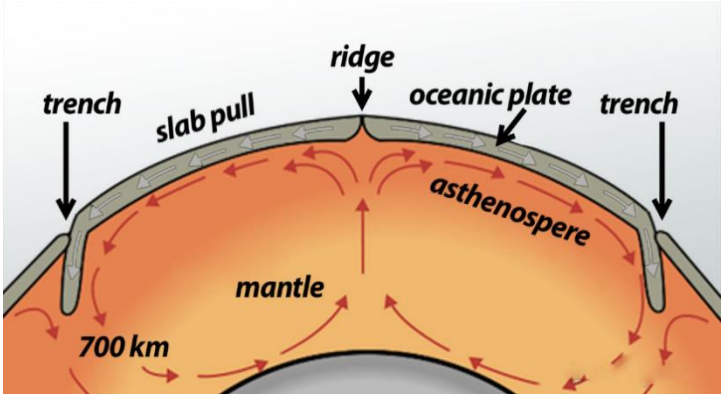


Figure 1.3 convectional currents within the Earths mantle.

Isostatic Adjustment

This is the rising of continental plates to upset the state of balance between SIAL (continental crust made up of silica and aluminium) and SIMA (oceanic crust made up of Silica and magnesium) layers.

The state of balance between the layers of SIAL and SIMA can be disturbed by the melting of continental sheets and the erosion on continents, thus the reduced weight on land causes continental mass rise, while oceanic masses sink.

Activity 1.1

In groups tackle the following questions.

1. Identify the main types of Earth movements.
2. Discuss vertical Earth movements and the resulting effects.
3. Design a poster to illustrate the different earth movements.
4. Which of the causes do you think is the strongest and why?

Theories Explaining the Formation of Continents

A theory refers to well thought out concepts intended to explain facts or ideas. There are two main theories which explain the formation of continents, namely: the Continental Drift Theory ;the Plate tectonics theory.

i. Theory of Continental Drift

Continental drift is a theory that explained how continents shift position on Earth's surface. Presented in 1912 by Alfred Wegener, a geophysicist and meteorologist, continental drift also explains why animal and plant fossils look-alike, and similar rock formations, are found on different continents.

The theory states that:

- The Earth was a single SIALIC land mass called **Pangaea. It was** surrounded by a huge ocean called **Panthalasa** whose floor was a mass of SIMA.

- Pangaea broke into two parts called **Laurasia** (Northern Hemisphere) which lay above the equator and **Gondwanaland** (Southern Hemisphere) which lay around south pole.These two were separated by a narrow ocean called **Tethys** (the present Mediterranean Sea).
- Laurasia broke into the Laurentian Shield and Fennoscandia (Europe, Asia and North America) and moved northwards to their present positions.
- Gondwanaland broke into Africa, Australia, South America, Antarctica, and the Indian subcontinent.
- Africa and the Indian subcontinents there after drifted northwards.

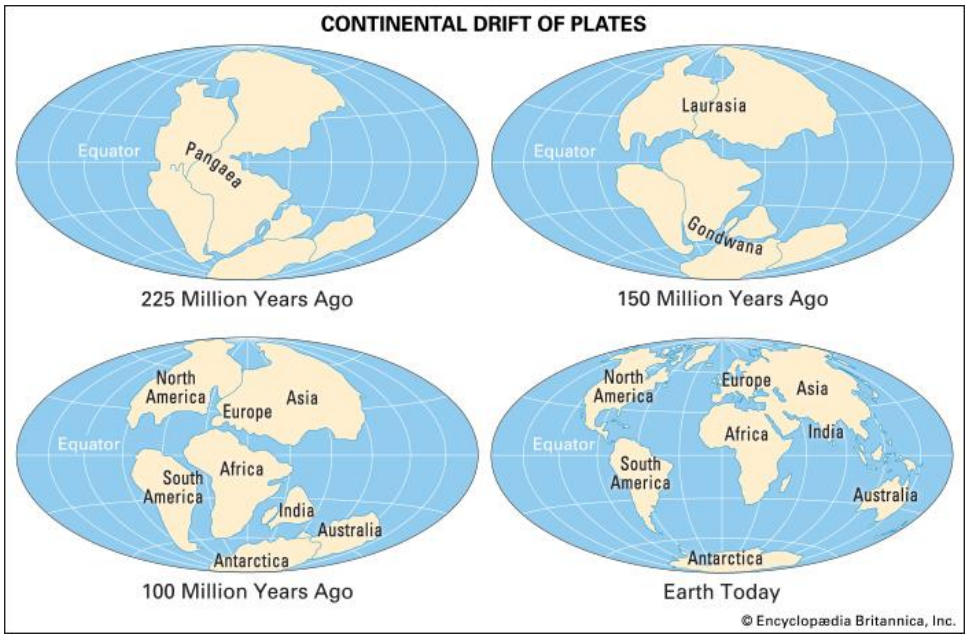


Figure 1.4 shows the Continental Drift.

Evidences supporting the Continental Drift Theory

1. The Western coast of Africa and the Eastern Coast of South America fits into a jigsaw.
2. Considerable displacement of rocks along some faults e.g. along the Great Glen Fault of Scotland.
3. The Cape fold belt and Buenos Aires folds resemble one another by having East West trend.

4. Red Sea shores show evidence of having undergone lateral displacement, an indication that it was formed by movement of the Earth's crust.
5. There is evidence of ancient glaciation to the south of Equator in Africa, in Madagascar and in India. There are ancient glacial deposits found here suggesting these areas were once around the South Pole.
6. There is also evidence of sea floor spreading where the age of rocks in the middle of the ocean differs to those closer to the coast. For example, some of the younger rocks have been found in the center of oceanic plates and were still being founds in areas such as Iceland and the oldest rocks were those nearest to the USA and Caribbean coast.

ii. Plate Tectonic Theory

Plate tectonic theory is an improvement of the Continental Drift Theory. This theory suggest that the Earth crust/lithosphere (SIAL and SIMA) is a series of semi-rigid blocks called tectonic plates. These plates are separated from one another by distinct boundaries.

The theory states that:

The Earth's outer layer is fragmented into plates that are inconstant motion. The movement's rate has been determined to be approximately 5 - 10 cm per year (2 - 6 inches per year), depending on location of the plates.

Progress check

Prepare a summary that outline the evidence for and against each theory.

Tectonic Plates

The Earths crust is made up of tectonic plates, which are in constant motion. Earthquakes and volcanoes are most likely to occur at plate boundaries.

Distribution of tectonic plates

The Earth's crust is broken up into pieces called plates. Heat rising and falling inside the mantle creates convection currents generated by radioactive decay in the core. The convection currents move the plates. Where convection currents diverge near the Earth's crust, plates move apart.

Where convection currents converge, plates move towards each other.The movement of the plates, and the activity inside the Earth, is called plate tectonics.Plate tectonics cause **Earthquakes** and **volcanoes.** sThe point where two plates meet is called a plate boundary. Earthquakes and volcanoes are most likely to occur either on or near plate boundaries.

Plate boundaries

There are three kinds of plate tectonic boundaries: divergent, convergent, and transform plate boundaries.

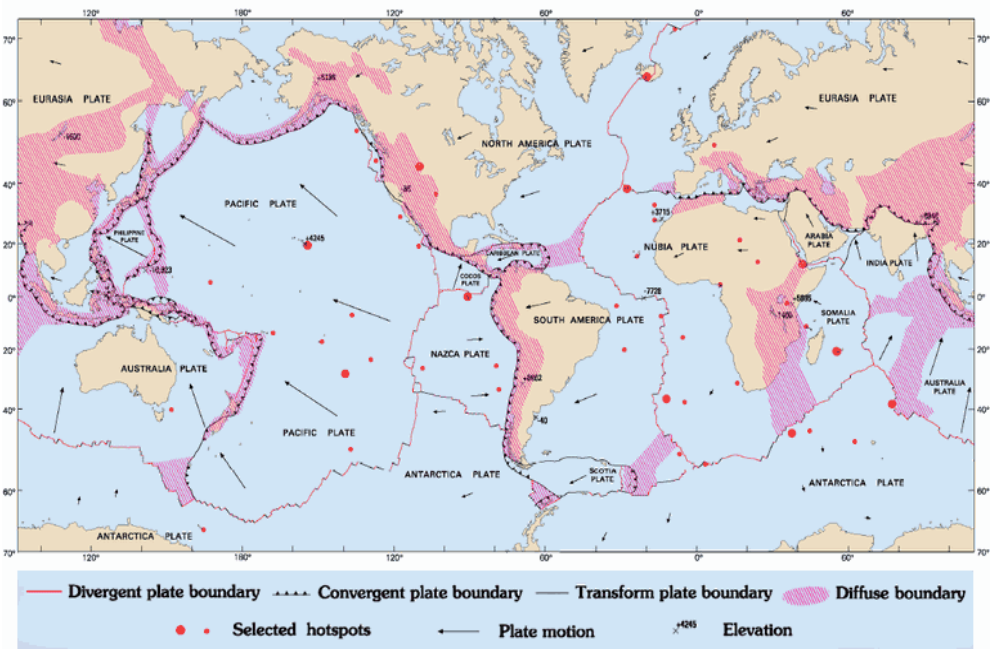


Figure 1.5 a plate boundaries map.

a. Divergent Boundary (Constructive Boundaries)

A **divergent boundary** occurs when two tectonic plates move away from each other lava spews from long fissures along these boundaries, and geysers spurt superheated water.

Frequent Earthquakes also strike along the rift. Beneath the rift, magma molten rock rises from the mantle.

It oozes up into the gap and hardens into solid rock, forming new crust on the torn edges of the plates.

Magma solidifies into basalt, a dark, dense rock that underlies the ocean floor. Thus, at divergent boundaries, an oceanic crust, made of basalt, is created.

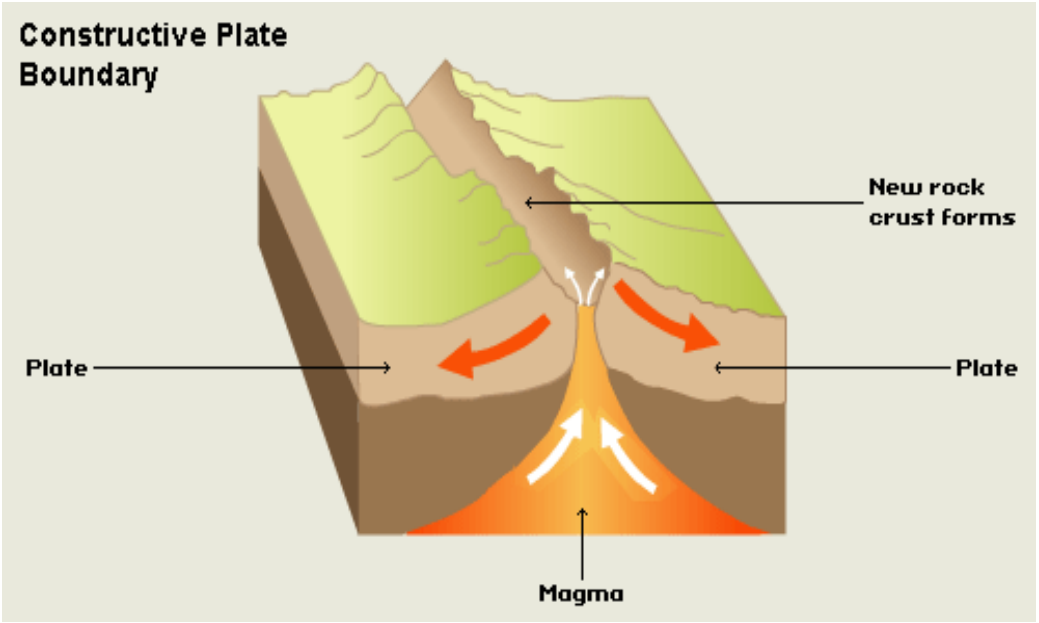


Figure 1.6 a divergent boundary.

Sea-floor spreading is a geologic process in which tectonic plates which are large slabs of the Earth's lithosphere,split apart from each other.

Sea-floor spreading and other tectonic activity processes are the result of convection, which is the slow, churning motion of Earths mantle. Convection currents carry heat from the lower mantle and core to the lithosphere. Convection currents also "recycle" lithospheric materials back to the mantle.

Sea-floor spreading occurs at divergent plate boundaries. As tectonic plates slowly move away from each other, heat from the mantle's convection currents makes the crust more plastic and less dense.
The lessdense material rises, often forming a mountain or elevated area of the seafloor.
Eventually, the crust cracks. Hot magma fueled by mantle convection bubbles up to fill these fractures and spills onto the crust.
This bubbled-up magma is cooled by frigid seawater to form igneous rock. This rock (basalt) becomes a new part of Earth's crust.

b. Convergent boundary

When two plates come together, it is known as a **convergent boundary**. The impact of the two colliding plates buckles the edge of one or both plates into a rugged mountain range, and sometimes bends the other down into a deep seaf loor trench.

A chain of volcanoes often forms parallel to the boundary, to the mountain range, and to the trench. Powerful Earthquakes shake a wide area on both sides of the boundary.

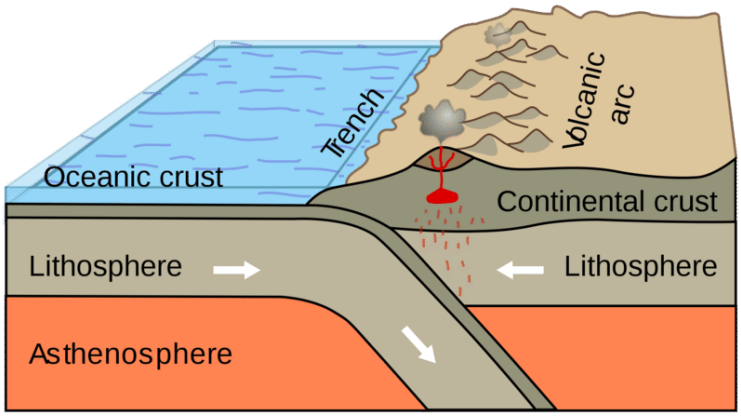


Figure 1.7 a convergent boundary.

If one of the colliding plates has an overidding oceanic crust, it is forced down into the mantle where it begins to melt. Magma rises into and through the other plate, solidifying into a new crust. Magma formed from melting plates solidifies into granite, a light coloured, low-density rock that makes up the continents.
Thus at convergent boundaries, continental crust, made of granite, is created, and an oceanic crust is destroyed.
Subduction happens where tectonic plates crash into each other instead of spreading apart. At subduction zones, the edge of the denser plate subducts, or slides, beneath the less-dense one. The denser lithospheric material then melts back into the Earth's mantle.

Seafloor spreading creates a new crust, while subduction destroys the old crust. The two forces roughly balance each other, so the shape and diameter of the Earth remain constant.

c. Transform plate boundary

Two plates sliding past each other form a **transform plate boundary**. Natural or Man-made structures that cross a transform boundary are offset split into pieces and carried in opposite directions.

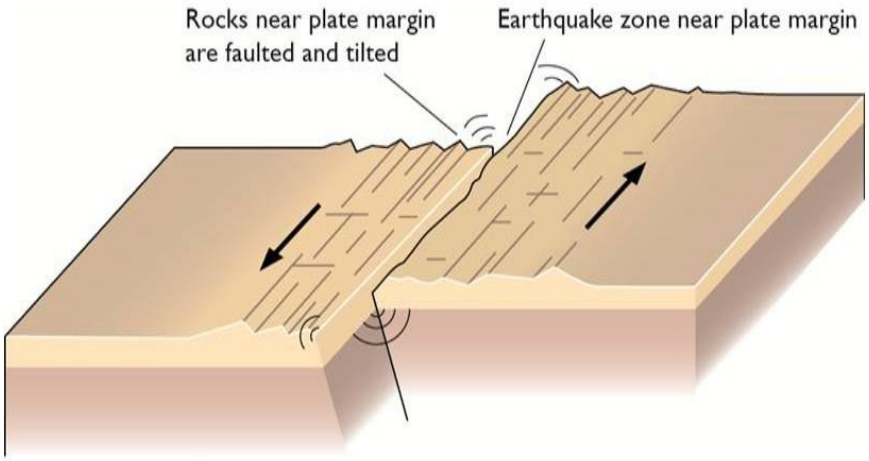


Fig 1.8 a transform boundary.

Rocks that line the boundary are pulverised as the plates grind along, creating a linear fault valley or undersea canyon.

As the plates alternately jam and jump against each other, Earthquakes rattle through a wide boundary zone. In contrast to convergent and divergent boundaries, no magma or new rocks in the crustare formed. Thus, the Earth's crust is cracked and broken at transform margins, but is not created or destroyed.

Significance of Plate Movements

Progress check

Identify from the statements below which are the advantages and which are the disadvantages of plate movements.

- Plate movements lead to formation of spectacular landscape features that are tourist attraction.
- Earthquakes that occur mainly along the transfer boundary leads to destruction of property and death of people and animals.
- Eruption of magma can result in the formation of valuable minerals.
- Volcanoes that erupt mostly along convergent boundaries end up destroying property and displacing many people.
- Plate movements lead to the formation of landforms such as fold mountains which beautify the land as well as ocean trenches.

Activity 1.2

In groups.

1 Describe what you believe to be the most significance causes of Earth movements.

2 Describe the origin of the continents according to the theory continental drift.

3 What do you understand by the term plate tectonics?

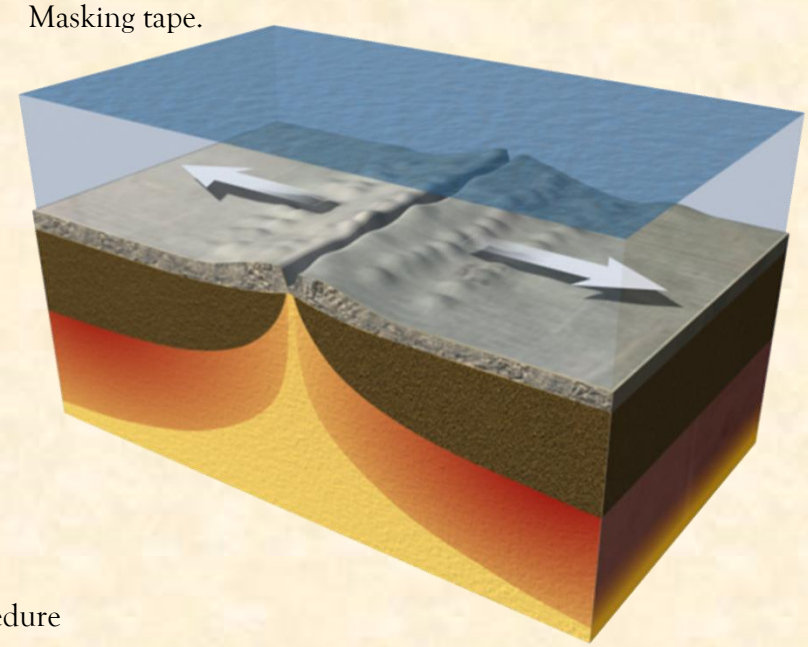
Understanding the spreading of the sea floor

Practical Activity

In groups as organized by the teacher.

Requirements;

- 2 sheets of 8.5" x 11" paper (cardboard may be substituted for 1 of the sheets)
- Ruler.
- Colored pencils or crayons.
- Scissors/Razor blade.
- Transparent tape.
- Masking tape.



Procedure

1. Your teacher will provide you with instructions on how to do the activity.
2. What did you observe from the practical activity?
3. Share with the rest of the groups what you discovered.

Folding

What is folding?

Experiment to define folding.

Practical Activity

Requirements.
A4 piece of paper.

Procedure

1) Spread the piece of paper on your desk or on the floor.
2) Place both of your hands on opposite edges of the paper then apply equal force using your hands and move the edges towards each other.
    a) What happens to the paper?
    b) Did you see any changes on the paper?
    c) Explain your results to other class members.

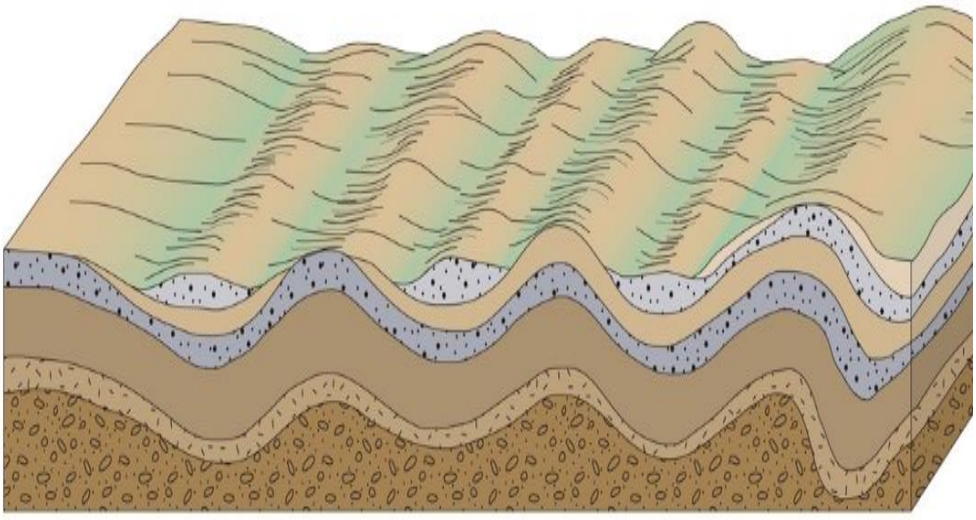


Figure 1.9 folding of the crustal rocks

Activity 1.3

From the previous experiment on folding:

1 Can you identify the parts of a fold?

2 Draw the parts observed and name the parts.

Parts of a Fold

a) Anticlines (upfolds) - these are parts of the Earth's surface which bend upwards when folding occurs.

b) Synclines (down folds) – these areparts of the Earth's surface which bend downwards when folding occurs.

c) Crest-this is the upper most part of Anticline.

d) Trough-lowest part of a syncline

e) Limp-these are the rock layers sloping on both sides of a fold

f) Axis- this is the imaginary line drawn vertically through the centre of the anticline.

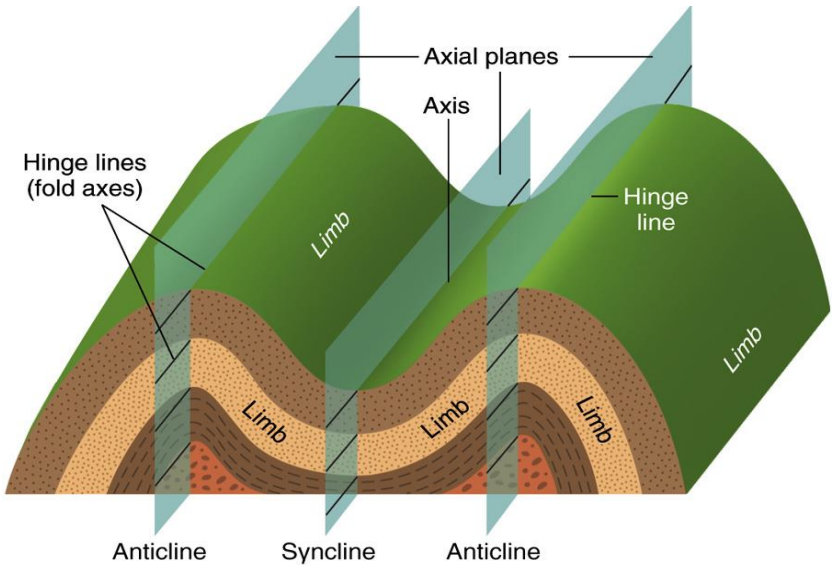


Figure 1.10 parts of a fold.

Types of Folds

Experiment on types of folds

Practical Activity

Using the same piece of paper used on the previous experiment on folding:

1 Apply equal forces on both sides of the paper.
Qa write down your observation.

2 Apply force on only one side of the paper.
Qb write down your observation.

3 Share with the class and present your results.

Types of Folds

a. Simple Symmetrical Folds

These are formed when two compressional forces of equal magnitude.

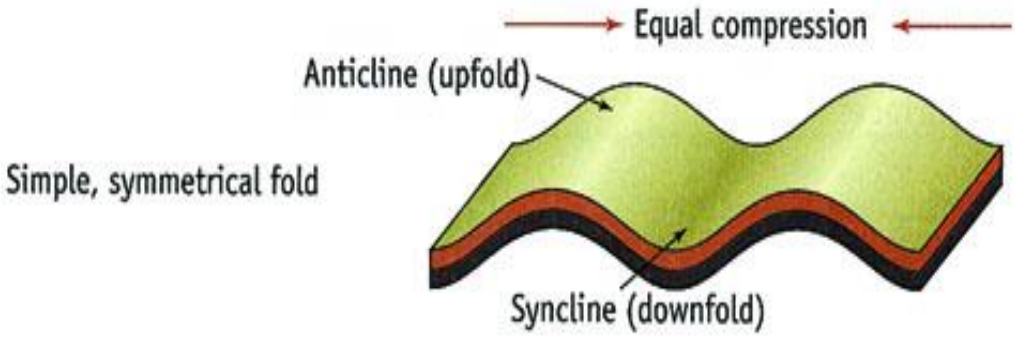


Figure 1.11 symmetrical fold.

b. Asymmetrical Folds

These are formed when compressional forces of unequal magnitude push against a piece of land from opposite directions.

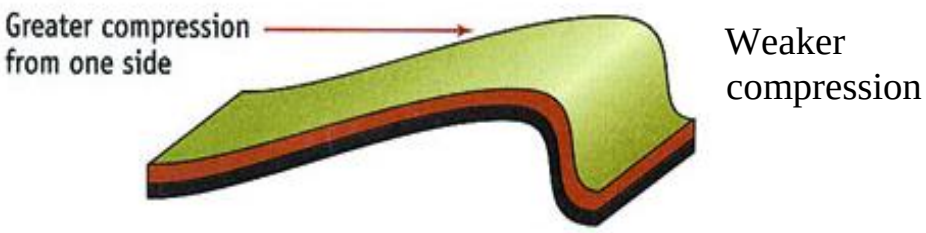


Figure 1.12 asymmetrical fold.

Fold Mountains and Their Distribution

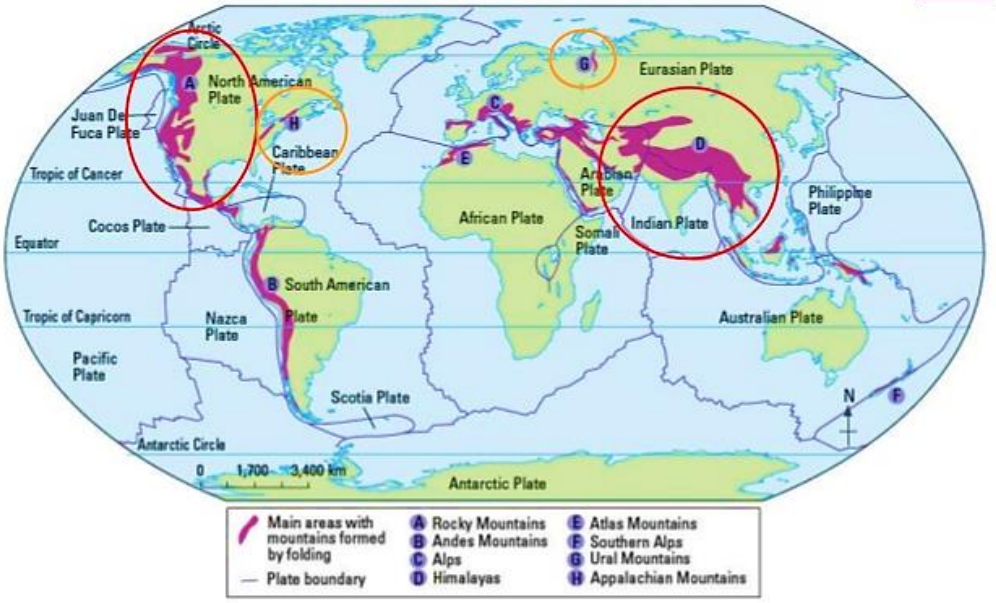


Figure 1.13 distribution of Fold mountains map.

Fold Mountains form the world's highest and most impressive mountains and the most conspicuous feature of folding and examples include:

- Imatong mountains in South Sudan
- Rocky mountains in the western part of North America
- Everest mountains at the border of Nepal and Tibet
- Atlas mountains in North West Africa.
- Appalachian Mountains in Eastern part of North America.
- Andes Peru in South. America.
- Alps South in Central Europe.

Theories of the Origin of Fold Mountains

a. Contraction Theory

During the Earth's formation, surface rocks cooled faster and wrinkled to form Fold Mountains.

b. Convectional Currents Theory

Horizontal convectional currents in the mantle exerted frictional pull on crustal rocks. Continental crusts were pulled towards each other. Sediments between them were squeezed into folds.

c. Continental Drift Theory

During the breaking of Gondwanaland,India drifted northwards and collided with Eurasia. Sediments between these two were squeezed to form fold mountains like the Himalayas and Mount Everest.

d. Plate Tectonics Theory

When an oceanic plate meets another or it meets a continental plate, the sediments under the sea are compressed to form fold mountains.

When two continental plates meet, the SIAL layer is compressed to form fold mountains. The Alps for example were formed when the Africa plate pushed against the rigid European plate.

Progress check

Draw a simple diagram to illustrate each of these theories.

Other features formed from folding

Escarpments

An escarpment is an area of the Earth where elevation changes suddenly. escarpment usually refers to the bottom of a cliff or a steep slope. (Scarp refers to the cliff itself)

Figure 1.14 an escarpment in South Africa.

Depressions

Depression are formed as result of down warping caused by the vertical movement in rocks of the crust. Some parts of the Earth's surface form synclines which eventually become basins.

Figure 1.15. The Qattara depression, Egypt

Ridges and Valleys

When folding occurs anticlines form uplands/ridges/hills while synclines form valleys.

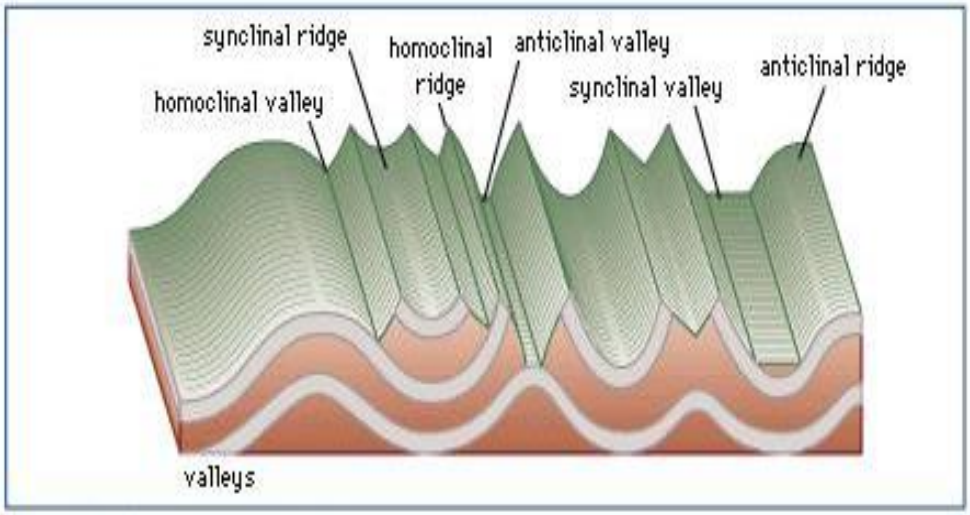


Figure 1.16 ridges and valleys.

Rolling Plains

These are plains which appear to rise and roll. They are formed when plains are acted upon by weak compressional forces resulting into gently sloping anticlines and very wide synclines.

Figure 1.17 Rolling plains.

Inter-Montane Plateaus

Inter-montane plateaus refer to the high fairly level land between mountains. They are formed when rocks at the edges of a region become intensely folded and the middle parts resist folding, resulting into mountains which enclose a high fairly level land

Figure 1.18 Inter-montane plateau in Tibet.

Inter-Montane Basins

They are formed when some parts of inter-montane plateau sink more to form basins.

Impacts of Folding to Human Activities

Activity 1.4

1. In groups discuss the advantages of folding to human activities.
2. Share the answers you have discussed among the other groups.

Advantages

1. Fold Mountains are a tourist attraction which brings foreign exchange.
2. Fold mountains are water catchment areas and sources of rivers.
3. Some fold mountains have valuable mineral deposits such as coal and petroleum.
4. Fold mountains can act as protective barriers during war.
5. Some fold mountains on the path of rain bearing rainfall influence rainfall causing the windward slopes to receive heavier rainfall than the leeward side.
6. Folding brings valuable minerals to the surface making them easily available.

Activity 1.5

Complete these sentences about the disadvantags of fold mountains:

1. Fold mountains cause the leeward slopes to receive less rainfall because_____.
2. Fold mountains discourage settlement due to_____.
3. Folding can lead to burying of_____ deeper into the Earths surface.
4. Fold mountains are a barrier to the construction of road and railway because_____.
5. Frequent fog can hinder a_____visibility.

Activity 1.6a

Folding can result in submerged coastal zones which are used as harbours. It can lead to metamorphism of rocks, changing their original state and making them more resistant to erosion. Depressions formed by folding turn into wet land important for water purification. Folding leads to faulting and magma may escape through faults leading to Volcanicity and Earthquakes.

From the above paragraph discuss the challenges presented by the effects of Fold mountains.

Activity 1.6b

1. Draw a diagram to show a simple fold. On it mark and name: An anticline, a limb and a syncline
2. Find out about one range of fold mountains in Africa and describe their effects on human activity.

Faulting

Faulting is the cracking/fracturing of the brittle crustal rocks due to tectonic forces. Faults are fractures or cracks that develop in the crust:

- when tensional forces cause crustal rocks to stretch and fracture at the region of maximum tension.
- when compressional forces cause squeezing of crustal rocks to fracture at the areas where they are intensely squeezed.
- when vertical movements exert pressure on rocks leading to fracturing.
- when shear forces cause crustal rocks to tear.

Parts of a Fault

a) Upthrown-this is part of the land that is displaced upwards.
b) Downthrown-part of the land displaced downwards.
c) Throw- this is the vertical displacement.
d) Heave- this is the horizontal displacement .
e) Hade- this is the inclination of fault to vertical plane.
f) Fault line- this is thepath of the fault.
g) Fault plane-this is the separation of land created by the fault.

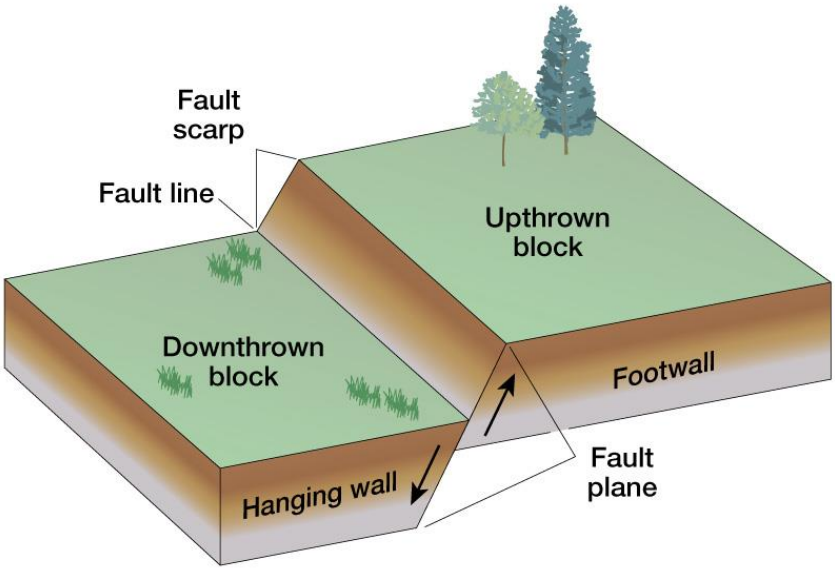


Figure 1.19 parts of a fault

Types of Faults

a. Normal Faults

Normal faults is formed by tensional forces where one block slides downwards in relation to the other.

- Rocks are subjected to tensional forces.

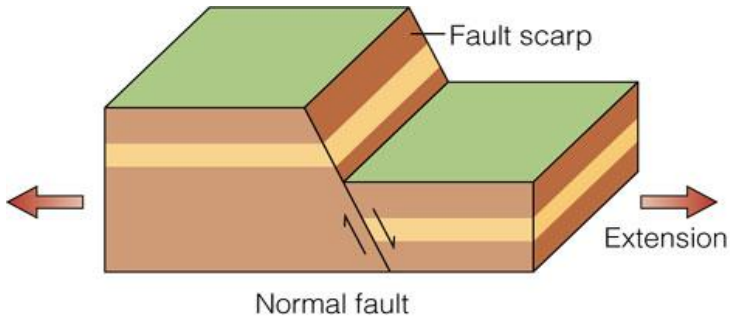


Figure 1.20 normal faults.

b. Reverse Faults

It is formed by compressional forces in which one block of land is pushed upwards in relation to the other. Rocks are subjected tcompressional forces in the formation of reverse fault.

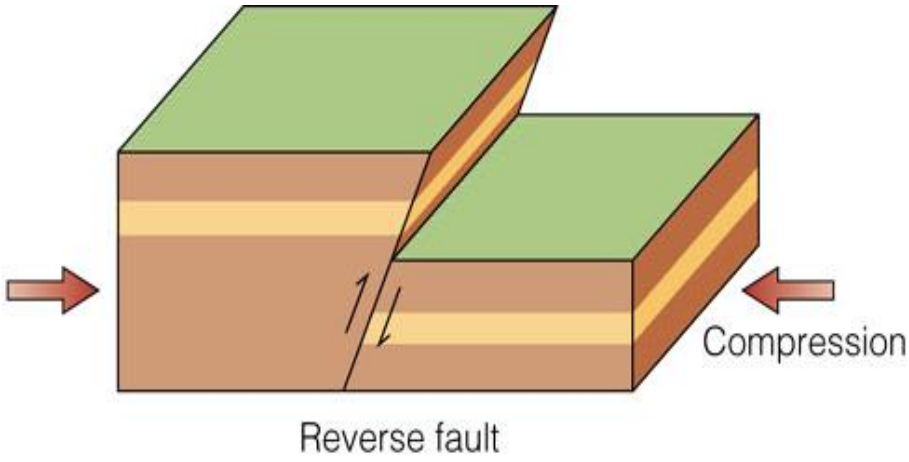


Figure 1.21 reverse fault.

c. Thrust Faults

Thrust faults are formed when very strong compressional forces cause almost horizontal faults to develop and one block of land is pushed over the other.

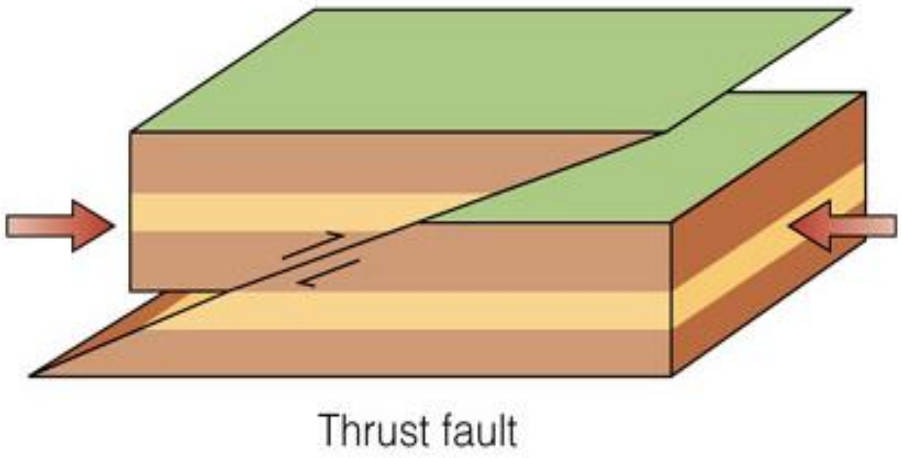


Figure 1.22 a thrust fault.

d. Anticlinal fault

Anticlinal faults are formed when anticlines are compressed further and cracks form on the crest.

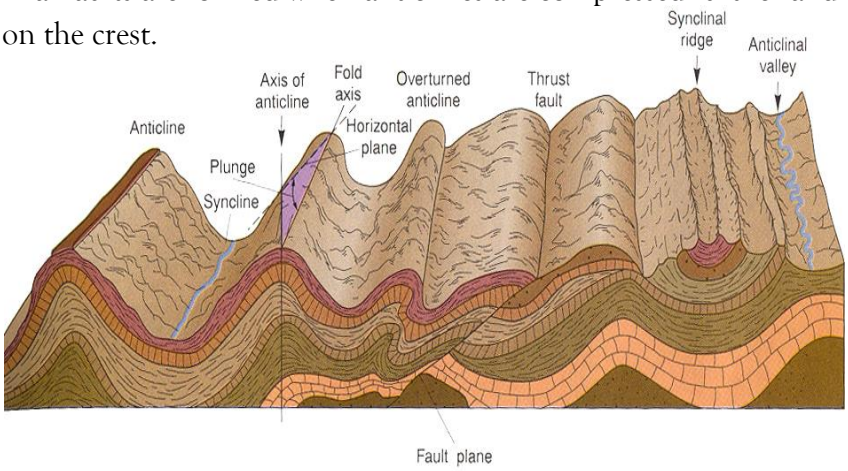


Figure 1.23 an anticlinal fault

Features Resulting From Faulting

Fault Scarp/Escarpment

Fault scarps or escarpments are steep lines of slopes formed by vertical movement of Earth along a fault. They are the exposed parts of a fault plane. They may be formed due to normal faulting or reverse faulting when overhanging blocks are eroded.

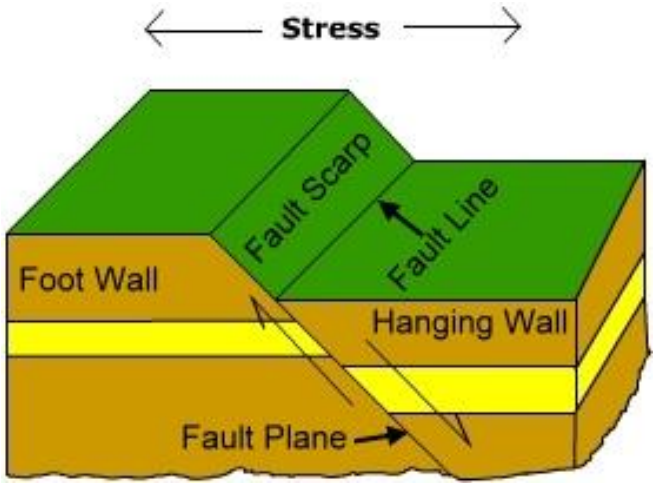
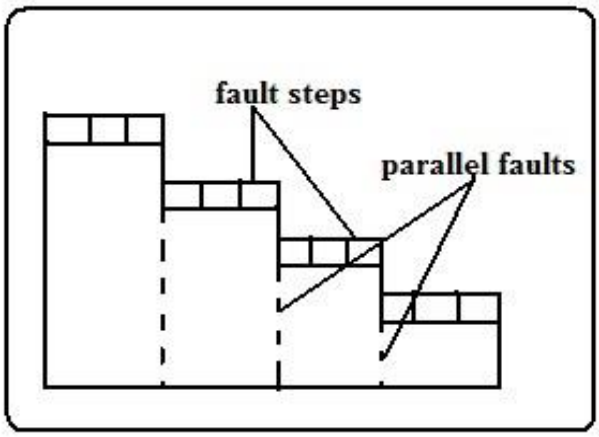


Figure 1.24 an escarpment.

Fault Steps

Fault steps refers to land resembling the staircase or steps of a house with a series of fault scarps at different levels.

- Parallel vertical faults develop.
- Land between the faults is unequally displaced downwards.
- A series of fault scarps at different levels is formed.



Fault Blocks/Block/Horst Mountains

Blocks of land raised above the surrounding land.

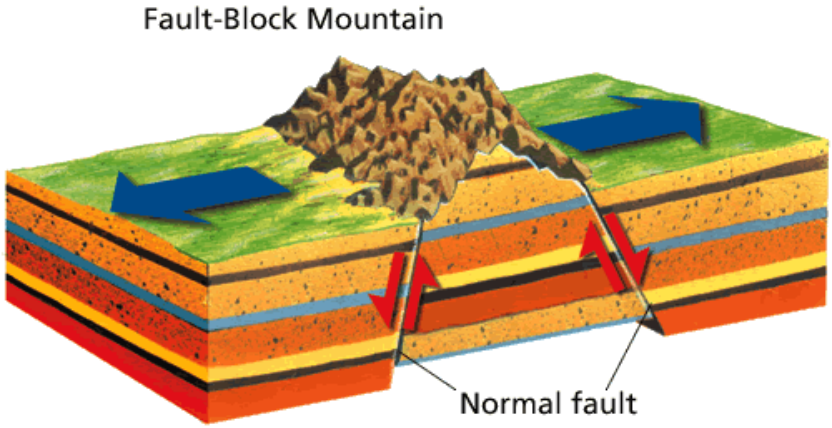


Figure 1.25 fault blocks.

Where tectonic forces cause faulting and land on one side of the fault get raised or sink along the fault planes.

Block mountains or host mountains

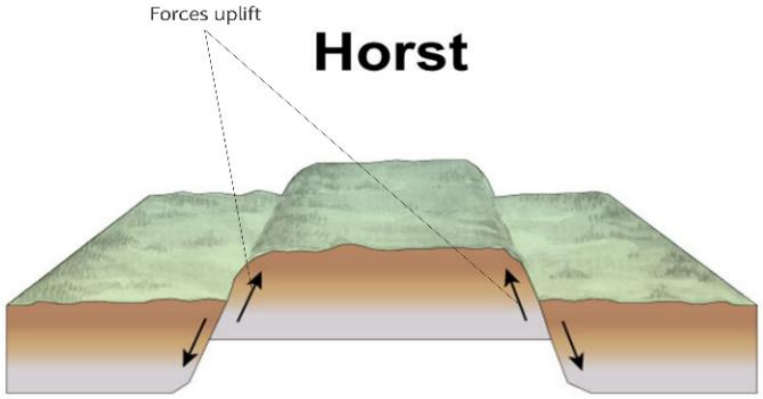


Figure 1.26 Block Mountains.

- Examples of horsts are Ruwenzori of W. Uganda and Usambara and Pare mountains of Tanzania.

- Occurs when the fault block, horst or fault steps have greater uplift on one side and as a result they are not flat at the top but tilted. They are known as, tilted horsts and tilt fault steps which form several ridges and fault guided valleys.

Theories of Formation

Tensional Theory

Experiment on Tensional Theory.

Practical Activity

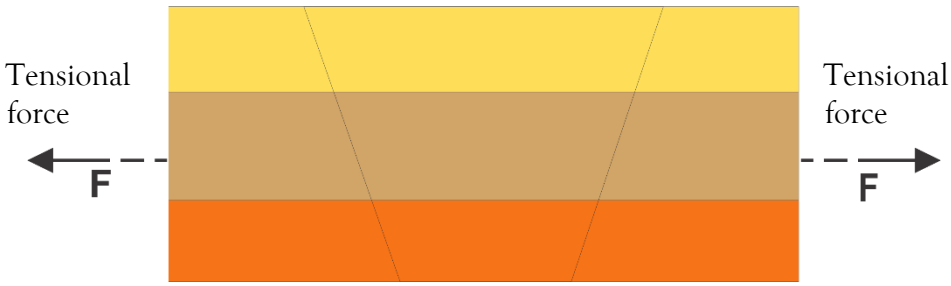
Requirements:

Bar of soap or plasticine

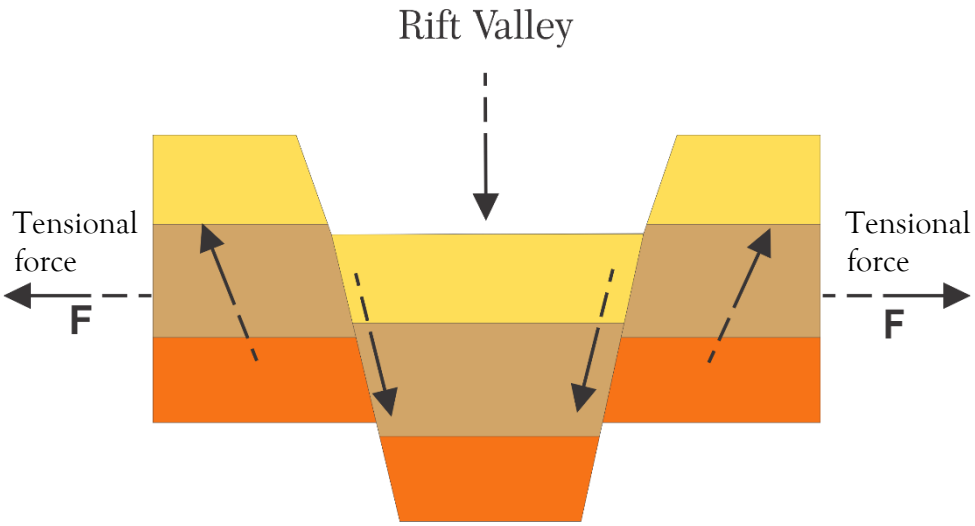
1. Cut the bar soap two sections at the centre
2. Move the two blocks at the edges away from the middle block.
3. What do you observe?

when fault rocks are subjected to tensional forces.

Tensional force leads to development of normal faults



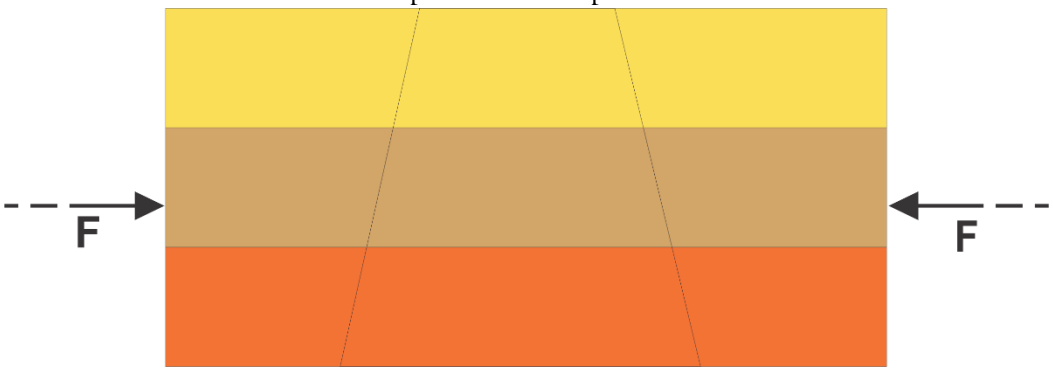
The side blocks are pushed above the middle block forming a Rift Valley



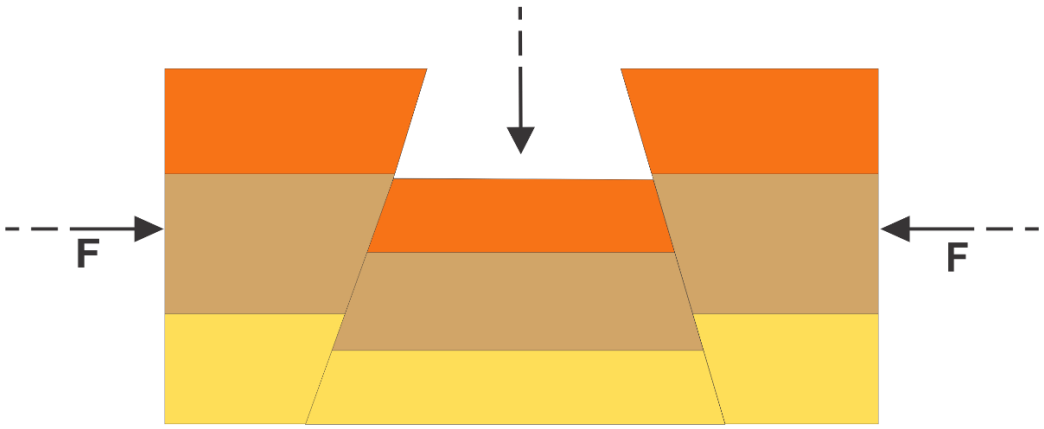
Compressional Theory

Rocks are subjected to compressional forces.

Reverse fault which are almost parallel develop.



Rift Valley



The side blocks are pushed over the middle block.

Overhanging blocks are worn out by denudation to form escarpments.

Anticlinal Theory

Upward forces from within the Earth pushed sedimentary rock strata upwards. Suggests the rift valley was formed by Anticlinal arching.

- The rock layers bent into a big arch. A gaping/huge crack developed at the crest of the arch due to tension forming the rift valley.

Activity 1.7

In groups

1. Discuss, and list, what you think the positive and negative significances of faulting are, on human activities.
2. Share your answers with other group members.

Impact of Faulting on Human Activities

Progress check

Group the these statements into positive and negative impacts of faulting on human activities.

- Rift valley lakes are important for fishing, irrigation and providing water for domestic use.
- Block mountains are water catchment areas and sources of rivers due to the heavy rainfall they receive on the windward side.
- Faulting results in the exposure of minerals such as diatomite in Gilgil and Fluorspar in Kerio Valley in Kenya.
- Faulting may lead to loss of life and property by causing land to sink.
- Faulting has given rise to semi-desert conditions in some areas when block mountains on the path of rain winds cause leeward sides to receive little rainfall.
- Fault scarps may expose underground water, resulting in the formation of scarp springs.

- Unequal subsidence caused by faulting may cause depressions which sometimes form lakes which useful for fishing, transport and mining examples of such include Lake Naivasha and Lake Ambadi.
- Hot springs and geysers formed during faulting can be harnessed for geothermal power.
- The rift valley and associated features are a tourist attraction which earns foreign exchange.
- Faulting disrupts transport and communication by disjointing land.
- Faulting may cause a river to disappear or change its course and flow along the fault line.
- Steep scarp slopes formed by faulting are prone to soil erosion.

Activity 1.8

1. What do you understand by the term faulting?
2. Name the relief features formed as a result of faulting.

Volcanicity

Volcanicity is a process through which solid, liquid or gaseous materials are forced out of the interior of the Earth into the Earth's crust surface. These materials include magma, lava, gases, dust, ash and cinder.

Causes of Volcanicity

1. Magma under high temperature and pressure moving through lines of weakness or faults to the Earth's surface.
2. When tectonic plates move away from each other and the resulting boundaries give way to magma.
3. Underground water coming into contact with hot materials hence changing into gaseous form.

There are 2 types of Volcanicity:

a. **Intrusive Volcanicity (plutonic)**: in which the molten materials intrude the crustal rocks but don't reach the Earth's surface. **Magma** is the molten material while it's underground.
b. **Extrusive Volcanicity (volcanic):** in which materials reach the Earth's surface.

There are two types of lava and magma, acidic and basic.

Acidic lava

Acidiuc lava is viscous and solidifies quickly and doesn't spread far but accumulates around the vent from which it erupts.

Basic lava

Basic lava is more fluid or less viscous and takes longer before cooling and spreads for great distances before doing so.

Volcanoes

A volcano is a cone shaped hill formed when volcanic materials flow out and accumulate around a vent. Volcanoes are classified into three main groups:

1. **Active volcano**- These are known to have erupted in recent times e.g. , Jebel Marra in Sudan, OL donyo Lengai in Tanzania and Mt. Cameroon, and Mauna Loa in Hawaii,
2. **Dormant volcano**- These are not known to have erupted in the recent past but show signs of volcanic activity such as presence of hot springs, geysers and fumaroles for example. Mt Rejaf in South Sudan, Mt. Kilimanjaro, Longonot and Menengai in Kenya.
3. **Extinct volcanoes**-These have not shown signs of possible future eruptions e.g. ,Okire Mountain in Magwi Mount Kenya and Elgon in Kenya.

Types of Volcanoes

Acidic Lava Domes

A steep dome shaped volcanic hill made of acidic lava. Viscous lava flows out through a vent.

- It accumulates around the vent because it's viscous.
- Eruptions occur later and lava flows out covering the layers below.
- A steep sided dome shaped mound of volcano is formed e.g. Itasy Massif of Madagascar, Mt. Kenya and Kilimanjaro.

Characteristics

- It's dome-shaped.
- It has steep slopes.
- It is made of acidic lava.
- It has lava layers.
- It has steep slopes.
- It has a narrow base.

Activity 1.9

Copy and complete this diagram below, putting the correct terms into the bank label boxes.

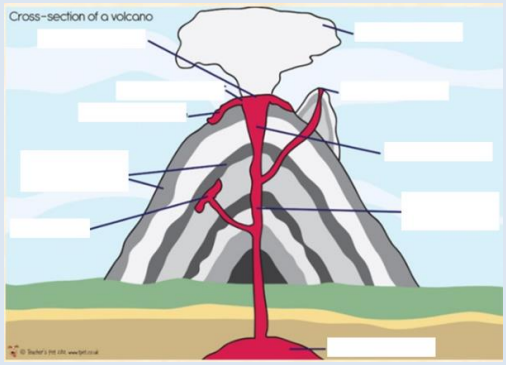


Figure 1.27 acidic lava domes.

Lava flow throat ash cloud crater secondary vent mainvent/conduit layers of lava and ash sill vent lava flow magma chamber.

Basic Lava Domes/Shield Volcanoes

A low lying volcanic hill made of basic lava.

- Basic magma flows out to the surface through a vent.
- The lava flows far before solidifying because it is main fluid.
- Eruptions may occur later and lava spreads over the old lava.
- A shield shaped mound of volcano is formed.

Characteristics of Basic Lava Domes/Shield Volcanoes

- Dome/shield shaped.
- It has gentle slopes.
- It is made of basic lava.
- It has lava layers.
- It has a broad base.

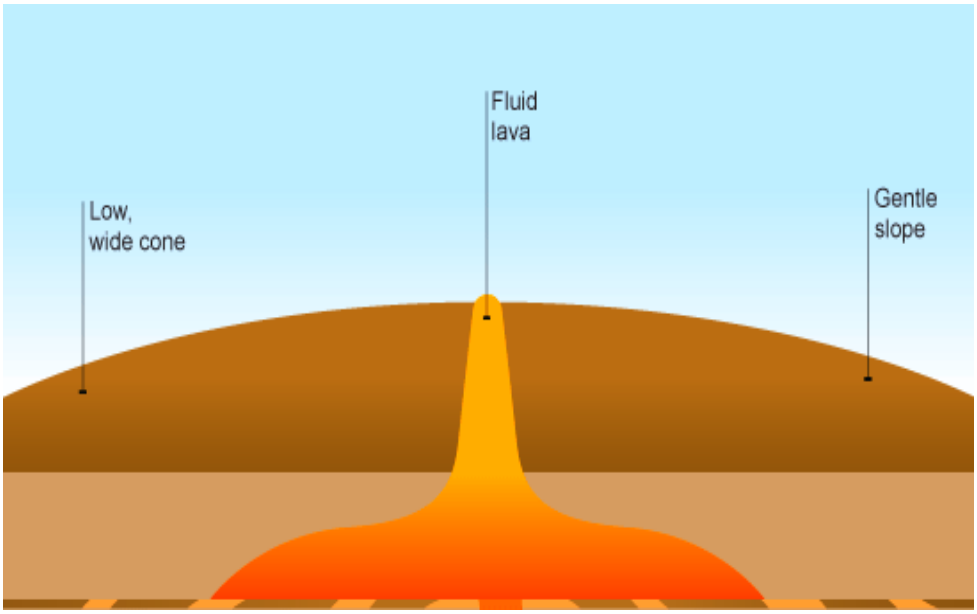


Figure 1.28 basic lava dome.

Ash and Cinder Cones

An ash and cinder cone is a volcano built from ash and cinder or small fragments of lava.

- Violent vent eruption occurs.

- Ash and pyroclasts are emitted and thrown high.
- Some materials fall and settle around the vent forming a hill.

- The light materials are blown by wind to the leeward side e.g. Chyulu Hills, Teleki and Likaiyu near L. Turkana in Kenya.

Progress check

Describe the characteristics of Ash and Cinder cones by reffering to fig 1.29

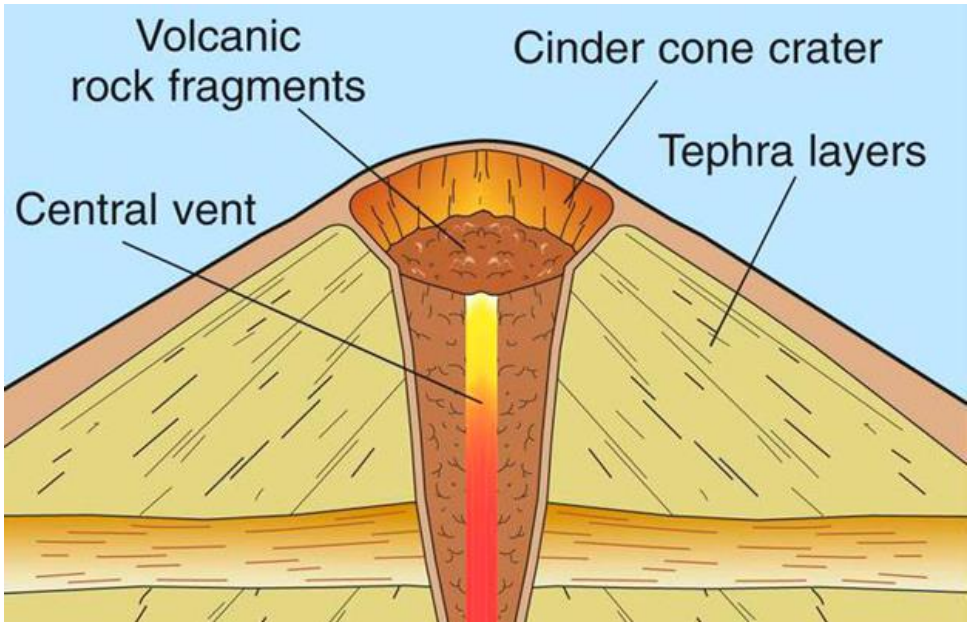


Figure 1.29 ash and cinder cones.

Composite /Complex/Stratified Volcanoes

These are steep-sided volcanoes composed of many layers of volcanic rocks, usually made from high-viscosity lava, ash and rock debris. These types of volcanoes are tall conical mountains composed of lava flows and other ejecta in alternate layers, the strata that gives rise to the name.
Examples include. Mountains Kenya, Longonot, Elgon and Kilimanjaro.

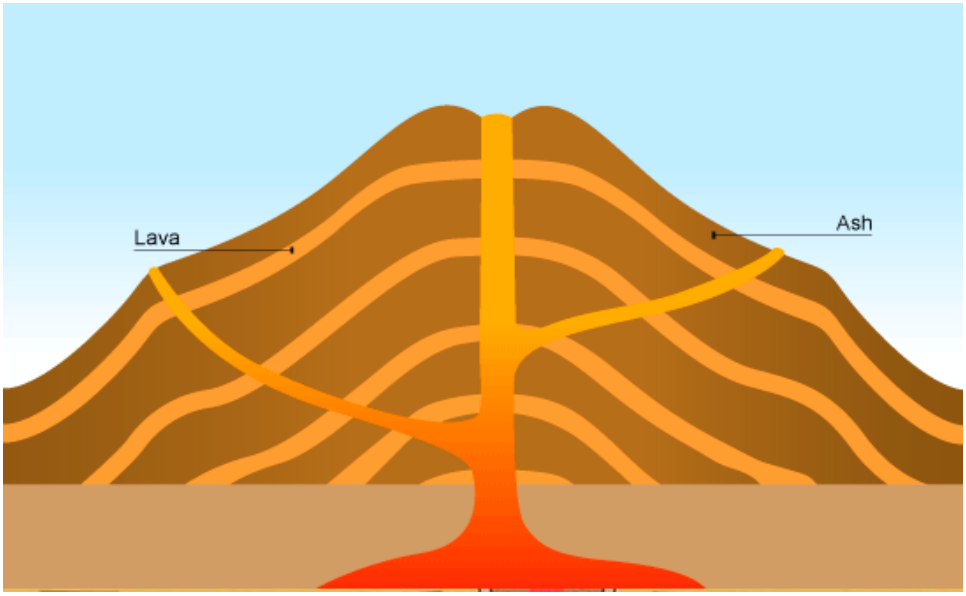


Figure 1.30 a composite volcano.

Activity 2.0

A composite volcano is made of alternating layers of lava and pyroclasts and cone lets. Arrange these sentences into the correct order to describe the formation of a composite volcano.

- Finally, the conelets are formed when magma is unable to overcome the plug and finds its way through weak lines at the sides of the volcano pyroclasts and lava accumulate around the side vent.
- The first eruption throws out the pyroclasts.
- Then viscous lava flows out and solidifies on them.
- The pieces of rock settle on earlier solidified lava.
- Another mass of lava flows out and spreads over pyroclasts and solidifies.
- This process is repeated causing the volcano to build upwards.
- Further eruption occurs later blowing the rocks sealing the vent.

Characteristics of Stratified Volcanoes

- It is cone shaped.
- It is stratified (made of alternating layers of lava and pyroclasts.
- It has conelets (parasitic cones).
- It has steep slopes.
- It is made of acidic lava.

World Distribution of Volcanoes

Volcanoes are found in the following parts of the world.

1. Regions of faulting e.g. the Great Rift Valley of E. Africa.
2. The mid-Atlantic ocean ridge.
3. The western coast of America.
4. Zones of recent mountain building such as the fold mountains of South East Asia.

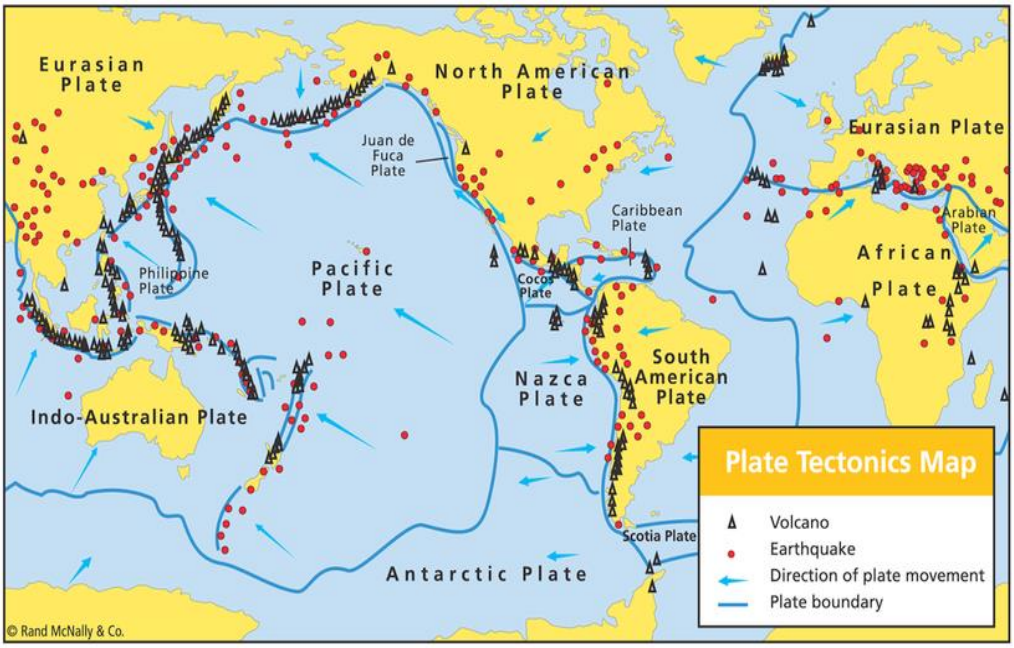


Figure 1.31 A world distribution of volcanoes map.

Impacts of Volcanicity

Progress check

Group the these statements into positive and negative impacts of volcanicity on human activities.

- Volcanic eruptions cause of life and destruction of property e.g. Sulphur dioxide, ash, cinder and lava may bury houses and farm land.
- Volcanic rocks like bosalt weather to form fertile agriculturally productive soils.
- Geysers are sources of geothermal electricity.
- Volcanic mountains are catchment areas, sources of rivers and habitats for wildlife.
- Hot springs water is pumped into houses for heating during winter.
- Volcanic features are a tourist attraction for example hot springs, geysers and snowcapped Mt. Kenya.
- Crater lakes are a source of fish, minerals and water for domestic use.
- Pumice, a volcanic rock, is used as a scrubbing stone.
- Volcanicity is useful for production of gases e.g. carbon dioxide used in soft drinks manufacture.
- Volcanic mountains are barrier to transport and communication.
- Volcanic mountains on the path of rain winds cause leeward slopes to receive little rainfall.
- Volcanic eruptions cause environmental pollution from dust, ash and Sulphur dioxide.
- Igneous rocks like phonolites are crushed to make ballast for building, roads, bridges, etc.

Forces that act and modify the appearance of the land scape

Internal land forming processes such as faulting, folding and Volcanicity lead to formation of various land forms on the Earths crust.

However all these land forms are attacked and destroyed by denudation. Denudation is the wearing away of rocks of the Earth's crust by weathering, Mass Wasting and erosion.

Weathering

Weathering is the disintegration and decomposion of rocks of the Earth crust without any movement.in disintegration the rocks are broken down into small particles by physical processes, while in decomposition the rocks decay or rot as a result of chemical processes.

Mass Wasting

Once rocks are broken down, the weathered materials start to move down the slope under the influence of gravity. This process is known as Mass Wasting.
(Mass wasting is the downslope movement of weathered rock materials under the force of gravity)

Erosion

Erosion is the wearing away of the land surface by various agents such as running water, wind, ice and wave action and the transportation of all the rock materials that result.
All the above forces have over the years destroyed the land forms hence changing/modifying their original appearance.

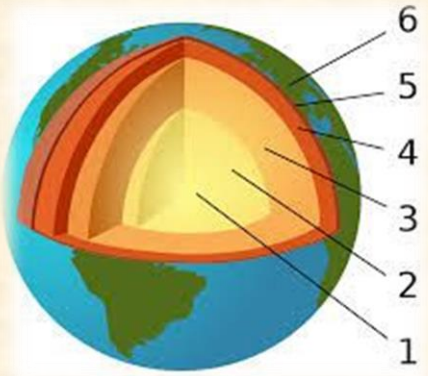
Activity 2.1

In Groups:

1. You are planning to carry out a field study on a volcanic landscape.
   a. State four reasons why it is necessary to conduct a reconnaissance of the area of study.
   b. Explain the differences and similarities between the forces of weathering and erosion that modify the original appearance of landscapes.

Activity 2.2

1. Define crustal Earth movement.
2. Draw the diagram below in your exercise book and label part 1-6.



3. Name the two types of Earth movements.
4. Outline four features formed due to Earth movements.
5. What causes Earth movements?
6. Define the term isostatic adjustment.
7. Name the two theories that explain the formation of continents.
8. Define folding and state how it occurs.
9. Draw and label the parts of a fold.
10. How are the asymmetrical folds formed?
11. Describe the theories that explain the origin of fold mountains?
12. Name four advantages of folding to human activities.
13. What is faulting?
14. Draw and label the parts of fault.
15. Name four types of faults.
16. Define volcanicity.
    i. Explain the causes volcanicity?
    ii. Name two types of volcanicity
    iii. What is a volcano?
    iv. Name the types of volcanoes.

UNIT 2: NATURAL AND MAN-MADE HAZARDS

Natural hazards

What do you understand by the term natural hazards?

Natural hazards are naturally occurring physical phenomena caused either by rapid or slow onset events. The events be geophysical (Earthquakes, landslides, tsunamis and volcanic activity), hydrological (avalanches and floods), climatological (extreme temperatures, drought and wildfires), meteorological (cyclones and storms/wave surges) or biological (disease epidemics and insect/animal plagues).

Natural hazards are also defined as disasters that occur due to natural forces.They are natural disasters, over which man has hardly any control. Some common natural disasters include, Earthquakes, landslides floods, droughts, cyclones, etc.

tsunamis, volcanic eruptions and wildfires. These disasters cause enormous loss to life and property.

Man-made disasters.

What are man-made disasters?

Man-made disasters are caused by human activities which bring about destruction and loss of life at local to global scales. Some common examples of disasters due to human error are terrain accidents, aeroplane crashes,collapse of buildings, bridges, mines and tunnels.

Progress check

Give examples of natural hazards and man-made disasters in South Sudan.

Natural Disasters

Some of the common natural disasters, their impact on the environment, and their prevention, control and mitigation are discussed below:

Earthquakes

Activity 2.0

1. What do you understand by the term an Earthquake?
2. Have you ever experienced an Earthquake? Where and when was it?
3. If you have ever experienced an Earthquake how strong was it?

An Earthquake is the shaking of the Earth's surface caused by rapid movement of the Earth's crust or outer layer.

Figure 2.1 buildings destroyed by an Earthquake in Italy.

Causes of Earthquakes

Some of the important causes of the Earthquake include:

Natural Causes of Earthquakes

i. **Tectonic Movement**: tectonic movements take place when the continental plate collides against the oceanic plate. The oceanic plate is overridden by the continental plate leading to occurrence of an Earthquake.

ii. **Volcanic Activity**: Earthquakes may also be caused by the movement of lava beneath the surface of the Earth during volcanic activity.
iii. **Dislocation of the Earth's crust:** Earthquakes may be caused by the dislocation of the crust beneath the surface of the Earth.
iv. **Landslides and avalanches**.
v. Faulting and folding in the rock beds are responsible for causing minor Earthquakes.

Man-made Earthquakes:

i. The impounding of large quantities of water behind dams disturbs the crustal balance. This causes Earthquakes such as the Koyna Earthquake in Maharashtra.
ii. The shock waves through rocks set up by the underground testing of Atom bombs or Hydrogen bombs may be severe,leading to occurrence of Earthquakes.

Effects of Earthquakes

Negative Effects

a. Earthquakes cause destruction of buildings, bridges and other structures found at or near the epicenter. Many human beings and animals are killed or buried under collapsed houses.
b. Rails are folded, underground wires get broken and fires break out.
   - ✓ Earthquakes causes sea waves called Tsunamis.
c. Earthquakes result in the formation of cracks and fissures on the ground.
d. Earthquakes cause landslides and disturb the isostatic equilibrium.
e. Landslide caused by Earthquake may block valleys to form lakes.

Positive Effects:

a. Sometimes the Earthquakes cause formation of hot springs which are useful to people for generating geothermal power.

b. The Earthquakes sometimes cause submergence in coastal land, and result in formation of inlets, bays and gulfs which help to develop of fishing and shipping industries.
c. Sometimes, the Earthquakes cause emergence of coasts and bring fertile soils out of water crop production.

Impact of Earthquake on the Environment.

Experiment on impact of Earthquake on the Environment

Practical Activity

In pairs

Requirements

- Model of houses or small blocks.
- Desk or a table.

Procedure

Place the house models on the desk, one on top of the other.

Shake the desk and observe what happens.

Answer the questions

a) Are the models still on the desk?
b) What did you discover upon shaking the desk?

The destruction an Earthquake causes, depends on its magnitude and duration or the amount of shaking that occurs.

Major impacts of Earthquakes are as follows:

Shaking of the ground and surface rupture:

This is the main cause of destruction in which buildings, bridges, roads, canals and other structures are damaged.

Liquefaction

Earthquakes make sands and silts to transform from a solid to liquid state. This also results in building collapse.

Landslides

Earthquakes of high intensity often trigger many landslides in the hilly regions.

Fires

It is a major hazard associated with Earthquakes. The shakings of the ground and building damage often break the gas pipes and electric lines that cause fires.

Tsunami.

Tsunami is a Japanese term meaning 'harbour waves'. Tsunamis are massive sea waves that mainly occur due to Earthquakes in the ocean floor, or possibly due to an undersea landslide or volcanic eruption. When the ocean floor is tilted or offset during an Earthquake, a set of waves is created similar to the concentric waves generated by an object dropped into the water.

Figure 2.2 a Tsunami in Japan

These waves are massive in size and gain height as they approach the seashore.

Prevention and Mitigation

Naturally occurring earthquakes cannot be prevented and are hard to predict. However some measures can be put in place to mitigate the impacts. These include:

a. Use of proper construction material that is not injurious even if the structures collapse.
b. Construction of quake resistant buildings having proper structural design.
c. Development of facilities to mitigate earthquakes.
   These include:
   - Establishment of Earthquake regulatory agencies for fast relief.
   - Establishment of specific health care units for treating Earthquake victims.
   - Proper land use planning.
   - Mapping of faults and weak zones in Earthquake prone areas.
   - Buildings such as schools, hospitals, offices, etc. should be in areas away from active faults.

Floods.

A flood is the overflow of water over large parts of land that is often dry but sometimes wet. Flooding occurs when a river's discharge exceeds its channel's volume causing the river to overflow onto the area surrounding the channel known as the floodplain.

Figure 2.3 a flooded area in South Sudan,2014.

The Impact of flood on the Environment.

Progress check

In groups discuss the Impacts of floods in south sudan.

Though the lives lost in floods may not be as high as in the case of Earthquakes or cyclones, the damage to the environment is immense.

The problem is further aggravated if the floods last for a longer duration of time. Floods not only damage property and endanger lives of humans and animals, but have other effects as well, such as:

i. Floods cause the spread of many epidemic diseases.
ii. Rapid runoff causes soil erosion.
iii. Wildlife habitat and forests are often destroyed.
iv. Man-made structures like buildings, bridges, roads, sewer lines, power lines, etc. are damaged.
v. Floods cause widespread damage to crops and degrade the agricultural land.
vi. Flood affected areas are faced with acute shortage of food and drinking water.

Prevention and Control

Though floods are a natural hazard,but there are measures that can be taken to control the extent of flood damage include land use planning, building of physical barriers, preventing human encroachment and use of technology for relief.

a. Land use planning:

Proper land use planning in flood prone areas includes:

i. Demarcation of the flood-prone areas that are first inundated during floods.

ii. Construction work and concentration of human population should be avoided in the floodplains.
iii. Afforestation on the upper parts of the river (catchment areas) to control soil erosion and excessive runoff.

b. Building of physical barriers

Flood can be prevented by building certain structures, such as:

i. Embankments along the banks of rivers in densely populated areas.
ii. Building of reservoirs to collect excess water during floods.
iii. The construction of channels that divert floodwater.

c. Preventing human encroachment

Human encroachment should be avoided in the following areas:

i. Floodplains and catchment areas.
ii. This would control deforestation and soil erosion which would prevent excessive runoff.

d. Use of technology for relief:

a) Advanced technology can be used in the following ways:

i. Advanced communication techniques for flood forecasting and warning.
ii. Fast evacuation of people.
iii. To provide relief in temporary shelters.
iv. Immediate supply of medicines, drinking water, food and clothes.
v. Epidemic diseases must be controlled through spraying, vaccination, etc.

Activity 2.1

1. Look at the picture below and identify what is happening.
2. Have you ever experienced the situation in the picture?

3. Your home area has flooded due to ongoing rainfall. **In groups**, discuss ways or measures you would use to control the flooding.
4. Share the ways or measures you have discussed with the rest of the class.

Drought.

1. What do you understand by the term drought?
2. Do you know any area in South Sudan that is affected by drought?

Drought is a condition of abnormally dry weather within a geographic region.

Figure 2.4 drought affected area in South Sudan.

It occurs when the rate of evaporation and transpiration exceeds precipitation for a considerable period.

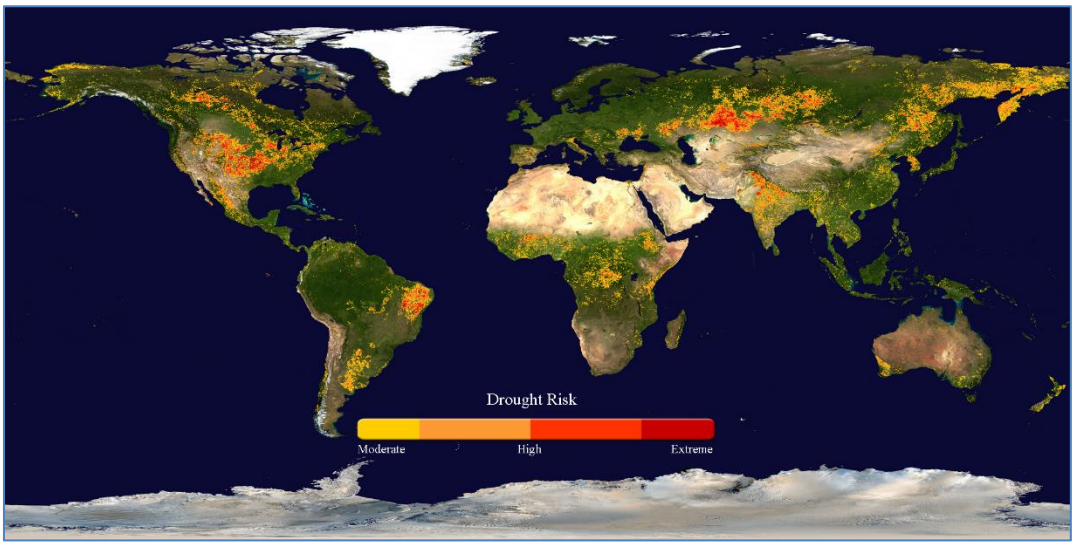


Figure 2.5 Global drought risk map

Drought should not be confused with dry climate, as in the Sahara or Thar Desert. It is marked by an unusual scarcity of water and food for humans as well as animals.

Progress check

Differentiate between drought and dry climate.

The Impact of drought on the Environment:

i. Water-supply reservoirs become empty, wells dry up and there is acute water shortage.
ii. Groundwater level is also depleted because of minimal recharge.
iii. Soil degradation and erosion occurs. Soil cracks because of shrinkage during desiccation.
iv. There is extensive crop damage.
v. People become impoverished and there are diseases due to malnutrition.
vi. Widespread damage to flora and fauna air including domestic animals.

Prevention, control and mitigation.

Certain precautions can be taken in drought prone areas, which relate to management of water resources, proper agricultural techniques and relief by different agencies.

Thes precautions that can be taken in drought prone areas include:

1. Conservation of water through rainwater harvesting, building check dams, bunds, etc.
2. Construction of reservoirs to hold emergency water supplies.
3. Proper agricultural techniques:
4. Avoid over-cropping and overgrazing.
5. Plant drought resistance crops.

Immediate relief to the drought-affected people should be provided in the form of:

- ❖ Employment generation programmes, like 'food for work' in the drought affected areas.
- ❖ To provide fodder for domestic animals.

Activity 2.2

1. In groups, discuss and identify areas affected by drought in South Sudan.
2. List ways in which drought can be prevented or controlled in South Sudan.

Cyclones

A cyclone is an area of low atmospheric pressure surrounded by a wind system blowing in anti-clockwise direction, formed in the northern hemisphere.

In common terms, acyclone can be described as a giant circular storm system. In a cyclone, the wind speed must be more than 119 km/hr.
Cyclones generated in the seas and oceans and move with a very high speed towards the land. Cyclones form when moisture evaporates from the warm oceans during the hot season. The air rises, condenses and gathers momentum as it moves over the ocean.

Figure 2.6 a cyclone satellite image.

Due to the extreme low pressure in the centre, more and more air rushes inwards and it grows to a considerable size and intensity.

The Impact of cyclone on the Environment

Cyclones are quite common in the Bay of Bengal and often cause much damage in Bangladesh and coastal areas of West Bengal, Orissa, Andhra Pradesh and Tamil Nadu. Bangladesh has been devastated by cyclones a number of times.

In November 1970, a severe cyclone caused a 6 m rise in sea-level and the consequent flooding killed approximately 300,000 people.
Another cyclone in 1971 killed more than 100,000 people.
The cyclone that hit Orissa in 1999, is the worst recorded natural disaster in India.
Cyclones cause devastation when they hit the landmass in the form of very strong winds, heavy rains and storm tides.

Environmental impacts from cyclones can be severe and include the following:

i The coastal low lying areas are most affected by flooding that causes lose of life and property.
ii The affected areas are inundated both with rainfall and the surge of seawater.
iii Devastation is also increased due to the accompanying high velocity winds.
iv Widespread damage in the form of uprooted trees, blown-off roof tops, standing crops, injuries and death to humans and animals.
v Many shipwrecks occur during cyclonic storms.
vi The affected areas are impoverished and are followed by spread of epidemic and diseases.

Prevention, Control and Mitigation

The occurrence of cyclones is a natural phenomenon, over which humans have no control, hence it cannot be prevented.

However, some scientists have speculated that the rise in global warming may cause an increased occurrence of cyclones.

The devastating effects of cyclones can only be controlled and mitigated through some effective policies such as use of advanced technology, hazard reduction initiatives and relief measures.

Use of Advanced Technology:

- ✓ Satellites can easily forecast the origin of cyclones in advance.
- ✓ Satellite images can track the movement and intensity of cyclones.
- ✓ Installation of early warning systems in the coastal areas.

Hazard reduction initiatives:

- ❖ Increasing public awareness regarding cyclones.
- ❖ Increasing the public response to cyclone warnings through training.
- ❖ Development of underground shelter belts in the cyclone prone areas.

Relief measures:

a Rushing relief to the affected areas in the form of medicines, food, clothes and other supplies.

b Checking the spread of epidemic water borne diseases as cyclones are generally accompanied by flooding.

Landslides

Landslides refer to a rapid down-slope movement of rocks or soil mass under the force of gravity.

Landslides may be reffered to as mudflow where there is down-slope movement of soil and debris flow, which is the down-slope movement of coarse material and rocks.

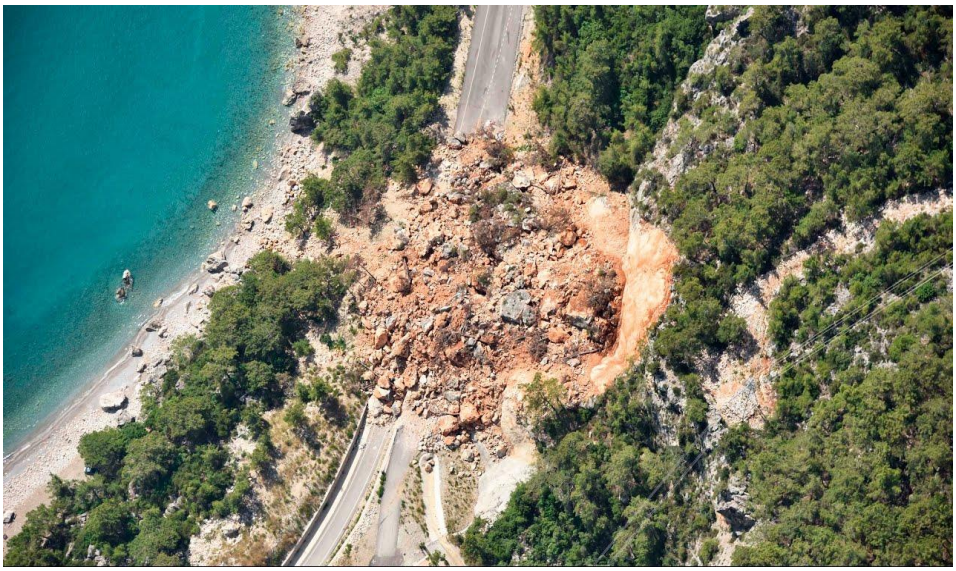


Figure 2.7 a landslide on a hill slope.

Landslides may occur when water from rain and melting snow seeps through the Earth on a slopy surface and encounters a layer of loose, unstable material such as clay.

Landslides mostly occur on unstable hillsides by the action of rain or snow that seep through the soils and rocks.

This results in the sliding of Earth and rock masses down the hill slopes.

These are further triggered due to deforestation and human encroachment on unstable slopes. All the hilly regions of our country are prone to landslides.

The factors responsible for landslide occurrence are as follows:

i. Stability of slopes
ii. The type of Earth and rock material on the slopes.
iii. The type of vegetation growing on the slopes.
iv. The role of ground water conditions and precipitation
v. Presence of streams, etc.

Avalanche.

An avalanche is a type of landslide involving a large mass of snow, ice and rock debris that slides and falls rapidly down a mountainside.

Figure 2.8 an Avalanche.

Avalanches are initiated when a mass of snow and ice begins to rapidly move downhill because of the overload caused by the large volume of new snowfall.

This results in internal changes of the snow pack, producing zones of weakness along which fissure occur.

Impact of landslides on the Environment

The impact on the environment is manifested in the form of:

1. Uprooted trees and degraded soil.
2. Buried buildings and settlements.
3. Damage to crops and plantations.
4. Frequent roadblocks in the hilly areas.
5. Injuries and death to humans and animals.

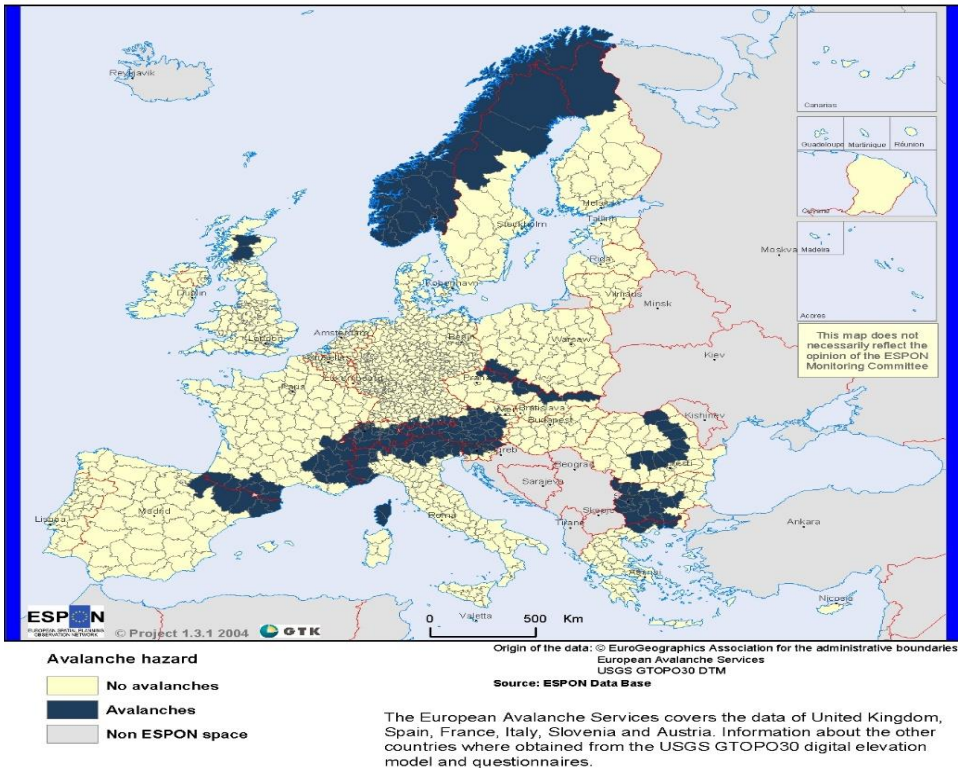


Figure 2.9 an Avalanche affect area map.

Prevention, Control and Mitigation

Though landslides are a natural phenomenon, and may occur without human interference, in certain cases human activities like deforestation, mining can also induce landslides.

Landslides can be controlled, to some extent, by adopting initiatives, such as providing slope support and minimizing human encroachment.

Providing slope support

- By building retaining walls made of concrete, gabions (stone filled wire blocks) and wooden and steel beams.
- By providing drainage control measures so that water may not infiltrate into the slope.

Minimizing human encroachment

i. Mining activities should be monitored in the hilly, unstable regions.
ii. Plantation of trees should be undertaken on the unstable hilly slopes.
iii. By preventing human encroachment in the form of buildings, roads, agriculture, grazing, etc. on unstable slopes.

Activity 2.3

1. What do you understand by the term cyclone?
2. Have you ever heard of a cyclone affected country? Explain how cyclones affected the country.
3. Name three hazard precautions for control and prevention of cyclones.
4. What do you understand by the term landslide?
5. What are the important factors responsible for landslide occurrence?
6. State four effects manifested by landslides on the environment.
7. In groups discuss ways of preventing and controlling droughts.

Man-Made Disasters

Man-made disasters are the result of carelessness or human errors during technological and industrial activities. The disasters are in the form of accidents, which occur suddenly and take a huge toll on life and property. Such disasters cause injuries, diseases and casualties where they occur.

Man-made disasters are mainly of two types:

1. **Local disasters.**

These are small-scale disasters such as train accidents, plane crashes and shipwrecks.

2. **Industrial and technological disasters.**

These are much larger in scale and are the result of technology failures or industrial accidents.

Figure 2.10 A factory emitting harmful gases to the environment

Such disasters affect both local population and may even cover a much larger area. Industrial disasters are as a result of accidental leakage of water or air pollutants. Many of the chemicals are extremely toxic and carcinogenic which greatly affect human poplation.

Some people die instantly while others are affected and crippled through blindness,paralysis and host of chronic diseases.

Impact on the environment

Leakage of toxic chemicals from the industries and accidents in the nuclear reactors has short-term and long-term effects on the environment and human health.

Short-term effects on human health include casualties and diseases like blindness, cancer, paralysis, heart trouble, gastric and respiratory abnormalities.

Long-term effects include genetic imbalances in humans and its impact on the future generations. Soil and water sources also remain polluted for long durations of time.

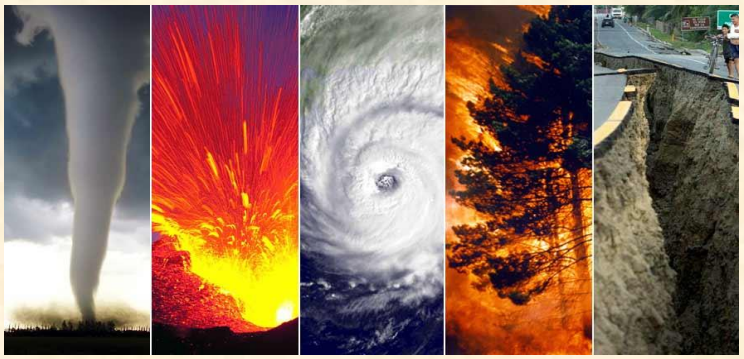
Natural hazards and climate management

Man-made disasters can be minimised to a large extent by adopting the following measures:

i. Proper training of personnel working in the hazardous industries.
ii. Proper maintenance and care of safety equipment.
iii. Making the people aware about the first-aid methods in case of accidents.
iv. Applying wet cloth over the mouth and nose in case of gas leakages minimises the health hazards.
v. Remaining indoors in case of radioactive accidents.
vi. Providing people with proper medical care, in some cases throughout their life.

Activity 2.4

1. How do you differentiate Natural hazards from Man-made disasters?



2. In groups, discuss impact of Man-made disasters to the environment.
3. State ways in which man-made disasters can be minimised.

Activity 2.5

1. Define natural hazards.
2. What causes man-made disasters?
3. Define Four Causes of Earthquakes.

In groups

4. Discuss three major Impacts of Earthquakes
5. State five ways in which a Tsunami can be prevented.
6. What do you understand by the term flood?
7. State five effects of flood to the environment.
8. Discuss four Impacts of drought to the environment.
9. What is a cyclone?
10. What is a landslide?
11. Outline five factors responsible for landslide occurrence.
12. State four impacts of Avalanches on the environment.

UNIT 3: PHYSICAL FEATURES OF SOUTH SUDAN

Physical features

A physical feature is a natural landform ocurring on the surface of the Earth. Physical features include: Bodies of water and landforms, for example, oceans, mountains, lakes, rivers, plateaus, plains, streams, hills, bays, gulfs, volcanoes, canyons, valleys and peninsulas are all various physical features. Anything that describes the Earth's topography is a physical feature.

Plains and plateaus

Plains

What is a plain?

Plains are large and continuous stretches of comparatively flat land, not rising much above the sea level.

Fig 3.1 plains in Tanzania,East Africa.

Many extensive plains are a result of down warping of the Earth. Examples include;Northern upper Nile and Pibor, Siberia in Asia, North European plains, Indo-getic plain and the Great central plains of North America.

Plateaus

Plateaus are extensive high altitude areas with more or less uniform summit levels. They are formed when forces within the Earth uplift a plain region. Major Plateau regions include the Boma Plateau in South Sudan the central plateau of Africa, the Brazilian Highlands and the Arabian Plateau. The main plateaus of South Sudan are; Boma Plateau, Lomareng Plateau and Ironstone Plateau.

a The Boma Plateau

This is a region in the eastern part yof South Sudan, located in the Jonglei and Eastern Equatoria provinces.

Figure 3.2 Boma plateau in South Sudan.

The Anyuak, Murle and Toposa people live here. The area is important wetlands for the birdlife in the region. The Boma Plateau is also one of the few places in the world where wild coffee Arabica grows.

b The Ironstone Plateau.

This is a region in the south and west of South Sudan. The Ironstone Plateau takes its name from the hard red lateritic soil called ironstone that covers almost the entire area.These soils are often thin and may be unsuitable for agriculture, except in the Green Belt in the extreme southwest of Western Equatoria and around Okire and Odire mountain ranges in Magwi county, Eastern Equatoria state.

c Lomareng Plateau

Lomareng Plateau is a plateau within South Sudan and is southwest of Moru urun, Eyata Moru and Apaiyaputh. Lomareng Plateau has an elevation of 444 meters.

Activity 3.0

i. What do you understand by the term physical feature?
ii. Name and explain any four physical features of South Sudan.

Mountains

A mountain is a large and elevated part of the Earth's surface rising to greater height of 1000-2500m (3300-8200 ft) above sea level than ordinary hills. There are three major types of mountains depending on how they are, these are:

- Fold mountains
- Block mountains
- Volcanic mountains

Fold Mountains

Formation of fold mountains

Fold mountains are mountains that form mainly by the effects of folding on layers within the upper part of the Earth's crust. Folding once occurs where rocks are laid in layers, Fold Mountains usually consist of high ranges that extend for hundreds of kilometers across the continent.

Thus Fold Mountains form the most extensive ranges in the world. For example, the Rocky Mountains in North America stretch to more than 4,800kilometres in length and vary in width from 110 to 480 kilometres. These types of mountains have some the highest peaks of the world:

Mountain Everest in Himalaya range is 8,848 meters and Aconcagua, the highest peak in the Andes, is 6,959 metres above sea level.

Figure 3.3 Mount Kidd, a fold mountain in the Canadian Rockies.

Other fold mountains include the Imatong mountains in South Sudan, the Alps in Europe, the Atlas in North Africa, the Cap Rangers in South Africa, the Appalachians in U.S.A and the Great Divide Range in Australia.

Block Mountains

Formation of Block mountains

Block Mountains are formed when a movement in the Earth's crust forces the rocks to break.

As a result, enormous cracks or faults are formed when sets of faults run parallel to each other and the ground between is forced up, a block mountain (horst) is formed.

Examples of block mountains are the USambara, Uruguru and Ruwenzori mountains in East Africa, the Vosges and Black forest mountains in Europe and mount Sinai in Asia.

Other features associated with faulting and Block Mountains are rift valleys or grabens. Rift valleys are formed when the land is between two sets of faults sink down.

The Great East African Rift valley is the longest in the world. It stretches from the Baka's valley east of the Lebanon Mountains, through the Red sea, Ethiopia, East Africa to the lower Zambezi Area.

A branch of the valley runs along Lake Tanganyika in Tanzania to Lake Albert in Uganda. Another less extensive rift valley is the middle Rhine Rift valley between the Vosges and black forest mountains.

The walls of a rift valley form fault lines or escarpments. Trenches formed by rift valley are sometimes filled with water to form Lakes like Lake Nyasa, Lake Albert, Lake Eyas, and Lake Turkana all of which are in East Africa and the Dead Sea in Jordan.

Volcanic Mountains.

What is a volcanic Mountain?

A volcanic mountain is a mountain formed from volcanic material ejected from a vent in a central crater.Volcanic mountains are formed from the pouring up and cooling of hot molten lava and ashes that are thrown out from the Earth's interior after a volcanic eruption.

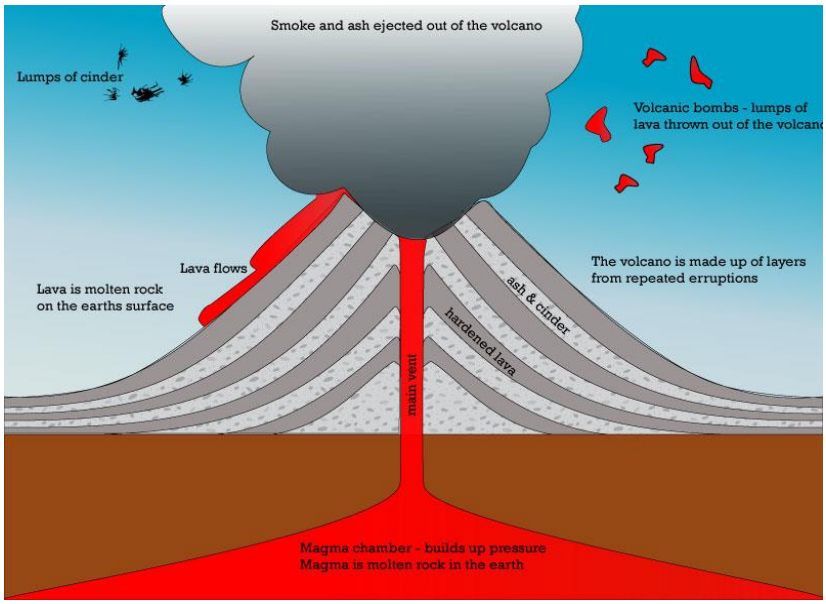


Figure 3.4 a volcanic mountain.

Types Of Volcanic Mountains

- Active volcanic mountain.
- Dormant volcanic mountain.
- Extinct (dead) volcanic mountain.

Volcanic Mountains are usually conical in shape and mostly contain craters at their peak, for example, Mt Kilimanjaro in Tanzania. Sometimes craters are filled with water to form Crater Lake.

Figure 3.5 Mt Kilimanjaro in Tanzania with a crater. lake.

Residual Mountains

Formation of residual mountains

Residual mountains are mountains formed from already existing mountains which are lowered or reduced by agents of denudation such as Running water, ice and wind. Residual mountains are therefore the remains of already existing mountains.

The Imatong mountains (also Immatong, or rarely Matonge) are mainly located in Imatong state in south eastern South Sudan, and extend into the Eastern Region of Uganda.

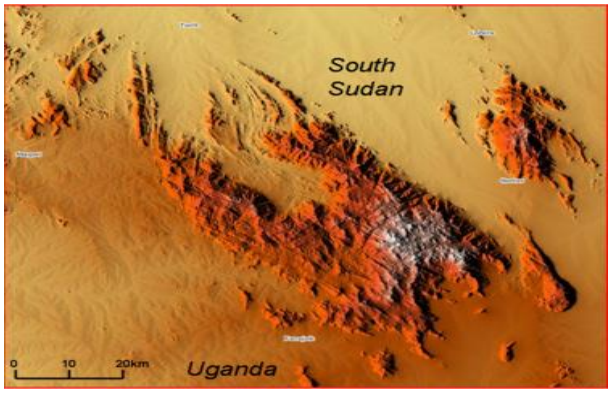


Figure 3.6 relief map of the Imatong Mountain Range at the borderof South Sudan and Uganda.

Mount Kinyeti is the highest mountain of the range at 3,187 metres (10,456 ft.), and the highest point of South Sudan.

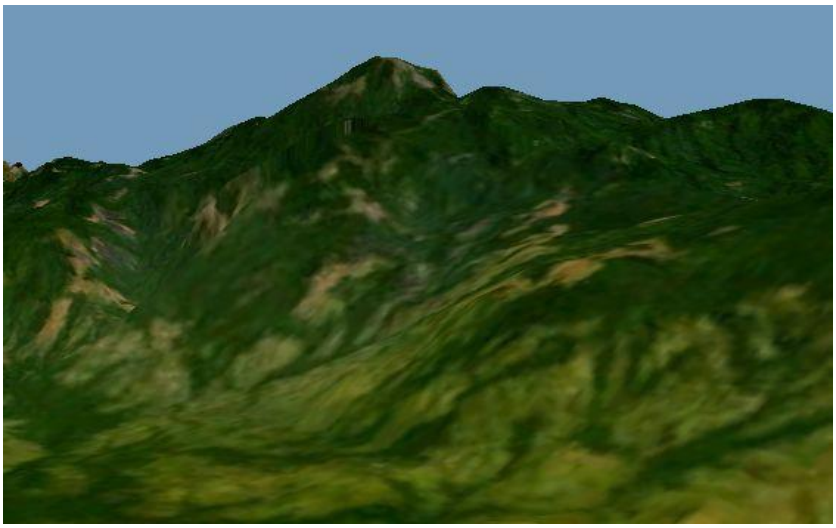


Figure 3.7 Mount Kinyeti in South Sudan

The range experience equatorial climate and had dense montane forests supporting diverse wildlife. Since the mid-20th century, the rich ecology has increasingly been severely degraded by native forest clearance and subsistence farming, causing extensive erosion of the slopes.

Progress check

Differentiate between Volcanic mountains, Residual Mountains and Block Mountains.
Research on the above mentioned types of Mountains in South Sudan.

Basins

A basin is a form of natural or artificial depression (hollow) varying in size in the Earth's surface, wholly or partly surrounded by higher land.

Formation of Basins

Basins are formed through several ways just like many of the other landforms of the world.

The water erosion causes some of the land to sink,while leaving other parts higher than the basin this creates bluffs. Basins usually take thousands of years to form. The basins of South Sudan include:

a) **The Muglad Basin-** it is a large rift basin in Northern Africa. The basin is located within southern Sudan and Northwest of South Sudan, and it covers an area of approximately 120,000 km^2 across the two nations.
b) **The Melut Basin** is a rift basin in South Sudan. It is situated in the states of Upper Nile and Jonglei, south of the capital of Sudan Khartoum and east of the river Nile.

   The basin contains several hydrocarbon accumulations, although oil exploration, as with elsewhere in Sudan, has been hindered by conflict.

Water bodies

Water bodies includes the following:

Rivers

A river is a natural flowing watercourse, usually freshwater, flowing towards an ocean, sea, lake or another river.

Formation of rivers

When rain falls or snow melts, water flows in small channels which finally join to form large streams or rivers.The natural outflow of water maybe from different sources like lakes, springs, melted ice moving towards the mouth, which can be an ocean,lake or sea.

Types of Rivers

Rivers are mainly categorized into two:

i. Permanent Rivers
ii. Seasonal Rivers

Permanent Rivers in South Sudan

The White Nile

The White Nile is one of the main tributaries of the River Nile. It winds through the vast swamp of The Sudd. It eventually makes its way to Lake No, where it meets with Bahr el Ghazal. The name comes from the clay colouring of the water. It continues northwards into Sudan where it ends at its confluence with the Blue Nile.

Figure 3.8 The White Nile in South Sudan.

Aswa River

Aswa river originates from Uganda in eastern Africa flows through the northern central part of the country, draining much of Uganda's northern plateau and northeastern highlands, before crossing the border into South Sudan where it joins the White Nile.

Figure 3.9 River Aswa in South Sudan

River Kinyeti

The Kinyeti River flows northward from the Imatong Mountains in the Imatong State state of South Sudan, eventually dispersing into the Badigeru swamp.

Yei River

Yei River originates from Morobo area,Southwest of Yei Town and flows through Moruland pouring its water into the Sudd.

Atepi River

Atepi river originates from Kineyite hills near Lobone in Eastern Equatoria and flows through Palwar,Pajok and Owinykibul before joining Aswa River at Aswa village, about 600m east of Aswa bridge on Juba Nimule Highway.

Unyama River

Unyama River originates from Northen Uganda and enters into South Sudan through the boarder town of Nimule,Eastern Equatoria and joins the Nile River at the Western part of Nimule.

Seasonal Rivers in South Sudan

Luri River

This originates from Lainya hills in centralEquatoria and flows Northeastwards before joining the Nile River.

Ibba River

Ibba river originates from Democratic Republic of Congo (DRC) boarder and flows Northwards into South Sudan East of Yambio town,towards Tonj and enters Jue/Sue in western Bahrel Ghazal.

Ayii River

This originates from Lotii Mountain Ranges (Greenland Lotii) in Obbo,Eastern Equatoria and flows through Obbo, Magwi,Panyikwara and Owing ki bul before joining the Nile River.

Kimoru River

Kimoru River originates from Imurok hills near Torit, Eastern Equatoria and flows through Magwi where it joins Ayii River.

Singata River

Singata River originates from Didinga hills in Eastern Equatoria and flows through Kapoeta into the Western plain.

Lakes

What is a lake?

A lake is a hollow in the Earth's surface in which water collects.

Formation of lakes

Lakes are formed when some surface runoff or running water accumulates into a depression or hollow on the Earths surface forming a lake. Example in South Sudan include: Lake No and Lake Ambadi.

Types of Lakes

Lakes are classified into two categories

i. Opened lakes: An open lake is a lake where water constantly flows out under almost all climatic circumstances. Because water does not remain in an open lake for any length of time, open lakes are always fresh water.
ii. Closed lakes :a closed lake is a lake where no water flows out, and water which is not evaporated will remain in a closed lake indefinitely. This means that closed lakes are always saline.

Lakes in South Sudan

i Lake No

Lake No is a lake in South Sudan. It is located just north of the vast swamp of the Sudd, at the confluence of the Bahr al Jabal and Bahr el Ghazal rivers.
It marks the transition between the Bahr al Jabal and White Nile proper.

ii Lake Ambadi

This is a lake located in Bahr el Ghazal in South Sudan with a natural conservation area covering 1,500 square kilometers. It forms one of the world's largest wetlands, and is home to large numbers of the rare Balceniceps Rex.

Activity 3.1

1. Define
    a. Physical feature.
    b. Plain
    c. Plateaus
2. What are the main plateaus in South Sudan?
3. Which are the three major types of Mountains.
4. Name two Types of Volcanic mountains.
5. What is a basin?
6. Discuss the Formation of a basin.
7. Which two types of basins are found in South Sudan.
8. Rivers are grouped into two categories,state the two categories.
9. State two permanent rivers in South Sudan.
10. Define:
    a. Opened lake.
    b. Closed lake.

UNIT 4: POPULATION AND SETTLEMENT

Population

what is population?

Population is the total number of people living in an area at a particular period of time. Population can be classified according sex and age.

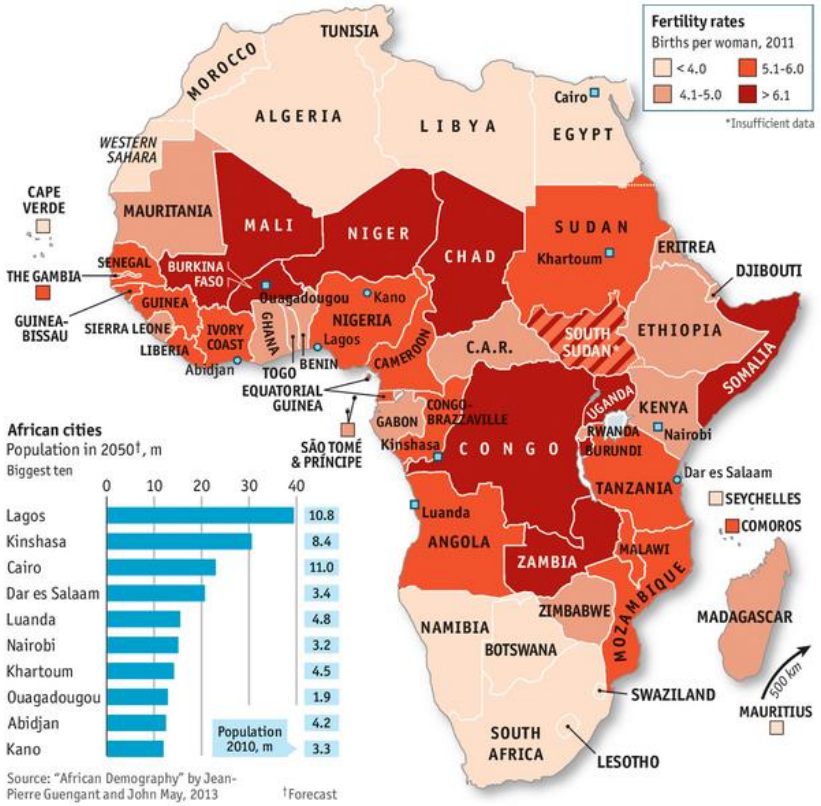


Figure 4.1 population map in Africa

The geographical area refers to a location where a particular pattern of population (settlement) is found.

Settlement pattern refers to the distribution of population in an area.

Activity 4.0

In groups

1. How many people live in your local area? Is it a town or a village?
2. Are there areas near you where no one lives? What is the reason?
4. In which part of South Sudan do you think most people live?

Human population

Human population is the group of people occupying a certain geographical unit. Demography is the scientific study of human population.

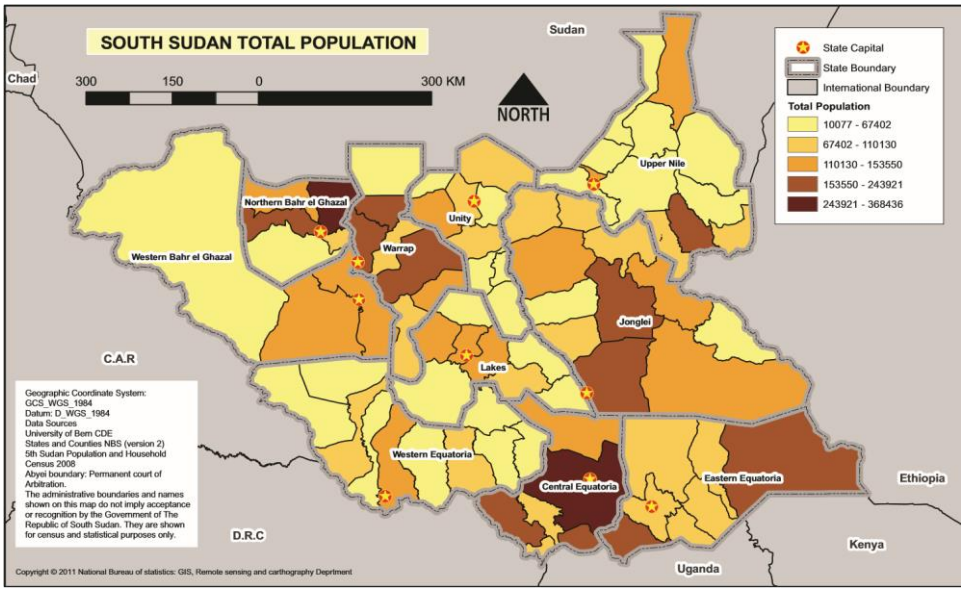


Fig 4.2 a map South Sudan total population.

Activity 4.1

In pairs look at the map above write your answers and share.

1. What do you think the map above is all about?
2. What does it show about the population pattern?
3. What facts would you select on the map to explain this?
4. Why do some areas have very few people?
5. Can you find on the map the area where you live?

Settlement

A settlement is a permanent or temporary community in which people live, without being specific as to size,population or importance. Settlement is a place where people live and interact through activities such as agriculture, trading and entertainment.

Types of settlement

Do you live in a village or a town?

There are two major types of settlements namely:

1 Urban settlement
2 Rural settlement

Urban settlement

An Urban settlement is a concentrated settlement that constitutes or is part of an urban area. It is an area with high density of human-created structures. Some people live in very small settlements with a small population,while others live in large cities. Some of the biggest cities in the world, like Shang Hai in China or Karachi in Pakistan has many people as the whole of South Sudan.

Figure 4.3 the city of shang Hai China.

Rural settlement

A rural settlement is a community involved predominantly primary activities such as farming, lumbering and mining. Some people in South Sudan live in very small and scattered communities. The picture below shows people living in the Sudd. This is a huge marsh area in the north of South Sudan. Do you see how the people have built their houses on islands in the marshes?

Figure 4.4 settlement in Marsh area to the north of South Sudan.

In South Sudan, it is more common for people to live in villages like the one below.

Fig 4.5 a village in South Sudan.

In some cases houses are built close together like the first picture, and sometimes are more spread like the second picture.

What do you think is the reason for the type of settlement shown?

Some people live in the mountains or on edges of hills.

A village out in the open countryside and by the river.

Many people live in big towns such as Juba.

Figure 4.6 different types of settlement in South Sudan

Settlement Patterns

A settlement pattern refers to the way that buildings and houses are distributed in a rural settlement,which include the following:

1 Nucleated
2 Dispersed
3 Linear

Nucleated

In a nucleated settlement pattern, the buildings are grouped around a central core.

Dispersed

In a dispersed settlement pattern, the buildings are scattered over a wide area. Dispersed settlement patterns are often associated with agricultural activity and are frequently surrounded by farmland.

Linear

In a linear settlement pattern, the buildings are arranged in lines. These lines often follow the route of a road or body of water.

Activity 4.2

Work in pairs and write the answers for the following questions.

1. Where do you live?
2. What type of settlement do you live in?
3. Which type of settlement is most common in South Sudan?
4. Why are the houses in some villages spread out and houses in other villages close together?

Population distribution

Population distribution is the way in which people are spread out across the surface of the Earth.Population distribution is mostly uneven and it changes over a period of time.

Population Density

Population density is the number of people per unit area. This describes the concentration of people in a specific area.

Figure 4.7 a densely populated village in South Sudan.

There are places where people are concentrated in one area while the land in the neighbourhood may be unoccupied. Population density can be described as dense, moderate, or sparse.

Activity 4.3

Which are the areas in South Sudan with the most dense and sparse population? And give the reasons for your anwers.

South Sudan is one of the least densely populated countries in Africa. It has a population of 11.74 million people in an area of 619,745 square km. That is a density of 19 people per every square kilometre. Rwanda is the most densely populated country in Africa with 440 people per square kilometre.

Factors Influencing Population Distribution

What are factors influence population distribution?

People have certain basic needs for life. Without these, they cannot live. People need water to drink and food to eat. They need shelter from the weather. They need safety from attacks. They need access to the materials required to make things like: houses, tools, implements and weapons. Thus people prefer to live somewhere where these things are available, there are several factors that influence population distribution and these include:

Climate

Climate refers to atmospheric condition of an area recorded over a period of time usually 30-35 years.The climaet of an area can be explained using elements of weather like rainfall and tempareture.

Rainfall

Areas like the northern part of South Sudan receive very low rainfall. It is difficult to grow crops for food or to find grazing lands for cattle, therefore few people live here.

Areas where there is enough rainfall, such as Western Equatoria, have high populations because people can cultivate to produce their own food for survival. The population here is therefore more dense.

Where rainfall is seasonal, grazing lands become too dry, so cattle have to be taken elsewhere to find grazing. People who move like this each year with their livestock are refered to as **nomadic pastoralists.**

Temperature

Human beings prefer moderate temperatures for settlement. The northern and south eastern areas of South Sudan are extremely hot and so are sparsely populated.

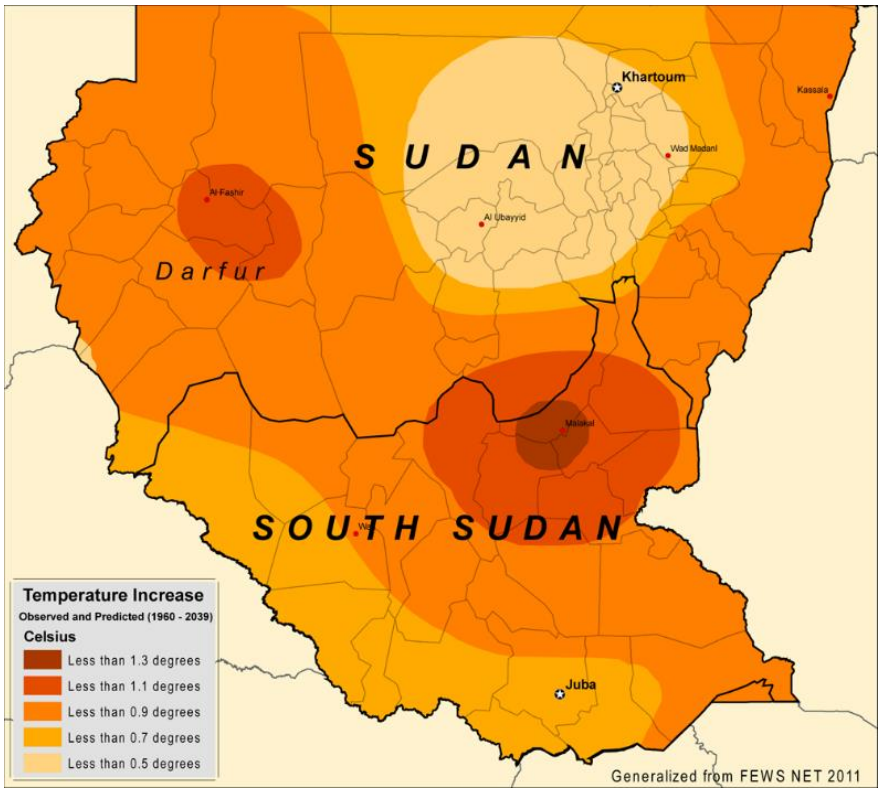


Figure 4.8 Temperature variations in South Sudan

Relief

Relief refers to the general appearance of the land. Steep or rocky, mountainous areas are very hard to settle in. It is hard to build houses in such places and almost impossible to grow crops.

Therefore they are sparsely populated. However, people often settle near the base of mountains because there are often springs water, and fertile soils.

Figure 4.9 Jebel Kujur Mountain, Juba, South Sudan

The flat tops of hills found in the southern eastern part of the country are good places to settle in because the land is flat and the temperatures are cooler.

Settlement patterns are influenced by the supply of water, and this is not always available on top of hills.

Relatively flat land where there is adequate water that attracts the highest population. This is the most densely populated area.

Access to Water

This is a key factor in population distribution. People tend to live near springs or along rivers. However, if the river is liable to flooding, then it becomes a eterrent, and flood plains will be sparsely populated.

Activity 4.4

Work in pairs

1. State any three factors affecting population?
2. Which of these factors apply in the area where you live?
3. Explain factors that has contributed to settlement patterns in your area.
4. Identify any other settlement patterns in South Sudan and erxplain factors that have favoured their existence.

Underlying Factors

The factors mentioned, that is relief, climate and access to water, are all evident factors because they are easily seen. There are other factors that are not easy to spot that is they are less evident.

Edaphic factors/ Soil types

Edaphic factors are abiotic aspects relating to the physical or chemical composition of the soil found in a particular area. For example, very alkaline soil may be an edaphic factor limiting the variety of plants growing in a region.

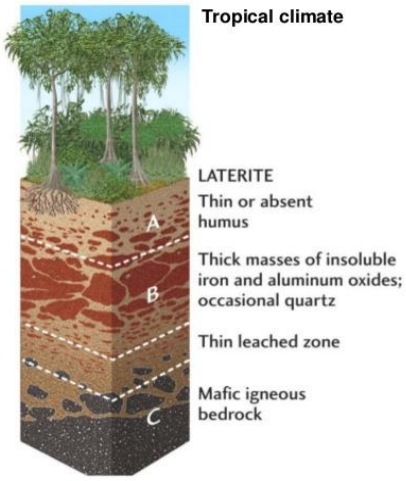


Figure 4.9 type of soil found in tropical climate .

Fig 4.9 shows what the rocks look like under the ground. Areas such as Western Equatoria have underlying rock strata that produce very fertile soils, and so favour the growing of varieties of crops.The population here is therefore more dense.

Figure 4.10 fertile soil.

The rocks underlying areas such as the south eastern part of South Sudan do not produce fertile soils. It is hard to grow crops, so the area is sparsely populated. The fertility of soil is affected by the minerals it contains.

Figure 4.11 a mining site in china .

More edaphic factors

- The underlying rocks do not only determine the type of soil found in an area. They often contain important minerals that we need. These minerals include Iron, Copper, Diamonds, Gold and silver.
- Where these minerals are found beneath the ground, people come to dig them up, which attracts settlement.
- In the northern parts of South Sudan, there is oil beneath the ground, and many oil wells have been dug to extract the oil. As a result, there are many settlements have sprung in the area.

Biotic Factors

Biotic factors relate to living things, which range from large wild animals to small insects and even microscopic organisms.

Examples of Biotic factors

i. **Competition for food is an example of a biotic factor in an ecosystem.**
A red squirrel and a grey squirrel living in the same habitat will compete for the same food source.

ii. **Predator-prey relationships are examples of biotic factors**.
When the moose population is high on Isle Royale, the wolves have more food source from preying on the moose. This supports an increase in the wolf population.

iii. **Parasitism is a biotic factor that can affect populations**.
Parasitism is when an organism lives off of a host organism and causes that host harm.
The Ascaris roundworm is a parasite that lives in pigs. It relies on the pigs digestive tract for food and reproduction but causes the pig illness.

iv. **Disease is a biotic factor that can affect populations.**
The influenza outbreak of 1918 caused between 20 and 40 million human deaths, more people died of this than World War I.

v. **Herbivory is a biotic factor that can affect plant populations**. Certain insects can devastate entire plant populations affecting the food supply for other organisms.

Activity 4.5

Work in pairs

1. Define edaphic factors.
2. Discuss two ways in which underlying rocks affect settlement patterns.
3. Which areas of South Sudan have the most fertile soils?
4. Explain the difference between edaphic and biotic factors.

Migration

Migration is the movement of people from one place or region to another which results in change of residence. This change may be temporary or permanent. Immigration is the movement of people into a particular region.

The people who come into a new area are reffered to as immigrants. Emigration is the movement of people out of their native land to go to other places.The people who move from a particular place to go elsewhere are reffered to as emigrants.

Types of Migration

Internal Migration

Internal migration is the movement of people within a country, it can be permanent, temporary, voluntary or forced.

External Migration

External migration is also called international, interstate or inter regional migration. Is the movement of people from their own countries to other countries.

Reasons/Causes of Migration

Activity 4.6

Work in pairs

State, explain, identify and outline the reasons why people migrate.

People migrate for the following reasons:

i. **Pressure on land.** People move to areas with available land for cultivation, settlement etc.

ii. **Availability of employment opportunities**. Move to areas where employment is possible e.g rural to rural, to work in plantations and mines.

iii. **Religious conflicts**. May result to chaos in a country thus trigger migration.

iv. **Political instability.** These civil wars cause people to migrate for example,as experienced in Rwanda, South Sudan and Burundi has resulted to influx of refugees in East African countries.

v. **Natural disasters like Epidemic diseases, floods, Earthquakes and drought**. These may cause people to migrate to other areas where it is safer.

Activity 4.7

1. Define population.
2. What do you understand by the term human population?
3. Define Settlement.
4. State two major types of settlements.
5. Define the following types settlement pattern.
    a. Nucleated
    b. Dispersed
    c. Linear
6. What is population distribution?
7. What is population density?
8. Discuss factors influencing Population Distribution.
9. Outline four biotic factors.
10. What is migration?
11. State and explain two types of migration
12. Discuss five reasons for migration.

UNIT 5: NATURAL RESOURCES OF SOUTH SUDAN

Natural resources

What is a natural resource?

Natural resources are materials or substances occurring in nature which can be exploited for economic gain.

Activity 5.0

In pairs, discuss

Types of natural resources you have at home?

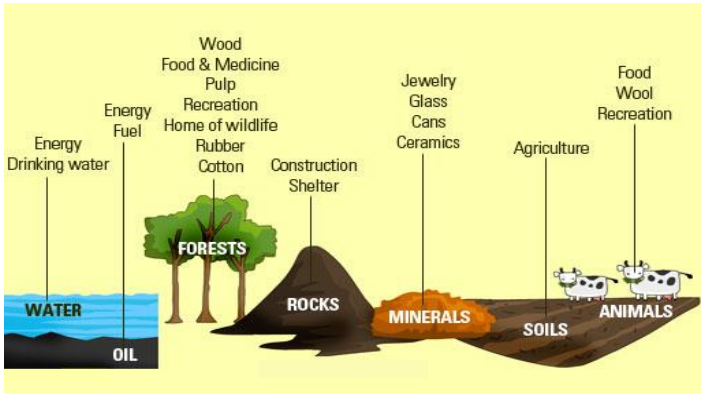


Figure 5.1 natural resources.

Types of Natural Resources

Many natural resources can be categorised as either renewable or non-renewable:

Activity 5.1

In pairs

1. What are renewable resources?
2. List and discuss renewable resources in South Sudan.
3. What are non-renewable resources
4. List and discuss non-renewable resources in South Sudan.

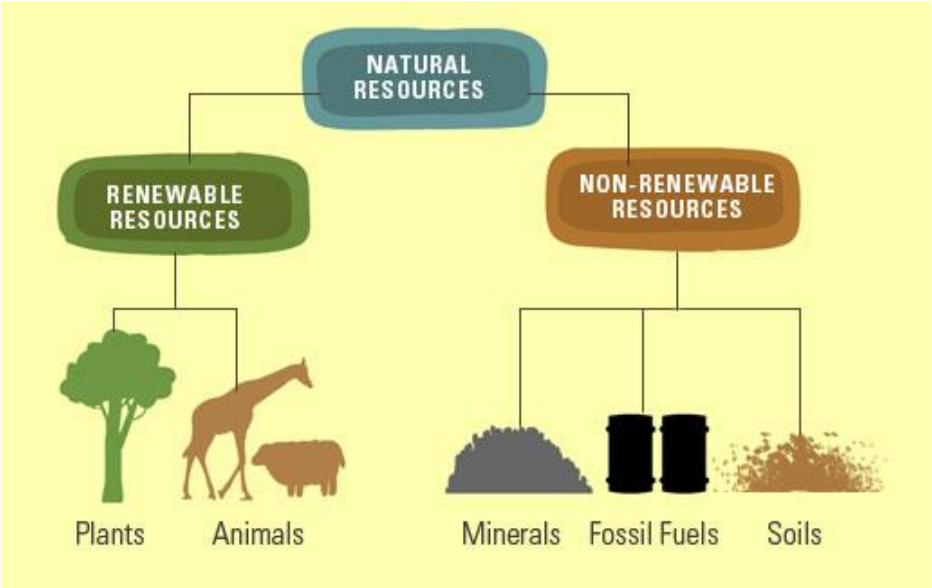


Figure 5.2 types of natural resources.

Renewable resources

Renewable resources can be replenished naturally. Some of these resources, like sunlight, air, wind and water are continuously available and their quantity is not noticeably affected by human consumption.

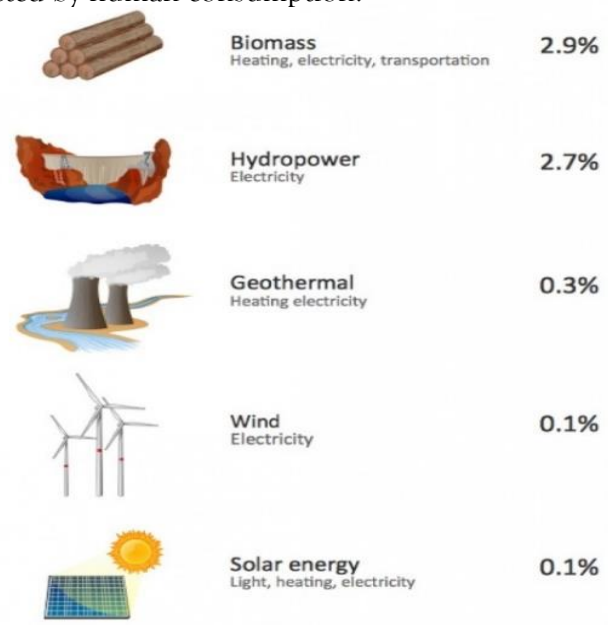


Fig 5.3 renewable resources.

Non-renewable resources

Non-renewable resources either form slowly or do not naturally form in the environment. Minerals are the most common resource included in this category.

Resources are non-renewable when their rate of consumption exceeds the natural rate of replenishment/recovery. A good example of these are fossil fuels. They are in this category because their rate of formation is extremely slow (potentially millions of years), meaning they are considered non-renewable.

Some resources naturally get depleted without human interference. The most notable of these are radio-active elements such as uranium, which decay into heavy metals.

Figure 5.4 non-renewable resources.

Of these, the metallic minerals can be re-used by recycling them, but coal and petroleum cannot be recycled. Once they are completely used up they take millions of years to replenish.

South Sudan is blessed with vast natural resources which include the following:

1. Oil

Oil resources are found in Bentiu area while potential reserves have been identified in Jonglei, Warrap, and Lakes. Block 5A is one of the country's oil concessions.

Figure 5.5 oil mining in South Sudan.

After oil production began during the Second Sudanese Civil War, extensive fighting took place into oil producing area.

Other oilfields include Adar, Fula,Paloich and Unity. The Greater Nile Oil Pipeline begins in the Unity oilfield and extends to the Port Sudan crude oil refinery on the Red Sea.

Production and impacts

In 2011, petroleum extraction accounted for 98% of the country's exports and contributed to 60.2% of Gross Domestic Product however in 2012 production declined drastically to about 14%.

Other minerals produced consisted of gold and quarry materials for construction such as brick clay snd sand.
In the late 1970s, a mineral exploration programme into metallic, radioactive, and industrial minerals took place throughout an area of 25,000 square kilometres in the eastern equatoria region of Juba.
Oil and gas concessions, and pipeline, in Sudan and South Sudan

After oil, the Mining Sector has the potential to become an engine for economic as it has plenty of mineral deposits including gold, copper, iron, manganese, uranium, zinc, marble/dolomite and gemstones among others.

2. Gold

Gold occurs in several areas including Kawokono in Kapoeta district.

Figure 5.6 gold mining in South Sudan.

Other potential areas include Morukanboloing, Nyangea, Anakanak, Karomi, Lopua, Nazarich, Lauro, Nathalani, Buno, Naputo and Luri.

3. Copper

The only known copper ore occurrence is at Hofrat en Nahas near the border with S. Darfur. Four cooper occurrences have been reported in different locations in the Kapoeta district.

4. Zinc and lead

Zinc and lead usually occur together in massive sulphide deposits, which have been identified in the Juba-Yei-Tori zone, with the highest zinc concentration detected around Juba. Lead concentrations are spread further south and also between Torit and Wau.

5. Aluminium

South Sudan has three areas of anomalous aluminium values of above 4.5% around Juba (coinciding with areas of nepheline syenite); Raga-Wau-Rumbek zone and west of Yambio up to the border with DRC.
In the latter two areas, the anomalies coincide with thick lateritic cover. In the Luri basin south west of Juba, aluminium values average 3.5% in the stream sediments and 5.5% in soil samples. Given the large area of anomaly, the deposits of aluminium are potentially huge.

6 Manganese

There are 2 distinct manganese anomalies: the major one is at the Juba Nimule-Yei-Amadi area at concentrations of over 35,000 ppm; the smaller one is around Wau (1,500-3,500 ppm).

7 Kaolin and other clays

Montmorillonitic clay that is, heavy, dark, sticky soil is widespread in many plains and valleys of Southern Sudan.
It is used locally for making mud walls with limited use in brick production in some urban areas.
The brick kilns in Juba are highly productive. Brick and tile production merit greater attention across the country, including for supplying the North.

National parks

What is a national park?

Activity 5.2

1. Have you ever visited a national park?
2. Name several national park in South Sudan.

The following are the national Parks of South Sudan.

1. Bandingilo National Park
2. Boma National Park
3. Nimule National Park
4. Southern National Park

Figure 5.7 Bandingilo National park.

Figure 5.8 Boma National park.

Figure 5.9 Nimule National park.

Figure 5.10 Southern National park.

Water

Abundance of fresh water in the Blue Nile and White Nile, as well as other lakes play a major role in the country.

Natural vegetation

a) Montane Forests

These are found on the mountains (Imatong, Dongotona, Greenland Lotii, Didinga and JebelGumbiri) to the southeast in Eastern Equatoria state. The montane forests of South Sudan are part of the Eastern Afro-montane ecosystem.

b) Woodland Savannah

Woodland savannah makes up the largest ecological region in South Sudan, it is divided into two regions, namely, the low rainfall woodland savannah, which is mainly found in Upper Nile State and the high rainfall savannah woodlands.

Figure 5.11 woodland savannah.

Low rainfall savannah covers about 2.9% of thetotal land area of the country while the high rainfall savannah occupies 52.6%.

c) The Sudd Wetland

The Sudd wetland, with an estimated area of approximately 57,000 km^2 represents one of the largest freshwater ecosystems in the world.

The extent of the Sudd wetlands is highly variable; it depends largely on the seasons and years respectively.

In the wet season ,the size of the wetland increases up to 90,000 km^2 and gradually decreases to about 42,000 km^2,depending on high seasonal flood.

Figure 5.12 the Sudd wetlands in South Sudan.

It is sustained by the flow of the White Nile (or Bahr el Jebel) from Lake Victoria in Uganda, in addition to rainfall runoff from its surrounding areas.

Natural resources and Management development

Natural resources are important for development because once utilized, they contribute to economic growth of the area. Countries that have utilised their natural resources well have a developed infrastructure and economy.

What do you understand by managing natural resources?

Activity 5.3

In pairs
Take a look at the natural resources in South Sudan.
Discuss and list ways in which you think the available natural resources can be managed.

Land when utilized well for agricultural activities, for instance, crop growing and livestock keeping ensures food security.
Egypy for example, has utilised its land resource to ensure food security for her population.
Egypt exports some of her crops to the neighbouring countries. South Sudan has not been able to utilise her land resource fully due to land tenure issues.

South Sudan's surface water sources include perennial rivers, lakes and wetland areas, as well as seasonal pools and ponds. These are important to the economy of the country in that they support agriculture, energy, construction, as well as wildlife and tourism.

Creation of employment – availability of resources leads to establishment of industries such as mining industries where people get employed to run machineries, and to carry out other activities in manufacturing. This leads to improved living standards of the people and hence economic development.

Activity 5.4

1. What do you understand by the term natural resources?
2. Name two types of natural resources.
3. State four examples of Renewable resources.
4. Write down Four examples of Non-renewable resources.
5. What is a national park.
6. Name four national parks in South Sudan.
7. Name three types of natural vegetation

UNIT6: UTILIZATION OF NATURAL RESOURCES

Natural Resources

A resource is defined as anything obtained from the environment to meet human needs. The resources that are created by nature are called natural resources. These resources are the gift of nature. Natural resources include air, water, land, forest, wildlife and mineral.

Types of Natural Resources.

There are two main types of Natural resources namely:

i. Renewable Resources.
ii. Non-Renewable resources.

Activity 6.0

1. What is natural resource?
2. How do you utilise Natural resources?

Types of Resource Energy in South Sudan.

- Petroleum
- Large hydro development.
- The sun
- Wind
- Biomass
- Geo-thermal power

Nature and distribution of natural resources.

Natural resources are not evenly distributed all over the world. Some places are more endowed than others — for instance, some regions have a lot of water (and access to ocean and seas).

Some have a lot of minerals and forestlands. Others have metallic rocks, wildlife, fossil fuels and so on.

Many countries have developed their economies by using their natural resources. Some also get a lot of income from their resources tourism and recreation. South Sudan for example, make a lot of money from the mining of oil.

Sustainable development

What is sustainable development?

Sustainable development involves the use of resources to meet human needs while preserving the environment, so that those needs can not only be met in the present but also in the future.
It involves preserving the environment from humans, animals and plants in the various ecosystems by restoring damaged ecosystems and reducing pollution.

The desired result is a state of society where living conditions and resource use continue to meet human needs without undermining the integrity and stability of the natural systems.

Natural resource utilisation

Resource utilisation refers to the process of making the most of the resources available to you, in order to achieve the objective that you have.

Ways of utilizing natural resources

Activity 6.1

In pairs discuss.

1) How do you utilize natural resources?
2) Ways of utilizing Natural resources in South Sudan.

Use of alternative sources of power such as solar and wind energy.

These alternative sources of energy are bio friendly, particularly because they do not produce greenhouse gases that contribute to global warming.

Figure 6.1 solar and wind energy power.

They are better compared to burning fossil fuels such as coal and charcoal.

They are also cheap to use, are not easily depleted and are renewable.

Practicing of reasonable ways to conserve water in our homes.

This entails simple practices like ensuring that taps are closed when they are not in use.

Reusing some of the water for watering the kitchen gardens in our homes, is also an important practice.

Treatment of industrial wastes and sewage before they are released in the water bodies

Rapid industrialization has resulted to wastes that are harmful to the ecosystem.

The release of these effluents directly into the water bodies has led to massive water pollution to some areas in the world especially, in developing countries. Therefore, industrial and human waste should be treated to prevent thermal and chemical pollution of water.

Ensure the recycling of wastes.

These wastes include plastics and paper bags that have resulted to tones of garbage. Recycling entails re-manufacturing of already used materials. This reduces the amount of waste available, which in return reduces soil and water pollution.

Translocation of wild animals

The growing population has led to human encroachment on the wildlife habitat. This has resulted to human-animal conflict where the wildlife are killed by humans as a way of protecting themselves from them. Translocation involves moving wild animals to adjacent areas and fencing the area to curb the conflict.

Task: In groups, discuss the strategies that could help people and wildlife co-exist harmoniously.

Measures to be taken for natural resource sustainability

Water Supply

Adequate water supplies o f high quality are necessary both for community use and local ecosystems.

Communities and jurisdictions must work together to assure an adequate water supply to meet future needs. This section presents resources to aid in that effort.

Adequate Energy

Communities require energy. Non-renewable sources of power at home and at the workplace, and transportation cause pollution, which in turn has harmful effects. Non-renewable sources of energy aslso contribute to enhanced global warming. Energy conservation and the use of renewable fuels provide cost-effective and more sustainable alternatives. This section contains resources available to make energy use more efficient.

Air and Climate

Both the natural ecosystem and human health can be adversely impacted by declining air quality and climatic change. Communities can preserve air quality by limiting or eliminating the discharge of harmful chemicals into the air and by minimising the sources of air pollution.

Land, Forests, and Ecosystems

While providing a protective covering for soil, water, and the atmosphere, forests are also renewable sources of an endless variety of products. In a healthy ecosystem, policies and programs must balance economic and conservation needs.

Activity 6.2

In pairs discuss.

The measures to be taken in order to sustain the natural resources.

Natural resource utilisation in South Sudan compared to other countries

Poor utilisation of resources, underdevelopment, and lack of democracy plunged South Sudan into senseless war that has bearing consequences on the lives of all South Sudanese people.

The scarcity of resources and inefficient resource utilisation coupled with bad practices in managing the state affairs has had negative consequences on South

Sudans economy. Some challenges of resources utilisation in South Sudan are highlighted below:

Governance

- **Weak institutions**: institutions at all levels remain weak, under-staffed and under-resourced, resulting in an inability to provide basic social services this makes the country more prone to corruption, a culture that can ruin the unique values of all South Sudanese people
- **Law and order remain weak:** there has been a prevalence of violence with generation of small arms and light weapons, tincreases the impact of disputes.

- Due to weak maintenance of law and orders, the police in uniform become the main actors in maiming and killing people, in the capital Juba. The government remains muted without eliminating out such practices.
- **Political unrest**: this affect employment, food distributions and the standard of living which, in turn, affect utilisation of resources. Politics has become the main means of earning in South Sudan and this has derailed the culture of academics professionalisms.

Humanitarian aspect

- **Loss of life and assets**: the conflict in the country has taken tremendous toll on people's lives, causing mortality rate to increase steadily. The offences committed during the war, which are still on going including destruction of property, have profoundly impacted on South Sudans economy and have perpetuate the poor use of resources.

- **Population displacement**: approximately 3 million people have been internally and externally displaced from South Sudan, this has had negative consequences on fertility, and has increased the crude death rate for children below age 5 and elderly people above age 65. This pattern has affected productivity across all age groups.

UNIT 7: MAP READING

Map

A map is a scaled representation of the Earth or a part of the Earth on a flat surface. For example, on a piece of paper, wall, clothes and a piece of wood. A map is a respresentation or a model of reality and as suich, along with the it chooses to display, offers a particular way of viewing the world.

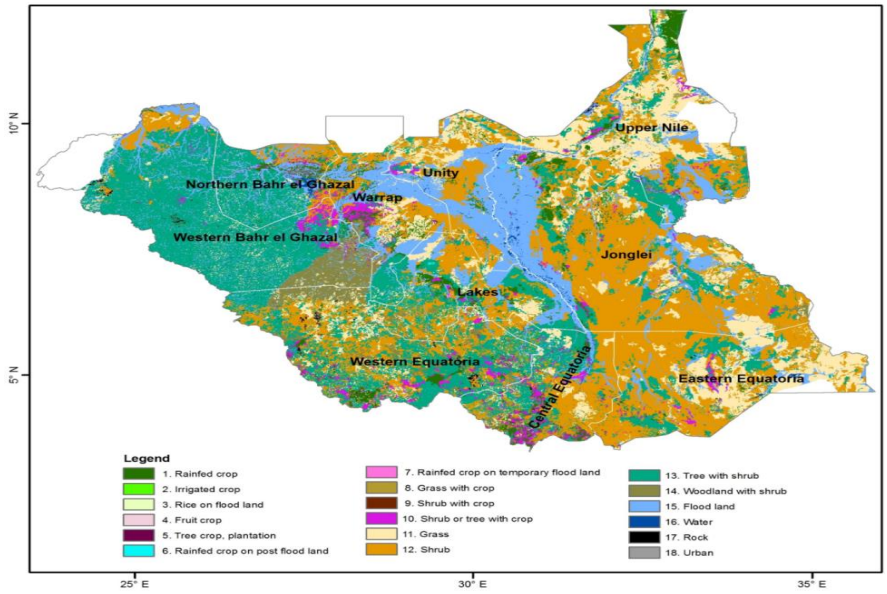


Figure 7.1 a Map of South Sudan.

Activity 7.0

In pairs

Look at the map above.

1. What features do you see in the map?
2. Can you identify the shrub with crops area?
3. What other details do you see in the map?

What is map Reading?

Map Reading

Map reading is the process of examining the details on a given topographical map, using conventional symbols and signs. Map interpretation is the process of examining a given topography for the purpose of identifying the geographical information presented.

Types of maps

The classification of maps is based on the purpose for which each map is drawn. Therefore maps can be categorised into three main types as follows:

i. Sketch map
ii. Atlas map
iii. Topographical maps

Sketch maps

A sketch map is one that is drawn from observation (rather than from exact measurements). It represents the main features of an area.

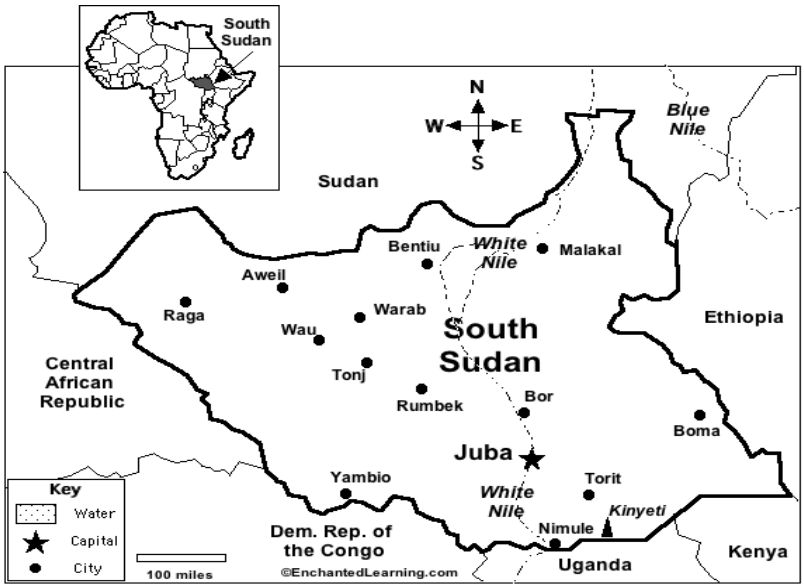


Figure 7.2 a South Sudan sketch map.

Atlas map

This is a collection of different maps that have been bound together in one volume to form a book. These maps are usually drawn to scale and they show a variety of details such as town and cities, hills, mountains, valleys, forests and countries.

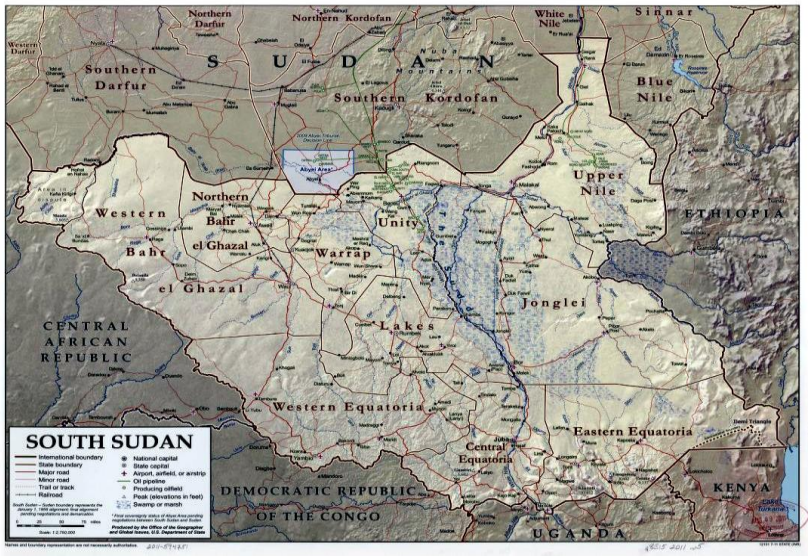


Figure 7.2 an example of an atlas map.

Topographical maps

Topographical maps show selected physical and human features in an area and their positions on the ground for example hills, village, mountains, lakes, ponds and rivers.

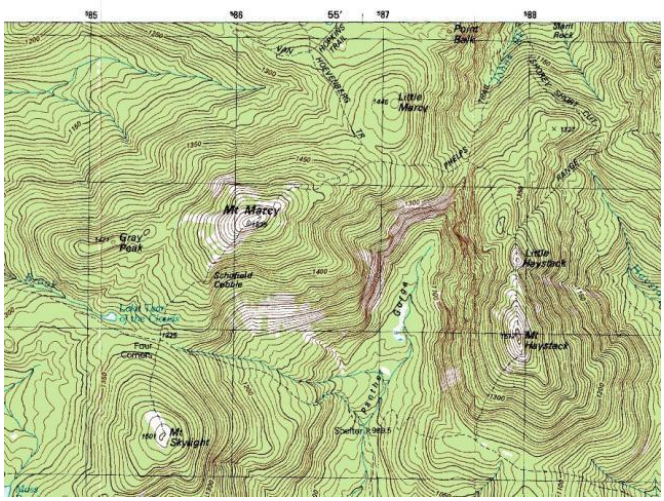


Figure 7.3 topographical map.

Components/elements of a good map

A good map contains all the essential elements of maps. These essentials elements are good qualities of maps.

Activity 7.1

In pairs

Look at the maps in this unit so far and identify the essential elements of a map.

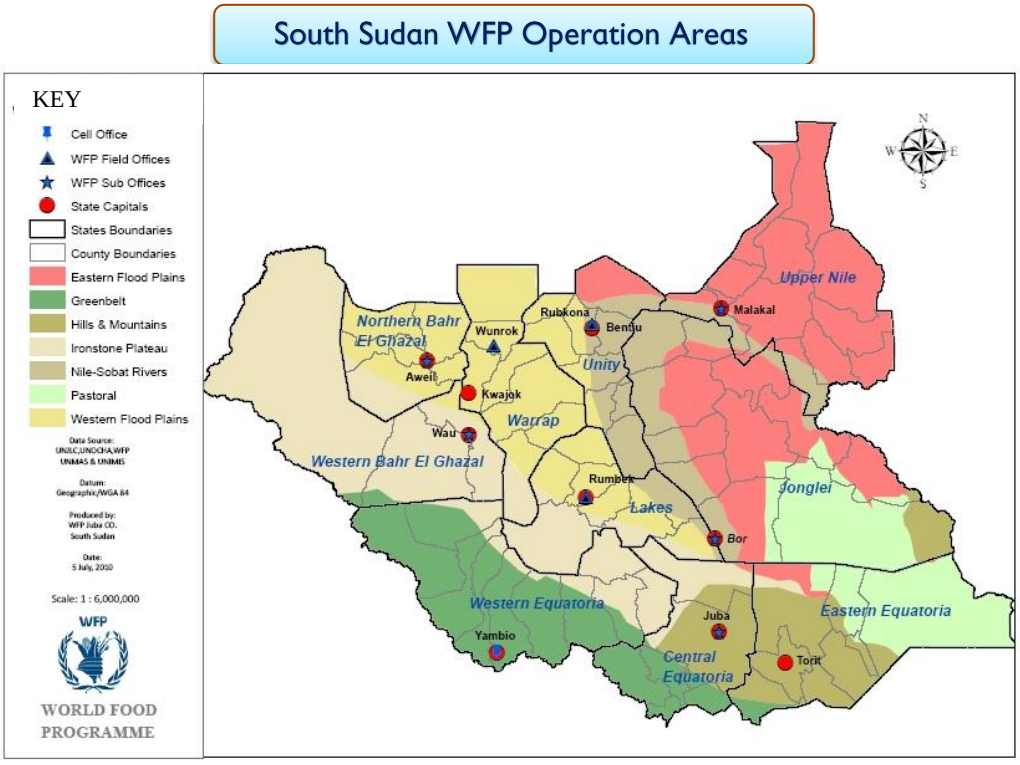


Figure 7.5 a map to illustrate the key elements of a good map.

Key/Legend

The key contains the symbols and signs found on a map. It appears in a box on the side of the bottom corner of the map.

Title

The title tella what the map is all about. It is the heading of the map. It mostly appears on top of the map.

North direction

This is an indication of the north direction. It shows where the north is thus one can know the direction and bearing of the place repreented by the map.

Margin

This is the boundary or limit around the map. It gives or shows the reader the extent of the map.

Publisher and date of publication

This shows when the map was produced as well as the publisher.

A scale

The scale shows the relationship between map distance and the actual ground distance. For example 1cm to 10km means one centimeter on the map represents ten kilometers on the ground. Map scale is the relationship or ratio between map distance and actual ground distance. Scale = Map distance Ground (actual) distance.

Ways used to express map scales

Different types of maps require different types of scales and this is determined by the size of the map.Maps can be drawn using the following:

a Large scale.

This scale is used to present information on small areas, for example a map of a village with buildings and farms. The map size involves numbers less than 1:25 000 I.e. 1:10 000 and 1:5 000 Characteristics of large scale.

- It has smaller numbers in the denominator.
- It allows the map to show features clearly.
- It allows the map to show many geographical details.

b Medium scale

medium scale used to represent medium details shown on the map. i.e. 1:50,000 and 1:100,000. Example of a map that can be drawn using medium scale is a map of a district, region, city etc.

c Small scale

They are used to present information that is long. This type of scale covers a big area with less detail. For example a map of a country, continent or world. May involve numbers between 1 : 500,000 to 1 : 1000,000

Characteristics of small scale.

- It has the largest denominator.
- Contains a lot of geographical information.
- It does not show geographical features clearly.

Types of scales.

Statement scale.

The statement scale is expressed in words or an explanation. For example, one centimeter on a map is equivalent to ten centimeters on the ground.

Linear scale

Linear scale is called plain or graphic scale. This is a line which is divided into two parts. The primary division and secondary division.

The secondary division is expressed in meters and placed on the left side from zero. The primary division is expressed in kilometers and placed on the right side from zero.

Importance of scale on the map

1. Scale help to calculate area of a map.
2. It enable us to calculate distance on a map.
3. Scale shows the relationship between map distance and the actual ground distance d) Scale help us to enlarge and reduce the area on a map or the whole map.

4. Scale can be used to calculate the vertical exaggeration on a Map.
5. Scale is used to calculate the gradient on a map.

Activity 7.2

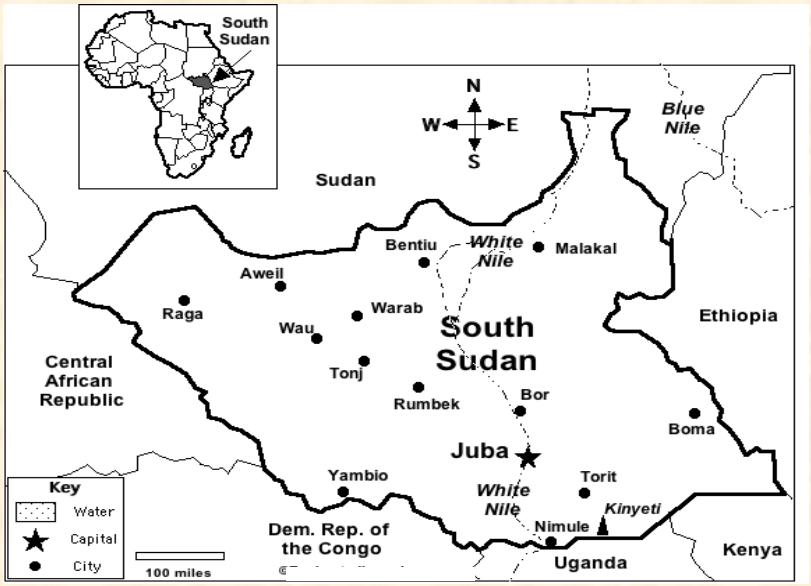
Individually

1 Define
   a) Map.
   b) Map reading.
   c) Scale.
   d) Contour.
   e) Why do we study maps?
   f) State the ways of expressing scale.

2 What is the importance of a scale?

Activity 7.3

1. What is a map?
2. What do you understand by the term map reading?
3. Name three types of maps.
4. Define topographical maps.



5. Look at the map above.
   a. What type of a map is it?
   b. From the above map which elements of a map can you identify.
6. State the elements of a good maps and their uses.
7. Maps are expressed in three ways, namely?
8. Discuss two types of scales.
9. State five examples of a scale on the map

UNIT 8: RIVER NILE

Understanding the flow of River Nile

The Nile is the longest river in the world. It rises south of the Equator and flows northward through northeastern Africa to drain into the Mediterranean Sea. It has a length of about 6,650 kilometers and drains an area estimated at 3,349,000 square kilometers. Its basin includes parts of Tanzania, Burundi, Rwanda, the Democratic Republic of the Congo, Kenya, Uganda, South Sudan, Ethiopia, Sudan and the cultivated port of Egypt. Its most distant source is the Kagera River in Burundi.

Figure 8.1 The Fula Falls at Nimule along the White Nile.

The most distant source of the Nile is the Ruvyironza River, which flows into Lake Victoria through the Ruvubu and Kagera rivers. Other rivers converging into Lake Victoria (the largest of the Equatorial Lakes) include; the Simiyu-Duma, Grumati-Rwana, Mara, Gucha-Migori, Sondu, Yala, Nzoia, Sio, Katonga and Ruizi.

From Jinja in Uganda, the White Nile emerges from Lake Victoria as the Victoria Nile and travels northwards, passing through two other Equatorial Lakes; Kyoga and Albert. Through these two Lakes, the Nile captures runoff from two mountainous and high-rainfall areas (Mts Rwenzori and Elgon) on the southwestern and southeastern peripheries of the basin.

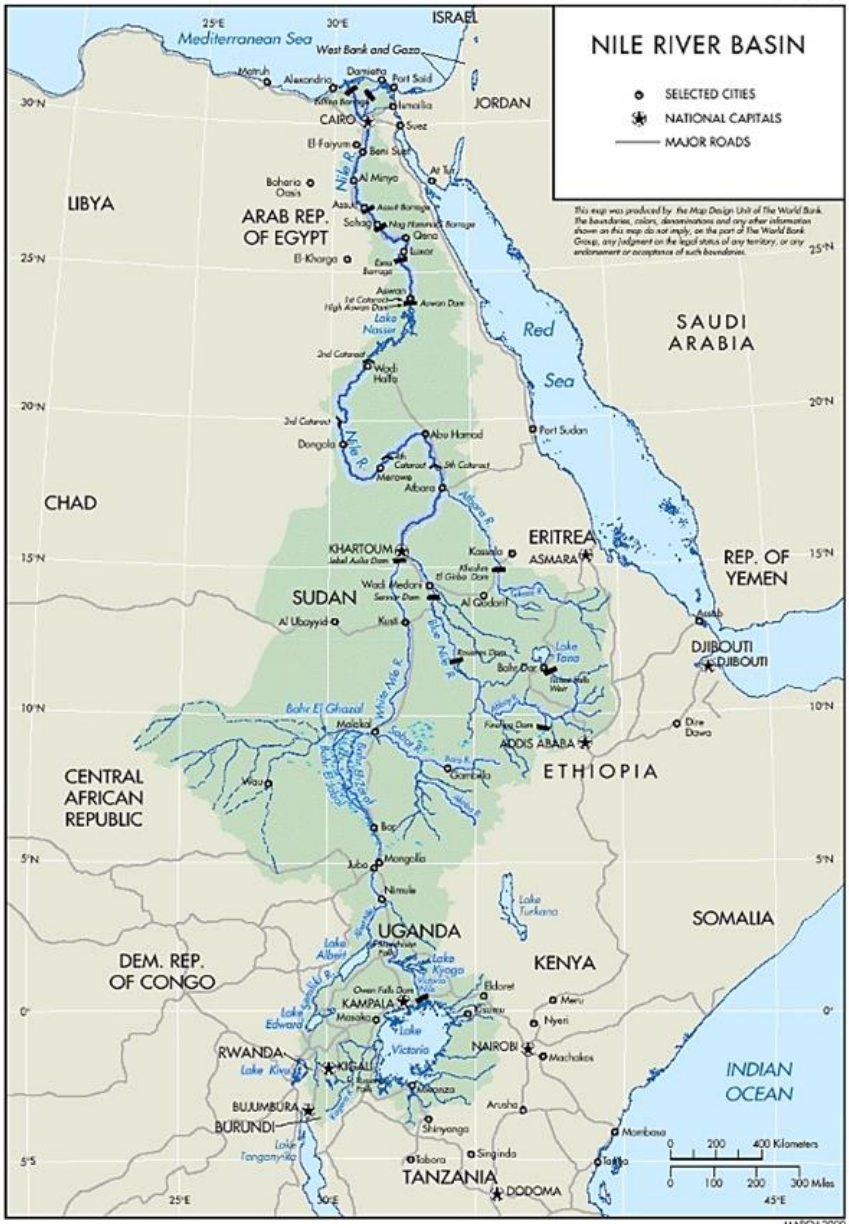


Figure 8.2 the Source to the mouth of River Nile.

The river re-emerges from Lake Albert as the Albert Nile and journeys northwards to Nimule near the South Sudan-Uganda border.

The White Nile runs from south to north across the entire length of the east-central part of the South Sudan and all streams and rivers of South Sudan drain toward the Nile. The White Nile enters the country from the south through Fula rapids at Nimule on the Uganda border. After the White Nile confluence with the left- (west-) bank tributary known as the Bahr Al-Ghazal (meaning river of the gazelles) at Lake No at the heart of the country where is a clay plain, the centre of which is occupied by an enormous swampy region known as Al-Sudd (the Sudd Region), the river turns eastwards to join with the Sobat River, which carries high, seasonally variable, flows originating in the Ethiopian Highlands near Malakal town.

Figure 8.3 the white and blue nile.

The White Nile continues its northward descent and meets with the Blue Nile at Khartoum, in Sudan. The Blue Nile (also known as the Abbai or Abay) originates in Lake Tana in Ethiopia, and is the second principal stream of the Nile. Before meeting the White Nile, the Blue Nile is joined by a number of rivers, the main ones being the Rahad and Dinder, both originating in the Ethiopian Highlands. From Khartoum, the combined rivers of the Nile flow northwards, and are joined by the Atbara (Tekezze), also originating in the Ethiopian Highlands. The Main Nile continues travelling northwards and flows into Lake Nasser/Nubia, a major man-made reservoir on the border between The Sudan and Egypt that provides inter-annual regulation for Egypt. The Nile eventually discharges into the Mediterranean Sea via its delta.

Activity 8.0

In groups

Measuring the length of the River Nile

Requirement

- A map showing the River Nile from the source, Lake Victoria to the Mediterranean Sea.
- 20 cm thread
- 30 cm ruler

Procedure

i. Align the piece of the thread on the river in the map from the source to the end.

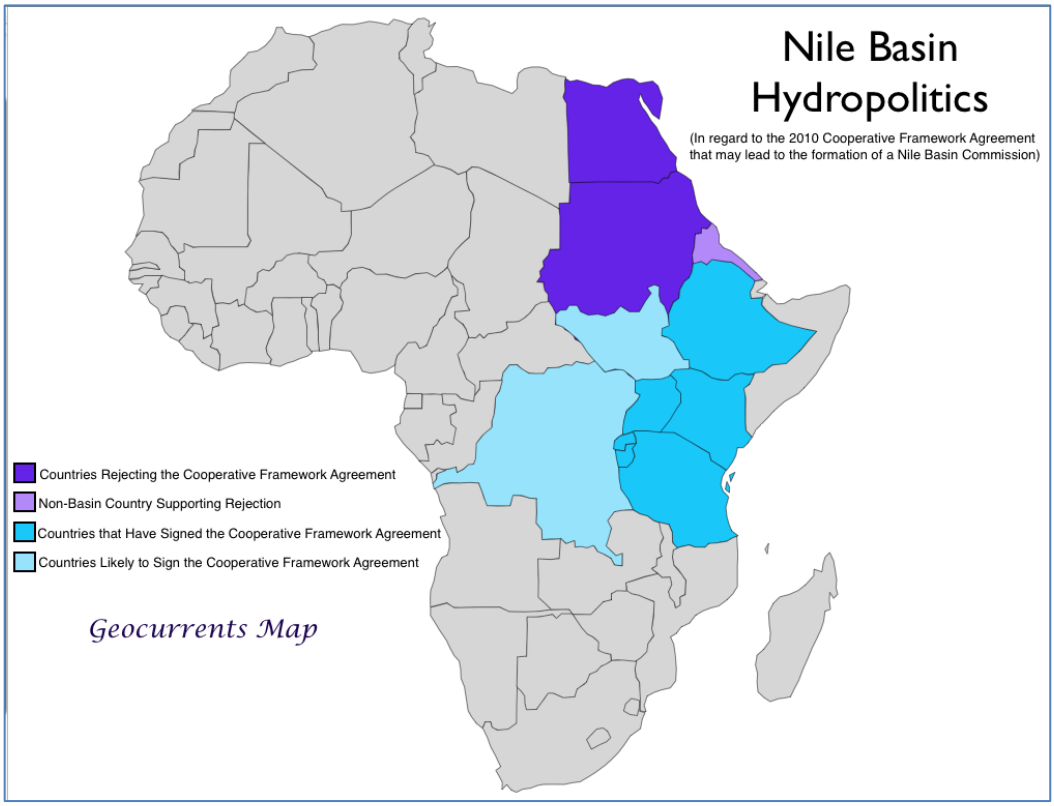
ii. Measure the distance covered by the thread using the ruler. Convert your measurement to a scale reading of 1:1000km

iii. Record and share your results.

Countries that lie in the Nile Basin

Classified as an international river, the Nile flows through ten countries, namely:

1. South Sudan
2. Egypt
3. Tanzania
4. Rwanda
5. Uganda
6. Burundi
7. Kenya
8. Ethiopia
9. Sudan
10. Democratic Republic of Congo.



The Features of the River Nile

Along the river Nile examples of erosion, traction, solution, deposition, attrition and hydraulic action all take place in the river Nile.

The River Nile landforms

Also along the river Nile there are a lot of different landforms these include:Meanders,oxbow lakes,tributaries and the obvious points like the source and the mouth.

Meanders

A meander is one of a series of regular sinuous curves, bends, loops, turns, or windings in the channel of a river, stream, or other watercourse.

Figure 8.3 shows a meandering river Nile

Oxbow lakes

an oxbow lake U-shaped lake that forms when a wide meander from the main stem of a river is cut off, creating a free-standing body of water.

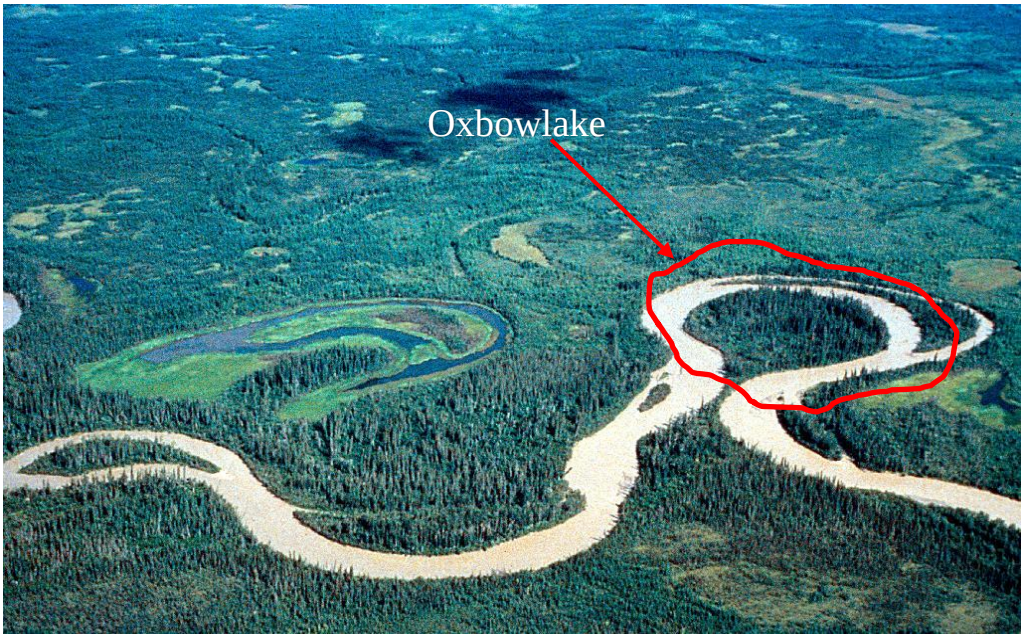


Figure 8.4 an Oxbow lake

Tributaries

A tributary is a stream or river that flows into a larger stream or main stem river or a lake. A tributary does not flow directly into a sea or ocean.

Figure 8.5 tributaries on River Nile

River Nile,the longest river in Africa and in the world has its source in a lake, and its mouth in a sea- the Mediterranean sea.

- Some parts of the river are not navigable because of the presence of cataracts boulders,rapids and cliffs.
- Its main tributaries are the Blue Nile and the White Nile which form a confluence at their meeting point in Khartoum.
- The river separates into several channels near its waters into the Mediterranean sea.
- It is bordered to the western side by Sahara Desert,the largest desert in the world and by the Eastern desert to the East.

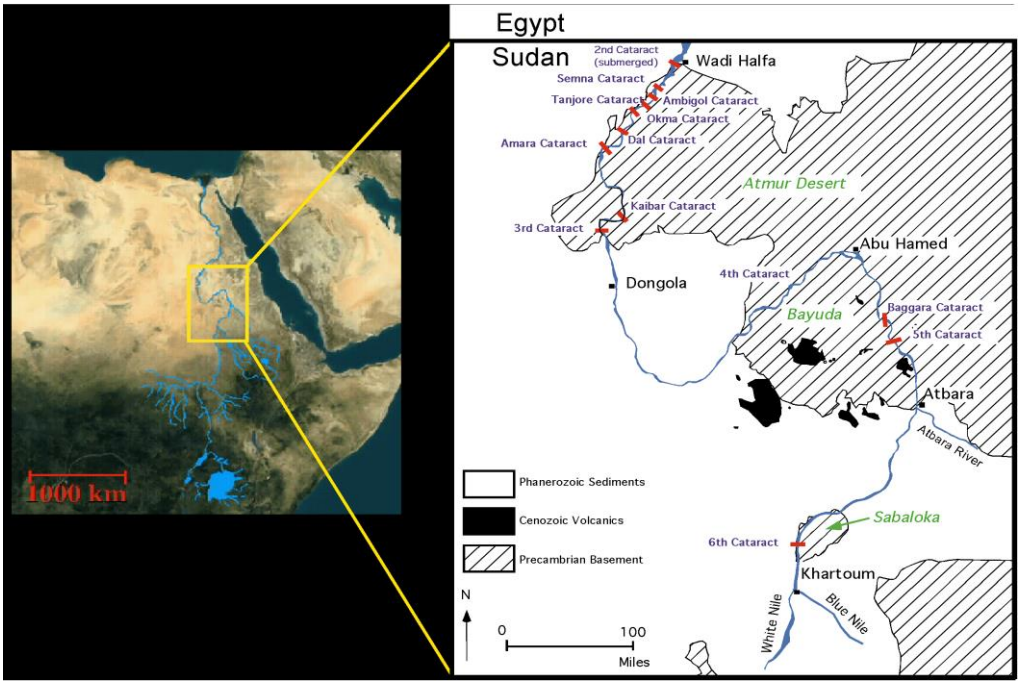


Figure 8.5 some of the features of River Nile

Importance of River Nile

Provides fertile soils

Whenever the Nile River floods, it leaves behind nutrients that increase the fertility of the surrounding lands.

Provides water for domestic use

Water from River Nile make lives of many people easy as they can wash, bath and cook with it. There is also a steady supply of food in the regions surrounding the river.

Transportation

Egypt has advanced infrastructures all over the country, but the presence of River Nile for many years has provided relief to those looking for other means of transport.

Figure 8.6 a tourist boat on River Nile

The Nile is an economic means of transporting bulky merchandizes as well as travel of masses. Hence, the country has been free from snarl up incidents experienced in many other nations in Africa.

Great attraction for tourism

Tourist from every sphere of life visit to experience wonders of life that the nation provides. Besides the pyramids, many people visit to have river cruises and familiarize with the nation.

Figure 8.7 tourists being ferried by a boat on river Nile in Uganda

Employment

Nile river offers jobs for security officers, tour guides and waiters in the beach resorts along the river.

It has also offered employment to individuals working in construction sites along the river for example those working on the GERD in Ethiopia.

Figure 8.8 GERD (Grand Ethiopian Renaissance Dam) construction

Helps generate electricity

Dams have been built across then Nile river which have aided in generation of hydroelectric power which is quite useful for domestic and industrial purposes.

Figure 8.9 Bujagali Power Station in Uganda

Irrigation

The Nile is a major source of irrigation with its large amount of water.

Figure 8.10 irrigation along the course of a river.

Interesting Facts About the River Nile

- The River Nile is the longest River in the world
- The Nile flows into the Mediterranean Sea
- The Nile has a length of about 6,695 Kilometers (4,160 miles)
- Its average discharge of water is 3.2 million litres.
- The Nile basin is huge and includes parts of Tanzania,Burundi,Rwanda,Congo(Kinshasa) Kenya.
- The name Nile comes from the greek "neilos",which means valley
- The Ancient Egyptians called the river Ar or Aur (black) because of the colour of the sediment left after the river's annual flood.

Nile Water Agreement

History of the Nile Waters Agreements

The disagreements over the use of the Nile are not recent and, in fact, have a long history because of the concerned countries' high dependence on the waters of the Nile.

In 1929, an agreement was concluded between Egypt and Great Britain regarding the utilization of the waters of the Nile River, Britain was supposedly representing its colonies in the Nile River Basin.

The Anglo-Egyptian Treaty covered many issues related to the Nile River and its tributaries.

On May 7, 1929 – The Agreement between Egypt and Anglo-Egyptian Sudan included:

- Egypt and Sudan utilize 48 and 4 billion cubic meters of the Nile flow per year, respectively;
- The flow of the Nile during January 20 to July 15 (dry season) would be reserved for Egypt;
- Egypt reserves the right to monitor the Nile flow in the upstream countries;
- Egypt assumed the right to undertake Nile river related projects without the consent of upper riparian states.
- Egypt assumed the right to veto any construction projects that would affect her interests adversely.

In effect, this agreement gave Egypt complete control over the Nile during the dry season when water is most needed for agricultural irrigation. It also severely limits the amount of water allotted to Sudan and provides no water to any of the other riparian states.

The 1959 Nile Waters Agreement between the Sudan and Egypt for full control utilization of the Nile waters included the following:

- The controversy on the quantity of average annual Nile flow was settled and agreed to be about 84 billion cubic meters measured at Aswan High Dam, in Egypt.
- The agreement allowed the entire average annual flow of the Nile to be shared among the Sudan and Egypt at 18.5 and 55.5 billion cubic meters, respectively.
- Annual water loss due to evaporation and other factors were agreed to be about 10 billion cubic meters. This quantity would be

deducted from the Nile yield before share was assigned to Egypt and Sudan.

- Sudan, in agreement with Egypt, would construct projects that would enhance the Nile flow by preventing evaporation losses in the Sudd swamps of the White Nile located in the southern Sudan. The cost and benefit of was same to be divided equally between them. If claim would come from the remaining riparian countries over the Nile water resource, both the Sudan and Egypt shall, together, handle the claims.
- If the claim prevails and the Nile water has to be shared with another riparian state, that allocated amount would be deducted from the Sudan's and Egypt's and allocations/shares in equal parts of Nile volume measured at Aswan.
- The agreement granted Egypt the right to construct the Aswan High Dam that can store the entire annual Nile River flow of a year.
- It granted the Sudan permission to construct the Rosaries Dam on the Blue Nile and, to develop other irrigation and hydro-electric power generation until it fully utilises its Nile share.
- A Permanent Joint Technical Commission was to be established to secure the technical cooperation between them. Over the years, especially as the populations of the other countries of the Nile River Basin have increased, and these countries have developed the capacity to more effectively harvest the waters of the Nile River for national development.

Disagreements have arisen over the fact that Egypt has insisted that the water rights it acquired through the 1929 and 1959 agreements (collectively referred to as the Nile Waters Agreements) be honoured and that no construction project be undertaken on the Nile River or any of its tributaries without prior approval from Cairo.

In fact, various Egyptian leaders have threatened to go to war to protect these so-called "acquired rights." Upstream riparian states such as Kenya, Tanzania,

Uganda, and Ethiopia, have argued that they are not bound by these agreements because they were never parties to them.

In fact, shortly after independence from Great Britain in 1961, Tanganyika's (now Tanzania, after union with Zanzibar in 1964) new leader, Julius Nyerere, argued that the Nile Waters Agreements placed his country and other upstream riparian states at Egypt's mercy.The agreement forced them to subject their national development plans to the scrutiny and supervision of Cairo, and that such an approach to public policy would not be compatible with the country's status as a sovereign independent state. All the upstream riparian states have since argued in favor of a new, more inclusive legal framework for governing the Nile River Basin.

Activity 8.1

1. Where does the river Nile flow from?
2. Discuss the source of and the length of River Nile.
3. State the countries that lie in the Nile basin.
4. In groups discuss the main features of the river Nile.
5. State and discuss four importance of the river Nile.

Glossary

1 Asthenosphere -A portion of the mantle which underlies the lithosphere. This zone consists of easily deformed rock and in some regions reaches a depth of 700 km.

2 Continental drift -The first hypothesis proposing large horizontal motions of continents. This idea has been replaced by the theory of plate tectonics.

3 Convergent plate boundary - A boundary between two lithospheric plates that move towards each other. Such boundaries are marked by subduction, earthquakes, volcanoes, and mountain-building.

4 Plate tectonics - The theory that proposes that the Earth's lithosphere is broken into plates that move over a plastic layer in the mantle. Plate interactions produce earthquakes, volcanoes, and mountains.

5 Subduction zone - A long, narrow zone where one lithospheric plate descends beneath another.

6 Settlement pattern -This refers to the distribution of population in an area.

7 Geographical area-This refers to a location where a particular pattern of population (settlement) is found.

8 Meanders-A meander is one of a series of regular sinuous curves, bends, loops, turns, or windings in the channel of a river, stream, or other watercourse.

9 Oxbow lakes-An oxbow lake U-shaped lake that forms when a wide meander from the main stem of a river is cut off, creating a free-standing body of water.

10 Tributaries-A tributary is a stream or river that flows into a larger stream or main stem river or a lake. A tributary does not flow directly into a sea or ocean.

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South Sudan

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