

Formation of main physical features in Kenya and Eastern Africa

Activity

1. What is a physical feature?
2. List down the main physical features in Eastern Africa
3. How were main physical features in Kenya and Eastern Africa formed?

Physical features are the natural features of the Earth's surface. They are the things you can see that are occurring naturally, not made by humans.

Eastern Africa boasts a varied and beautiful landscape, shaped by great geological forces over millions of years.¹ Here are some of the main physical features that define the region:

1. The Great Rift Valley and the numerous lakes found there. Eg L.Turkana, L. Naivasha, Baringo etc
2. Mountains eg. Ruwenzoris, Mt Kilimanjaro, Mt. Kenya
3. Highlands eg. Ethiopian Highlands
4. Lakes eg. Lake Victoria, Tanganyika
5. Rivers eg R. Nile, R. Tana
6. Plateaus

The formation above takes place as a result of a complex interplay of geological processes. These processes either operate from within the crust (internal) or on the surface of the earth (External). They are:

- a) Earth movement - internal forces.
- b) Volcanic Eruptions - internal forces.
- c) Denudation - External forces.

d) Deposition - External forces.

Earth Movements

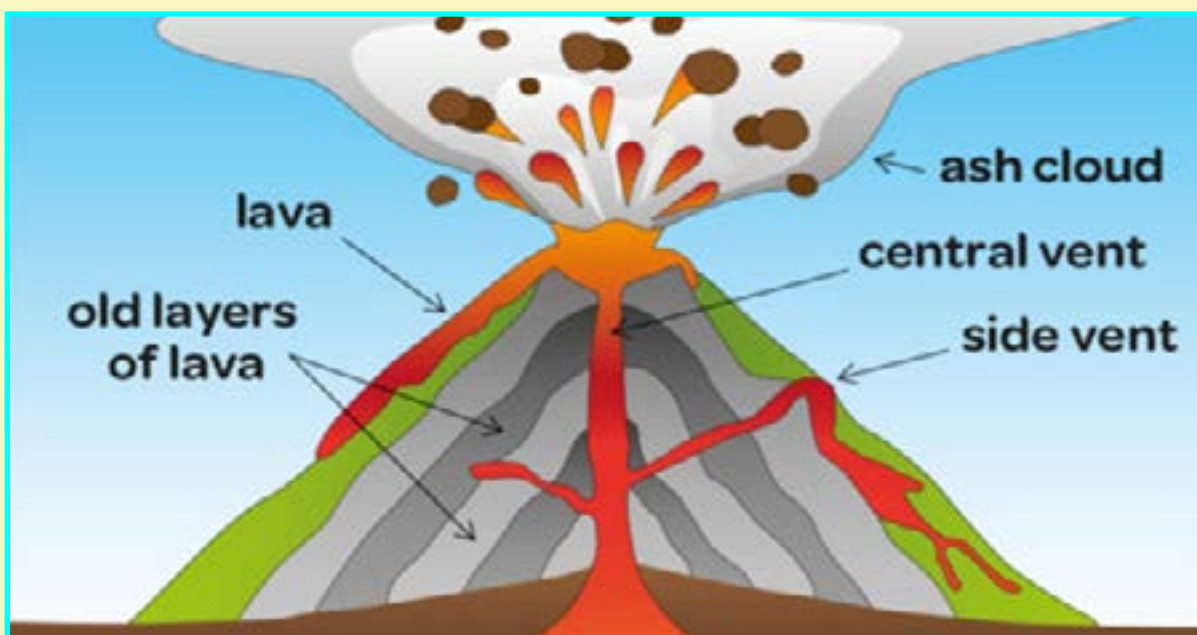
Earth movements refer to the various ways in which the Earth moves and changes. Earth movements are of 2 types:

1. Horizontal/lateral/orogenic movements
2. Vertical/epeirogenic movements

[Click here to read more about earth movements](#)

Volcanic Eruptions - internal forces.

Volcanic Eruptions of process of vulcanicity: Vulcanicity refers to all the processes related to the origin, movement, and eruption of magma (molten rock) from within the Earth's interior. The eruption of molten rock (magma) onto the Earth's surface influences the formation of major features in Kenya and east Africa.



[Click here to read more about Volcanic eruptions](#)

Denudation - External forces

Denudation, the wearing down and flattening of the Earth's surface, plays an important role in shaping many of the physical features that we see around us. This is through a combination of processes, primarily;

1. Weathering
2. Erosion
3. Mass wasting

Earth movements

Internal land forming/endogenetic processes

Processes operating in the interior of the earth resulting in the formation of natural physical features or landforms.

They are caused by earth movements.

Examples of these processes are folding, faulting and Vulcanicity.

Formation of land forms by internal land forming processes is determined by:

- ☐ Nature and age of earth materials
- ☐ Type of movement involved
- ☐ Intensity and scale of movement involved

Crustal Earth Movements

- ☐ Displacement of the earth's crustal rocks.

They are brought about by tectonic forces which originate and operate in the interior of the earth 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 earth's centre).

Earth movements are of 2 types:

1. Horizontal/lateral/orogenic movements
2. Vertical/epeirogenic movements

Horizontal Earth Movements

-Movements which act along a horizontal plane within crustal rocks.

They are caused by tensional and compressional and shear forces.

Effects

They cause:

- ☐ Strain and stretching of crustal rocks due to stretching caused by tensional forces which cause formation of cracks or faults.
- ☐ Squeezing and shortening of crustal by compressional forces rocks which cause them which also cause formation of faults.
- ☐ Crustal rocks to shear by slipping past each other or by dividing into

layers which is caused by shear forces.

Results of Horizontal Earth Movements

Results in the formation of the following features:

1. Faults
2. Rift valleys
3. fold mountains
4. Escarpments
5. Basins
6. Tilt blocks
7. Block mountains

Vertical Earth Movements

These are movements which occur along the earth's radius or towards the earth's surface or towards its centre.

Effects

The movements causes:

- ☐ Subsiding/sinking/downwarping or pulling of crustal rocks downwards
- ☐ Uplifting/upwarping or pushing of crustal rocks upwards
- ☐ Tilting of crustal rocks or shearing in vertical direction due to greater uplift on one side.

Results of Vertical Earth Movements

1. Raised cliffs
2. Tilt blocks
3. Rift valleys
4. Fault scarps/escarpments
5. Plateaus
6. basins

Causes of Earth Movements

- (a) Magma movement within the earth's crust.
- (b) Gravitational force
- (c) Convectional currents in the mantle
- (d) Isostatic adjustment

a. Magma Movement within the Earth's Crust

- ☐ When magma moves with force pushing crustal rocks horizontally

or vertically.

- When magma moves from reservoir and leaves empty spaces onto which crustal rocks are pulled inwards.

b. Gravitational Force

- When the attractive force of the earth pulls crustal rocks into empty spaces left after magma escaping from the reservoir.

c. Convectional Currents within Mantle

- When convectional currents in magma in mantle drag crustal rocks by friction.
- Horizontal movement of currents cause horizontal movements while vertical cause vertical movements.

d. Isostatic Adjustment

- Rising of continental masses to restore the upset state of balance between sial and sima layers.
- Isostasy is the state of balance between sial and sima layers.
- It can be disturbed by erosion on continents and melting of continental ice sheets.
- The reduced weight causes continental masses to rise.

Theories Explaining the Earth's Movements

A theory is reasoned ideas intended to explain facts or ideas.

There are 2 theories which explain the earth's movements namely the Continental Drift Theory and the Plate tectonics theory.

i) Theory of Continental Drift

Its proponent was A. Wegener.

It explains the origin of 6 continents.

It states:

- The earth was a single sialic land mass called Pangaea surrounded by a huge ocean called Panthalassa whose floor was a mass of sima.
- Pangaea broke into two parts called Laurasia (N. Hemisphere) which lay around equator and Gondwanaland (S. Hemisphere) which lay around south pole which were separated by a narrow ocean called Tethys (the present Mediterranean Sea).
- Laurasia broke into Laurentian Shield and Fennoscandia (Europe, Asia and N. America) and moved northwards to their present positions.
- Gondwanaland broke into Africa, Australia, S. America and Antarctica and

India subcontinent.

· Africa and India drifted northwards.

Evidences Supporting the Theory

1. Fitting of western coast of Africa and S. America into a jigsaw.
2. Discovery of coal 40°N and 55°N which was formed by burying of tropical vegetation.
3. Considerable displacement of rocks along some faults e.g. along the Great Glen Fault of Scotland.
4. Cape and Buenos Aires folds resemble one another by having east west trend.
5. Red sea shores show evidence of having undergone lateral displacement an indication that it was formed by movement of the earth's crust.
6. Evidence of ancient Glaciation to the south of equator in Africa in Madagascar and India where there is presence of ancient glacial deposits suggesting these areas were once around south pole.

ii) Plate Tectonics Theory

It states that:

The earth's crust is made of blocks called plates.

These are the 7 Large Ones;

1. Eurasian plate
2. Australian plate
3. Africa plate
4. Antarctic plate
5. N. American plate
6. S. American plate
7. Pacific plate

These are the Smaller Ones

1. Indian
2. Arabian
3. Caribbean
4. Cocos
5. Somali plates
6. Juan de Fuca
7. Nazca
8. Philippine
9. Scotia

These plates are two types : tectonic plates:

1. Oceanic plates which form major areas of the ocean floor including coastal lowland.
 2. Continental plates which form the bulk of the continental land mass.
 - The plates float on molten mantle layer called Asthenosphere.
 - The plates move relative to each other due to convectional currents in the mantle.
 - They move away from each other forming extension or constructive boundary called so because magma fills the space between.
 - They move towards each other forming compressional or destructive boundary called so because materials between are crushed. The movements of those two types of plates have the following effects:
1. When two oceanic plates meet
 - There is subduction and the ocean floor is pulled inwards forming a trench e.g. Java Trench .Subduction is the passing of edge of one plate beneath the edge of another.
 - Sediments on the sea floor in the region of subduction are compressed to form Fold Mountains.
 1. When an oceanic plate meets a continental plate the edge of the oceanic plate slides beneath the continental plate in a movement called subduction.
 - Sediments on the sea floor in the region of subduction are compressed to form Fold Mountains.
 - Fold Mountains are also formed at the edge of the continent when the sial layer is compressed.
 - The edge of the oceanic plate bends into the mantle forming a trench.
 2. When two continental plates collide the sial layer is folded into mountains.
 - They move past each other forming transform or conservative boundary called so because there is neither construction nor destruction which occurs where the plates are separated by a major fault.

Significance of Plate Movements

1. Are sources of earthquakes and Vulcanicity.
2. Causes formation of land forms such as Fold Mountains and ocean trenches.
3. Spectacular landscapes formed are a tourist attraction.
4. Eruption of magma can result in formation of valuable minerals.

Vulcanic eruptions

Vulcanicity refers to all the processes related to the origin, movement, and eruption of magma (molten rock) from within the Earth's interior. Here's a breakdown of the key processes:

1. Magma Generation:

- Melting of Rocks: Deep within the Earth, under intense heat and pressure, rocks can melt.¹ This melting can occur due to various factors:
 - Increased Temperature: As you go deeper into the Earth, temperatures increase significantly.²
 - Decreased Pressure: When rocks are brought closer to the surface, the pressure decreases, which can cause them to melt.³
 - Addition of Water: Water can lower the melting point of rocks, facilitating their melting.⁴
- Formation of Magma Chambers: The molten rock (magma) collects in large chambers beneath the Earth's surface.⁵

2. Magma Ascent:

- Buoyancy: Magma is less dense than the surrounding solid rock, so it tends to rise towards the surface due to buoyancy.⁶
- Pressure: The pressure exerted by the overlying rock also forces magma upwards.

3. Volcanic Eruptions:

- Explosive Eruptions: When magma reaches the surface, it erupts.⁷ The nature of the eruption depends on several factors, including the composition of the magma, the amount of gases dissolved in it, and the viscosity (thickness) of the magma.⁸
 - Explosive eruptions occur when the magma is viscous (high silica content) and contains a large amount of dissolved gases.⁹ This leads to the buildup of pressure, resulting in violent eruptions.¹⁰
 - Effusive eruptions occur when the magma is less viscous (low silica content) and the gases escape more easily.¹¹ This results in the relatively gentle flow of lava.

4. Volcanic Landforms:

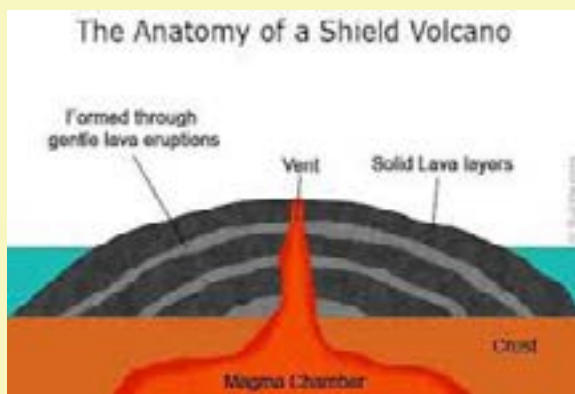
Volcanic landforms are divided into **extrusive and intrusive landforms** based

on whether magma cools within the crust or above the crust.

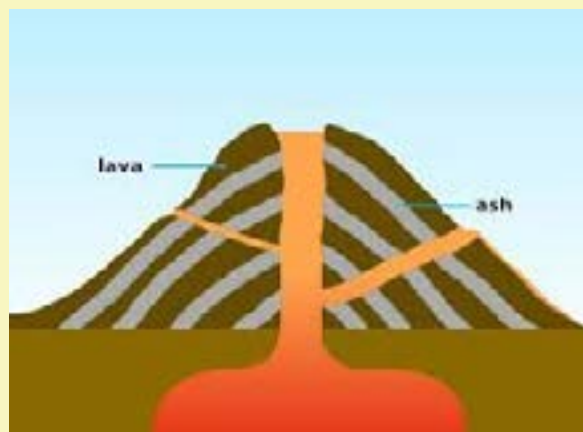
Extrusive

Extrusive landforms are formed from material thrown out to the surface during volcanic activity. The major types are all volcanoes of various shapes and forms, but there are much smaller types too.

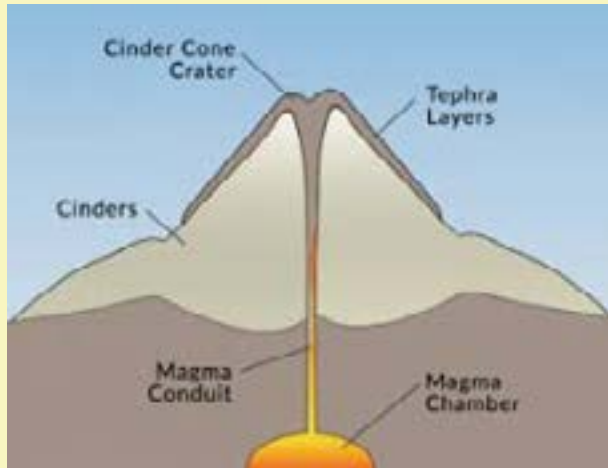
- Volcanoes: The most common landforms resulting from volcanic activity.
 - Shield volcanoes: Broad, gently sloping volcanoes built up from fluid lava flows.



- Composite volcanoes (stratovolcanoes): Steep-sided volcanoes composed of layers of lava flows, ash, and other volcanic debris.



- Cinder cones: Small, steep-sided cones built up from cinders and ash ejected from a single vent.



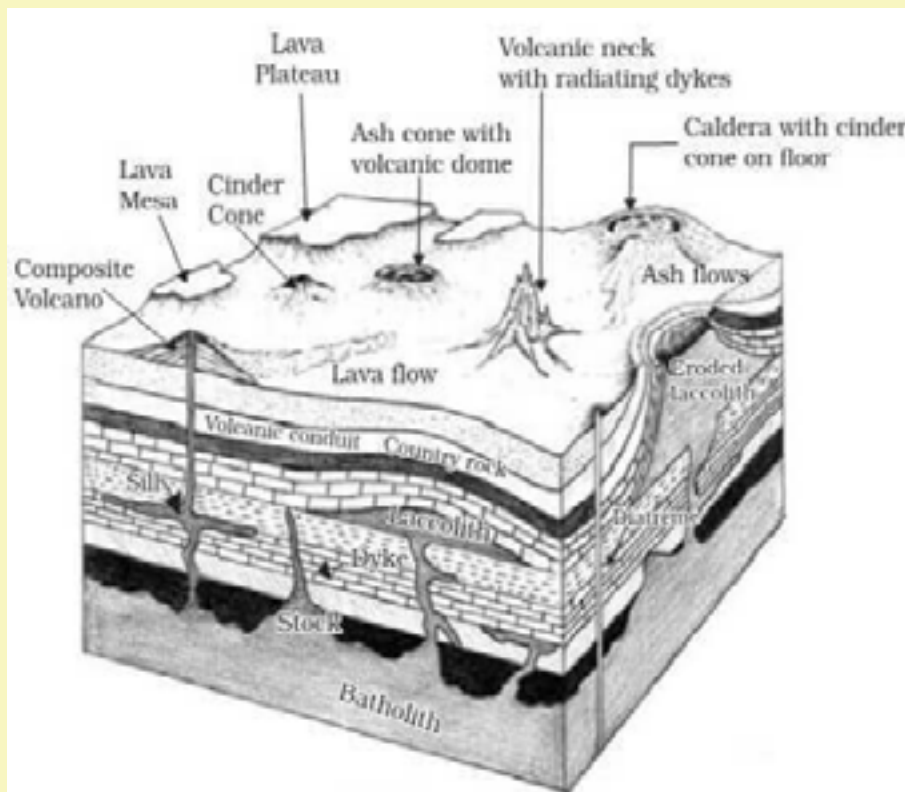
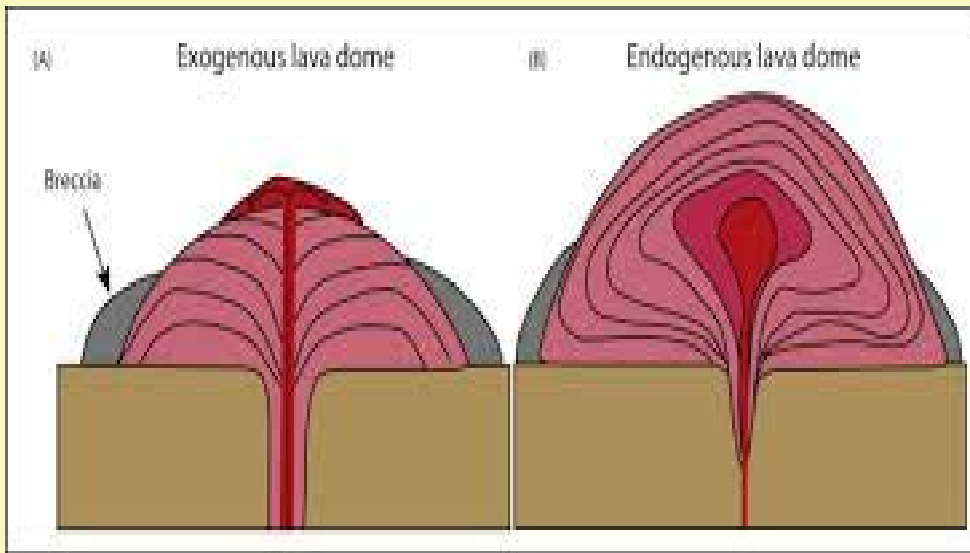
- Lava Flows: The outpouring of molten lava onto the Earth's surface.



- Pyroclastic Flows: Rapidly moving currents of hot gas and volcanic debris.

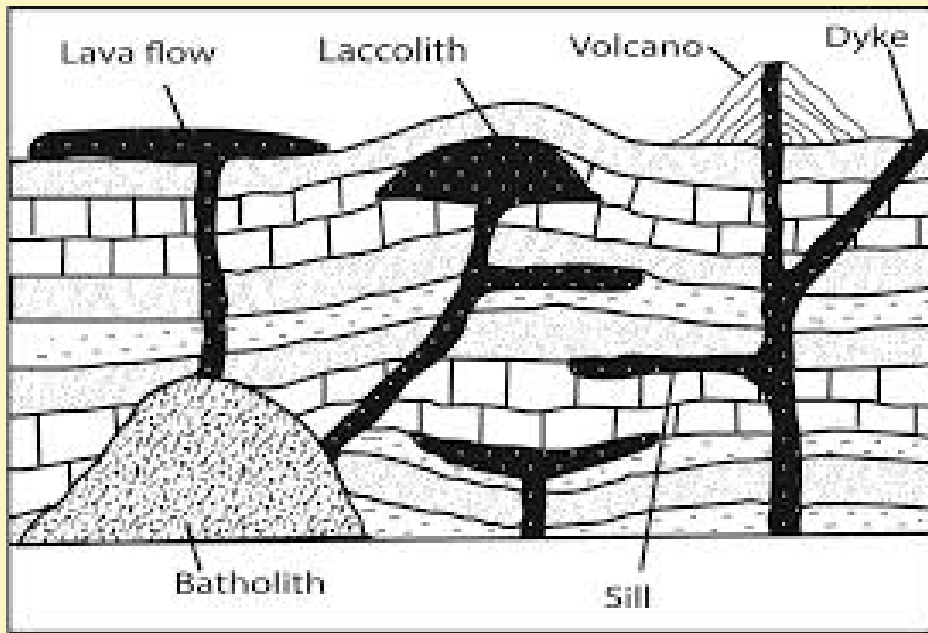


- Lava Domes: Viscous lava that piles up around the vent, forming a dome-shaped structure.



5. Intrusive Activity:

- Intrusions: Some magma may solidify within the Earth's crust instead of reaching the surface.¹⁸ These solidified intrusions form various landforms, such as:
 - Dikes: Sheet-like intrusions that cut across existing rock layers.¹⁹
 - Sills: Sheet-like intrusions that are parallel to existing rock layers.²⁰
 - Batholiths: Large, irregularly shaped intrusions of solidified magma.²¹



Key Points:

- Vulcanicity is a complex process involving the generation, movement, and eruption of magma.²²
- The characteristics of volcanic eruptions and the resulting landforms are influenced by the composition of the magma and other factors.²³
- Volcanic activity plays a significant role in shaping the Earth's surface and has both constructive and destructive effects on the environment.²⁴

I hope this comprehensive explanation helps!