Ethiopian Geography and the Horn 101

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- **Unit Contents**
- 1.1. Definition, Scope and Themes of Geography
- 1.2 Location, Shape and Size of Ethiopia and the Horn
- 1.3. Basic Skills of Map Reading

Chapter one

- **Meaning of Geography**
- Geography is the scientific study of the Earth that describes and analyses spatial and temporal variations of physical, biological and human phenomena, and their interrelationships and dynamism over the surface of the Earth

The Scope, Approaches and Themes of Geography

The scope

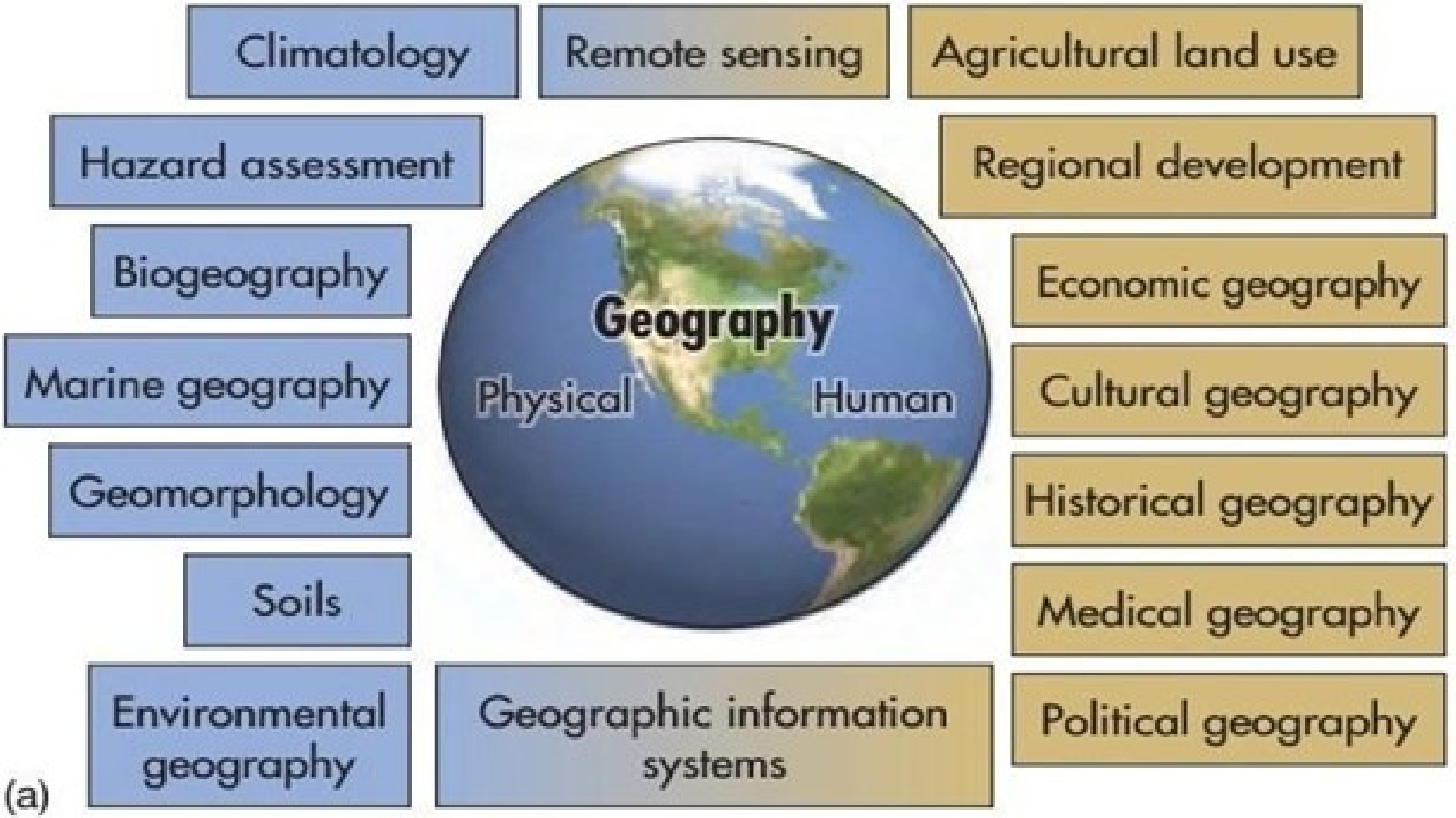
- the scope of Geography is the surface of the Earth, which is the very thin zone that is the interface of the atmosphere, lithosphere, hydrosphere and biosphere, which provides the habitable zone in which humans are able to live

Approaches

The topical (systematic) fields of Geography view particular categories of physical or human phenomena as distributed over the Earth

regional geography is concerned with the associations within regions of all or some of the elements and their interrelationships.

Cont'd.....


Climatology
Remote sensing
Agricultural land use
Hazard assessment
Regional development
Biogeography
Economic geography
Geography
Physical
Human
Marine geography
Cultural geography
Geomorphology
Historical geography
Soils
Medical geography
Environmental geography
Geographic information systems
Political geography
(a)

Geography has five basic themes these are location,place,human environment interaction,movement and region

- **Location** is defined as a particular place or position; Location can be of two types: absolute location and relative location.

Place refers to the physical and human aspects of a location

toponym (the name of a place),

site (the description of the features of the place),

situation (the environmental conditions of the place).

Human-Environment Interaction

- human-environment interaction involves three distinct aspects

Dependency refers to the ways in which humans are dependent on nature for a living.

Adaptation relates to how humans modify themselves, their lifestyles and their behavior to live in a new environment with new challenges

Modification allowed humans to “conquer” the world for their comfortable living.

Movement

- The physical movement of people
- the transport of goods
- the flow of ideas that allows the unification of the human civilization and promotes its growth and prosperity.

Region

- A region is a geographic area having distinctive characteristics that distinguishes itself from adjacent unit(s) of space

Location, Shape and Size of Ethiopia and the Horn

- **Location of Ethiopia**

Astronomical location,or absolute using the lines of latitudes and longitudes.

3 degree N (Moyale) and 15 degree N (Bademe - the northernmost tip of Tigray) latitudes

33degree E (Akobo) to 48 degree E (the tip of Ogaden in the east) longitudes.

Relative location expresses the location of countries or places with reference to the location of other countries (vicinal), landmasses or water bodies.

The implications of the location of Ethiopia

a) **Climate** the country has a tropical climate, though modified by its altitude.

b) **Socio-cultural** Ethiopia is one of the earliest recipients of the major world religions namely Christianity, Islam and Judaism due to its proximity to the Middle East

- c) **Political**

Geopolitical considerations of superpowers

Adjacency to the Red Sea (a major global trade route)

The Middle East geopolitical paradigms

Size of Ethiopia

- total area 1,106,000 sq.kilometer
- the 8th largest country in Africa
- 25th in the World

1,639 kilometers East-West

1,577 kilometers North-South

About 0.7% of the country is covered by water bodies

The size of Ethiopia also affects both the natural and human environment of the country

The shape of Ethiopia and its Implication

- Countries of the World have different kinds of shape that can be divided into five main categories: compact, fragmented, elongated, perforated, and protruded. These shapes have implications on defense, administration and economic integration within a country

Compact shape



Fragemented shape





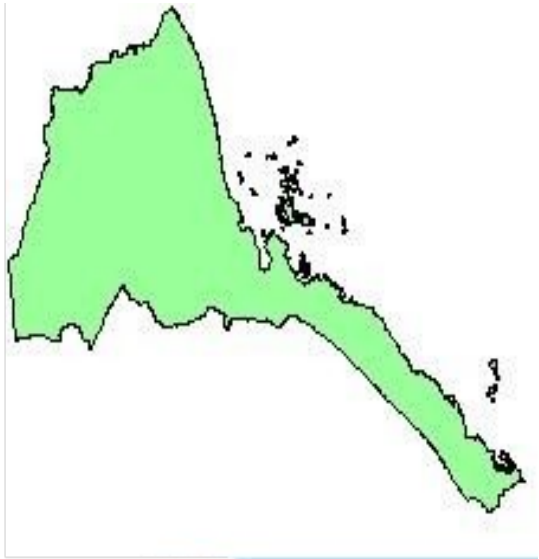
Elongated shape(chile)



Perforated shape(Republic of South Africa)



Protrude shape(Myanmar and Eritrea)



Basic Skills of Map Reading

What is a Map?

- A map is a two-dimensional scaled representation of part or whole of the Earth surface on a flat body such as piece of paper, black board, wood
- Map reading encompasses a systematic identification of natural features and manmade features

Importance of maps

Provide the basis for making geographical details of regions represented

Maps are powerful tools for making spatial analysis of geographical facts of areas represented

Maps are useful for giving location of geographical features

Maps are used on various disciplines like land use planning, military science, aviation, tourism, marine science, population studies, epidemiology, geology, economics, history, archaeology, agriculture etc.

Map makes storage of the geographical data of areas represented

Maps are potentially used to asses‟ reliable measurements of the geographical features. The measurements can be of area size, distance

Types of Map

according to their purpose and functions.

***a*. Topographical maps:** depict one or more natural and cultural features of an area Contents of topographical maps depend on purpose of a map, scale of a map, date of compilation, and nature of the land represented

***b*. Special purpose/statistical maps:** These are maps, which show distribution of different aspects such as temperature, rainfall, settlement, vegetation etc

Marginal Information on Maps (Elements of Maps)

aTitle:
b.Key (legend):
c.Scale:
d. **North arrow**
e. **Margin:**
f. **Date of compilation**
Basic Principles of Map Reading
Map Readers must have ideas about the symbol and also the real World (landscapes).
Secondly, knowledge of directions is an important principle in reading maps. B 3`1

Chapter Two

THE GEOLOGY OF ETHIOPIA AND THE HORN

- **Introduction**

Geology

- is an Earth science that studies the evolution,;the gradual devt of organism,; of the earth
- the materials of which it is made of
- the processes acting upon them.

by indirect methods

geophysics(studying earthquake waves)

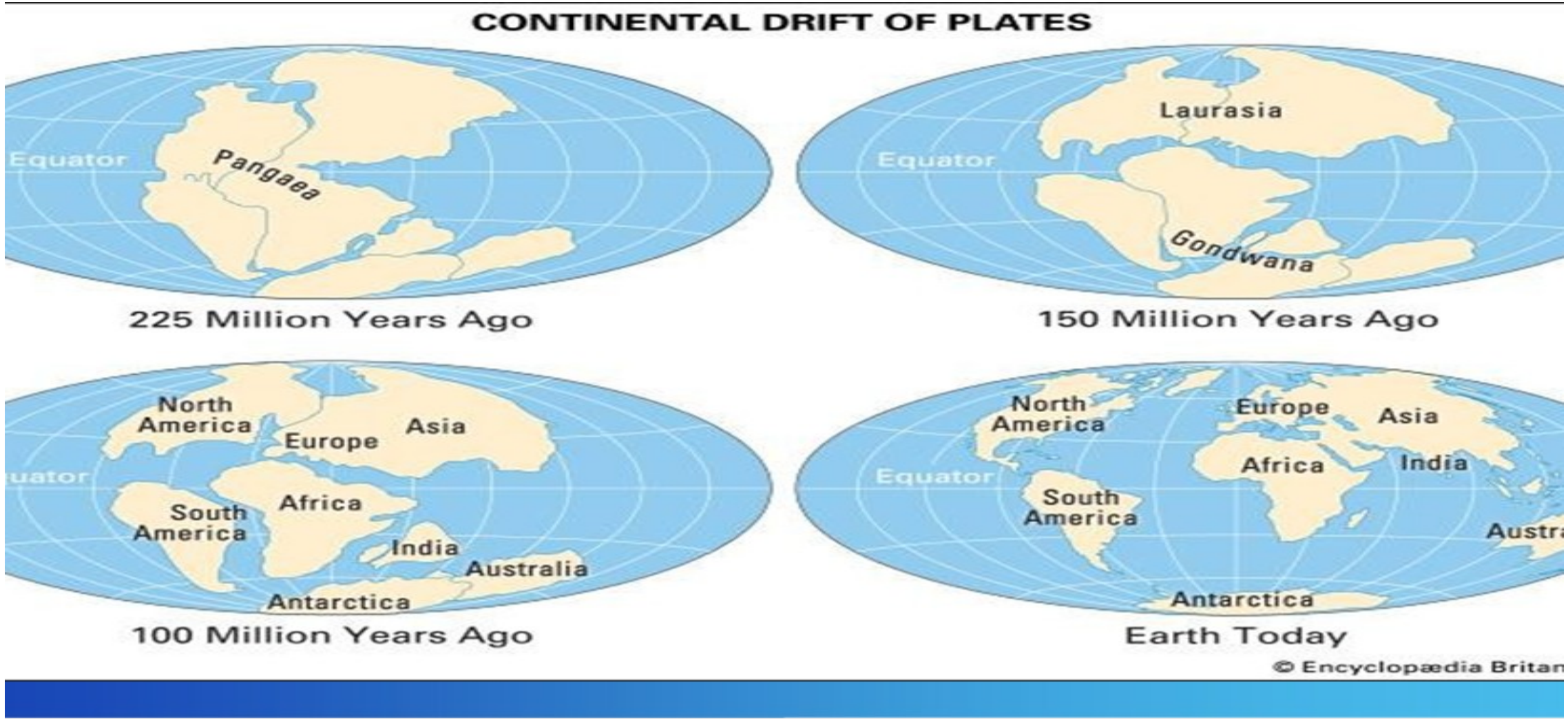
geochemistry(composition of rocks)

geochronology(finding the ages of rocks)

- The earth‟s continents were once bunched up together in to a single huge continent called ***Pangaea***. The large super continent was then split into Gondwanaland where Africa is a part and Laurasia; and later into smaller fragments over the last million years. These then drifted apart to form the present arrangement of continents.

Cont,

- Australian Climatologist **Alfred Wegener** proposed the hypothesis that the continents were once assembled together as a supercontinent, called the Continental drift Theory.
- Wegener‟s principal observations were:
- ***Fit of the continents:*** The opposing coastlines of continents often fit together.
- ***Match of mountain belts, rock types:*** If the continents are reassembled as Pangaea, mountains in West Africa, North America, Greenland, and Western Europe match up.
- ***Distribution of fossils:*** The distribution of plants and animal fossils on separate continents forms definite linked patterns if the continents are reassembled.
- ***Paleoclimates:*** rocks formed 200 million years ago in India, Australia, South America, and southern Africa all exhibited evidence of continental glaciations


CONTINENTAL DRIFT OF PLATES
Equator
Pangaea
225 Million Years Ago
Equator
Laurasia
Gondwana
150 Million Years Ago
North America
Europe
Asia
Africa
South America
India
Australia
Antarctica
100 Million Years Ago
North America
Europe
Asia
Africa
India
Equator
South America
Antarctica
Earth Today
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The Geologic Processes: Endogenic and Exogenic Forces

- The internal processes (endogenic) include volcanic activity and all the tectonic processes (folding, faulting, orogenesis (mountain building), and epeirogenesis (slow rising and sinking of the landmass).
- The external (exogenic) processes are geomorphic processes. They include weathering, mass transfer,; The net movement of mass from one location e.g the evaporation of water from apondto the atmosphere; erosion and deposition.
- The landmass of Ethiopia, as elsewhere, is the result of the combined effect of endogenic and exogenic processes

The Geological Time Scale and Age Dating Techniques

- the Paleozoic Era (ancient life) is the age of invertebrates
- the Mesozoic Era (the middle life) is the age of reptiles
- the Cenozoic Era (recent life) is the age of mammals

1. An *epoch* is the smallest unit of time on the scale and encompasses a period of millions of years.

2. Chronologically, epochs are clumped together into larger units called *periods*.

3. Periods are combined to make subdivisions called *Eras*.

4. An *eon* is the largest period of geological time.

Age Dating Techniques

- There are two techniques of knowing the age of rocks: Relative and absolute age dating.
- **A. Relative Dating**

Relative dating uses geological evidence to assign comparative ages of fossils which one is younger and which is older .

B. Absolute Dating

This technique was developed with discovery of radioactivity in 1896.

The Precambrian Era Geologic Processes (4.5 billion - 600 million years ago)

- The Precambrian Era covers 5/6th of the Earth‟s history
- the land was subjected to intense folding The result was the formation of huge mountain ranges.
- forming the basement rocks
- by pressure and heat the original rocks were altered into metamorphic rocks Since these same processes have allowed mineralization and crystal formation, the rocks are also collectively described as *crystalline rocks*
- The Precambrian rocks are overlaid by recent rock formations. However, as surface rocks covering 25% of the land mass of the country

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The major geological events of the precamberian era in the country may be summarized as follows:

- great earth movements(orogenic folding) which produced huge mountains.
- volcanic activities,mainly volcanic intrusions
- widespread metamorphism
- series of denudation process

Cont.

they are found exposed in the following areas

- In the northern part: Western lowlands, parts of northern and central Tigray.

A. In the western Part: Gambella, Benishangul-Gumuz (Metekel and Asossa), western Gojjam, western Wellega, Illuababora, and Abay gorge.

B. In the southern Part: Guji, southern Omo, and parts of southern Bale and Borena.

C. In the eastern part: Eastern Hararghe.

The Paleozoic Era Geologic Processes (600 million - 225 million years ago) (ancient life)

- is the age of invertebrates
- The major geological process of this Era was denudation.
- The gigantic mountains that were formed by the Precambrian orogeny were subjected to intense and prolonged denudation.
- At the end, the once gigantic mountain ranges were reduced to a "peneplained" surface.
- Because of the limited deposition within Ethiopia, rocks belonging to this Era are rare in the country.

The Mesozoic Era Geologic Processes (225-70 million years ago) (the middle life)

- It was an Era of alternate slows sinking and rising (epeirogenesis) of the landmass.
- the flourishing of marine life
- is the age of reptiles

Mesozoic rocks are considered to have the greatest potential for oil and gas deposits.

- the sands and lime were compacted to form sandstone and limestone layers respectively. These are known as the Adigrat sand stone and Hintalo limestone layers. They are named after place names in Tigray where they might have been first identified.

Cont.

- As surface rocks, these old marine sediments are extensively found in the Southeast lowlands. Other exposures include central Tigray, and along the gorges of Abay and Wabishebelle rivers

The Cenozoic Era Geologic Processes (70million years ago - Present) (recent life)

- is the age of mammals
- The Cenozoic Era is the most recent of the geologic Eras.
- The tectonic and volcanic activities that took place in this Era have an important effect in the making of the present-day landmass of Ethiopia and the Horn of Africa.
- Three geologic activities are takes place.

a. Uplifting of the Arabo-Ethiopian landmass and outpouring of huge quantity of lava.

b. Formation of the Rift Valley.

c. Quaternary volcanism and deposition

Uplifting of the Arabo-Ethiopian landmass and outpouring of lava flood

- The whole of the Arabo-Ethiopian landmass was pushed up in blocks as one mass.
- The greatest uplift was in central Ethiopia.
- This immense tectonic force also fractured the crust at many places.
- Huge quantity of lava came out through these fractures.
- The out pouring of this flood of basalt spread widely and extensively and covered a large part of the Mesozoic sedimentary layer to form the Ethiopian plateau surface and also the floor of the present-day Rift Valley. At that time the Rift Valley was not yet formed.

Cont.

- Where the lava comes out through vents.
- huge volcanic rocks were piled up to form many and huge Volcanic Mountains‟ towering the flat basaltic plateau. This volcanic material is known as Trappean lava or Trap Series lava.

The Formation of the Rift Valley

- the Rift Valley may be lying on the Earth‟s crust below which lateral movement of the crust in opposite directions producing *tensional forces* that caused parallel fractures or faults on the sides of the up-arched swell. As the tension widened the fractures, the central part of the landmass collapsed to form an extensive structural depression known as the *Rift Valley*

Cont.

- The Red Sea and the Gulf of Aden were connected as a result of the rifting and faulting of the land bridge that separated them.

The Spatial Extent of the Rift Valley

- The Ethiopian Rift Valley is part of the Great East African Rift system
- that extends from Palestine-Jordan in the north to Malawi-Mozambique in the south.
- for a distance of about 7,200 kilometers.
- Of these, 5,600 kilometers is in Africa, and 1,700 kilometers in Eritrea and Ethiopia.
- On land, the widest part of the Rift Valley is the Afar Triangle (200-300 km).
- The Red Sea, the Gulf of Aden, and the East African System meet and form the triangular depression of the Afar

Cont.

- where the Kobar Sink lies about 125 meters below sea level.
- The formation of the Gulf of Aden and the separation of the Arabian Peninsula from the Horn of Africa also took place during the Tertiary period.
- The Rift Valley region of Ethiopian is the most *unstable* part of the country.
- There are numerous hot springs, fumorales, active volcanoes, geysers, and frequent earthquakes

The formation of the Rift Valley has the following structural (physiographic) effects

- It divides the Ethiopian Plateau into two.
- It separates the Arabian landmass from African landmass.
- It causes the formation of the Dead Sea, Red Sea and the Gulf of Aden troughs.
- It creates basins and fault depressions on which the Rift Valley lakes are formed

Quaternary Volcanic Eruptions and Depositions

- This activity was generally limited to the floor of the Rift Valley and the region south of Lake Tana, where the lava covers an area of more than 3,000km2. Aden volcanics and recent faulting are more extensively developed in the Afar region.

Quaternary Deposition

- the Earth experienced a marked climatic change
- This was the time of the last „“Ice Age“ in the middle and high latitude areas
- the time of the Pluvial Rains in Africa.
- The heavy Pluvial Rains eroded the Ethiopian plateau and the eroded materials were deposited in the Rift Valley lakes. They carried a lot of water and sediments …
- For example, Ziway-Langano-Shalla; Hawasa-Shallo; Chamo-Abaya; and Lake Abe and the nearby smaller lakes and marsh basins formed huge lakes.

Cont.

- The quaternary deposits are mainly found in the Rift Valley (Afar and Lakes Region)
- Baro lowlands,
- southern Borena,
- northwestern low lands.
- the Cenozoic rocks cover 50% of the land mass of the country.

Rock and Mineral Resources of Ethiopia

- The occurrence of metallic minerals in Ethiopia is associated with the Precambrian rocks
- The exploitation and search for mineral deposits in Ethiopia has been taking place for the past 2000 years or so.
- the case of gold production and utilization, which has become part of Ethiopia's history, tradition and folklore

Brief Facts and Current State of Main Minerals in Ethiopia

- **Gold**
- Gold has been mined in Ethiopia for quite long time, mainly from Benishangul-Gumuz (Metekel) and Adola.
- primary sources gold deposits, Lega-dembi.
- Secondary gold deposits, Adola, Shakiso, Kaffa, In Gambella and Illuababora (Akobo River), in Sidama (Wondo), Borena (Negele-Yabelo area) and in Benishangul-Gumuz (Sherkole), west Wellega.
- **Platinum**

The Yubdo area in Wellega, is the only active Ethiopian Platinum mine.

Tantalum

- Significant deposit of tantalum and niobium is found in southern Ethiopia, in Adola more than 17,000 metric tons of world class ore reserve is found.

Gemstones ,opal

occur in many parts of Ethiopia, mainly in Amhara and Oromia Regional States.

Potash

- The potash reserve in the Danakil (Dallol Depression) of the Afar region is believed to be significant.

Gypsum and Anhydrite

- A limited amount of gypsum is produced for domestic consumption in Ethiopia, mainly for the cement industry, but very large deposits are known to occur in sedimentary formations of the Red Sea coastal area, Danakil Depression, Ogaden, Shewa, Gojjam, Tigray, and Hararghe.
- **Clay**

Ethiopia is endowed with industrial clay material. Alluvial clay deposits for bricks and tile, pottery and pipe industry occur in Adola, Abay gorge, and the Rift Valley lakes region. Ceramic clay for the production of glasses, plates, bricks is found at Ambo and Adola. Tabor ceramic industry in Hawassa gets most of its raw materials from local sources

Marble

- Crystalline limestone is widespread in the basement rocks of Ethiopia.
- Marble has been quarried in such localities as west of Mekelle and south of Adwa in Tigray. In the northwestern also in areas built of Precambrian schist in Gonder, and the Dabus River and other neighboring river basins in Benishangul-Gumuz and Gojjam.

Construction stones

- Basalt, granite, limestone and sandstone are important building stones. For the surfacing of roads and compaction, basalt, scoria and other volcanic rocks are extensively used.

Mineral Potential Sites of Ethiopia

- 1. *The Western and South-western-greenstone belt:*
- 2. *The Southern greenstone belt*
- 3. *The Northern greenstone belt(Tigray):*