Addis Ababa University

College of Natural and Computational Science

Freshman Course

Course Title:
Geography of Ethiopia and the Horn



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Chapter Three :
The Topography of Ethiopia and the Horn

Content

- **Introduction**
- **General Characteristics of the Ethiopian Physiography**
- **The Physiographic Divisions of Ethiopia**
- **The Impacts of Relief on Biophysical and Socioeconomic Conditions**

Objectives

- **At the end of this chapter, the learners will be able to:**

- Describe the topography of Ethiopia and the Horn.
- Identify the physiographic divisions of Ethiopia.
- Explain the physiographic characteristics of the Rift Valley.
- Explain the impacts of relief on biophysical and socioeconomic conditions.

Introduction

- The **topography of Ethiopia** is largely **determined** by the **geologic activities** of the **Cenozoic Era**.
- The **uplifting of the Arabo-Ethiopian swell** and the **subsequent outpouring**, **spreading** **and** **thick accumulation of Trapean lava** have given **rise to** an outward sloping **highland plateau** and **mountains**.
- The **major faulting** **resulted in** the **division of the plateau** into **two broad units** and **the** **formation of a great structural valley**.
- **Faulting** leads to the **formation** of **depressions** on which **lakes** were subsequently **created.**

General Characteristics of the Ethiopian Physiography

- The **Ethiopian landform** is characterized by **great diversity since t**here are:

  - flat-topped plateaus,

  - high and **rugged mountains,**

  - deep river gorges and

  - vast plains.

- **Altitude ranges** from **125 meters** below sea level (**Kobar Sink**) to **the highest mountain in Ethiopia**, **Mount Ras Dashen (4,620 m a.s.l),** which is the fourth **highest mountain** in Africa.
- **Ethiopia** has the **largest proportion** of **elevated landmass** in the African continent.
- **Ethiopia** is sometimes described as **the Roof of East Africa** because of its **height** and **large area**.

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- **More than 50%** of the **Ethiopian landmass** is **above 1,000 meters** of **elevation.**
- **Most of the Ethiopian Highlands** are part of **central** and **northern Ethiopia**, and its **northernmost portion extends** into **Eritrea**.
- The **highland core** is **encircled** by **semi-arid** and **lowlands**.
- The **Ethiopian Highlands** have been **dissected** by several **rivers** and **ravines (narrow valley)** which have cut **deep gorges**.
- Most of the **country consists** of **high plateau** and **mountain ranges** that are **sources of many rivers** and **streams** that **made** the **country** to be described as the "**Water Tower of East Africa**".

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- The **diversity** in **topography** is accompanied by **differences** in **other natural features** such as **soil**, **climate**, **vegetation** and **wild life**.
- The **socio-cultural** and **economic phenomena** are also **affected** by the **topography**.
- Taking the **1,000 meters contour line** for the **highland-lowland demarcation**, one can observes the following **contrasting features** between the Ethiopian **highlands** and **lowlands**:
- **Characteristics of Ethiopian highlands**:

  - Moderate and high amount of rainfall (>600 mm per year).

  - Lower mean annual temperature (<20^{0}C).

  - The climate is favorable for biotic life.

  - Rain-fed agriculture is possible.

  - Free from tropical diseases.

  - Attractive for human habitation and densely settled.

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- The **highlands** have been **significant** throughout Ethiopian **history in the economic**, **cultural** and **political life** of the people.
- The **highlands** make up nearly **56% of the area of the Ethiopia, t**his is further **subdivided** into **lower highland** (**1,000 - 2,000 m.a.s.l**), which make up **35%** and **higher highland (>2,000 m.a.s.l)** constituting nearly **21%.**
- The remaining **44% of the Ethiopian lowlands** are **characterized** by:

  - Fewer amounts of rainfall and higher temperature.

  - High prevalence of tropical diseases.

  - Lower population densities.

  - Nomadic and semi-nomadic economic life.

  - Vast plain lands favorable for irrigation agriculture along the lower river basins.

The Physiographic Divisions of Ethiopia

- **The three major physiographic units of Ethiopia are:**
  1. **The Western highlands and lowlands**
  2. **The South-eastern (Eastern) highlands and lowlands**
  3. **The Rift Valley**

1.The Western Highlands and Lowlands:

I. Western Highlands

II. Western Lowlands

The Western Highlands and Lowlands

- It **includes all the area west** of the **Rift Valley.**
- It makes up about **44% of the area of the country.**
- This **region** is further **subdivided** into:
  - **four groups of highlands (76.3%)** and
  - **four groups of lowlands (23.7%)**

a. The Tigray Plateau

b. North Central Massifs

c. The Shewa Plateau/central highlands

d. The Southwestern Highlands

a. The Tigray Plateau:

- It **extends** from the **Tekeze gorge** in the **south** to **central Eritrean** highlands.
- The **Tigray plateau** is separated from the **Eritrean plateau** by the **Mereb River**.
- It lies to the **southeast** of the **upper course** of the **Mereb/Gash River** and to the **northeast of Tekeze River Gorge**.
- It constitutes about **13% of the area of the region**.
- It is an **elongated highland** with **most of the land** being in between **1,000 and 2,000** meters above sea level.
- The right bank **tributaries** of **Tekeze drain this plateau.**
- There are **high mountains** in this plateau with **elevations of over 3000 meters**, namely

  .Mount Tsibet (3988 m a.s.l),

  .Mount Ambalage (3291 m a.s.l), and

  .Mount Assimba (3248 m a.s.l).

- The **famous monastery at Debre-Damo**, a tableland that can onlybe climbed by a rope pulley, is located in this plateau region.

b. North Central Massifs

- This division is the **largest** in the **western highlands**.
- Much of its **northern** and **southern limit** follows the **Abay** and **Tekeze gorges.**
- In its central part, the physiographic unit also accommodates the **Lake Tana basin** surrounded by **plains of Fogera** and **Dembia** in the **north** and an **upland plain** in its **south**.
- **58% percent of the region** is at **an altitude of more than 2,000 m**, which makes the **second highest physiographic division, next to the Shewan Plateau**.
- The region **consists** of the **Gonder, Wello** and **Gojjam Massifs**.
- Out of the **26 mountain peaks** with **altitude** of **more than 4,000m.a.s.l** in Ethiopia, **19 mountain peaks** are found in this **physiographic region**.

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- The **most popular ones** include:

  - **In the Simen Mountain System:**

    .**Mount Ras Dashen (4,620m a.s.l),**

    .**Mount Weynobar/Ancua (4462m a.s.l),**

    .**Mount KidisYared (4453m a.s.l) and**

    .**Mount Bwahit (4437m a.s.l)**

  - **In the Debre Tabour Mountain System:**

    .**Mount Guna (4,231m a.s.l),**

  - **In the Lasta highlands of Wello:**

    .**Abune Yoseph (4,260m a.s.l)**

  - **In the Choke Mountain System in Gojjam**

    .**Mount Birhan (4,154m a.s.l)**

- The **Mountain systems** in **Gonder** and **Gojjam** are **separated** from the **eastern group of mountains in Wello** by **impenetrable** and **deep gorges, but at one point they are connected** by **Yeju- Wadla Delanta land bridge (ridge).**
- This **land bridge** has been **significant in history, b/c** it served as a **route** of **penetration** by the **Turks, Portuguese** and **Italians** etc.
- The **Woreta-Debre Tabor-Woldya road constructed** to **link** the **northwestern region** with **Asseb** through **Woldya** and **Dessie took advantage of this land bridge**.

c. The Shewa Plateau/Central Highlands

- It is bounded by:

  - the **Rift Valley** in the **east** and **southeast**,
  - the **Abay gorge** in its **northern** and **western** limit, and
  - the **Omo gorge** in the **south** and **west**.

- This plateau occupies a **central geographical position** in Ethiopia
- the **Shewa Plateau** is the **smallest** of the **Western highlands region** (constitute only **11% of the area of the region**)
- **Nearly three-fourth** of **its area** is at an **altitude of more than 2,000 m a.s.l**. It has, therefore, the **largest proportion of elevated ground**.
- **The Shewa plateau is drained,** outward in all directions **by** the **tributaries of Abay, Omo,** and **Awash.** Therefore, it **forms** a **water divide** for these **three river basins**.

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- The **tributaries of Abay (Guder, Muger, Jema)** have **cut deep gorges** and **steep sided river valleys**. They have **created several tablelands** and **isolated plateau units** in the **north**. Similarly, **the tributaries** of **Omo** and **Awash** have **dissected** the other **sides of the plateau**.
- This plateau has relatively **extensive flat-topped uplands**, giving it the appearance of **a true plateau**.
- The **highest mountain in the Shewan plateau** is **Mount Abuye-Meda (4,000 m.a.s.l) in Northern Shewa**, **Mount Guraghe in the south is 3,721 meters high.**

d. The Southwestern Highlands

- It **consists** of the **highlands of Wellega, Illuababora, Jimma, Kaffa,Gamo and Gofa**.
- This region is **separated** from the **adjacent highlands** by the **Abay** and **Omo river valleys**.
- It extends from the **Abay gorge** in the **north** to **the Kenya border** and **Chew Bahir in the south**.
- It accounts for **22.7%** of the **area of the region**.
- The region is the **second largest** in the **Western highlands**. About **70% of its area is lies within 1,000-2,000 meters altitude**.
- The **southwestern plateau** is the **wettest in Ethiopia**.
- It is **drained** by **Dabus**, **Deddessa** (tributaries of Abay), **Baro**, **Akobo** and the **Ghibe/Omo rivers.**
- **Guge Mountain** is **the highest peak** with height of **4,200 m a.s.l**

II. The Western Lowlands

- These are the **western foothills** and **border plains** that extend from **Western Tigray** in **the north** to **southern Gamo-Gofa** in the **South**.
- They make **11% of** the area of the physiographic region**;** the general **elevation** ranges between **500** and **1000 m a.s.l**
- This physiographic sub-region is further subdivided into four:

a. Tekeze lowland,

b. Abay-Dinder lowland,

c. Baro lowland, and

d. Ghibe lowland.

- With the **exception** of the **Baro lowland**, the region is generally **characterized** by **arid or semi-arid conditions**.
- **Pastoral or semi-pastoral economic activities dominate the area**.
- **Irrigation agriculture** is highly **feasible in the area using the existing few rivers** (For example, the **Baro lowland** has **an extensive flat area suitable for mechanized agriculture**), but **rain fed agriculture** is difficult **due to the arid or semi-arid conditions in the area.**

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- The **Ghibe/Omo lowland**, which includes **the lower Ghibe/ Omo Valley** and **the northern section of the Turkana basin;** But **structurally** it also **belongs** to the **Rift Valley.**
- In the **Western lowlands**, there are important towns like **Humera, Metema, Omedla, Kurmuk** and **Gambella**

2.The Southeastern Highlands and Lowlands:

I. Southeastern Highlands

II. Southeastern Lowlands

The Southeastern Highlands and Lowlands

- This physiographic region is the **second largest** in terms of **area**. It accounts for **37% of the area of Ethiopia**.
- The **highlands** make up **46% of the physiographic division** while **the rest is lowland**.
- It is further **subdivided** into **two units of highlands** and **two units of extensive lowlands.**

a. The Arsi-Bale-Sidama Highlands:

- These highlands are found to the **east of the Lakes Region**
- They make up **28.5% of the area of the region** and **62% of the south - Eastern Highlands.**
- The **well-known mountains** in this area are **Mount Kaka** (4,180 m a.s.l), **Mount Bada** (4,139 m a.s.l) and **Mount Chilalo** (4,036m a.s.l).
- The **Bale highlands** are separated from the **Arsi highlands** by the head and main stream of **Wabishebelle**.
- The **Afro-Alpine summit of Senetti plateau** is found in Bale.
- **The highest mountain peaks** in this region are **Tulu-Demtu** (4,377 m a.s.l) and **Mount Batu** (4,307 m a.s.l).
- The **Arsi-Bale Highlands** are **important grains producing areas**
- **The Sidama Highlands** are **separated** from the **Bale Highlands** by the **Ghenale river valley**
- The **prominent** feature in the Sidama highlands is the **Jemjem plateau**, an important **coffee growing area.**
- **Rivers Wabishebelle** and **Ghenale** along with their **tributaries** have dissected this physiographic region (SEHLs)
- **Weyb River**, **tributary of Ghenale**, has **cut an underground passage** (**Sof Omar cave**); the cave is found near **Bale Mountains**.

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b. The Hararghe Plateau:

- It extends from the **Chercher highlands** in the south-west to **Jigjiga** in the east.
- It makes up **38%** of the **South Eastern highlands** and **17.4%** of the **whole physiographic region**.
- **It has** the **smallest proportion** of upper highland (>2,000 meters).
- The **left-bank tributaries** of **Wabishebelle** drain it
- The **highest mountain** here is **Mount Gara-Muleta** (3,381 m a.s.l).

II. The Southeastern Lowlands

- The **Southeastern lowlands** are located in the **southeastern part of the country** and **they are the most extensive lowlands in Ethiopia**.
- They make up **54% of the area of the physiographic region** and **around one-fifth of the country**.
- This region **is divided** into **Wabishebelle plain** (60%) and the **Ghenale Plain** (40%).
- They include the **plains of Ogaden, Elkere,** and **Borena**
- Because of the **harsh climatic conditions**, **these lowlands** are **little used** and **support very small population**
- They are **sparsely inhabited** by **pastoral** and **semi-pastoral** communities
- The **economic potential** for this region includes **animal husbandry, irrigation agriculture** and perhaps **exploitation of petroleum** and **natural gas**.

3. The Rift Valley

Rift Valley

- The **Rift Valley** is a **tectonically** formed **structural depression.**
- It is bounded by **two major** and **more or less parallel escarpments**.
- The formation of the **Rift Valley** has **separated** the Ethiopian **Highlands** and **Lowlands** in to two.
- It **extends** from the **Afar triangle** in the **north** to **Chew Bahir** for about 1,700 km^2.
- **It covers 18% of the area of Ethiopia**
- The **floor of the Rift Valley** is made up of **interconnected troughs, grabens** and **depressions**.
- **Volcanic rocks**, **fluvial** and **lacustrine** **deposits cover the floor**.
- **Altitude** in the **floor** ranges from **125 meters below sea level** at **Dallol Depression**, to **as high as 2,000** meters **above sea level** in the **lakes region**.
- Because of its **altitudinal variation** and **positional differences**, **the climate** also **varies** from **warm**, **hot** and **dry** to **cool** and **moderately moist conditions**.
- There are **sparsely inhabited pastoralists** **in there area** and also some parts of people **practice some rain-fed agriculture**

i. The Afar Triangle

- The **Afar Triangle** is the **largest** and **widest** part of the **Rift Valley**. It makes up **54% of the Rift Valley area**.
- The area is low in **altitude** (300-700 meters).
- **It is a triangular-shaped lowland**
- **The lowest ground is Danakil depressio**n, particularly **the shores of Lake Asale** with **125 meters b.s.l ,** represent the **lowest sub aerial point** of the **African continent**.
- The area **hosts** one of the **most hostile environment**, that is, **Dallol**
- The **area** is characterized by **faulted depressions** (**grabens**), **volcanic hills**, **active volcanoes**, **volcanic ridges**, **lava fields** and **low lava platforms.**
- **Lakes (Abe, Asale,** and **Afrera*)* occupy** some of the basins.
- A **prominent feature** in this region is the **Denakil Depression *(*Kobar Sink).** A **larger part of the depression** is covered by **thick** and **extensive salt plain.**
- **Lake Asale** and **Lake Afrera occupy** the **lowest parts** of this **sunken depression.**
- The **Afar Triangle** is generally **hot** and **dry.**
- One can get **water** only from **Awash River**
- The **economic importance** of this region includes **salt extraction**, **irrigation along the Awash River** and **electric potential** from **geothermal energy**.

ii. The Main Ethiopian Rift/Central Rift

- It refers to the **narrow belt** of the Rift Valley that extends from **Awash River** in the north to **Lake Chamo** in the south.
- This part of **the Rift Valley** is the **narrowest** and the **highest**. It has an average **width** of **50-80 kilometers** and general elevation of **1,000-2,000 meters a.s.l**.
- **In the floor, the big volcanic mountains include:**
  - **Mount Fentale,**
  - **Mont Boseti-guda (near Adama),**
  - **Mount Aletu (north of Lake Ziway) and**
  - **Mount Chebi (north of Lake Hawasa).**
- Because of **altitude**, the **lakes region of the Main Ethiopian Rift** is generally **milder** and **watery**.
- In the area **rain-fed agriculture** is also practiced.
- Other **resource bases** in the area include the **recreational value** of the **lakes**, the **agricultural importance** of some **streams** and **lakes**, and the **geothermal energy potential**.

iii. The Chew Bahir Rift

- This is the **smallest** and the **southern-most part** of the Rift Valley
- It is **separated** from the **Main Ethiopian Rift** to the north by the **Konso** and **surrounding highlands**
- The **characteristic feature** of this region is **the broad** and **shallow depression**, which is a **marshy area** covered by **tall grass**, into which the **Segen** and **Woito streams empty**.

The Impacts of Relief on Biophysical and Socioeconomic Conditions

- The **highly dissected character** of **land escape** and **the limited extent of flat or plain surface in the country influenced** the **various** the **socioeconomic aspects** of people in Ethiopia:

1. Agricultural practices:

- **Relief influences:**

- farm size and **shape,** particularly in **rugged terrains (here, farm land is small in size and fragmented-irregular in shape)**

- the **choice** of **farming techniques** and **farm implements (i.e. mechanization is difficult in rugged terrains)**

- crop production as some corps are **well adapted** to **higher altitudes** (barley, wheat) and others to **low altitude** (sorghum, maize).

- the practice of animal husbandry

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2. Settlement pattern:

- **Highlands of Ethiopia** that experience **a temperate type of climatic condition** that are mainly **free from** most of the **tropical diseases** are **densely settled.**
- **Rugged and difficult terrain hinders the development of settlement and** its **expansion.**
- **The highlands of Ethiopia** are characterized by **sedentary life** and **permanent settlements** while **lowlands** that are **inhabited by pastoralists** have **temporary settlements.**

3. Transportation and communication:

- **The highly dissected nature of the landscape** is a **barrier** to the **development of internal surface transportation** that resulted in the long-term isolation of many communities
- The **difficult terrain** makes **infrastructure development** and **maintenance costly**.
- **TV** and **radio communications** are also **highly influenced** by **relief**.
- The **rugged topography rendered rivers less navigable** due to the **waterfalls**, **deep gorges** and **steep cliffs**.

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4. Hydroelectric power potential:

- The **great difference** in **altitude** coupled with **high rainfall** created **suitable conditions** for a **very high potential** for the **production of hydroelectric power** in Ethiopia.

5. Socio-cultural feeling :

- The **rugged terrain** as a result of **excessive surface dissection** resulted in the **long-term isolation of communities** that **led to the occurrence** of **cultural diversity**.
- **People who live in the highlands** have been identifying themselves as **degegnas (mountaineers)** and those **who live in the lowlands** as **kollegnas (lowlanders).**

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6. Impacts on climate:

- The **climate** of Ethiopia is a result of the **tropical position** of the country and the **great altitudinal variation** of the general topography.
- **Highlands** with **higher amount of rainfall** and **lower rate of evapo-transpiration** tend to be **moisture surplus** compared to the moisture **deficit lowlands**.

7. Impacts on soil:

- **Steep mountain slopes** provide **low angle of rest**, **unstable surface materials** and **subject** to **degradation processes** and **relatively** form **shallow** and **little developed soils**.

8. Impacts on natural vegetation

- **Relief through** its **effect on climate** and **hydrology affect** the **type** of **natural vegetation grown** in an area.

Discussion Question

- **Answer the following questions briefly.**

1. What are the **impacts of relief** on the **biophysical and socioeconomic conditions** of Ethiopia?
2. Discuss the **physiographic characteristics** of the **southeastern highlands and lowlands**.

Thank You!!!