

CHAPTER THREE

THE TOPOGRAPHY OF ETHIOPIA AND THE HORN

Outline of the Chapter

CHAPTER THREE

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Review Questions

3.1 Topography of Ethiopia & the Horn: An overview

What are the key geologic activities of Cenozoic era that largely determine the topography of Ethiopia?

- In the Cenozoic Era, **two major geologic activities** happened in Ethiopia and the Horn. These include:
 - a) **The uplifting of Arabo-Ethiopian landmass**
 - b) **Faulting that resulted in the formation of Great East African Rift Valley system**
- Overall, these events determined the current topographic features (e.g., Mountains, Valleys, and drainage systems) of Ethiopia and the Horn.

3.1.1 Unit 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.*
- ✓ *Elucidate the physiographic characteristics of the Rift Valley.*
- ✓ *Explain the impacts of relief on biophysical and sociop-economic conditions.*

3.1.2 General Characteristics of Ethiopian Physiography

- The Ethiopian Physiography is **very diverse**: flat-topped plateaus, high and rugged mountains, deep river gorges and vast plains.
- Altitude ranges from **125 m.b.s.l (Kobar Sink)** to the highest mountain in Ethiopia, **Mount Ras Dashen (4,620 m.a.s.l)**.
- ***Why is Ethiopia described as the Roof of East Africa?***
- Whilst the **highlands** are located in the **central** locations, the **semi-arid lowlands** are located in the **peripheries**
- The diversity in topography is accompanied by differences in other natural features such as **soil, climate, vegetation and wild life**.
- Likewise, the socio-cultural and economic phenomena are also affected by the topography.

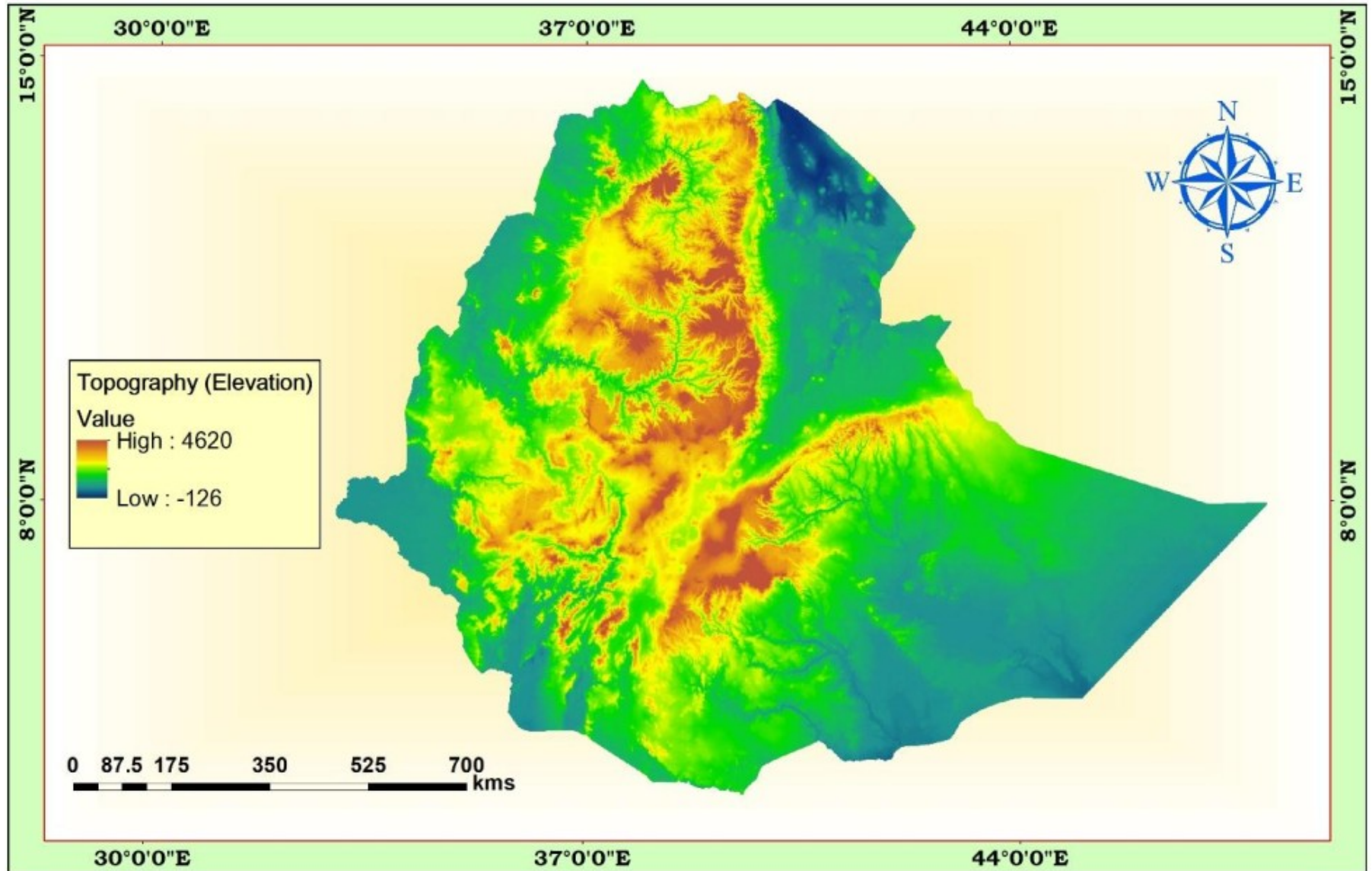
3.1.2.1 Comparison of Highlands & Lowlands based on their major characteristics

Major characteristics of Highlands (56%)	Lowlands
▪ Moderate and high amount of rainfall (>600 mm per year). ▪ Lower mean annual temperature (<20°C). ▪ The climate is favorable for biotic life. ▪ Rain-fed agriculture is possible. ▪ Free from tropical diseases. ▪ Attractive for human	▪ Receive smaller amounts of rainfall and higher temperature. ▪ Have a high prevalence of tropical diseases. ▪ Have lower population densities. ▪ Are dwelled by nomadic and semi-nomadic economic life. ▪ Are a vast plain lands favorable for irrigation

3.2. The Physiographic Divisions of Ethiopia

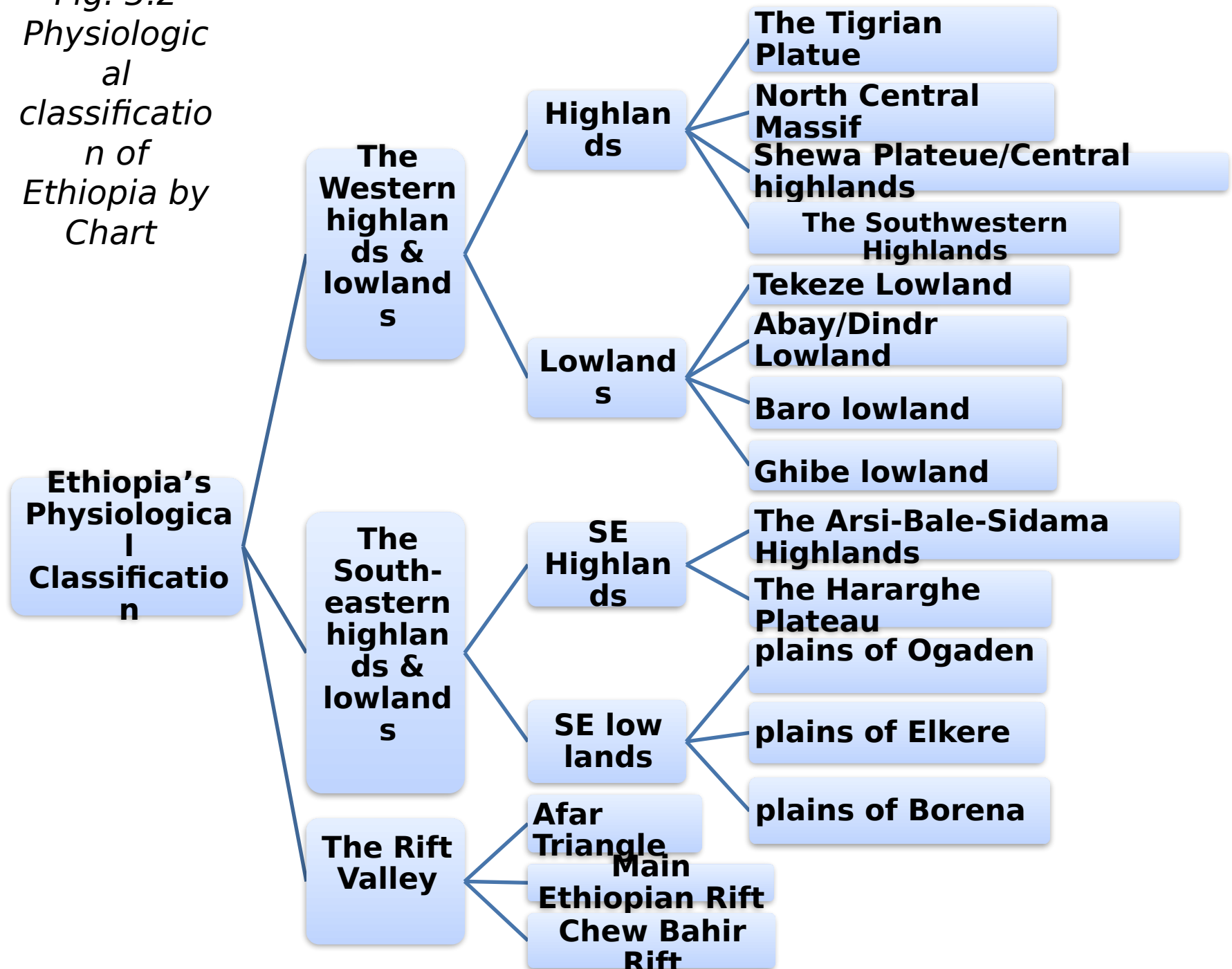
- Following the structural divisions brought about by the geologic processes of the Cenozoic Era, **three major physiographic** units can be identified in Ethiopia. These are:
 1. **The Western highlands and lowlands**
 2. **The South-eastern (Eastern) highlands and lowlands, and**
 3. **The Rift Valley**

Figure 3.1. Ethiopian Topography



Source: CSA shape file, 2012

Fig. 3.2
Physiologic
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classificatio
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Ethiopia by
Chart



3.2.1. The Western Highlands and Lowlands

- includes all the area west of the Rift Valley.
- It extends from north to south encompassing nearly the whole western half of Ethiopia.
- 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%)

The Western 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.
- Long period of denudation has created residual features of granite hills, rugged topography, and Ambas.
- 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)

b. North Central Massifs

- is the largest in the western highlands.
- Much of its northern and southern limit follows the Abay and Tekeze gorges.
- The Abay, Tekeze and their tributaries have cut into this region a maze of gorges, steep sided river valleys, dividing the land into many isolated plateau blocks, precipitous tablelands and other rugged surface forms.
- plateau and tablelands are still capped by the Trappean lava.
- accommodates the **Lake Tana** basin.
- **58% of** the region is at an altitude of more than 2,000 meters, making it, next to the Shewan Plateau, the **second highest physiographic** division.
- 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.
- the most popular ones include Mount **Ras Dashen** (4,620 m.a.s.l), Mount **Weynobar/Ancua** (4462 m.a.s.l), Mount **KidisYared** (4453 m.a.s.l), and Mount **Bwahit** (4437 m.a.s.l) in the Simen Mountain System.
- Mount Guna (4,231m.a.s.l), Abune Yoseph (4,260 m.a.s.l and Mount Birhan (4,154 m.a.s.l)
- These mountains have **steep cliffs and rugged** terrain that provide scenic views to climbers

C. The Shewa Plateau/central highlands

- is bounded by the Rift Valley in the east and southeast, by the Abay gorge in its northern and western limit, and the Omo gorge in the south and west.
- occupies a central geographical position in Ethiopia.
- With only 11% of the area of the whole physiographic region, the Shewa Plateau is the smallest of the Western highlands.
- Nearly **threefourth** of its area is at an altitude of more than 2,000 meters above sea level. 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. It, therefore, forms a water divide for these three river basins.
- 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

- ❖ consists of the highlands of Wellega, Illuababora, Jimma, Kaffa, Gamo and Gofa.
- ❖ 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.
- ❖ is the wettest in Ethiopia.
- ❖ It is drained by Dabus, Deddessa (tributaries of Abay), Baro, Akobo and the Ghibe/Omo rivers.
- ❖ With a height of 4,200 meters above sea level, **Guge** Mountain is the highest peak in this physiographic subdivision.

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 meters above sea level.
- is further subdivided into four by the protruding ridges.
- These are **Tekeze lowland, Abay-Dinder lowland, Baro lowland, and Ghibe lowland** from north to south.
- 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.
- As one moves northwards, the degree of aridity increases, making rain-fed agriculture more difficult.
- Since one or two rivers cross all of these lowlands, **irrigation agriculture** is highly feasible.

For example, the **Baro lowland** has an extensive flat area suitable for mechanized agriculture.

- The Ghibe/Omo lowland, which includes the lower Ghibe/Omo Valley and the northern section of the Turkana basin, is classified in the Western lowlands from its geographical location. But structurally it also belongs to **the Rift Valley**.
- In the Western lowlands, there are small but important towns. These are Humera, Metema, Omedla, Kurmuk, Gambella etc.

3.2.2. The Southeastern Highlands and Lowlands

- 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.
- These are further subdivided into two units of **highlands** and **two units of extensive lowlands**.

A. The Arsi-Bale-Sidama 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 Arsi Highlands are made up of flat rolling uplands and dissected mountains.
- ❖ The wellknown mountains in this area are Mount **Kaka** (4,180 m.a.s.l), Mount **Bada** (4,139 m.a.s.l) and Mount **Chilalo** (4,036 m.a.s.l).
- ❖ The Bale highlands are separated from the Arsi highlands by the head and main stream of **Wabishebelle**.
- ❖ The highest mountain peaks in Bale 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 with still high potential.

- The **Sidama Highlands** are separated from the Bale Highlands by the **Ghenale river valley**.
- The prominent feature here is the **Jemjem plateau**, an important **coffee growing** area.
- Rivers Wabishebelle and Ghenale along with their tributaries have dissected this physiographic region. Specially, Weyb River, tributary of Ghenale, has cut an underground passage (**Sof Omar cave**) through the Mesozoic Limestone rocks.
- The cave is found near **Bale Mountains**. It is one of the World's most spectacular and extensive underground caverns creating a magnificent view accessible only by an underground stream.

B. The Hararghe Plateau

- is a north-easterly extension of the south-eastern highlands.
- 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).
- It is a low lying and elongated region.
- The highest mountain is Mount **Gara-Muleta** (3,381 m.a.s.l).

The Southeastern Lowlands

- are located in the southeastern part of the country
- they are **the most extensive lowlands in Ethiopia**.
- make up 54% of the area of the physiographic region and around **one-fifth** of the country.
- This region is divided into:
 - ❖ Wabishebele plain (60%) and
 - ❖ the Ghenale Plain (40%).
- They include the plains of Ogaden, Elkerre, 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**.

3.2.3. The Rift Valley

- ❖ is a tectonically formed structural depression.
- ❖ The formation of the Rift Valley has separated the Ethiopian Highlands and Lowlands into two.
- ❖ It extends from the Afar triangle in the north to Chew Bahir for about 1,700 km².
- ❖ It covers 18% of the area of Ethiopia.
- ❖ It is elongated and funnel shaped, with a NE-SW orientation.
- ❖ It opens out in the Afar Triangle, where it is the widest, and narrows down to the south.
- ❖ 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.
- ❖ The Rift Valley is further subdivided into three physiographic sub-regions.
 - ✓ the Afar Triangle,
 - ✓ the Main Ethiopian Rift, and
 - ✓ the Chew Bahir Rift.

i. 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 generally of low altitude (300-700 meters).
- 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 these basins.
- A prominent feature in this region is the **Denakil Depression** (Kobar Sink).
- A larger part of it is covered by thick and extensive salt plain.
- The Afar Triangle is generally hot and dry.
- The only respite one gets in the Southern part is from the waters of the 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.
- It is bounded by the western and eastern escarpments. With the exception of the Arbaminch area, the bounding escarpments are generally low.
- 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 above sea level.
- The floor in many places is dotted by cinder cones and volcanic mountains.
- The big ones include Mount **Fentale, Boseti-guda** (near Adama), **Aletu** (north of Lake Ziway) and **Chebi** (north of Lake Hawasa).
- the lakes region of the Main Ethiopian Rift is generally milder and watery. Here rain-fed agriculture is practiced.
- Other resource bases 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

- is the smallest and the southernmost part of the Rift Valley.
- Gneissic highlands of **Konso** and the surrounding highlands separate it from the Main Ethiopian Rift to the north.
- 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.

3.3. The Impacts of Relief on Biophysical and Socioeconomic Conditions

The highly dissected character of the landscape over much of the country's territory along with the limited extent to which flat surfaces are present influence the various socioeconomic aspects of Ethiopia as presented hereunder.

1. Agricultural practices

- Relief influences **farm size and shape** in that in an area of rugged terrain the farmlands are small in size and fragmented and tend to be irregular in shape.
- **Choice of farming techniques** and **farm implements** are highly influenced by relief as in rugged terrain mechanized farming techniques are difficult to practice.
- Relief influences **crop production** as some crops are well adapted to **higher altitudes**(**barley, wheat**) and others to **low altitude** (**sorghum, maize**).
- The practice of **animal husbandry** is also influenced by relief as

3.3. The Impacts of Relief...cont'd

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

3.3. The Impacts of Relief...cont'd

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).

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.

3.3. The Impacts of Relief...cont'd

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.

Review Questions

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.
3. Discuss how highlands have been historically significant in Ethiopia's economic, cultural and political life?