

# GEOGRAPHY

STUDENT TEXTBOOK  
GRADE 9

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The collage features several elements: a Pegasus Airlines aircraft in flight, a globe showing latitude and longitude lines, and a detailed map of Ethiopia's river basins. The map includes labels for major basins such as Tekeze, Abbay / Blue Niles, Awash, Baro Akobo, Riri Valley, Wabi Shebele, Omo Gibe / Lake Turkana, Genale Dawa, and Ogaden. It also shows major cities like Addis Ababa, Hargeysa, and Djibouti. A legend on the right side of the map defines symbols for surface water (Surface water, Lake, Occasional lake), dams (Dam), basins (Main basin, Sub basin), watersheds, and contributors. The map is credited to Esri, HERE, Garmin, FAO, NOAA, USGS | WLRC Ethiopia, CDE.



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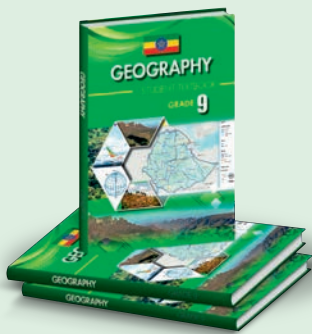


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# GEOGRAPHY

## STUDENT TEXTBOOK

### GRADE 9

**Writers:** Muluemebet Worku (Ph.D)  
Kidanemariam Paulos (Ph.D.)

**Editors:** Sintayehu Teka (M.Sc.) (Content Editor)  
Kassie Molla (M.A.) (Language Editor)  
Hirut Woldemichael (M.A.) (Curriculum Editor)

**Illustrator:** Agenchw Nega (M.Sc.)

**Designer:** Geda Hoka (M.A.)

**Evaluators:** Tesfaye Shiferaw (PhD)  
Abebe Yibeltie (MA)  
Hussein Seid (MA)



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**HAWASSA UNIVERSITY**

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# 1. GEOLOGICAL HISTORY AND TOPOGRAPHY OF ETHIOPIA

## INTRODUCTION

As you remember, in grade eight you learnt about the physical characteristics of the Earth, people and socioeconomic activities, natural resources and socioeconomic development, modern history of Ethiopia and contemporary global issues.

In this grade you are going to study about the geography of Ethiopia. This textbook comprises the physical, human and economic environment of the country. Subsequently, you will learn about the country's location, size, shape, geological history, topography, drainage, climate, vegetation, wildlife, soil, mineral resources, major economic activities and human-natural environment interactions. In addition, the major topics to be covered also include the geographic enquiry, skills and techniques.

Before you start studying the above mentioned geographical themes, you will be acquainted with some basic concepts related to the science of geography hereunder. These concepts include the meaning, scope and branches of geography.



## Unit Outcomes

*After completing this unit, you will be able to:*

- ✓ recognize the concept, scope and branches of geography;
- ✓ express the basic land features of the physical environment;
- ✓ describe the absolute and relative location of Ethiopia;
- ✓ analyze the effects of shape and size of Ethiopia on its sociocultural, political and economic condition;
- ✓ explain geologic processes that shaped the land surface of Ethiopia; and
- ✓ describe the different landforms of Ethiopia.



## Main Contents

- 1.1 Geography: Meaning, scope and branch
- 1.2 Location, size, and shape of Ethiopia
- 1.3 Geological history of Ethiopia

 **Unit Summary**

 **Review Exercise**

## 1.1 GEOGRAPHY: MEANING, SCOPE AND BRANCHES





*At the end of this section, you will be able to:*

- ✓ define geography as a subject;
- ✓ describe the scope of geography; and
- ✓ identify the branches of geography.



## KEY TERMS

 Geography  
 Human geography

 Physical geography  
 Spatial

### 1.1.1 Meaning of Geography

*What is geography? Do you think geography has a single universally accepted definition? If not, why?*

The term “Geography” first appeared in history at the time when the Greek civilization reached its peak. They defined geography for the first time by combining two words of Greek origin namely: *Geo* and *Graphos*.

→ *Geo* – which means earth

→ *Graphos* – which means writing

Eratosthenes, a famous Greek Philosopher (276-194 B.C) coined the term Geography and defined it as “the field of study that deals with the description of the earth”. Now this definition seems very general when we compare it to the scope of current geography.

A number of definitions have been given by different scholars of the nineteenth and twentieth centuries. These definitions relate to geography’s current concerns, interests and focus.

Here are some of the most important definitions that scholars have proposed:

- 🌐 **Eratosthenes (276-196 BC)** – *Geography is the description of the earth.*
- 🌐 **Alexander Von Humboldt (1769-1859)** - *Geography is a synthesizing discipline to connect the general with the particular through measurement, mapping, and a regional emphasis.*
- 🌐 **Concise Oxford Dictionary (1964)** - *Geography is the science of the earth’s surfaces.*
- 🌐 **Hartshorne, R. (1899-1992)** – *Geography is a branch of knowledge that is concerned with the provision of an accurate, orderly and rational description of distributions on the surface of the earth.*
- 🌐 **Yeates, M. (1968)** – *Geography is a science that is concerned with the rational development and testing of theories that explain and predict the spatial distribution and locations of things and phenomena on the surface of the earth.*

As you have read above, each of these definitions includes the idea that *geography studies the earth*. Most of them specify *the surface of the earth*.



It is difficult to forward a definition acceptable to all geographers at all times and places because of the dynamic nature of the discipline and the changes in its scope and method of study. However, the following may be widely accepted definitions by most scholars.

*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.*

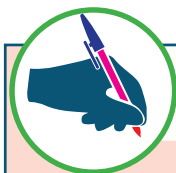
### 1.1.2 The Scope of Geography

***What does the word scope mean? What is the scope of geography?***






Scope refers to the content (how broad or narrow) of the field of study of a given discipline, in this case geography. The scope of Geography is very wide. As the scope is dynamic, it often changes as discoveries and ideas enter the field.

Geography studies a great many physical and human features of the world. Its focus includes their causes, effects, and interactions. As a result, the subjects that geography examines include features in the hydrosphere, atmosphere, lithosphere, biosphere and anthroposphere.

Geography as a field of study is also concerned with the economic, social, political and ecological problems that you hear every day. It is also concerned with modern technology, such as computers, Global Positioning System (GPS) and Geographic Information System (GIS) to analyze information and draw conclusion with accuracy.



#### NOTE

-  **Hydrosphere** – it includes all the bodies of water, i.e., oceans, rivers, lakes and others.
-  **Biosphere** – refers to all living organisms in and on the earth's surface.
-  **Atmosphere** – it includes all aspects of air composition surrounding our planet.
-  **Lithosphere** – it is the solid layer of rocks that covers the entire surface of the planet.
-  **Anthroposphere** – it is the part of the environment that is made or modified by humans.

*Did you notice how wide the scope of geography is? Do you understand the extent of its scope?*

It is true that geography has a very wide scope. However, this does not mean its scope is limitless. The major areas that geography focuses on are:

- 🌍 *the earth, its position in the universe and its movements;*
- 🌍 *the different physical features that constitute the earth's surface, the forces that cause them, their variations from place to place and their changes over time;*
- 🌍 *the different relationships between human beings and their natural environment. Also, the interdependence and the impact that each has on the other;*
- 🌍 *the conditions of the lower part of the atmosphere and the subsequent weather and climatic conditions, together with their spatial distribution and variation;*
- 🌍 *the materials that make up the earth and its diverse landforms; and*
- 🌍 *the major economic activities of humans and the impacts on the environment.*

Therefore, geography deals with an enormous range of phenomena ranging from physical and biotic to human environment. It is possible to conclude that although wide in its scope, geography has certain areas that it focuses upon. Hence, geography is a holistic discipline of knowledge and research (academics).

### 1.1.3 Branches of Geography

*What are the two branches of geography? Can you list some of the fields of geography that fall into each of the two branches?*

You have studied the definition of geography, and you have considered its scope. Next, you will learn about the main parts of geography and its sub-branches. The two main parts are:

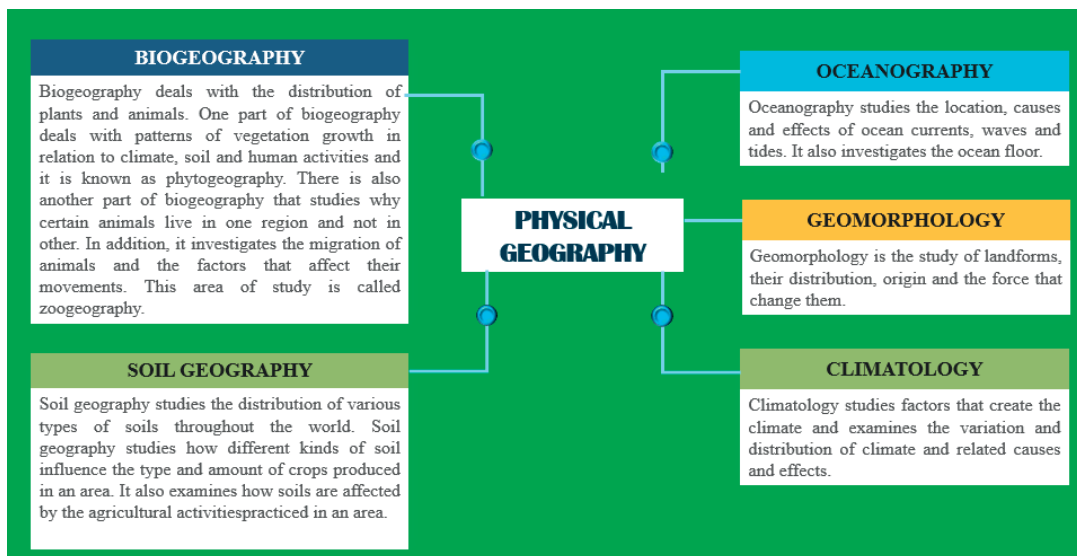
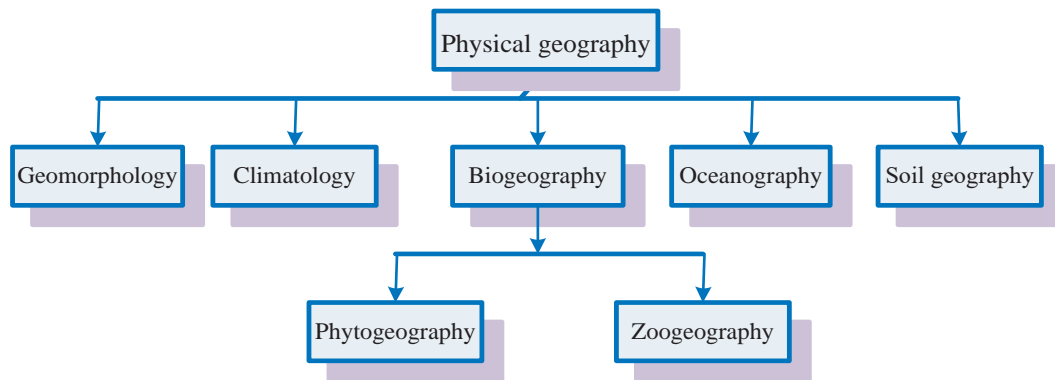
- 🌍 *physical geography; and*
- 🌍 *human geography*

## A. Physical Geography

*What does physical geography study? Do you know the sub-branches of physical geography?*

Physical geography studies the distribution of the natural features of the world, such as climate, landforms, soil, vegetation, surface drainage systems, water resources and animals. This branch of geography also considers the causes, effects and interactions of these features.

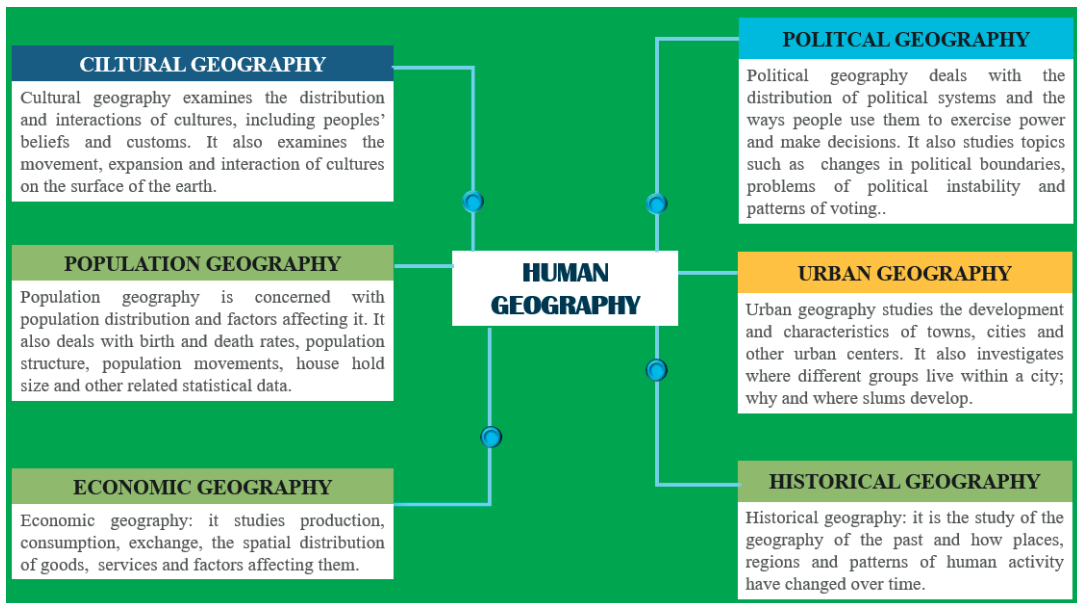
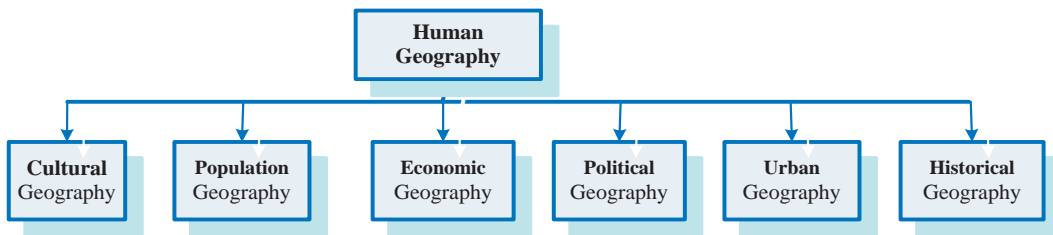
Physical geography is further sub-divided into more specialized fields of study as follows:



## B. Human Geography

*What does human geography study? Do you know the sub-branches of human geography?*

Human geography studies the distribution and influence of human aspects of our world, including cultures, population settlement, economic activities and political systems. This branch of geography is sub-divided into the following specialized fields of study.



## Activity 1.1



**Discuss the following questions in small groups.**

1. Geography studies the spatial distribution of phenomena on the earth's surface on one hand and the two-way interactions and interdependences between humankind and the environment on the other. Do you agree or disagree to this statement? Why?
2. Some people say geography is concerned only with the study of place names. Do you agree or disagree to such idea? Why?
3. Do you think that the scope of geography is limitless? Why or why not?
4. What are the major areas of the study of geography?

## 1.2 LOCATION, SIZE AND SHAPE OF ETHIOPIA

*At the end of this section, you will be able to:*

- ✓ describe the absolute and relative location of Ethiopia; and
- ✓ discuss the effects of size and shape of Ethiopia on its sociocultural, political and economic condition.



### KEY TERMS

- 🔑 Absolute location
- 🔑 Compact shape
- 🔑 Elongated shape
- 🔑 Strategic location

- 🔑 Latitude
- 🔑 Longitude
- 🔑 Relative location
- 🔑 Vicinal location

### 1.2.1 Location of Ethiopia

***Why is the location of things important in geography? What locational significance does Ethiopia have as a country that is in the Horn and near the Red sea route?***

A location is a place where a particular point or object exists. In spatial distribution, every place has its own particular location in relation to its surroundings.

In geography, the term *location* is a much more abstract concept than what an ordinary person knows. This important term is usually expressed in two ways: relative location and absolute location.

### A. Relative Location of Ethiopia

*Can you identify the relative location of your school or residence?*

Relative location refers to the position of a place in relation to the location of other geographic features. Relative location can be expressed in the following two ways; namely; vicinal location and geological location. Vicinal location shows the location of a country in relation to neighboring countries (Table. 1.1), while the strategic also known as natural location describes a country's location in reference to water bodies and landmasses.

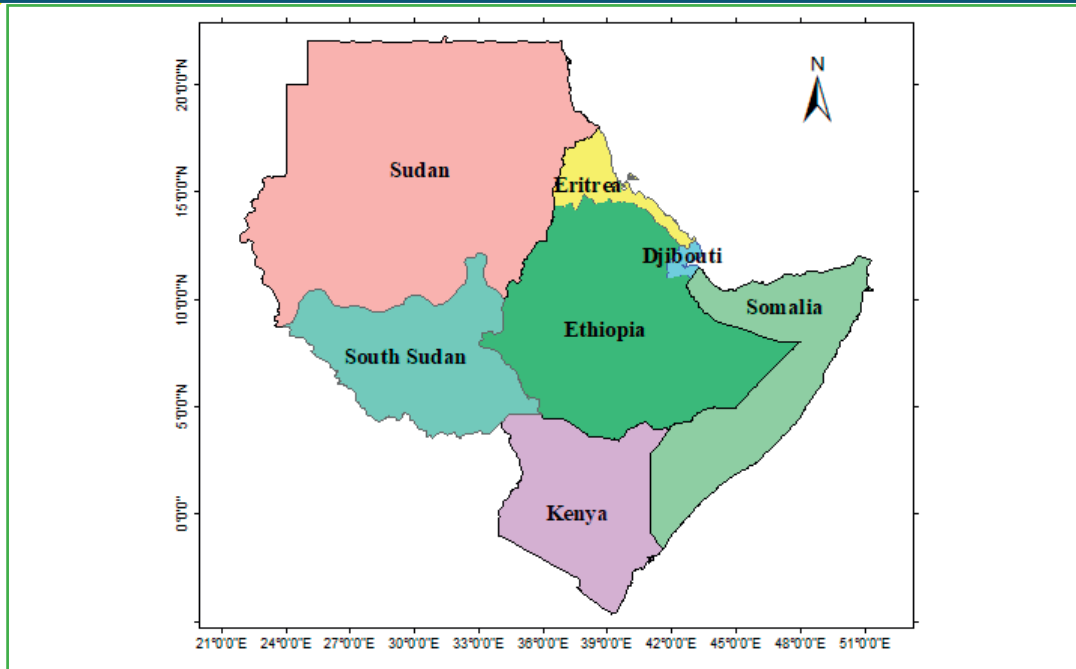
#### i. Vicinal Location of Ethiopia

Ethiopia is a landlocked country that is surrounded by six neighboring countries (see Fig 1.1). Each country shares different lengths of Ethiopia's borderlines. The total length of Ethiopia's boundary line is 5,260 km.

*Table 1.1: Ethiopia's Boundary Line length as Shared with Neighboring Countries*

SN	Bordering Countries	Shared Boundary Length in Km	Ethiopia is found;
1	Djibouti	310	West of Djibouti
2	Eritrea	840	South of Eritrea
3	Kenya	760	North of Kenya
4	Somalia	1,600	West and Northwest of Somalia
5	Sudan	744	East and Southeast of Sudan
6	South Sudan	1,006	Northeast of South Sudan
Total		<b>5,260</b>	

Table 1.1 indicates that Ethiopia shares the longest length of boundary line with Somalia while the Republic of Djibouti shares the smallest boundary line length.



**Figure 1.1:** Relative Location of Ethiopia

## ii. Strategic Location of Ethiopia

Strategic location is also called natural or global location. Consequently, Ethiopia's strategic location can be described in the following ways. It is found:

- 🌐 *in northeastern (Horn) Africa;*
- 🌐 *to the southwest of the Asian continent;*
- 🌐 *in the Nile Basin;*
- 🌐 *to the south of Europe;*
- 🌐 *to the northwest of the Indian Ocean;*
- 🌐 *to the southwest of the Red Sea; and*
- 🌐 *to the south of the Mediterranean Sea.*

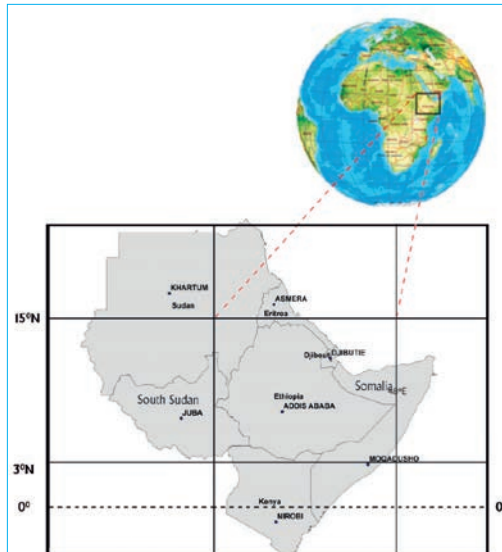
## B. Absolute or Astronomical Location of Ethiopia

*How do we know the exact position of Ethiopia on the earth's surface? Can you describe the absolute location of Ethiopia?*

Absolute location is expressed as a geographical extent, in terms of latitudes and longitudes. The absolute location of Ethiopia is expressed as follows.

*Ethiopia is located between 3°N – 15°N latitudes and 33°E– 48°E longitudes*

As a result, Ethiopia's extreme points lie at:



- 🌍 the Northern tip of Tigray in the north;
- 🌍 Moyalle in the south (Borena);
- 🌍 Akobo in the west (Gambella) and
- 🌍 the tip of Ogaden in the east (Ogaden) ( see Fig.1.2).

**Figure 1.2:** Absolute Location of Ethiopia

## 1.2.2 Size of Ethiopia

*How big is Ethiopia areally and what are the effects of its size?*

Ethiopia is the tenth largest country in Africa, with a total area of 1,106,000 square kilometers. It contains about 0.7 percent of the world's land area and about 3.6 percent of Africa's land mass.

**Table 1.2:** Comparison of Ethiopia's Areal Size with its Neighbors

Country	Total area (in sq.kms)	Rank	Size in comparison to Ethiopia
Ethiopia	1,106,000	2	–
Sudan	1,849,233	1	1.01 times bigger
Somalia	637,661	3	1.73 times smaller
Kenya	580,000	5	1.91 times smaller
Eritrea	118,000	6	9.42 times smaller
Djibouti	23,200	7	Almost 50 times smaller
South Sudan	631,928	4	1.75 times smaller

**Source:** CSA, 2012





## NOTE

The Horn of Africa takes its name from the horn-shaped land formation that forms the easternmost point of the African continent, projecting into the Indian Ocean south of the Arabian Peninsula. Ethiopia is the largest country in the Horn. This status in size, in combination with its status of having a large population, confers many advantages to Ethiopia in the Horn area.

***What advantages and disadvantages does Ethiopia's large size offer the country?***

**Advantages:** Ethiopia's large size lets it:

- 🌐 *enjoy diverse agro-ecological zones, resulting in a wide variety of fauna and flora;*
- 🌐 *possess a large amount of arable land;*
- 🌐 *have a great variety of mineral resources; and*
- 🌐 *be the home of diverse ethnic groups.*

**Disadvantages:** Its large size forces Ethiopia to:

- 🌐 *require expensive administrative expenditure;*
- 🌐 *have a large army to protect its sovereignty;*
- 🌐 *require great financial power to construct infrastructural facilities; and*
- 🌐 *face challenges for effective administration and socio-economic integration.*

### 1.2.3 Shape of Ethiopia

***Look at the shape of Ethiopia and the neighboring countries. Does Ethiopia have similar shape with its neighboring countries? Can you identify the shape of each neighboring countries?***

Countries of Africa and the world at large vary not only in location and size but also in shape. Some countries have nearly circular (compact) shapes, others have elongated (linear) shapes, and still others have truncated (shortened) shapes. These shapes have implications on the administrative, defense and economic integration, both within the country and with respect to outside areas.

When you compare the shape of Ethiopia with the other countries, you find that Ethiopia has more or less compact (circular) shape. Its shape is considered to be compact or essentially circular because the extreme north-south and east-west spans of the country cover comparable distances. You can easily see this approximate circularity in your school atlases and wall maps.

There are three theoretical indicators of the compactness of an area:

- 🌍 *the boundary - circumference ratio (B/C);*
- 🌍 *the area - boundary ratio (A/B); and*
- 🌍 *the actual area - area of the inscribing circle (A/A').*



### NOTE

Each of these theoretical assumptions is based on a value of 1 as indicating a perfectly compact shape except A/B ratio. They consider 0.5 –1.5 values as deviating only slightly from circular/compact and therefore indicating approximate compactness. In contrast, smaller values indicate greater divergence from compactness, especially as they approach zero (0). These small values reflect tendencies to elongation or truncation. On the other hand, A/B ratio compares the total area of a country under consideration with the total boundary length of the same country. The larger the areal size per unit boundary length is, the more compact the country is.

For example, let's use the boundary-circumference ratio to measure Ethiopia's degree of compactness or index of compactness. In the ratio, circumference is based on the assumption of a circle having equal area with the country under consideration.

$$\text{Index of compactness using } \frac{B}{C} \text{ ratio} = \frac{\text{Boundary length of the country}}{\text{Circumference of the circle}}$$

The formula to find the circumference of a circle having equal areal size as the country under consideration is  $2\pi r$  ( $\pi=3.14$ ). The value of radius (r) is not given, and it should be computed. It is going to be calculated taking an area of a circle that is assumed to have equal areal size as the country under consideration.. Thus, area of the circle is calculated taking the following formula (i.e.  $A=\pi r^2$ ).

### Example

The B/C ratio of Ethiopia can be calculated as follows:

Given

- The total boundary length of Ethiopia: = 5260Kms
- Circumference of a circle having an area similar to area of Ethiopia (=1,106,000Km<sup>2</sup>).

Solution:

$C=2\pi r$ , The value of  $\pi$  is 3.14, while the value of "r" is derived from the circle whose area is equal to Ethiopia's area (i.e., 1,106,000Km<sup>2</sup>).

$$\pi r^2 = 1,106,000 \text{Km} \quad r^2 = 352,229.3$$

$$\text{Hence, } r = 593.5 \text{ Kms}$$

$$\text{Therefore, } C = 2\pi r$$

Circumference of area of Ethiopia (if it were circle)

$$= 2 \times 3.14 \times 593.5 = 3727.18$$

$$\text{B/C ratio of Ethiopia} = 5260/3727.18 = 1.411$$

*This value implies that the shape of Ethiopia has a deviation of 41% from the assumed theoretical circular shape it ought to have.*

The compact shape has militaristic advantage as stated earlier. This can be well explained by considering an area and borderline length ratio. The index of compactness using A/B ratio for Ethiopia is indicated hereunder.

$$\frac{\text{Area (A)}}{\text{Borderline (B)}} = \frac{1,106,000 \text{ km}^2}{5,260 \text{ km}} = 210 \text{ km}^2$$

### What does this ratio imply?

- 🌐 *It implies that if 1 km borderline is safeguarded by national army, 210 km<sup>2</sup> of the hinterland will become free from the assault of an enemy.*

Another way of estimating the compactness of shape of any country is considering the ratio of area of the country to the area of the smallest inscribing circle. In the ratio, area the circle is based on the assumption of smallest inscribing circle that touches the north, south, east and west boundaries of Ethiopia described earlier in the "Absolute Location" section.

The ratio of actual area to the area of the smallest inscribing circle ( $A/A'$ ) for Ethiopia can be calculated using the following formula:

$$\frac{\text{Actual area of the country}}{\text{Area of the inscribing circle}}$$

N.B. Lower value near 0 indicates elongation and a higher value near 1 suggests more compactness.

## Activity 1.2



### Answer the following questions

1. Use a world map or atlas and identify places that are in the following positions:  
3°N – 15°N & 33°E– 48°E
2. In small groups, discuss the advantages and disadvantages of the Ethiopia's large size.

## 1.3 GEOLOGICAL HISTORY OF ETHIOPIA



*At the end of this section, you will be able to:*

- ✓ explain the geological history of Ethiopia;
- ✓ distinguish the geological processes that result in the current landform of Ethiopia; and
- ✓ describe major landforms of Ethiopia.



### KEY TERMS

- 🔑 Endogenic force
- 🔑 Epeirogenic
- 🔑 Epoch
- 🔑 Era

- 🔑 Exogenic force
- 🔑 Geology
- 🔑 Orogenic
- 🔑 Period

- 🔑 Regression
- 🔑 Relief
- 🔑 Transgression

### 1.3.1 The Geological Processes in Ethiopia

*Which geological era is significant regarding the formation of the various landforms in Ethiopia?*

The geological history of Ethiopia is part of the geological processes that acted within and upon the earth's surface for many millions of years in the past. To describe the geology and history of life on Earth, scientists have developed the geological time scale. The geological time scale measures time on a scale involving four major geological eras. Each era is divided into periods, the periods into epochs, epochs into years and years into major occurrences.

Each geological era is distinguished from the others based on grounds of the following three characteristics:

- 🌐 *the relative positions of the continents;*
- 🌐 *the character of the prevailing climate; and*
- 🌐 *the predominant lifeform (plants and animals).*

#### Summary of Major Geological Events in the Horn

Let's begin by considering the different geological eras and then study the events that took place in those eras. Here are the geological eras, in chronological order.

- The Precambrian Era – the oldest era (from 4.5 billion years to 600 million years ago).
- The Paleozoic Era (from 600 million years to 250 million years ago).
- The Mesozoic Era (from 250 million years to 70 million years ago).
- The Cenozoic era (from 70 million years to the recent time).

#### 1. The Precambria Era (from 4.5 Billion to 600 Million years ago).

*What do you understand by the term Precambrian?*

The Precambrian Era is the oldest and longest geological era, covering about 5/6 of the earth's geological time.

The following geological events occurred in the Horn during this era.

- 🌐 *Frequent orogenic movements (mountain building process by volcanic eruptions);*
- 🌐 *Intensive volcanic activities;*

- 🌐 Denudation during the later periods (reduction or wearing down of the mountains); and
- 🌐 Formation of folded mountain.



### NOTE

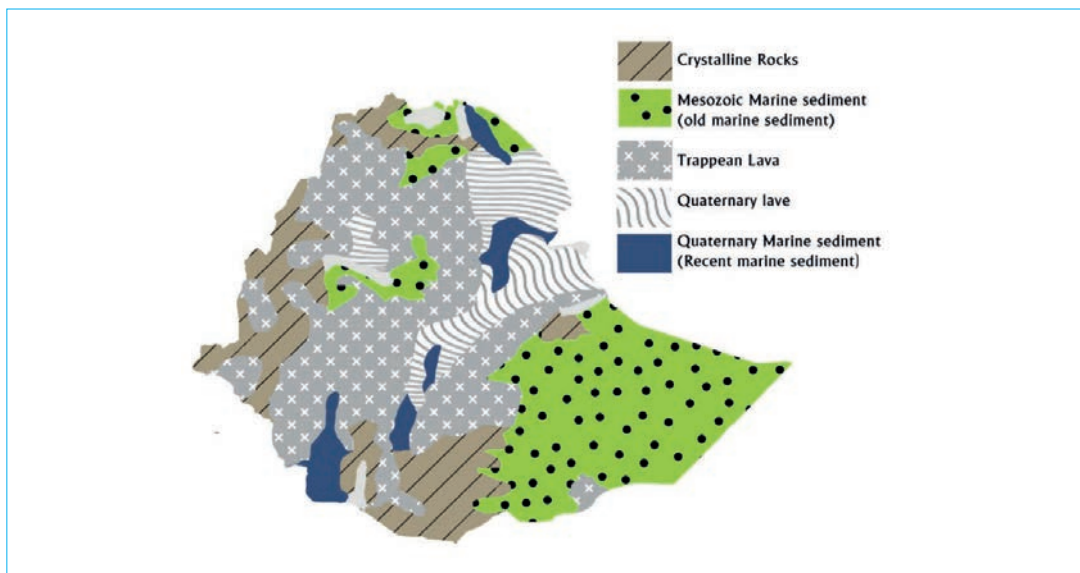
During the Precambrian era:

- 🌐 The first forms of life (one-celled) emerged, such as amoeba, and jellyfish, and
- 🌐 The oldest rock formed – the old crystalline basement/ basement complex rock. This rock is found beneath all other rocks.

Today, in a few areas of Ethiopia, outcrops of old crystalline basement complex rocks are found on the surface, due to continuous denudation.

Example:

- 🌐 In central and northern Tigray;
- 🌐 In Mettekel, Assossa, Illubabor and the Abbay Gorge;
- 🌐 In central Sidama, southern Omo, southern Bale and Borena, and
- 🌐 In central, western and northern Eritrea.



**Figure 1.3:** Geological Map of Ethiopia

## II. The Paleozoic Era (from 600 million years to 250 million years ago)

### *Which life form was dominant in the Paleozoic era?*

During this era, in Ethiopia, the major geologic (geomorphic) process was *denudation* followed by *peneplanation*. No significant structural formation took place. Hence, the Paleozoic is the only era that left a gap in a rock formation in Ethiopia. The massive denudational activity resulted in the formation of inselbergs (residual features) in some parts of Ethiopia.



### NOTE

The Paleozoic era is known for the predominance of invertebrates.

## III. The Mesozoic Era (from 250 million years to 70 million years ago)

### *Which life form was dominant in the Mesozoic era?*

This era was marked by alternate slow sinking and uplifting of the landmass (*Epeirogenesis*) of the Horn of Africa. The Mesozoic Era was an era of sedimentary rock formation in Ethiopia. The Mesozoic era has three distinct periods as indicated hereunder.

*Table 1.3 The Three Periods of Mesozoic Era*

Periods	Geological time scale
Triassic	250 - 180 millions
Jurassic	180 - 135 millions
Cretaceous	135 - 70 millions

### Triassic Period

During this Period, the landmass sank due to internal forces. This event was followed by transgression of a nearby sea into the mainland of today's Somalia and southeastern Ethiopia. During the Triassic Period, the oldest sedimentary rock known as *Adigrat sandstone* was formed. The Adigrat sandstone is the oldest in the southeast and progressively decreases in age to the northwest.

## Jurassic Period

In this Period, the transgression of the sea continued into the mainland in the northwest direction. This event deposited another sedimentary rock known as *Hintalo limestone*. The Hintalo limestone in the northwest is younger while it is older in the southeast.

## Cretaceous Period

During this period, the landmass *began* to rise and the sea started to regress towards the southeast, depositing sedimentary rock known as *Upper Sandstone*. Upper Sandstone is the youngest sedimentary rock and therefore overlies the rest.

Because of the direction of the regression and deposition, Upper Sandstone is the youngest in the southeast, and it is the oldest in the northwest.



### NOTE

The transgression of the sea extended up to northwestern Ethiopia, as far as central Tigray and the western slopes of the western highlands. The sedimentary rocks formed in the Mesozoic Era were later buried by overlying Cenozoic igneous rocks. However, the sedimentary rocks have been exposed at the surface in some areas of Ethiopia. They are thinnest (because they are the youngest) in the southeast and thickest (because they are the oldest) in the northwest.

One can see them exposed at the surface mostly in the southeastern lowlands of Ethiopia, central Tigray, and in the Abbay and Wabishebelle gorges. (For more information, look at the geological map of Ethiopia.)

The Mesozoic is also known for the *predominance of reptiles*. Huge reptiles, such as dinosaurs, were dominant. However, at the end of this era, two other significant biological events occurred:

- 🌐 *one was the disappearance of the dinosaurs, and*
- 🌐 *the other was the emergence of mammals, birds and flowering plants.*



#### IV. The Cenozoic Era (from 70 million years to the recent time)

*Do you know the era in which the Great East African rift valley was formed?*




It is the most recent geological era. During this era very significant structural, climatic and biological events have occurred in Ethiopia. Thus, geologic events of the Cenozoic era have greatly resulted in the development of very recent landforms in the Horn of Africa in general and Ethiopia in particular.

The Cenozoic Era is divided into two periods namely, Tertiary and Quaternary. To make this lesson simple and comprehensible, we shall discuss only the geological events of this era into events of each of the Periods.

##### a. Geologic Events of the Tertiary Period - (70 million - 2 million years ago)

In the Tertiary Period, the uplifting that *began* in the Cretaceous Period of the Mesozoic Era continued and reached its maximum height. In Ethiopia and the Horn it formed huge blocks of dome over the greater part of the region. As the uplifting continued through time, great cracks opened in the crust and resulted in the pouring out of extensive basaltic lava (known as the *Trappean lava series*).

The lava resulted in the formation of:

-  *the Northwestern Highlands,*
-  *the Southeastern Highlands, and*
-  *the Somali plateaus.*

As the cracking and faulting continued during the period, it formed the Great East African Rift Valley System – of which the Ethiopian Rift Valley System is part. The Great East African Rift system 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.

##### b. Geologic Events of the Quaternary Period (2 million - recent years)

This period is known for its recent volcanic activities that took place after the formation of the Rift Valley.

In the Quaternary Period, the structures which were formed in Ethiopia and the Horn are:

- 🌐 *the Afar Horst that extends into Djibouti,*
- 🌐 *the active volcano of Ertalle in Afar,*
- 🌐 *the dormant volcanic mountain of Fentalle in Eastern Oromia,*
- 🌐 *the extensive lava field and sheets of Metahara,*
- 🌐 *thermal springs and fumeroles of the rift valley, and*
- 🌐 *the Pluvial rainfall in Africa and the resultant deposition that took place in the lowlands of Ethiopia including the Rift Valley.*



### NOTE

The Cenozoic Era in its Quaternary Period is assumed to be the period in which modern man evolved.

## Activity 1.3.



### Answer the following questions

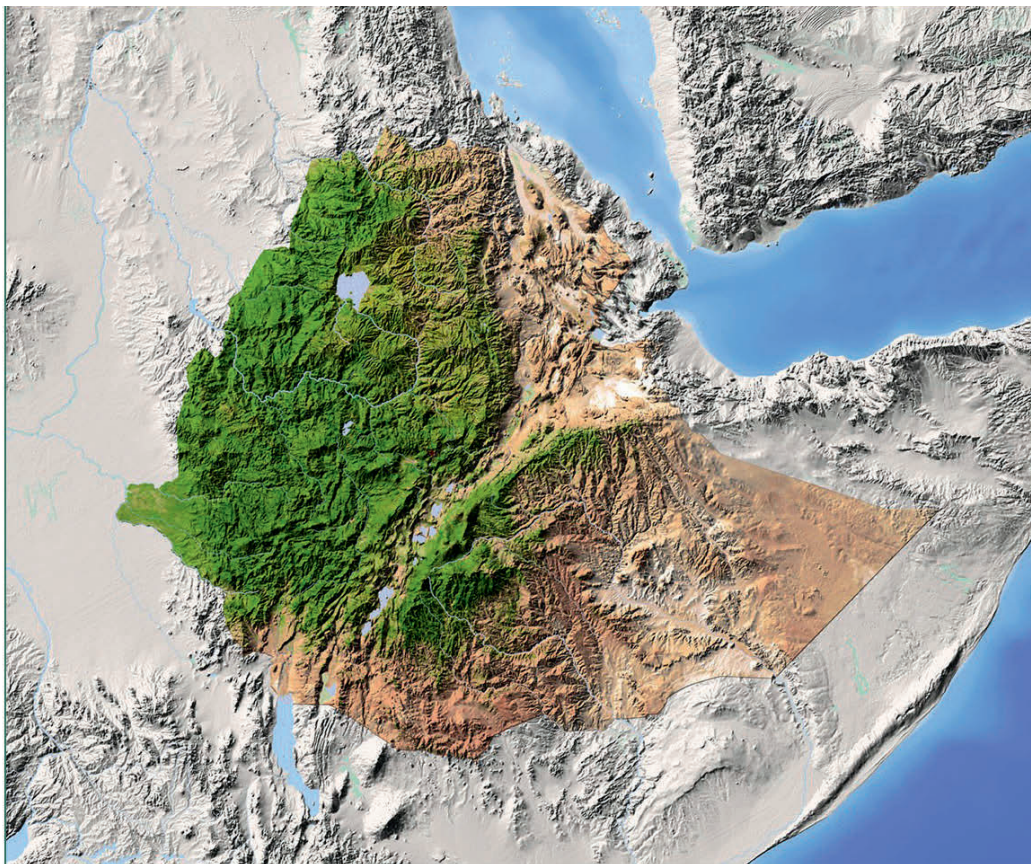
1. What was the noticeable geological event of the Precambrian era in Ethiopia?
2. List the most important sedimentary rocks ever formed in Ethiopia during the Mesozoic era?
3. When was the Ethiopian rift valley formed?
4. By looking at a geological map of Ethiopia, identify the areas where these rocks are found on the surface as outcrops:
  - a) Metamorphic rocks
  - b) Sedimentary rocks
  - c) Quaternary lava deposits

### 1.3.2 Landforms of Ethiopia

*Have you had opportunities to travel to the different regions of Ethiopia? If you have, what did you notice along your routes?*

Landform refers to individual earth surface features. As mentioned earlier subsection, the landforms of Ethiopia are largely the result of the Cenozoic era's tectonic and volcanic activities. Consequently, they are characterized by great diversity of highlands, plateaus, ambas, and rugged mountains, deep river gorges and lowlands.

Altitude varies from about 116 meters below mean sea level at the Dallol depression (Kobar sink) to 4620 m above mean sea level (a.m.s.l.) at *Ras Dashen* in the Semein mountain system. Between these extreme points lie a number of mountains. If 1000 meters is chosen as a demarcating contour line between highlands and lowlands, 56 percent of Ethiopia's land is highland. This fact has given Ethiopia the name "Roof of Eastern Africa." It is the only country in the region with such a high proportion of elevated surface. This elevated surface is bisected diagonally by the Rift Valley which extends from Syria to Mozambique across the East African lakes.



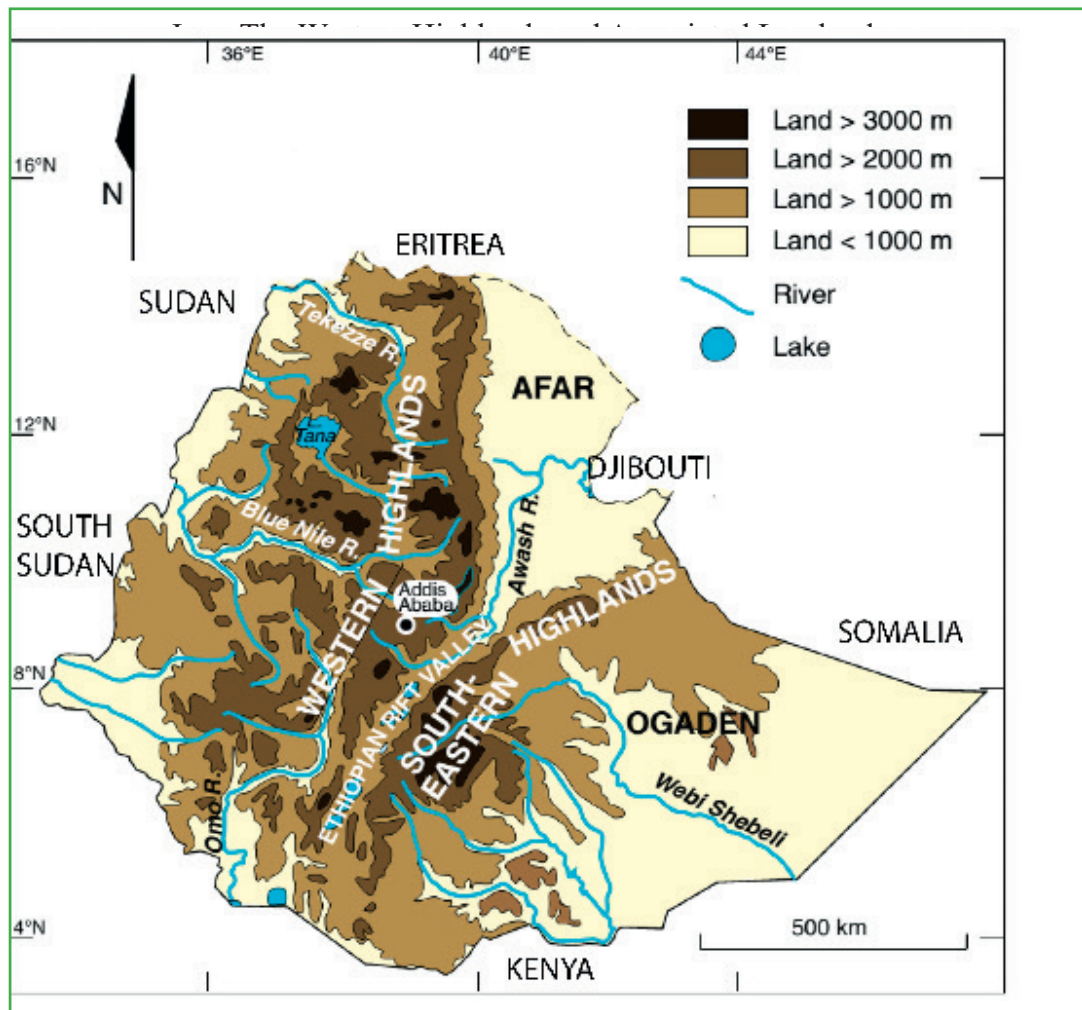
**Figure 1.4. Topography of Ethiopia**

These landforms are the results of two opposite forces:

- 🌐 *the endogenic force that originates from inside the earth. For example, volcanic activity and tectonic forces, and*
- 🌐 *the exogenic force that originates at the surface (denudation and penepalantion).*

It is a combination of these two forces that created the existing landforms of Ethiopia.

In terms of the geological and structural features that resulted from the two types of forces, the relief of Ethiopia can be divided into three main physiographic divisions (see Figure 1.4):



*Figure 1.5.: Ethiopian' Main Topographic Regions*

## I. The western Highlands and Associated Lowlands

## A. The Western Highlands

*Have you ever had a chance to go to Bahrdar, Gondar, Mekelle, etc.?*

The Western Highlands stretches from Tigray in the north to the highlands of *Gamo* and *Goffa* in southwest. They are separated from the southeastern highlands by the Rift Valley. It is the biggest physiographic region. It makes up 44% of the area of the country ( see Fig 1.5).

The Western Highlands are the source of a large number of rivers and streams. Famous rivers like *Abbay*, *Baro* and *Tekezze* emerge from these highlands. As the rivers are cross boundary, they influence Ethiopia's geopolitics role in north eastern Africa and the Middle East.

Based on the internal altitudinal variability, the region is further sub-divided into four groups of highlands.

- a) *The Plateau of Tigray*
- b) *The North Central Massif*
- c) *The Plateau of Shewa*
- d) *The Southwestern Highlands*

### a. The Plateau of Tigray




*Can you mention known mountain peaks in plateau of Tigray?*

The Tigrean plateau is the most northerly group of plateau bounded in the north by the Mereb River and in the south by the Tekezze river. It is drained by Mereb and the tributaries of the Tekezze.

It is an area composed largely of sandstones and limestones, as the overlying basalt has been eroded. As a result, the soils are poor and thin. The plateau has been exposed to severe erosion due to long periods of human inhabitation.

There are very high mountains on this plateau with elevations of over 3000 meters above sea level. Three of these are:

Known mountain peaks on this sub-division include:

-  *Mount Tsibet – 3988 m a.m.s.l.*
-  *Mount Ambalage – 3291 m a.m.s.l.*
-  *Mount Assimba – 3248 m a.m.s.l.*

## b. The North Central Massif

*What makes the Northern central Massif distinct from the Massif of central Ethiopia?*

The north central Massif are found between the Abbay Gorge in the south and the Tekezze Gorge in the North. This massif contains the highlands of Gondar, Gojjam and Wollo. River *Abbay* and *Tekezze* along with their tributaries have formed a number of gorges and steep sided river valleys.

The north central Massif are the most rugged and dissected plateaus of Ethiopia. They are capped by basalts of the tertiary period and surrounded by deep gorges. Within each of the plateaus are small arable lands known as *ambas*. The *ambas* are isolated from one another by gorges.

The Mountain systems in Gondar and Gojjam are separated from the eastern group of mountains in Wollo by impenetrable and deep gorges. At one point though, they are connected by *Yeju-Wadla Delanta* land bridge (ridge). The western Massif make up the Massif of South Gondar (Semein), while the eastern ones make up the Lasta and Wollo Massif. South of these is found the Gojjam Massif.

The Gojjam Massif is the most extended tableland and is comparatively less dissected. It is formed on the core of the *Amedamit-Choke* mountains. It is carved by the *Abbay* river that effectively separated it from the *Shewa* plateau in the south and the *Amhara Saynt* Massif in the northeast. The North-Central Massif are known for the production of cereals, such as *teff*, pulses and oil seeds.

Known mountain peaks in this Massif are:

- 🌐 *Mount Ras Dashen* – 4620 m a.m.s.l.,
- 🌐 *Mount Legeda* – 4532 m a.m.s.l.,
- 🌐 *Mount Analu* – 4480 m a.m.s.l.,
- 🌐 *Mount Tefaw Lezer* – 4456 m a.m.s.l.,
- 🌐 *Mount Kolo* – 4300 m a.m.s.l.,
- 🌐 *Mount Guna* – 4231 m a.m.s.l.,
- 🌐 *Mount Abuna Yoseph* – 4190 m a.m.s.l., and
- 🌐 *Mount Hey* – 4154 m a.m.s.l.

## C. The Plateau of Shewa (Central Plateau)

*Have you ever had the opportunity to travel from your locality to nearby plateau? If yes, what do you recognize all the way through until you reach any gorge?*

The Shewan Plateau is the smallest sub-division of the western highlands. It is a dome-shaped plateau that serves as a watershed between the Awash, Omo- Gibe and Abbay River basins. It extends westwards into western Wollega through Horo Guduru and forms a crescent shape which causes the Abbay to swerve and drain northwards. The Shewan plateau is separated from:

- 🌐 *the plateau of Gojjam by the Abbay gorge in the north;*
- 🌐 *the southeastern highlands by the Awash River and the Rift Valley, and*
- 🌐 *the Highlands of Kafa by the Gibe River.*

The Plateau of Shewa is drained by the tributaries of the Abbay River in the west and the Awash River in the east. Its high mountains are found on its northeastern and south eastern margins; they are:

- 🌐 *Mount Abbuye Meda – 4000 m a.m.s.l., and*
- 🌐 *Mount Guraghe – 3721 m a.m.s.l.*

#### d. The Southwestern Highlands

*Which regional zones are found in the southwestern highlands of the Horn?*

The southwestern highlands lie south of the Abbay trough which is greatly eroded due to torrential rain that pours down in the area for almost all of the year. It is the wettest region of the country with a total average annual rainfall of above 1500 mm. They include the highland areas of Wollega, Illubabor, Jimma, Kafa and Gamo and Goffa. The region is drained:

- 🌐 *Northwards, by the Dabus and Didesa tributaries of the Abbay River;*
- 🌐 *Westwards, by the headstreams of the Baro-Akobo River;*
- 🌐 *Southwards, by the Omo-Gibe River, which ends in Lake Turkana; and*
- 🌐 *Eastwards, by the right-bank tributaries of the Omo-Gibe (the Gojeb- Gibe River of Jimma Zone and Yem Special Woreda).*

The general elevation of these highlands is relatively low when compared to that of the Northern and Eastern Highlands. Only a few areas are above 2500 meters.

The highest points in the region are the:

- 🌍 *Gamo-Konso Highlands,*
- 🌍 *Maji-Korma Highlands,*
- 🌍 *Dawuro-Konta Highlands,*
- 🌍 *Tullu Wallel, and*
- 🌍 *Benishangul mountain.*

Mount Gughe has the highest altitude: 4200 m a.m.s.l. It is found in the Gamo plateau.

These highlands are well-known for the production of coffee, inset, spice production, timbering, rubber tree production, cattle, honey, maize and high percentage of forest cover.

### Activity 1.4



**Answer the following questions.**

1. List the four sub-divisions of western highlands.
2. Why are northern mountains highly rugged?

### B. The Western Lowlands

The Western Lowlands extend from western Tigray in the north up to the southern Gamo and Goffa in the south, bordering the Sudan and South Sudan with a general elevation of 500-1000 m a.m.s.l. They are characterized by arid and semi-arid climate. The Baro-Akobo lowland is the wettest lowland compared to other lowlands of this physiographic division. That is why the rivers draining the region (particularly the Baro river) have almost a regular flow of water for much of the year.

These lowlands of this physiographic region are sub-divided into:

- 🌍 *the Tekezze and Angereb Lowlands,*
- 🌍 *the Abbay Dinder Lowlands,*
- 🌍 *the Baro-Akobo Lowlands, and*
- 🌍 *the Omo-Gibe Lowlands.*



The Tekezze and Angereb Lowlands are the most northerly lowlands, drained by Tekezze and Angereb. The Abbay Dinder Lowlands extend from south of Metema town up to the southern part of the Abbay River.

Because of climatic hardship in most parts of these lowlands, the communities practice pastoralist and semi-pastoralist ways of life. However, there are notable towns, such as Humera, *Kurmuk*, Omedla and Metema that serve as business centers for the communities living along the Ethio-Sudanese border.

## II. The Southeastern Highlands and Associated Lowlands

*Can you propose what feature separates these highlands from the northwestern highlands? Which highlands are said to be the components of southeastern highlands of Ethiopia?*

This physiographic region is found to the southeast of the rift valley. This region is further divided into highland and lowland units.




### A. The Southeastern Highlands

The Southeastern Highlands of Ethiopia include:

- a) *the Hararghe plateaus,*
- b) *the Arsi plateau,*
- c) *the Bale Massif, and*
- d) *the Sidama highlands.*

Their formation is similar to that of the North and Southwestern Highlands and they are capped by basaltic rock. They are the main sources of the Wabe Shebelle and Genale rivers.

They are bounded:

-  *in the west, by the fault line of the Rift Valley;*
-  *in the east, by the Ogaden Lowlands; and*
-  *in the south by the Elkerie and Borena Lowlands.*



#### a. The Hararghe Plateaus

The Plateau of Hararghe rises sharply from the fault line of the Rift Valley and extends gently to the east up to Jigjiga. After Jigjiga, a fall in elevation takes place, giving way to the Ogaden Lowlands. The Plateau is drained by the left-bank

tributaries of the Wabe Shebelle River. The basaltic rocks have been worn away, exposing limestones and earlier sedimentary rocks.

The Hararge Plateau area and its foothills are significant producers of coffee, chat, sorghum and millet.




The prominent mountain peaks include:

-  *Mount Gara Muletta (3381 m a.m.s.l.), and*
-  *Mount Jebel Tita (3122 m a.m.s.l.).*

### b. The Arsi Plateau

This plateau area consists of the Gugu and Chillalo Massif. It is an extendingly rolling plateau; it is a very suitable plateau for farming. These features has been comparatively low because of the erosion on the Arsi plateau. The Arsi plateau is known for its wheat production.



The highest points on the Arsi plateau are:

-  *Mount Chillallo (4136 m a.m.s.l.),*
-  *Mount Bada (4139 m a.m.s.l.), and*
-  *Mount Kaka (4180 m a.m.s.l.).*

### c. The Bale Massif

The Bale Massif is next to the Arsi Plateau but is separated from it by the headstreams of the Wabe Shebelle, popularly known as the *Wabe River*. In the north, the massif consists of a flat form that is similar to basaltic plateaus. The Bale massif is known for its barely. In its southern part, the massif consists of huge mountains.

The highest points on the Bale Mountains are:

-  *Mount Tulu Dimtu (4377 m a.m.s.l.), and*
-  *Mount Batu (4307 m a.m.s.l.).*

### d. The Sidama Highlands

The Sidama Highlands are separated from the Bale Highlands by the Genale river valley. The area constitutes the southwest extension of the southeastern highlands. The plateau slopes away gently to the south and southeast, and is drained by the Genale river and its tributaries.

## B. The Southeastern Lowlands

These lowlands extend from the foot hills of the southeastern highlands along the Ethio-Somalian and Ethio-Kenyan borders. Their general elevations lie between 500 and 1000 m a.s.l. They consist of:

- 🌐 *the Ogaden plains,*
- 🌐 *the Borena plains, and*
- 🌐 *the Elkeri plains,*
- 🌐 *the Genale plains.*

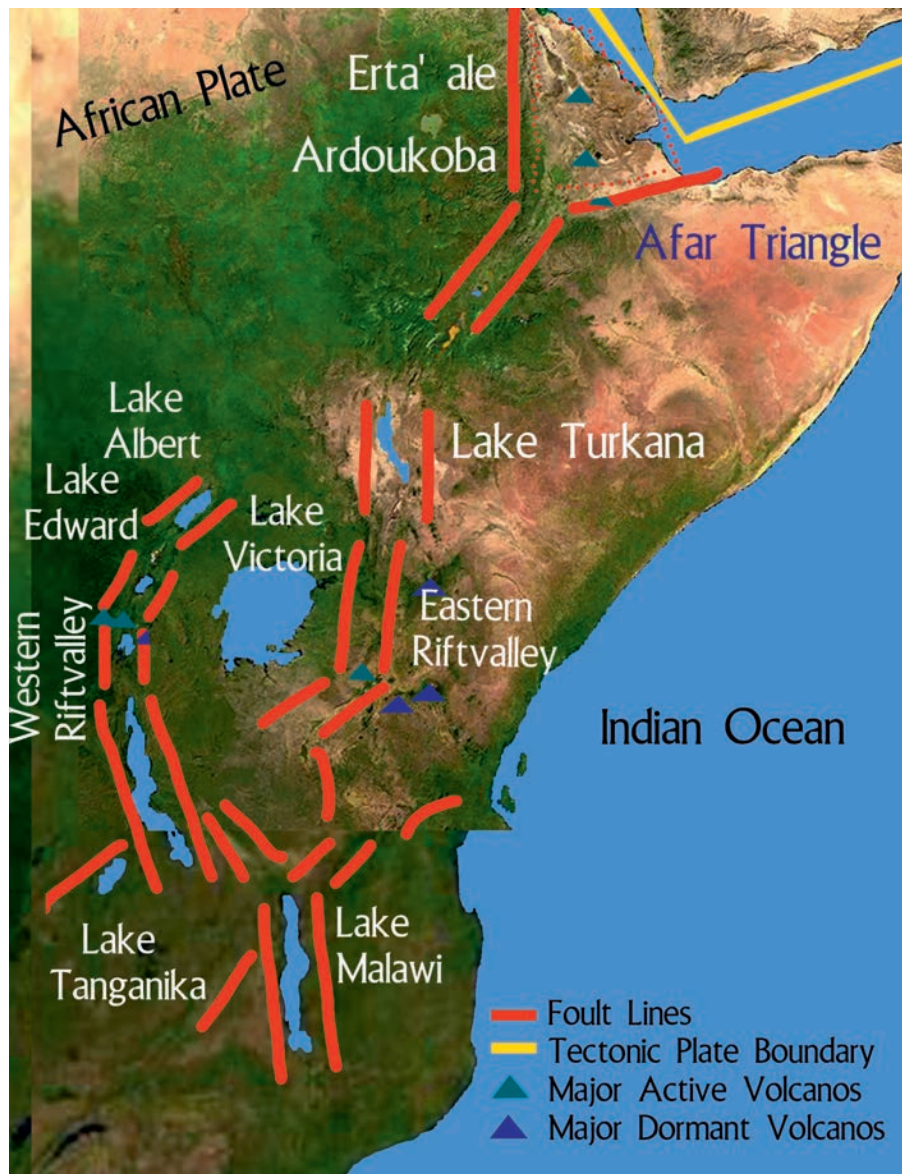
These landforms are highly extensive lowlands. They are characterized by extreme climatic condition with low annual rainfall-often below 500 mm. Most of these lowlands are covered by sandstones and recent marine deposits. The people practice a pastoralist way of life because of the harsh climate.

## III. The Rift Valley

***What is the difference between a river valley system and a rift valley system? Can you give examples?***

The Ethiopian Rift Valley System is a narrow strip of land, which stretches from the Afar Depression in the north, through the Rift Valley Lakes' region up to Lake Turkana and Chew Bhair.

The Ethiopian Rift Valley System is part of the Great East African Rift Valley, which covers a distance of 5600 kms in Africa. The Great East African Rift System is a set of fractures in the earth's crust that extend from the Jordan River valley in the north, through the Red Sea, and then across East and Central Africa to Mozambique in the south (Figure 1.6).



**Figure 1.6.:** *The Rift Valley System of Ethiopia and the Horn*

The rift valley was, as indicated earlier, formed at the end of the Tertiary Period as a result of tectonic epeirogenic activity. The presence of active volcanoes, minor faulting, hot springs, cinder cones fumaroles and geysers could be good evidence for the unstable nature of the region geologically.

As you can see in fig. 1.6, the Ethiopian Rift Valley System runs diagonally from northeast to southwest and divides Ethiopia Highlands into two. It covers a total length of 1700 kilometers in Ethiopia and Eritrea.

Covering a length of 1700 kms, the Ethiopian Rift Valley System comprises 18 percent of the country's total area. It is subdivided into three main parts:

- a) *The Afar Triangle (northern),*
- b) *The Main Ethiopian Rift or the Lakes' Region (central), and*
- c) *The Chew-Bahir Rift (southern).*

### a) The Afar Triangle (Northern Part)

The Afar Triangle is the largest and widest part of the system extending 200-300 kilometers. Its altitude is generally low, ranging from 116 meters below mean sea level at the Kobar Sink to about 900 meters above sea level at Awash. Much of the area here lies below sea level.

This part of the Ethiopian Rift System is characterized by

- 🌐 *Faulted depressions (the Dallol Depression) and grabens (also called troughs), and*
- 🌐 *Cinder cones and Volcanic mountains*

Also, a large part of the area is covered by extensive salt plains and lakes (for instances, Lake Assale and Lake Afrera). The Afar triangle is bounded by parallel fault lines on the east and west. Its floor is made up of:

- 🌐 *Grabens such as the Tendaho Graben,*
- 🌐 *Volcanic ash and lava deposits,*
- 🌐 *Lacustrine and fluvial deposits, and*
- 🌐 *Volcanic mountains such as Mount Fentalle.*

What is more, the Afar Triangle has special characteristics that do not exist in other regions of Ethiopia. It consists of:

- 🌐 *Fossil rich sediments, and*
- 🌐 *Rich archeological sites have shown us that the area was the home of the ancient ancestors of primates and hominids.*

### b) The Main Ethiopian Rift or the Lakes Region (Central Part)

The central subdivision of the Ethiopian Rift system, i.e., the Main Ethiopian Rift, covers the area from the lower Awash basin up to Lake Chamo. This subdivision is the most elevated and narrowest part of the Ethiopian Rift Valley. It is also the wettest, most densely vegetated, and most densely populated.

Unlike others, sedentary farming is practiced here. The area also includes numerous lakes of enormous economic and aesthetic value.

### c) The Chew-Bahir Rift (Southern Part)

The southern subdivision of the Ethiopian Rift system, the Chew-Bahir Rift, is also known as the Omo-*Gibe* trough. It is the smallest section of the Ethiopian Rift System separated from the Lakes' Region to the north by the Konso Highlands and its surroundings. It consists of an extensive shallow marshy area covered by tall grasses into which the Sagan and Woito streams end.

In the vicinity of Arba Minch, this part of the Ethiopian Rift valley system is split into the Ganjuli and the Galena Valleys by the Amaro mountain range. At large, the Chew-Bahir Rift region is occupied by a pastoralist population.

## Activity 1.5.



### Answer the following questions

1. Draw a map of Ethiopia showing the major physiographic divisions.
2. Why is the Baro-Akobo lowland the wettest of all lowlands?
3. Draw a map of the Rift Valley System in Ethiopia and demarcate its subdivisions.

## UNIT SUMMARY

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- 🌍 Ethiopia is located in Eastern Africa within the 3°N-15°N latitudes and 33°E-48°E longitudes. Regarding shape, Ethiopia has more or less compact shape.
- 🌍 In terms of size, Ethiopia is the tenth largest country in Africa. It has an area of 1,106,000 square kilometers. Because of its large size, Ethiopia enjoys a diverse climate, a great variety of fauna and flora, diversified ethnic groups and a large potential of arable land as well.
- 🌍 The geological time scale measures time on a scale involving four major geological eras. The geological structure of Ethiopia is the result of the geological events that occurred during these eras. For example, crystalline basement complex rocks were formed during the Precambrian era; peneplanation took place during the Paleozoic era; land mass sinking and up-lifting were dominant during the Mesozoic era; formation of Ethiopian Rift Valley System during Cenozoic era respectively.
- 🌍 The landforms of Ethiopia are largely the results of the Cenozoic era tectonic and volcanic activities. Consequently, Ethiopia has rugged mountains, plateaus, ambas, river gorges, a rift valley and lowlands. The altitudinal variation in Ethiopia ranges from the highest peak, *Ras Dashen* (4620 meters above sea level) to the lowest point, Kobar Sink (116 meters below mean sea level).

## REVIEW EXERCISE

### PART I: MULTIPLE CHOICE ITEMS

**Direction: Choose the correct word or phrase from the given alternatives.**

- Which one is true about geomorphology?
  - Deals with the distribution of plants and animals
  - Examines the pattern of climate
  - Studies landforms and their distribution
  - Studies human influence on the atmosphere
- Which neighboring country shares the longest boundary line with Ethiopia?
  - Somalia
  - Eritrea
  - Sudan
  - Djibouti
- We cannot observe the outcropping basement complex rocks in one of the following areas of Ethiopia:
  - In Central Tigray
  - Around Assossa
  - In the Abbay gorge
  - In Central Shewa
- As Hintalo sandstone is to Jurassic, Upper sandstone is to
  - Permian
  - Cambrian
  - Cretaceous
  - Triassic
- The Afar Horst that extends into Djibouti was formed during
  - Quaternary period
  - Tertiary Period
  - Triassic period
  - Jurassic period
- One can associate the Mesozoic Era with the formation of
  - Igneous rock
  - Metamorphic rock
  - Sedimentary rock
  - A and B
- All of the following are drained by the Abbay and its tributaries, except,
  - The Southwestern Highlands
  - The North and Western Highlands
  - The Central Highlands
  - The Southeastern Highlands



8. The north central Massif are separated from the plateau of Tigray by the
  - A. Mereb River
  - B. The Danakil Lowlands
  - C. Tekezze River
  - D. Abbay River
9. The smallest sub division of the western highlands is
  - A. Shewan plateau
  - B. Tigrean plateau
  - C. North central massif
  - D. Semein mountain

### PART II: COMPLETION ITEMS

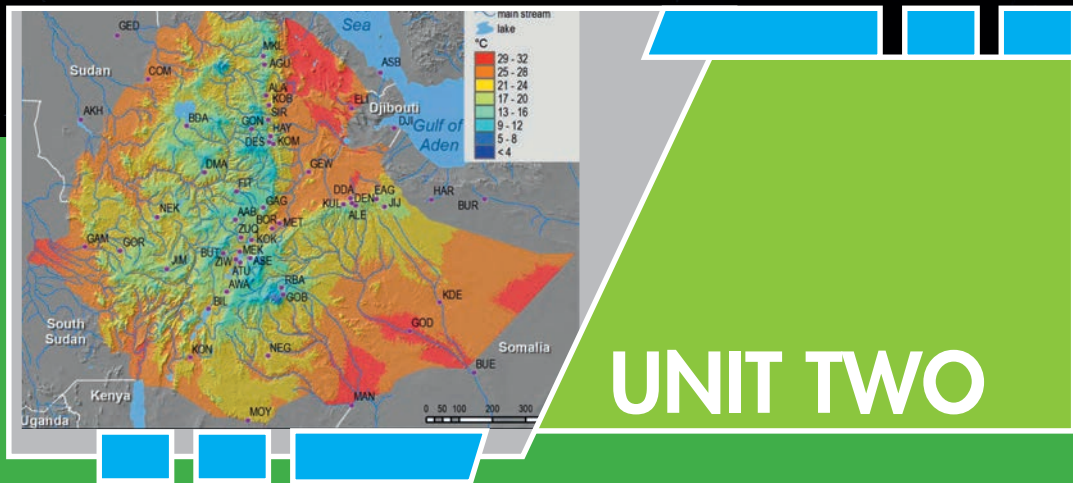
**Directions: Complete each of the following sentences with the correct word or phrase.**

10. During the Triassic period, land subsidence (sinking) *began* in the \_\_\_\_\_ part of Ethiopia and progressed towards the \_\_\_\_\_ part of the country.
11. The landforms of Ethiopia are largely the result of the \_\_\_\_\_ era.
12. The \_\_\_\_\_ era is the oldest and longest geological era.
13. The \_\_\_\_\_ era is known for the predominance of invertebrates.

### PART III: SHORT ANSWER ITEMS

**Direction: Give a short Answer for the following questions.**

14. Who was Eratosthenes? What did he contribute to geography?
15. Explain how wide is the scope of geography?
16. What are the major branches of geography?
17. What is the difference between a relative location and an absolute location?
18. What is the distinction between a vicinal location and a geological location?
19. What are the advantages of compact shape?
20. Describe the major geological events that occurred during the Cenozoic era of Tertiary Period in Ethiopia.
21. State why sandstone and limestone are seen as surface outcrops in the Plateau of Tigray.
22. Describe the geological era which was significant regarding the formation of the various landforms in Ethiopia.



# UNIT TWO

## 2. CLIMATE OF ETHIOPIA

### INTRODUCTION

Climate is an important control over the distribution of flora and fauna and in consequence largely determines the agricultural activities, and the materials available for shelter and clothing.



### Unit Outcomes

- By the end of this unit, you will be able to:**
- ✓ recognize the meaning and concepts of weather and climate;
  - ✓ identify elements of climate;
  - ✓ distinguish elements of climate from its controls;
  - ✓ compare and contrast the spatial and temporal variations of climate; and
  - ✓ identify factors affecting climate of Ethiopia.



## Main Contents




- 2.1 Meaning of Weather and Climate
- 2.2 Elements of Weather and Climate
- 2.3 Controls of Weather and Climate in Ethiopia
- 2.4 Climatic Regions and Seasonal Variations in Ethiopia
- 2.5 Measurements of Weather and Climate

 *Unit Summary*

 *Review Exercise*

## 2.1 MEANING OF WEATHER AND CLIMATE

*At the end of this section, you will be able to:*

-  recognize the meaning and concepts of weather and climate;
-  define weather and climate; and
-  describe the difference between weather and climate.



### KEY TERMS

 Climate

 Weather

***What do you know about the concepts of weather and climate? Do you see any change in the weather day in and day out?***

The word “weather” and “climate” are closely related but have quite different meaning. Weather refers to the condition of the atmosphere in terms of temperature, rainfall, pressure, wind, moisture, cloud cover, humidity etc. observed in a certain place over a short period of time. It is a phenomenon which varies very much from hour to hour, even from day to day. While climate is a pattern of weather condition experienced in an area over a long period of time. It considers the trends, fluctuation and vibration that may occur in departure from the average conditions in time and space. A large area can experience only one type of climate.

## Activity 2.1



**Answer the following question.**

1. Write a minimum of three major differences between weather and climate.

## 2.2 ELEMENTS OF WEATHER AND CLIMATE

*At the end of this section, you will be able to:*

- ✓ identify elements of weather and climate;
- ✓ define the elements of weather and climate; and
- ✓ differentiate the elements of weather and climate from their controls.






### KEY TERMS

- 🔑 Air pressure
- 🔑 Cloud cover
- 🔑 Humidity
- 🔑 Precipitation
- 🔑 Temperature
- 🔑 Wind

***What are elements of weather and climate? What is the significance of knowing the climatic condition of a place?***

Both weather and climate are composed of the following elements.

- 🌍 **Precipitation** - is any liquid or frozen water that forms in the atmosphere and falls back to the Earth in form of rain, sleet, hail, and snow.
- 🌍 **Temperature** - is the degree of measurement of hotness or coldness of an object.
- 🌍 **Humidity** - is the concentration of water vapor present in the air
- 🌍 **Air pressure** - is the force exerted on a surface by the air above it as gravity pulls it to Earth.

-  **Wind** - Wind is the movement of air, caused by the uneven heating of the Earth by the sun and the Earth's own rotation.
-  **Sunshine**- is a direct sunlight to which a given area is exposed.
-  **Cloud**- is any visible mass of water droplets or ice crystals suspended in the atmosphere.

The distribution of these elements over the surface of the earth is uneven in terms of magnitude and time. This spatial and temporal distribution of climatic elements is governed by the climate control factors described in the sections below.

## Activity 2.2




**Answer the following question.**

1. List the most important elements of weather and climate in Ethiopia.






## 2.3 CONTROLS OF WEATHER AND CLIMATE IN ETHIOPIA

*At the end of this section, you will be able to:*

-  *distinguish elements of climate from its controls.*



### KEY TERMS

-  Altitude
-  Distance from the sea
-  Latitude
-  Mountain barriers
-  Ocean currents

There are varieties of climate in Ethiopia. The spatial and temporal distribution of the climatic elements in Ethiopia is determined by various physical factors which are generally known as controls of weather and climate.

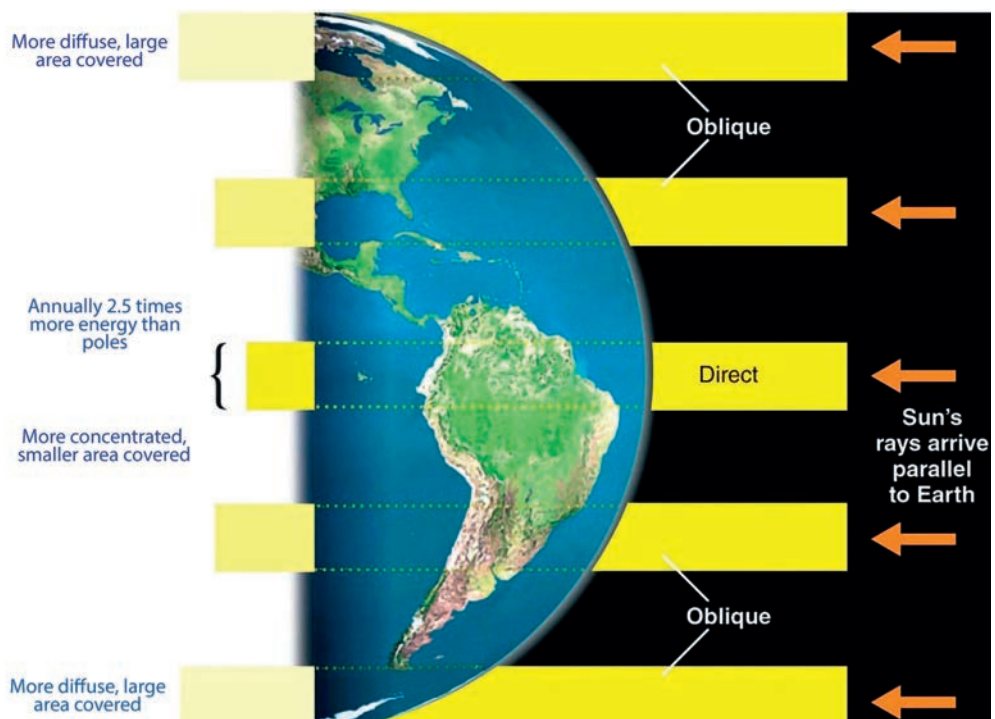


The most important are:

- a) *Latitude*
- b) *Altitude*
- c) *Mountain Barriers*
- d) *Revolution of the earth and the inclination of the earth's axis*
- e) *Distance from the sea*
- f) *Ocean Current*

### a) **Latitude**

Latitude, as a climate control, is the angular location of a place or point with reference to the direct rays of the sun. When we speak of the latitudinal impact on the climate of Ethiopia, we are considering angle of the sun ray in country. This is because the rays of the sun fall vertical on the equator and slanting in the temperate and polar regions (See Figure 2.1).



**Figure 2.1:** *Insolation Receipt and Earth's Curved Surfaces (Source: Pearson Education Inc., (2013))*

Ethiopia's location within the tropical zone results in;

- 🌍 *high temperatures during most of the year,*
- 🌍 *high daily (diurnal) ranges of temperature,*
- 🌍 *relatively small annual ranges of temperature, and*
- 🌍 *little difference between summer and winter in the ratios of daylight to night.*

### b) Altitude

*Do you have information about the altitude of the place where you are living? Is it a highland or lowland? Is the temperature mild or hot or cold?*

Altitude is the main factor that determines the spatial distribution of temperature in Ethiopia. Different places that exist on the same plane or angle of the rays of the sun might be expected to experience equal temperatures. However, due to the impact of altitude, they do not.

For example, three Ethiopian cities, Bako, Addis Ababa, and Awash all lie on the 9°N latitude, and therefore they might be expected to receive equal magnitudes of direct rays from the sun and therefore equal temperatures. However, their altitudes vary, and therefore their temperatures vary, as shown in Table 2.1.

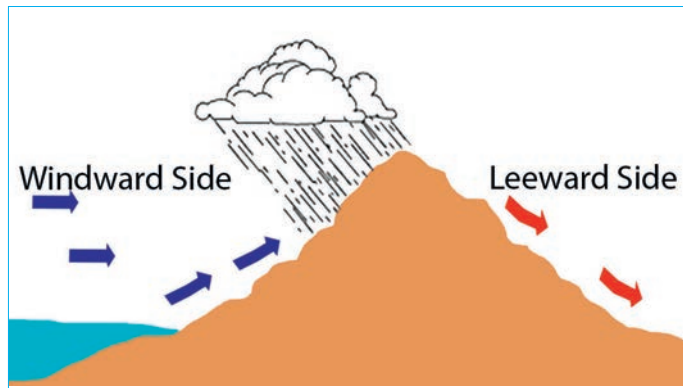
*Table 2.1. The Role of Altitude in Modifying Temperatures*

Towns	Latitude	Altitude	Average annual temperature
Addis Ababa	9°N	2,200 m.a.m.s.l.	16°C
Bako (West Shewa)	9°N	1,800 m.a.m.s.l.	17°C
Awash	9°N	916 m.a.m.s.l.	25°C

The table illustrates the effect of altitude on temperature, confirming the fact that temperature decreases as altitude ascends from the lowlands towards the interior highlands.

### c) Mountain Barriers

Mountain barriers can affect climate in that they exert influence on the spatial distribution of rainfall. Places located on the *leeward side of mountains (also called rain shadow)* receive little rain.



The side of the mountain facing the wind laden with moisture is called the windward side mountain.

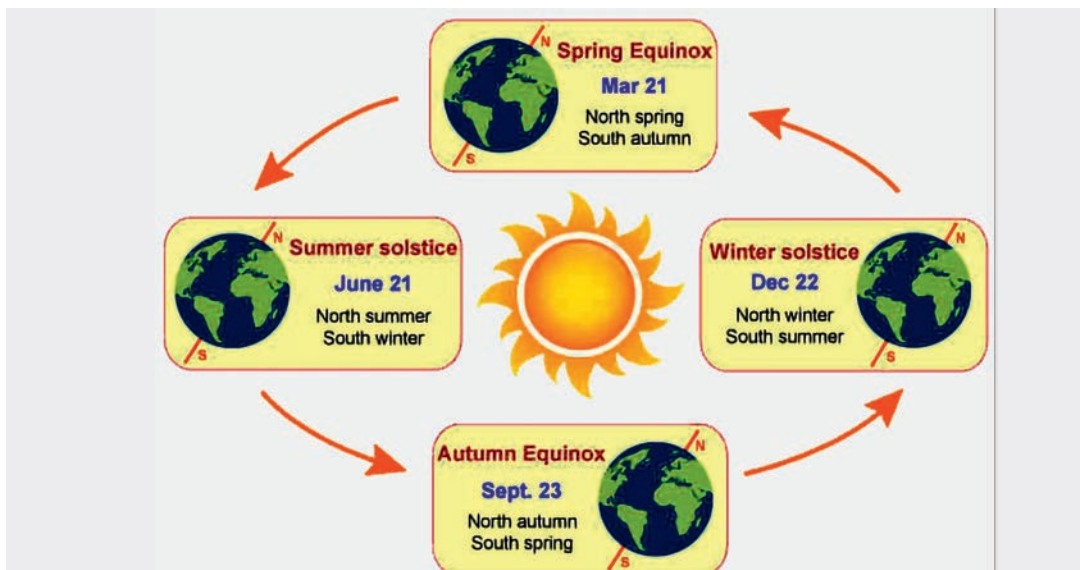
Leeward side is named the other side of the mountain that does not face the laden moisture.

*Figure 2.2.: Effects of Mountain Barriers*

#### d) Revolution of the Earth and the Inclination of the Earth's Axis

The axis of the earth inclines  $23\frac{1}{2}^{\circ}$  to the normal of the elliptic. As the earth revolves around the sun, this inclination produces a change in the angle of the sun's rays, thereby affecting the length of time that the sun shines on the earth every other day (See Figure 2.2).

Changes in the length of the day and angle (directness) of the sun's rays cause seasons. These different seasons result in the temporal variation of temperature in a year in Ethiopia.



*Figure 2.3: Annual March of the Seasons (Source: <https://www.studyandscore.com>)*



e) **Distance from the Sea**

*Do you know that water bodies or lakes (at local levels) have a moderating effect on the climate of vicinal or adjacent land areas?*

Water bodies and landmasses have different levels of heat absorption. Land masses absorb and release heat energy more quickly than water bodies do. Distance from the sea affects the Horn's climate only in coastal areas that are adjacent to the Red Sea and the northwestern Indian Ocean. Towards the interior, the role of distance from the sea in climate control is insignificant.

f) **Ocean Current**

Warm and cold ocean currents can affect the climate of coastal regions, but only when local winds blow in from the sea. Warm currents heat the air over the ocean and bring higher temperatures over land. Cold currents can lower air temperatures and can bring colder temperatures over land. In Ethiopia the role of ocean current in climate control is inconsequential.

**NOTE**

Among the above mentioned controls of climate, the climate of Ethiopia is dominantly controlled by *altitude* and *latitude*.

**Activity 2.3****Answer the following questions**

1. Explain how Ethiopia's latitudinal location affects the distribution of climate.
2. Why is altitude known as the strongest of all the controls of climate in Ethiopia?
3. Why every place in Ethiopia experiences the overhead sun twice in a year?

## 2.4 CLIMATIC REGIONS AND SEASONAL VARIATION IN ETHIOPIA



**At the end of this section, you will be able to:**

- ✓ identify agro-climatic zones of Ethiopia; and
- ✓ compare and contrast the spatial and temporal variations of climate in Ethiopia.



### KEY TERMS

- 🔑 Agro-climatic zones
- 🔑 Alpine or Afro-Alpine
- 🔑 Bereha
- 🔑 Dega
- 🔑 Inter-Tropical Convergence Zone
- 🔑 Kolla
- 🔑 Subtropical
- 🔑 Woina Dega
- 🔑 Wurch/Kur

### 2.4.1 Agro-climatic Zones of Ethiopia

In Ethiopia, the impact made by altitude has resulted in the formation of five agro-climatic zones. These zones have traditionally been defined in terms of temperature (see Table 2.2).





*Table 2.2. Agro-climatic Zones*

Altitude in meters	Traditional agro-ecological name	Global equivalence	Mean annual temperature in °C
3,300 and above	<i>Wurch/Kur</i>	Alpine or Afro-Alpine	<10
2,300 – 3,300	<i>Dega</i>	Temperate	10 – 15
1,500 – 2,300	<i>Woina Dega</i>	Subtropical	15 – 20
500 – 1500	<i>Kolla</i>	Tropical	20 – 30
Below 500	<i>Bereha</i>	Desert	> 30

### a) Wurch-Zone Areas

*Do you know that the term wurch has resemblance to temperature severity?*




The *Wurch*-zone areas have the highest altitudes and lowest temperatures. Frequently they have temperatures of less than 10°C. These areas exist in the very high mountains of South Gondar, Wollo, Shewa, Arsi and Bale. Example:

-  *Mt. Ras Dashen in Semine Gondar*
-  *Mt. Guna in South Gondar*
-  *Mt. Megezez in North Shewa*
-  *Mt. Batu in Bale, etc.*

### b) Dega-Zone Areas


*What crops are grown in Dega areas?*

The *Dega*-zone areas are highland areas with lower altitudes and higher temperatures than *Wurch*-zone areas. Historically, *Dega*-zone agro-climatic areas were the home of concentrated human settlement. They were chosen because of the features below:

-  *Secure location (from which people could defend themselves from threats)*
-  *Reliable rainfall*
-  *Absence of tropical diseases such as malaria, etc.*

Due to this high concentration of human population, the *Dega* zone has been intensively cultivated and has a high rate of soil erosion, overgrazing and deforestation.

Some of the humid areas of this zone support two growing periods per year under rain-fed agriculture. Example:

- |  |   |
|--|---|
|  <i>Dinsho in Bale</i>    |  <i>Hulla in Sidama</i>          |
|  <i>Chillallo in Arsi</i> |  <i>Debresina in North Shewa</i> |

### C) Woina-Dega-Zone Areas

*What is your understanding why the term Woina Dega comes after Dega? Does the term mean milder Dega?*

The *Woina-Dega*-zone areas contain most of Ethiopia's agricultural land. They are the country's main areas producing:

-  *Surplus grain*
-  *Inset and its derivatives*

In the *Woina-Dega* zone, as in the *Dega* zone, there can be two growing seasons when rainfall reliability is high.

#### d) Kolla Zone Areas

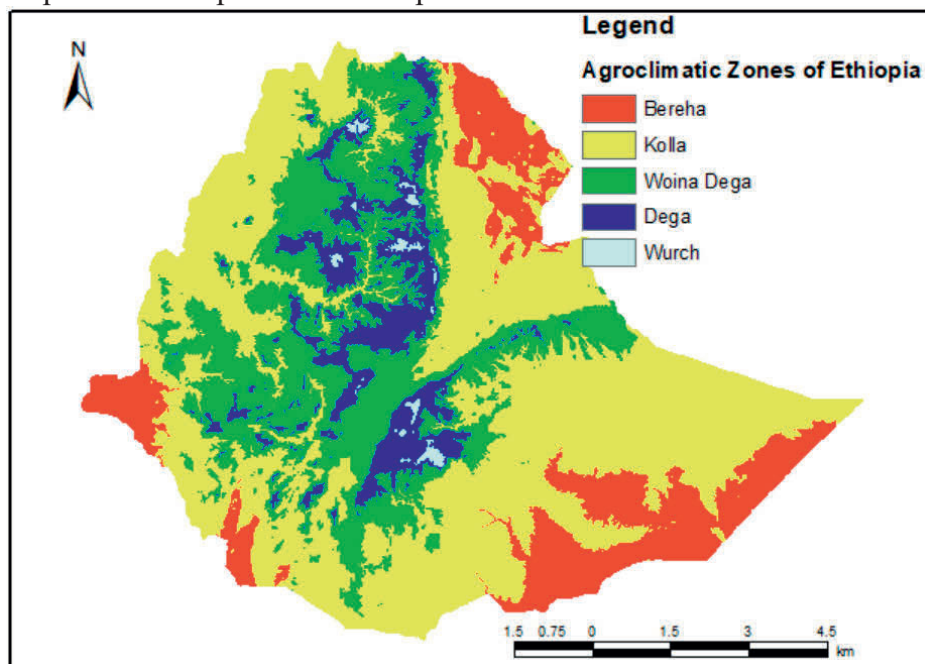
*What are the dominant crops grown in Kolla areas?*

Kolla is a (warm-to-hot semi-arid climate). *Kolla* is the climate of the hot lowlands with an altitudinal range of 500 to 1500 m a.s.l. Average annual temperatures are between 20°C and 30°C. Although mean annual rainfall ranges between 410 mm and 820 mm, it can be as high as 1600 mm in the wet western lowlands of Gambella. Rainfall is highly variable from year to year. Example: Western lowlands.

#### e) Bereha-Zone Areas

*Can we grow crops in Bereha zone areas?*

*Bereha* is the hot arid climate. *Bereha* is the climate of the desert lowlands that are found below 500 m above mean sea level where the average annual rainfall is less than 400 mm, and average annual temperature is over 30°C. *Bereha* is usually characterized by strong wind, high temperature, low relative humidity, and little cloud cover. Evapotranspiration is always in excess of rainfall in some places. Example: Danakil depression in Afar lowlands.



**Figure 2.4:** Agroclimatic Zones of Ethiopia (Source: EMA ,1994)

## 2.4.2 Seasonal Variation in Ethiopia

A season is a period of the year characterized by a particular set of weather conditions resulting from the inclination of the earth's axis and the revolution of the earth around the sun. The same cycle of season is repeated year after year.

### 2.4.2.1 Seasonal Variation of Temperature in Ethiopia

*Can you identify the temperature differences in Ethiopia between the months of April/May and those of October/November? How do these differences occur?*

In Ethiopia, temperatures vary from season to season. For example, in most parts of Ethiopia, high temperatures are recorded from March to June. Conversely, low temperatures are recorded from November to February. These variations are primarily due to:

- 🌍 *the tilting of the earth at  $23\frac{1}{2}^{\circ}$  to the normal elliptic, and*
- 🌍 *the distance of the overhead sun and its apparent north-south movement across the equator as the earth revolves around the sun.*

During the winter season of the northern hemisphere, Ethiopia experiences the “Bega” season. During this season, day have clear skies. Thus, the incoming solar rays are intense. As a result temperature increases in day time and abruptly decreases at night because of clear sky. This, therefore, results in high diurnal range of temperature.

- 🌍 *The mean maximum temperatures are experienced over the western, north eastern and south eastern lowlands while the lowest temperatures are over the Semein and Arsi-Bale mountains.*
- 🌍 *The highest temperature i.e. over  $45^{\circ}\text{C}$  is recorded in the Danakil Depression - the hottest place of Ethiopia.*

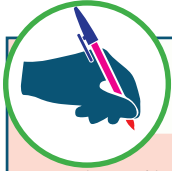
### 2.4.2.2 Seasonal Variation of Rainfall in Ethiopia

*Do you distinguish the two concepts spatial and temporal? Which of the two terms is very much explanatory in the distribution of rainfall in time series?*

Rainfall, like temperature is a major element of climate. Ethiopia experiences marked spatial and temporal variations of rainfall.

### A. Spatial Variation of Rainfall in Ethiopia

The spatial variation is the result of strength and nature of prevailing weather systems following the oscillation of the Inter Tropical Convergence Zone (ITCZ).



#### NOTE

As described earlier, Ethiopia's weather systems also result from the apparent movement of the overhead sun, prevailing winds and the presence of barrier that checks the moisture arrival into the area

#### *Inter-Tropical Convergence Zone (ITCZ)*

It is a low atmospheric pressure zone formed by the convergence of northeasterly and southeasterly trade winds. It shifts north and south of the equator following the position of the overhead sun.

In June, its position is at the Tropic of Cancer. During this time, Ethiopia comes under the influence of the Equatorial Westerlies and Easterlies. As they originate from water bodies, these winds bring moisture to the highlands, but decrease their magnitude and length of rainy periods northwards.

In December, its position shifts to the Tropic of Capricorn leaving the region for the prevalence of the Northeast Trade winds that are non-moisture-laden as they originate from the continental landmass. During this time only lowland areas in Afar region close to the coast receive some amount of rain given that these winds pick up little moisture as they blow passing over the Red Sea. In most of Ethiopia, it becomes dry season.

In March and September, the position of the ITCZ is around the equator. Hence, the Equatorial Easterlies provide rain to the Southeastern lowlands, Central and highlands of Ethiopia.

### B. Temporal Variation of Rainfall in Ethiopia

Ethiopia's rainfall is characterized by seasonal variation. There are two main rainy seasons: *Kiremt* (summer) that extends from June to August and *Belg* (spring) that covers the time from March to May. These two rainy seasons contribute more than 90% of the country's rain supply. There are two other rainy seasons namely the

*Meher* (autumn) rains and the *Bega* (winter) rains. Compared to the two main rainy seasons, the duration, volume, and aerial coverage of *Meher* (autumn) rains that takes place from September to November are less. The *Bega* (winter) is generally the dry season that takes place from December to February. It supplies small amount of rain only to the Afar lowlands.

### 2.4.3 Rainfall Regions of Ethiopia

Based on rainfall distribution, both in space and time, five types of rainfall regions can be identified in Ethiopia. These are:

- a) *Year-round rainfall region (wet in most months)*
- b) *Summer rainfall region*
- c) *Autumn-and-spring rainfall region*
- d) *Winter rainfall region*
- e) *Merged spring, summer, and autumn rainfall region*

Each region is discussed in turn as follows

#### a. Year-round Rainfall Region (wet in most months)

In Ethiopia, the area of year-round rainfall includes the southwestern plateau comprising the highlands of Wollega, Kafa, Illubabor and Gamo and Goffa. The reason for the high rainfall and an exceptionally long wet season is due to the dominance of the equatorial Westerlies wind system. They pick up moisture from the Atlantic Ocean.

This region can be represented by the following stations, namely; *Gore, Mizan, Metu, Bonga, Gambella, etc.*

The region has more rainy days than any other part of the country. The average rainfall varies from 1400 mm to 2200 mm.

The year-round rainfall region is represented by the letter **B** on Figure 2.5.

#### b. Summer Rainfall Region

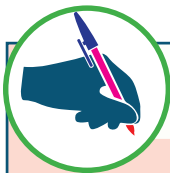
The summer rainfall region is the largest in the country. This region consists of the Northwest Highlands and Western Lowlands, and can be represented by the following stations, namely; *Debre Markos, Fitcha, Gondar, Bahir Dar, etc.*

Its moisture-bearing winds are the Equatorial Westerlies and Easterlies. The summer rainfall region is represented by the letter **A** in Figure 2.5.

### c. Autumn-and-Spring Rainfall Region

The autumn-and-spring rainfall region covers the southeastern highlands and associated southeastern lowlands. They can be represented by the following stations: *Gode, Moyalle, Jigjiga, Yabello*.

The region's moisture-bearing winds are the Equatorial Easterlies. They pick up moisture from the Indian Ocean, and they blow over the autumn and spring rainfall region when the Northeasterlies and Equatorial Westerlies are weak. The region's average rainfall varies from less than 500 to 1000 mm. The autumn-and-spring rainfall region is represented by **E** in Figure 2.5.



#### NOTE

In Ethiopia, highland rainfall is more dependable than lowland rainfall. However, highland dependability decreases from the southwestern highlands in all directions. In short, rainfall variability (deviation from the expected amount and time) decreases from areas of heavy rains to areas of low rainfall.

### d. Winter Rainfall Region

The winter rainfall region consists of the eastern escarpment of the western highlands, the middle Rift Valley section and the Afar subdivision. The winter rainfall region can be represented by the Assaita station (Afar Region). The region's moisture-bearing winds are, for the most part, the North Easterlies. The air mass is continental (dry) and has only a short sea trajectory (that is the Red Sea).

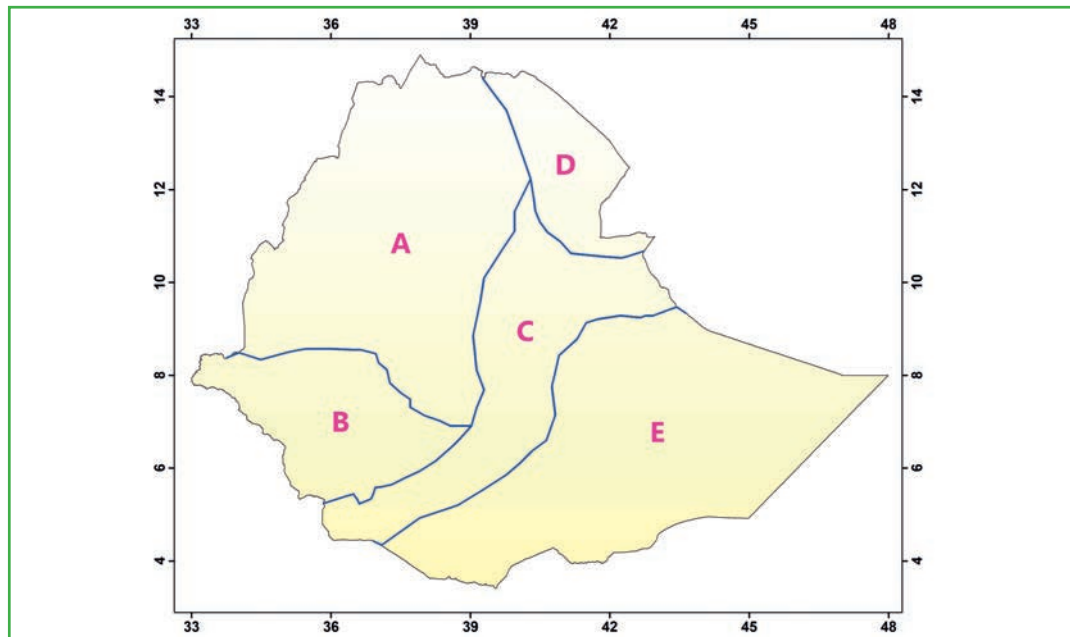
It is represented by letter **D** in Figure 2.5. The region's total annual moisture is very low and of short duration.

### e. Merged Spring, Summer, and Autumn Rainfall Region

The merged spring, summer and autumn rainfall region is the smallest in the country. It consists mainly of the western foothills of the Southeastern Highlands. The region's total annual rainfall varies from 1500 mm to 1000 mm. It covers a corridor that stretches from the Sidama Highlands to the Hararge Plateau.

The merged spring, summer, and autumn rainfall region is represented by the letter **C** in Figure 2.5. It can be represented by the following stations namely, *Assaita, Awash, and etc.*





**Figure 2.5:** Rainfall Regions of Ethiopia

## Activity 2.4



### Answer the following questions

1. What do we mean by spatial and temporal in the context of Geography?
2. Identify your own agro-climatic zone by referring to your area's altitude. You might be able to obtain the meters above sea level value of your altitude from your area's kebele offices or from those of other agencies in your area. Your teacher may help you as you try to get that information so that you can use it to identify your agro-climatic zone.
3. Identify all the characteristics of your agro-climatic zone.
4. State the dominant wind systems over Ethiopia during the “Bega” and “kiremt” seasons.
5. Identify your locality, based on its rainfall seasons. In which seasons do you experience rain?
6. What moisture-bearing winds prevail over your area?
7. What is the attractive factor for the moisture coming as rain to your locality?

## 2.5 MEASUREMENTS OF WEATHER AND CLIMATE



*At the end of this section, you will be able to:*

- ✓ measure the temperature variation from the thermometer;
- ✓ read the amount of rainfall receipt from a rainguage;
- ✓ measure air pressure with a barometer; and
- ✓ detect wind direction with the help of a wind vane.



### KEY TERMS

- 🔑 Anemometer
- 🔑 Barometer
- 🔑 Rain gauges

- 🔑 Thermometer
- 🔑 Wind vane

### A. Measuring and Recording Air Temperature

Temperature is a very important element of climate and weather. The instrument for measuring temperature is the thermometer, which is a narrow glass tube filled with mercury or alcohol. It works on the principle that mercury expands when heated and contracts when cooled. On thermometers, temperatures are marked in one of two ways. In °F. (Fahrenheit) the freezing-point is 32°F. and the boiling-point is 212°F. For most scientific purposes the Centigrade °C. scale is preferred. Its freezing-point is 0°C. and its boiling-point is 100°C. These two scales are interconvertible. Look at the following formula:

$$C = (F - 32) \times \frac{100}{180} = (F - 32) \times \frac{5}{9}$$

$$F = \left( C \times \frac{180}{100} \right) + 32 = \left( C \times \frac{9}{5} \right) + 32$$



### Focus

**Mean daily temperature:** it is calculated by adding the maximum and minimum temperature of the day and dividing the sum by 2.

**Daily (diurnal) range of temperature:** it is the difference between the daily maximum and daily minimum temperature.

**Mean monthly temperature:** is determined by adding together the daily averages and the dividing the number of days in a month.

**Mean annual temperature:** it is calculated by adding the mean monthly temperatures and dividing the sum by 12.

**Annual range of temperature:** it is the difference between the temperatures of the hottest and coldest months.

### b. Measuring and Recording Rainfall

Rainfall is measured using a rain gauge. The rain gauge is usually anchored in the ground with the top of the gauge around 30cm above the ground surface to ensure that rain splash does not affect the results. The depth of the rain in millimeters can be read from the side of the container at least once a day (usually at 9:00a.m). A records is kept of the amount of rain (if any) which has fallen during the past 24 hours. At the end of a month the daily amount rainfall records are added together and this gives, of course, the total amount of rainfall for that month.



#### Focus

**Mean monthly rainfall:** it is calculated by adding all the amounts of rainfall on daily basis for the month and dividing the sum by the number of days of the month.

**Total annual rainfall:** it is calculated by adding the amounts rainfall of the 12 months.

**Mean annual rainfall:** it is calculated by adding the annual amounts of rainfall for 30-35 years and dividing the sum by the number of those years.

### c. Measuring and Recording Air Pressure

Air is made up of a number of mixed gases and has weight. It therefore exerts a pressure on the earth's surface which varies from place to place and from time to time. This force that presses on the surface of any object can be fairly accurately measured. The instrument for measuring pressure is a barometer. The unit more commonly used for measuring pressure is called millibar and millimeter. At sea level, the mercury column is 1013.25 millibars, or 760 mm.

### d. Measuring and Recording Wind Speed

Wind speed can be measured using an anemometer. The anemometer should be held at arm's length, above the head so that the cups can rotate without any interference.

### e. Measuring and Recording Wind Direction

Wind direction is reported by the direction it is blowing from, according to the compass. Wind blowing from the west is travelling eastwards so is called a westerly wind, not an easterly wind. Wind direction is often observed using a wind vane.

## Activity 2.5



### 1. Convert

- a) 70° F to °C      b) 25°C to °F      c) 15°C to °F

**Table 2.3:** Average Temperature of Addis Ababa (1991-2020)

Months	J	F	M	A	M	J	J	A	A	O	N	D
Annual Min. Temperature (°C)	9	10	12	13	13	12	12	12	12	10	9	8
Annual Max. Temperature (°C)	24	25	25	25	25	23	21	20	21	23	23	23

**Source:** NASA Climate Data Service

### 2. By referring to Table 2.3;

- a) Calculate annual range of temperature.  
b) Calculate annual mean temperature.

**Table 2.4:** Average Rainfall of Addis Ababa, 2020

Months	J	F	M	A	M	J	J	A	A	O	N	D
Rainfall (mm)	13	30	60	80	85	140	280	290	150	25	7	7




**Source:** NASA Climate Data Service

### 3. By referring to Table 2.4;

- a) Calculate the total annual rainfall  
b) Identify the wettest and driest seasons.

## UNIT SUMMARY

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-  Climate is the average conditions of the atmosphere over a long period of time in a given area. Climatic elements include precipitation, temperature, humidity, air pressure, winds, etc. The spatial and temporal distribution of the climatic elements in Ethiopia is determined by various physical factors which are generally known as controls of climate. The most important are latitude, altitude, mountain barriers and evolution of the earth and the inclination of the earth's axis.
-  The apparent spatial variation of altitude, in Ethiopia has resulted in agro-ecological zonation of climate ranging from "Bereha" to "Wurch". Especially in the highlands, Ethiopia experiences four seasons, namely 'Kiremt', 'Meher', 'Bega' and 'Belg'. Laterally, due to the altitude effect we see spatial variation of temperature, rainfall, vegetation and population density.
-  Based on the areal and seasonal variation of the spread of rainfall, Ethiopia is divided into five main rainfall regions, namely year-round rainfall region, summer rainfall region, autumn-and-spring rainfall region, winter rainfall region and merged spring, summer, and autumn rainfall region.

## REVIEW EXERCISES

### PART I: TRUE OR FALSE ITEMS

**Dection: Write "True" if the statement is correct and false if it is incorrect**

1. Weather and climate both mean the same thing.
2. The majority of Ethiopia's agricultural land is located in the Dega agro-climatic zone.
3. A climate is a pattern of weather conditions experienced in an area over a long period of time.
4. The eastern escarpment of the western highlands, the middle Rift Valley section, and the Afar subdivision experience mostly summer rains.
5. The side of the mountain facing the wind laden with moisture is called the windward side.

### PART II: MULTIPLE CHOICE ITEMS

**Direction: Choose the correct word or phrase from the given alternatives.**

6. Temperature variations in Ethiopia are mainly the result of
 

A. altitude.	C. ocean current.
B. latitude.	D. mountain barriers.
7. As summer rainfall is to the Northwest Highlands and Western Lowlands, \_\_\_\_\_ is to the Southeastern Highlands and Southeastern lowlands.
 

A. Winter Rainfall	C. Year-round Rainfall
B. Merged Spring, Summer, and Autumn Rainfall	D. Autumn and Spring Rainfall
8. With regard to the traditional temperature zones of Ethiopia, which of the following matches the Tropical Climate?
 

A. Bereha	C. Wurch/Kur
B. Qolla	D. Woina Dega

9. Which of the following regions of Ethiopia receives year-round rainfall and is least likely to be affected by droughts?
- A. Eastern lowlands.
  - B. Western lowlands.
  - C. Southwestern highlands.
  - D. North eastern highlands.
10. The short term state of the atmosphere, including, temperature, humidity, precipitation, wind, and visibility.
- A. Humidity
  - B. Climate
  - C. Precipitation
  - D. Weather

### PART III: COMPLETION ITEMS

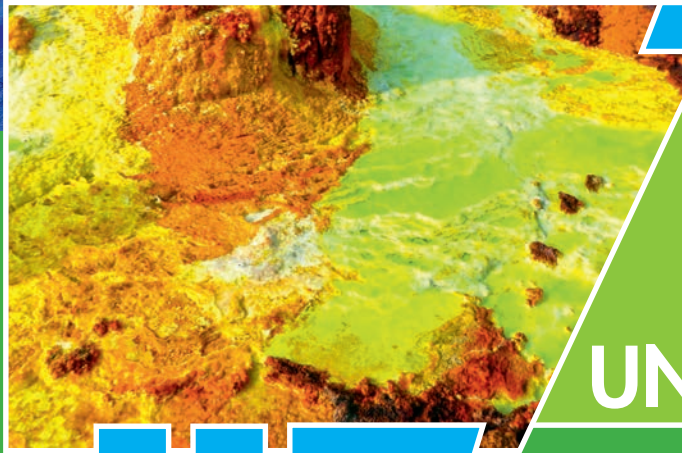
**Directions: Complete each of the following sentences with the correct word or phrase.**

11. The year-round rainfall region corresponds to \_\_\_\_\_.
12. The two areas in Ethiopia with high rainfall variability are \_\_\_\_\_ and \_\_\_\_\_.
13. The two areas in Ethiopia with very low rainfall variability are \_\_\_\_\_ and \_\_\_\_\_.
14. \_\_\_\_\_ is known as the strongest of all the controls of climate in Ethiopia.
15. \_\_\_\_\_ is the instrument used to measure air pressure.

### PART III: SHORT ANSWER ITEMS

**Direction: Give a short Answer for the following questions.**

16. What are the elements of weather and climate?
17. What are the factors controlling the distribution of climate in Ethiopia?
18. Which rainfall season, in Ethiopia, constitutes the highest contribution to livelihood of the farmers living on the highlands?
19. State the dominant wind systems over Ethiopia during the 'Bega' and 'Kiremt' seasons.
20. List the main instruments for measuring elements of weather and climate

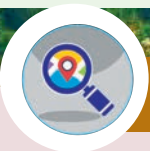


## UNIT THREE

### 3. NATURAL RESOURCE BASE OF ETHIOPIA

#### INTRODUCTION

As it is indicated in the unit title, now you are going to deal with the natural resource base of Ethiopia that is concerned on those major natural resources such as soils, water, natural vegetation, and wildlife that are foundation of any economic development, food security and other basic necessities for the Ethiopian population.



#### Unit Outcomes

*After completing this unit, you will be able to:*

- ✓ recognize the concept of natural resources;
- ✓ elaborate on the major drainage systems of Ethiopia;
- ✓ explain the distribution of the major water resources in Ethiopia;
- ✓ state soils types and distribution in Ethiopia;
- ✓ explain factors responsible for difference in types of natural vegetation in Ethiopia;
- ✓ describe the types of wildlife in Ethiopia and factors that affect their distribution; and
- ✓ describe the spatial distribution and variation of minerals in Ethiopia.





## Main Contents

- 3.1 Meaning of Natural Resources
- 3.2 Drainage Systems of Ethiopia
- 3.3 Water Resources of Ethiopia
- 3.4 Major Soils Types of Ethiopia
- 3.5 Major Mineral Resources and their Distribution in Ethiopia
- 3.6 Biotic Resources of Ethiopia

 *Unit Summary*

 *Review Exercise*

## 3.1 MEANING OF NATURAL RESOURCES

*At the end of this section, you will be able to:*

- ✓ recognize the concept natural resources; and
- ✓ describe the classification of natural resources.



### KEY TERMS

 *Non-renewable resources*

 *Renewable resources*

Natural resources are natural assets occurring in nature that can be used for economic production or consumption. They are classified into renewable resources and non-renewable resources. Plants, animals, soil, water, geothermal energy, wind energy, solar radiation are categorized under renewable resources while all minerals, coal, crude oil and natural gas under non-renewable resources.

Renewable resources are resources which can be replenished by nature while non-renewable resources are resources that cannot be regenerated by nature and exist in limited amount.

In Ethiopia, these resources are under the influence of various interconnected factors like population pressure, agricultural expansion, migration, rapid urbanization, resettlement, climate change, and environmental pollution. The huge population of

Ethiopia had been putting a great burden on the sustainability of almost all types of natural resources. There is, therefore, serious degradation of land, water, forest, rangeland, and wildlife resources that appear to feed off each other.

### Activity 3.1



#### Answer the following questions

1. What does sustainable utilization of natural resources mean?
2. Ethiopia's natural resources have been deteriorating from time to time. Why?

## 3.2 DRAINAGE SYSTEMS OF ETHIOPIA

*What natural factor influences the drainage systems of Ethiopia?*

*Where do most rivers of Ethiopia end?*

*At the end of this section, you will be able to:*

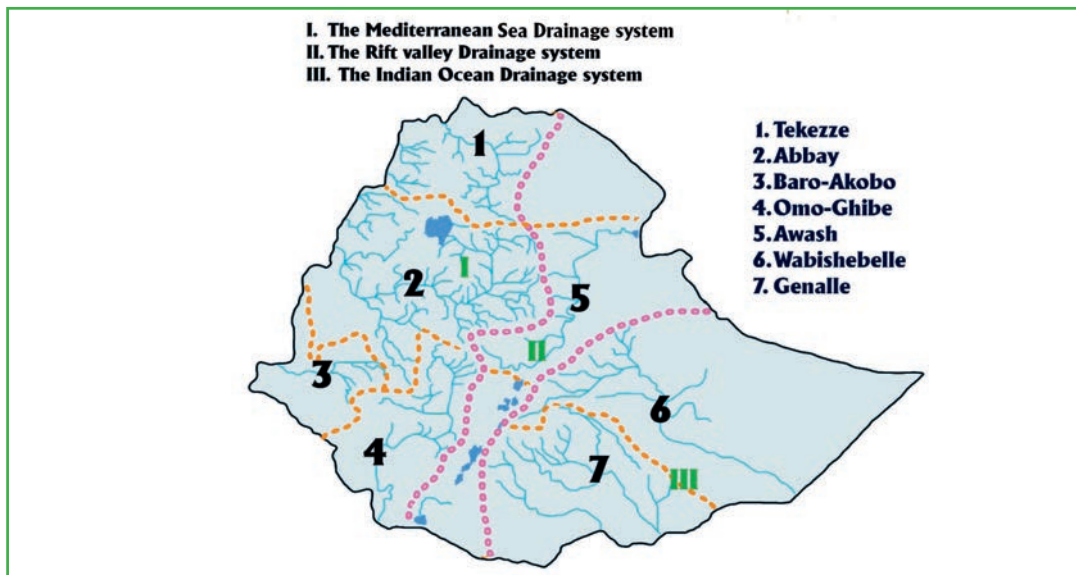
- ✓ elaborate major drainage systems of Ethiopia.



Drainage systems refer to the flow direction and destination of the rivers. The drainage patterns and systems of Ethiopia are the results of various structural events that took place in the Cenozoic era.

The drainage systems of Ethiopia are basically classified into three major groups:

- i. The Western (Mediterranean) sea drainage system
- ii. The Southeastern (Indian Ocean) drainage system
- iii. The Inland (Rift Valley) drainage system



**Figure 3.1:** *The Drainage Systems of Ethiopia*

### i. The Western (Mediterranean Sea) Drainage System

The western drainage system is the largest of the three systems both in terms of catchment area and volume of water. It contributes 60% of the country's total annual water discharge. It is made up of major rivers and their tributaries namely:

- 🌍 **River Tekezze** – This river drains the Massif of western Lasta, northern Gondar/ Semein and southwestern, western and central Tigray.
- 🌍 **River Abbay** – This one has its origin in the Gojjam plateau. A large number of streams join the river from the plateaus of western Shewa, southwestern Wollo, northern Wollega, and northern Illubabor. It has a semicircular course from Lake Tana, separating southeastern Gondar from Gojjam and separating Gojjam from Shewa.
- 🌍 **River Baro-Akobo** – This water course drains the wettest highlands of the southwest and crosses the border to join the Nile.

These rivers joining the Nile in the Sudan and finally end up in the Mediterranean Sea.

### ii. The Southeastern (Indian Ocean) Drainage System

This system is the second largest drainage system. It consists of the Genalle and Wabe Shebelle. These rivers collect waters from the highlands of Hararghe, Sidamo, Bale and Arsi. This drainage system flows southeast, across the Somali arid and semi-arid areas. It contributes about 32% of the country's total annual water flow.

The Wabe Shebelle, the longest river in the country, does not reach the Indian Ocean. It ends at the Benadir coast of Somalia. The Genale, on the other hand, reaches the Indian Ocean. It joins the Dawa River at the Ethio-Somalia border, where it acquires the name Juba.

### iii. The Inland (Rift Valley) Drainage System

This system is the smallest of the three systems in terms of catchment area, discharge of water and volume of water. There are a number of lakes and smaller streams, like the Bilate and Gedabo, which flow into Lake *Abbaya*; the Segan, which flows into Chew Bahir; and the Meki and the Katar, which flow into Lake Ziway. The major rivers in this drainage system are the Awash and the *Omo-Gibe*.

The Awash River basin is the most utilized in the Rift Valley. The basin covers a total area of 110,000 km<sup>2</sup>. It rises from the Shewan plateau near Ginchi town, a town at about 100 kilometers west of Addis Ababa, and flows along the Rift Valley. It terminates in the salty lake of Abbe on the border with Djibouti. The middle and lower courses are part of the Great Rift Valley system (the upper course is not part of the system). The lower Awash River basin comprises the deltaic alluvial plains of the Tendaho, Assaita, and Dit Behri areas, and of the terminal lakes area.

## Activity 3.2



### Answer the following questions

1. To which direction do rivers in your locality flow? What determines their direction of flow?
2. Draw a map of Ethiopia and divide it into the three drainage systems.

### 3.3 WATER RESOURCES OF ETHIOPIA



*At the end of this section, you will be able to:*

- ✓ explain the distribution of the major water resources in Ethiopia.

As you know, Ethiopia has been known as the “Water Tower of Northeastern Africa” for the last fifty to sixty years. Ethiopia is the second richest African country in terms of water resource potential, following the Democratic Republic of Congo. Generally, Ethiopia has adequate average annual rainfall in most areas. As a result, it has several major rivers, lakes, and significant ground water potentials.

#### 3.3.1 Major Rivers of Ethiopia and Their Characteristics

*Do you know the major rivers of Ethiopia?*

Ethiopia is among the few countries that have many rivers. Ethiopia has enormous potential water resources. As well as being numerous, Ethiopian rivers are energetic. They flow from the highlands of the interior to the peripheral lowlands and then to seas and lakes bouncingly. These conditions have made Ethiopia known as the “water tower of Northeastern Africa” and as the watershed between the Mediterranean Sea and the Indian Ocean drainage systems.

*Table 3.1: Major Rivers of Ethiopia and Their Tributaries*

Rivers	Catchment Area (km <sup>2</sup> )	Length in kms			Major Tributaries
		Inside	Outside	Total	
Wabe Shebelle	205,407	1340	660	2000	Ramis, Erer, Dakata, Fafen, Yerer, Gabelle, Galleti, Mojo
Abbay	198,508	800	560	1360	Dabus, Didessa Fincha, Guder, Muger, Jemma, Beshillo, Shinta, Dinder
Genale	168,141	480	570	1050	Dawa, Weyb, Welmel, Mena
Awash	113,709	1200	-	1200	Akaki, Kessem, Borkena, Mille
Tekkezze	87,733	608	560	1,168	Tirari, Anghereb, Ghiba, Guang
<b>Gibe/Omo</b>	77,205	760	-	760	Gojeb, Gilgel <b>Gibe</b>
Baro	75,718	227	280	507	Akobo, Gilo

### 3.3.2 Characteristics of Ethiopian Rivers

*Are all Ethiopian rivers perennial and non-fluctuating in their volume of water?*

The most important characteristics of Ethiopian rivers include:

- 🌐 *seasonal fluctuation in water volume;*
- 🌐 *steep profiles; they arise from very high places and flow to the country's borders across lowlands;*
- 🌐 *rapids and waterfalls along their courses;*
- 🌐 *running through steep-sided river valleys and gorges; and*
- 🌐 *serve as boundaries, both international and domestic.*

#### Activity 3.3



**Answer the following questions.**

1. By referring table 3.1, identify;
  - a) *the longest river in Ethiopia;*
  - b) *river with the largest catchment area in Ethiopia;*
  - c) *rivers forming an inland drainage system;*
  - d) *river with many tributaries compared to others.*



#### Focus

Some of the Ethiopian rivers are given new names after they cross the country's borders.

**Examples:**

- 🌐 *River Abbay becomes Blue Nile in the Sudan.*
- 🌐 *River Tekezze becomes River Athbara in the Sudan.*
- 🌐 *River Genale becomes River Juba in Somalia.*
- 🌐 *River Baro becomes River Sobat in the Sudan.*

### 3.3.3 Lakes of Ethiopia

*Can you tell the deepest and shallowest lakes of Ethiopia?*

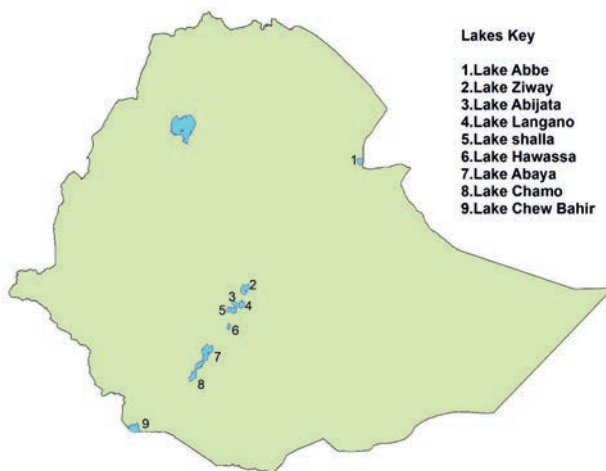
By African standard, Ethiopia is a country rich in lakes. They are found dispersed on the plateaus and clustered in the Rift Valley.

Most of the lakes are the result of structures that occurred during the Quaternary Period; i.e., they are not outcomes of climate. This fact is proved by the location of these lakes in the drier parts of the country. The natural lakes found in Ethiopia can be classified into highland and Rift Valley lakes.

**Highland Lakes:** These lakes are situated on the plateaus, either as crater or watershed lakes. These types of lakes resulted from different types of structural formations.

A crater lake is formed after an explosive volcano breaks a mountain open, leaving a deep mouth. The mouth is filled with water – from either small streams or subterranean sources. The highland crater lakes in Ethiopia are Haik near Dessie and Hashenge near Korum . There are also crater lakes in different parts of Ethiopia. They include many small but deeper lakes in and around Bishoftu, e.g. Bishoftu, *Kuriftu*, Babbo Gaya, and Arsed. Wonchi and Dendi around Ambo, Ginchi and Wellisso and Ziquala are the other crater lakes.

A watershed lake is formed when a sheet of lava dams up a shallow surface depression. For example, Lake Tana was formed during the Quaternary Period, when a sheet of flowing lava dammed the shallow depression that had already been formed between the Gojjam and Gondar Massif.



**Rift Valley Lakes:** Unlike the highland lakes, the Rift Valley lakes are clustered. The Rift Valley lakes are formed in the depressions and basins caused by tectonic activities. They are found in a linear pattern along the floor of the Rift Valley (see Figure 3.2).

**Figure 3.2:** Major Rift Valley Lakes of Ethiopia

**Table 3.2:** Depth, Area and Location of Ethiopian Lakes

Lakes	Area (km <sup>2</sup> )	Maximum depth (meters)	Type
Tana	3,600	9	Highland
Abbaya	1,160	13	Rift Valley
Chamo	551	10	Rift Valley
Ziway/Danbal	434	4	Rift Valley
Shalla	409	266	Rift Valley
Langano	230	46	Rift Valley
Hawassa	229	10	Rift Valley
Abijatta	205	14	Rift Valley
Haik	35	23	Highland
Hashenge	20	25	Highland

### Activity 3.4








#### Answer the following questions.

1. By referring table 3.2, identify;
  - a) *the deepest lake*
  - b) *shallowest lake*
  - c) *the largest lake*

### 3.3.4 Significance of Ethiopian Lakes and Rivers

Ethiopian rivers and lakes are very important natural resources for the development of socio-economic and aesthetical value in the country. Some of their general importances are given briefly below:

**I. Hydroelectric Power (H.E.P.) Generation:** rivers are the main source of hydroelectric power (H.E.P.) supplies for the country. Example:

-  *River Gibe – Gilgel Gibbe – 1, 2 and 3 H.E.P. plants,*
-  *River Awash – Awash 1, 2 and 3 H.E.P. project,*
-  *River Fincha – Fincha H.E.P. project,*
-  *Tekezze – Tekezze H.E.P plant,*
-  *Melka Wakena – Wabe Shebelle H.E.P,*



- 🌐 *Koysha - Under construction,*
- 🌐 *Great Ethiopian Renaissance Dam H.E.P plant – under construction.*

- II. **Fishery:** Ethiopian rivers and lakes are also the country's main source of fish. Example: Lake Chamo, Lake Abbaya, Lake Tana, River Baro, etc
- III. **Major Irrigation Schemes:** They are again very important water sources for irrigation. River Awash is the most utilized in this regard; this is because of the flat plains it crosses for hundreds of kilometers.
- IV. **Navigation:** The River Baro is the only river in Ethiopia used for water transport. Similarly, Lake Tana, Lake Ziway and Lake Abbaya are important inland water ways.
- V. **Tourism and Recreation:** Ethiopia's lakes and rivers provide recreation resorts and aesthetic value. Their scenic beauty emanates from the rich variety of birds, fish and other wildlife, spectacularly deep gorges, waterfalls of all description and the mists they produce. These panoramic features win the affection of the Ethiopian people and tourists and they are sites of the country's best recreational resorts. The economic potential of these scenic resources is enormous but it is not well developed yet.

### Activity 3.5



#### Answer the following questions

1. Ethiopia is known as the “Water Tower of East Africa”. Explain
2. Most rivers of Ethiopia are not suitable for navigation. Why?
3. Compare and contrast watershed lakes and crater lakes.
4. Make an educational trip to a nearby river or stream with your teacher and perform these tasks:
  - a) Draw a sketch map of the stream or river area. Then, answer the following questions:
    - b) Do the local people use the river for small scale irrigation purposes such as growing vegetables? If so, how?
    - c) If not, why not? Present the case to your teacher and discuss it.

## 3.4 MAJOR SOILS TYPES OF ETHIOPIA



*At the end of this section, you will be able to:*

- ✓ distinguish major soil types in Ethiopia; and
- ✓ explain the characteristics of major soils types in Ethiopia.



### KEY TERMS

🔑 Conservation  
🔑 Humus

🔑 Parent material  
🔑 Soil

### 3.4.1 Formation of Soils in Ethiopia

Soil is the loose material overlying the crust of the earth consisting mainly of very small particles. Its major components are water, air, organic and inorganic minerals. It is a dynamic, natural and complex substance which can support animals and plants.

Soils of Ethiopia are the result of:

- 🌐 *Parent rock material, which has been broken into small particles by way of weathering and natural decomposition*
- 🌐 *Climatic conditions, which largely determine the speed and nature of the processes that form the soil; for example, extreme heat, or cold, could stop the work of bacteria, and the amount of moisture influences on several aspects of soil formation.*
- 🌐 *Vegetation cover, which adds humus to the soils and renders support to the soil making animals and bacteria*
- 🌐 *Topography, soils on the side of hills tend to be shallow, due to erosional losses.*

On the plateaus that make up extensive areas in north, north western, south western, central and south eastern Ethiopia the parent rocks are volcanic origin and experience sufficient rainfall. The soils formed in these areas are red basaltic and black basaltic soils. Unlike the red basaltic soils, the black soils have high clay content that makes the soil difficult for farming.

In areas where the hard crystalline rocks are the parent rock, the soils are poor and thin. They are also rocky and acidic. They range in colour from grey to brown. They are found in Hararghe plateaus and Borena lowlands.

In the Afar region where recent volcanic deposits and dried-out lake deposits had occurred, very shallow and saline-dominated soils are formed. Due to time and climatic effects, these soils are not deep and fertile.

In the southeastern lowlands where the parent rocks are sedimentary rocks, the soils lack humus but they are rich in phosphorous and potash. They are also low in nitrogen content.

In the lower course of the major rivers, transported soils often known as alluvial soils are dominant. These soils are fertile because of their volcanic origin and continuous nourishment of water.

People depend on soils; conversely, the quality of the soils depends on how wisely people use the land. Not only in countries like Ethiopia, whose economy is largely agrarian, but also in highly industrialized countries, soil is one of the most important bases of life.

### 3.4.2 Types of Soil in Ethiopia

The soils of Ethiopia are basically derived from volcanic, metamorphic and sedimentary rocks. According to the latest classification made by the FAO, there are eighteen classes of soil in Ethiopia.



*Can you mention names of soils you know in your locality or elsewhere?*

Here are the main soil types. They cover more than 85 percent of the country.





#### 1. Nithosols (Red Basaltic Soils): These soil types:

- 🌐 *cover about 12 percent of the country.*
- 🌐 *are basically associated with high rainfall and are found in areas that were previously covered with forest.*
- 🌐 *are predominant in the Western Highlands of Wollega, Kafa, Illubabor, the Southern Highlands of Sidama, the Central and Western Highlands of Shewa, the Highlands of Gojjam and the Eastern Highlands of Hararghe.*
- 🌐 *are matured soils with deep profiles. They are highly leached and lack*




*soluble minerals like Sodium, Calcium, etc., but they are rich in iron and aluminum.*

-  *are potentially good for farming and other agricultural practices since they are friable, and have a stable structure; as a result,*
-  *are the most widely cultivated soil type. They are the best soils for coffee, inset and cereals.*




## 2. Vertisols (Black Basaltic Soils): soil types of these sort:

-  *cover about 10 percent of the total land of Ethiopia.*
-  *have high clay content; so, are sticky. For this reason and for poor drainage qualities, such soils are difficult to be used for farming purposes.*
-  *have excellent nutrients that could provide support for agriculture, but their poor drainage qualities limit their use for grazing purposes.*
-  *are largely found in Arsi, Bale and central Hararghe, where there are pronounced wet and dry seasons.*





## 3. Cambisols: Such soils:

-  *are soils that developed from the recent lava deposits of the Quaternary Period.*
-  *are young and shallow.*
-  *are found on the rugged and sloping terrain of the Plateau of Shewa (eastern escarpment) and Chercher Highlands.*





## 4. Regosols: These types:

-  *like the cambisols, are shallow and young; but they are coarse-textured.*
-  *have low agricultural value.*
-  *are found in the Danakil and Ogaden plains.*




## 5. Xerosols: These soils:

-  *are generally young and shallow, and are found in arid and semi-arid regions. They have a weakly developed profile.*
-  *are found extensively in the Northeastern escarpment, Northwestern and Southeastern Lowlands.*
-  *are characterized by high salt content and humus deficiencies.*
-  *have little significance for agriculture except places where they could be irrigated.*






**6. Luvisols:** These soils:

-  *are well-developed in areas where there are clearly marked wet and dry seasons and when leaching is not very high.*
-  *are among the best soils, since they have good chemical nutrients.*
-  *are intensively cultivated, except in areas that are steeply sloped or water-logged.*
-  *are found around Lake Tana, and in the eastern part of the Northern Central Highlands and in the Southern Lowlands.*

**7. Lithosols:**Such soils:

-  *are similar to cambisols and regosols in their poor maturity and their location on steep slopes.*
-  *are found in areas of low precipitation.*
-  *cover the escarpments of the Northeastern and Chercher Highlands.*

**8. Fluvisols:** This type of soils:

-  *are soils that rivers have transported from highlands to lowlands.*
-  *cover about 10 percent of the country's total area.*
-  *are associated with river, sea and lake deposits.*
-  *have very good agricultural potential.*
-  *are found extensively in the lower regions of the Omo, Awash, Abbay and Baro-Akobo Rivers.*

### Activity 3.6



#### Answer the following questions

1. List the soils of Ethiopia in the order of their suitability for agriculture from the best to the worst.
2. What is the basic difference between the Red Basaltic and the Black Basaltic soil?
3. Compare and contrast Cambisols and Fluvisols.

### 3.5 MAJOR MINERAL RESOURCES AND THEIR DISTRIBUTION IN ETHIOPIA

*At the end of this section, you will be able to:*

- ✓ elaborate major mineral resources of Ethiopia; and
- ✓ describe the spatial distribution minerals in Ethiopia.



#### KEY TERMS

- 🔑 Coal
- 🔑 Gold
- 🔑 Metallic minerals

- 🔑 Non-metallic minerals
- 🔑 Petroleum
- 🔑 Platinum

According to some preliminary geological survey, there is an agreement that Ethiopia has many different types of untapped mineral deposition. None of them is currently extracted on a large scale either for commercial or industrial use.

In Ethiopia non-metallic minerals are more produced annually compared to the metallic ones. With the exception of common salt, almost all other productions of minerals are produced in small scale. Some amounts of these minerals are exported. Currently, a number of known occurrences and distribution of metallic and non-metallic minerals have been identified as follow:

#### 1. Metallic Minerals

##### a) Gold

It has been extracted in Ethiopia since ancient times from alluvial deposits. There are two principal geological environments in Ethiopia in which gold is found. These include volcanic veins in Precambrian rocks and alluvial deposits. The largest active gold mines in Ethiopia are Adola, Bule Hora, Arero, Moyale, Akobo, Lega Dembi, Sakaro and the Tigray regions.

##### b) Platinum

It is the key input for manufacturing of many electronic equipment including mobile phones. The deposits are identified in the western parts of Ethiopia (north east Yubdo, north of Gimbi and in the Akobo area of Gambella region).

c) **Tantalum**

Like platinum it is used for manufacturing of many electronic equipment including mobile phones. Kenticha, a place 50 kms South-east of Shakiso in Adola is identified as a tantalum rich area. In other areas of Adola, tantalum bearing minerals have been found but none of these areas has been explored in detail.

## II. Non-metallic Minerals

- a) **Potash and Salt:** They are found in the Danakil depression (Dallol) area of the Northern Rift Valley. This area is known for its rich potash and salt deposits.
- b) **Soda Ash:** Geological surveys indicated that some rift valley lakes of Ethiopia namely Abijata, Shalla, etc. contain 460 million metric tons of Sodium Carbonate. The concentration of salt, combined with a favorable climate, which makes this area potentially one of the best locations for soda ash production in the country.
- c) **Limestone:** It is important mineral resource for building and construction. It is used for the production of cement and chalk. Good reserves are found in Tigray, Shewa and Harerghe.
- d) **Clay:** Clay deposits are found in many parts of Ethiopia. It is used for pottery and brick industries.
- e) **Silica:** It is an important raw material for glassy industries. Reserves of silica sand are found in Harer, Shewa, Gondar, Gojjam, Sidamo, Arsi, Tigray and Wollega.
- f) **Crude Oil and Natural Gas:** Reserves of natural gas and crude oil are believed to be found in the Ogaden basin.
- g) **Coal:** The lignite coal deposits are proved to exist in Shewa (Debre Brihan-Dessie road, Sululta and near Mojo), Sidama, Wollega.

### Activity 3.7



#### Answer the following question

1. In group, discuss the socio-economic significance of mineral resources in Ethiopia

## 3.6 BIOTIC RESOURCES OF ETHIOPIA



*At the end of this section, you will be able to:*

- ✓ describe the major types of natural vegetation in Ethiopia; and
- ✓ explain variations in the distribution of wildlife in Ethiopia.



### KEY TERMS

- 🔑 Afroalpine
- 🔑 Biotic resource
- 🔑 Endemic animals

- 🔑 Game animals
- 🔑 Savanna woodlands
- 🔑 Xerophytes

### *What do you know about biotic resource?*

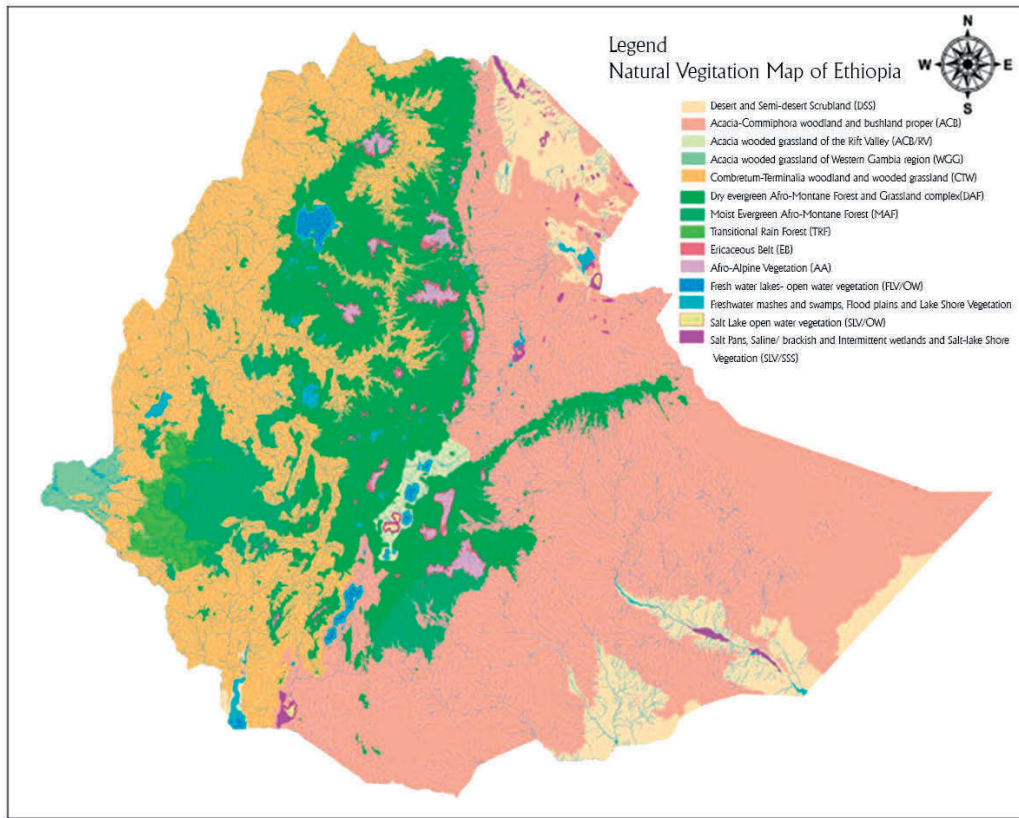
Biotic resources are living organisms in an ecosystem. They are typically sorted into three main categories: 1) *Producers* (include all green plants); 2) *Consumers* (include all animals and 3) *Decomposers* (include bacteria and fungi).

### 3.6.1 Major Types of Natural Vegetation of Ethiopia

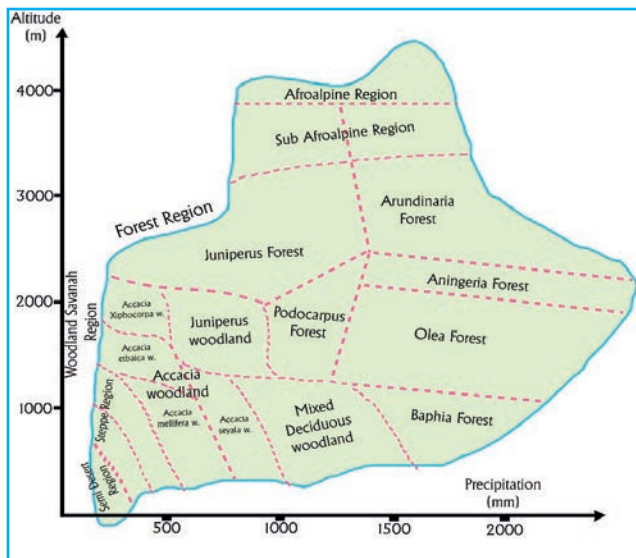
Natural vegetation refers to any original plant grown in and covering an area. The distribution of natural vegetation is influenced by many factors. The most important ones are: Altitude, Climate, Soil type, and Drainage.

In Ethiopia, the types of the natural vegetation of an area are highly correlated with altitude and rainfall; they are also correlated with temperature. The lowlands have harsh environments due to low rainfall and are characterized by xerophytic plants, while the highlands are characterized by different types of tree stands and forests.





**Figure 3.3.:** Distribution of the Major Natural Vegetation of Ethiopia



The natural vegetation of Ethiopia is classified into four major types based largely on the altitude and climate.

- a) Afroalpine and sub-Afroalpine
- b) Forests
- c) Woodland savanna
- d) Semi-desert and Desert Vegetation

**Figure 3.4:** Vegetation Regions Correlated to Altitude and Mean Annual Rainfall

## A. Afroalpine and Sub-Afroalpine

This type of vegetation is often known as high mountain vegetation. It is very much similar to the European Alpine vegetation. The Afroalpine type of vegetation is found at very high altitudes (above 3300 m.a.m.s.l.). Sub-afroalpine vegetation is found between 3000 – 3300 m.a.m.s.l., while Afroalpine vegetation is found at higher altitudes than these. In Ethiopia, Afroalpine and sub-Afroalpine vegetation are found in the *Highlands of Semein* and the *Highlands of Bale*.



(a) (b)  
**Figure 3.5:** *View of Afroalpine Vegetation (a) Bale Mountains and (b) Semein Mountains*

Afro-Alpine vegetation consists of tussock grasslands, serules, scattered mosses and lichens. Sub-Afro Alpines vegetation is dominated by woodland scrubs. Gibra (*Lobelia rhynchopetalum*) and Asta (*Erica arborea*) are dominant plant species in this region of natural vegetation.

## B. Forests

In Ethiopia, forests are found in areas where the altitude ranges from 450 – 3300 m.a.m.s.l. and where the total annual rainfall is between 200 – 2200 mm (see Fig. 3.3). This wide variation in altitude and rainfall results in the formation of *highland* and *lowland forests*. These two types of forests have very different characteristics since they are the results of altitudinal zonation.

### i. **Highland Forests** (*forests that grow between 1500 - 3300 m a.m.s.l. altitude.*

They consist of:

- 🌍 Kerkha (*Arundinaria*) at an altitude of 2800 – 3000 m a.m.s.l.
- 🌍 Tid (*Juniperus Procera*) or Coniferous trees at an altitude of 2200 – 2800 m a.m.s.l.
- 🌍 Zigba (*Podocarpus*) at an altitude of 1800 – 2200 m a.m.s.l.
- 🌍 Woira (*Oliia Africana*) and Kosso (*Hagenia Abyssinia*) at an altitude of (1500 – 1800) m a.m.s.l.

ii. **Lowland Forests** (*forests that grow below 1500 m a.m.s.l. altitude*)

These forests are known as *gallery/riverine* forests. In Ethiopia, they grow along the banks of the Awash, Wabe Shebelle, and Genale Rivers etc. where moisture is available in the soil. The predominant trees are Sholla and Warka. In areas where mean annual rainfall exceeds 500 mm, Baphia forest predominates.



**Figure 3.6:** *View of Forest of Southwest Ethiopia (Arbaminch)*

### C. Savanna Woodland

***Do you expect certain similarities between woodland Savanna and proper Savanna?***

Like forests, Savanna woodlands are found in both highland and lowland areas (250-2300 m.a.m.s.l.) with significant annual rainfall variation of (200-1400mm). The woodland savannas are grass mixed with scattered trees, shrubs and bush lands. In different areas, they are consisting of:

- 🌍 *Juniperious woodlands-mountain grasslands with Tid trees*
- 🌍 *Accacia woodlands-grasslands with Ghirar trees*
- 🌍 *Mixed deciduous woodlands-grasslands with trees like Sholla and Warka*

Savanna grasslands experience marked seasons and are characterized by scattered acacia trees. They are mainly dominant at lower elevations and drier climates than the forests.

In areas where mean annual rainfall is more than 1000 mm, these grasslands can form attractive park-like areas with acacia, wild fig, sycamore and kosso trees. Ethiopia's savanna grasslands are found in the southern half of Ziway, Langan, Abiyatta and Hawassa.



**Figure 3.7:** *View of Woodland Savanna in Awash National Park*

#### D. Semi-desert and Desert Vegetation



In these regions xerophytic (i.e. drought-resisting plants) are the dominant vegetation. These are short acacia, thorn bushes, succulent plants and a few rough grasses. In Ethiopia, vegetation of this kind is found in the Eastern (Afar lowlands), Northwestern and Southeastern Lowlands (Ogaden lowlands), i.e., in areas where annual rainfall is below 600 mm and drought persists for a long period of time.

**Figure 3.8:** *View of Desert Vegetation in Northwest of Asaita*

## Activity 3.8



### Answer the following questions.

1. With your teacher, schedule an educational trip to nearby natural areas.
2. Draw a sketch map of the target area.
3. Write a short report describing the area's predominant vegetation and discuss with your classmates.

### 3.6.2 Main Kinds of Wildlife of Ethiopia

Owing to Ethiopia's great environmental diversity in relief, climate and natural vegetation, the country is believed to be very rich in all kinds of wildlife.

Ethiopia has about 277 species of mammals and 862 species of birds, 201 reptile species and 63 amphibian species. Of these, 7 species of mammals and 25 species of birds are endemic to Ethiopia. These wild animals are found in many parts of the country, but they are largely concentrated in the south and western parts.

The wild animals of Ethiopia can be grouped into the following six broad categories:

- 1) **Common wild animals:** These animals are commonly found in many places of Ethiopia. For example hyenas, jackal etc.
- 2) **Game animals:** Most of them inhabit the grasslands found in the lowlands. Ethiopia's game animals include herbivores and carnivores. Some examples of Ethiopia's game animals are:
  - Herbivores include browsers such as *giraffes* and grazers like *wild asses*, *zebras*, etc.
  - Carnivores include *lions*, *leopards*, *cheetahs* etc.
- 3) **Arboreals (Tree animals):** These animals are animals that climb up trees. Ethiopia's arboreal animals, such as the colobus monkey, apes, baboons, etc. are mostly found in the rainforest regions of Ethiopia.
- 4) **Aquatic animals:** These creatures are animals that live in lakes and rivers, for example, hippopotamus, fish and crocodiles.
- 5) **Birds:** Ethiopia has different kinds of both endemic and migratory birds; for example, fish eagles, pelicans, geese, Abyssinian Ground Horn bill and

flamingoes. Most of them are found in the rift valley sanctuaries and forest lands.

- 6) **Endemic animals:** These are wild animals found only in Ethiopia. These days Ethiopia's endemic animals exist in only very small numbers. They inhabit highland and other areas. They are also at great risk of extinction. The following are some of them.

- 🌍 *Walia Ibex (wild goat), found in the Semein highlands.*
- 🌍 *Mountain Nyala (Dega Agazon), found in the Bale Mountains.*
- 🌍 *'Gelada' or 'Chilada' baboon, found in the Semein highlands.*
- 🌍 *Menilik's Bushbuk ('Dikula') in the Shewan and Bale highlands.*
- 🌍 *Swayne's Hartebeest ('Korkay'), found in the Nechsar park and the Sankalle sanctuary.*
- 🌍 *Semein Fox ('Key Kebero'), found in the Bale and Semein Highlands.*
- 🌍 *Wild Ass ('Yedur Ahiya'), found in the Afar and Southeast Lowlands.*

These rare animals, especially the Walia Ibex and Semien Fox, are approaching extinction.

### Activity 3.9



#### Answer the following questions.

1. Do you think that wild animals have significance to the national economy? If so, can you mention some?
2. Can you identify or state some of the common and endemic wild animals found in Ethiopia? Which type is prevalent in your wereda or zone?

## UNIT SUMMARY

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- 🌍 Because of its diverse physical environment, Ethiopia has a wide variety of natural vegetation, water, wildlife and soil resources. The altitude plays a significant role in determining the climate, natural vegetation, drainage systems as soil resources distribution.
- 🌍 The drainage system of Ethiopia is the altitudinal effects, rivers as flow out from the central highlands to the peripheral lowlands. This has made the rivers flow swiftly. Many bigger rivers drain towards neighboring countries. Because of this and the fact that Ethiopia possesses many rivers and lakes, it is known as the “Water Tower of East Africa”.
- 🌍 Ethiopia has different types of soils. They are basically derived from volcanic, metamorphic and sedimentary rocks. The major types of soil in Ethiopia are nithosols, vertisols, acrisols, cambisols, regosols, xerosols, yermisols, luvisols, fluvisols and lithosols. The volcanic soil, especially nithosol, is the most widely utilized soil. The country’s cereals, coffee, inset, etc. are grown on this soil type.
- 🌍 In Ethiopia, the types of the natural vegetation of an area are highly correlated with altitude and rainfall. They are classified into five major types namely, Afro-alpine and sub-Afro alpine, forest, woodland savanna and semi-desert and desert vegetation. Ethiopia is a home of different wild animals of which some are endemic. These endemic animals are at the risk of extinction.

## REVIEW EXERCISES

### PART I: MATCHING ITEMS

**Direction: Match the Items Under Column "A" with the Items Under Column "B"**

- | A                               | B  |
|---------------------------------|--|
| 1. Vertisols                    | A. Comprises the Genalle & the Wabishebelle rivers             |
| 2. Non-metallic mineral         | B. Platinum  |
| 3. The Southern drainage system | C. Comprises the Awash & the Omo-Ghibe rivers                  |
| 4. Xerosols                     | D. Characterized by high clay content and sufficient nutrients |
| 5. Metallic mineral             | E. Potash  |
| 6. The Inland drainage system   | F. Characterized by high salt content and humus deficiencies   |

### PART II: MULTIPLE CHOICE ITEMS

**Direction: Choose the correct word or phrase from the given alternatives.**

7. Which of the following is an example of non-renewable resources?
- |         |          |
|---------|----------|
| A. Coal | C. Water |
| B. Wind | D. Plant |
8. The deepest lake in Ethiopia is
- |                  |                   |
|------------------|-------------------|
| A. Lake Tana.    | C. Lake Hashenge. |
| B. Lake Langano. | D. Lake Shalla.   |
9. Which of the following provides the best example of a decomposer?
- |                 |                 |
|-----------------|-----------------|
| A. Dead animals | C. Dead plants  |
| B. Fungi        | D. Grass plants |



10. Which of the following is an example of a biotic component of environment?
- A. Water
  - B. Wind
  - C. Plants
  - D. Temperature

### PART III: COMPLETION ITEMS

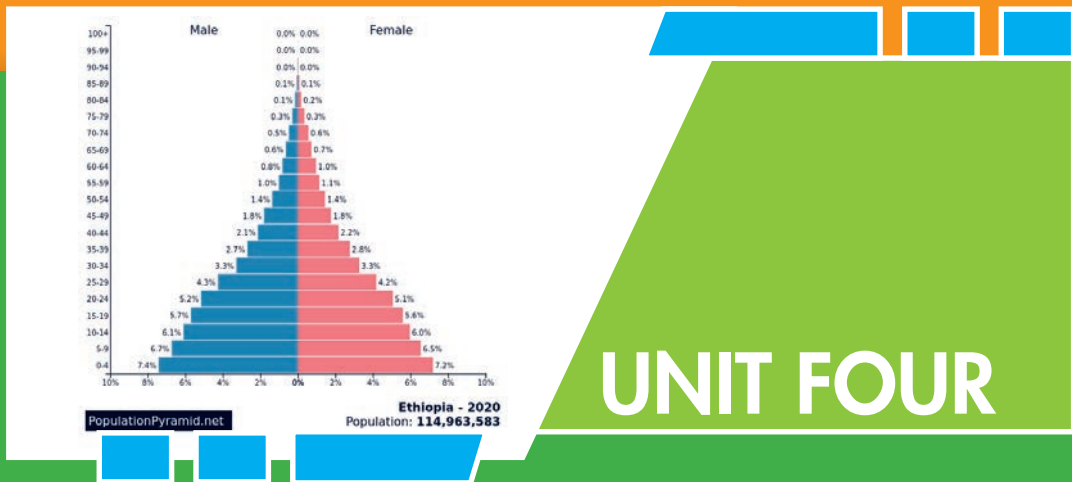
**Directions: Complete each of the following sentences with the correct word or phrase.**

11. Fertile soils which develop in seasonally flooded river valleys (plains) of Ethiopia's major rivers are \_\_\_\_\_.
12. Based on altitudinal zonation, we can classify the forests of Ethiopia into \_\_\_\_\_ and \_\_\_\_\_.
13. \_\_\_\_\_ and \_\_\_\_\_ are common wild animals that are found in many parts of Ethiopia.
14. \_\_\_\_\_ are young and shallow soils found in arid and semi-arid regions of Ethiopia.
15. The western drainage system that is made up of \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_ river basins,
16. The lakes of Ethiopia are classified into \_\_\_\_\_ and \_\_\_\_\_.
17. \_\_\_\_\_ are animals that live in water.

### PART III: SHORT ANSWER ITEMS

**Direction: Give a short Answer for the following questions.**

18. Discuss the relationship between altitude, soils, vegetation and wild animals
19. Identify the dominant factors that determine the drainage systems in Ethiopia
20. Which soil classes in Ethiopia are very productive? What are the reasons for this productivity?
21. Which type of vegetation is often known as high mountain vegetation?
22. Name five endemic wild animals of Ethiopia.
23. Explain the difference between carnivores and herbivores and their dependability.



## UNIT FOUR

# 4. POPULATION AND DEMOGRAPHIC CHARACTERISTICS OF ETHIOPIA

## INTRODUCTION

In the previous unit, you have learned about the natural resource base of Ethiopia such as drainage systems, soils, natural vegetation, wildlife and mineral resources of Ethiopia. This unit deals with population and demographic characteristics of Ethiopia. The major topics to be covered include the trends of population growth in Ethiopia, population composition, population distribution, urban and rural settlement patterns, health and disease in the highlands and lowlands of Ethiopia and impacts of population structure on sustainable development in Ethiopia.

Throughout human history, people have changed and adapted to the earth. They have done so in order to survive. Today there are 7.9 billion people living on the earth. The study of human population has long been of interest to geographers. The pressure of population growth in today's world adds great urgency to the study of population for everyone.



## Unit Outcomes

*After completing this unit, you will be able to:*

- ✓ *define the concept of human population;*
- ✓ *recognize the pattern of population growth in Ethiopia;*
- ✓ *examine population structure and trends in Ethiopia;*
- ✓ *explain the population characteristics of Ethiopia;*
- ✓ *demonstrate the population distribution and settlement patterns of Ethiopia;*
- ✓ *identify factors influencing spatial distribution of health and diseases in lowland and highland of Ethiopia;*
- ✓ *analyze the influence of population pressure on resources in Ethiopia; and*
- ✓ *describe the diversity of language and religion in Ethiopia;*



## Main Contents

- 4.1 Concept of Human population
- 4.2 The trends of Population Growth in Ethiopia
- 4.3 Population Composition
- 4.4 Population Distribution
- 4.5 Urban and Rural Settlement Patterns
- 4.6 Health and Disease in the Highlands and Lowlands of Ethiopia
- 4.7 Impacts of Population Growth on Sustainable Development in Ethiopia
- 4.8 Language and religion diversity in Ethiopia

 **Unit Summary**

 **Review Exercise**

## 4.1 CONCEPT OF HUMAN POPULATION



*At the end of this section, you will be able to:*

- ✓ define the concept of human population; and
- ✓ discuss facts about human population.



### KEY TERMS

🔑 Human population  
🔑 Population

🔑 Population Geography

### 4.1.1 Concepts of Human Population

In the previous grades, you have already learned different aspects of population among which world population trends, characteristics, distribution, growth and patterns. This section focuses on human population and the importance of studying human population

The term population in population studies refers to the total number of human inhabitants of a specified area, such as a city, country, or continent, at a given time. The human population has been a matter of study for various academic disciplines such as geography, biology, sociology, medical science, history, etc. In geography as well, there is a separate branch that studies about human population: Population Geography. It is concerned mainly with the spatial analysis of the human population. It focuses on population-space relationships. It also emphasizes the spatial aspects of human population and the interaction and interdependence between the human population and the physical environment.

The human population is given great emphasis and is studied by various disciplines including population geography.

The human population is studied for many reasons including the following.

- 🌍 *It is very dynamic as it demonstrates significant quantitative and qualitative changes over time and space. Such changes have a tremendous*

*impact on the socio-economic development of societies.*

- ④ *Change in the size, composition, structure and location of human population can have policy implications.*
- ④ *Knowing about the characteristics of the human population is important in order to adjust situations to existing realities.*

Population studies yield knowledge that is important for planning, particularly by governments, in fields such as health, education, housing, social security, employment, and environment preservation. Such studies also provide the information needed to formulate government population policies, which seek to modify demographic trends in order to achieve economic and social objectives

The study of human population is also necessary for development and socio-economic activities. For example, population is the major source of the labour force for the productive and non-productive economic sectors, such as agriculture, manufacturing, teaching, health services, etc. Moreover, human population is the main productive force and creator of material wealth. This makes the study of population extremely important for the overall socio-economic development of a country.

### Activity 4.1



**In a small groups, discuss the following questions.**

1. Why is studying human population important?
2. For what purposes, do you think, governments use population information/data?
3. What is the advantage of studying population?

## 4.2 TRENDS OF POPULATION GROWTH IN ETHIOPIA


*At the end of this section, you will be able to:*

- ✓ explain the trends of population growth in Ethiopia; and
- ✓ compare population size of Ethiopia on regional bases.



### KEY TERMS

 Growth Rate

 Population size

### 4.2.1 Trends of Population Growth in Ethiopia

Ethiopia is the second most populous country in Africa. In 2020, its population was estimated to be 114.9 million (UN, 2021), which ranks 12<sup>th</sup> in the world, and the current growth rate is about 2.6 percent. According to the 2007 Census, the population of Ethiopia was 73.8 million. The country's population is among the fastest growing population in the world. It was estimated that, in 1900, Ethiopia had only 11.8 million persons. This number increased to about 13 million in 1920 and 23.5 million in 1960, as it is shown in (Table 4.1). The table shows the population of the country in 1960 was doubled in 1990. These values show that, during those decades, it took 60 years for the population to double its size. In contrast, since 1960, the time required for the population to double has been on the decline. This is because of a rapid rate of population growth. For instance, the population doubled in size between 1960 and 1990, indicating a doubling time of only 30 years.

A historical profile of the growth rates of the Ethiopian population since 1900 shows that the population increased by less than 1.0 percent until about 1920. After 1920, however, the rate of growth slightly increased; and then, by 1950, it went up to 2.0 percent. The slow rate of population growth before 1920 reflected the country's high mortality rate. With worldwide efforts to control malaria and other diseases in the 1950s and later, the growth rate rose from year to year and reached 2.8 percent in 1980. Between 1980 and 1990, the growth rate of Ethiopian population was around 3.0 percent. Between 2010 and 2020, the growth rate of Ethiopia was around 2.6 percent.

Table 4.1: Population Size and Growth of Ethiopia (1900-2020)

Year	Population (Million)	Annual Growth Rate (%)	Population Doubling Time (year)
1900	11.8	0.2	346
1910	12.1	0.5	139
1920	12.9	1.0	69
1930	14.4	1.2	58
1940	16.2	1.5	46
1950	19.2	2.0	38
1960	23.5	2.2	32
1970	29.5	2.3	30
1980	37.7	2.8	25
1984	42.6	3.1	22
1990	51.2	3.0	24
1994	53.5	2.9	24
2000	63.4	2.8	25
2007	73.8	2.6	35
2010*	79.0	2.6	27
2020*	114.9	2.6	27

Source: CSA, 2009 and \*UN, 2021



## Focus

Although there has been a slight decline in the population growth rate between the three censuses, Ethiopia has one of the fastest growing populations in the world. Over the two decades between the three censuses, for instance, the population of Ethiopia increased from 42.6 million in 1984 to 53.5 million in 1994 and to 73.8 in 2007. In 2020 the Ethiopian population was estimated to be 114.9 million (UN, 2021).

## Activity 4.2

**In a small group, discuss the following question.**

1. Why is the Ethiopian population growing so fast?



## 4.3 POPULATION COMPOSITION



*At the end of this section, you will be able to:*

- ✓ explain how the population structure of Ethiopia changed overtime; and
- ✓ describe the composition of Ethiopian population.



### KEY TERMS

- 🔑 Age structure
- 🔑 Age dependency ratio
- 🔑 Sex structure
- 🔑 Sex ratio

- 🔑 Population pyramid

***What is population composition? What do you know about age and sex structure? What is the importance of studying the age structure of a population?***

The population of a country can be divided in accordance to age, sex, occupation, language, religion and other attribute.

Population composition refers to those aspects of population that can be measured in terms of age, sex, marital status, family size, economic activities, nationality, language and religion.

### A. Age Structure

Age structure is the classification of a given population into different age groups of various features. This structure becomes clear after we group all of the people in that population by age. In other words, age structure is the pattern that results from the distribution of members of a population into different age categories.

The distribution of population by age is among the most fundamental demographic characteristics of human population and that of demographic statistics. It plays an important role in the development of any society. The economic and cultural life of society critically depends upon the age structure of the population. Moreover, the planning process of any country makes use of this data extensively for the development of the economy, culture and for its regions.





Two important statistical tools for understanding age structure are:

- 🌐 *age groups, and*
- 🌐 *population pyramids*

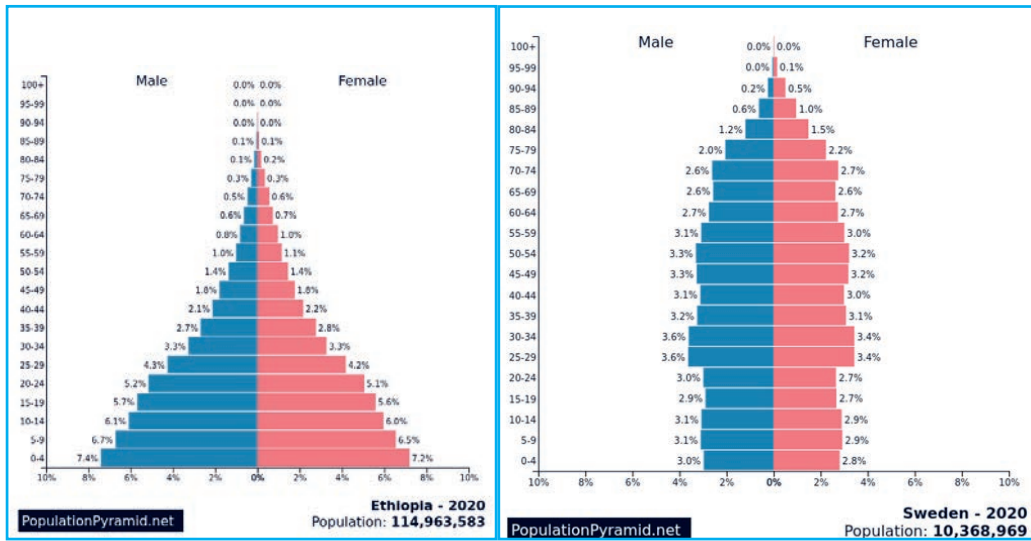
**Age Groups:** Although we can use different sets of numbers to define age groups, the most widely used age groups are the five-year age groups 0-4, 5-9, 10-14, ..., 60-64, 65+ and broad age groups 0-14, 15-64, 65+. In the broad age groups, age groups 0-14, 15-64 and 65+ are known, respectively, as young age (the young dependent population), working age (the economically active population) and old age (the elderly dependent population).

### Population Pyramid

#### *What is population pyramid?*

A Population pyramid is a very useful aid in examining the age and sex structure of a population. It is a graphic representation of the distribution of the population by age and sex. In the age pyramid, the vertical axis is divided in years (usually five year age group interval) from zero upwards and the horizontal axis shows the percentages of males and females within these groups. Percentages are calculated to both sexes separately or of the total population.

In countries where birth rates are high and death rates are also high, the population pyramid has the form of a triangle. This pattern is typical of the population of developing countries like Ethiopia, in which many children are born, but few reach old age. In contrast, in the developed countries, with their lower birth rates and fewer people dying young, the population pyramid is more rectangular, narrowing only nears its top. In these countries, both birth and death rates decline with a result showing the number of people in each group at an equivalent state.



a) **Figure 4.1:** Population Pyramid of Ethiopia (a) and Sweden (b), 2020  
(Source; [www.populationpyramid.net](http://www.populationpyramid.net))

### Activity 4.3



**Look at Figure 4.1 and answer the following questions**

1. What does the vertical axis on population pyramid represent?
2. What does a narrow base on a population pyramid indicate?

In general, population pyramids of developing countries like Ethiopia have very broad bases, showing the dominance of the young-age population. These pyramids become increasingly narrower towards the top, advancing through the age groups, showing that the percentage of the population becomes less and less in the upper age groups (65-69, 70-74, etc.). The high percentage for the young age group is the result of high birth rate and natural increase, while the small percentage of the old age group is the reflection of high mortality rate, which results in low life expectancy.



## Focus

- Age structure is one of the most important demographic characteristics of a population.
- Age information is often used to understand the sizes of school-age, labour-force, elderly, and other populations.
- A population pyramid is usually employed to show the age distribution of a given population by age and sex.
- The population pyramid of Ethiopia has a broad base that narrows towards the top as age increases. This shape is typical of a population with a high fertility rate.

### Age Dependency Ratio (ADR)

*What do you think age dependency is? Do you think that it is a problem in Ethiopia?*

Age Dependency Ratio is the relationship between the working or economically active population and the non-working population. It is generally accepted that people in the young and old ages are dependent on the working-age population. The Age Dependency Ratio (ADR) is used to show the magnitude of this dependency in a given population. This means that the dependency burden, represented by the non-working population in the young and old age groups, on the working-age population can be shown by the age dependency ratio. The formula for calculating the age dependency ratio (ADR) is:

$$ADR = \left( \frac{(\% \text{ of population } 0-14) + (\% \text{ of aged } 65+)}{\% \text{ of population aged } 15-64} \right) \times 100$$

### Example

Suppose country ‘Z’ has a total population of 65 million of which 40% of the total population (26 million) children age (0-14) and productive age group (15-64) 50% of the total population (32.5 million) and old age group (65 and above) 10% (6.5 million).

$$ADR = \left( \frac{26,000,000 + 6,500,000}{32,500,000} \right) \times 100 = \frac{100}{100}$$

This shows that there are 100 dependents on 100 working population. In other words, it means that each person of working age has, on average, to support one of

the dependent.

Ethiopia's age dependency ratio in 2020 was 76.8/100, this shows that there are 76.8 dependents on 100 working population. A high dependency ratio in Ethiopia indicates that the economically active population and the overall economy face a greater burden to support and provide the social services needed by children and by elderly persons who are often economically dependent.

### B. Sex Structure

Sex structure is one of the basic demographic characteristics of a population. Sex structure is very important for demographic analysis because it provides useful information about reproductive potential, human resources, and so on. Sex structure refers to the ratio of the male population to the female population at different age groups. It is usually expressed as number of males per 100 females in a population. A ratio greater than 100 shows a greater number – called an excess – of males than females. Sex ratios can affect marriage prospects, labour force participation, and other social and economic variables.

The formula for calculating a sex ratio is:

$$\text{Sex ratio} = \frac{\text{Number of males}}{\text{Number of females}} \times 100$$

According to the 1984 census result, the sex ratio for the population of Ethiopia was 99.4. This means that there were about 99 males for every 100 females. The 1994 census result showed that it was 101.3 and in 2007 sex ratio was 101.9. In 2020, male to female ratio in Ethiopia was estimated to be 100.12 males per 100 females.

## Activity 4.4



### Answer the Following Questions

1. What is sex ratio?
2. What is the significance of studying the sex composition of population?
3. By referring to the table below answer the questions that follow:

Country	Total Population	Female Population	Young Age Population (%)	Old Age Population (%)
X	800,000	500,000	42	8
Y	1,250,000	790,000	20	15
Z	930,000	405,000	50	6

- a) Calculate sex ratio for each country
- b) Calculate ADR for each country
- c) Which country shows the maximum dependency ratio?

## 4.4 POPULATION DISTRIBUTION



*At the end of this section, you will be able to:*

- ✓ discuss the spatial distribution of population in Ethiopia; and
- ✓ identify factors affecting population distribution in Ethiopia.



### KEY TERMS

- 🔑 Dense population
- 🔑 Population density

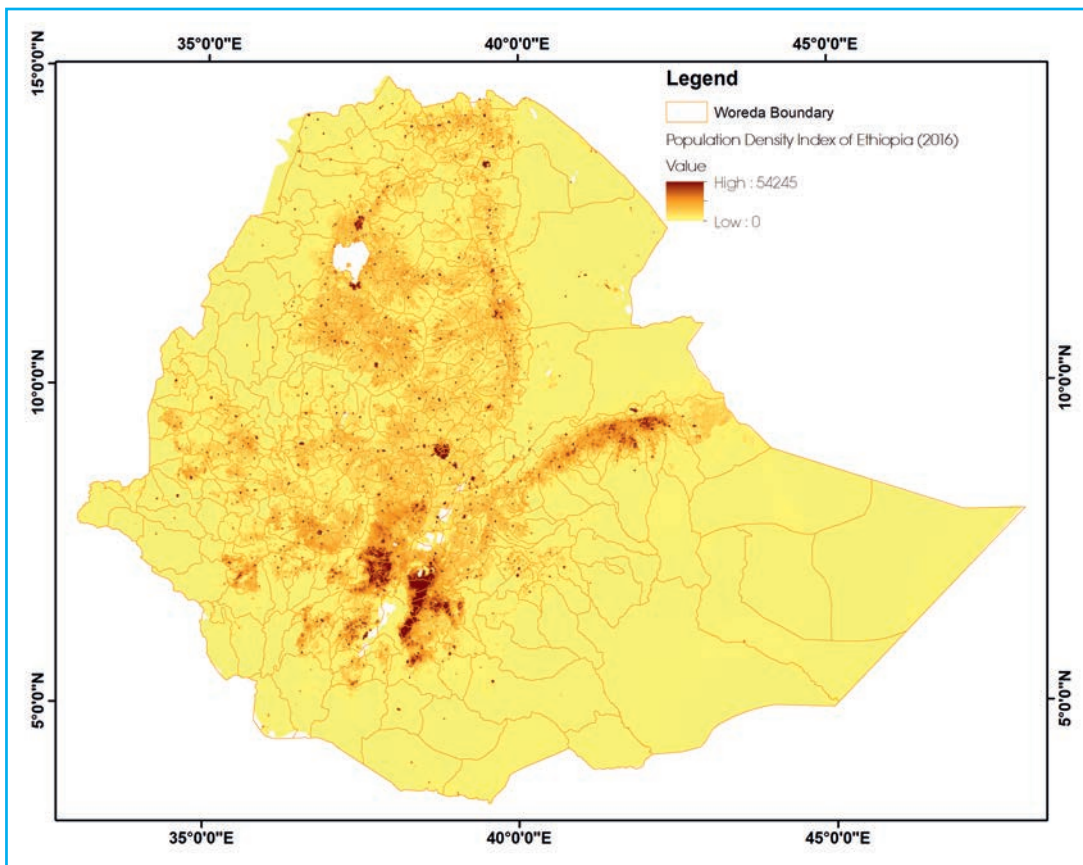
- 🔑 Population distribution
- 🔑 Sparse population

***Do you know what population distribution means? How is it characterized in the context of Ethiopia?***

Population distribution refers to the way how population spreads out over a given area, i.e., of any size from a small area to the earth as a whole. The distribution of population is indicated by population density. Population density is the average

number of people per square kilometre in a given area.

In Ethiopia, the population is unevenly distributed for various physical and human related reasons. In the nation, people live mostly in areas with agreeable life conditions such as moderate climate, adequate supply of water, good vegetation cover, fertile soil, and absence of disease causing insects. For such preferences, most people are found concentrated in the highlands and plateaus of the country. These places have the country's most favourable natural conditions for settlement and crop cultivation. Therefore, those areas have attracted denser population than the lowlands. The highlands, where there are no vector borne diseases, have generally been the areas of high population concentration. On the other hand, the lowlands are of low population concentration. Thus, 77.5 percent of the population of Ethiopia lives in the highlands at altitudes above 1800 meters, and only 22.5 percent lives at altitudes below 1800 meters.



*Figure 4.2: Population Distribution Map of Ethiopia*

**Measures of Population Distribution:** Population distribution is a measurable concept. It is measured by using population density. Population density refers to the number of people per unit area. There are various density measures. Among them, the crude density is the most widely used method to measure population distribution. It is found by dividing the total population to the total area. It is man land ratio. In 1990 crude density for Ethiopia was 40.74 people/km<sup>2</sup> and this has increased to 52 people /km<sup>2</sup> in 1998; and in 2020; 103.9 people/ /km<sup>2</sup>.

$$CD = \frac{TP}{TA}$$

where CD is crude density, TP is total population and TA is total area

The distribution of Ethiopia's population generally is related to altitude, climate, and soil type. Figure 4.2 indicates that uneven population distribution in Ethiopia. The highest population concentration is found in the highlands, which are endowed with moderate temperature, rich soil and adequate rainfall. The lowlands are very sparsely populated mainly this happens because of high temperatures and low rainfall.

*Table 4.2: Population Density of Ethiopia by Administrative Regions*

Region	Population	Area(km <sup>2</sup> )	Density(p/km <sup>2</sup> )
Tigray	5,247,005	84,722	61.9
Afar	1,723,000	72,053	23.9
Amhara	20,401,000	154,709	131.9
Oromia	33,692,000	284,538	118.4
Somali	5,453,000	279,252	19.5
Benishangul Gumz	1,005,000	50,699	19.8
SNNPR	18,276,000	105,476	173.3
Gambella	409,000	29,783	13.7
Harari	232,000	334	716
Addis Ababa	3,273,000	527	6,210
Dire Dawa City Administration	440,000	1,559	282
Total	90,078,000	1,106,000	84.7

Source: CSA, Statistical Abstract, 2015.

There is a considerable variation in population density among the administrative regions of the country. Excluding the urban based administrative regions (Harari,

Dire Dawa and Addis Ababa) Southern Nations, Nationalities and Peoples (SNNP) region is the administrative area with the largest population density (173 people/km<sup>2</sup>) followed by Amhara region (131.9 people/km<sup>2</sup>), Gambella (13 people/km<sup>2</sup>), Somali, Afar; and Benishangul-Gumuz are regions with low densities of population. Crude population density conceals /much of the variations within regions.



### NOTE

Recently two administrative regions were established from Southern Nation Nationalities and Peoples region namely; Sidama Regional State and Southwest Ethiopia People Regional State.

When population densities are considered in terms of zones, the variation of population density in Ethiopia is generally greater than the differences among the regions. Some of the zones with very high densities are Gedeo, Kambata, Guraghe, Wolayta and Hadiya; where densities exceed 300 persons per km<sup>2</sup>. On the other hand, peripheral zones such as Kamashi, and Metekel have population densities of less than 20 persons/km<sup>2</sup>. Likewise, if population densities of lower administrative units are considered, the variations could still be greater. For instance, Wanago, Damot Gale, Aleta Wendo, Yirga Chefe, Dara, Kacha Bira, Angacha, Sodo Zuria, Shebedino and Kedida Gamela have crude densities of exceeding 500 people/km<sup>2</sup>; while *woredas* with extremely low densities (less than 10 people/km<sup>2</sup>) include Guba Woreda (Benishangul Gumuz Region), Dolo Woreda (Somali Region), Gog Woreda (Gambela Region). Therefore, it could be generalized that “the lower the administrative unit the greater the variations in population density”

### Activity 4.5



#### Answer the following questions referring to Table 4.2.

1. Which region is the most densely populated in Ethiopia?
2. Describe the status of your region with respect to the spatial distribution of population








## Factors Affecting Population Distribution in Ethiopia

*You can easily see from the preceding lesson that the distribution of population in Ethiopia is extremely uneven. What factors do you think are responsible for such spatial variation in the distribution of people over land?*

This extreme unevenness is the result of a number of factors operating in combination. These factors can be grouped into two: physical and human.

### A. Physical Factors

The most significant physical factors affecting the distribution of population in Ethiopia are the following.

-  *Climate (mainly rainfall and temperature)*
-  *Soil fertility*
-  *Natural water supply*
-  *Relief (slope and altitude)*
-  *Vegetation cover*

In Ethiopia, most of the physical factors are influenced by altitude. Therefore, altitude is the most crucial physical factor influencing patterns of population distribution and settlement in the country. Studies in climatology make it clear that rainfall increases while temperature decreases with an increase in altitude. Incidentally, this means that rainfall is very low and temperature is high in lowland areas, while rainfall is high and temperature is moderately low in the highlands. Since soil formation and vegetation growth are closely associated with adequate rainfall and moderate temperature, highlands tend to have better soils and vegetation cover.

Lowlands in Ethiopia are characterized by scarcity of rainfall, high temperature, and poor vegetation and soil conditions. In addition to these negative factors, the prevalence of tropical diseases such as malaria and yellow fever contributes to the sparse population distribution in such areas.

For reasons of tropical diseases, most of the valleys of the major rivers of Ethiopia are also characterized by sparse population concentration. The main exception to this is the Awash River Valley, where irrigation agriculture is practiced. This overall pattern differs from what can be seen in other parts of the world, where valleys of major rivers are zones of large concentrations of people. However, with improvements in agricultural and medical technology, Ethiopia's lower major river valleys might, in the future, attract more people from the densely populated highland areas.

*Table 4.3: The Relationship Between Altitude and Population in Ethiopia*

Altitude (Meters)	Area (%)	Population (%)
Above 2600	5.8	10.4
1800-2600	31.8	67.1
1400-1800	28.1	11.5
1000-1400	13.4	8.2
Below 1000	21.5	2.8
Total	100	100

**Source:** *Aynalem Adugna, 1987.*

From the Table 4.3, above we can understand that 77.5 percent of the population of Ethiopia lives in areas with altitudes above 1800 meters, and these areas constitute only 37.6 percent of the total area of the country. The area above 1,400, which makes up 65.7 percent of the total area of Ethiopia, supports 89.0 percent of the population of the country. However, caution could be made, as there are many severely dissected areas within the highlands with a few or no people.

Lowlands are characterized by scarcity of rainfall, high temperature, and poor vegetation and soil conditions. In addition, the lowlands tend to be infested with tropical diseases like malaria and yellow fever that contribute to the sparse population distribution.

### Activity 4.6





**In small groups, discuss the following questions.**

1. What are the major factors that attract large populations to the highland areas of Ethiopia for settlement?
2. Why are the lowland areas of Ethiopia sparsely populated?
3. In most parts of the world, valleys of major rivers are zones of large concentrations of population. In contrast, the valleys of major rivers of Ethiopia are areas of sparse population distribution. Why is this so?

## B. Human Factors

*Can you mention the major human factors that have influenced population distribution in Ethiopia?*

The major human factors which have influenced population distribution in Ethiopia are the following.

-  *Types of economic activity*
-  *Historical patterns of population movement*

### *Types of Economic Activities*

The types of economic activity performed in an area strongly influence the carrying capacity of that land. Consequently, the carrying capacity influences the number of people that can inhabit a given area. Being a country of diverse environmental and cultural conditions, Ethiopia offers ample evidence of these relationships.

The arid and semi-arid lowland areas of Ethiopia are areas that are more suitable for pastoralist activities than for crop farming. By its nature, pastoralism is an economic activity that requires large areas of grazing lands. In most pastoralist areas of Ethiopia, the land requirement for grazing is as large as 20 hectares or more per head of cattle. The arid and semi-arid lowlands of Ethiopia that are inhabited by pastoralists and semi-pastoralists are sparsely settled. Hence, with pastoral herding, population densities are extremely low.

As it has been said earlier, compared to pastoralist areas, crop-farming areas have greater carrying capacity and higher densities of population. This is typically the case in the highland areas of Ethiopia where natural conditions are suitable for crop cultivation. In the crop-farming highland areas, the man-land ratio is significantly higher than the one in the pastoralist lowlands.

However, the crop-farming areas of Ethiopia do not have uniform carrying capacities or population densities. Population density is significantly influenced by the types of crops cultivated. For instance, in the northern and north central highland areas of Ethiopia, the most cultivated crops are cereals. Cereals have relatively low yields per unit area. Therefore, these areas tend to have relatively lower carrying capacities and population density. In contrast, the southern, *enset* and coffee-growing regions of the country have greater yields per unit area. This is an important reason for the very high population densities in some zones and *weredas* of the southern region that you read about earlier.

The development of commercial farms in some parts of Ethiopia, such as Awash valley, is another significant factor in population movements and their effects on population distribution. Some decades ago, there were very few people in the Awash valley. However, because of the development of many small and a few large commercial farms, several thousands of settled and migratory people are found there.

In Ethiopia, urban and industrial growth/expansion are other human factors that bring about population redistribution over time, and they are responsible for considerable spatial variation of population density at present.

### *Historical Patterns of Population Movement*

The historical pattern of population movement in Ethiopia is also another human factor affecting population distribution in Ethiopia.

## Activity 4.7



**In small groups, discuss the following questions.**

1. Why do Ethiopia's crop farming areas have high carrying capacities and high population densities, while its areas of pastoralists have low carrying capacities and low population densities?

## 4.5 URBAN AND RURAL SETTLEMENT PATTERNS

*At the end of this section, you will be able to:*

- ✓ describe settlement patterns of Ethiopian population; and
- ✓ differentiate urban and rural settlements patterns of Ethiopia.



### KEY TERMS

- 🔑 Dispersed settlement
- 🔑 Nucleated settlement
- 🔑 Rural settlement
- 🔑 Settlement
- 🔑 Urban settlement
- 🔑 Villagization

***Define the term settlement.***

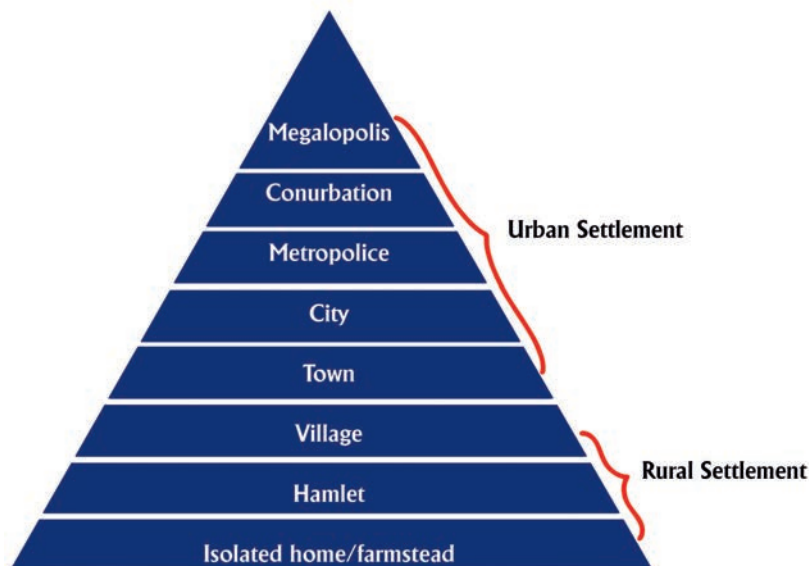
***What is the difference between a rural settlement and an urban settlement?***

The term settlement refers to the characteristic groupings of population into occupancy units, together with the facilities in the form of houses and streets, which serve the inhabitants. It is also defined as a place in which people live, carrying out a variety of activities, to make their livings such as trade, agriculture and manufacturing.

The origin of settlements can be traced back to the caves where people gathered for protection against the natural forces or defence against rival tribes. There are varieties of settlements, and they are changing rapidly over time. These include hamlets, villages, towns, cities, metropolises, megalopolises, etc. In all cases, however, ‘settlement’ designates an organized colony of human beings, together with their residences, buildings (stores, factories, warehouses, etc.) paths and streets.

Different settlement types develop mainly in response to some physical and human factors. Studies of settlements are concerned with the facilities humans construct in the process of living in an area and using its resources. Naturally, settlements are situated as strategically as possible with respect to natural features, such as water, fuel, food, and protection, as well to access to transportation and communications.

Ethiopian settlements are broadly categorized as rural and urban. The primary bases for this dichotomy are the dominant economic activities and the degree of population density. Urban settlements are usually branded by non-agricultural economic activities, while rural settlements are typically agricultural. Leaving social, cultural and physiological differences aside, rural and urban settlements in Ethiopia can very well be distinguished by population densities, which are generally very high in urban settlements compared to the relatively lower densities of population in rural settlement areas.



*Figure 4.3: Hierarchies of Settlement*

## Activity 4.8



**In small groups, discuss the following questions.**

1. What do you know about the concept of settlement?
2. Do you know why settlement patterns differ from place to place in Ethiopia?

### 4.5.1 Rural Settlements

*What do you think are the differences between rural and urban settlements?*

*What kinds of settlements exist in the rural areas of Ethiopia?*

Rural settlement is the name given to all villages and dispersed (scattered) settlements in areas far from urban centres. Such settlements are widely dispersed and are dominated by isolated homesteads. The inhabitants of rural settlements are mainly engaged in agriculture. Settlements in the rural areas of Ethiopia can be broadly grouped into two: permanent and temporary settlements.

#### A. Permanent Settlements

*What kinds of settlements are considered permanent? In which areas of Ethiopia are these types of settlements mostly found? Highlands or lowlands?*

Settlements are considered permanent if their locations do not frequently change, i.e. if they remain in place for more than ten years. In this sense, most rural settlements over the highland areas of Ethiopia are permanent. The permanent rural settlements of Ethiopia are mostly associated with the crop-farming highland areas of the country.

The permanent rural settlements of Ethiopia can also be broadly divided into two: the scattered (diffused or dispersed) settlements and the grouped (nucleated) settlements. In areas of scattered settlements, homesteads are separated by relatively long distances. On the other hand, the grouped settlements are characterized by a large number of homesteads concentrated in one place

In Ethiopia, the Derg Regime's compulsory villagization program resulted in the formation of grouped settlements (villages) in many parts of the country. In most parts of the northern regions of the country, such settlements have remained in place for years with the idea that they would enhance communal ownership of land and the provision of social services. However, because the program was conducted by forcing people into villages against their will, and the services were non-existent, people *began* to return to their original sites, in a manner of reversal move. This movement *began* even before the regime was overthrown. The government of Ethiopia has recently conducted villagization programs that are based on peoples' will to leave their original settlement sites. Besides, the resettlement program of the FDRE government has also been implemented within similar administrative

regions.

### B. Temporary Settlements

*What kinds of settlements are temporary?  
Do you know the areas of Ethiopia in which these types of  
settlements are mostly found?*

Temporary settlements are mobile settlements inhabited by nomadic people of lowland Ethiopia. The rift valley region and lowlands of the west, east and, south are characterized by hot and dry conditions. This harsh climatic condition forces people living in these areas to seasonally move from one area to another with their herds.

### 4.5.2 Urban Settlements

*What kinds of settlements are considered urban? Do you know  
the features that make urban settlements different from the rural  
settlements in Ethiopia?*

Urban settlements, on the other hand, are always larger and compact or nodal. In the rural settlements the concern is chiefly with primary production, and most commonly agriculture. In urban settlements, on the contrary, the primary goods produced by the farmers, miners, or lumbermen are processed in manufacturing plants, transported, bought, sold, and financed. Urban settlements include residence in cities and towns. In addition, urban centers have always been centers of civilization and they are the intellectual and social capitals, perform functions of a political, educational, and social character. More vitally, urban centers, in economic spheres, are major transport centers, the main assembly and break of bulk points, the great markets, and the major financial nodes.

The process of the development of urban settlements is known as urbanization. In most parts of Africa, urbanization is a recent phenomenon, and it is attributed to colonialism. Urbanization in Ethiopia is not influenced by European colonialism. It is an unplanned, natural phenomenon of the late 19<sup>th</sup> and early 20<sup>th</sup> centuries.





## Focus

Not all grouped settlements are classified as urban centers. Different countries use different criteria for assigning the status of urban center of a settlement. The major criteria used in Ethiopia are:

- 🌐 *the settlement has a minimum of 2000 people;*
- 🌐 *two-thirds of the population in the settlement are engaged in non-agricultural activities;*
- 🌐 *the settlement has a chartered municipality; and*
- 🌐 *the presence of social services and amenities.*



(A)



(B)

**Figure 4.4:** Rural (A) vs Urban (B) Settlement in Ethiopia

The number of settlements meeting these criteria in 1984 was about 322. These settlements had 10.23 percent of the total population of the country and this is one of the least urban population sizes in the world. The number of settlements with greater than 2,000 people in 1994 had increased to 539. These have 12.8 percent of the country's population. In 2007, the number further rose to 927. In 2020, the urban population is about 20 percent of the country's population.

The distribution of urban centers in Ethiopia shows considerable spatial variation. This could be explained in terms of the varying concentration of industries, and services such as schools, health institutions, water supplies, electricity, and means of transport, etc.

## 4.6 HEALTH AND DISEASE IN ETHIOPIA

Ethiopia's investment in health has resulted in improvements in the health condition of its population. For example, life expectancy has increased from 56.8 years in 2005 to 65.5 years in 2016). Three consecutive Ethiopian Demographic and Health Surveys (EDHS) (2005, 2011, and 2016) have indicated declining trends in neonatal, infant, under-five and maternal mortality. Despite great progress, Ethiopia is still facing a high burden of disease.

The health extension program HEP has certainly contributed to the increased access and coverage of high-impact public health interventions in the country. Improved public health interventions such as malaria control efforts, access to safe drinking water, improved toilet facilities, and vaccination against childhood diseases are some of the factors behind the improved health outcomes in Ethiopia.

The Government of Ethiopia has been investing heavily in health system strengthening through its pro-poor policies and strategies that brought about significant gains in improving the health status of Ethiopians. Despite recognizable improvements, Ethiopia has still a heavy burden of diseases but a low rate of self-reported illness and low health facility coverage and utilization. The available literature indicates that the majority of ill health in Ethiopia is related to potentially preventable, communicable diseases and nutritional disorders. Some of the root causes of the poor health status of the population are:

1. **Lack of access to clean water:** Rivers and lakes remain the most important sources of water particularly for people in rural areas although such waters are largely unsafe.
2. **Lack of adequate nutrition:** Studies reveal that malnutrition is rampant and is among the highest in the world. About half of the children under the age of five are malnourished, stunted or wasted. Malnutrition remains high as the country has not attained food security, or due to poor knowledge about nutritional requirements and dietary habits.
3. **Disease related to beliefs, behaviors and traditional practices** which have a negative effect on health status include Female Genital Mutilation (FGM), and early marriage.
4. **Lack of health services:** The health care infrastructure of the country had suffered from underfunding, and health service coverage is less than 50% of the population. The services tend to be urban biased.

The combined problem of poor health and inadequate nutrition are likely to have life-long effects on children making them physically unfit, unproductive, mentally inactive and less dynamic. Since protein and energy malnutrition affects adult working population, the impact on agricultural production and productivity is likely to be high.

The lowlands of Ethiopia tend to be infested with tropical diseases like malaria and yellow fever that contribute to the sparse population distribution. The major killer diseases accounting for about 75% of all deaths include prenatal-maternal conditions, acute respiratory infection, malaria, nutritional deficiency for children under 5 years, diarrhea, AIDS and tuberculosis.

Despite significant improvements, Ethiopia's health situation is still at a staggering situation. The current health workforce consists of 0.04 doctors, 0.43 nurses and 0.05 midwives per population of 1000, also represented as: one doctor for 26,943 people, one nurse for 2,311 people, and one midwife for 21,810 people. In order to overcome the lack of human resources for health and low utilization of health services, the country adopted a strategy to train the health extension workers (HEP) and midwives as well as scaling up family planning.

There are variations among the regions of Ethiopia in population per hospital and hospital bed. Regions like Amhara, Somali and SNNP have population-hospital ratios of over 10,000 in each case. These three regions also have high population - hospital bed ratios. The implication is that there could be many people with no chance of seeing a doctor or having an access to a hospital bed even if they wished to. Large numbers of people should also travel several tens of kilometres to arrive at the location of the nearest hospital. Since Ethiopia's high population growth rate will continue for of coming couple of years, and given the low rate at which the services are expanding, it could be assumed that problems in health and other areas of services will continue.

### Activity 4.9



**In small groups discuss the following questions.**

1. Describe and explain the nature of health and diseases in areas where you live.

## 4.7 IMPACTS OF POPULATION GROWTH ON SUSTAINABLE DEVELOPMENT IN ETHIOPIA

*At the end of this section, you will be able to:*

- ✓ explain the impact of population growth on Ethiopia's socioeconomic condition; and
- ✓ describe the impact of population growth on Ethiopia's environmental condition.



### KEY TERMS

- 🔑 Deforestation
- 🔑 Drought
- 🔑 Environmental degradation
- 🔑 Famine
- 🔑 Food scarcity
- 🔑 Health care
- 🔑 Pollution

***Can you mention some of the challenges of rapid population growth in Ethiopia? Can you mention some of the real problems that have resulted from population growth in your locality?***

As we have already discussed, the size of Ethiopia's population has been growing very rapidly. The population growth rate is much higher, and it is increasing much faster than the economic growth rate and is growing beyond the carrying capacity of the country's natural resources, such as land, water, soil, forest, etc. These negative results of rapid population growth have caused many environmental and socio-economic problems that are stated hereunder.

### 1. Population Growth and Environmental Degradation

Environmental degradation is a process through which the natural environment is compromised in some way, reducing biological diversity and the general health of the environment.

In Ethiopia, massive environmental degradation has occurred during the last few decades due to natural factors, unwise use of its natural resources, unsound ecological practices and population pressure. The major factor accelerating the environmental degradation rate is man's abusive actions such as the removal of the natural vegetation cover through deforestation, over-grazing and inappropriate

agricultural practices. The population which is growing at a very rapid rate of about 2.6 percent annually has been clearing forests and vegetation at an alarming rate in order to meet its increasing requirements of food, fiber and energy.

The land degradation problem is affecting considerable parts of Ethiopia, especially the highlands, mainly due to water erosion. Soil erosion is the main feature of land resource depletion leading to desertification which leads to reduced agricultural production and shortage of food. Overall, the effects of population pressure and resulting environmental degradation have driven the country into widespread food insecurity, drought and famine for the last three decades. The main activities that are responsible for environmental degradation in Ethiopia include the removal of vegetation cover and over cultivation as a result of the rapidly increasing population requirements for crop production and fuel wood. In addition, overgrazing and high livestock density resulted in the deterioration of rangeland resources.

### Activity 4.10



**In pairs, discuss the following question.**

1. What are the indirect consequences of deforestation on socio-economic conditions?

### II. Population Growth and Food Production





The situation of food in Ethiopia during the last successive three decades is largely dominated by a decline in domestic food production. Ethiopian agriculture is dominated by small holder peasant farming which contributes about 95% of the annual food production of the country. This sector is dependent mainly on traditional and subsistent farming methods (with a very limited use of modern technologies) and rainfall. Moreover, the rising population pressure and clearing of forests to satisfy its basic demands such as food and energy made the soil susceptible to wind and water erosion that can affect both soil fertility and food production in Ethiopia.

The sustained deterioration in the per capita food production and hunger has resulted in widespread malnutrition, particularly among children in many parts of Ethiopia, which will lead to physical and mental impairment over the next successive decades.

### III. Population Growth and Fuel wood Consumption

Though fuel wood is the most important source of energy in Ethiopia, its supply is steadily collapsing in most parts of the country, because it is being collected faster than it can regrow. Increased forest clearance to create farmland, wood for construction purposes and forage has led to a shortage of fuel wood, deforestation, and environmental degradation. The forest cover resource of Ethiopia has been declining significantly over time. This is caused mainly by rapid population growth and the increasing population's needs for forest resources such as wood and land. Many people in the country use wood for cooking, heating, and lightning, as well as for houses and furniture. Similarly, the increasing demand for agricultural and settlement lands is a major cause of forest destruction in the country. In Ethiopia, there is a direct correlation between population density and deforestation – the more people there are in an area, the more trees they cut down. New trees do not spring up to replace the old ones.





Such deforestation has various negative consequences, both directly on the natural environment, and indirectly on the socio-economic conditions of the people. Its direct consequences include the following.

-  *It accelerates soil erosion.*
-  *It destroys biodiversity.*
-  *It affects rainfall by decreasing evapotranspiration.*
-  *It affects the natural beauty of the affected areas*



## Focus

In Ethiopia, rapid population growth leads to deforestation mainly because of people's increasing needs for more:

-  *fuel wood*
-  *agricultural land*
-  *settlement land*
-  *grazing land*

## IV. Population Growth and Pollution

Pollution refers to any undesirable change in natural conditions of water, air, and other components of the natural environment that has negative effects on the health and activities of human beings and other living creatures.

*Can you mention some of the causes of air and water pollution? Is pollution a problem in your locality?*





Water and air pollution are mainly caused by human activities in households, industries, farmlands, means of transportation, and so on. However, it can also be caused by natural events such as volcanic eruptions, wildfires, and the like.

When an area is overcrowded (i.e. inhabited by a rapidly growing number of people) the natural environment is polluted by a variety of unwanted and harmful wastes that peoples' activities produce. In Ethiopia, pollution is a major problem in overpopulated urban centers. In large cities like Addis Ababa, most people live in unsafe environments that have extremely polluted air and water. They are surrounded by the garbage and pollutants that households, industries, automobiles, and other sources discharge.



## Focus

In Ethiopia, rapid population growth leads to environmental pollution by increasing emission of the amounts of pollutants such as:

-  Sewage, solid wastes, and pollutant gases generated by households.
-  Pollutant gases, liquids, and solid chemicals generated by expanded industries.
-  Pollutant gases generated by the increasing number of automobiles.
-  Agricultural pollutants, such as fertilizers, pesticides, animal wastes, etc.

## V. Population Growth and Provision of social services

**Effect on Education:** The rapid population growth has resulted in a growing demand for education. Nowadays the total number of students has increased enormously, but there are large number of children who do not get chance to go to school. In many urban centres schools have overcrowded classrooms.

**Effect on Health:** Ethiopia has registered a poor health status and a high rate of population growth. The majority of the population has low access to modern health service. Relatively, the situation in urban areas is better than rural areas. Growing poverty, low level of education, inadequate access to clean water, shortage of sanitary facilities and poor accesses to health facilities have contributed to the poor health situation in Ethiopia.

### Activity 4.11



**In small groups, discuss the following questions**

1. Do all school –age children in your locality go to school? If no, why?
2. Do people in your locality have easy access to hospitals and health centres?
3. Do farmers in your locality have enough land for farming? If no, what are the cause of this problem?
4. Discuss measures taken to overcome population pressure in your locality.

## 4.8 LANGUAGE AND RELIGIOUS DIVERSITY IN ETHIOPIA

*At the end of this section, you will be able to:*

- ✓ describe the language diversity of Ethiopia; and
- ✓ identify the major religions in Ethiopia.



### 4.8.1 Language

Ethiopians are ethnically diverse, with the most important differences on the basis of linguistic categorization. Ethiopia is a country where about 80 languages are spoken.

The Ethiopian languages belong to two super Families:

- i. Afro-Asiatic and
- ii. Nilo-Saharan.

Most Ethiopian languages belong to the Afro-Asiatic super family.



## I. Afro-Asiatic

The Afro-Asiatic super family is divided into three families, namely:

- a) *Cushitic*;
  - b) *Semitic and*
  - c) *Omotic*.
- a) **Cushitic**: the Cushitic languages are predominantly spoken in central, southern, eastern and northeastern parts of Ethiopia mainly in Afar, Oromia, Sidama, and Somali Regional States. It has the largest number of speakers and the widest spatial coverage. This family of languages consists of many individual languages such as Oromo language (*Afaan Oromoo*), Somali language (*Af-Somali*), Sidama language (*Sidaamu Afo*), Afar language (*Qafaraf*), Kembata language (*Kambatissa*), Hadiya language (*Hadiyissa*), Halaba language (*Halabissa*) and Gedeo language (*Gedeoffa*) and others.
  - b) **Semitic**: the Semitic languages are spoken in northern, central and eastern parts of Ethiopia particularly in the regional states of Tigray, Amhara, Harari and Southern Nations, Nationalities and Peoples' Regional State. Some of the Semitic Languages include Amhara language (*Amarigna*), Tigrai language (*Tigrigna*), Gurage language (*Guragigna*), Adere language (*Aderigna*), and Argoba language (*Argobigna*).
  - c) **Omotic**: the Omotic languages are predominantly spoken in the south–central and south-western parts of Ethiopia mainly between the Lakes of southern Rift Valley and the Omo River. The languages, which make up this family, are numerous although they are not as widely spoken as the Cushitic and Omotic. Wolaita language (*Wolaitatto*), Dawuro language (*Dawurootsuwa*), Kafa language (*Kafi noono*), and Konta language (*Kontaatsuwa*) are some of the languages spoken in this family.

## II. Nilo-Saharan

The Nilo-Saharan languages are spoken in the western lowlands of Ethiopia along the border with Sudan, in Gambella and Benishangul Gumuz Regional States. The individual languages of Nilo-Saharan Super Family include Kunama language, Beiji language, Gumuz language, Mao language, Kewam language, Nuer language, Annuak language, and others.

## 4.8.2 Religion

Ethiopia is home to diversified religions. According to the Ethiopian Central Statistical Agency (2007) census data, the national religious composition of Ethiopian include: Orthodox (43.5%), Islam (33.9%), Protestant (18.6%), Catholic (0.7%), and others (3.2%).

### Activity 4.12



**In small groups, discuss the following questions**

1. List down the Afro-Asiatic language families
2. List down some of the religions you know in Ethiopia.

## UNIT SUMMARY

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- 🌍 Human population is the number of people living in a definite area. The study of human population is also necessary for the development and socio-economic activities.
- 🌍 The term population, in population studies, refers to the total number of human inhabitants of a specified area, such as a city, country, or continent, at a given time.
- 🌍 Ethiopia is the second most populous country in Africa with a population of 114.9 million. With a growth rate of 2.6 percent, the country's population is among the fastest growing in the world.
- 🌍 In Ethiopia a high percentage of the national population is the young age group. This is the result of high birth rate.
- 🌍 In Ethiopia, the population is unevenly distributed; this is due to various physical and human-related factors.
- 🌍 Settlements in Ethiopia are broadly categorized as rural and urban. The primary bases for this distinction are the dominant economic activities and population density.
- 🌍 The majority of Ethiopian population (80 percent) currently lives in rural areas.
- 🌍 The lowlands of Ethiopia tend to be infested with tropical diseases like malaria and yellow fever.
- 🌍 In Ethiopia, rapid population growth has brought about serious negative impacts on the country's socio-economic development and on its environmental protection.
- 🌍 Ethiopians are ethnically diverse, with the most important differences on the basis of linguistic categorization.
- 🌍 Ethiopia is a country where more than 80 languages are spoken. The Ethiopian languages belong to two Super Families: Afro-Asiatic and Nilo-Saharan.

## REVIEW EXERCISES

### PART I: TRUE OR FALSE ITEMS

**Dection: Write "True" if the statement is correct and "False" if it is incorrect.**

1. The main reason for the broad base of Ethiopia's population pyramid is high rate of mortality in the country.
2. The high age dependency ratio in Ethiopia is the result of large numbers of people in the old-age group.
3. In Ethiopia, altitude is the major factor that influences population distribution.
4. In Ethiopia, fertility is higher in urban centres than in rural areas.
5. There is a direct relationship between fertility and education.

### PART II: MULTIPLE CHOICE ITEMS

**Direction: Choose the correct word or phrase from the given alternatives.**

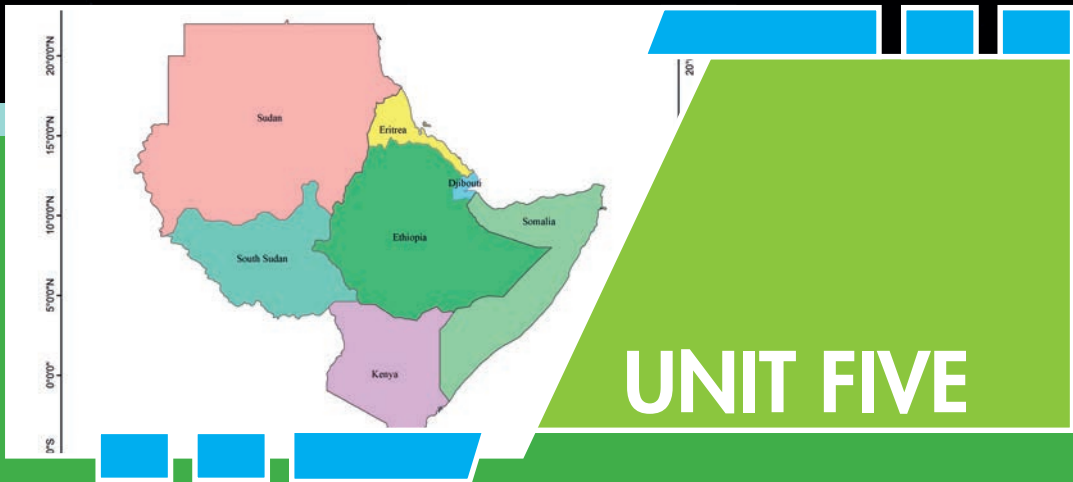
6. One of the following is a branch of human geography that deals with the number, composition and distribution of human population in relation to the environment
  - A. Climatology
  - B. Population geography
  - C. Morphology
  - D. Map reading
  - E. Biogeography
7. People living in rural settlements are mainly engaged in
  - A. Industry
  - B. Trade
  - C. Mining
  - D. Agriculture
  - E. Tourism
8. Which of the following areas is in the most sparsely populated areas of Ethiopia?
  - A. Kembata
  - B. Sidama
  - C. Borena
  - D. Hadiya
  - E. B and D

9. Rapid population growth results in
- A. Food sufficiency
  - B. Food shortage
  - C. Shortage of housing
  - D. B and C
  - E. None of the above

### PART III: COMPLETION ITEMS

**Directions: Complete each of the following sentences with the correct word or phrase.**

10. \_\_\_\_\_ is the graphic representation of the age distribution of a given population by sex.
11. The major human factors which have influenced population distribution in Ethiopia are \_\_\_\_\_
12. \_\_\_\_\_ is the relationship between the working or economically active population and the non-working population.
13. In the pastoralist areas of Ethiopia, population densities are \_\_\_\_\_
14. \_\_\_\_\_ refers to any undesirable change in natural conditions of water, air, and other components of the natural environment
15. \_\_\_\_\_ is the number of people per unit area.



## 5. MAJOR ECONOMIC AND CULTURAL ACTIVITIES IN ETHIOPIA

### INTRODUCTION

In the previous unit you learned about population and demographic characteristics of Ethiopia. The current unit is about the major economic and cultural activities of Ethiopia. Humans have been involved in many activities in order to satisfy their diverse material and spiritual needs. These activities, which are designed to satisfy the needs of human beings, are known as economic activities. Economic activities are highly diversified in their nature and characters. Some are simple while others are complex. Some of them are primitive whereas others are advanced. But whatsoever characters they have, all of them are equally important through satisfying peoples' needs.



### Unit Outcomes

- After completing this unit, you will be able to:*
- ✓ recognize the importance of the major economic activities of Ethiopia;
  - ✓ examine the trade and transport systems of Ethiopia; and
  - ✓ appreciate cultural landscapes and their contribution to tourism industry.



## Main Contents

- 5.1 Major Economic Activities in Ethiopia
- 5.2 Contribution of Subsistence Farming and Cash Crop to the Ethiopian Economy
- 5.3 Problems of Agriculture in Ethiopia
- 5.4. Trade and Transport in Ethiopia
- 5.5. Road Safety in Ethiopia
- 5.7. Cultural Landscape and Tourism in Ethiopia

 *Unit Summary*

 *Review Exercise*

## 5.1 MAJOR ECONOMIC ACTIVITIES IN ETHIOPIA

*At the end of this section, you will be able to:*

- ✓ list the five types of economic activities;
- ✓ explain the major characteristics of economic activities; and
- ✓ examine how economic activities modify and transform resources.



### KEY TERMS

-  Agriculture
-  Economic activity
-  Industry

-  Tourism
-  Trade
-  Transport

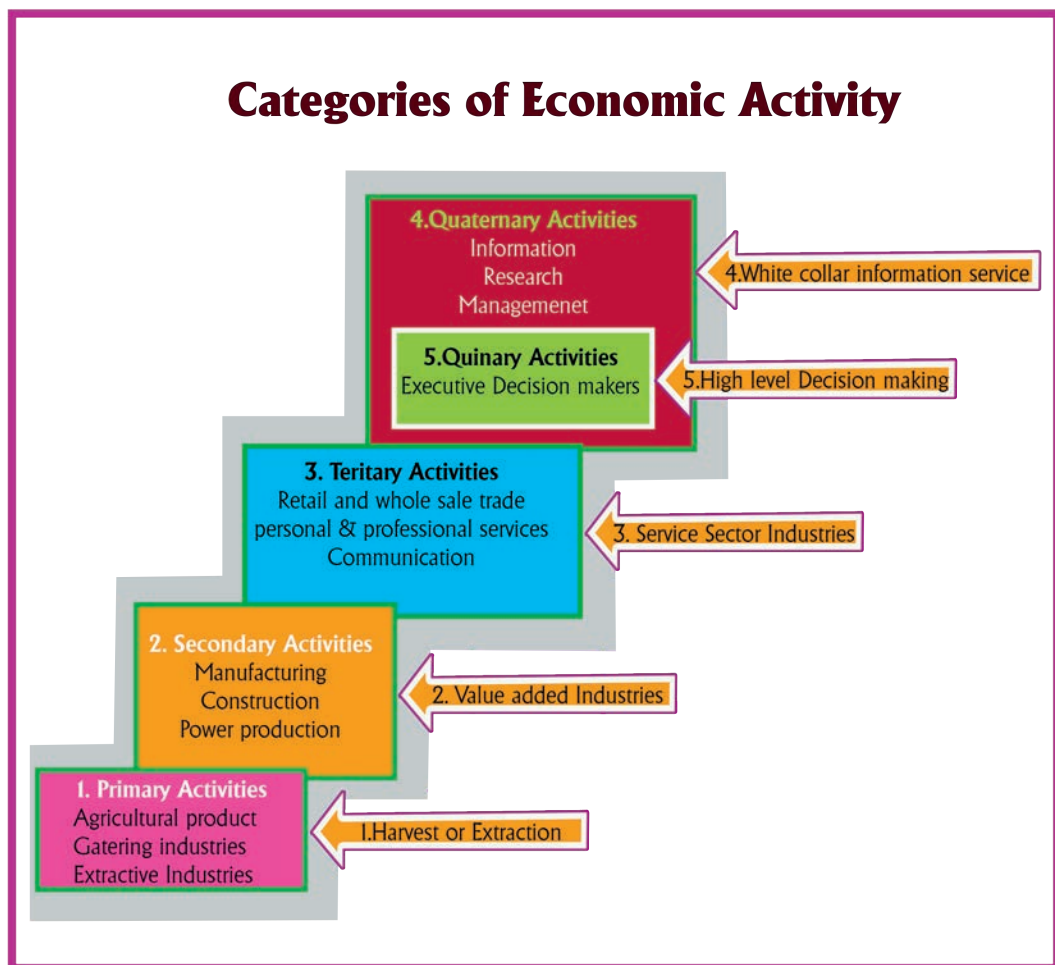
***What is economic activity? What influences economic activity?***

Economic activity is the production, distribution, and exchange of goods and services. Some examples of these activities are hunting, fishing, farming, grazing, mining, manufacturing, transportation, trade and others.

## Classification of Economic Activities

*What are the major classes of economic activities?*

The economic activities practiced in the world are grouped into five, namely primary, secondary, tertiary, quaternary and quinary. Each type of economic activity is important to a society. The distribution of jobs in a particular economic activity in a country may indicate the level of development of the country. Geographers classify a nation's economy into primary, secondary, tertiary, the service sectors. Increasingly the service sectors are seen as forming a fourth or quaternary sector and a fifth or quinary sector.



*Figure 5.1: Categories of Economic Activity*



## Activity 5.1



By referring to Figure 5.1, try to answer the following questions. .

1. What are the major activities that are categorized under?
  - a) Primary economic activities
  - b) Secondary economic activities
  - c) Tertiary economic activities
  - d) Quaternary economic activities
  - e) Quinary economic activities
2. What do you think are the differences among them?

### A. Primary Economic Activities

*What are the major primary economic activities practiced in your locality?*

Primary economic activities focus directly on the extraction of resources from the environment. They involve the production of foodstuffs and raw materials. These economic activities occur at the beginning of the production cycle, where people live in close contact with the resources of the earth. A few examples of primary economic activities include agriculture, fishing, forestry, and mining. All of these jobs are dependent upon the natural resources of the earth

Primary economic activities are characterized by the following. They are:

- 🌐 *dependent on the natural environment;*
- 🌐 *related to the production of foodstuffs and raw materials through the exploitation of the resources of the earth;*
- 🌐 *influenced by the condition of the physical environment in one way or another*





**Figure 5.2:** *Types of Primary Activities (Agriculture, Fishing, Forestry and Mining)*

## 1. Agriculture

***What is agriculture? Why is agriculture an important primary economic activity?***

Agriculture is the science and art of cultivation of the soil and the rearing of livestock for either local consumption or commercial purposes. In Ethiopia, agriculture is an old economic activity, which has been practiced since 4000 BC. Thus, Ethiopia is mentioned as one of the original centers of the world's most important cultivated crops. In Ethiopia, most agricultural production takes place in the *Dega* and *WeynaDega* zones, where land productivity has traditionally coincided with the densest rural population.

Types of agriculture in Ethiopia can be divided into two broad types namely: crop production and livestock raising.

### 1. Crop Production/Arable Farming

***What is arable farming?***

Crop production is the process of cultivation of plants to yield food, feed, and fiber or to provide medicinal or industrial ingredients, or grow ornamental products. Arable farming practices, in Ethiopia can be classified into the following types:

#### a) Seed (Grain) Production

In Ethiopia, in areas of *WeinaDega* and *Dega* zones on northwestern highlands and parts of Southeastern highlands, seed farming is a common activity. Seed/grain production mainly include cereals, pulses and oilseeds)

🌍 *The principal cereal crops are teff, barley, wheat, maize, sorghum, millet, and oats.*

- 🌐 Pulses include horse beans, chickpeas, haricot beans, field peas, lentils and vetch.
- 🌐 Oilseeds include oilniger, linseed, fenugreek, rapeseed, sunflower groundnuts, and sesame.

### b) Permanent (Perennial) Crop Cultivation

Perennial crops like *enset*, coffee, cotton, etc. are major crops in the WoinaDega areas of southern and southwestern parts of the country. Enset is the staple food of the people of these areas.

### c) Shifting Cultivation

Shifting cultivation is the cut-and- burn cultivation system. In Ethiopia, Shifting cultivation is practiced in western and southwestern fringes of the Ethiopian highlands and lowlands or Benishangul-Gumuz, Gambella and Southern Regions where population density is low and livestock rearing is limited areas.

### d) Plantation Agriculture

In Ethiopia, Plantation agriculture produces mostly cash or industrial crops like sugarcane, cotton, coffee, tea, and rubber. Such agricultural systems are found in areas either where there is abundant rainfall or irrigation is possible.

## II. Livestock Raising

### *What is livestock raising?*

The term livestock includes all animals that are kept on the farm to provide food, power, raw materials, or are meant for market. Ethiopia has a large livestock population that includes cattle, goats, sheep, Camels, poultry, and packed animals. In cattle population, Ethiopia stands first in Africa and tenth in the World. The Livestock sector is an important subsector of the nation's economy and supports both the agricultural income and the Growth of Domestic Production.

## 2. Forestry




### *What is forestry?*

A forest is a mass of plants or a wooded area in which trees are the most common features. The extraction of forest products for different purposes by people is called forestry.

## Economic Significance of Ethiopian Forest

Even though the importance of forest and forest products is little in earning foreign exchange, their significance at a local level is large. For instance, their contribution to the national economy in the form of GDP is about 6.10%.

Most of the trees cut in Ethiopia today are used for domestic purposes like for:

-  Fuel wood,
-  Timber household furniture,
-  For building and construction.

### 3. Fishery

#### *What is fishing?*

Fishing is a primary economic activity concerned with the catching and harvesting of fish, other marine creatures. Fishing is one of the oldest occupations of humankind. Most fishing activities in Ethiopia take place in freshwater, such as rivers, lakes and ponds. In general, the Ethiopian fishing grounds could be classified as Lakes and Rivers

### 4. Mining

#### *What is mining?*

Mining is a primary economic activity concerned with the extraction of mineral-bearing substances from the earth's crust. The earth's crust is composed of rock containing minerals. A mineral is an inorganic chemical element or compound found naturally in the crust of the earth. Mining is important to the economy of Ethiopia. Currently, mining contributes to only 1.5 % of GDP.

## Activity 5.2



### Discuss the following in groups

1. Discuss the process involved in shifting cultivation
2. What are the major forest products obtained from forests in your locality?
3. Do people in your area catch fish? Where and how? If not, why?
4. Explain the contribution of Primary economic activity for Ethiopian Economic development.

## B. Secondary Economic Activities

### *What is manufacturing?*

Secondary economic activities include manufacturing, construction and power production. Manufacturing activities take place in factories. It is the activity, which turns raw materials into products by using labour, energy, and equipment, while industry refers to the place where manufacturing takes place.

Activities associated with the secondary sector include metalworking and smelting, automobile production, textile production, chemical and engineering industries, aerospace manufacturing, energy utilities, engineering, breweries and bottlers, construction and shipbuilding.



*Figure 5.3: Types of Secondary activities (Manufacturing & power Production)*

### Types of Manufacturing Industries in Ethiopia

Manufacturing industries in Ethiopia can be classified into two. These are:

- a) *Cottage(traditional) industries*
- b) *Modern Manufacturing industries*

#### **a) Cottage (Traditional) Industries**

The main cottage industries include weaving, wood carving, pottery, metal works, basketry, etc. The cottage industries of Ethiopia have existed with little changes and refinement throughout history. The major factor that hindered their development was the negative traditional outlooks towards these activities. Hence people engaged in such activities had, in some instance, low social status. Still, this low status has not been done away with entirely

## b) Modern Manufacturing Industries

As a developing nation, Ethiopia's modern manufacturing sector is at low level. Ethiopia's modern manufacturing consists of largely light industries which produce consumer goods.

## C. Tertiary Economic Activities

### *What is a tertiary economic activity?*

The basic characteristic of the tertiary economic activity is the provision of services. The tertiary sector involves the provision of services to other businesses as well as to the final consumers. Examples of tertiary economic activities include legal services, medical services, trade, transportation services, tourism, etc.



*Figure 5.4: Types of Tertiary Activities (Transport and Tourism)*

## D. Quaternary Economic Activities

### *What are the major quaternary economic activities practiced in your locality?*

The quaternary sector may realistically be seen as an advanced form of service activity involving specialized knowledge, technical skills, communication ability, or administrative competence. These activities include research, financial services, and government activities. These are the activities performed in office buildings, elementary and university classrooms, hospitals and doctors' offices, theatres and television stations. They are activities primarily concentrated in large urban places and require higher levels of education than the other sectors. This section also includes other pure services, such as the entertainment industry.

## E. Quinary Economic Activities

### *What are quinary economic activities?*

Quinary economic activities are generally considered to be a sub-set of quaternary activities and are those that involve high-level decision-making and scientific research skills. It is also a sub-division of the tertiary sector representing the special and highly paid skills of top business executives, government officials, research scientists, financial and legal consultants, and the like. These people find their places of business in major metropolitan centres, in and near major universities and research centres.

## 5.2 CONTRIBUTION OF SUBSISTENCE FARMING AND CASH CROP TO THE ETHIOPIAN ECONOMY

*At the end of this section, you will be able to:*

- ✓ describe agricultural practices in Ethiopia;
- ✓ explain the importance of subsistence farming to the Ethiopian economy and
- ✓ explain the contribution of cash crop production to the Ethiopian Economy.



### KEY TERMS

 Cash crop production

 Subsistence farming

### *What are the contributions of farming to the Ethiopian Economy?*

Ethiopian national economy largely bases itself on agriculture. Agriculture constitutes the principal source of income and employment for the majority of the population in Ethiopia. Greater proportion of the foreign exchange the country earns also comes from this sector.

The importance and predominance of the agricultural economy in the country can be suggested by the following facts:

1. Agriculture employs the majority (80%) of the Ethiopian total population
2. Agriculture supplies more than 90% of export commodities. Thus, agriculture is the main source of Ethiopia's export earnings
3. Agriculture contributes 32.7% of the Gross Domestic Products (GDP) of the country (See Table 5.1).

*Table 5.1: Sectoral Percentages Shares in GDP (2014-2020)*

Sector	Share (%)					
	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
Agriculture	39.6	37.5	36.3	34.9	33.3	32.7
Industry	21.0	23.7	25.9	27.0	28.1	29.0
Service	39.5	39.7	38.8	39.2	39.8	39.5

*Source: National Bank of Ethiopia, 2019/20*

Agriculture's main products are food crops, cash crops, industrial crops, fruits and vegetables, flowers, and animal products. Agriculture had been the leading sector followed by the service sector until 2014/15. But, after 2015/16, the service sector emerged as the dominant sector mainly due to natural factors and economic factors..

### Activity 5.3



**By referring to Table 5.1, try to answer the following questions. .**

1. Which sector has
  - a) the highest share
  - b) the smallest share
2. What is the trend (pattern) of agriculture's contribution to the Ethiopian economy? Is it increasing or decreasing? Why?



### 5.2.1 Contribution of subsistence farming to the Ethiopian Economy

Subsistence farming, method of farming in which nearly all of the crops or livestock raised are used to maintain the farmer and the farmer's family, leaving little, if any, surplus for sale or trade. It is a common feature of developing countries including Ethiopia. Both crop farming and animal rearing use traditional tools and techniques and hence, subsistence agriculture is hand-to-mouth in nature. As a result the products grown are primarily for family needs. This, therefore, leaves little surplus production entering the market.

The subsistence farming sector of Ethiopia produces varieties of food crops, which grow in different agro-climatic conditions. The crops include cereals such as teff, wheat, barley, sorghum, etc. Enset is another major food crop cultivated in parts of southern, western and central Ethiopia. Pulses and oilseeds are also among the food crops grown in this sector.

Agriculture in Ethiopia is typically characterized by smallholder and subsistence farming which is highly dependent on rainfall. The urban livelihood is also highly dependent on the rural economy and as such small farm constitutes the life support mechanism of the country. Most agricultural households in Ethiopia, for example, mainly produce for own consumption but also for sale, which can have many purposes – saving, procuring food or non-food items tax or loan repayment. These households purchase some of their inputs (fertilizer) and provide some (family labor) from their own resources.

Subsistence farming is the practice of self-sufficiency in which the farmers focus only on producing enough food for personal consumption. Thus it can play an important role in Ethiopia's economy by reducing the vulnerability of rural food-insecure households, improving livelihoods.

### 5.2.2 Contribution of Cash Crop Production to the Ethiopian Economy

Commercial farming as opposed to the subsistence farming sector, it is concerned with producing crop for sale. Hence, the main objective of this sector is to make money. In this regard, Ethiopian farmers produce varieties of cash crops such as coffee, oilseeds, pulses, chat, sugar cane, cotton and fruit. Contribution of cash crop production to the Ethiopian economy listed hereunder:

### a) Source of Food and Raw Material

One of the main roles of agriculture in the Ethiopian economy is being the source of food and raw materials. For example, agriculture supplies the country with food grains, dairy and meat products. The agricultural sector is also the supplier of foodstuff to consumers and raw materials to agro- industries

### b) Source of Capital

Cash crops provide a stimulus to agricultural innovation, by raising capital for agricultural investment and accelerating the build-up of institutions that enable further commercialisation. Cash crop production in Ethiopia provides funds for capital formation such as: agricultural taxation and export of agricultural products,

**i. Agricultural taxation:** Taxes paid by cash crop production farmers important contribution to the Ethiopian Economy.

**ii. Export of Agricultural products:** The major Cash crop production for export items of the country include coffee, oilseeds, flower, chat and pulses. Coffee is Ethiopia's most important export commodity, accounting for about 28.6 % of the value of all exports in 2019/20. Other cash crops oil seeds, pulses and chat accounts for 11.5%, 7.9%, and 10.9%.of the total value of all exports in 2019/20 respectively.

### C. Contribution to Employment:

About 80% of the Ethiopian population earns their livelihood from agriculture. Cash crops bring substantial wage and employment opportunities to the rural economy.

## 5.2.3 Problems of Agriculture in Ethiopia

As discussed in the previous section agriculture is the mainstay of the Ethiopian economy. The majority of the Ethiopians are farmers but they have not yet secured food at large. The Ethiopian agriculture reveals a picture of virtual stagnation in production; a rapidly rising population, and declining domestically produced food per capita. In other words, because of the instability in agriculture production, agriculture has failed to play the decisive role expected of it. The major obstacles to the development of this sector include:

### A. Land degradation

Studies revealed that because of the topography of the land 50% of the cultivable land of Ethiopia is exposed to various levels of soil erosion. The soil in many areas has

lost some biological productivity and physical properties needed for optimal plant growth. Land degradation can reduce soil fertility, depth, and essential nutrients and water holding efficiencies thereby reducing the crop production capacity.

## B. Variable Rainfall

It is a matter of fact that Ethiopian agriculture is heavily dependent upon unreliable rainfall which may produce surplus only in years of favourable weather. What is more it has not always been timely. Sometimes it comes early or late. Other times it falls short of the required amount or it falls in excess amount that can highly impact both productivity and food security.

## C. Fragmentation of Farm Plots and Small Size of Holdings

The land owned by peasants is getting smaller and smaller over time due to continuous division of farmland among the number of families in the form of inheritance. The agricultural lands are therefore highly fragmented.

Table 5.2 shows that agricultural land is highly fragmented, the majority (38%) of households access less than 0.5 hectares of land, 23.65% of households access between 0.51 to 1.0 hectares, 24.04% between 1 and 2 hectares, and that only the remaining 14.31% of households access more than 2 hectares of land. Households with less than one hectare of land are often unable to fulfill household needs including necessary food consumption.

*Table 5.2: Distribution of Households by Farmland Size in Ethiopia 2014/15*

Farmland Size holding (in hectares)	% of Farmers
< 0.10	7.71
0.10 – 0.5	30.29
0.51 – 1.00	23.65
1.01 – 2.00	24.04
2.01 – 5.00	13.03
5.01 – 10.00	1.20
> 10.00	0.08
Total	100

## D. Backward Technology

In Ethiopia the smallholder farming is characterized by dependence on traditional tools and farming practices. Land preparing is done by oxen drawn plough. Planting is generally performed by manual broadcasting which hampers effective weeding and spraying activities. Weeding is done manually and harvesting is also performed

manually with the help of sickle.

### E. Poor Rural Infrastructure

Agricultural infrastructure primarily includes a wide range of public services that facilitate production, procurement, processing, preservation and trade. It has mainly focused on irrigation, transportation, electric power and agricultural markets. As the Ethiopian economy is largely subsistence the country's transport and communication systems are poorly developed. The bad conditions of the road in rural areas affect the cost of transportation of agricultural product which in turn reduce farmers' income.

## 5.3 TRADE AND TRANSPORT IN ETHIOPIA

*At the end of this section, you will be able to:*

- ✓ explain the need for expanding trade;
- ✓ describe the major types of trade in Ethiopia;
- ✓ explain the importance of transport to Ethiopian economy.



### KEY TERMS

- 🔑 Domestic trade
- 🔑 Export trade
- 🔑 Foreign Trade

- 🔑 Import trade
- 🔑 Modes of Transport
- 🔑 Road Traffic Accident

### 5.3.1 Trade

***What is trade? Can you explain the significance of trade in a society?***

Trade is a basic economic concept involving the buying and selling of goods and services, with compensation paid by a buyer to a seller, or the exchange of goods or services between parties. Trade can take place within an economy between producers and consumers.

## Types of Trade

In Ethiopia there are two main types of trade namely:

- a) **Internal (Domestic) trade:** This refers to the exchange of goods and services within the country. Internal trade is the base for foreign trade.
- b) **External (Foreign) trade:** is the process of trading, which involves the exchange of commodities among different countries. Since there is no country that is self sufficient in all demands, the movement of items from one country to another in the form of trade is unavoidable.

## The Structure of Export and Import Trade

### I. Export Trade Sector of Ethiopia

As the Ethiopian economy is an agrarian economy raw materials mainly originate from the agricultural sector are the export items of the country. These include coffee, oilseeds, flower, chat, pulses, gold, textile and textile products, etc. According to the National Bank of Ethiopia 2019/20 report, the most dominant export item of the country is coffee.

Table 5.3: Values of Major Export items (In Millions of USD)

Export Item	2017/18		2018/19		2019/20		Percentage change	
	A	% share	B	% share	C	% share	B/A	C/B
Coffee	839.0	29.6	764.1	28.7	855.9	28.6	2.0	12.0
Oil seeds	423.5	14.9	387.8	14.5	345	11.5	-18.5	-11.0
Leather and leather products	132.4	4.7	117.4	4.4	72.9	2.4	-45.6	-38.6
Pulses	269.5	9.5	272.3	10.2	234.8	7.9	-12.8	-13.8
meat & Meat products	101.7	3.6	88.6	3.3	67.4	2.3	-33.7	-23.9
Fruit and Vegetables	61.4	2.2	60.9	2.3	58.8	2.0	-4.2	-3.4
Textile & Textile Products	103.8	3.7	152.9	5.7	168.9	5.7	62.6	10.5
Live Animals	61.1	2.2	45.8	1.7	54.1	1.8	-11.5	18.1
Chat	263.2	9.3	303.6	11.4	324.4	10.9	23.3	6.9
Gold	100.2	3.5	27.9	1.0	196.5	6.6	96.2	604.5
Flower	228.6	8.1	256.6	9.6	422.3	14.1	84.7	64.6
Electricity	80.5	2.8	55.7	2.1	66.4	2.2	-17.4	19.3
Others	171.2	6	132.9	5.0	121.1	4.1	-29.3	-8.9
Total Exports	2836.1	100	2,666.50	100.0	2,987.70	100.0	5.3	12.0

Table 5.3 reveals the fact that despite the persistent decline of the share of coffee in the total export since 2018/19, it is still the major source of export earning of the country. The second and the third position in the share of total export value were occupied by flower and oilseeds with 14.1 %, and 11.5%, respectively for the year 2019/20.

## II. Import Trade sector of Ethiopia

Ethiopia imports mainly finished products like machinery, transport equipment, electrical and electronic goods, fuel and the like. The overall annual import values of Ethiopia have been constantly declining both by value and percentage.

*Table 5.4: Values of Imports by Commodity Groups (In Millions of USD)*

Import Item	2017/18		2018/19		2019/20		Percentage change	
	A	% share	B	% share	C	% share	B/A	C/B
Raw Materials	138.0	0.9	151.5	1.0	162.2	1.2	9.8	7.0
Semi-finished goods	2,527.8	16.6	2,778.8	18.4	3,110.7	22.4	9.9	11.9
Fertilizer	478.5	3.1	499.7	43.3	597.8	4.3	4.4	19.6
Fuel	2,319.3	15.2	2600.7	17.2	2,088.1	15.0	12.1	-19.7
Petroleum products	2,227.2	14.6	2493.4	16.5	2,003.7	14.4	11.9	-19.6
Others	92.0	0.6	107.3	0.7	84.3	0.6	16.7	-21.4
Capital Goods	5,269.1	34.5	5,030.6	33.3	4,122.0	29.7	-4.5	-18.1
Transport	1,130.9	7.4	1,492.2	9.5	397.6	2.9	26.4	-72.2
Agriculture	51.5	0.3	58.6	0.4	88.2	0.6	13.7	50.7
Industrial	4,086.7	26.8	3542.9	123.4	3,636.2	26.2	-13.3	2.6
Consumer Goods	4,707.0	30.9	4,273.1	28.3	4,010.6	28.9	-9.2	-6.1
Durables	1,351.7	8.9	1,200.7	7.9	920.5	6.6	-11.2	-23.3
Non-durables	3,355.3	22.0	3,072.3	20.3	3,090.1	22.3	-8.4	0.6
Miscellaneous	294.2	1.9	277.2	1.8	387.8	2.8	-5.8	39.9
Total Imports	15,255.3	100.0	15,112.0	100.0	13,881.3	100.0	-0.9	-8.1

Table 5.4 above indicates that the total merchandise import bill 15.1 billion USD (United States Dollar). Meanwhile, for the year 2018/19 reached USD 13.9 billion for the year 2019/20 depicting an 8.1 percent decline mainly due to lower import bills of fuel, capital goods and consumer goods. Payments for semifinished goods, raw materials, and miscellaneous goods, however, registered annual increment.

## Activity 5.4



**By referring to Table 5.4, try to answer the following questions.**

1. Which import item shares the highest percentage in these three years?
2. Which import item shows growth in the given three years?

### Trade Balance of Ethiopia

Trade balance is the yearly difference between the export and import values. If the yearly export value of a given country exceeds its yearly import value it will be a positive or surplus trade balance. If import exceeds export it will be a negative trade balance. In Ethiopia import values exceed export values, hence the country experiences a trade deficit (negative trade balance).

### 5.3.2 Transportation in Ethiopia

Transportation may be defined as a movement of materials and goods, or people from one place to another with a specified objective. Transportation is fundamental to the functioning of any society. One of the major functions of the transport system is to facilitate movements of different goods or commodities from areas of surplus to areas of deficit. Transport plays a vital role in the expansion and development of the socio-economic life of people at all levels.

Nowadays, the types and quality of transportation have made much progress. This has enabled people to travel longer distances in shorter times than ever before. Also, the flow of ideas, beliefs and innovations has become faster and wider.

### Modes of Transport in Ethiopia

*What sorts of transportation systems are available in your area?  
How do you explain the use of transportation in Ethiopia?*

Based on their stage of development the existing modes of transport in Ethiopia are broadly divided into two:

1. **Traditional modes of transport:** include the use of pack animals and human portorage

**II. Modern modes of transport:** the modern transport sector in Ethiopia uses the following four different modes of transport. These includes:

- a) *Road transport*                      c) *Inland waterways*  
 b) *Railway transport*                  d) *Air transport*

### a. Road Transport

Road transportation is the mode of freight and passenger transportation using buses, cars, and truck. Road transport is more widespread and more flexible than railway. Road transportation is most important to the Ethiopian economy. Roads are the most important transport infrastructure in providing access to rural and urban areas in Ethiopia.

### Road Network

Table 5.5 below shows the status of road development and road network in Ethiopia. During 2005/06 classified road network in Ethiopia was 39,477 kms while the total road network increased rapidly reached 138,127 kms during 2018/19. The country's total road network was consisted of 55,808 kms (40.4%) Woreda road, 30,924kms (22%) Rural road, 28,699 Kms (20.8%) Federal road and 22,697 Kms (16.4%) urban road. Asphalt road network accounted for about 11.5% of the road network in the country.

*Table 5.5: Length of All Weather Roads by Type*

Year	Federal Road		Rural Road	Woreda Road	Urban Road			Total
	Asphalt	Gravel			Paved	Cobel	Unpaved	
2005/06	5,002	14,311	20,164	NA	-	-	-	39,477
2006/07	5,452	14,628	22,349	57,764	-	-	-	42,429
2007/08	6,066	14,363	23,930	70,038	-	-	-	44,359
2008/09	6,938	14,234	25,640	85,767	-	-	-	46,812
2009/10	7,476	14,373	26,944	100,385	-	-	-	48,793
2010/11	8,295	14,136	30,712	854	-	-	-	53,997
2011/12	9,875	14,675	31,550	6,983	-	-	-	63,083
2012/13	11,301	14,455	32,582	27,628	-	-	-	85,966
2013/14	12,640	14,217	33,609	30,056	-	-	-	99,522
2014/15	13,551	14,055	30,641	46,810	1,693	850	2,814	110,414
2015/16	14,632	13,400	31,620	48,057	1,693	-	3,644	113,066
2016/17	15,886	12,813	33,367	52,748	1,693	-	3,644	120,171
2017/18	15,886	12,813	35,985	56,732	1,693	2,814	850	126,773
2018/19	15,886	12,813	30,924	55,808	1,914	5,199.6	15,583	138,127



## b. Railways

The major advantage of rail transport is that it helps transport bulky products. For more than a century, Ethiopia was served by an international meter gauge railway, from Addis Ababa to Djibouti. The railway was built from 1897–1917 and was about 781 km long primarily served to move export- imports for a long time. Compared to those of the developed countries the railway was backward. It was also a single lane track. Eventually, the Ethio-Djibouti Railway and its decades old rolling stock were lacking spare parts and were forced to close down over a number of years.

Recently a new railway line of 752.7 km length connecting Addis Ababa to Djibouti was officially inaugurated in Djibouti in 2018. The Addis Ababa–Djibouti Railway is a new standard gauge international railway that serves as the backbone of the new Ethiopian National Railway Network. It provides Ethiopia with access to the sea, linking Addis Ababa with Djibouti and its Port of Doraleh. More than 95% of Ethiopia’s trade passes through Djibouti. The railway line has double-track for 115 km, from Addis Ababa to Adama, and a single track for the remaining 600 km to Djibouti. Power is supplied through 20 distribution stations 17 in Ethiopia and 3 in Djibouti.

The other important railway is Addis Ababa Light Rail Transit (AA-LRT). It is the first light rail and rapid transit in eastern and Sub-Saharan Africa. The total length of both lines (north-south and east-west) of the rail is about 31.6 kilometres, with 39 stations. It is estimated that AA-LRT currently transports about 60,000 people daily, significantly reducing traffic congestion in the capital, Addis Ababa.

## c. Inland Waterways

Water transport is cheap and convenient for transporting bulky goods over long distances. The use of Ethiopian rivers and lakes as inland waterways is extremely limited. This is due to the ruggedness of the topography and the seasonal nature of rainfall in most parts of the country. The only navigable river in Ethiopia is Baro. There is also small-scale transportation over lakes Tana, Abbaya and Ziway.

## d. Air transport

For countries like Ethiopia where the topography is difficult for communication, air transport is of special significance. Air transport is the most recent and fastest mode of transportation. The Ethiopian Airlines, which is the major airlines in the country, is amongst the best airlines by African standards. Ethiopian Airlines (EAL) was established in 1945.



Ethiopian Airlines is the leading and most profitable airline in Africa. It has more than 62 destinations in Africa and more than 127 international destinations in five continents. It also has more than 22 domestic destinations and 58 cargo destinations. It is the largest cargo network operator in Africa. Ethiopian Airlines joined Star Alliance Network, an international airline network giving it access to more routes with partner airlines, in 2011.

**Figure 5.5:** Ethiopian airline cargo transport during Covid 19

Ethiopian Airlines Group has transported 50 million doses of COVID 19 vaccine to more than 28 countries across the globe and became the only African carrier to reach such a milestone playing crucial role during such a difficult time. In addition to this, Ethiopian Cargo and Logistics Services, Africa's largest cargo service provider, has successfully distributed the vaccines to different countries with its technologically equipped facility called 'Pharma Wing'.

Furthermore, the air transport sector makes a major contribution to Ethiopia's economy. In 2018, the air transport industry, including airlines and its supply chain, are estimated to support US \$1.54 billion of GDP in Ethiopia. Foreign tourists arriving by air to Ethiopia, who spend their money in the local economy supports a further US \$2.61 billion of the country's GDP, totalling to US \$4.15 billion

## Activity 5.5



**Discuss the following questions in your group.**

1. Why do you use transportation?
2. Which one of the transportation systems is the most common in Ethiopia?
3. Give at least three examples of the land transportation system.
4. Is transportation a tertiary economic activity? Why?

## 5.4 ROAD SAFETY IN ETHIOPIA



*At the end of this section, you will be able to:*

- ✓ describe the cause and consequences of road traffic safety in Ethiopia
- ✓ explain the performance of road safety in Ethiopia



### KEY TERMS

- 🔑 fatalities
- 🔑 injuries
- 🔑 passengers

- 🔑 pedestrians
- 🔑 Road safety
- 🔑 Road Traffic Accident

### *What is Road safety?*

Road safety is safety in using roads. There are ways to make roads safe for motor traffic, cyclists and pedestrians. It involves rules such as speed limits and those about drinking and driving, and control systems, such as traffic lights and crossings.

Current Accident Severity Definition in Ethiopia:

- 1. A fatal accident** is the one in which one or more individuals die as a result of a traffic accident within the same reporting 30 days of the occurrence of the accident.
- 2. A serious injury** is one in which a victim sustains severe cuts, bleeding, breaks, and other damages, which requires medical treatment as “in-patient” in hospital.
- 3. A slight injury** is the one as a result of which the victim sustains only small cuts, scratches, and other small damages which may be treated as an out-patient without requiring admission to a hospital.
- 4. Property damage only** accident is the one as a result of which no person is injured only one or more vehicles involved in the accident are damaged.

### Road Traffic Accidents in Ethiopia

Road accidents are a global problem affecting all parts of society. However, road safety has received insufficient attention at national and regional levels. As a result, traffic accident has been increasing dramatically from time to time. According to

the WHO (2020) report as a consequence of road traffic accidents, an estimated 1.3 million people die and about 50 million people are injured each year on the world's roads. Most road traffic deaths and injuries occur in low- and middle-income countries.

Ethiopia has experienced high rates of road traffic accidents, as the road is the major means of transportation. According to official statistics for Ethiopia, road traffic deaths more than doubled in the 12-years between 2007 and 2018, rising from 2,161 to 4,597. The size of the vehicle fleet in 2018 was 1,071,345 (see Table 5.6). This implies that nearly 43 people were killed per 10,000 vehicles in the country in 2018. Viewed from another perspective, Ethiopia loses 13 people per day in road traffic crashes.

*Table 5.6: Number of vehicles in the regions (up to June 2019) Registered vehicles*

Regions	Number of vehicles
Addis Ababa	596,084
Amhara	94,001
Afar	6,598
Benishangul	8,842
Dire Dawa	21,938
Somali	15,160
Tigray	52,751
Gambela	5,558
Harari	8000
SNNPR	91,105
Oromia	171,308
Total	1,071,345

## Activity 5.6

**Discuss on group the following question.**

1. Why traffic accident is on the rise in developing countries including Ethiopia?



## The Main Road Safety Actors in Ethiopia

The National Road Safety Council (NRSC) of Ethiopia is overseen by several ministries and private stakeholders. The Council is led by the Ministry of Transport, the Ministry of Finance, the Ministry of Education, the Ministry of Health, the Federal Police Commission, the Ethiopian Roads Authority, the Federal Transport Authority, and private, and public transport associations.

Recently, there has been a yearly increase in the number of fatalities and serious injuries from road traffic crashes. The trends show that road traffic crashes have become a burden of economic, social and health proportions for the country.

*Table 5.7: Road Traffic injury victim distribution among the Regional States in Ethiopia*

Region	2016			2017			2018		
	Deaths	Serious Injuries	Slight Injuries	Deaths	Serious Injuries	Slight Injuries	Deaths	Serious Injuries	Slight Injuries
Tigray	386	854	381	374	858	584	371	664	356
Afar	56	73	20	72	49	31	131	164	79
Amhara	1 104	1 032	1 252	1 152	1 181	1 924	1 035	1 190	1 990
Oromia	1 478	1 448	1 386	1 882	1 710	1 586	1 541	1 459	1 485
Somalia	132	127	134	204	533	447	157	408	396
Benishangul	91	136	266	36	126	215	33	224	395
SNNPR	712	1 152	725	720	1 121	922	634	990	937
Gambela	19	43	81	18	20	48	16	38	101
Hareri	55	203	188	34	224	507	53	123	284
Addis Ababa	528	2 210	1 274	585	1 804	1 232	477	2 085	1 232
Dire Dawa	36	129	242	41	128	279	31	141	180
Total	4 597	7 407	5 949	5 118	7 754	7 775	4 479	7 486	7 435

Road traffic injuries in Ethiopia, mostly affect passengers; and pedestrians. In other words, one person is killed on the roads every two hours. It is likely that actual fatality figures in the country are larger than those reported by the Ethiopian Federal Police Commission due to factors such as underreporting and misclassification of road traffic fatalities. An integrated crash database is needed to overcome underreporting road traffic crashes.

According to the Federal Police Commission (2019) report distribution of road traffic crashes in the country is uneven, with road fatalities and injuries concentrated on roads in the central part of the country. For instance, four out of 12 regional States, namely the Oromia, Amhara, South Nations Nationality People regions, and

the Addis Ababa City Administration accounted for almost 85 % of the fatalities in the country.

### Factors Influencing Road Accidents

There are four major factors influencing road traffic accidents. These are:

- 🌐 *Vehicle related factors*
- 🌐 *Road related factors*
- 🌐 *Road user related factors*
- 🌐 *Environmental related factors*

### Causes of Road Traffic Accidents



Many factors result in car crashes, and sometimes multiple causes contribute to a single crash. Factors include the following:

- **Driver distraction:** Drivers miss their attention while driving due to factors including fiddling with technical devices, talking with passengers, eating or grooming in the car, dealing with children or pets in the back seat, or attempting to retrieve dropped items;
- **Driver Impairment by Tiredness:** Driver impairment describes factors that prevent the driver from driving at their normal level of skill. Common impairments include: illness, alcohol, legal or illegal drugs, and sleepiness,. Impaired driving is dangerous. It's the cause of more than half of all car crashes.
- **Mechanical failure:** These are factors associated with the vehicle itself including flat tires or tires blowing out, brake failure, axle failure, steering mechanism failure;
- **Road conditions:** It refers to those factors related to the road infrastructure including foreign obstacles or substances on the road surface; making the roads slick; road damage including potholes.
- **Speed exceeding safe conditions:** Speed exceeding safe conditions such as the speed for which the road was designed, the road condition, the weather, the speed of surrounding motorists, and so on.

### Consequences of Road Traffic Accidents

The consequences of road traffic accidents include:

- 🌐 *loss of productivity of the victims,*
- 🌐 *the cost of the legal system,*

-  *the cost of pain and suffering, and*
-  *loss of quality of life of the victim and their family.*

### Road Safety Rules

Road Safety rules for Pedestrian	Road Safety rules for drivers
<ul style="list-style-type: none"> <li>* Prepare a safe walking route in advance.</li> <li>* Use sidewalks if they are available.</li> <li>* Walk facing the traffic if a sidewalk isn't available.</li> <li>* Obey all signs and signals.</li> <li>* Only cross streets at designated areas.</li> <li>* Stay on well-lit paths at night.</li> <li>* Wear bright colours during the day and reflective tape at night.</li> </ul>	<ul style="list-style-type: none"> <li>* Never drink &amp; drive.</li> <li>* Always wear seat belt.</li> <li>* Keep a safe distance from the vehicle ahead,</li> <li>* Always avoid distractions.</li> <li>* Never break red signal.</li> <li>* Always drive within speed limit.</li> <li>* Avoid the drowsiness while driving.</li> <li>* Watch out for drivers on the road.</li> </ul>

## Activity 5.7






**Project: Write a report on:**

1. “Road Accidents in Ethiopia: Causes, consequences and Possible Remedies”

## 5.5 CULTURAL LANDSCAPES AND TOURISM IN ETHIOPIA

*At the end of this section, you will be able to:*

-  *identify cultural landscape places in Ethiopia;*
-  *explain the importance of tourism; and*
-  *identify natural and human made tourist attraction sites*



### KEY TERMS

 Cultural landscapes

 Tourist attraction sites

### 5.5.1 Cultural Landscape in Ethiopia

#### *What is cultural landscape?*

**Cultural Landscapes:** a cultural landscape as a geographic area (including both cultural and natural resources), that is associated with a historic event, activity or person, or exhibiting any other cultural or aesthetic values. Cultural landscapes represent the “combined works of nature and man”. Konso cultural landscape one of the example of cultural landscape in Ethiopia.

The Konso cultural landscape is located in a dry, hilly environment at the edge of the Rift Valley in southern Ethiopia. The Konso cultural landscape is characterized by dry stone terrace agriculture and walled town settlement. Dry stone terrace agriculture and walled town lifestyle might have been practiced for 400 years. The dry stone terrace agriculture is an indigenous adaptation to the dry environment of Konso that is mountainous, barren and rocky. These terraces retain the soil from erosion and create terrace saddles that are used for agriculture. The terraces are the



main features of the Konso landscape and the hills are contoured by the dry stone terraces that could reach at some places up to 5 meter high. The Konso Cultural Landscape was officially recognised by the United Nations Educational, Scientific and Cultural Organisation (UNESCO) in 2011.

*Figure 5.6: Konso Cultural Landscape*

### 5.5.2 Tourism in Ethiopia

#### *What is tourism?*

Tourism is a collection of activities, services and industries that delivers a travel experience, and they include transportation, accommodations, eating and drinking establishments, retail shops, entertainment businesses, activity facilities and other hospitality services provided for individuals or groups travelling away from home. Tourism is a source of both job opportunities and income. It is known as a ‘smokeless industry’. The main tourist attractions include natural and human-made features.



## Natural tourist attraction sites in Ethiopia

- 🌐 The Simien Mountains National park
- 🌐 Bale Mountains National Park
- 🌐 Awash National Park
- 🌐 NechSar National Park
- 🌐 Omo National park
- 🌐 The Blue Nile Falls (Tis isat Falls)
- 🌐 Mago National Park
- 🌐 The Lake Tana
- 🌐 Gambella National park
- 🌐 The Sof Omar Cave
- 🌐 Abijata – Shalla National park
- 🌐 The Rift Valley

## Human made Features

- 🌐 Lalibela
- 🌐 Harar
- 🌐 Axum
- 🌐 Gonder castle
- 🌐 Tiya



Figure 5.7: Some Tourist attraction sites in Ethiopia

## Activity 5.8

In your small group, discuss the following questions.

1. What is the importance of tourism?
2. What are the benefits of tourism to our economy?
3. Prepare the general outline map of Ethiopia and show the location of the leading tourist attraction sites in Ethiopia



## UNIT SUMMARY

- 🌍 Economic activity is the production and distribution of goods and services. Some of the activities are hunting, fishing, farming, grazing, mining, manufacturing, transportation, trade and others.
- 🌍 The various economic activities practiced in the world, may be arranged into 5 groups, namely primary, secondary, tertiary, quaternary and quinary.
- 🌍 The main types of primary economic activities include agriculture, forestry, fishing and mining.
- 🌍 Secondary economic activities include manufacturing, construction and power production
- 🌍 The tertiary sector involves the provision of services to other businesses as well as to final consumers. It includes tourism, transportation, trade, etc.
- 🌍 More than 80% of Ethiopia's population is engaged in agricultural activities
- 🌍 Ethiopian agriculture can be divided in to arable farming and pastoral farming
- 🌍 Agriculture is the science and art of cultivation of the soil and the rearing of livestock for either local consumption or commercial purposes.
- 🌍 Agriculture in Ethiopia is typically characterized by small holder and subsistence farming which is highly dependent on rainfall.
- 🌍 Fishery is a primary economic activity which involves the catching of fish and other marine creature
- 🌍 Ethiopia has a number of lakes, reservoirs and rivers rich in fish, But fishery is not yet developed in the country
- 🌍 Mining is a primary economic activity concerned with the extraction of mineral bearing substance from the earth crust.
- 🌍 Manufacturing industries in Ethiopia can be classified into cottage(traditional) modern manufacturing industries
- 🌍 One of the major functions of transport system is to facilitate movements of different goods or commodities from areas of surplus to areas of deficit.

- 🌐 Road safety is safety in using roads. There are ways to make roads safe for motor traffic, cyclists and pedestrians.
- 🌐 Ethiopia has experienced high rates of road traffic accidents, as the road is the major means of transportation
- 🌐 Trade balance is the yearly difference between the export and import values
- 🌐 The main tourist attractions include natural and humanmade features

## REVIEW EXERCISES

### PART I: TRUE OR FALSE ITEMS

**Dection: Write "True" if the statement is correct and "False" if it is incorrect**

1. Fishing is a secondary economic activity concerned with the catching of fish and other marine creatures.
2. The level of transport development is a good indicator of economic development.
3. Trade activities have considerable effect on socio-economic life of any society
4. Agriculture is the pillar of the national economy of Ethiopia
5. Power production is one type of secondary economic activity.
6. The tertiary sector of industry involves the provision of services to other businesses as well as final consumers.
7. Tourism is a type of primary economic activity

### PART II: MATCHING ITEMS

**Direction: Match the Items Under Column "A" with the Items Under Column "B"**

Column "A"	Column "B"
8. Cereal crop	A. Sunflower
9. Perennial crop	B. Haricot beans
10. Pulses	C. Cotton
11. Oil seed	D. cut-and- burn cultivation
12. Cash crop	E. Wheat
	F. Enset

### PART I: MULTIPLE CHOICE ITEMS

**Direction: Choose the correct word or phrase from the given alternatives.**

13. The service sector of human economic activities is designated as:
 

A. Secondary	C. Primary
B. Quaternary	D. Tertiary

14. Of the following, one is a primary economic activity.
- A. Forestry
  - B. Trade
  - C. Tourism
  - D. Refineries
15. Which one of the following refers to a tertiary economic activity?
- A. Processing raw materials
  - B. The production of services
  - C. The provision of services
  - D. The production of raw materials
16. The types of human activities related to the extractive sector belong to:
- A. Secondary
  - B. Tertiary
  - C. Primary
  - D. Quaternary
17. One of the following is a characteristic of manufacturing activities.
- A. It requires large capital investment and involves mass units of production
  - B. Large number of employees are engaged
  - C. They involve a high degree of division of labour
  - D. All are correct answers
18. The use of Ethiopian rivers for navigation extremely limited. This is due to
- A. Ruggedness of the topography
  - B. Seasonal fluctuation of the volume of water
  - C. Presence of rapids and falls in the course of river
  - D. All of the above
19. Which of the following is not a tertiary economic activity?
- A. Wholesale trade
  - B. Tourism
  - C. Transportation
  - D. Construction
20. One of the following involves periodic abandoning of farm plots
- A. Subsistence farming
  - B. Terracing
  - C. Shifting cultivation
  - D. A and C are correct answers

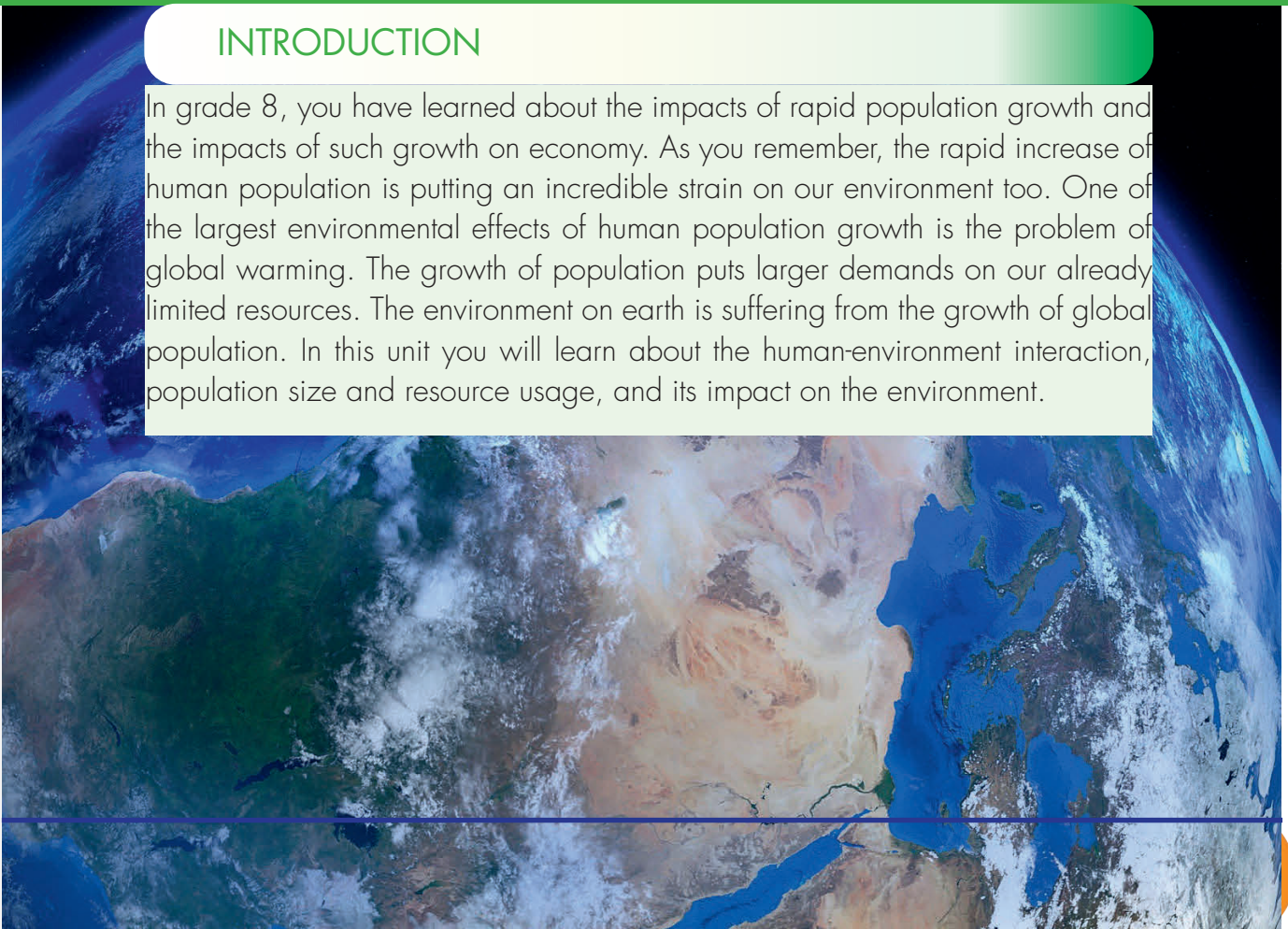


## UNIT SIX

### 6. HUMAN – NATURAL ENVIRONMENT INTERACTIONS IN ETHIOPIA

#### INTRODUCTION

In grade 8, you have learned about the impacts of rapid population growth and the impacts of such growth on economy. As you remember, the rapid increase of human population is putting an incredible strain on our environment too. One of the largest environmental effects of human population growth is the problem of global warming. The growth of population puts larger demands on our already limited resources. The environment on earth is suffering from the growth of global population. In this unit you will learn about the human-environment interaction, population size and resource usage, and its impact on the environment.





## Unit Outcomes

*After completing this unit, you will be able to:*

- ✓ describe the relationship between human activities and the environment by giving examples from their localities;
- ✓ describe the link between 'optimal' population and sustainable development;
- ✓ explain how protecting the environment is in the interest of humans and other living beings;
- ✓ examine the dynamic flows, interactions and exchanges within an integrated human-environment system at different spatial and temporal scales in the highlands and lowlands of Ethiopia
- ✓ recognize the implication of trends in population growth on sustainable resources
- ✓ assess how humans use natural resources and give examples that illustrate over-exploitation in the over-populated area of Ethiopia
- ✓ explain the advantages and disadvantages of underpopulation for environmental and socio-economic development; and
- ✓ assess the impacts of rapid population on environmental and socioeconomic development



## Main Contents

- 6.1 Human – Environment Relationship
- 6.2. Optimum Population and Resource Use
- 6.3 Over-Population and Resource Use
- 6.4 Under-Population and Resource use
- 6.5 Impacts of Rapid Population Growth

 **Unit Summary**

 **Review Exercise**

## 6.1 HUMAN-ENVIRONMENT RELATIONSHIP



*At the end of this section, you will be able to:*

- ✓ describe the relationship between human being and the environment;
- ✓ identify the three modes of human environment interaction ; and
- ✓ explain how human being affect the physical environment and vice versa.



### KEY TERMS

- 🔑 Adaptation
- 🔑 Dependence
- 🔑 Modification

- 🔑 Resource Use
- 🔑 Pollution

### *What kinds of relationships exist between human beings and environment?*

Environment refers to the physical surroundings and the characteristics of the place in which we live. It also refers to the wider natural world of land, sea, and atmosphere. Humans have been interacting with their environment since people *began* to live on the Earth. For example, humans have been cutting forests to grow crops for centuries and by doing so we altered the environment. Conversely, the environment affects humans in many different ways as well. A simple example is the way we change our clothes in response to cold or hot weather.

A good climate, accessible clean water, fertile soil, etc. are aspects of the physical environment that enable people to live and thrive. However, harsh environments, such as a very hot or cold climate, limited water, and infertile land, make it more difficult for people to survive. Humans are also affected by major environmental events such as earthquakes, floods and drought that damage homes, property and agriculture. These can lead to the displacement of people and can cause injury, loss of life and destruction of livelihoods. They can also damage water sources and pipelines, causing water contamination and spreading waterborne diseases.

The relationship between human being and environment can be seen in three ways namely; dependence, modification and adaptation.



## A. Dependence on the Environment

### *How human being is dependent on physical environment?*

Every single living thing on this planet is dependent on the environment it lives in. Whether it is for air, water, food, or shelter, living beings simply cannot survive without some form of interaction. Basically, everything you see around you is entirely dependent on environmental resources that come from thousands of miles away.

## B. Modification of the Environment

### *How can human modify his/her environment?*



Human activities frequently result in environmental change, both with negative and positive results. Even the most ecologically sustainable farming methods and renewable energy projects require resources provided by nature. Human beings use increasing amounts of land to build homes, shopping centers, and schools.

## C. Adaptation to the Environment

### *How human beings adapt the environment?*

People seem to live in the strangest places on this planet, which is partly due to increased knowledge of the environment. The more successful species are able to adapt to changes in their environment, the more likely they are to survive. For example, there are people who live in different climatic regions such as the Arctic, deserts and dense forest regions. It proves how humans are adapted to the natural environment.

The links between human activities and the environment are complex and varied, but can be grouped into two main types of activities:

-  *use of natural resources such as land, food, water, soils, minerals, plants and animals, and*
-  *production of wastes from a range of activities including agriculture, industry and mining, as well as wastes from our bodies.*

### 1) Use of natural resources

We use many different types of natural resources in our daily lives. We depend on food and water for survival and we need energy for many different purposes, from domestic cooking through to major industrial processes. Our clothes, transport,

buildings, tools, and all other items we use require many different resources for their production. Let us take a simple example. Think of the resources that have been used to produce a notebook of the type you may be using right now as you study this subject. Manufacturing the paper needed raw materials of wood and water as well as energy for its production process. The trees that supplied the wood required soil, water and land to grow on. There may be ink or metal staples or other components in your notebook that were made from other types of resources. Our need for resources is vast and it is growing as the population and consumption per person increases with socio-economic progress.

Globally, both population and resource extraction increased by almost 50% in the 25 years from 1980 to 2005. Over that time, the world population increased from 4.44 billion in 1980 to 7.8 billion in 2020. Metals are used in the manufacture of wide ranges of goods – from cars to computers. Minerals are used in industrial processes and in construction to build houses and roads. Both metallic and non-metallic minerals are obtained from rocks that have been mined and are then processed in various ways to extract valuable resource.

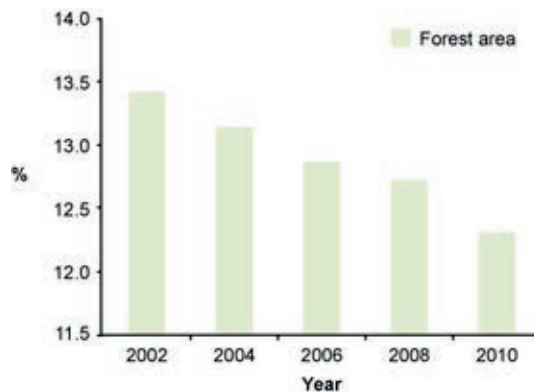
Natural resource extraction shows a steady increase from 1980 to 2005, with the greatest amount extracted in the most recent years. The most likely reason is the increase in the global population in this period; more people need more resources. It could also be the case that the amount used by individuals and by wider society is increasing due to changes in behavior and levels of consumption.

Advances in technology have increased natural resource exploitation by enabling people to reach new resources and to exploit more resources per capita. For example, fishermen who use traditional technologies such as small boats are limited in the number of fish they catch. Modern industrial fishing fleets use very large ships that cover huge areas of the ocean at greater depths to catch many more fish. This can lead to overfishing, which means catching fish at a faster rate than they can reproduce.

Overfishing and other examples of over-exploitation of natural resources can result in damage to or the loss of entire ecosystems. An ecosystem includes all the living organisms (humans, plants, animals, micro-organisms) and their physical environment (soil, water, air, land) and the interactions between them. If one component of the system is removed, this can have knock-on effects on the other parts of the system.

## I. Use of Forest Resources

One particular problem caused by over-exploitation of forest resources is deforestation, which occurs when forest areas are cleared and the trees are not replanted or allowed to regrow. In Ethiopia, clearing land for agriculture to meet the food needs of the growing population and the demand for fuel and construction materials has resulted in a steady loss of forest area, which is continuing as you can see from Figure 6.1. below.



**Figure 6.1:** Proportion of Land area in Ethiopia Covered by Forest (%) (2002-2011). Source: MoFED, 2012a)

The loss of forests has several undesirable consequences. Forests are home to many different types of trees, as well as other plants, and a wide range of animals from insects to birds and mammals. The conversion of forest lands to agriculture greatly reduces biodiversity, which is a measure of the variety of living organisms (all life forms). Biodiversity is important for humans because we use other living organisms to provide several essentials like:

- 🌍 *Food: we use plants and animals such as fish, goats, wheat, rice, and maize as sources of food.*
- 🌍 *Medicines: many traditional medicines are made from plants and animals and new medicines are developed from them as well.*
- 🌍 *Ecological services: living organisms, especially plants and microorganisms, play an important role in processes that maintain our lives and environment such as providing oxygen, cleaning the air, purifying water, breaking down wastes and controlling erosion.*

Deforestation is a significant contributory cause of soil erosion. Once the trees and undergrowth are removed, the underlying ground is exposed. Without the intercepting effect of the vegetation and the tree roots binding the soil together,

the soil is more likely to be washed away when it rains. Loss of forests also has a significant impact on water supply. Tree roots reach deep into the soil and create spaces between the particles which increases soil permeability, allowing rainwater to soak in and replenish groundwater.

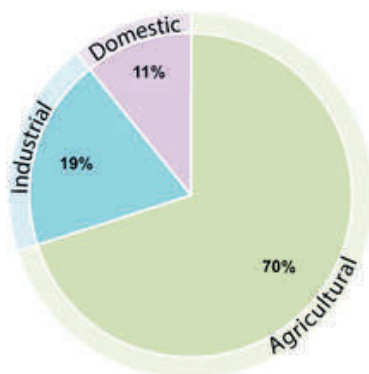
## II. Energy Resources

The use of renewable or non-renewable resources is a critical factor when considering energy resources. Fossil fuels have been the main energy source for global industrialization, but because they are non-renewable, the quantity is ultimately limited and their use is not sustainable over the long term. Furthermore, the burning of fossil fuels is the main cause of climate change. There are several renewable alternatives to fossil fuels. The wood used as a fuel is renewable in the sense that trees will regrow but there are other disadvantages such as deforestation, as you have read. In Ethiopia, wind farms are harnessing wind power to generate electricity but the most important source of renewable energy in Ethiopia is water. Ethiopia already has several hydroelectric power stations and more are planned, including the Grand Ethiopian Renaissance Dam, currently under construction. Hydroelectric power is renewable because it makes use of the energy of flowing water but does not use up the water in the process. Another renewable energy source is solar power, using photovoltaic cells that convert the sun's energy into electricity.

## III. Water Resources

The direct use of water falls into three main categories:

- 🌍 *domestic uses, including drinking, washing and cooking;*
- 🌍 *agricultural uses, principally irrigation; and*
- 🌍 *industrial uses, in manufacturing processes and for energy generation.*



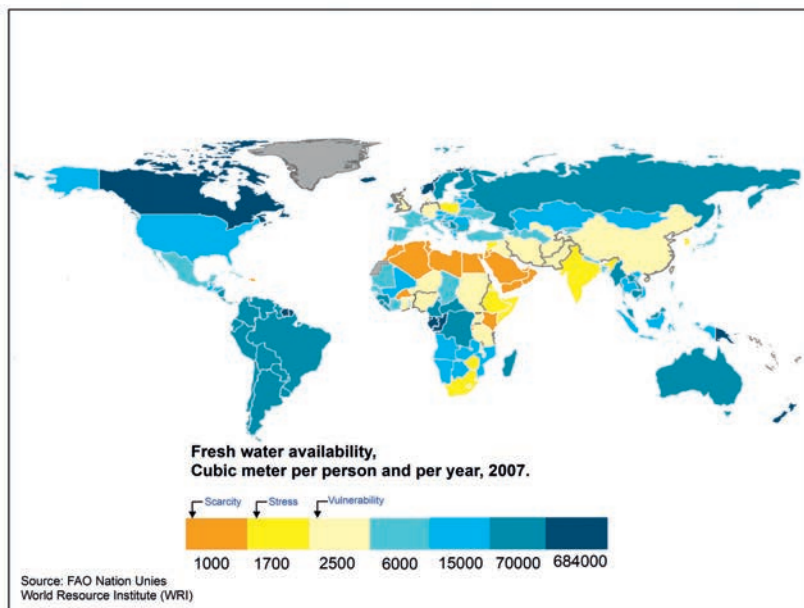
The relative proportions of these three categories vary in different parts of the world, but globally the sector using the most water is agriculture.

**Figure 6.2:** Global water withdrawal by sector. (Adapted from FAO, 2012)

In addition to direct use of water for human activities, it is also essential for the environment to maintain biodiversity. Rivers, lakes and wetlands are important habitats for wildlife and need a certain amount of water at all times to function properly within the system. This becomes a problem when the demand for water for human activities exceeds the supply.

Water is not an endlessly renewable resource. In many parts of the world water demand is significantly above sustainable water supply. Sustainable water supply means there are adequate supplies, in both quality and quantity, to meet the current and future needs of people and of the environment.

Many countries are already experiencing water stress or scarcity. These terms refer to the volume of water available relative to the use and demand for it, which is linked to the population served. Countries, which have less than 1700 m<sup>3</sup> of water per person per year for all purposes are defined as water stressed. Water-scarce countries have been defined as those with less than 1000 m<sup>3</sup> of water per person per year. These precise figures should be used with caution, however, because they do not recognize variations between countries and they hide the underlying causes of water scarcity.



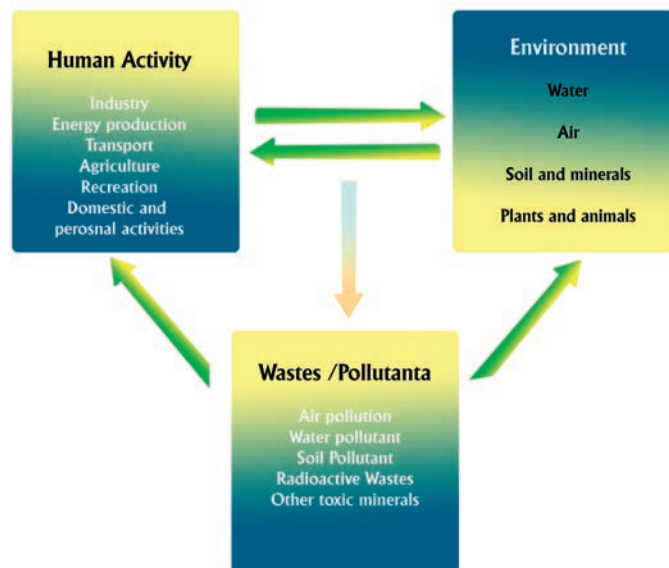
**Figure 6.3:** Global Freshwater Availability in Cubic meters (m<sup>3</sup>) per person per year (2007). (Note that although calculated 'per person', these figures apply to all uses of water not just personal use.)

## 2) Production of Waste and Pollutants

The impacts of open defecation and inadequate sanitation on human health and on the wider environment are profound. Waterborne diseases are caused by pathogens (disease-causing agents) in water and food that has been contaminated by the wastes from infected people.

Industry, agriculture and energy production all generate wastes that can pollute the air, water and soil. Pollution means the introduction into the environment of substances liable to cause harm to humans and other living organisms. For example, the leather industry produces large amounts of liquid wastes from the tanning process. These wastes contain organic materials such as fat from the hides and toxic (poisonous) chemicals including some human carcinogens (cancer-causing agents). Another example is the release of so-called greenhouse gases such as carbon dioxide, methane and nitrous oxide, which contribute to human-induced climate change.

Figure 6.4 summarizes the interactions between human activities and ‘the environment’. The green arrow indicates the waste generated as a product of this interaction. The red arrows indicate the negative effect on both the environment and humans if the waste is not properly managed.



**Figure 6.4:** Human–environment Interaction and the Generation of Waste and Pollutants.

## Activity 6.1



### Form a group and discuss the following questions

1. How do human beings affect the physical environment?
2. Explain the positive and negative impacts of physical environment on human beings.
3. Based on figure 6.4 explain the relationship between the environment and your community, and write a report on this issue.

## 6.2 OPTIMUM POPULATION AND RESOURCE USE



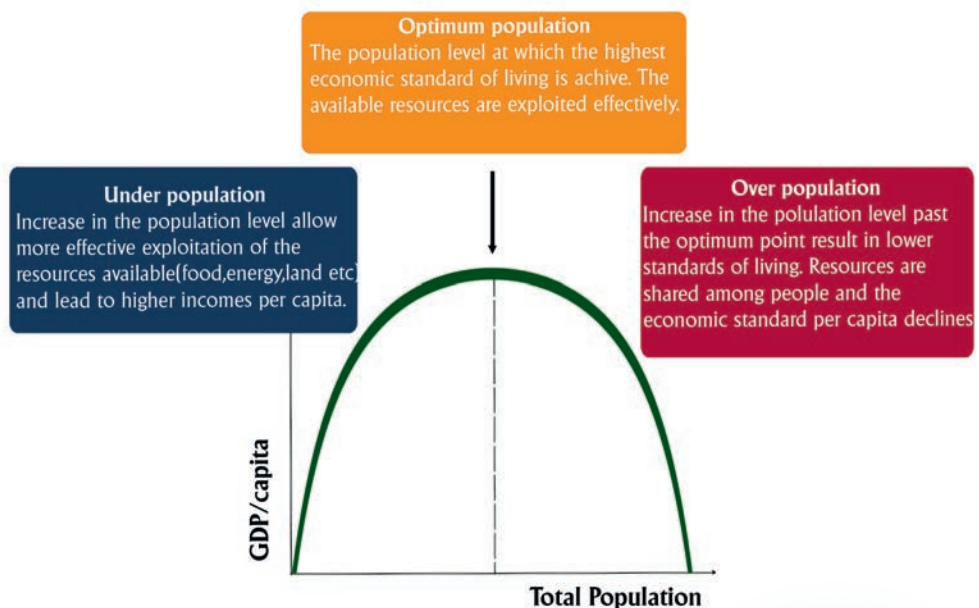
*At the end of this section, you will be able to:*

- ✓ define the concepts of optimum population; and
- ✓ demonstrate the balance between population size and the amounts of resources available using concrete examples.

***What is an optimum population size? What are the advantages of optimum population size?***

Optimum population is where the amount of resources available in a country is equal to the country's population needs, therefore there are enough resources to maintain its population. The optimum population means the best and the most desirable size of a country's population. Thus optimum population yields the highest quality of life, which means each person has access to adequate food, water, energy and air of the highest quality, adequate medical care, recreational facilities and cultural outlets. The optimum size of a population is which along with the existing natural resources and a given state of technology, yields the highest income per capita in a country.

Indications of an optimum population may be high average living standards, full employment, rational development of increasing resources and balanced demographic structure, but these are not precise criteria. Optima vary in time and space according to a wide variety of factors: the size of a state, its geography, social structure, stage of technical progress, quality of communications, etc. In general, the numerical range of the optimum is greater in varied economies and open environments than in specialized economies and isolated communities, where population growth, economic crises, war or drought may prove disastrous to the delicate balance between population and resources.



**Figure 6.5:** Under, Optimum and Over population

## Activity 6.2



### Answer the following questions

1. Explain the impacts of optimum population on natural resources.
2. If the number of population and resource at your locality is at an optimum level, what do you expect on the utilization of
  - Water
  - Forest
  - Soil
  - Farmland



## 6.3 OVER POPULATION AND RESOURCE USE



*At the end of this section, you will be able to:*

- ✓ define the concepts of overpopulation
- ✓ explain how the growth and decline of population affects the availability of natural resources; and
- ✓ justify how the availability of natural resources in turn affects the pattern of population growth.

*Can you define the concept of “overpopulation”? What do you think about the population of Ethiopia?*

Overpopulation occurs when there is an excess of population over utilized or potential resources. It may result from an increase in population, a decline in resources, a decline in the demand for labor, or a combination of these factors. In other words, overpopulation may take place where resource development does not go hand in hand with population growth, and where growth of tertiary services lags behind technical progress.

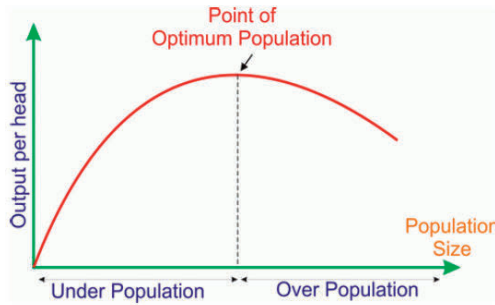
Absolute overpopulation may be distinguished from relative overpopulation, the former occurring where the absolute limit of production has been attained though living standards remain low, while the latter indicates that present production is inadequate for the population although greater production is feasible. Relative overpopulation is more common than absolute overpopulation.

Overpopulation may be found at various levels: rural, industrial, regional, national. Rural overpopulation is common but is most striking in populous underdeveloped areas. In South-East Asia, where there is high fertility and declining mortality, intensive agriculture, land fragmentation and minimal mechanization, natural checks to overpopulation have exercised great control in the past. The demographic evolution of China has been frequently interrupted by famines, floods, droughts and epidemics.

Rural overpopulation may also result from

- a) *uneven distribution of land among farmers,*
- b) *increased mechanization and reduced demand for agricultural laborers,*
- c) *a change from cultivation to livestock farming and again reduced demand for labor; and*
- d) *rapid rural population growth.*

Many of these features can be seen in old countries of Europe. Famine, hunger, prolonged unemployment and increase of landless laborers and beggars as symptoms of rural overpopulation. Unfortunately, solutions other than emigration are slow and difficult, but in the long-run social and cultural revolutions are more effective. Invariably overpopulation expresses itself only at the lowest levels of society: rural



overpopulation affects the landless and the smallholders; industrial overpopulation hits the unskilled and semi-skilled workers.

**Figure 6.6:** *population Resource Relationship*

Overpopulation can result from: an increase in births, a decline in mortality rates due to medical advances, an increase in immigration and decrease in emigration, lack of education, poverty, and poor contraceptive use.

**Effects of overpopulation are:** depletion of resources especially fossil fuels, the problem of water shortages, increased levels of air pollution, water pollution, soil erosion and noise pollution, deforestation and loss of ecosystems, changes in atmospheric composition and consequent global warming, permanent loss of arable land and increases in desertification, migration, mass species extinctions, starvation, malnutrition or poor diet with ill health and diet-deficiency diseases (e.g. rickets), low life expectancy, high crime rate, and conflict over scarce resources. Moreover, it results in over-utilization of infrastructures, such as mass transit, highways, and public health systems, and higher land prices.

### Activity 6.3



#### Answer the following questions

1. What are the main causes of overpopulation in Ethiopia?
2. Do you think that Ethiopia is overpopulated? If yes, what is the impact of it?
3. Do you think that Ethiopia is poor because of overpopulation? Make a debate on this idea.

## 6.4 UNDER POPULATION AND RESOURCE USE



*At the end of this section, you will be able to:*

- ✓ define the concepts of under population; and
- ✓ identify the causes of under population.

### *What is underpopulation? What are the causes of underpopulation?*

Under population may be said to exist where a population is too small to utilize fully its resources, or where the resources could support a larger population without lowering living standards or increasing unemployment. The former is more frequent than the latter.

Absolute under population is quite rare, serve in the case of isolated population where numbers are incapable of normal demographic replacement of adequate economic production. Relative under-population takes place where there is insufficient development of the resources available; nowhere is it more common than in the southern continents.

Under population is when there are more resources in an area (for example, food, energy and minerals) than can be used by the people living there. Under population is when a region or country has insufficient workers to exploit their resources efficiently, to support retired population and to provide growth. Therefore, too few people use all the resources of an area to the maximum efficiency. The number of people is not sufficient to utilize the resources of the country, the resources are vast, much can be produced, but men are not sufficient.

Most areas considered under-populated today are large in area and rich in resources. These countries can export the surplus of food, energy, and mineral resources, have high incomes, good living conditions and level of technology and immigration. This phenomenon results in a decline in population. With fewer people, there is a decrease in demands for services.

Underpopulation can have a significant impact on resource use. The positive impacts of underpopulation on resource use may include a decrease in resource demand, leading to reduced resource depletion and lower environmental impacts. On the other hands the negative impacts of underpopulation includes fewer people, the demand for resources such as food, water, and energy decreases, leading to

a reduction in resource use. However, this can also lead to a decline in resource production, as there are fewer people available to work in industries that produce these resources. Additionally, underpopulation can lead to aging populations and a decline in the workforce, which can further exacerbate the decline in resource production. It can also result in a shortage of workforce, fewer people to pay taxes etc.

### Activity 6.4



#### Answer the following questions

1. Go to your school library or other online sources and read available materials. Then, list underpopulated countries of the world.
2. Discuss the advantages and disadvantages of underpopulated countries on resource usage.

## 6.5 IMPACTS OF RAPID POPULATION GROWTH



*At the end of this section, you will be able to:*

- ✓ explain how the growth and decline of population affects the availability of natural resources, and how the availability of natural resources in turn affects the pattern of population growth
- ✓ demonstrate the balance between the population size and the amounts of resources available using concrete examples; and
- ✓ assess the impacts of rapid population growth on the environment and socioeconomic development using concrete examples.



### KEY TERMS

Deforestation  
Degradation

Pollution  
Rapid population growth

The rapid increase of human population is putting an incredible strain on our environment. While developed countries continue to pollute the environment

and deplete their resources, developing countries are under increasing pressure to compete economically and their industrial advancements are damaging as well. The demands that this growth places on our global environment are threatening the future of sustainable life on earth. One of the largest environmental effects of human population growth is the problem of global warming. Some scientists fear that global warming will lead to rising sea levels and extreme weather conditions in the future. In order to support the growing population, forests are being destroyed at an alarming rate. Humans also continue to put a great demand on the natural resources of our planet. Many non-renewable resources are being depleted due to the unrestrained use of fuel and energy. Many parts of the world also suffer from a shortage of food and water. The growth of population puts demands on our already limited resources. The environment on earth is suffering from the growth of global population. The depletion of resources and biodiversity, the production of waste, and the destroying of natural habitats are serious problems that must be addressed in order to ensure that life on earth will be sustainable throughout the next century.

Physical environment means nonliving environment or the land, air, water, soil and minerals. The utilization, overuse and misuse of physical resources increased manifold due to the growth of human population. As it has been discussed earlier, more population means more mouths to feed which requires more agricultural production. Accordingly, more cultivable land has been made available by clearing forests and by reclaiming wetland, ponds and green belts. Feeding the growing population requires more advances in agriculture that in turn requires the utilization of more water, more fertilizers and more pesticides.

It is clear that the growing population demands more space to construct houses and availability of more consumer goods. It also requires more means of transport, more consumption of fossil fuels and more pollutants of air, land and water. Thus, the growth of population leads to pollution of air, land and water. To this effect, different types of pollutions are causing many problems in the physical environment that are further affecting the biological environment seriously.

Ethiopia is the most populous country in Africa with a higher rate of population growth. Its population was estimated to be over 101 million by 2016 and currently growing at a rate of 2.6%. The majority of the population are making their livelihoods in lands that are now categorized as moderately to severely degraded areas; mostly in the Ethiopian highlands. Unless significant conservation measures are set out and implemented accordingly, many of the moderately degraded lands might be rigorously degraded in the future. This often becomes the underlining

cause for over-exploitation of the natural resources and subsequent environmental degradations

As has been discussed earlier, the size of Ethiopia's population has been growing very rapidly. The population growth rate is much higher, and is increasing much faster than the economic growth rate and is growing beyond the carrying capacity of the country's natural resources, such as land, water, soil, forest, etc. These negative results of rapid population growth have caused many environmental and socio-economic problems. For example, population growth causes serious environmental degradation in the area where it occurs, including deforestation, pollution, soil erosion, depletion of resources, etc.

Some of the impacts of rapid population growth are discussed in detail hereunder.

### 1. Deforestation

*What is deforestation? Can you mention some of the problems caused by deforestation? Is deforestation a problem in your locality?*

Deforestation refers to the removal of forest cover of an area without adequate replacement. In other words, it is the process of the indiscriminate destruction of the natural vegetation cover of a forest area.

Removal of forest has several consequences. Among these, the most important one is the increase of carbon dioxide in the atmosphere which in turn results global warming. During photosynthesis plants absorb carbon dioxide and release oxygen in which all heterotrophs can depend upon it. Such circulation and interdependence can be disrupted by deforestation and finally result other species of biodiversity will be affected negatively.

The forest cover resources of Ethiopia have been declining significantly over time. This is caused mainly by rapid population growth and the increasing population's needs for forest resources such as fuel wood and land. Many people in the country use wood for cooking, heating, and lightening, as well as for houses and furniture. Similarly, the increasing demand for agricultural and settlement lands is a major cause of forest destruction in the country. In Ethiopia, there is a direct correlation between population density and deforestation – the more people there are in an area, the more trees they cut down. New trees do not spring up to replace the old ones.

In Ethiopia, rapid population growth leads to deforestation mainly because of people's increasing needs for more:

- 🌍 *wood*
- 🌍 *agricultural land*
- 🌍 *settlement land*
- 🌍 *grazing land*

Such deforestation has various negative consequences, both directly on the natural environment, and indirectly on the socio-economic conditions of the people. Its direct consequences include the following.

- 🌍 *It accelerates soil erosion.*
- 🌍 *It destroys biodiversity.*
- 🌍 *It affects rainfall by decreasing evapotranspiration.*
- 🌍 *It results in shortages of wood supply.*
- 🌍 *It affects the natural beauty of the affected areas.*

While little reliable information exists about the extent and location of the past and present natural forest and woody vegetation cover in Ethiopia, historical sources indicate, on the basis of potential climatic climax, that high forests might once have covered about 35-40 percent of the country's total land area. If the savanna woodlands are included, 66 percent of the country used to be covered with forests and woodlands. However, the country's forest and woodland resources have been declining both in size (deforestation) and quality (degradation).



*Figure 6.7: Deforestation in Ethiopia*

As a result, it has been estimated that high forests covered 16 percent of the land area in the early 1950s, 3.6 percent in the early 1980s, and only 2.7 percent in 1989. Some five million hectares of savanna woodlands remained at that time, giving a total forest and woody vegetation area of 7 percent. In 1994, it was estimated that such forests covered less than 2.7 percent of the country. With the current annual loss of high forests, estimated at 150,000-200,000 hectares, it has been projected that the area covered by high forests may be reduced to scattered minor stands of heavily disturbed forests in inaccessible parts of the country within a few decades.

The major reasons for deforestation are the clearing of forests and woodlands for cultivating crops and the cutting of trees and shrubs for various purposes, notably for fuelwood, charcoal, construction materials, etc. The fact that plantation forestry has been very far from meeting the demand for wood indicates the inevitability of deforestation.

*Table 6.1: Forest Resource Degradation in Ethiopia*

The local area under vegetation cover	Study years	Forest cover decline (%)	% change year <sup>-1</sup>
South Wollo	1958–1986	30.6 & 51*	1.1 & 1.8*
Northwestern Ethiopian Highlands	1957–1995	98.9	2.6
Hawassa watershed	1972–2000	82	2.9
Northern Afar rangelands	1972–2007	89.9**	2.6
Gish Abbay watershed	1957–2001	64	1.5
Eastern Ethiopia highlands	1985–2011	63.4*	2.4
Central rift valley area	1973–2014	56.6	1.4
Gumara watershed, Lake Tana basin	1957–2005	85.3 & 91.4*	1.8 & 1.9*
Libokemkem District, South Gonder	1973–2015	82.2	1.9
Andassa watershed, Blue Nile Basin	1985–2015	45	1.6
Gelda catchment, North Western Ethiopia	1957–2014	83.8	1.5
South-Western Ethiopia	1987–2015	54.4	1.9
Muga watershed, Upper Blue Nile basin	1985–2017	21 & 12*	0.7 & 0.4*
Central Highlands of Ethiopia	1957–2017	37.8	0.6
Komto protected forest East Wollega Zone	1991–2019	37.4	1.3
Lake Ziway watershed	1973–2018	76.4**	1.7

\* *Shrublands (areas covered with small trees, bushes and shrubs which are less dense than forests)*

\*\* *Woodlands (areas covered by woody plants mainly acacia-dominated species)*



Rapid population growth has not only led to land clearance for agricultural purposes, but also to overgrazing in a dominant mixed cereal-livestock production system. It also urges increased pressure on existing forests because of the increasing demand for fodder, fuelwood, and building materials. At a national level, biomass energy offers over 99% of the total domestic energy consumption (92% for households and the remaining being consumed by small-scale industry and food enterprises). From this, about 78% is derived from woody biomass, whereas around 12 and 9% are from animal dung and crop residue respectively.

Forest resources are also used as cash income sources through selling wood logs, fuelwood, and charcoal. During the last 50 years, charcoal production increased from one million tons to more than three million tons each year. Within this period, fuelwood consumption also increased from 40 to 100 million cubic meters in a year. These all had been done at the expense of forests. Encroachment of farmland and pasture into the natural forests had also been a common practice in many parts of Ethiopia. Such deforestation activities and overgrazing have led to soil erosion resulting in land quality deterioration, biodiversity loss, and impact on the overall climate system posing a serious problem in every aspect of human life

## II. Pollution

The term ‘pollution’ refers to any undesirable substance added or contaminated to environmental resources which are hazardous or potentially hazardous to human health, safety, and welfare or risky to the normal functioning of other living creatures. Pollution refers to any undesirable change in natural conditions of water, air, and other components of the natural environment that has negative effects on the health and activities of human beings and other living creatures.

Environmental pollution is any change within the environment that affects the integrity of an ecosystem. In most cases, such changes are caused by the action of human beings mainly due to urbanization, industrialization, construction and transportation activities, agricultural and land use management practices. Because of various unwanted substances released to the environment, the majority of natural resources have been affected, many destroyed and a large portion of it falls under immense threat.

*Can you mention some of the causes of air and water pollution? Is pollution a problem in your locality?*

Water and air pollution are mainly caused by human activities in households, industries, farmlands, means of transportation, and so on. However, it can also be caused by natural events such as volcanic eruptions, wildfire, and the like.

When an area is overcrowded (i.e. inhabited by a rapidly growing number of people) the natural environment is polluted by a variety of unwanted and harmful wastes that peoples' activities produce. In Ethiopia, pollution is a major problem in overpopulated urban centers. In large cities like Addis Ababa, most people live in unsafe environments that have extremely polluted air and water. They are surrounded by the garbage, and pollutants that households, industries, automobiles, and other sources discharge.

Practically in Ethiopia, the agriculture sector is found to be the major source of environmental pollution. Application of chemical fertilizers and pesticides can easily contaminate living organisms, soil, water, meadows, and other vegetation. This has caused air pollution which continuously affects human health, and also triggers global warming. In such cases, indoor air pollution from biomass fuel is responsible for 50,320 annual under-5-year children deaths accounting for 4.9% of the national burden of disease in the country.

At the same time, pollution due to emissions from motor traffic and industrialization processes have also their share in polluting the environment. Chemical wastes and byproducts from industries and unmanaged urban waste disposal from major cities in open landfill sites are continuously polluting the environment. For instance, many of the leather processing industries in Ethiopia lack proper waste treatment methods. By its very nature, leather processing involves soaking, fleshing, washing, etc. to remove dirt, flesh, salt, and other foreign substances by making use of water.

As a result, different things like salt, pesticides, flesh, hair, suspended solids, sulfate, ammonia, base, chlorides, acid, and other oxygen demanding substances might be released into the surrounding water bodies.

Generally, in Ethiopia, rapid population growth leads to environmental pollution by increasing emission of the amounts of pollutants such as:

- 🌐 *Sewage, solid wastes, and pollutant gases generated by households.*
- 🌐 *Pollutant gases, liquids, and solid chemicals generated by expanded industries.*
- 🌐 *Pollutant gases generated by the increasing number of automobiles.*
- 🌐 *Agricultural pollutants, such as fertilizers, pesticides, animal wastes, etc*

### III. Land/Soil Degradation

The land serves as storage for water and nutrients required for plants and other living micro-macro-organisms. The demand for food, energy and other human requirements depends upon the preservation and improvement of the productivity of land. The loss of arable land has been caused by a number of factors, many or most of which are tied to human development. The primary causes are deforestation, overexploitation for fuelwood, overgrazing, agricultural activities and industrialization.

Land degradation involves both soil erosion and loss of soil fertility; hence, measurements of land degradation usually focus on the severity of soil erosion. Ethiopia with high-intensity rainstorms and extensive steep slopes, is highly susceptible to soil erosion, especially in the high lands. Erodibility also depends on the soil depth and the organic content of the soil; a 1 percent increase in organic matter reduces erodibility by about 15 percent.

Land degradation is also a widespread problem in Ethiopia with over 85% of the land moderately to very severely degraded and about 75% affected by desertification. In the country, degradation of land stems from the historical development of agriculture and human settlement in the highland regions. Recent estimates using satellite imagery shows that land degradation hotspots over the last three decades cover about 23% of the land area in the country, basically in large areas of Tigray, Wollo, and Gondar among others.

The factors influencing soil erosion and, therefore, land degradation are multiple and mutually reinforcing. As indicated earlier, the massive removal of vegetative cover is the driving force behind land degradation. This loss is largely due to an expanding population, with its corresponding increased demand for crops, grazing land, and fuel wood. The removal of vegetative cover for use as fodder and fuel leads to an increase in surface runoff and, thus, to higher soil erosion. With the

removal of top soil (a reduction in soil depth), there is less root anchor age for plants. In addition, there is a loss of soil nutrients and a reduction in water holding capacity.

When animal dung and crop residues are used for household fuel rather than recycled into the soil, the soil loses nutrients and organic matter. As the fuel wood scarcity grows worse, women and children have to collect fuel wood from more distant sources and substitute more and more dung and crop residues for household fuel. In the intensively farmed rural areas as well as in the drought-prone degraded areas of the north and the east, cattle dung has already largely replaced wood as the primary household energy source. All of these factors combined lead to a reduction in crop productivity. They also contribute to crop failure, reduced cropping intensity, and decreased resistance to drought. This induces further land clearing and reinforces the vicious cycle of land degradation. As soil depth is reduced, croplands revert to grassland and ultimately to bare rock.





*Figure 6.7: Badly degraded lands in Ethiopia*

## Activity 6.5



**Form a small group with the help of your teacher. Your teacher will assign one of the following topics to each group.**

1. What do you know about global warming?
2. How does rapid population growth lead to environmental degradation?
3. What are the indirect consequences of deforestation on socio-economic conditions?
4. Discuss the impact of rapid population growth in Ethiopia on:
  - Housing
  - Food supply
  - Farmland
  - Education
  - Health care
  - Drought and famine

## UNIT SUMMARY

- 🌍 Our environment means our physical surroundings and the characteristics of the place in which we live. It also refers to the wider natural world of land, sea and atmosphere. Humans have been interacting with their environment since people first walked the Earth. The links between human activity and the environment are complex and varied, but can be grouped into two main types of activity namely use of natural resources and the production of wastes from a range of activities.
- 🌍 Optimum population is where the number of resources available in a country is equal to the country's population needs, therefore there are enough resources to maintain its population. The optimum population means the best and the most desirable size of a country's population.
- 🌍 Overpopulation is when there are too many people, to be supported to a good standard of living, by the resources of a region or country. It has too little resources to maintain its population. Overpopulation is a condition when an organism's numbers exceed the carrying capacity of its ecological place.
- 🌍 Under population is when there are more resources in an area (for example, food, energy and minerals) than can be used by the people living there. Under population is when a region or country has insufficient workers to exploit their resources efficiently, to support retired population and to provide growth
- 🌍 Ethiopia is one of the countries which faced challenge as a result of rapid population growth. These were deforestation, pollution, extinction of species and land degradation

## REVIEW EXERCISES

### I.PART I: TRUE OR FALSE ITEMS

**Dection: Write "True" if the statement is correct and "False" if it is incorrect**

1. Human being can live solely by isolating him/herself from the natural environment.
2. Optimum population is the most preferable for economic development
3. Relative overpopulation is more common than absolute overpopulation.
4. In Ethiopia, deforestation is a direct impact of rapid population growth.
5. High birth rate is a reason for underpopulation.

### PART II: MATCHING ITEMS

**Direction: Match the Items Under Column "A" with the Items Under Column**

**"A"**

6. Population size greater than resource consumption
7. Amount of resource is greater than existing population size
8. Balanced number of population and resource usage
9. Clearance of trees
10. Unexpected rise in the number of population

**"B"**

- A. Optimum Population
- B. Population Explosion
- C. Over Population
- D. Deforestation
- E. Under Population
- F. Mortality
- G. Fertility

### PART III: SHORT ANSWER ITEMS

**Direction: Give a short Answer for the following questions.**

11. Mention the importance of natural resources
12. State the ways where human being uses the natural environment.
13. List the impacts of rapid population growth on resource use in Ethiopia.



## UNIT SEVEN

# 7. CONTEMPORARY GEOGRAPHIC ISSUES AND PUBLIC CONCERNS IN ETHIOPIA

### INTRODUCTION

Understanding the state of environmental degradation with its root causes and consequences as well as mitigation practices is important. Therefore, this unit focuses on the major environmental problems prevailing in Ethiopia with emphasis on its cause, consequence and management practices implemented to reverse the problem.



### Unit Outcomes

*After completing this unit, you will be able to:*

- ✓ state causes of natural resource degradation;
- ✓ explain the effects of natural resource degradation; and
- ✓ elaborate Ethiopia's vision to achieve development without undermining the potential of the natural environment.





## Main Contents




- 7.1 Natural Resource Degradation
- 7.2 The Ethiopian “Green Legacy” Movement

 *Unit Summary*

 *Review Exercise*

## 7.1 NATURAL RESOURCE DEGRADATION





*At the end of this section, you will be able to:*

-  describe causes of natural resource degradation;
-  recognize the effects of natural resource degradation; and
-  identify the conservation measures to combat natural resource degradation.



### KEY TERMS

-  Afforestation
-  Agroforestry
-  Deforestation
-  Leaching
-  Reforestation

-  Soil conservation
-  Soil erosion
-  Water management
-  Water pollution

You remember that in unit three, you learned about the natural resource base of Ethiopia. In this unit you are going to study about their degradation tendencies and conservation measures to combat them.

### 7.1.1 Soil

Soil degradation refers to a change in the state of soil due to increased erosion, leaching and both processes. Among others, erosion by running water is the most serious problem of soil resource in Ethiopia.

Erosion is the term given to the process of the wearing away of soil by natural agents (running water, wind, ice, wave action and corrosion) and the transport of the eroded particles to some other location, where it is deposited as sediment. Soil erosion is a natural process that removes soil from the land. However, human

activities frequently aggravate this process.

Factors that accelerate soil erosion in Ethiopia can be divided into two: natural and human-made.

### I. Natural Factors

It involves a combination of the following natural factors: steepness of slope (Topography), the intensity, duration and seasonality of rainfall, soil type (example, texture), torrent rivers during the summer and vegetation cover.

### II. Human-made Factors:

Here are some of the many ways in which people have contributed to the erosion of the land that they depend on.

- **Deforestation:** Most of the highlands of Ethiopia were once covered by forests. These forests provide habitats for animals and livelihood for humans; they also offer watershed protection, prevent soil erosion and mitigate climate change. Deforestation is progressing at a rapid rate and has become one of the main causes of Ethiopia's hastened erosion rate.
- **Overgrazing (keeping too many livestock in a small spatial unit):** Most areas used for pastoral activities are overgrazed because too many animals have been kept there relative to their grass. The livestock destroys the vegetation faster than it can replenish itself. When the vegetation is destroyed, the land is laid bare and is therefore vulnerable to erosion. Among domestic animals goats are particularly damaging. They destroy all kinds and parts of an area's vegetation, including the roots.
- **Bad cultivation practices:** Bad cultivation practices also speed up erosion by making the soil vulnerable to the natural forces that we have just described a few lines above. For example,
  - **Over cropping** – It is the act of planting an area too densely. This approach to farming uses up the soil's nutrients faster than natural processes can replenish them and destroys the land's fertility.
  - **Over cultivation** – This one entails tilling land every year. For example, in order to keep up with increasing food requirements,

people overcultivate their lands. Too frequent tilling can remove nutrients from the soil faster than natural processes can replenish them.

- **Slash and burn** – With such a practice, people slash (cut down and dig up) all or most of an area’s vegetation and then burn the results. In farming, this practice is sometimes used periodically to strip an area before leaving it to lie fallow to regain its nutrients. However, since the soil is now bare and therefore unprotected, the land is vulnerable to the forces of erosion. Slash-and-burn techniques are also used to clear forestland in order to prepare it for farming, but unwittingly exposing the soil for erosion.

In Ethiopia, about 1.9 billion tons of topsoil are washed away from the highlands every year. River Abbay alone carries away 3000 – 4000 million cubic metric tons of soil annually. The loss of topsoil has been estimated to cost billions of Ethiopian birr per year. Since topsoil production rates are so slow, the lost topsoil is essentially irreplaceable.

### Conservation Measures to Combat Soil Erosion

Here are some conservation measures that have been recommended for minimizing soil loss by erosion in Ethiopia.

- **Reforestation** – is the planting of trees on land previously forested but from which the trees have been removed (see Fig. 7.1)



*Figure 7.1: Reforestation*

- **Afforestation** - refers to the planting of land, not formerly so covered, with trees to make a forest for commercial or other purposes.
- **Terracing:** involves building level surfaces at right angles to the slope to retain water and reduce the amount of erosion (see Figure 7.2).



*Figure 7.2: Terraces in Konso Zone*

- **Strip cultivation** – is planting different crops in alternating strips to retain water and soil (see Figure 7.3).



*Figure 7.3: Strip Cultivation. The strips are planted with alternating crop types.*

- **Controlling livestock population.**
- **Intercropping** – is the practice of growing two or more crops on the same field so that the land is not exposed to erosion.
- **Contour ploughing** – is ploughing across slopes, rather than up and down them, to create barriers to runoff (see Fig. 7.4).



*Figure 7.3: Contour Plowing*

- **Developing improved grass types that can feed more livestock.**
- **Proper construction of tracks and routes so that drainage could not wash them easily.**
- **Constructing check dams.**
- **Installing shelter-belts and windbreaks in arid and semi-arid areas**



## Focus

Soil is a renewable resource that can be replenished indefinitely by applying appropriate measures of conservation, although some of these measures are enormously expensive. Conservation is a wise use of resources in the best possible way, so that the greatest long-term benefit is realized by the society.

## Activity 7.1



1. What is soil degradation?
2. What causes soil degradation?
3. In your group, discuss the cheapest and most effective soil conservation measures.
4. In your group, discuss the difference between reforestation and afforestation.

### 7.1.2 Vegetation

One vital evidence for the prevailing natural vegetation degradation in Ethiopia is the growing deforestation. The major causes of deforestation are:

- 🌍 *demand for fuelwood;*
- 🌍 *demand for construction material;*
- 🌍 *expansion of agricultural lands;*
- 🌍 *slash-and-burn practices;*
- 🌍 *overgrazing;*
- 🌍 *forest fires (natural and artificial); and*
- 🌍 *expansion of settlements.*

**Overgrazing:** This is the practice of placing too many livestock on a given piece of land. The activities of these animals strip the land bare.

In addition to overgrazing pasture areas, people are increasingly converting forest land to pasture land. This practice has expanded grazing land at the expense of forest land – in other words, through deforestation.

**Slash and burn practices:** People are involved in slash-and-burn practices to clear forestland in order to prepare it for farming. This practice essentially strips the forest bare by slashing (cutting down and digging up) all or most of the trees and other vegetation and then burning the piles away.

Slash and burn is also used to periodically strip an area of farmland in order to leave it lying fallow to regain its nutrients. In Ethiopia, slashing and burning forests destroys a large area of forest annually. This approach to gaining farmland is commonly practiced in southwestern Ethiopia.

**Expansion of built up areas:** Built-up areas are areas occupied by factories, residence, recreational sites etc. Ethiopia’s expanding human population increasingly requires more area for housing and other services. Some of the land that is converted to build up areas is forestland.

### Mitigation Measures

*What should be done to protect, rehabilitate and achieve sustainable use of forests in Ethiopia?*

The following approaches have been suggested for slowing down and/or mitigating Ethiopia’s rapid deforestation rate. They are:

- 🌍 *conservation;*
- 🌍 *capacity building; and*
- 🌍 *institutional development.*

These approaches are described below. However, despite their having great potential, these approaches alone are not enough. More ideas are needed, and sustained effort must be applied to enhance the mitigation effort.

#### Conservation measures to combat deforestation includes:

- 🌍 *reforestation – planting trees after every tree harvest;*
- 🌍 *afforestation – planting trees on bare and unproductive lands;*
- 🌍 *controlling burning practices (i.e., the slash-and-burn activities);*
- 🌍 *practicing agro-forestry;*
- 🌍 *use alternative sources of energy for household consumption;*
- 🌍 *using alternative raw materials for construction and house hold furniture;*
- 🌍 *controlling overgrazing; and*
- 🌍 *control population growth rate.*

### Capacity Building and Institutional Development

Here are some approaches to preserve Ethiopia’s forests through capacity building and institutional development:

- 🌍 *Providing environmental education to enhance public awareness about the use and management of natural vegetation.*
- 🌍 *Developing forest-related curricula for schools, colleges, universities, forestry institutions, and forestry-management institutions. Then implement those curricula.*

- 🌍 *Supporting and protecting community forests by applying strict legal measures.*
- 🌍 *Moderating the existing rapid rate of population growth*
- 🌍 *Facilitate community participation in combatting deforestation.*
- 🌍 *Changing the lifestyle of the people in terms of ongoing deforestation activities.*

These goals must be dynamically implemented if we are to attain the country’s ongoing goal of defeating deforestation. For example, the anti-deforestation rules and laws must be vigorously executed by relevant agencies.

Thus, responsibility and commitment with active community participation towards the conservation and preservation of the country’s forest resource is a call to every citizen.

## Activity 7.2



### Answer the following questions


1. What are the major causes of the drastic rate of deforestation in Ethiopia?
2. What should be done to protect, rehabilitate and achieve sustainable use of forests in Ethiopia?
3. Which conservation measures do you apply to conserve natural vegetation at your locality?

### 7.1.3 Water

Ethiopia has been known as the “Water Tower of East Africa” for the last fifty to sixty years. Ethiopia is the second richest African country in terms of water-resource potential, following the Democratic Republic of Congo. However,

- 🌍 *Drought is recurring every 3 to 5 years.*
- 🌍 *Some riftvalley lakes such as lake Abijata and Lake Chelekeltu are disappearing or are on the verge of disappearance.*
- 🌍 *The volume and purity of Ethiopia’s rivers are decreasing. Pollutants like sewage, organic wastes and fertilizers are increasingly contaminating the country’s water resources.*



 Due to the rapid growth of human population, there is a crucial growing demand for potable water.

These and other factors have led to the need for the conservation and management of water resources in Ethiopia. In response to this need, the Federal government has adopted a national strategy to conserve and manage water resources in Ethiopia. This strategy is adopted to:

- a) subject all major conservation, development and management, projects should include the cost and benefits of protecting watershed forests, wetlands and other relevant key ecosystems;
- b) recognize that natural ecosystems, particularly wetlands and upstream forests, are fundamental for regulating water quality and quantity, and integrate their rehabilitation and protection into the construction, development and management of water resources;
- c) ensure that the control of environmental health hazards is a necessary condition in the design, constitution and use of dams and irrigation systems;
- d) ensure that any proposed introduction of exotic species into water ecosystems as subject to detailed studies and environmental-impact assessment;
- e) promote the protection of the interface between water-bodies and land (for example, lake shores, river banks and wetlands);
- f) involve water-resource users, particularly women and animal herders, in the local planning, designing, and follow up of water policies, programs and projects, in order to promote these activities without affecting the ecological balance;
- g) recycle waste water when it is found to be safe for health and the environment;
- h) promote, to the extent possible, viable measures to artificially recharge ground and surface water resources;
- i) promote effective water-management techniques at the farm level for improved performance of medium-to-large-scale irrigation schemes; and
- j) provide technical and credit support to the private sector in water resource development activities.

### Activity 7.3

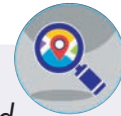


#### Answer the following questions

1. Why do you think most urban and rural areas of Ethiopia suffer from clean water shortage?
2. Suggest possible ways of effective conservation of water resources in your locality.
3. In your group, discuss why Egypt very much concerned with the Nile Basin is.

## 7.2 THE ETHIOPIAN “GREEN LEGACY” MOVEMENT

*At the end of this section, you will be able to:*



- ✓ describe the concept of the green legacy movement in Ethiopia; and
- ✓ recognize the effects of the green legacy movement of Ethiopia.



### KEY TERMS

 Climate change

 Green legacy movement

The “Green Legacy “Initiative is part of the Government’s plan launched in 2019 by Ethiopian Prime Minister Abiy Ahmed, aimed at a tree planting campaign to curb the effects of climate change and deforestation.

The Green Legacy movement encompasses agroforestry, forest sector development, greening, and renewal of urban areas and integrated water and soil resources management. It has a plan to plant 20 billion seedlings across the country over four years (2020-2023). Following this plantation program, post-planting care such as watering, weeding, and replacement planting will be carried out to enhance tree seedlings’ survival rate.

This will not only contribute towards the country’s long-term social, economic and environmental development goals but also towards meeting its international commitments such as the Paris Climate Change Agreement, the 2030 Agenda for Sustainable Development (UN), and the African Agenda 2063.

The efforts on the ground are guided by strategic documents such as the Climate Resilient Green Economy (CRGE) Strategy, the Ten-Year National Forest Sector Development Program, and the Bamboo Development Strategy and Action Plan. These programs and strategies are aligned with global goals, and provide guidance on Ethiopia’s afforestation, restoration, urban greening, forest protection and sustainable use of forest resources for the coming years.

The overall “Green Legacy” movement goals are:

- 🌍 *to curb the effects of climate change and deforestation;*
- 🌍 *to intensify climate smart agricultural to increase productivity;*
- 🌍 *to improve food security;*
- 🌍 *to prevent environment-related conflicts;*
- 🌍 *to battle desertification and soil erosion;*
- 🌍 *to build climate resilient green economy; and*
- 🌍 *to ensure gender equality.*



**Figure 7.5:** “Green Legacy” Movement

**Source:** <https://www.bbc.com> (BBC Reality Check)

## Activity 7.4



### Answer the following questions

1. What is Green Legacy Initiative?
2. Did you take part in Green Legacy Movement in your district? If yes, which seedling species you planted? Tell to your classmates post-planting care you have carried out.
3. Discuss climate change: what it is and how it differs from climate variability. List some of its most noticeable effects.

## UNIT SUMMARY

- Ethiopia is gifted with abundant natural resources of adequate landmass, fertile soil, favorable climate, water, wildlife, vegetation and others. However, these resources are under the influence of various interconnected factors like population pressure, agricultural expansion, migration, rapid urbanization, resettlement, climate change, and environmental pollution that result in serious degradation.
- The major problem of Ethiopia's soils is erosion by running water. Both human-made and natural factors are responsible for erosion. Attempts have been underway to check erosion through reforestation, afforestation, terracing, constructing check dams, plugging gullies, contour ploughing, strip cultivation, etc.
- Long term human occupation of the highlands of Ethiopia, accompanied by sedentary agriculture and extensive cattle herding activities, in combination with population pressure have resulted in the heavy deforestation, and subsequent wild animals extinction. The forest resource stock that had covered 40 percent of the country has come to less than 3 percent these days. However, due to the recently adopted Ethiopian government strategy known as "Green Legacy", the forest area coverage has been raised up to about 15.7%, as indicated by National Forest Inventory report of 2018.
- Hence, the Ethiopian government has taken several steps to address these problems like launching soil and water conservation campaign, tree planting programs, developing water resources conservation and management policy and others. Moreover, awareness has been created at all levels through school syllabi and extension services to mitigate the problem.

## REVIEW EXERCISES

### PART I: TRUE OR FALSE ITEMS

**Dection: Write "True" if the statement is correct and "False" if it is incorrect**

1. Planting trees to replace trees destroyed by deforestation refers to reforestation.
2. Planting different crops in alternating strips to retain water and soil is known as intercropping.
3. Building level surfaces at right angles to the slope to retain water and reduce the amount of erosion is called terracing.
4. The major problem of Ethiopia's soils is pollution.
5. The "Green Legacy "movement is aimed at building irrigation dam to enhance agricultural productivity.

### PART II: MULTIPLE CHOICE ITEMS

**Direction: Choose the correct word or phrase from the given alternatives.**

6. The environmental policy of Ethiopia is aimed, primarily, at
  - A. lowering the level of water pollutant.
  - B. decreasing the level of air pollutant.
  - C. promoting industrialization.
  - D. minimizing soil erosion.
7. Extensive planting of trees to increase forest cover is called
 

A. afforestation.	C. intercropping.
B. agroforestry.	D. terracing.
8. The soil conservation strategies of Ethiopia is aimed, primarily, at
  - A. strip cultivation.
  - B. planting of shelter belts.
  - C. afforestation and reforestation.
  - D. fallowing.
9. Which of the following is an example of a bad cultivation practice?
 

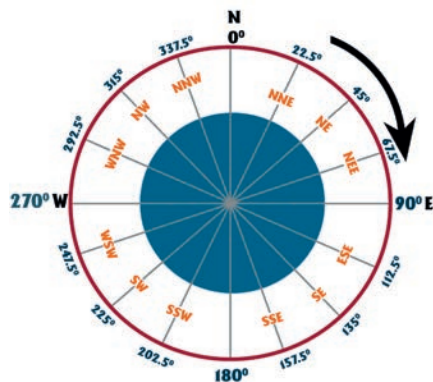
A. Reforestation	C. Strip cultivation
B. Over cropping	D. Overgrazing

10. The “Green Legacy” movement of Ethiopia is aimed, primarily, at
- A. building climate resilience green economy.
  - B. improving food security.
  - C. ensuring gender equality.
  - D. all of the above is true.

### **PART III: COMPLETION ITEMS**

**Directions: Complete each of the following sentences with the correct word or phrase.**

11. The two natural factors that accelerate soil erosion in Ethiopia are \_\_\_\_\_ and \_\_\_\_\_.
12. One of the attainable measures for reducing soil erosion is afforestation. It is the \_\_\_\_\_.
13. Examples of disappeared lakes of Ethiopia include \_\_\_\_\_ and \_\_\_\_\_.
14. \_\_\_\_\_ is a movement launched in 2019 by Ethiopian Prime Minister Abiy Ahmed, which was aimed at a tree planting to mitigate the effects of climate change and soil erosion.



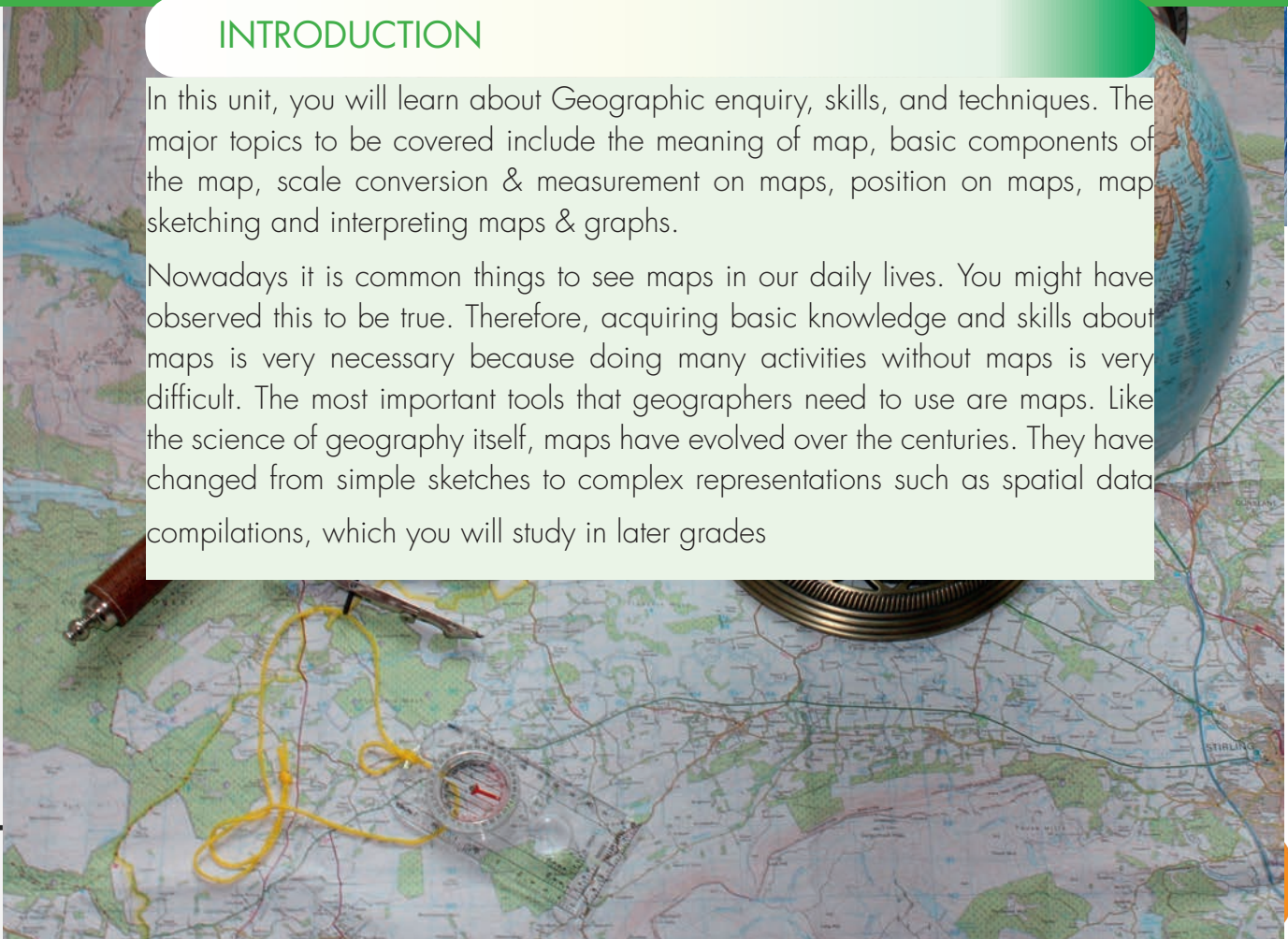
# UNIT EIGHT

## 8. GEOGRAPHIC INQUIRY SKILLS AND TECHNIQUES

### INTRODUCTION

In this unit, you will learn about Geographic enquiry, skills, and techniques. The major topics to be covered include the meaning of map, basic components of the map, scale conversion & measurement on maps, position on maps, map sketching and interpreting maps & graphs.

Nowadays it is common things to see maps in our daily lives. You might have observed this to be true. Therefore, acquiring basic knowledge and skills about maps is very necessary because doing many activities without maps is very difficult. The most important tools that geographers need to use are maps. Like the science of geography itself, maps have evolved over the centuries. They have changed from simple sketches to complex representations such as spatial data compilations, which you will study in later grades







## Unit Outcomes

*After completing this unit, you will be able to:*

- ✓ recognize the concept of a map and its basic components;
- ✓ categorize scales and interpret maps at different scales;
- ✓ make measurements of area and distances using maps;
- ✓ demonstrate position on maps and make sketch maps; and
- ✓ undertake investigate, gather geographic information and analyze the data using appropriate techniques.



## Main Contents

- 8.1. Map and its basic components
- 8.2. Scale, scale conversion and measurements on maps
- 8.3. Position on maps
- 8.4. Map sketching
- 8.5. Interpreting maps and graphs

 *Unit Summary*

 *Review Exercise*

## 8.1 MAP AND ITS BASIC COMPONENTS




*At the end of this section, you will be able to:*

- ✓ explain the meaning of a map;
- ✓ express the historical development of maps; and
- ✓ describe its basic components of a map.



## KEY TERMS

 Cartography  
 Modern map

 Map making








 Traditional map

### 8.1.1 The Meaning of a Map

*What is a map? Do you remember what you have learned about map?*

A map is a simplified, diminished, plain representation of all or part of the earth's surface as viewed vertically from above.

The main features of maps:

-  A map represents all or part of the earth's surface. For example, a map might show a city such as Addis Ababa, the entire world, or a section of a garden.
-  A map is a two-dimensional (plane) representation. For example, a map might be printed on a piece of paper.
-  Maps show the earth's surface as if it were seen from directly above. This view is called a bird's-eye view.
-  All maps are smaller than the area they represent.
-  Maps are drawn to scale. In other words, the features shown on a map have the same relative proportions as they do in reality.
-  Maps are simplified representations.
-  Most maps use generally accepted symbols to represent natural, artificial or cultural features of the area they represent. They also use conventional notations to provide background information such as the map's title, date and scale.

#### Activity 8.1



**In a small group, discuss the following questions.**

1. What does "A map is a two-dimensional plane representation"?
2. Compare and contrast maps and globes.

#### Historical Development of Map

Maps are among our oldest tools. People created maps even in primitive times. For instance, men and women sketched their routes to hunting, fishing and gathering grounds. Today, we also prepare maps, for many purposes. However, map-making has passed through many stages of development since its beginning. The two main

stages of the historical development of map-making are:

- a) *Traditional map-making*
- b) *Modern map-making*

## A. Traditional Map Making

The art of traditional map-making is as old as the human race. Traditional maps have been made in many ways. For example, early map materials included sticks, shells, clay tablets, parchment, paper, and solid plates of silver. Many traditional maps were locational. For example, they have shown the locations of water holes and hunting grounds and have included paths that led to these places.



### Focus

In traditional map-making, collecting measurements of distances, directions, areas and locations was one of the greatest challenges. Each measurement was being made by hand, through fieldwork in the area being mapped. This process was laborious and tiresome. Often the accuracy of the resulting information is imperfect and therefore not fully dependable.

Another main difference between traditional and modern maps is that a traditional map might include drawings of three-dimensional objects. As a result, a traditional map might be somewhat pictographic (or physiographic) rather than strictly diagrammatic.

## B. Modern Map Making

Modern scientific mapping has its roots in the 17<sup>th</sup> century. Several developments during the Renaissance gave impetus to accurate map-making (cartography). Furthermore, advancements in science and technology resulted in the invention of better cameras and airplanes specially designed to take aerial photographs. Today, map-makers have diverse opportunities to acquire spatial information. In addition to aerial photography, satellite imagery provides a wealth of information.

Nowadays, the use of computers has become common in cartography. This is because computers are found valuable to assist in making maps. The last four decades have witnessed that computers have become an integral part of almost every stage of the cartographic process. This process includes collection, storage, analysis and presentation and even in the mapmaking and reproduction of maps.

## Uses of Maps

*Why are maps very important in geography? What are the major uses of maps?*

Maps are used for identifying locations, distance, area and direction.

**Location:** A map shows the exact site of a place as well as the general situation relative to other areas. For example, Ethiopia's location can be expressed in terms of its neighbouring countries, external land masses and water bodies. It is also possible to locate a place using astronomical grid references – parallels and meridians.

**Distance:** With the help of a map, we can measure the distance between places. This is done by using the scale of the map. For example, the air distance between Hawassa and Addis Ababa can be calculated by using a map of Ethiopia.

**Area:** the size of a certain place, a country, a region, a continent can be calculated from a map. This is done by measuring the length and the width of the given place on the map and by converting them to ground distances with the help of the scale of the map.

**Direction:** A map can enable us to identify the direction and bearing of any place on the map. This is accomplished by referring to another place

### Activity 8.2



#### Answer the following questions

1. Name the two methods of map making.
2. What are the major characteristics of modern map-making?
3. Give a brief account of the uses of maps.

### 8.1.2 Basic Components of a Map

A map should include the following components namely: the title, scale, direction, grid reference, legend, date, place of publication and publisher, the magnetic declination (variation), and compass.

**Title:** A map must have a title. The title of a map should tell the reader “what,” “where,” and possibly “when” about the map. If a map contains a title, the purpose of the map can be identified easily before someone goes deep into it.

**Scale:** is refers to the relationship between a unit of length on a map and the corresponding length on the ground. This information indicates the extent to which the area that is represented in the map has been reduced.

**Direction or orientation (North) arrow:** Shows the north direction on the map. By convention, cartographers or map makers place North at the top of maps.

**Grid reference:** The map needs to have a coordinate system in the form of parallels of latitude and meridians of longitude so that the area can be placed in its proper geographical location on the globe.

**Legend/Key:** There must be a legend or key that explains the symbols used by the cartographer. The map legend explains the meaning of the signs and symbols used in the map.

**Date/Year of publication:** **it** identifies the year in which the map was published. Because this information tells you how old the map is, you might be able to judge whether the map’s contents are current or might be out of date.

**Place of publication and publisher:** It tells where the map was published and identifies the organization that published the map.

## 8.2 SCALE, SCALE CONVERSION AND MEASUREMENTS ON MAPS



*At the end of this section, you will be able to:*

- ✓ distinguish between a small scale, medium scale and large scale map
- ✓ calculate the scale of a map;
- ✓ measure distance using the scale of the map; and
- ✓ measure area using the scale of a map



### KEY TERMS

- 🔑 Distance
- 🔑 Field distance
- 🔑 Large scale map
- 🔑 Map Scale

- 🔑 Medium scale Map
- 🔑 Scale
- 🔑 Small scale map

### *What is scale?*

Each map is a diminished representation of the whole world or a part of it. The exact degree to which the map has been reduced in size is known as scale. Thus, scale is the ratio or proportion of the distance and areas shown on the map to the corresponding distance and area on the earth's surface. Mathematically, it can be shown as:

$$\text{Scale} = \frac{\text{Map Distance (MD)}}{\text{Ground Distance (GD)}}$$

Based on scale differences, maps can be classified into three:

- Large-scale maps
- Medium-scale maps
- Small-scale maps

## 1. Large scale maps

*Large scale maps* show a smaller geographic area with greater detail. Large-scales are greater than or equal to 1:50,000. (1cm on a map represent 50,000 cm on the ground)

Large scale maps  $\geq 1:50,000$

## 2. Medium scale maps

These maps are prepared with scales that range between 1:50,000 and 1:250,000. Medium-scale maps cover wider areas than large scale maps are but cover smaller areas than small-scale maps. They are also able to present more detailed information than small-scale maps but are less detailed than large-scale ones.

Medium scale maps 1:50,000 – 1:250,000

## 3. Small scale maps

Small-scale maps tend to show a larger geographic area and less detailed. Small-scale maps are those which are prepared with scales less than or equal to 1:250,000.




Small scale maps  $\leq 1:250,000$






### Focus

Large scale maps depict a small area and show more detail, but small scale maps depict a large area and show less detail.



#### Large-Scale maps

-  Scale:  $\geq 1: 50,000$
-  Cover small areas
-  Contain highly detailed information

#### Medium-Scale Maps

-  Scale: between 1:50,000 and 1:250,000
-  Cover medium sized areas
-  Contain moderately detailed information

#### Small-Scale Maps

-  Scale:  $\leq 1:250,000$
-  Contain less-detailed information

## Ways of Map Scale Expression

A map scale can be expressed on a map in three ways. These are:

- a) *Scale Statement*
- b) *Representative Fraction*
- c) *Graphic Scale*

### a) Scale Statement

It is a technique by which scale can be expressed in words. Example: One centimeter to one kilometer (1cm to 1km). One centimeter on the map represents one kilometer on the ground

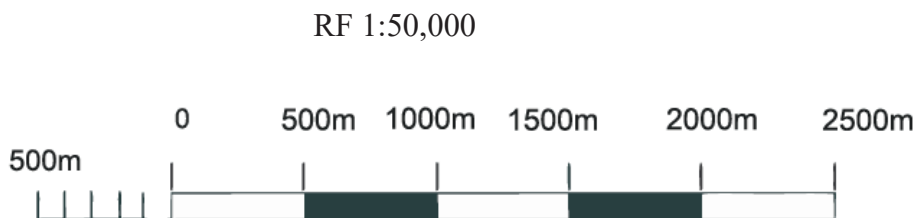
### b) Representative Fraction

In this method, a map scale is expressed as a ratio or fraction. However, Representative fraction is commonly expressed in a ratio.

Example: 1:400,000 (ratio) or  $\frac{1}{400,000}$  (Fraction)

### c) Graphic Scale/Linear Scale

It is called bar, linear or line scale. Graphic scale is a line drawn on a map and it is subdivided into units appropriate to the scale of the map. This is usually a horizontal line of convenient length divided into a number of equal parts. Graphic scale is drawn with primary divisions towards the right of zero where one division with secondary divisions marked on the left of zero, for reading distances smaller than the values of primary divisions. The graphic scale is mostly drawn in the lower margin of the map.



### *Graphic Scale*

1cm = 500m or, 1cm = 500 X 100 cm = 50,000 cm = 1:50,000



## Conversion of a Map scale

Sometimes it becomes necessary to change one form of map scale into another. So conversion of a map scale can be done as follows.



### Focus

$$1 \text{ km} = 100,000 \text{ cm}$$

#### A. RF to statement scale

Example: Given RF = 1:500,000

This implies that 1cm to 500,000cms. To change 500,000 cm into kilometres, divided it by 100,000 (Because 1km= 100,000cm)

Therefore the answer is:  $\frac{500,000}{100,000}$       5km = 1cm to 5Kms

#### B. Statement of scale to RF

Example : Given 1cm to 10kms

First change 10kms into centimetres

$$1 \text{ cm to } 10 \times 100,000 \text{ cms. RF is } 1:1,000,000$$

### Activity 8.3



#### 1. Convert the following RF into a Statement scale

- a) 1:50,000      b) 1:250,000      c) 1:400,000

#### 2. Change the following statement of scales into RF

- a) 1 cm to 100kms      b) 4cms to 1km      c) 2.5 cms to 2.5 kms

#### 3. Draw a graphic scale for the following

- a) 1 cm to 2.5 kms      b) 2cms to 100kms

## Measurement on Maps

A variety of information about the earth, and about the features distributed on its surface, is obtained by direct measurements from maps. Two measurements of primary importance are the distance between locations and the area of a region.

### 8.2.1 Measurement of Distance

All distances obtained through measurements on maps and the use of the scale only are called **map distances (MD)** which are expressed in cm. Map distance is the straight-line air distance which does not take into account ups and downs of the earth's surface. It is expressed in km or meter. We can find three different types of distances through measurements and calculation. These are:

#### 1. Distance along Straight-line

A straight-line distance is the one measured simply along a straight line without considering the real earth's features. It is called air distance.

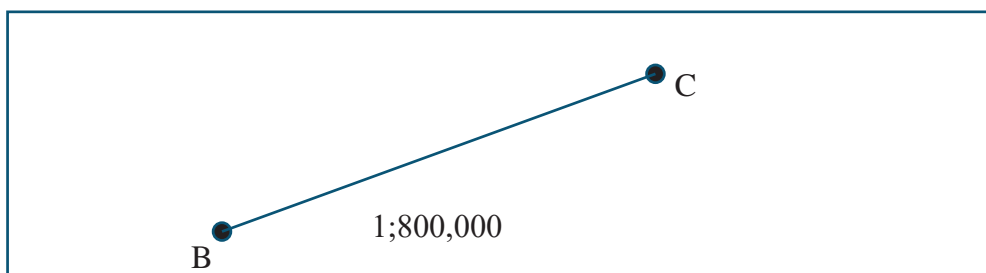
Example: Figure 8.1 straight line distance from B to C is 4 cm (map distance measured using a ruler). The scale of the map is 1:800000

$$1\text{cm} = 800,000\text{cm}$$

$$4\text{cm} = x$$

$$\begin{aligned}\text{Ground Distance} &= 4\text{cm} \times \frac{800,000}{100,000} \\ &= 32 \text{ km}\end{aligned}$$

Thus the straight line ground distance between B and C is 32 Kilometers.



**Figure 8.1:** Measurement of Straight line distance on a map

## II. Distance along the Curved line

The distance along a curved line is called bending line curve. It includes distance along roads, railways, rivers and coastal lines. To find the distance on the map in the case of a bending line distance in addition to a ruler we need to use threads, strings or the edge of a pair of dividers. If the distance between two points is shown in curved line, divide a curved line into nearly straight portions. Then, measure each portion carefully and add the whole measurement together.

Example: what is the distance of the road shown below?



**Figure 8.2:** Distance along the C curved path

The road measures 8.4 cm on the map. The scale of the map is given as 1:50,000 or 1cm to 0.5km.  $1\text{cm} = 50,000\text{cm}$

$$8.4\text{cm} = x$$

$$\text{the roadline distance (ground)} = 8.4\text{cm} \times \frac{50,000}{100,000} = 4.2\text{km}$$

### Measurement of Area

You may be asked to find areas of two different types of pieces of land. They are areas with a regular shape and areas with an irregular shape. The procedures to calculate the areas for each of the two shapes are different.

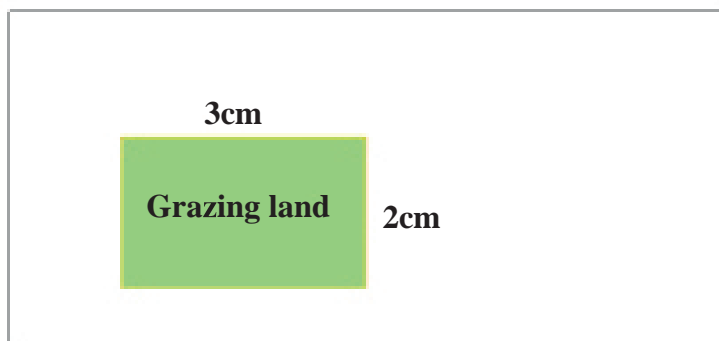
#### I. Measuring Regular shaped area:

These include squares, rectangles, triangles and circles. From your geometry lesson in lower grade you know the formula for calculating the areas of these figures. However, you should know the necessary facts about them (sides, base, height, radius, etc.). Then calculate the ground area by using the map's areal scale. The

following table gives you some geometric formulae for calculating the areas of regular shapes.

*Table 8.1: Geometric Formula*

Regular Shaped Areas	Mathematical Formula
Square	$A = S^2$ ; where A = area, and S = side
Rectangle	$A = l \times w$ ; where A = area, l = length, and w = width
Right Angle Triangle	$A = \frac{1}{2} bh$ ; where A = area, b = base, and h = height
Circle	$A = \pi r^2$ ; where A = area, and r = radius. ( $\pi = 3.14$ )



scale = 1:250,000

**Figure 8.3:** *A sketch map of grazing land*

### **What is the ground area of the grazing land?**

The scale is 1:250,000 or 1cm to 2.5km

$$\text{Length of grazing land} = \frac{3\text{cm} \times 2.5\text{km}}{1\text{cm}} = 7.5\text{km}$$

$$\text{Width of grazing land} = \frac{2\text{cm} \times 2.5\text{km}}{1\text{cm}} = 5\text{km}$$

$$\text{Area} = l \times w = 7.5\text{km} \times 5\text{km} = 37.5\text{km}^2$$

Therefore, the total area of the grazing land is 37.5km<sup>2</sup>.

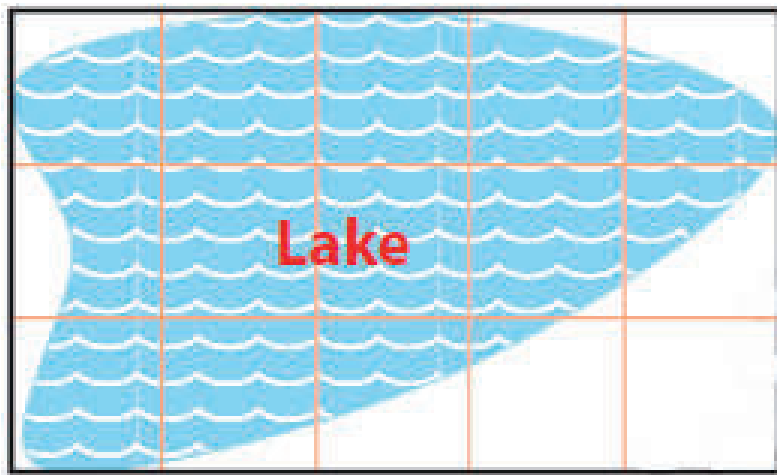
## II. Measuring Irregular-Shaped Areas

The area of the irregular shaped piece of land such as islands, farmlands, parks, etc. cannot be obtained accurately by simple methods as the regular shapes. Such areas can be obtained by devices like planimeter and other methods such as the grid square method.

**Planimeter:** is an instrument used to get accurate areas of both regular and irregular shaped features from maps.

**Grid Square method:** it deals with the area of purely irregular shape. It is manual and involves tremendous labor.

**Example:** If the map of an irregular shaped lake is drawn with a scale of 1 cm to 2 km (Figure 8.5), calculate the area of the lake on the ground?



Scale= 1cm to 2km

**Figure 8.4:** A sketch map of a lake

To find the area of the lake, we follow the following steps:

- Copy the boundary of the lake.
- Draw grid lines at a uniform interval (for example, 1 cm apart) over the lake.
- Count the number of grid squares within the lake:
  - number of full squares = 4
  - number of  $\frac{3}{4}$  squares =  $5 \times \frac{3}{4}$
  - number of  $\frac{1}{2}$  squares =  $4 \times \frac{1}{2}$
  - number of  $\frac{1}{4}$  squares =  $1 \times \frac{1}{4}$

Then, Area = [Full Cells + (half cells)/2 + (Quarter cells)/4] etc... X Cell value

**Thus, total number of squares =  $4 + 5 \times \frac{3}{4} + 4 \times \frac{1}{2} + 1 \times \frac{1}{4} = 10$**

a) Calculate the approximate area of the lake.

- First, find the area of one square by using the scale.

$$\text{Area} = S^2 = 1 \text{ cm} \times 1 \text{ cm} = 1 \text{ cm}^2 \text{ or } 2 \text{ km} \times 2 \text{ km} = 4 \text{ km}^2$$

- Then, calculate the total area of the lake.

$$\text{If one square} = 4 \text{ km}^2$$

$$10 \text{ Square} = ?$$

**Therefore, the approximate area of the lake is 40 km square.**

### 8.3 POSITION ON MAPS



**At the end of this section, you will be able to:**

- ✓ define what the geographic grid system means;
- ✓ demonstrate the position of a given place by means of a geographic grid system;
- ✓ acquire the skill of finding direction on a map; and
- ✓ show the direction of a given place on a map using compass direction and bearings.



#### KEY TERMS

- 🔑 Bearing
- 🔑 Cardinal points
- 🔑 Easting
- 🔑 Grid

- 🔑 Grid north
- 🔑 Latitude
- 🔑 Longitude
- 🔑 Meridians

- 🔑 Northing
- 🔑 Parallels
- 🔑 Prime meridian
- 🔑 True north

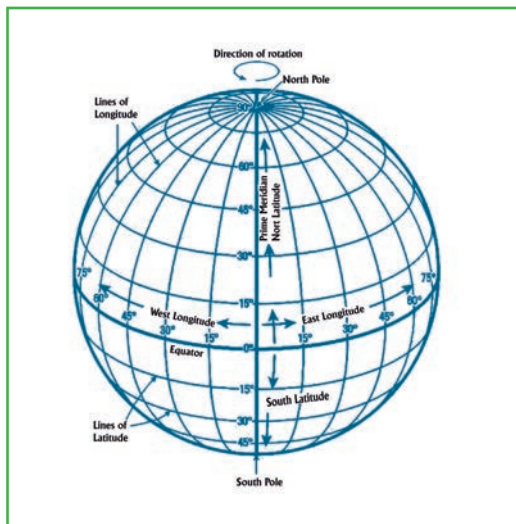
The position of places on the earth's surface and upon maps can be given in many different ways. The most important is through the use of:

- 🌐 *Latitude and longitude (international grid references)*
- 🌐 *National Grid References (eastings and northings)*

### 8.3.1 Grid References

#### A. Position by the use of Geographic Grid

In this method, the position is given accurately with the help of a grid composed of a network of lines known as *Parallels and meridians*. One set of lines run from the North Pole to the South Pole – these imaginary lines are called *Meridians* and join all the points with the same longitude. The other set of lines run around the globe parallel to the equator and are called *Parallels* – these lines join all the points with the same Latitudes.



Latitude is angular measurements from the center of the earth northwards and southwards whereas longitude is angular measurements from the center of the earth in eastwards and westwards. The parallels give the position in degree ( $^{\circ}$ ), minutes ( $'$ ) and seconds ( $''$ ) north or south of the equator – this is the Latitude of the place.

**Figure 8.5:** The Complete Geographic Grid

The meridians also give position of a point in degree, minute and seconds east or west of the zero degree (Prime Meridian)– this is the Longitude of the point (Figure 8.6).

Parallel are an imaginary line joining all points with the same latitude. Meridian: An imaginary line joining all points with the same longitude. Note that the first set of terms (latitude and longitude) deal with angles the second set (Parallel and Meridians) with lines. Consider the following figure for the positioning of points B, C, N, and O.

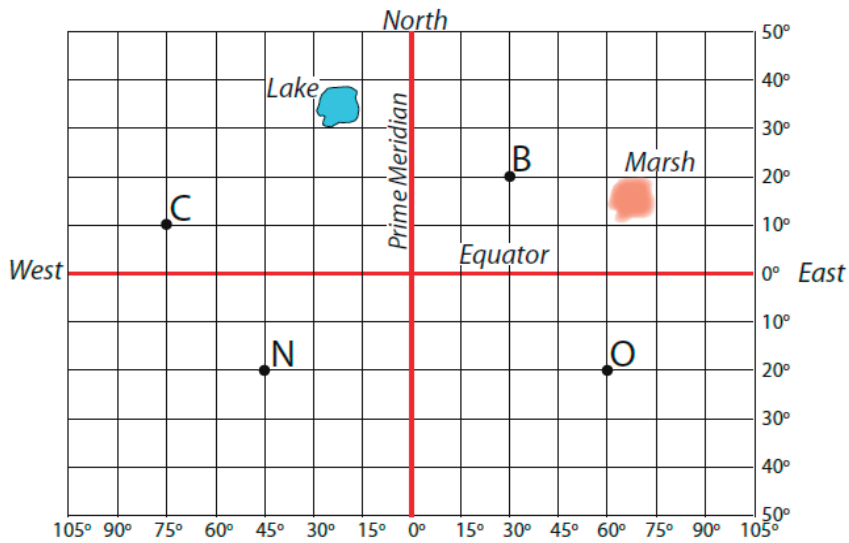


Figure 8.6: Geographic Grid

*How do we locate the position of a place on a map?*

Example 1: Find the geographic grid of point C in Figure 8.7. Follow the following steps

1. Identify whether point C is North or South of the Equator.
2. Read the latitudes of C, North of the equator i.e.,  $10^{\circ}$  N.
3. Read the longitude of C, West of the prime meridian i.e.,  $75^{\circ}$  W.
4. The complete geographic grid of point C is  $10^{\circ}$  N  $75^{\circ}$  W.

### Activity 8.4.

**Based on** Figure 8.7 above find the geographic grid of the following points:

- |      |         |
|------|---------|
| a) B | c) O    |
| b) N | d) Lake |





## B. Position by the use of National Grid Reference

*What is a National Grid system? How can a national grid system help us to identify the position of a place on a map?*

The criss-cross reference lines on a map is called Grid. The grid provides a frame of reference for locating points on a map. The vertical and horizontal lines of the grid cross at the points called Co-ordinates – Each of these lines are numbered. The lines that run horizontally are called Northings. The lines that run vertically are called Eastings. These lines are the basis for reference to landmarks and places shown on the map. There are two types of grid references:

- 🌐 *The four digit grid reference*
- 🌐 *The Six digit grid reference*

This point is the southwestern corner of the whole grid for the country and it is called the grid origin or the National grid origin.

- 🌐 *The grid origin of Ethiopia lies in south-west most corner, is at the point in SW Kenya where the 34° 30'E meridian crosses the equator (0° ).*
- 🌐 *Such a grid system provides the position of any point, in kilometres and fractions of kilometres east and north of the grid origin.*
- 🌐 *From the origin, all vertical lines are numbered eastwards. They are called eastings.*
- 🌐 *All horizontal lines are numbered northwards. They are called northings.*
- 🌐 *In contrast to meridians, eastings (verticals) do not indicate true north.*

### The Four Digit Grid Reference

It is common on a map drawn on a small scale. The 10 Km sides of the square are marked with numbers that increases towards East and North. The Northing and Easting are numbered at every 10 Km intervals. Again, each side of the square is divided into 10 units (1 unit represents 1 Km).

### Example

Find the four digit grid reference for point F using Figure 8.8.

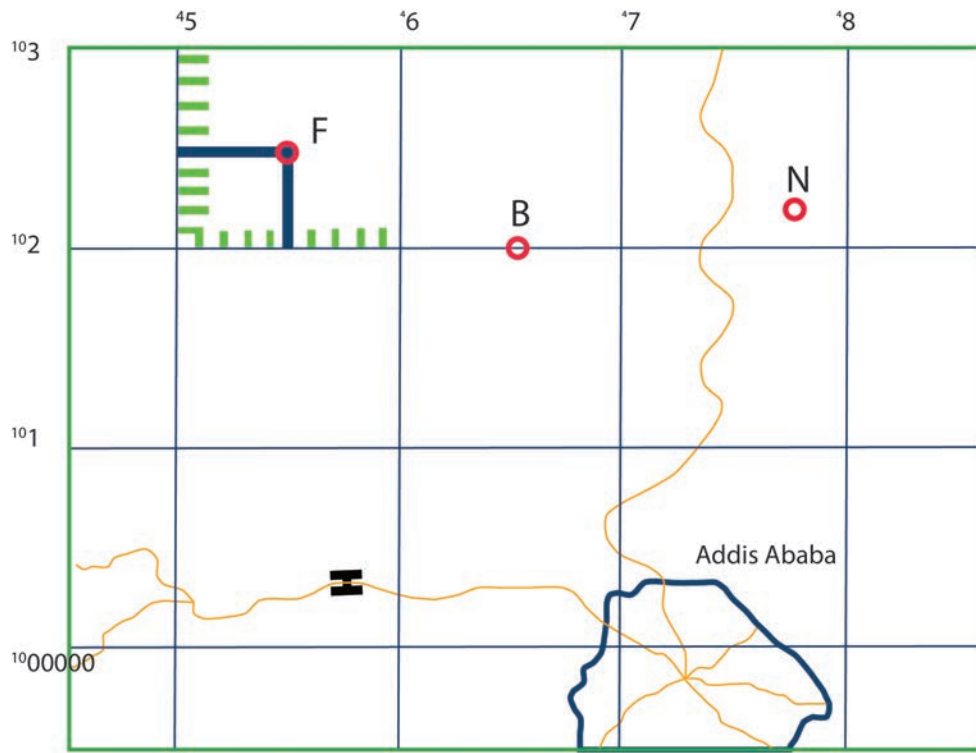


Figure 8.7: four-Digit grid reference

Table 8.2: Procedures of finding location using four digit grid references

	Steps for positioning F	Eastings (Verticals)	Northings (horizontal)
1	Locate the vertical grid line to the left of the point F and read the large number.	5	
2	Divide the square into ten equal divisions and pick the tenth of the point.	5	
3	Locate the horizontal grid line below the point F and read the large number.		2
4	Again divide the square into ten equal divisions and pick the tenth.		5
	The grid references for point F:	55	25
The 4-digit grid reference for point F: 5525			

## The Six Digit Grid Reference

The six digit grid reference is appropriate on a map drawn in a larger scale so that a greater accuracy in position can be obtained.

### Example

Find the national 6 digit grid reference for the points B, F and N on the map.

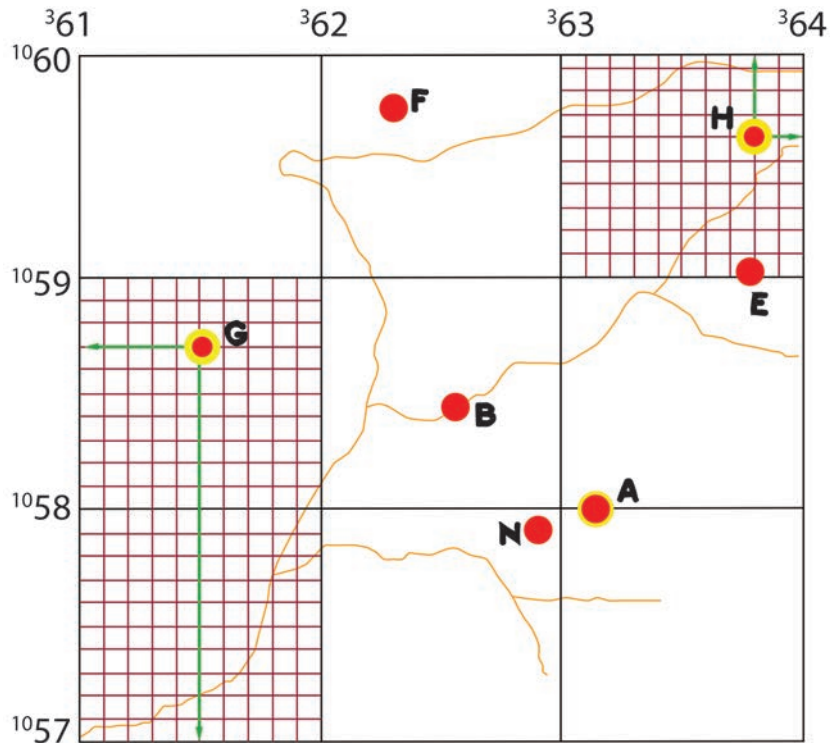


Figure 8.8: six-Digit grid reference

In the above figure 8.9 the grid of a map drawn in the scale 1:20,000 is shown. Each square has a side of one kilometer. To find the location of point B, F and N we can use the following steps.

*Table 8.3: Procedures of finding location using six digit grid references*

	Procedure	Point B	Point F	Point N
1	All points are in the 100 km square marked CA.	CA	CA	CA
2	Locate vertical grid line nearest to the left of the point and write large digits only	62	62	62
3	Measure tenths from grid line to point	6	3	9
4	Locate horizontal grid line nearest below point and write large digits only	58	59	57
5	Measure tenths from grid line to point	4	8	9
	Full National Grid Reference	CA 626584	CA 623598	CA 629579

Note that the three first digits in the grid reference always refer to the eastings and the three last digits to the northings. Where the two lines cross one another you will have the point you are looking for. The accuracy obtained with six figure grid reference as far as position is concerned is to the nearest 100 meters. This accuracy is made possible by the larger scale of the map. The actual difference between a four figure and six figure grid reference is therefore one of accuracy. Four figure grid reference should therefore be used only in connection with maps that have a scale so small that it is impossible to get a greater accuracy than to the nearest kilometre.

Remember always that a grid reference NEVER can be used to indicate an area. The reference always stands for a POINT, which is the intersection of two lines.

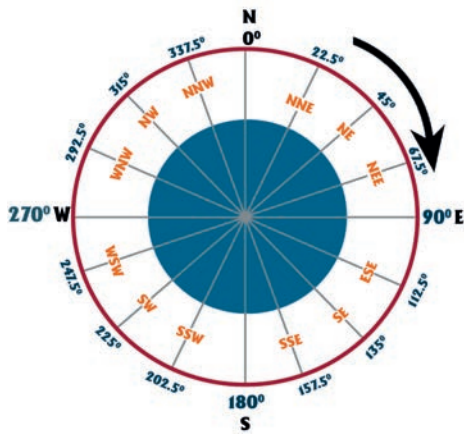
## Activity 8.5



### Answer the following questions

- Based on Figure 8.7, find the four digit grid reference for the following points
  - B
  - N
- Based on Figure 8.8, find the six digit grid reference for the following points
  - E
  - A
  - B

### 8.3.2 Points Compass Direction



Compass is an instrument that indicates or identifies direction, used by mariners, aviators, campers, hunters, and other travelers to enable them to get from one place to another. There are *thirty-two* points of the compass. Many of us are familiar with the four *cardinal* points of the compass—North, East, South and, West. The angle between two adjacent cardinal points is  $90^\circ$ . Between the cardinal points there are subsidiary (Intermediate) points which give a further indication.

Figure 8.9: *Compass Points*

The points midway between the cardinal points at  $45^\circ$  intervals include; North West (NW), North East (NE), South East (SE) and South West (SW). There are additional sub-divisions between the cardinal and subsidiary points which give more precise directions at  $22\frac{1}{2}^\circ$  intervals. These include: North-North-East (NNE), East-North-East (ENE), East-South-East (ESE), South-South-East (SSE), South-South-West (SSW), West-South-West (WSW) and West-North-West (WNW).

Compasses are marked with degrees as well as with the direction points we described earlier. As shown in Figure 8.7 above, the degrees start at the north from  $0^\circ$ , and increase in the clockwise direction. The direction points coincide with degree points. For example,  $0^\circ$  coincides with N, and  $180^\circ$  coincides with S. You can express direction more precisely in degrees than direction points.

#### Activity 8.6

##### Answer the following questions

1. Draw a figure that shows compass points and bearings respectively.
2. Identify the four cardinal points.
3. How many points do we have on a compass?
4. Which points of the compass coincide with  $90^\circ$ ,  $135^\circ$ ,  $225^\circ$ ,  $270^\circ$ , and  $315^\circ$ ?



### 8.3.3 North Points

In map reading, reference may be made to the three North Points. *These are: True north, Magnetic north and Grid north.*

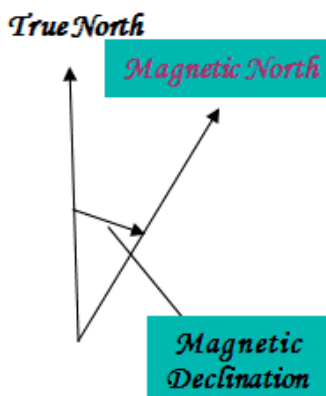
#### A. True North/Geographic North

The most commonly used north for finding direction is *True North (sometimes called Geographic North)*. True North is the northerly direction along a line on Longitude (Meridian Direction). The earth spins on an axis, which passes through the North and South poles. The North Pole is geographical North; or true North. Lines drawn from the North Pole to the South Pole are true north-south lines. True North is therefore the direction from any point on the earth's surface to the North Pole.



Figure 8.10: *True North direction*

#### B. Magnetic North

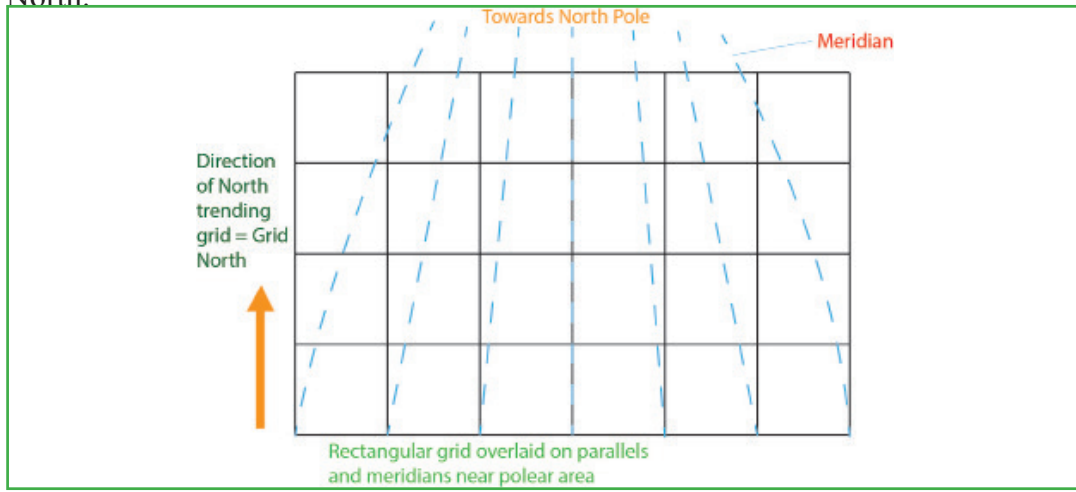


The position of the north magnetic pole varies slightly from year to year. The direction a compass needle points is known as *Magnetic North*. The difference between True North and Magnetic North at any given location is called *Magnetic Declination*. A direction measured from the Magnetic North, the one indicated by the magnetic compass is referred to as the Magnetic bearing or Azimuth with respect to the True or Geographic North.

Figure 8.11: *Magnetic North and Magnetic Declination*

### C. Grid North:

The grid lines on a map do not lie true north and south except along one standard Easting called the central meridian. Elsewhere on the map they make an angle with the true north-south line. Since the grid lines are parallel, and since they are drawn on most maps, it is very convenient to use them for drawing or measuring bearings. The direction of the north-south grid lines (Eastings) is therefore known as Grid North.



**Figure 8.12:** Grid North

## 8.4 MAP SKETCHING



**At the end of this section, you will be able to:**

- ✓ draw sketch map of existing situation of local areas and
- ✓ indicate the positions of selected features

### **What is a sketch map?**

A sketch map is an outline map drawn from observation rather than from exact survey measurements and showing only the main features of the area. Sketch maps are free hand maps drawn on a blackboard or drawing pad to present geographic

ideas and facts Sketch mapping minimizes irrelevant detail and maximizes major geographic points. Thus such maps are the ultimate in geo-graphic simplification.

One of the most important Geography skills is the ability to create maps. Maps are an ideal way to organize and present a large amount of information. As technology advances, students can create increasingly sophisticated maps using GIS, Google Earth, and other platforms. The sketch map can lay a foundation for understanding geographic relationships, organizing information, and answering questions.

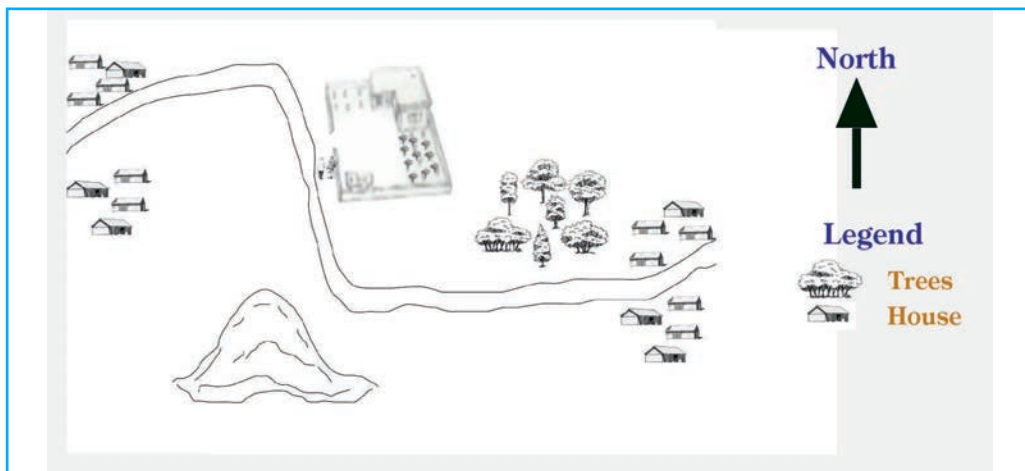


Figure 8.13: *Sketch Map*

### How to draw a sketch map

1. Decide what region your map will show. Choose boundaries so that you do not sketch more than you need to.
2. Determine how much space you need for your map. Things that have the same size as each other in reality should have the same size as each other on your map.
3. Decide on and note the orientation of your map. Most maps use a directional indicator. On most maps, north is “up”.
4. Select reference points so that viewers of your map can quickly and easily figure out what they are looking for. For a map of your community, a major street or river might be your reference point.
5. Decide how much detail your map will show. The larger the area you want to represent, the less detail you will need.
6. You are ready to begin sketching. First, sketch general shapes. If you do not know or cannot remember exact shapes, you can use circles, rectangles, and triangles.
7. Now, fill in more details, as they occur to you – names of places, major land features, and so on.



8. Do not spend more than an hour working on your map, and do not try to make it perfect or overly detailed.

### Activity 8.7



#### Answer the following questions

1. Sketch map of your school compound.
2. Sketch, locate, and interpret Ethiopia's population density map.

## 8.5 INTERPRETING MAPS AND GRAPHS

*At the end of this section, you will be able to:*

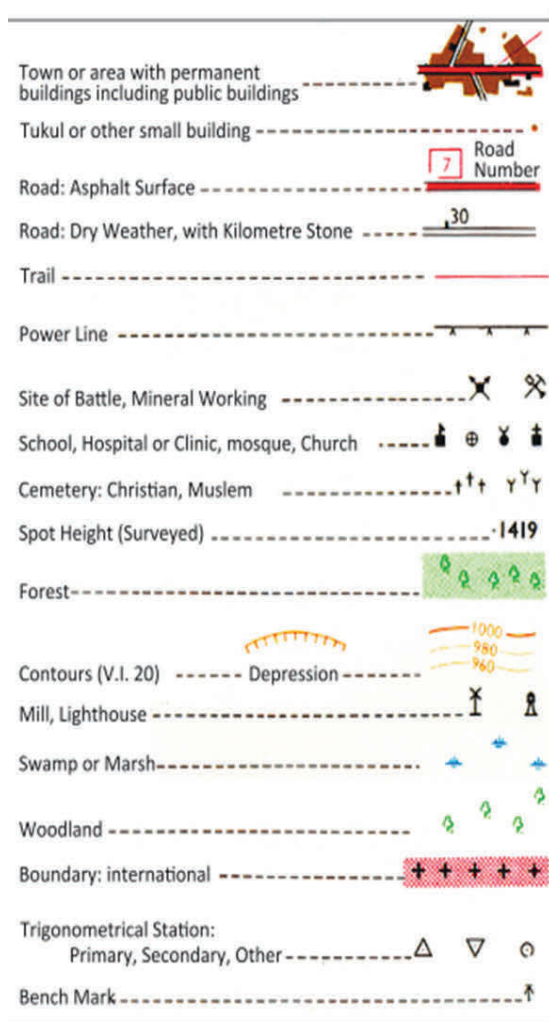
- ✓ interpret different physical and human landscapes on maps; and
- ✓ construct statistical diagrams based on the provided data.



### 8.5.1 Interpreting Features of the Physical and Human Landscapes

*What do map-makers use to represent the different physical and human features on maps?*

Geographers have developed a standard set of symbols and other graphic conventional signs to represent features shown on maps. Conventional signs and symbols are those signs and symbols that are used on maps through the agreement of all map-makers of the world. They are used to represent the same detail on a map in all the countries of the world. Signs and symbols help the map reader to understand maps. Therefore, the map reader has to look first at the key or legend of the map.



When you create a map, the symbols you select should satisfy the following requirements.

- 🌐 They should be uniform throughout the map.
- 🌐 They should be easy to read and understand.
- 🌐 The space occupation, orientation and size of the symbols should be constant.

Here are some of the symbols and conventional signs that are widely used, and understood worldwide:

- 🌐 Cities and towns are indicated by dots or patches of shading;
- 🌐 Streams and bodies of water are often printed in blue; and
- 🌐 Political boundaries are shown by dot lines/solid lines.

Figure 8.14: Conventional Signs and Symbols

### 8.5.2 Interpreting Graphs, Tables and Diagrams

Statistical diagrams are pictorial representations of numerical information. Charts, graphs and diagrams are examples of statistical diagrams. By using statistical diagrams, geographers make information easier to present and understand. It is easier to make comparisons, see trends (changes over time) and draw conclusions. Statistical diagrams are particularly important tools for presenting large amounts of statistical data.

In this section, you will learn about some of these statistical diagrams:

- i) Simple line graphs
- ii) Simple bar graphs
- iii) Pie charts

### i. Simple Line Graph

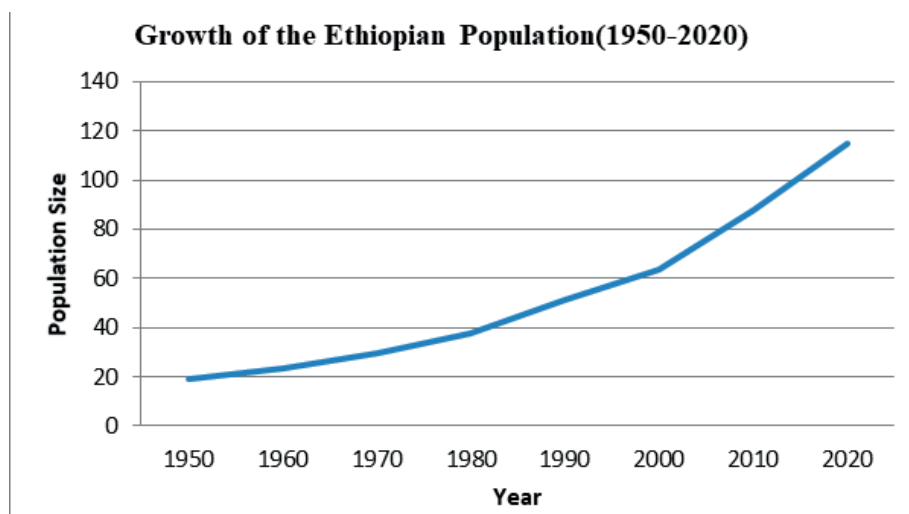
#### *What is a line graph?*

A line graph uses lines to show changes over time. It is also used to show the relationship between two sets of information/phenomena. The line graph shown in Figure 8.15, illustrates the data presented in Table 8.4. It shows the changes in the population size of Ethiopia from 1900 to 2020. In the graph, the x-axis represents years, and the y-axis represents population size. Steps used to draw a line graph:

1. The horizontal axis is normally used to represent an independent variable, i.e. time, while the vertical axis represent a dependent variable,
2. The base of the vertical scale should be at zero, and the top should be slightly higher than the maximum value to be recorded on it.
3. When plotting the graph use small crosses or dots to mark values.

*Table 8.4: Growth of the Ethiopian Population (1950-2020)*

Year	1950	1960	1970	1980	1990	2000	2010	2020
Population in (Million)	19.2	23.5	29.5	37.7	51.2	63.4	87.6	114.9



*Figure 8.15: Growth of the Ethiopian Population (1950 - 2020)*

As we have already indicated, similar line graphs can be used to present a variety of data in relation to time – for example, changes in temperature, employment, and production

## ii. Simple Bar Graph

### *What is a bar graph?*

A bar graph is another graphical tool for displaying statistical data. It uses horizontal or vertical bars to show different amounts of the same item or different values for the same phenomenon. The heights or lengths of the bars on a graph are proportional to the quantities they represent. Such a graph might show how amounts or values differ from place to place or as they change over time.

For example, a bar graph can be used to show how rainfall varies from month to month in a certain place. The following bar graph has been prepared based on the data given in Table 8.5. It shows the monthly distribution of rainfall in Kokosa town West Arsi Zone of Ethiopia.

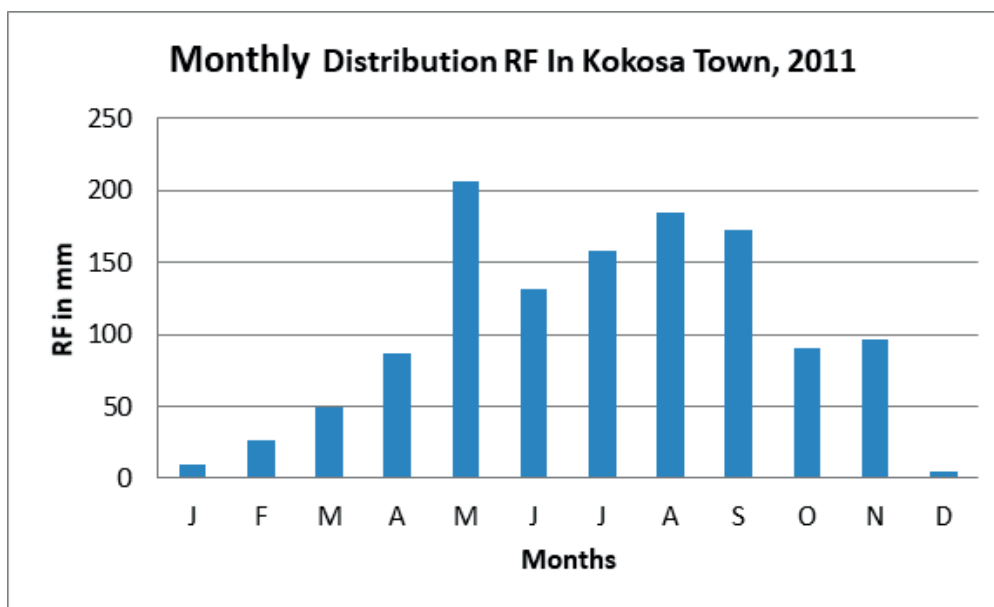
. Steps used to draw a simple bar graph:

1. The horizontal scale usually represents the independent variable, more specifically when the time element is of significant, such as when graphing mean monthly rainfall or annual production.
2. All bars must start at zero and bar graphs are drawn for the purposes of comparison must be drawn on the same scale.
3. When vertical bars are drawn, the time sequence should be from left to right.
4. The width of the bar is a matter of choice. However, avoid bars that are too thick or too thin.
5. The value of each bar can be assessed more easily if space or gap is left between each bar.

Compare a single feature as it exists in different places or as it changes over time. For example, they can represent such statistical data as annual rainfall distribution on a monthly basis. The mean monthly distribution of rainfall in Kokosa town can be shown as follows. **NB** The graph in Figure 8.16 below has been drawn using the data given in Table 8.5.

Table 8.5: Monthly average rainfall of Kokosa town West Arsi, 2011

Months	J	F	M	A	M	J	J	A	S	O	N	D
RF mm	9.1	26	49.8	87.3	206.3	131.7	158.2	184.2	173.1	91.1	96.5	5.4



**Figure 8.16:** Monthly Average Rainfall of Kokosa Town, West Arsi (Source NMA, 2016)

### iii. Pie Chart

*What is a pie chart? What are they used for?*

Pie charts are circle graphs. They use segments of the circle to show the sizes of the items that make up its subject. The segments are shaped like the slices of a pie. The circle of the chart represents the total (100%). The segments represent parts of the whole. The size of each segment is proportional to the size of the part that it represents.

Pie charts are primarily used to

- 🌐 Show the sizes of parts in relation to a single whole.
- 🌐 Show the sizes of those parts in relation to each other.

Often, pie charts also emphasize one or more significant elements in the data.

Table 8.6 gives the export item destination of the five continents in percent. Then,

the same data appears as a pie chart in Figure 8.17.

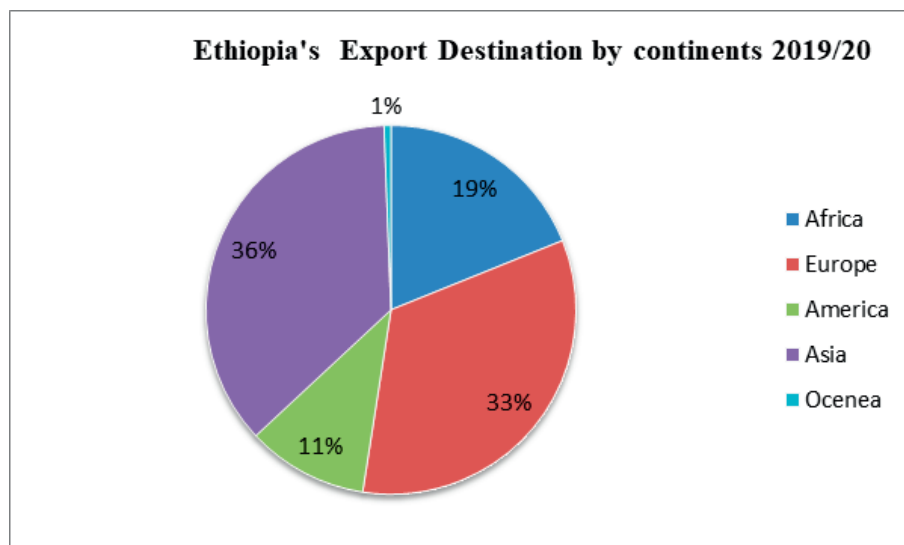
Pie charts use segments of a circle to show the percent of export destination that make up a data series. Steps used to draw a pie chart:

1. The circle can be of any convenient size depending upon the available space for drawing.
2. The circle is divided into segments which are proportional to the value of the individual components calculated as a percentage of the total and, 1% of the whole circle is equivalent to 3.6% of the value of an item or data component. Segments can be drawn accordingly with a protractor.

*Table 8.6: Ethiopia's Export by destination continents*

Destination continents	Africa	Europe	America	Asia	Oceania
Export (%)	18.9	33.6	10.6	36.4	0.6

*Source: National Bank (2019/20)*



**Figure 8.17:** Ethiopia's Export Destination by Continents

## Activity 8.8



### 1. Draw a line graph for the following data.

Table 8.7: Early Child Mortality Rate in Ethiopia (2000-2016)

Year	NMR	IMR	Under 5 MR
2000	49	97	166
2005	39	77	123
2011	37	59	88
2016	29	48	67

Source: Ethiopia Demographic & Health Survey (2016)

### 2. Draw Bar Graph to represent the following data.

Table 8.8: Ethiopia's Sectorial Percentages Shares in GDP (2017-2020)

Sector	Share (%)		
	2017/18	2018/19	2019/20
Agriculture	34.9	33.3	32.7
Industry	27.0	28.1	29.0
Service	39.2	39.8	39.5

Source: National Bank of Ethiopia, 2019/20

### 3. Draw a pie chart for the following data

Table 8.9: Grain Crops Production Ethiopia (%) 2018/19

Crop Category	Cereals	Pulses	Oilseeds	Total
%	87.97	9.54	2.49	100

Source: CSA, 2020

## UNIT SUMMARY

- 🌐 Map-reading deals with the skill of reading maps. A map is a simplified, diminished, plain representation of the earth's surface
- 🌐 Map making is the skill of making maps. Thus it includes traditional map making and modern map making
- 🌐 Maps are basically used for identifying locations, distance, area and direction.
- 🌐 A map scale can be expressed on map in three ways. These are: Scale statement, Representative fraction and Graphic scale
- 🌐 The scale of a map can be calculated by using a known distance between two points or between parallels or latitudes.
- 🌐 The area of regular and irregular features can be measured from maps.
- 🌐 Direction is always measured clock wise starting from north. Direction can be expressed in compass points (N, E, S, W) or in degree (bearings)
- 🌐 Position of a place can be described from maps by using latitude and longitude and national grid reference.
- 🌐 The most accurate and international method used for locating places on maps is the geographic grid reference (latitude and longitude).
- 🌐 Conventional signs and symbols are those signs and symbols that are used on maps through the agreement of all map-makers of the world.
- 🌐 Line graphs, bar graphs and pie charts can be used to represent statistical data. These simplified and easily understandable formats make it easy to compare places and phenomena



# REVIEW EXERCISES

## PART I: MULTIPLE CHOICE ITEMS

**Direction: Choose the correct word or phrase from the given alternatives.**

- The meaning of symbols on a map can be obtained from \_\_\_\_\_
  - Key
  - Title
  - Scale
  - Grid
- The marginal information that shows the relationship between distance on the map and ground distance is:
  - Key
  - Scale
  - Title
  - Grid reference
- Distance on the field are not usually measured in
  - Centimetre
  - Kilometre
  - Mile
  - Meter
- Which one of the following scales is for a small-scale map?
  - 1: 250,000
  - 1:75,000
  - 1: 40,000
  - 1:10,000
- If the angular bearing of point A to point B is  $135^{\circ}$ , then the cardinal direction will be:
  - Northwest
  - Southwest
  - Northeast
  - Southeast
- Large-scale maps:
  - cover smaller areas than small-scale maps
  - convey less information than small-scale maps
  - have scales that lie between 1:50,000 and 1:250,000
  - are used to cover a large area in detail

**PART II: COMPLETION ITEMS**

**Directions: Complete each of the following sentences with the correct word or phrase.**

7. All distances obtained through measurements on maps and the use of the scale, only are called \_\_\_\_\_
8. \_\_\_\_\_ is an instrument used to get accurate areas of both regular and irregular shaped features from maps.
9. Imaginary lines that join all the points with the same Latitudes are called \_\_\_\_\_
10. \_\_\_\_\_ is the northerly direction along a line on Longitude.
11. The four cardinal points of the compass are: \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_

**PART III: WORKOUT ITEMS**

**Direction: Show all the necessary steps**

12. Convert the following RF to statement scale.
  - A. 1:10,000
  - B. 1:1,000,000
  - C. 1:250,000
  - D. 1:500,000
13. Convert the following scale statement to RF.
  - A. 1cm to 1km
  - B. 1cm to 2km
  - C. 1cm to 1.5 km
  - D. 1cm to 4.5km

# Glossary

***Afro-alpine*** – A natural vegetation that grows at altitudes above 3300 meters.

***Agroforestry*** – The planting of trees that could provide edible fruits along with the purpose of covering the surface.

***Altitude - Height above sea level.***

***Climate-smart agriculture (CSA)*** – is an integrated approach to managing landscapes cropland, livestock and forests that address the interlinked challenges of food security and accelerating climate change.

***Climate change***– refers to a change in the state of the climate that can be identified (e.g. using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer

***Climate Resilient Green Economy (CRGE)*** – is strategy sets that by 2025 Ethiopia will be a middle- income country, resilient to climate change impacts and with no net increase in greenhouse gas emissions from 2010 levels.

***Compact shape countries*** – The distance from the geographic center of the state to any of the borders does not vary greatly.

***Deforestation*** – it is the process of indiscriminate destruction of the natural vegetation cover of an area without adequate replacement.

***Denudation- It is the long*** – term sum of processes that cause the wearing away of the Earth's surface by moving water, ice, wind and waves, leading to a reduction in elevation and relief of landforms and landscapes.

***Elongated shape countries***– They are geographically long and relatively narrow like Chile.

***Endemic***– Plant or animal found only in a particular country or region.

***Endogenic force*** – is the pressure that originates inside the earth. These internal forces lead to vertical and horizontal movements and result in subsidence, land uplift, volcanism, faulting, folding, earthquakes, etc.

***Environmental degradation*** –is loss or deterioration of the quality of the environment often expressed by loss of soil, plants and other living things.

**Epeirogenic** – is the uplifting or sinking of the surface. It is the vertical movement of the surface.

**Epoch** – is a subdivision of geological period

**Era** – is the second largest division of geological time characterized by differences in life forms (Example: Paleozoic era - an era of amphibians, Mesozoic era - an era of reptiles).

**Exogenic force**– is a force which derives its strength from the earth's exterior or originate within the earth's atmosphere.

**Fragmented shape countries**–They are divided from their other parts by either water, land or other countries.

**Geographic information system (GIS)**– an organized collection of computer hardware, software, and geographic data that is designed to capture, store, update, manipulate, and display geographically referenced information.

**Geological location** – is a variant of relative location that considers global or semi-global areal extents (Example: the location of Ethiopia with reference to the middle East, etc).

**Global positioning system (GPS)** – is a system of satellites which orbit the earth on precisely predictable, paths, broadcasting highly accurate time and locational information.

**Igneous rock**– A Rock formed when molten material, magma, solidifies, either within the Earth's crust or at the surface

**Latitude** – is angular distance of places north and south of the equator.

**Leaching** – is the removal of minerals that have been dissolved in water.

**Longitude**– is angular distance east and west wards from the prime Meridian.

**Metamorphic rock**– A rock which has been changed by intensive heat or pressure

**Orogenic**– mountain building associated with Fold Mountain. Unlike the epeirogenic, it is a horizontal movement of the earth's crust (surface).

**Over cultivation** – is a continuous ploughing of a given farm land without fallowing or rotating crops.

**Overgrazing**– keeping too many cattle over a given grazing land.

**Peneplanation**– is a low-relief plain formed by protracted erosion.

**Period** – is a subdivision of geological era.

**Pollution** – is a damage to the environment caused by waste levels that overload natural recycling systems or by synthetic materials that cannot be broken down by natural processes.

**Regression**– is a geological process occurring when areas of submerged seafloor are exposed above the sea level.

**Relief** – involves the vertical and horizontal dimensions of land surface.

**Rift valley**– is a valley formed by the sinking a portion of land between two parallel faults.

**Science** – is the intellectual and practical activity encompassing the systematic study of the structure and behavior of the physical and natural world through observation and experiment.

**Sedentary**– Fixed in place not nomadic.

**Sedimentary rock**– It is a rock, which is composed of the fragments and particles of older rocks that have been eroded and the debris deposited by wind or water, often as distinct strata. Their origin can be organic or inorganic.

**settlement**– refers to the characteristic groupings of population into occupancy units, together with the facilities in the form of houses and streets, which serve the inhabitants

**Spatial**– To do with geographic (not outer) space with distribution or location across a land Scape or surface.

**Sustained development** – A continuous/unwavering development trend that meets the needs of the present generation without compromising the ability of future generations to meet their own needs.

**Transgression**– is a geologic event during which sea level rises relative to the land and the shoreline moves toward higher ground, resulting in flooding.

**Vicinal location** – Unlike geological location, it is a type of relative location that considers very nearby areas (i.e., neighboring countries).