GEOGRAPHY

STUDENT TEXTBOOK

GRADE 10

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FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA
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GEOGRAPHY STUDENT TEXTBOOK GRADE 10

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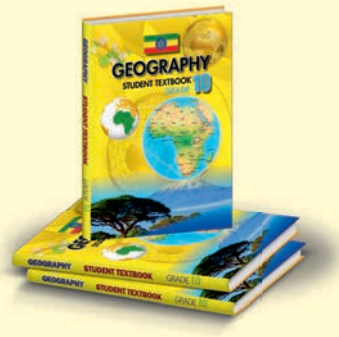

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Writers: Wondafrash Genet Degu (M.A.)
Kenate Worku Tabor (Ph.D.)

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.)

Evaluator Dereje Guteta (Ph.D.)
Tesfaye Shiferaw (Ph.D.)
Abebe Yibeltie (M.A.)
Hussein Seid (M.A.)

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UNIT ONE

1 LAND FORMS OF AFRICA

INTRODUCTION

In the previous grade, you have studied many important features of our country – Ethiopia. Here in grade ten, you will primarily study about our wonderful continent – Africa. Hence, this textbook examines the nature of Africa's landforms, climate, natural resource bases, population, economic and cultural activities. Human environment interactions, geographic issues and public concerns in Africa ,and geospatial information and data processing are other important issues and skills that you will study in this grade. Therefore, successful completion of the subject at this grade level helps you to develop an understanding and acquire knowledge of basic geographic concepts, principles, and theories – focusing on Africa.

Unit Outcomes

After completing this unit , you will be able to:

- *develop general idea on the major landforms of the world;*
- *identify the major landforms and their spatial distribution in Africa;*
- *describe the major landscape features of Africa; and*
- *recognize the spatial variations in the distribution of the major landforms in Africa*

Main Contents

1.1 OVERVIEW OF THE WORLD'S MAJOR LANDFORMS

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

- *explain the formations of major landforms of the world;*
- *locate the major landforms of Africa; and*
- *explain the spatial variations in the distribution of the major landforms in Africa.*

KEY TERMS

- *Continents*
- *Landforms*
- *Mountains*
- *Oceans*
- *Peninsula*
- *Plain*
- *Plateaus*
- *Plate tectonic*
- *Volcanic activities*

Landforms are physical features on the Earth's surface that form terrain of an area. **Mountains**, **plateaus**, and **plains** are the three major types of landforms. Minor landforms include hills, gorges, valleys, and basins.

Activity 1.1

1. How do the major and minor landforms occur?

Tectonic plate movement and volcanic activities (internal processes) in the Earth's interior can create landforms by pushing up mountains and hills. Erosion by water and wind (external processes) can erode land and create minor landforms like gullies, river valleys ,and gorges. Both processes happen over a long period , sometimes millions of years. For example, it took a very long period to cut the deep Abbay Gorge between the towns of Goha Tsiyon in North Shewa, Oromia, and Dejen in East Gojam, Amhara National Regional State. The Abbay Gorge thus cuts down about 1000 m deep between the two towns mentioned above.

Figure 1.1: *Abbay Gorge at a Point Near Goha Tsiyon and Dejen Towns*

Activity 1.2

1. What important (specific) landform features can you indicate from Figure 1.1 above?

The major landforms (mountains, plateaus and plains) are widely distributed on the earth's surface. The surface of the Earth is covered by **land** and **water**. The landforms make up **continents** and the water forms **oceans**. Continents are the largest landmasses in the world. The Earth is divided into seven continents, from largest to smallest are; **Asia**, **Africa**, **North America**, **South America**, **Antarctica**, **Europe,** and **Oceania** (**Australia)**.

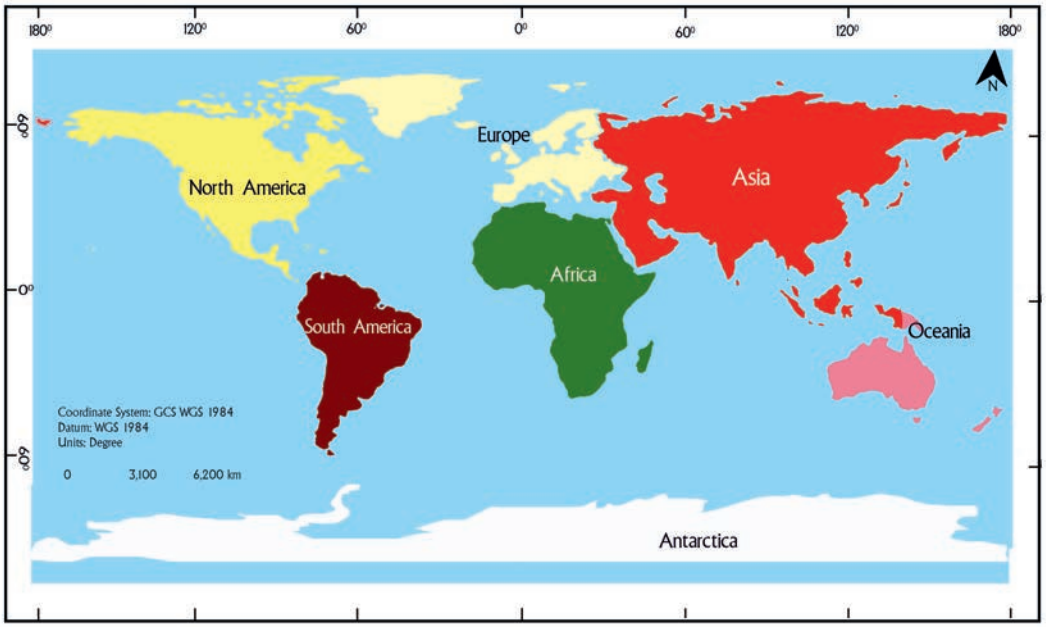


Figure 1.2: *Map of the World*

Activity 1.3

1. In which of the continents is our country – Ethiopia found?
2. Can you indicate Ethiopia on the map in Figure 1.2 above?
3. Can you indicate Japan on the map in Figure 1.2 above?

Oceans are large areas of salt water between the continents. Although all the oceans are connected, making them one big ocean, they are divided into five smaller oceans that are separated by their location and the way the water in them moves. These oceans are the **Arctic** Ocean, the **Atlantic** Ocean, the **Indian** Ocean, the **Pacific** Ocean, and the **Southern** Ocean. The oceans together cover huge areas of the Earth. They cover seventy one percent of the Earth. The Pacific Ocean is both the largest and the deepest ocean, which covers one-third of the Earth's surface.

Oceans are important factors for creating or forming coastal land features such as **islands**, **peninsulas, isthmuses.** An island is a piece of ground that is completely surrounded by water. Islands can be big or small in any part of the world. The largest island in the world is Greenland. Australia is bigger than Greenland but it is considered as a **continent** instead of an island.

Activity 1.4

1. List sovereign island countries of the world within their respective continents.

Africa	Asia	Europe	North America	Oceania

Two more coastal land features that involve a little land and a lot of water are **peninsulas,** and **isthmus**. A **peninsula** is a piece of land that has water on three sides but it is connected on the fourth side to the mainland. The two well-known peninsulas are Italy and Florida. An isthmus is a narrow strip of land with water on both sides connecting two larger pieces of land. A well-known example is the Isthmus of Panama that connects North America to South America.

Activity 1.5

1. What are the three major landforms of the world?
2. Why is it important to study about the landforms?

The major landforms of the world create unique areas where people around the world want to know, explore, and visit. These landforms generally divide continents and countries into different physiographic divisions. Let us find out important physiographic regions formed by these landforms in the world.

I. Mountain

Mountains are the largest elevated and most recognizable landforms on the Earth's surface. They have steep sides, and high peaks, that stand out from the surrounding land. Around mountains, we may find smaller, less steep landforms called **hills**. Mountains are usually formed when rock layers are pushed together from opposite sides. Thus, the pressure exerted from the movement forces the land in the middle to rise. The low areas between mountains are called **valleys**. Mountains may also be

formed by volcanic activity when lava and other materials build up on the surface, but mountains are not the only landforms that can be made by volcanoes.

The highest landform on Earth is Mt. Everest. It is a peak in the Himalaya's Mountain range. It is located between Nepal and Tibet. It measures 8,849 meters above sea level. It is part of the **Himalaya Mountain range** that runs across several countries in South and Southeast Asia such as India, Pakistan, Nepal, Bhutan, China, and Afghanistan. The mountain range extends 320 to 400 kms in width and 1500 kms in length. The Himalayas were formed about 40 to 50 million years ago when the Indian tectonic plates collided with the Eurasian plate. Indian tectonic plate and the Eurasian plates are continental crust and have the same density. Therefore, when the two plates collide, pushing upwards at their edges formed the Himalayan Mountains.

Figure 1.3: *Landforms of the World – Mountains*

Landforms can also exist under oceans in the form of mountain ranges and basins. The Mariana Trench, the deepest landform on Earth, is in the South Pacific Ocean.

II. Plain

Another major type of landform is **plain**. Plains are large areas of flat low land with no hills or mountains in them. The Great Plains in the mid United States is a good example of a large plain. Plains are very important areas for crop cultivation and animal husbandry (ranch).

III. Plateaus

Plateaus are large areas of raised land that are flat on top. Plateaus may be formed by volcanic activity beneath the earth's surface. Sometimes the pressure of the magma beneath is not strong enough to break through the crust and create a volcano, hence, instead, the land is pushed upwards, plateaus may stand all by themselves in otherwise flat land or may sometimes be close to other plateaus.

Activity 1.6

1. Use Figure 1.3 and mark the following;

- *Himalayas*
- *Plain areas*
- *Mariana trench*

1.2 LOCATION AND RELATED FEATURES OF AFRICA

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

- *identify the location and size of Africa in relation to the other continents and major water bodies.*

KEY TERMS

- *Continents*
- *Equator*
- *Surface area*
- *Sovereign state*

The continent of Africa is bounded by the Mediterranean Sea, the Red Sea, the Gulf of Aden, the Indian Ocean, and the Atlantic Ocean. It is divided into half by the **Equator**.

Africa is the second largest and second most populous continent on earth after Asia in both cases. Africa's areal size is 30.37 million Km^2, hence, it covers 6% of the Earth's total surface area and 20% of its land area. Africa's total population was estimated to be 1.3 billion people in 2020. Therefore, Africa accounts for about 16% of the world's population.

Figure 1.4: *Africa - Location and Countries*

Africa is home to 54 recognized sovereign states. This division of Africa into almost two equal parts (lengthwise) across the equator makes the climatic and physical conditions in the north repeat themselves in the south. For example, the Kalahari Desert is exactly similar to the Sahara in the southern part of Africa; the Karoo in southern part of the continent matches the Maghreb, and the conditions in the Cape area are almost identical to those of the Mediterranean region in the north.

1.3 MAJOR LANDFORMS OF AFRICA

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

- *explain the spatial variations and distributions of the major landforms in Africa.*

KEY TERMS

- *Atlas Mountains*
- *Benguela*
- *Congo Basin*
- *Deserts*
- *Ecosystems*
- *External processes*
- *Graben*
- *Great Escarpment*
- *Great Karoo*
- *Highveld*
- *Hills*
- *Internal processes*
- *Island*
- *Isthmus*
- *Macroclimate*
- *Microclimate*
- *Rift Valley*
- *The Sahara*
- *The Sahel*
- *The Savanna*
- *Tropical rainforest*

Landforms are the results of volcanic and tectonic processes. These processes form major landforms of the world as mentioned in the section 1.1 above. Similarly, in Africa there are several recognizable major landforms. Understanding landforms is very important because as part of a landscape, landforms greatly affect human perception and interactions with the environment. Landforms provide a physical context for describing the landscape, topography, and ecological units within the environment. Understanding the physical and historical context of the landscape is necessary in order to understand the temporal and spatial scales of ecosystems. Landforms are ecologically important elements because **ecosystems** (which consists of all the organisms and the physical environment with which they interact) develop within landform regions, and material and energy flows occur within the landform system. Landforms also affect, modify, and influence climate. The effect can be recognized in both large areas as **macroclimate** and small areas as **microclimate**.

Effects of landforms on ecosystem patterns and processes include:

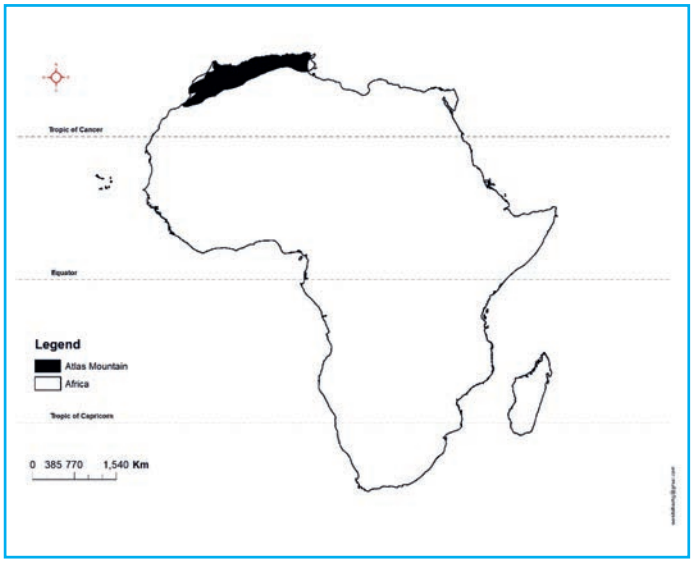
1 *Landform attributes (elevation, steepness of slope, and aspect) produce many different patterns which determine the ecological potential of an area.*
2 *Landform regions affect the flow of organisms, energy ,and material.*
3 *Landform regions affect the spatial pattern of non-geomorphic disturbance by fire and wind.*
4 *Landforms may resist changes that geomorphic processes create; hence they protect biotic features and processes.*

In Africa , there are four significant landform regions. Each of these regions contains eight major physical regions: the Atlas Mountains, the Sahara, the Sahel, the savanna, the rainforest, the Rift Valley and African Great Lakes, the Ethiopian Highlands, mountains and desert systems of South Africa. Some of these regions cover large bands of the continent, such as the African massif of the Sahara and Sahara Desert.

Table 1.1: Major Regions of Landform in Africa

Major Landform Regions	Physical Regions
African Alpine System	Atlas Mountains
African massif	The Sahara
	The Sahel
	The Savanna
	The Tropical rainforest
East African Highlands and rift system	The Rift Valley and African Great Lakes
	The Ethiopian and Eritrean Highlands
Southern Africa Platform	Mountains and desert systems of Southern Africa

1.3.1 African Alpine System



***i. Atlas Mountains*:** contains a range of mountains in North Africa that extends from Morocco to Tunisia. It forms a series of mountain chains including, the Anti-Atlas, High Atlas, Middle Atlas, Rif Mountains, Tell Atlas, and Sahara Atlas.

Figure 1.5: *Atlas Mountain*

The Atlas Mountains make up the *Maghrib* (meaning 'west' in Arabic) region including Morocco, Algeria, and Tunisia. The mountain range extends for more than 2,000 kilometers, from the Moroccan port of Agadir in the southwest, to the Tunisian capital of Tunis in the northeast. The topography of the mountain forms a high divide between the Mediterranean Sea in the north and the Sahara Desert in the south.

Activity 1.7

1. The Atlas Mountain covers part of the countries of Algeria, Morocco, and Tunisia. Arrange the countries where the Atlas covers from the largest to the smallest based on Figure 1.4 and Figure 1.5 above.

1.3.2 African Massif

I. The Sahara Desert

The Sahara is a desert on the African continent. With an area of 9,200,000 square kilometers, it is the largest hot desert in the world. It covers the entire region of North Africa, from the Atlantic coast in the west to the Red Sea in the east. The Sahara borders the Mediterranean Sea and the Atlas Mountains in the north, extending south into **Sudan** and a region known as the **Sahel**. The Sahara encompasses whole

or large parts of ten countries in North Africa. These countries are Algeria, Chad, Egypt, Libya, Mali, Mauritania, Morocco, Niger, Sudan, and Tunisia.

Figure 1. 6: *Desert Landscape*

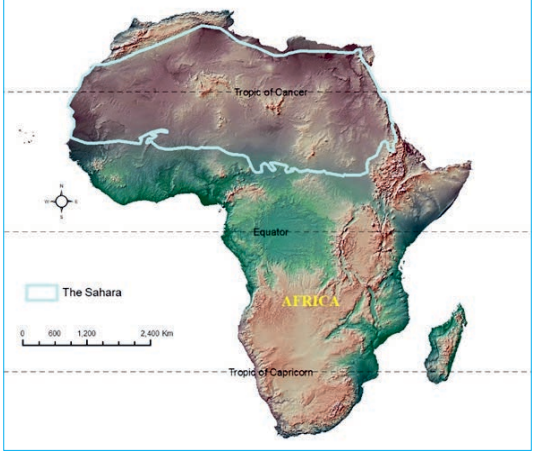


Figure 1.7: *The Sahara*

The landscape of the Sahara is covered with sand. The Sahara Desert has enormous quantities of reddish sand dune that is weathered from **sandstone**. This sand makes up a great sand sea, called an *erg*. Elsewhere in the Sahara, you find a desert pavement of pebbles on top of vast flat-surfaced sheets of sand. This type of surface is called a *reg*.

Figure 1. 8: *Erg* - in the Sahara Desert

Figure 1.9: *Reg* - in the Sahara Desert

Activity 1.8

1. Using Figure 1.8 and Figure1. 9, compare and contrast the *erg* and *reg*. What are the similarities and differences between them?

II. The Sahel

The Sahel is a vast semiarid region of North Africa, to the south of the Sahara that forms a transitional zone at the south of the desert and comprises the northern part of the region known as the **Sudan**. Sahel is an Arabic word (*sahil*) meaning "shore". It refers to the 5,000 kilometers stretch of savanna that is the shore or edge of the Sahara Desert. The Sahel spreads west to east from Mauritania and Senegal to Somalia. Countries in the Sahel include: Mauritania, Senegal, Mali, Niger, Nigeria, Burkina Faso, Chad, Sudan and Eritrea.

The Sahel lands are grasslands and savannahs, with scrub areas to the north, alternating areas of trees, mainly acacias in the south.

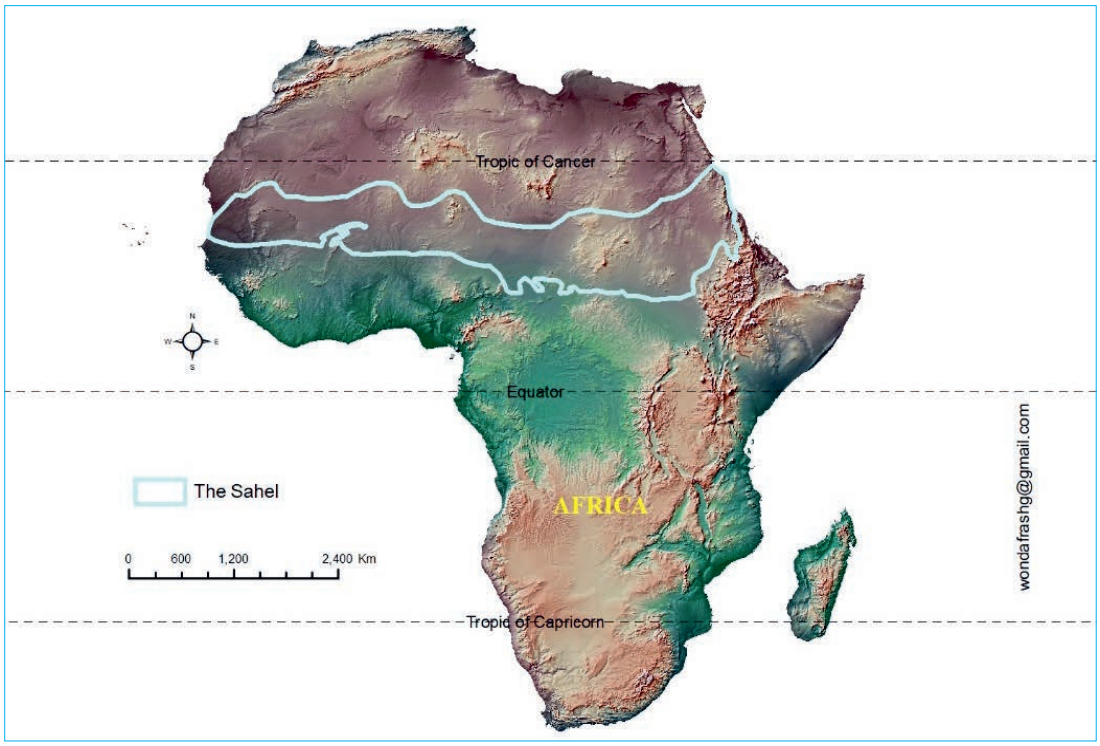


Figure 1.10: *The Sahel*

The semiarid grassland of the Sahel has natural pasture (*land covered with grass and other low plants suitable for grazing animals*), with low-growing grass and tall herbaceous perennials. Hence, there is plenty of forage for the livestock (camel, pack ox, and grazing cattle and sheep).

The landscape of the Sahel is similar to the savanna type. However, it tends to merge into **desert** because of human activities and climate change.

Activity 1.9

1. What is desertification? How can desertification be a problem in the Sahel Region?

III. The Savanna

The Savanna is a transitional region between rainforest and the Sahel grassland. The African savanna region is a tropical grassland with few trees and shrubs (*a shrub is a woody plant smaller than a tree and has a very short stem with branches near the ground*). The trees in the Savanna region are drought resistant *trees.* The tree and shrub species in the savanna usually shed their leaves during the dry season. The shedding of the leaves is an **adaptation** process of the trees to the all year-round hot temperature of the Savanna. This adaptation reduces water loss from the plants.

Figure 1.11: *The Savanna Region*

Figure 1.12: *The Savanna Woodland*

Figure 1.13: *Thorn Tree Tall Grass Savanna*

Based on vegetation types, the Savanna region has two important parts – woodland and thorn tree tall grass Savana. In *Savana woodland*, the trees are widely spaced because there is not enough soil moisture during the dry season to support a full tree cover (Figure *1.11*). The open spacing lets a dense lower layer where grasses develop. The woodland has an open, park-like appearance.

In the tropical savanna woodland of Africa, the trees are of medium height. Tree crowns are flattened or umbrella-shaped, and the trunks have thick, rough bark. Some species of trees are *xerophytic forms* – adapted to the dry environment with small leaves and thorns. Others are broad-leaved **deciduous** species that shed their leaves in the dry season. Fires occur frequently in the savanna woodland during the dry season, but the tree species are mostly fire resistant.

Activity 1.10

1. Why do we find many parks in the Savanna region in Africa?

IV. The Tropical Rainforest

Tropical rainforests occur both to the north and south of the ***Equator***. The rainforests near the equator are known as *equatorial rainforests*. These forests are very diverse and contain large number of plant and animal species. Flora is highly diverse in the equatorial rainforests where a square kilometer may contain as many as 100 different tree species as compared to 3 or 4 in the temperate zone. *Broadleaf evergreen trees* dominate the vegetation cover.

Six African countries – Cameroon, Central African Republic, Republic of the Congo, Democratic Republic of the Congo, Gabon, and Equatorial Guinea makeup the

Congo Basin of the Tropical Rainforest. Other areas where the rainforest is found include; Ghana, Ivory Coast and Madagascar.

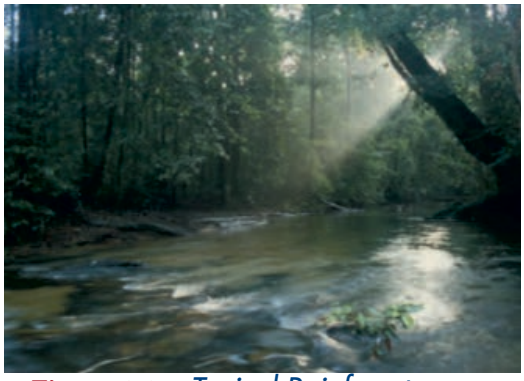


Figure 1.14: *Typical Rainforest*

Figure 1.15: *Buttress of Tall Tree*

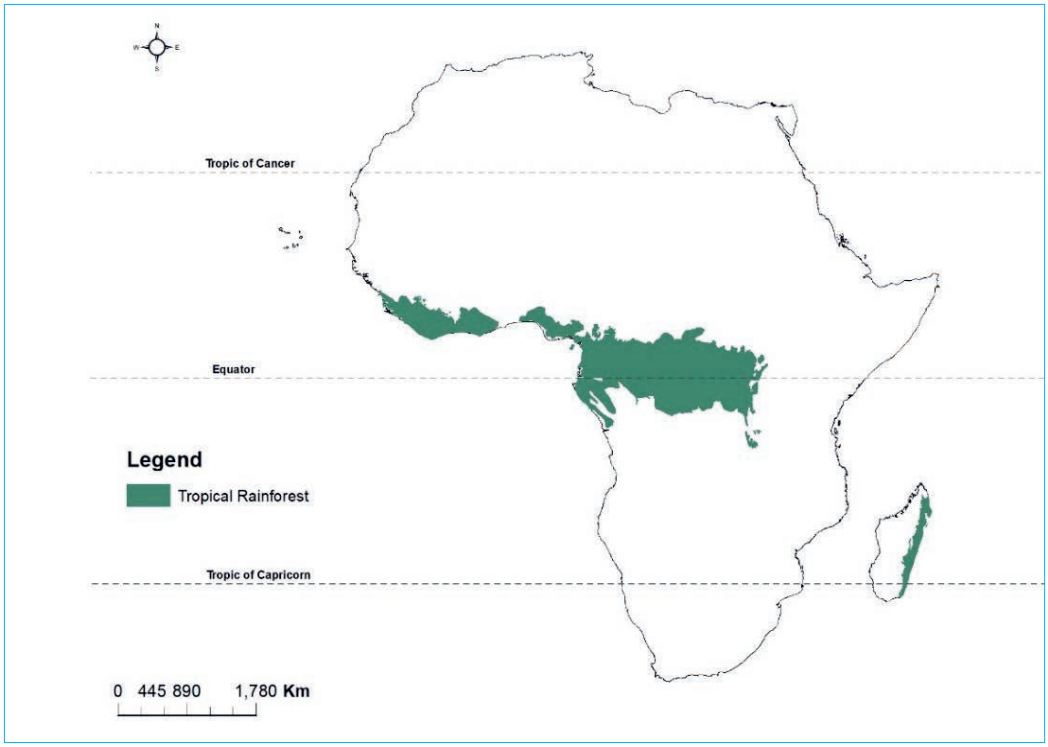


Figure 1.16: *The Tropical Rainforest of Africa*

The various trees of the tropical rain forests are closely spaced together and form a thick continuous canopy some 25 to 35 meters tall. Sometimes the canopy is interrupted by the presence of very tall trees (up to 40 meters) that have wide buttressed bases for support. Most plants are evergreen with large, dark green, leathery leaves. Epiphytic and herbaceous plants as well as vines (lianas) and ferns are very characteristic of the tropical rainforest.

The rainforest climate is wet all the year or it has a short dry season. Annual rainfall, which exceeds 2000 to 2250 millimeters, is evenly distributed throughout the year. Temperature and humidity are relatively high throughout the year.

Decomposition is rapid in the tropical rainforests because of high temperature and high moisture. Meanwhile, due to the frequent and heavy rainfall in the area, tropical soils are subject to extreme ***chemical weathering*** and ***leaching***. These environmental conditions also make tropical soils ***acidic*** and ***nutrient*** poor.

Activity 1.11

1. Why do trees in the rainforests grow very tall?

1.3.3 East African Highlands and Rift System

I. The Rift Valley and African Great Lakes

The Rift Valley of East Africa was formed by normal **faulting**. It was formed as the land stretched by forces moving in opposite direction creating rupture and splitting apart the land in between. This creates an area called **graben**. This is an elongated block of the earth's crust lying between two faults and displaced downward relative to the blocks on either side in a rift valley.

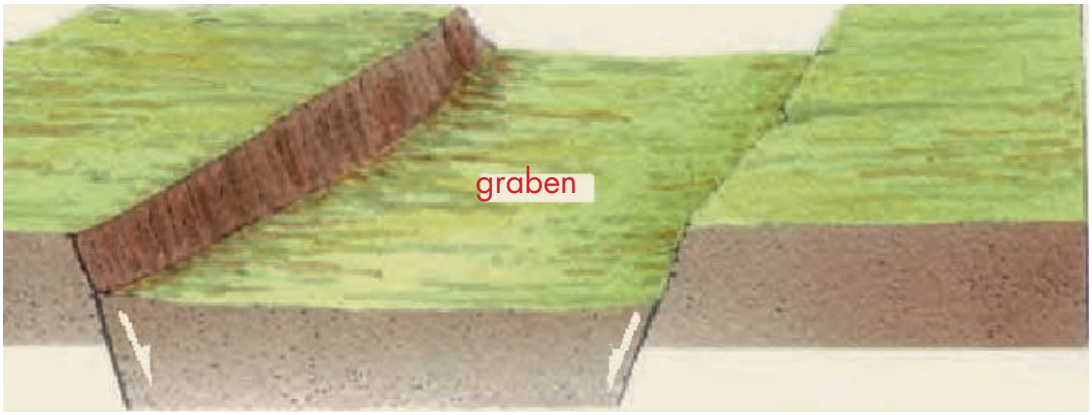


Figure 1.17: *Formation of Graben or Rift*

The Rift Valley System is a unique feature of Africa's physiography. It begins from the Red Sea and extends through the Ethiopian landmass to the Lake Victorian region where it subdivides into an east and west segment and continues southward through Lake Malawi to Mozambique. Its total length is estimated to be 5,600 km. The average width of the Rift Valley System ranges between 32 km and 80 km.

The **Rift Valley lakes** are series of lakes in the East African Rift valley that runs through eastern Africa from Ethiopia in the north to Malawi in the south, and includes the **African Great Lakes** in the south. Many of the lakes are **freshwater** lake with great biodiversity in them, while others are **alkaline** or salty lakes.

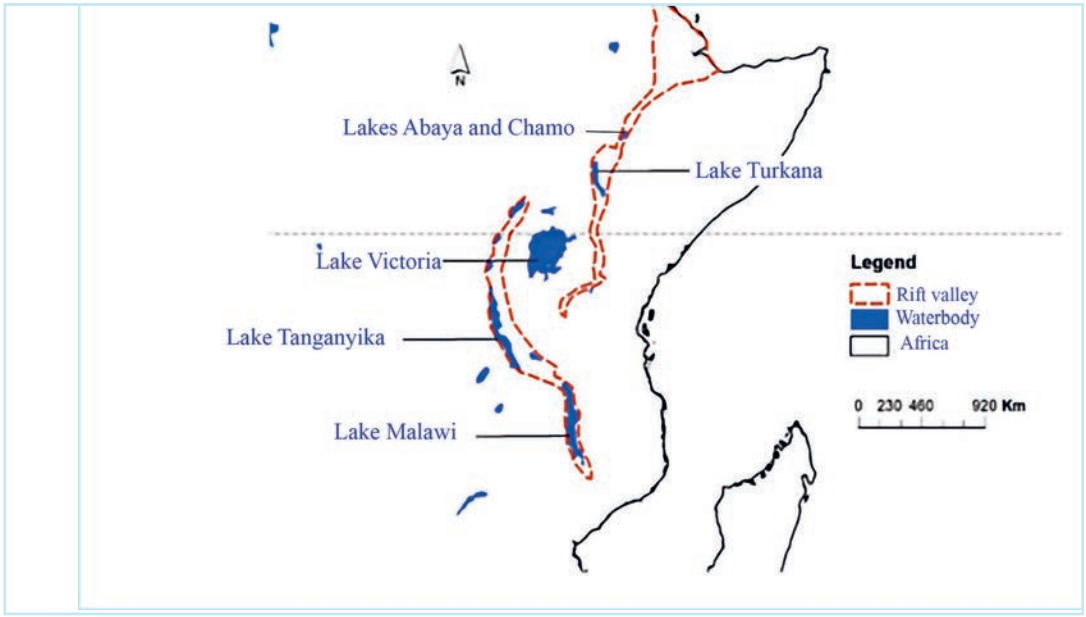


Figure 1.18: *The Rift Valley and African Great Lakes*

The **Ethiopian Rift Valley** lakes are the northernmost of the African Rift Valley lakes. In central Ethiopia, the Main Ethiopian Rift, also known as the Great Rift Valley, splits the Ethiopian highlands into northwestern and southeastern halves, and the Ethiopian Rift Valley lakes occupy the floor of the rift valley between the two highlands.

Lake Victoria lies at an elevation of 1,134 meters above sea level, with an area of 68,800 square kilometers is the largest lake in Africa. It is not in the rift valley, but instead occupies a depression between the eastern and western rifts formed by the uplift of the rifts to either side.

II. The Ethiopian and Eritrean Highlands

Ethiopia has some of the most spectacular scenery in Africa. Much of the country is set on a high plateau, with a massive central highland complex of mountains divided by the deep Great Rift Valley and a series of lowlands along the periphery (edges) of the higher elevations. The wide diversity of terrain produces regional variations in climate, natural vegetation, soil composition, and settlement patterns.

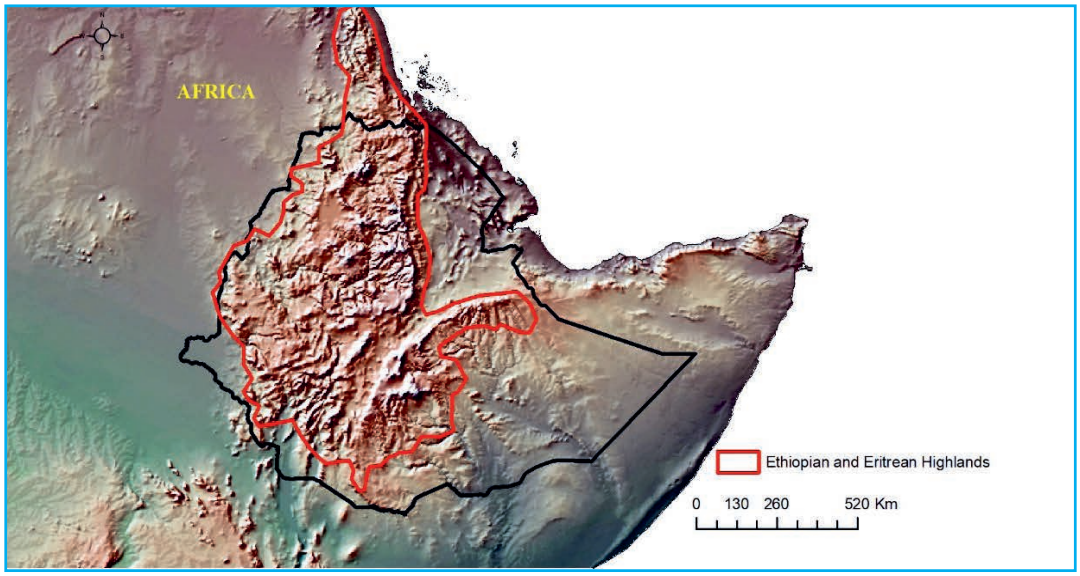


Figure 1.19: *Ethiopian and Eritrean Highlands*

Ethiopia's northwestern highlands extend into Eritrea, reaching elevations of more than 2,000 meters above sea level. Eritrea shares the northeast section of the Ethiopian high plateau, which in appearance looks more like a set of rugged uneven mountains. The plateau, also known as the Northwestern Highlands, rise on the western scarp of the Great Rift Valley and projects northward from Addis Ababa in Ethiopia to the Red Sea coastline in Eritrea. It descends to the Red Sea coast in a series of hills.

Activity 1.12

1. What is the role of the Rift Valley in the classification of Ethiopia into different physiographic regions?

1.3.4 Southern Africa Platform

I. Mountains and Desert Systems of Southern Africa

The region of the African continent south of the Congo and Tanzania is named Southern Africa. This landform region has a very diverse landscape. It includes escarpment, mountains, grassland, and desert landscapes. The Tropic of **Capricorn** runs straight through the middle of the region, indicating that the southern portion is outside the tropics or there is a **temperate** part in the region.

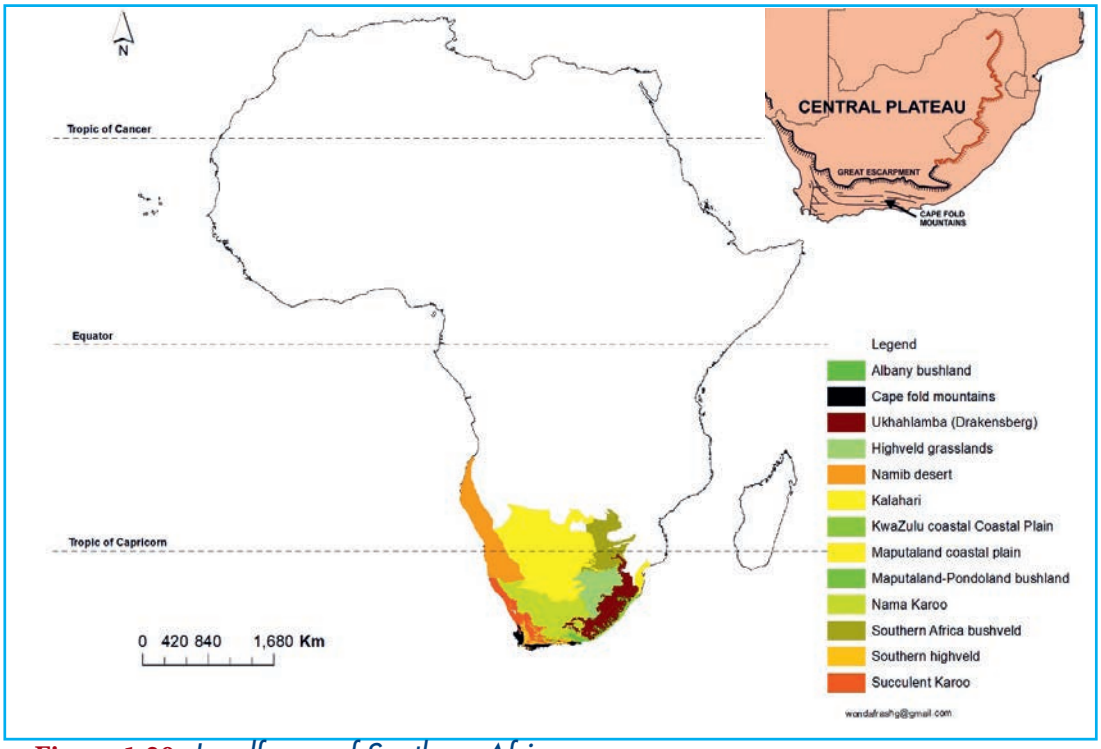


Figure 1.20: *Landforms of Southern Africa*

The **Ukhahlamba** (Drakensberg) escarpment is the most recognizable landscape in the region. The average altitude of the escarpment is almost 3,000 m above sea level.

Two important **deserts** form large part of southern Africa. The first one is the **Kalahari Desert**, which lies mainly in Botswana. It is an extensive desert region with an arid mixture of grasslands and sand. When there is adequate rainfall, the grasslands provide excellent grazing for wildlife. The Kalahari is home to game reserves and national parks. The second is **Namib Desert**, found along the west coast of Namibia. It is a desert land affected by the cold ocean current of **Benguela** that borders the area. Hence, the Namib desert was formed partly because of the cold ocean current nearby.

The **highveld** is the portion of the South African inland plateau. The Highveld slopes gently downwards and is bounded by the Great Karoo to the south, the Kalahari Desert to the west and the Bushveld to the north.

The highveld is home to some the South Africa's most important commercial farming areas, as well as its largest concentration of metropolitan centers, especially the Gauteng conurbation, which accommodates one-third of South Africa's population. The continuation of the Great Escarpment to the south separates the Highveld from KwaZulu-Natal. The southeastern portion of the Great Escarpment or the Ukhahlamba (Drakensberg) forms the boundary between KwaZulu-Natal and Lesotho.

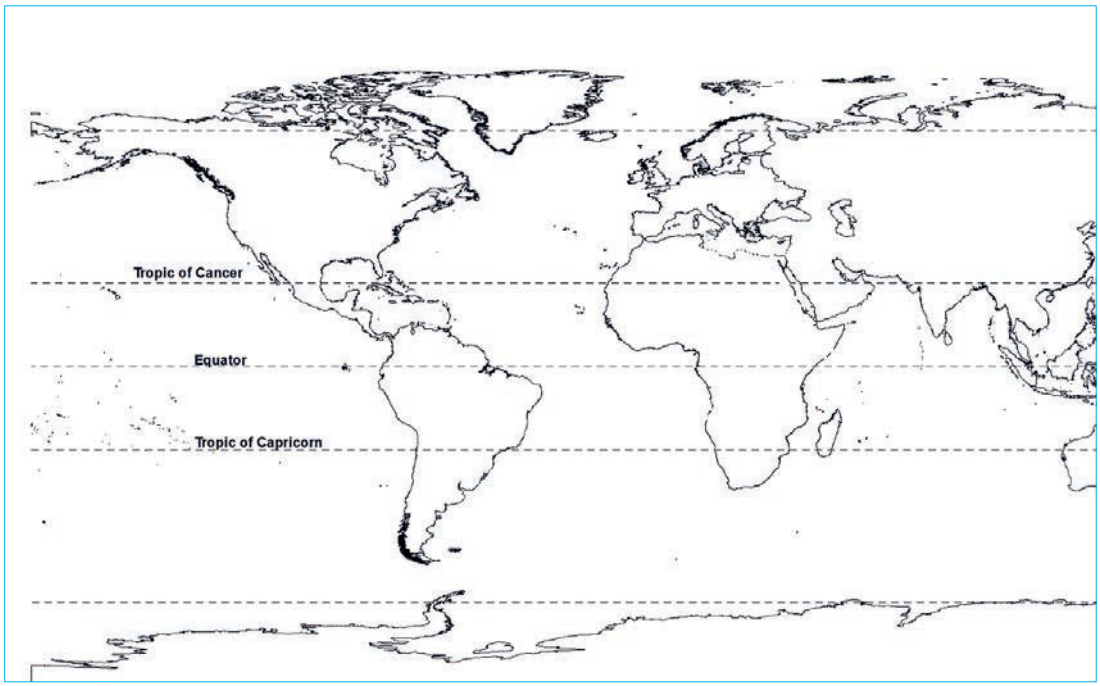


Figure **1.21:** *World Map for Exercises*

UNIT SUMMARY

Unit one examined the nature of Africa's landforms in detail. However, in order to have a better understanding of concepts related to landforms, an overview of the world's landforms was discussed. The major landforms of the world create very unique areas where people around the world want to know, explore and visit. Hence, landforms generally divide continents and countries into different physiographic regions or divisions.

Landforms are the results of volcanic and tectonic processes or internal and external processes that make up landforms. These processes form major landforms of the world. Understanding landforms is very important because as part of a landscape, landforms greatly affect human perception and interactions with the environment.

Africa has several recognizable major landforms. The landforms of our continent can broadly be categorized into four major regions – African Alpine System, African massif, East African Highlands and rift system and Southern Africa Platform. Each of the regions has a unique landform feature that distinguishes it from the other. The regions also vary in terms of the area they cover. Hence, the African Alpine System covers a small area compared to the African massif which covers a very large area of the continent.

REVIEW QUESTIONS

PART I. TRUE OR FALSE ITEMS

Direction: Write "True" if the statement is correct and write "False" if it is incorrect.

1. The Himalaya fold Mountains were formed when the Indian tectonic plates collided with the Eurasian plate.
2. Africa's largest lake, Lake Victoria, is found within the floor of the Great East African Rift valley.
3. A peninsula is a piece of land that has water on three sides but it is connected on the fourth side to the mainland.

PART II. MATCHING ITEMS

Direction: Match the items in column "A" with items in "B".

"A"	"B"
4. A dip or low point between two areas of higher ground.	A. Hill
5. An area of high ground but is lower than a mountain in elevation.	B. Mountain
6. A high land with steep slopes and a peak, that stand out from the surrounding land.	C. Plain
7. A long low-lying area of land, often with a river or stream running through it, that is surrounded by higher ground.	D. Plateau
8. A large area of raised land that are flat on top.	E. Saddle
9. Large areas of flat low land with no hills or mountains in them/areas of low relief with more or less flat surface configuration	F. Valley

PART III: MULTIPLE CHOICE ITEMS

Direction: Choose the correct answer from the given alternatives.

10. ---------- is a narrow strip of land with water on both sides connecting two larger pieces of land.

A. Peninsula
B. Isthmus
C. Strait
D. Gulf

11. Which of the following is not the characteristics of the tropical rainforest of Africa?

A. Confined to areas with equatorial climates both in the north and south of the equator
B. Different plants exhibit different stages of growth at the same time, due to the absence of climatic season.
C. Some species of trees are xerophytic forms – adapted to the dry environment with small leaves and thorns
D. Trees have little undergrowth, as the canopies of the tall trees prevent light penetration.

12. Which of the following is considered as the effects of landforms on ecosystem patterns and processes:

A. Landform attributes produce different patterns which determine the ecological potential of an area.
B. Landform regions affect the flow of organisms, energy and material.
C. Landform regions affect the spatial pattern of non-geomorphic disturbance by fire and wind.
D. All

PART IV: FILL IN THE BLANK SPACES ITEMS
Direction: Fill the blanks spaces with appropriate word(s).

13. _____and _____are the two deserts that form large part of southern Africa.

14. _____are a mixture of sand and gravel, often described as desert pavement of pebbles on top of vast flat surfaced sheet of sand.

PART V: SHORT ANSWER QUESTIONS
Direction: Answer the Following Questions

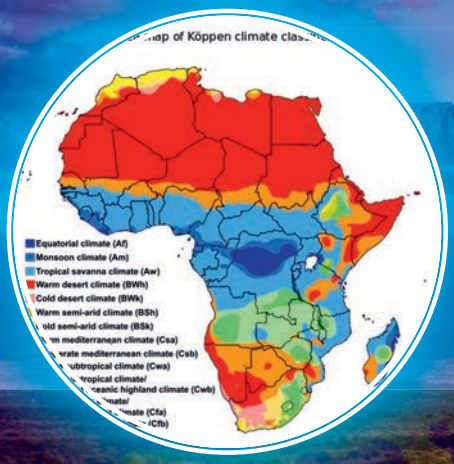
15. Use figure 1.21 to complete the following;
- i. Mark the continents of the world.
- ii. Mark the oceans of the world.
- iii. Mark the Atlas Mountains.

16. What are the major landforms of the world?

17. Why is it important to study about landforms?

18. In which of the major landforms of Africa are many of the national parks found?

19. What important landform feature divides Ethiopia into different physiographic regions?



UNIT TWO

CLIMATE OF AFRICA

INTRODUCTION

In unit one, you have learnt about landforms of Africa. In this unit , you will study about the climate of Africa. The first section of the unit presents the climate types or zones and regions of the world. In the second section, you will study the features of the climate of Africa.

Climate is an average of weather conditions in a place over a long period – 30 years or more. It represents the sum of all interacting atmospheric processes over a given period . Weather, on the other hand, refers to a short-term atmospheric condition such as the temperature and precipitation on a certain day, the state of the atmosphere with respect to heat or cold, wetness or dryness, calm or storm, clearness or cloudiness.

Climatic zones are spacious areas with a climatic similarity. The climate zones spread in an east-west direction around the Earth and can be classified using different climatic parameters. Climatic region refers to a continuous geographic area in which similar climate characteristics are observed. Average temperature is the most important factor in determining climate regions of the world, although other weather aspects like precipitation play roles.

Unit Outcomes

After completing this unit , you will be able to:

- *assess the climatic regions and climate types of the world;*
- *compare climatic regions within Africa;*
- *examine how climate provides substantial benefits for the life of people in Africa; and*
- *analyze the challenges posed by climate change on the development of Africa.*

Main Contents

2.1 OVERVIEW OF WORLD CLIMATIC REGIONS AND TYPES

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

- *identify the major climate types and regions of the world; and*
- *distinguish the different classification schemes of world climate.*

KEY TERMS

- *Climate classifications*
- *Climate*
- *Climate zones*
- *Climate regions*
- *Weather*

Global climate is a description of the climate of the Earth as a whole, with all the regional differences averaged. The world has several climatic zones. Geographers and climatologists defined climatic region based on different climatic elements. In fact, the Earth's climate is driven by energy from the sun which arrives in the form of radiation.

Activity 2.1

1. How many world climate regions and types do you know? How do climate scientists and geographers classify world climates into different types and regions?

2.1.1 Climate Classifications

Why classification? How do scientists classify world climates into different types?

Climate classifications help people know what types of conditions a region usually experiences throughout the year. Rather than describing the full range of conditions observed in a region over each month or season of a year, a classification scheme can communicate expected conditions using just two or three terms. Knowing a region's climate classification can be useful when choosing building materials for protection and durability, or when considering what crops are likely to thrive in a region. For tourists, knowing a location's climate classification can help them select and pack appropriate clothing.

There are various classification schemes used by climatologists for categorizing world's climate into different regions. Perhaps the first attempt at climate classification was made by the ancient Greeks, who divided each hemisphere into three zones: torrid (tropical), temperate, and frigid.

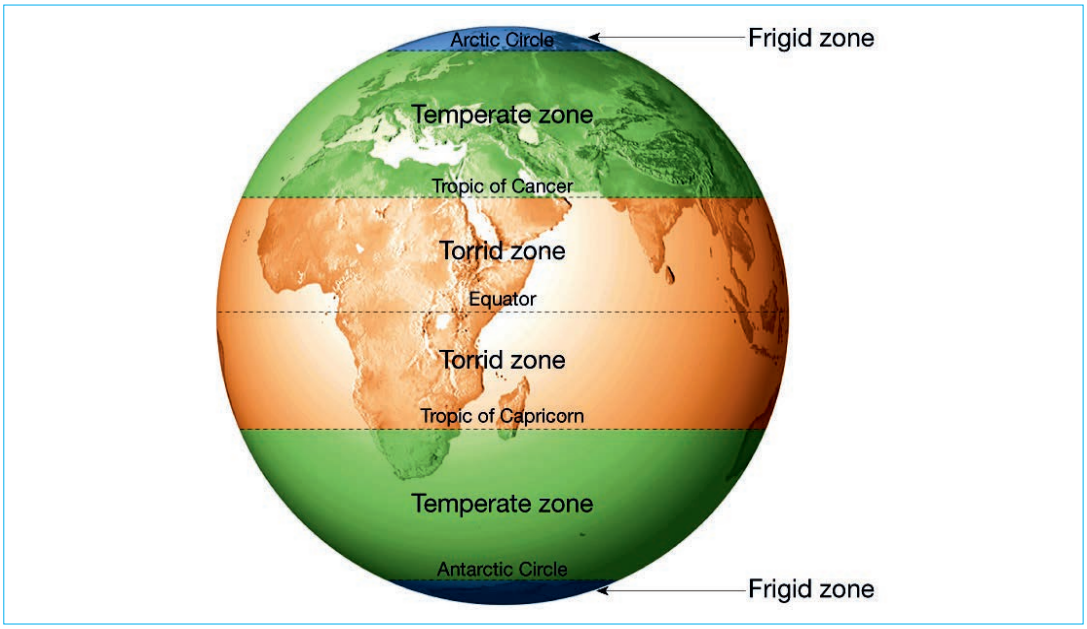


Figure 2.1: *World Climate Zones According to Ancient Greeks*

Since the beginning of the twentieth century, however, many climate-classification schemes have been devised. Long-term records of temperature and precipitation reveal climate patterns across continents, delineating them into climate regions. Class names for classification systems based on weather patterns often include geographical names such as polar, tropical, continental, and marine. These terms are modified by terms describing temperature and moisture, or the intensity of weather during summer or winter. The descriptors that are used in this method of classification include moist or dry, warm or cold, and temperate or severe.

Today, climate scientists split the earth into approximately **five major types**: tropical, dry, temperate, continental, and polar considering a variety of factors including altitude, air pressure, wind patterns, latitude and geographical characteristics such as mountains and oceans.

One of the most widely used classification schemes is made by the German Climatologist and Botanist Wladimir Köppen (1846-1940). He divided the world's climates into categories based upon general temperature profiles related to latitude. The Köppen classification uses easily obtained data: mean monthly and annual values of temperature and precipitation.

Köppen believed that the distribution of natural vegetation was the best expression of an overall climate. Köppen recognized five principal climate groups, each designated with a capital letter:

> **A** (humid tropical), **B** (dry), **C** (humid middle-latitude, mild winters), **D** (humid middle-latitude, severe winters), and **E** (polar), and **H** (highland). Four groups (A, C, D, E) are defined by temperature. The fifth, (group B), has precipitation as its primary criterion, while **H** is determined by altitude.

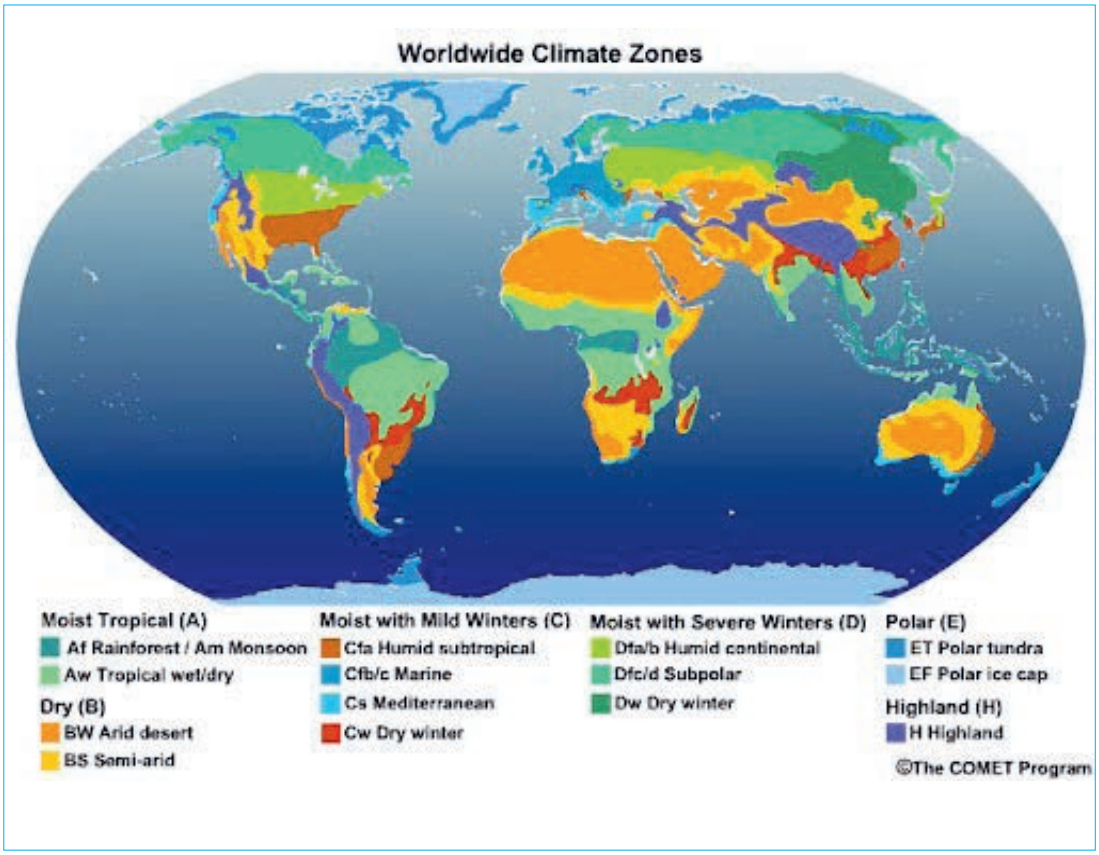


Figure 2.2: *Map of Köppen's Five Principal Climate Groups*

2.1.2 World Climate Zones and Regions

Activity 2.2

1. Be in a small group and discuss the characteristics of each one of the climate types in Köppen's classification scheme. What other classification schemes do you know?

Climate zones are areas with distinct climates, which occur in the east-west direction around the Earth, and they can be classified using different climatic parameters. Generally, climate zones are belt-shaped and circular around the poles (see Figure 2.3). In some areas, climate zones can be interrupted by mountains or oceans. The world's climate pattern reflects a regular and dependable operation of the major climate controls.

The solar radiation reaches the ground on different parts of the Earth at different angles. On the equator, the sunlight reaches the ground almost perpendicularly, whilst at the poles the angle of the Sun is lower or even under the horizon during the polar night.

Throughout the seasons, the position of the Sun to the Earth changes and thus the angle of incidence of the sunlight also changes. The angle of the Sun at noon varies from perpendicular (90°) within the tropics up to horizontal (0° = Sun does not or only partially appear on the horizon) within the polar circle. Thus, the sunlight warms up the Earth around the equator much more strongly than at the poles. Due to temperature differences caused by the differences in radiation, recurring climatic conditions develop.

There are four major global climate zones:

1. Tropical Zone from 0°– $23^1/_2$° (between the tropics) - In the regions between the equator and the tropics (equatorial region), the solar radiation reaches the ground nearly vertically at noontime during almost the entire year. Thereby, it is very warm in these regions. Through high temperatures, more water evaporates and the air is often moist. The resulting frequent and dense cloud cover reduces the effect of solar radiation on the ground temperature.

2. Subtropics Zone from 23.5°– 40° - The subtropics receive the highest radiation in summer, since the Sun's angle at noon is almost vertical to the Earth, whilst the cloud cover is relatively thin. These regions receive less moisture (see trade winds), which increases the effect of radiation. Therefore, most of the deserts in the world are situated in this zone. In winter, the radiation in these regions decreases significantly, and it can temporarily be very cool and moist.
3. Temperate Zone from 40°– 60° - In the temperate zone, the solar radiation arrives at a lower angle, and the average temperatures here are much cooler than in the subtropics. The seasons and day length differ significantly in the course of a year. The climate is characterized by less frequent extremes, more regular distribution of the precipitation over the year and a longer vegetation period – therefore, it is named as "temperate".
4. Cold Zone from 60°– 90° - The polar areas between 60° latitude and the poles receive less heat through solar radiation, since there is very low angle of the Sun. Because of the changes of the Earth axis angle to the Sun, the day length varies most in this zone. For instance, in the summer, polar days occur. Vegetation is only possible during a few months per year and even it is often sparse. The conditions in these regions make life very challenging.

The characteristics of the climate zones change with great altitude differences within a small area, like in mountain areas, since temperatures decrease rapidly with altitude.

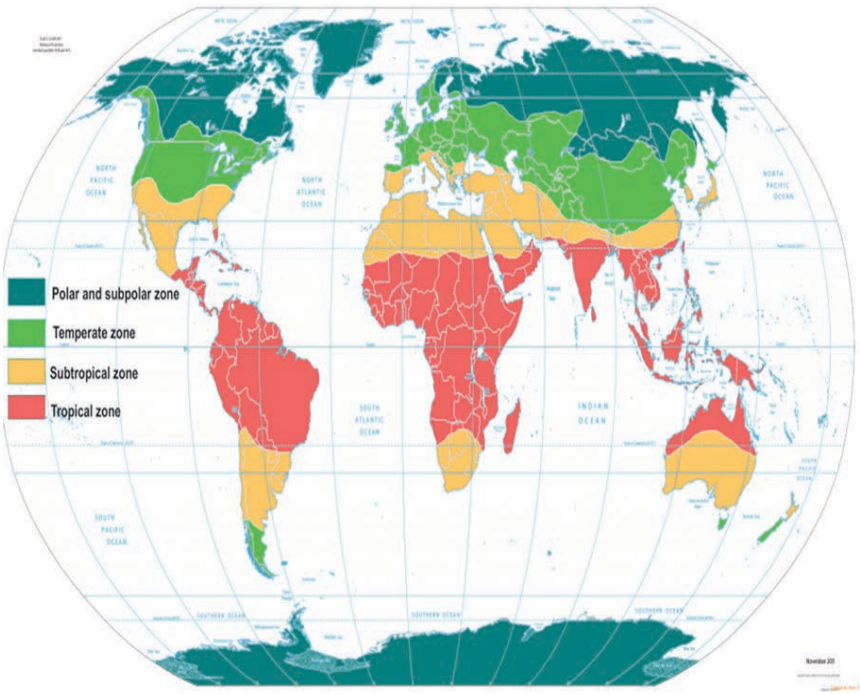


Figure 2.3: *World Climate Zones*

2.2 CLIMATE TYPES AND ZONES OF AFRICA

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

- *identify the major climate types and regions of Africa; and*
- *distinguish the controls of the climate of Africa.*

KEY TERMS

- *Continental climates*
- *Equatorial climate*
- *Maritime climates*
- *Ocean current*
- *The ITCZ*
- *The tropical wet-and-dry region*
- *Tropic of Cancer*
- *Tropic of Capricorn*

Activity 2.3

1. What are the major types and zones of climate in Africa? Which factors determine the types of climates in Africa?

The climate of Africa is characterized by a range of climates such as the equatorial climate, the tropical wet and dry climate, the tropical monsoon climate, the semi-arid climate (semi-desert and steppe), the desert climate (hyper-arid and arid), and the subtropical highland climate. Temperate climates are rare across the continent except at very high elevations and along the fringes of the continent. In fact, the climate of Africa is more variable in rainfall amount than in temperatures, which are consistently high. African deserts are the sunniest and the driest parts of the continent, owing to the prevailing presence of the subtropical ridge with subsiding, hot, dry air masses. Africa holds many heat-related records: the hottest extended region year-round, the areas with the hottest summer climate, the highest sunshine duration, and more.

Activity 2.4

1. Explain the relationship between position of Africa and its climate types.

Owing to Africa's position across equatorial and subtropical latitudes in both the northern and southern hemisphere, several different climate types can be found within it.

The continent mainly lies within the tropical zone between the Tropic of Cancer and the Tropic of Capricorn, hence its interesting density of humidity. Precipitation intensity is always high, and it is a hot continent. Warm and hot climates prevail all over Africa, but mostly the northern part is marked by aridity and high temperatures. Only the northernmost and the southernmost fringes of the continent have a Mediterranean climate (see Figure 2.4).

The equator runs through the middle of Africa, as do the Tropic of Cancer and the Tropic of Capricorn, making Africa the most tropical of all the continents. Africa's position is relatively unique in the sense that it almost has a mirror image of climate zones to the north and South of the Equator with regard to latitude. When considered in detail, the movement of air masses and their effects provide the basis for a division of the continent into eight climatic regions. These are;

- *the Equatorial (Tropical Wet Climate) Region,*
- *the Tropical Wet-and-Dry Region,*
- *Semi-arid Climatic Region,*
- *Hot Desert Climatic Region,*
- *Humid Subtropical Climatic Region,*
- *Mediterranean Climate Region,*
- *The Warm Temperate East Coast Climate Region*
- *Warm Temperate Continental Climate Region*
- *The Mountain Climatic Region*

2.2.1 Types and Characteristics of Climate Zones in Africa

Climate is regulated by the apparent movement of the sun between the two tropics and the associated movement of winds. Meanwhile, north or south of the Equator the climate tends to change similarly . This gives rise to symmetrical climatic zones in Africa consisting of the central zone of equatorial climate, tropical zones, hot deserts ,and Mediterranean zones. Details of the types and characteristics of each climate zones are presented below.

I. The Equatorial Climate Region

The equatorial climate is experienced in the lowland area between latitudes 5° N and 5° S of the equator. This covers mainly parts of Central Africa which includes the Democratic Republic of Congo, Gabon and Cameroon. It is also experienced in the Southern part of Nigeria, Ghana, Benin and Sera Leone. Highland and coastal areas, especially in Eastern Africa, experience modified equatorial climate where the temperature is much lower than it is experienced in the true equatorial climate.

In the Equatorial climate, temperatures are very high throughout the year averaging about 26° C, the hottest months in the year are March and September when the sun is overhead at the equator. The diurnal temperature range is very low, about 3° C. There is often heavy cloud cover and the humidity is high throughout the year. This region mainly receives convectional rainfall.

II. The Tropical Wet-and-Dry Region

The tropical wet-and-dry region is often called the savanna climatic region; this implies, incorrectly, that all areas with savanna vegetation have this type of climate. This region covers a little less than half of the total surface area of the continent, extending toward the Equator from the semiarid areas. The great distinguishing feature of this climatic region is the seasonal character of its rainfall. During the period of high sun, the maritime air masses produce up to six months of rainfall, the length of the rainy season depending on the nearness to the Equator. The rest of the year is dry. In a few places, for example, on the coast of Mauritania and Senegal, there is also a little rainfall in the period of low sun. As in the desert and semiarid climatic zones, mean monthly temperatures show less variation than daily temperatures. In western Africa, the period of low sun corresponds to the harmattan season. The harmattan is a warm, dry, northeasterly or easterly wind that blows out of the southern Sahara and is frequently laden with large quantities of sand and dust.

Regions with the equatorial, or tropical wet, type of climate, or variants, are the wettest in Africa. There are two peak periods of rainfall corresponding to the double passage of the inter-treopical convergence zone (ITCZ). Because areas with an equatorial climate are constantly covered by warm maritime air masses, variations in their monthly and daily temperatures are less pronounced than in the tropical wet-and-dry regions.

Marked variations in the rhythm of equatorial climate sometimes occur. For example, the rainfall may be monsoonal or the second rainy season may not exist at all.

However, the most notable variation can be observed on the western African coast from around Cape Three Points in Ghana, eastward to Benin, where the bimodal rainfall regime prevails, and the total annual precipitation is less than 1,000 mm. Some of the explanations about these variations include: the presence of a cold body of water off-shore chills the lower of the maritime air mass and makes it stable; the body of cold air that forms offshore diverts the incoming airstreams to the west and east of the anomalously dry area; there is a strong tendency for the winds to blow parallel to the shore during the rainy seasons; the absence of highlands deprives the region of Orographic (mountain) rainfall; fluctuations in the offshore moisture-bearing winds occur during the rainy season and reduce rainfall; and that local meteorological peculiarities of thunderstorms contribute to the reduction in rainfall.

In Eastern Africa, the tropical climate type is experienced in Sudan, Ethiopia, Kenya, Tanzania and Somalia. Similarly in Central Africa, it is experienced in Zambia, Malawi, Angola, Namibia, Botswana and Zimbabwe.

In the northern and southern extremities of the continent, there is a dry summer subtropical, or the Mediterranean type of climate. Rain falls only in winter (December–January in North Africa, June–July in Southern Africa), although in some localities it may fall in autumn (September in North Africa, April in Southern Africa). Mean monthly temperatures are lower than in tropical climates, dropping to about 10 °C in winter, while summer (June–July in North Africa, and December–January in Southern Africa) temperatures may sometimes exceed those of tropical climates. Clear and blue skies are the common characteristics of this climate region.

III. Semi-arid Climatic Region

This region fringes the desert areas and include the greater part of the land south of the Zambezi River. They differ from true desert regions in being just within reach of the ITCZ in the course of its seasonal movement and therefore receiving more rainfall. Temperatures are about the same as those in the desert regions.

IV. The Hot Desert Climatic Region

Hot deserts are places where there is little or no rainfall. The hot desert region consists of the Sahara and Kalahari deserts, which are always under the influence of dry continental tropical air masses, and the northern Kenya–Somali desert, the aridity of which is principally caused by the stable nature of the maritime air masses that pass over it throughout the year. The stability of these maritime air masses is induced by their passing over the cool body of water offshore. In addition to aridity,

the desert climate is characterized by high mean monthly temperatures; the diurnal (daily) temperature range is, however, greater than the annual range of the mean monthly. The daytime temperatures are extremely high; temperatures usually range between 30ºC - 40ºC, some places in the Sahara Desert experience above 40°C, the highest ever recorded temperature in the region, and also in the world, was 58°C in Azizia, Libya. At night, temperatures are very low, dropping to below 10º C. The skies are clear and because of this, the heat received from the sun during the day is quickly lost back into the atmosphere at night.

V. Humid Subtropical Climatic Region

This climate type is found in Eastern side of continents between 20° and 35° north and south latitudes. The humid subtropical climate is a transition between the tropical and temperate climates. In Africa this climate type is confined to the southeastern coast of South Africa. The region is characterized by a relatively high temperature with warm and wet climate. In Koppen's classification the humid subtropical climate is constitutes of two climates (Cfa and Cwa) as shown on figure 2.4.

VI. Mediterranean Climate Region

This climate is also called Warm Temperate Western Margin Climate and it is experienced in very small areas of the continent. The Mediterranean climate is best developed on the shores of the Mediterranean Sea. It is also experienced in the South-Western tip of Africa. Temperatures in the Mediterranean climate region range from 10º C in winter to about 21º C in summer. These areas lie in the path of westerly winds. In the summer season, winds blow from the land to the sea. Therefore, they are dry winds. Winters are wet because cool moist winds blow towards the land from the sea. The influence of moist westerly winds also makes the winters mild. The average amount of rainfall each year is about 500-750 mm.

VII. The Warm Temperate East Coast Climate Region

The climate is experienced between latitudes 30º - 40º North of the Equator and 30º-40º South of the Equator. It is experienced along the Eastern coast of South Africa, especially in Natal and Cape Provinces, as well as in Mozambique. These areas are under the strong influence of the warm Mozambique current and the warm southeast trade winds. Summer temperatures are generally high with an average of about 26ºC. Winter temperatures are low, averaging about 10º C. Annual rainfall is between 1000 - 1500 mm per year but it decreases as one moves westwards into the interior.

VIII. Warm Temperate Continental Climate Region

This climate is mainly experienced in the interior of South Africa, between the Drakensberg Mountains and the Kalahari Desert. The rainfall amount is generally low because the area is inland and the winds blowing from the sea reach here when they are already dry. Most of the rain falls during the winter season and averages about 700 mm per year. The Eastern areas are wetter than those in the West which are close to the Kalahari Desert. The annual temperature ranges from about 26º C in summer to about 10º C in winter.

IX. The Mountain Climatic Region

This climate region includes the high mountain areas of Kenya, Ethiopia and the lakes region of East Africa. In some respects, the climate is similar to the warm temperate upland climate, except the temperatures are even lower and snow occurs on the tops of the highest peaks, such as Kilimanjaro. The area receives more rainfall than the surrounding areas. It mostly receives relief rainfall, formed as the warm moist winds are forced to rise up the highlands. The highest amount of rainfall is received on the windward slopes. At the lower slopes, the mountains are warmer and wetter. The slopes facing away from the sea are called leeward or rain shadow slopes. They receive little or no rain. The winds here are descending and have a cooling effect. Temperature decreases with an increase in altitude. At the very top of high mountains, temperatures are below freezing point.

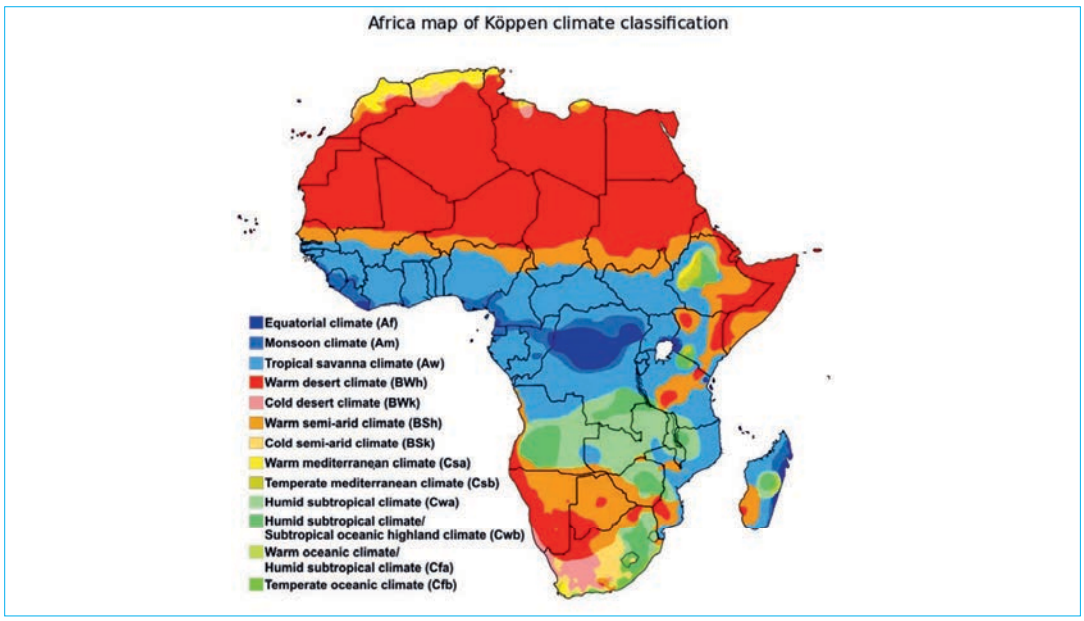


Figure 2.4: *Climate Zones of Africa based on Köppen's Classification*

2.2.2 Factors Controlling Climate of Africa

Activity 2.5

1. List the factors that control the climate of Africa. How do these factors control the continent's climate?

There are several factors that influence the climate of the African continent. These include angle of the sun, latitude, air pressure, wind system and the Intertropical convergence zone (ITCZ), major ocean currents, land and water (maritime versus continental) influence, and altitude. These factors determine the amount of temperature and precipitation. Below is the description of each one of the factors.

I. Latitude and its influence on Solar Radiation received

Africa straddles the Equator from 37º N to 34º S, hence it lies within the tropics. Variations in the receipt of solar energy and temperature differences are largely a function of latitude. Temperature is high throughout the continent because of the continent's location relative to Equator. As latitude increases, the sun shines more obliquely and provides less energy. The equator, however, faces the sun's rays directly, so the climate is warm year-round.

II. Pressure Systems, Winds, and the Intertropical Convergence Zone (ITCZ)

Located on about Latitude 30º North and South of the Equator are Sub-tropical High-Pressure Belts that dictate surface wind patterns and influence rainfall and temperature regimes on the continent. The Subtropical High-Pressure Systems on both sides of the Equator generate two wind systems that converge on the equator in a zone termed as Inter-Tropical Converge Zone (ITCZ). From the north, Subtropical High-Pressure Belt zone blows the Northeast Trade Winds (locally called Harmattan). The Harmattan is dry and cool and blows over Sub-Saharan Africa from about November to April. From the south Sub-tropical High Pressure belt zone blows the Southwest Trade Winds (locally called Monsoon).

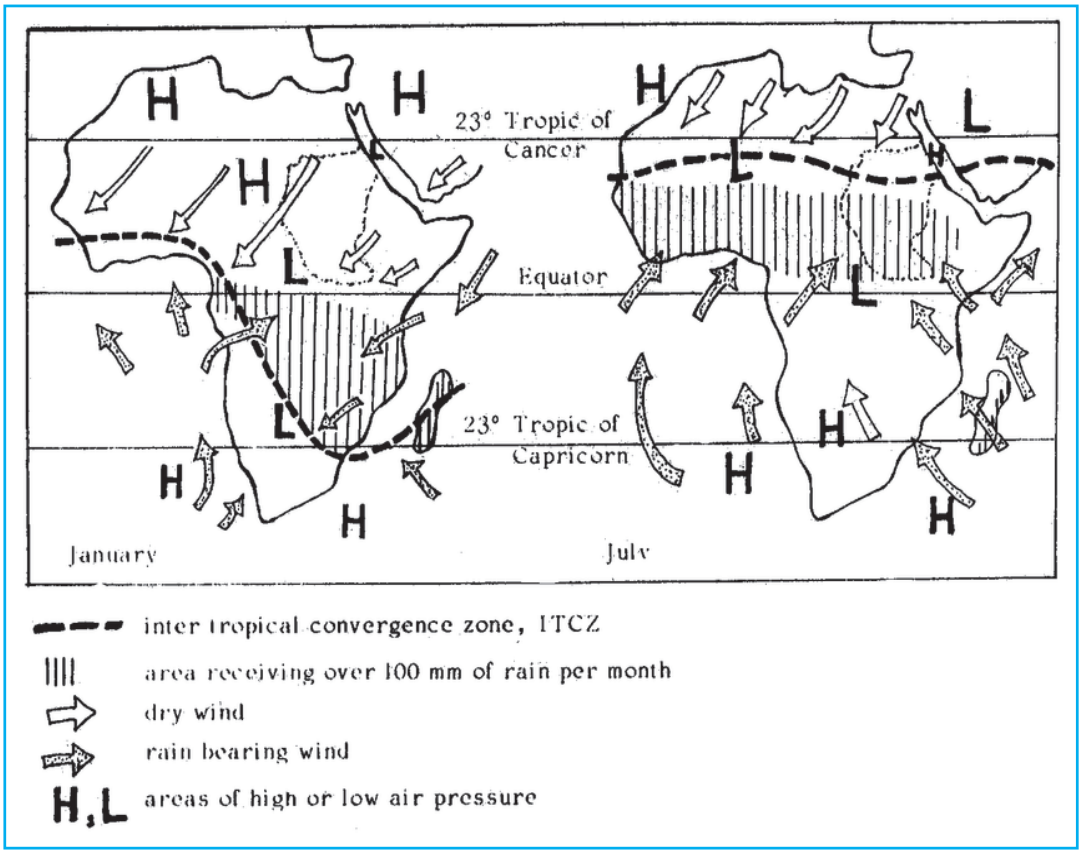


Figure 2.5: *The Position of I.T.C.Z in Africa January and July*

The Monsoon winds are moist and bring rainfall to the coasts of West Africa. The African continent does not extend much beyond 35° of latitude from the equator. The implication is that the range of climatic conditions is limited and that the general direction of wind movement is towards the equator (or in more accurate terms towards the inter-tropical convergence zone - ITCZ). The ITCZ shifts with the seasonal movement of the sun across the tropics:

- In **June**: the northern summer season, the ITCZ is located at about 13 degrees of latitude in North Africa at the southern boundary of the Sahara.
- In **December**, the Northern winter season, the ITCZ moves southward along the West African Coast and to the northern and eastern margins of the **Congo** basin and continues to Madagascar.

Movements in the ITCZ are closely related to the distribution of rainfall and climatic zones. The climatic zones assume symmetry around the equator, although the high altitudes in some parts of the continent and the adjacent disturb the symmetry.

III. Major Ocean Currents

Winds that tend to blow persistently over the ocean tend to drag a thin surface layer of the water in their direction of flow. This layer of ocean water called **Ocean Current** dictates the temperature and moisture characteristics of the wind and the coastal regions over which the wind blows. When ocean currents blow from low latitudes (near to the equator) towards higher latitudes (towards the pole) the currents carry Warm ocean water into relatively cool regions. Such an ocean current is called Warm Ocean Current.

Warm Ocean Currents supply moisture to winds blowing over them to develop rainfall on the adjacent coasts. In Africa, Warm Ocean Currents include **Warm Guinea Currents** - in West Africa, **Warm Mozambique Currents** – in Southeast Africa. The cool surface of **Cool Ocean Currents** causes moisture in winds blowing over them to condense and form fogs, etc. The winds are deprived of their moisture so they tend to absorb rather than deposit moisture at the adjacent coasts. Cool currents, therefore, cause dry conditions and in Africa the **Cool Canary Currents** - the western coast of the Sahara Desert, the **Cool Benguela Currents** – the Western coast of Kalahari Desert. The cool ocean currents tend to create rich fishing grounds. Rich fishing grounds exist along the Morocco and Spanish Saharan Coasts that are washed by the Cool Canary Currents. The Namibian coast that is washed by the Cool Benguela current also has rich fishing grounds.

IV. Distribution of Land and Water

Large water bodies such as the Ocean and huge lakes modify climates in adjacent lands. In the continental interior, where there are no large bodies of water, temperatures get **very warm** in summer or during the day. The land is solid, so it heats up more rapidly during the day. The compact nature of the land means that only a thin surface gets heated. As a result, heat absorbed into the thin layer of surface rocks is released very rapidly. The land surface is, therefore, **very cool** at night and in winter. The interior location does not also allow rainfall to reach such places thereby creating warm, humid, hot and dry climates. These extremities in climate affect all states located in the interior of continents. Such climates are called **Continental Climates** as against **Maritime Climates** experienced on lands located along coasts. In places such as Timbuktu in Mali the diurnal and annual ranges in temperature are very high because of continentality.

V. Altitude

Since energy from the sun is transformed into heat on the surface of the earth, air temperature decreases with altitude at an average rate of 6.4°C per 1000 meters. This change in temperature with altitude is called the **Lapse Rate**. Because of this decrease in temperature with height, mountainous regions such as the Ethiopian highlands have very cool temperatures. Very high peaks such as Mountain Kilimanjaro located along the equator even have permanent snow cover.

While these factors help to account for the broad climatic patterns of African continent, there are nevertheless numerous local variations to be found from place to place within the same climatic zone.

2.3 BENEFITS OF CLIMATE FOR LIFE OF PEOPLE OF AFRICA

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

- *explain the benefits of climate for the life of people of Africa.*

KEY TERMS

- *Agriculture*
- *Human health*
- *Natural resources*
- *Surface-water supply*
- *Temperature extremes*

Activity 2.6

1. In a group discuss the benefits of climate to the life of the people of Africa.
2. Debate on the benefits and disadvantages of climate on the life of the people of Africa.

Climate affects nearly every aspect of our lives from our food sources to our transport infrastructure; from what clothes we wear, to where we go for recreation. It has a huge effect on our livelihood, our health, and our future. People's settlement

and living are hugely associated with climate types. For instance, some places are overpopulated due to the better climate and associated factors. On the other hand, regions of extreme climatic conditions like the deserts, rainforests, and polar regions have fewer people.

Africa is a continent with a diversity of climate landscapes. It has a climate that ranges from intense heat to bitter cold in its different parts. This diversity in turn influences the living style of people including settlement patterns, livelihood options, resource endowments, health ,and wellbeing. The relationship between climate, physical resources ,and socio-economic condition of people in Africa is briefly presented in the following section.

2.3.1 Climate and Agriculture in Africa

It is indisputable that agriculture is the backbone of Africa's economy and accounts for the majority of livelihoods across the continent. Agriculture is an extremely important sector on the African continent, on average accounting for 70% of the labor force and over 25% of the Gross Domestic Product (GDP). Agriculture has always been deeply dependent on the weather, with farmers needing a steady mixture of sun, warmth, and rains to reliably produce the crops they need. The bulk of agricultural systems in Sub-Saharan Africa are highly climate-dependent: the region is marked by a strong dependence on rain-fed agriculture and natural resources. Africa is one of the continents that are most highly affected by climate change for two reasons: its geographical characteristics of having a major land lying across the warming tropics, and the limited human, social, and economic capacity that African countries have to adapt to the impacts of climate change. A change in a climate, therefore, exacerbates the complexity of issues (such as few technological inputs, the majority of Africa's farmers working on a small-scale or subsistence level and have few financial resources, limited access to infrastructure, and, etc.) in the continent.

2.3.2 Climate and Health in Africa

Climate change has widespread effects on human health by impacting both environmental and social determinants.

Humans have understood the importance of climate to human health since ancient times. In some cases, the connections appear to be obvious. For instance, a flood can cause drownings, a drought can lead to crop failure and hunger, and temperature

extremes pose a risk of exposure. In other cases, the connections are obscured by complex or unobserved processes, such that the influence of climate on a disease epidemic or a conflict can be difficult to diagnose. In reality, however, all climate impacts on health are mediated by some combination of natural and human dynamics that cause individuals or populations to be vulnerable to the effects of a variable or changing climate.

Africa is commonly described as a "climate-vulnerable" continent in which rainfall variability, hydrological extremes, and anthropogenic climate change have the potential to inflict significant harm on a large population.

2.3.3 Climate and Water Resources in Africa

Water is the most important of all natural resources. Without water ,life would not be able to thrive on the Earth. It has been argued that the level of streams, flow of streams/rivers, the volume of underground water and the like all depend on types of climates and water availability. Therefore, persistent climate change may lead to shrinkage in the surface-water supply as well as the quantity and regularity of streams and rivers, and water supplies in Africa.

Activity 2.7

1. What are the benefits of climate to other physical and socio-economic aspects of Africa? Mention the role of climate in determining lifestyle, tourism development, fishing, and natural vegetation in the continent?

2.4 CLIMATE CHANGE AND ITS CHALLENGES TO AFRICA'S DEVELOPMENT VISION

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

- *explain the major challenges of climate change on African development vision.*

KEY TERMS

- *Africa's development vision*
- *Climate change*
- *Climate system*
- *Climate variability*
- *Development policies*
- *Millennium Development Goals (MDGs)*

In many cases climate variability and climate change are interchangeably used. However, there is a clear demarcation between the two. Variability may be due to natural internal processes within the climate system or to variations in anthropogenic (caused by human) external forcing. In other words, climate variations occur with or without our actions. It is critical to assess precisely which human actions affect climate and those that do not. Climate change, on the other hand, is a change in the state of the climate system, identified by changes in the average conditions and the variability of its properties, that persists for an extended period, typically decades or longer, due to natural and/or anthropogenic processes and drivers.

Activity 2.8

1. What is climate change? How does climate change affect Africa's development vision?

Climate change in Africa is an increasingly serious threat for Africans as Africa is among the most vulnerable continents to climate change. Anthropogenic climate change is already a reality in Africa, as it is elsewhere in the world. According to the Intergovernmental Panel on Climate Change (IPCC), the vulnerability of Africa to climate change is driven by a range of factors that include weak adaptive capacity,

high dependence on ecosystem goods for livelihoods, and less developed agricultural production systems. The risks of climate change on agricultural production, food security, water resources and ecosystem services will likely have increasingly severe consequences on lives and sustainable development prospects in Africa.

Most studies on the potential impact of climate change have predicted that Africa is likely to experience higher temperatures, rising sea levels, changing rainfall patterns and increased climate variability, all of which could affect much of its population. The actual and potential impacts of climate change in Africa are large and wide-ranging, affecting many aspects of people's everyday lives. Many climate models predict negative impacts of climate change on agricultural production and food security in large parts of Sub-Saharan Africa (SSA). Higher temperatures, the drying up of soils, increased pest and disease, shifts in suitable areas for growing crops and livestock, desertification, floods, deforestation, and erosion are all signs that climate change is already happening. Therefore, this indicates that climate change is one of the greatest environmental, social and economic threats facing Africa. The impact of climate change is more serious on the world's poorest countries, most of which are found in Africa. Poor people already live on the frontlines of pollution, disaster, and degradation of resources and land. For them, adaptation is a matter of sheer survival.

Unfortunately, despite growing concern, no exact and reliable figures are available to quantify the economic costs of the negative impacts of climate change in Africa for either individuals or society as a whole. As far as development is concerned, climate change will have a strong impact on Africa's ability to achieve the Millennium Development Goals (MDGs) and the Africa 2063 goal and on its development policies in general, with increased pressure on agriculture, water supply and demand, health, and political stability.

In general, African has been seriously affected due to the following reasons. First, the African society is very closely coupled with the climate system, hundreds of millions of people depend on rainfall to grow their foods. Second, the African climate system is controlled by an extremely complex mix of large-scale weather systems. Third, the degree of expected climate change is large. The two most extensive land-based end-of- century projected decreases in rainfall anywhere on the planet occur over Africa, particularly in North and South Africa. Finally, the capacity for adaptation to climate change is low.

UNIT SUMMARY

Weather and climate are the two essential concepts interchangeably used. However, there is a clear boundary in meaning between the two. Weather refers to a short-term atmospheric condition – for example, the temperature and precipitation on a certain day, the state of the atmosphere with respect to heat or cold, wetness or dryness, calm or storm, clearness or cloudiness. On the other hand, a climate is an average of weather conditions in a place over a long period, 30 years or more. A climate, however, is more than just a generalization of weather, it includes extreme events and probabilities, it is the sum of all statistical weather information describing a place or region.

There are various classification schemes used by climatologists for categorizing the world's climate into different regions. The ancient Greeks classified the world climates into three: torrid, temperate, and polar. Later, since the beginning of the twentieth century, however, many climate-classification schemes have been devised that used long-term records of temperature and precipitation.

The most widely used and popular climate classification scheme is developed by the German Climatologist and Botanist Wladimir Köppen (1846-1940). Köppen classified the world climate regions into five. He used temperature for four of the climate regions and precipitation for the fifth one. In general, there are 4 (four) major global climate zones; namely the Tropical zone from 0°– 231/2° (between the tropics), the Subtropics from 231/2°– 40°, the Temperate zone from 40°–60°, and the Cold zone from 60°–90°. The characteristics of the climate zones change with great altitude differences within a small area, like in mountain areas, since temperatures decrease rapidly with altitude.

The climate of Africa is characterized by a range of climates such as the equatorial climate, the tropical wet and dry climate, the tropical monsoon climate, the semi-arid climate (semi-desert and steppe), the desert climate (hyper-arid and arid), and the subtropical highland climate. The equator runs through the middle of Africa, as do the Tropic of Cancer and the Tropic of Capricorn, making Africa the most tropical of all the continents.

Its position is relatively unique in the sense that it almost has a mirror image of climate zones to the north and south of the Equator with regard to latitude. There are a number of factors that influence the climate of the African continent. These include the angle of the sun, latitude, air pressure, wind system and the ICTZ, major ocean

currents, land and water (maritime versus continental) influence, and altitude. These factors determine the amount of temperature and precipitation.

The movement of air masses and their effects provide the basis for a division of the continent into eight climatic regions. These are the equatorial (tropical wet), semiarid, tropical wet-and-dry, hot desert, Mediterranean, humid subtropical marine, warm temperate upland, and mountain regions.

Climate affects nearly every aspect of our lives from our food sources to our transport infrastructure; from what clothes we wear, to where we go for recreation. It has a huge effect on our livelihood, our health, and our future. People's settlement and living are hugely associated with climate types. However, climate change in Africa is an increasingly serious threat for Africans as Africa is among the most vulnerable continents to climate change. Many climate models predict the negative impacts of climate change on agricultural production and food security in large parts of sub-Saharan Africa (SSA).

As far as development is concerned, climate change will have a strong impact on Africa's ability to achieve the Millennium Development Goals (MDGs) and the Africa 2063 goal and on its development policies in general, with increased pressure on agriculture, water supply and demand, health, and political stability. One of the most important reasons for this is the continent's low adaptive capacities to withstand the ever-changing climate conditions.

REVIEW QUESTIONS

PART I: TRUE OR FALSE ITEMS

Direction: Write "True" if the statement is correct and write "False" otherwise.

1. The Sahel is the area of Africa that is most affected by drought.
2. Tropical desert climate is characterized by low mean annual temperature and high diurnal range of temperature.
3. The influence of climate on human activities can be both positive and negative.

PART II: MULTIPLE CHOICE ITEMS

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

4. Which of the following is not among the common classification of world broad climatic conditions?
   - A. Hot climates
   - B. Warm climates
   - C. Cool climates
   - D. Cold climates
   - E. None of the above

5. Which one of the following factors most affects the climate of East Africa?
   - A. Distance from the sea
   - B. Latitude
   - C. Altitude
   - D. Ocean currents
   - E. Winds

6. Of all the climatic regions of Africa, the one with the highest rainfall variability is:
   - A. Highland climatic region
   - B. Mediterranean climatic region
   - C. Warm temperate continental climate
   - D. Desert climatic region
   - E. Equatorial climatic region

7. One among the following is not true about Africa. Which one is it?

A. Nearly 2/3rd of Africa lies within the tropics.

B. Africa gets much of its rainfall in the winter season.

C. The Mediterranean climatic region has mild wet winters.

D. Eastern Africa is characterized by the Great Rift Valley system.

E. Africa has a short smooth coastline, which contributes to the fact that its shape is compact.

8. Which one of the following ocean currents along the coast of Africa tends to create rich fishing grounds?

A. Warm Mozambique current

B. Cool Benguela Currents

C. Warm Guinea Currents

D. None of the above

PART III: COMPLETION ITEMS

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

9. _____ is the climatic region found along the southeast coast of Africa.

10. The wettest climatic region in Africa is _____.

11. In March, the ITCZ is located around _____.

12. Rainfall in the Mediterranean climatic region is brought by the _____ winds.

13. The climate of the equatorial and tropical highlands of Africa is highly dominated by _____.

14. The most dominant type of rainfall in equatorial Africa is _____.

15. The Mediterranean type of climate is located in the _____ and _____ Africa.

PART IV: SHORT ANSWER ITEMS

Direction: Give a short Answer for the following questions.

16. What characteristics do we use to differentiate between one climatic zone and another?

17. Africa is the only continent that can be regarded as "a mirror image of each hemisphere" with regard to climate zones. Elaborate this statement with examples.

18. Identify the three major ocean currents that affect the shores of African continent and discuss how they control the local climate system. Indicate on a map the parts of Africa affected by the impacts of the ocean currents.

19. What is the ITCZ? Discuss the processes and mechanisms in which the ITCZ governs the climate types and zones in Africa.

20. Draw the map of Africa and show the distribution of each climate zones using colors.

UNIT THREE

NATURAL RESOURCE BASE OF AFRICA

INTRODUCTION

In the previous unit, you have carefully studied about the climate of Africa. In this unit ,you will study the natural resource base of Africa. Therefore, this unit examines Africa's natural resources endowment. However, in order to better understand and give due attention to natural resources, you will first identify the key natural resources of the world.

Natural resources are parts of the environment that people can extract and exploit. The natural resources provide fundamental life support in the form of both consumptive use and public-good services. However, the sustainable and wise use of natural resources is more important than the existence of the resources. The major life sustaining resources of the world are water, soil, forest, minerals, and oil. In this unit ,you will also study the major resource bases of Africa. Hence, the drainage basins of Africa, and its water resources, soils and mineral resources, vegetation, and wildlife of Africa will be discussed in detail.

Unit Outcomes

After completing this unit , you will be able to:

- *identify key natural resources of the world;*
- *describe the main drainage systems and water resources of Africa;*
- *identify the major soil types and mineral resources of the continent of Africa; and*
- *assess the main vegetation and wildlife types of Africa.*

Main Contents

3.1 OVERVIEW OF MAJOR NATURAL RESOURCES OF THE WORLD

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

- *describe the major natural resources of the world.*

KEY TERMS

- *Ecosystem services*
- *Fixed amounts*
- *Freshwater*
- *Natural resources*
- *Nonrenewable resources*
- *Oil*
- *Renewable resources*
- *Sustainable use*

Natural resources are parts of the environment that people **can** extract and exploit (use or manipulate to one's advantage). People do not make natural resources. They gather natural resources. Natural resources are categorized into two – **renewable** and **nonrenewable** resources. Renewable resources can be replenished by natural processes as quickly as humans use them. Examples of renewable resources include *sunlight* and *wind*. Whereas nonrenewable resources are natural resources that exist in ***fixed amounts*** and can be used up sometime in the future. Examples include fossil fuels like petroleum and coal.

Activity 3.1

1. Categorize the following resources into renewable and nonrenewable?
Wood, water, iron, oil, hydroelectricity, uranium and, the energy of the wind and sun

Renewable	Nonrenewable

Our planet has huge supplies of natural resources that we need to survive. However, our biggest challenge is to use resources without destroying or degrading the environment. Our quality of life and survival depends on our ability to use, rather than abuse the environment.

Therefore, sustainable use of resources is very important. Sustainable use refers to the use of resources in a *way* and at a *rate* that does not lead to the long-term degradation of the environment, thereby maintaining its **potential** to meet the needs and aspirations of present and future generations. It is a way that meets the needs of the present and also preserves the resources for future generations.

We need to practice the ideas and methods of Natural Resource Management (NRM) for sustainable use of resources. Natural resource management refers to the sustainable utilization of major natural resources such as land, water, air, minerals, forests, fisheries, and wild flora and fauna. Altogether, these resources provide the ecosystem services that provide better quality to human life.

Focus

Key Strategies of Sustainable Natural Resource Management

Sustainable management of resources involves effective utilization of the following key strategies.

- *Sustainable management of land resources;*
- *Maintaining and enhancing water resources;*

- *Conserving and recovering biodiversity;*
- *Enhancing skills, capacity, and engagement of people;*
- *Protecting and enhancing the marine and coastal environment;*
- *Delivering high-quality planning that leads to effective action.*

3.1.1 The Major Natural Resources of the world

The Earth is blessed with different natural resources. However, there are a few selected natural resources that we rely on more than others. Natural resources provide fundamental life support in the form of both **consumptive use** and **public good** services. Consumptive use is the use of resources in ways that reduce supply. Examples include mining and logging in a forest. Public good is a good that benefits many people whether or not they have paid for it. Here is a list of natural resources that are extremely important to the existence of life on Earth .

I. Water

The first natural resource in the above list is water. Arguably, water is the most important of all natural resources. Without water, life would not be able to thrive on the Earth. About 71% of Earth's surface is water and the oceans hold about 96.5% of that water.

While it is technically a renewable resource, the amount of fresh or drinkable water is very small in amount. There is only about 2.5% freshwater from the total amount of water on Earth. Most of the freshwater cannot easily be accessed since it is found underground or in a form of ice and snow in remote areas.

Activity 3.2

1. Why is water so important? Think about how many things in your daily life require water and list them below.

In addition, water in seas and oceans is saline hence, it cannot be directly used for household use and drinking purposes. Of course, there are systems in place to purify non-drinkable water into water safe for consumption through filtration methods.

Table 3.1: The Earth's Water Resources

Category	Total volume (km^3)	Percent of total	Percent of fresh
World ocean	1,338,000,000	96.5	
Groundwater (to 2,000 m)	23,400,000	1.7	
Predominantly fresh **groundwater**	10,530,000	0.76	30.1
Soil moisture	16,500	0.001	0.05
Glaciers and permanent snow	24,064,100	1.74	68.7
Antarctica	21,600,000	1.56	61.7
Greenland	2,340,000	0.17	6.68
Arctic Islands	83,500	0.006	0.24
Mountain areas	40,600	0.003	0.12
Ground ice (permafrost)	300,000	0.022	0.86
Lakes	176,400	0.013	
Freshwater	91,000	0.007	0.26
Salt water	85,400	0.006	
Marshes	11,470	0.0008	0.03
Rivers	2,120	0.0002	0.006
Biological water	1,120	0.0001	0.003
Atmospheric water	12,900	0.001	0.04
Total water	1,385,984,610	100.00	
Freshwater	35,029,210	2.5	100.00

In addition, **climate change** is affecting freshwater by reducing its availability for humans. Due to the changes in weather and increase in ice melt in the poles, precipitation patterns have been changing and reserves of freshwater are quickly disappearing.

Activity 3.3

1. From the table above, extract freshwater sources of the world and discuss how scarce the resource is and what need to be done to effectively utilize the existing freshwater.

Freshwater sources	Measures for effective utilization

II. Air

Air is another important natural resource which every living thing needs. Air is more than oxygen. Air holds moisture which helps regulate temperature both on the surface and in humans. Meanwhile, oxygen is extremely important because every living thing needs oxygen to survive. Air also includes the atmosphere that is necessary for containing gases needed to keep the temperature of the Earth at a constant and warm enough to support life.

Air also regulates the winds which are renewable resources. Windmills or turbines have been created to harness this energy and use it to generate electricity. However, breathable air is becoming more and more polluted. In some areas of the world air pollution is so great that people are forced to wear face masks so they do not breathe in any toxins. Air pollution can lead to many illnesses including cancer. There are many things that you can do to reduce air pollution most importantly by reducing the emission of carbon dioxide.

Activity 3.4

1. Give some examples by which you can reduce air pollution.

III. Soil

Soil as a resource, contains many minerals and nutrients that allow plants to grow. Therefore, it is important for the growth of plants and trees. Soil is also an agent of the ***nitrogen cycle***. This is the process of taking nitrogen from the air and converting it into basic ingredients which let plants make their own food.

Soil is another natural resource that is threatened by pollution. Soil pollution, caused by overgrazing, landfills, waste materials, fertilizers, pesticides, and other factors is a pressing issue for the land. It can result in low crop production, as well as plant life containing chemicals that are not ideal for human consumption. It can also result in desertification which means the land becomes barren and unable to support plant life.

IV. Forest

Trees help us in many ways. They produce oxygen, help to deal with the level of carbon dioxide in the atmosphere, and allow people to heat their homes. Moreover, forests are also home to incredible amounts of biodiversity, especially tropical rainforests. About 80% of the world's species can be found in the tropical rainforests.

Moreover, a lot of medicinal drugs are made of plants found in the rainforests. However, forests are being constantly threatened by deforestation. This is unwise destruction of trees by cutting them down. The reason for this deforestation is for lumber, clearing of land for plowing, and other causes such as illegal logging and forest fires, etc. If we are to continue to thrive on this Earth, we have to start treating forests carefully and plant more trees annually.

V. Minerals

Minerals are very important for industrialization. Rare minerals found within the Earth are the raw material for making electronics like computers and cellphones. Whereas, iron and other minerals are highly used for building and construction purposes. Minerals are either **metallic –** that can be melted to gain new products or **nonmetallic** – a combination of minerals that do not produce new products by melting them. Since minerals are nonrenewable resources, wise utilization or sustainable use of the resources is vital. Hence, reuse and recycling of the resources are the most common methods used in the world today.

Activity 3.5

1. What do you think is your role in the sustainable use of natural resources? What can you do to avoid wastage and unwise use?

VI. Oil

Oil is very essential natural resource. However, this is one of the very scarce non-renewable natural resources. It is the cause of pollution, wars and conflict in many parts of the world. However, it is also what powers our lives. Nearly all of our transportation and manufacturing industries rely on petroleum products.

However, because we are almost reliant on oil, our rapid use has reduced the total amount of the resource by depleting it quickly. The general estimate is that the remaining reserves of oil will last possibly the next few decades. However, companies and governments are still pushing for **fracking** and **drilling** to continue at a rapid rate. If we want to hold on to the resource we have, we need to embrace other means of energy production. Shifting our reliability on renewable resources such as air, solar, and water is so important. There need to be a shift to **green technology** as well as diversification of economies of countries away from oil.

3.2 MAJOR DRAINAGE AND WATER RESOURCES IN AFRICA

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

- *describe the major drainage systems and water resources of Africa.*

KEY TERMS

- *Confluence*
- *Drainage Basin*
- *Outlet*
- *The Chad Basin*
- *The Congo Basin*
- *The Niger Basin*
- *The Nile Basin*
- *The Orange Basin*
- *The Zambezi Basin*
- *Watershed*

A drainage basin is an area of land where surface water from rain converges to a single point at a lower elevation. This usually appears at the exit of the basin, where the main river joins another water body such as a river, lake, reservoir, estuary, wetland, sea, or ocean. Meanwhile, watershed refers to a divide that separates one drainage area from another drainage area. Other terms which are alternatively used to describe a **drainage basin**, are catchment, catchment area, catchment basin, drainage area, river basin and water basin. Drainage basin also consists of parts such as tributaries, confluences and an outlets.

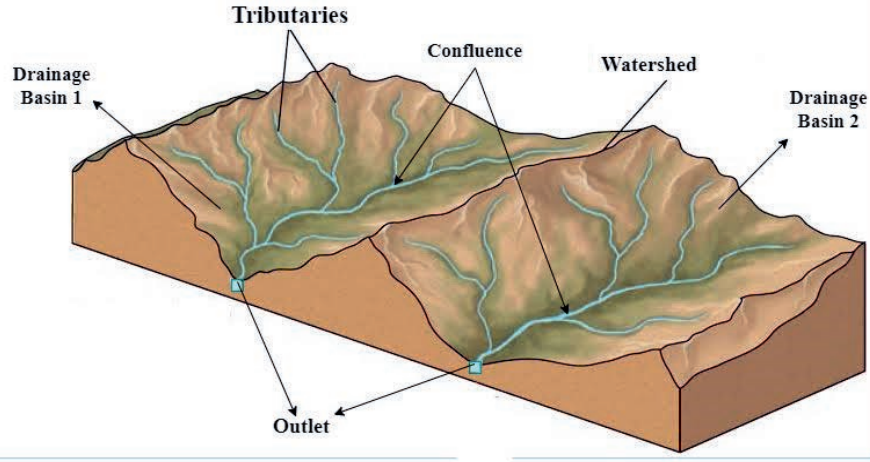


Figure 3.1: *Drainage Basin and its Parts*

Focus

The Major Drainage Basins of Africa

Some of the world's largest and longest rivers are found in Africa. The basins are:

- *The Nile Basin*
- *The Congo Basin*
- *The Niger Basin*
- *The Zambezi Basin*
- *The Orange Basin*
- *The Chad Basin*

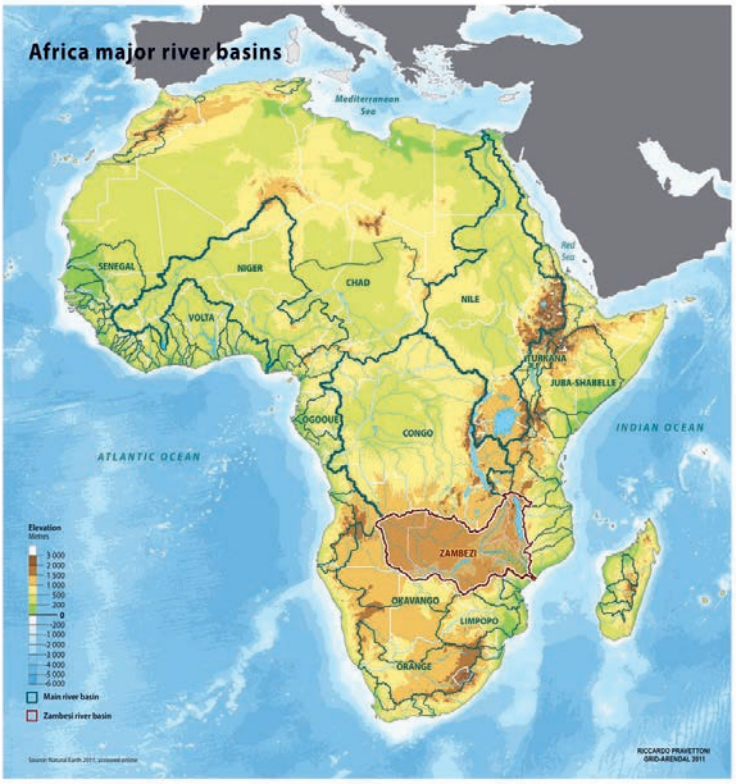


Figure 3.2: *M Figure ajor Drainage Basins of Africa*

3.2.1 The Nile Basin

The Nile is about 6,650 kilometers long and it is the longest river in the world. Its main headstream rises from Lake Victoria of Tanzania and Uganda and makes the leftwing tributary called **White Nile**. While the rightwing tributary of the Nile originates in Ethiopia and contributes the largest amount of the Nile's water. Eighty-six (86%) of Nile water comes from Ethiopia. The main right-bank tributaries are the

Baro River, the Abbay (Blue Nile) River, and the Tekeze River. These rivers meet in Sudan and flow into Egypt, finally emptying into the Mediterranean Sea.

The Blue Nile River flows into steep gorges in the Ethiopian Plateau and encounters swamps in South Sudan – the Sudd is the largest of the swamps which interrupts the river's course. Joined with the White Nile at Sudan the Blue Nile forms the Nile River and flows into low-lying desert areas of Egypt. Therefore, if the water is equitably shared among the countries in the basin, the Nile has huge economic potential for every country in the basin. It could help generate hydroelectric power in Ethiopia, Congo, Tanzania and Uganda, and irrigation for Sudan and Egypt.

Focus

The Nile Basin Countries

The Nile basins contains 11 countries, these are:

- *Ethiopia*
- *Sudan*
- *South Sudan*
- *Egypt*
- *Rwanda*
- *Tanzania*
- *Uganda*
- *Burundi*
- *Democratic Republic of Congo*
- *Eritrea and*
- *Kenya*

The Nile River has limited use for transportation in its lower course in South Sudan and Sudan. The upper courses of the Blue Nile and White Nile are not navigable because of the presence of rapids and waterfalls, and due to the annual fluctuation of the rivers. However, the upper course of the rivers has huge potential for the generation of hydroelectricity.

Activity 3.6

1. What do you think the Nile Basin countries should do to equitably share Nile water?

3.2.2 The Congo Basin

The Congo is the Earth's second-largest river by volume in the world (next to the Amazon in South America). The Congo River is also the second-longest river in Africa, shorter than the Nile River only. It drains an area of 3.7 million square kilometers and extends for some 4,660 kilometers. The river drains the central and western portions of Africa, and finally empties into the Atlantic Ocean.

The Congo basin consists of a vast shallow depression that rises by a series of giant steps to an almost circular rim of highlands through which the river has cut a narrow exit into the Atlantic Ocean. Its many waterfalls and rapids cause its valley, like that of the Nile, to lose elevation quickly. The river's course is often constricted by gorges. The best-known is the Boyoma Falls at Kisangani, where the river swings through an arc to flow westward.

Figure 3.3: *The Boyoma Fall in the Democratic Republic of Congo*

Downstream from Kisangani, the Congo is joined first by the **Ubangi** from the right and then by the **Kasai** from the left. The Congo enters the sea through a swampy estuary that is about 10 km wide at its mouth.

The Congo is an important navigational system in Africa. Within the territorial limits of the Democratic Republic of the Congo alone, there are some 14,000 km of navigable waterways. Unlike other rivers of Africa, the Congo is accessible in all

seasons due to its high volume of water content. In addition, because large sections of the river basin lie above and below the equator, its flow is stable, with at least one river experiencing a rainy season. Hence, river transport remains essential for communications with regions that are inaccessible by road transport.

The Congo River's hydroelectric potential is estimated at 100,000 MW, out of which 44,000 MW may come from the Inga site alone at the Inga Falls, in the Democratic Republic of Congo. It has been estimated that the hydroelectric potential of the Congo basin amounts to about one-sixth of the known world resources, but only a fraction of this potential has been put into use so far.

Activity 3.7

1. What unique similarities and differences can you identify between Congo Basin and Nile Basin?

3.2.3 The Niger Basin

The Niger basin is the largest river basin in western Africa. The Niger River, which rises in the mountains of Guinea (the Futa Jalon highlands) and enters the sea through its delta in southern Nigeria, is about 4,200 km. It is the third longest river in Africa. Rapids interrupt the Niger basin's course at several points.

The Niger receives water from its largest tributary, the Benue, which flows from its left bank in Nigeria. The middle Niger was separated from the upper Niger by the Benue trough (a narrow depression) which became an inland lake, but dried up through a long time of evaporation, the remnants of which now form the inland Niger delta.

Fishing is an important activity across the river system. The discovery and exploitation of petroleum in the delta region, however, has seriously disrupted fishing as a result of pollution of the basin. Irrigation is largely practiced in the Niger valley. Many canals were constructed and huge tracts of irrigated land now produce rice, cotton, sugarcane, and vegetables. The Niger is also a source of hydroelectricity. The largest project is the Kainji Dam in Nigeria which was completed in the late 1960s. Most of the Niger River, more than three-fourths of its total length, is used by commercial shipping. From the Atlantic Ocean to Onitsha (a city located on the eastern bank of the Niger River, in Anambra State, Nigeria) the river is navigable by large vessels throughout the year particularly from June – March.

Activity 3.8

1. What unique differences can you identify between Nile Basin and Niger Basin?

3.2.4 The Zambezi Basin

The Zambezi River is about 3,540 km in length and occupies a basin with an approximate area of 1,199,164 square kilometer. Originally, there were two rivers, corresponding to the upper and lower courses of the present river; the valley of the lower section eroded toward the headwaters until it captured the waters of the upper section. There are numerous waterfalls, and the most spectacular of them is the Victoria Falls. After these falls, the river winds through a number of deep gorges cut out of basalt and, after flowing through a broad valley, enters Kariba Gorge, which is more than 28 km. The Kafue and the Luangwa, the two main tributaries, which both flow through gorges and join the Zambezi on its left bank downstream from Kariba. At the mouth of the main river is a delta which is about 60 km wide.

Figure 3.4: *Victoria Waterfall*

Due to its numerous natural barriers (e.g., sandbars) at the mouth, shallowness, and rapids and cataracts, the Zambezi is of little importance for navigation. However, about 2600 km of the river is navigable by small boats. Hydroelectricity is harnessed at the Kariba across the Zambezi River at Kariba Gorge, on the border between Zambia and Zimbabwe.

Activity 3.9

1. What unique similarities and differences can you identify between Zambezi Basin and Congo Basin?

3.2.5 The Orange Basin

The Orange basin is drained by Orange River in southern part of Africa. The Orange River is the longest in South Africa. Flowing across almost the entire width of South Africa, Orange River makes its way from the highlands in the east through the Kalahari depression in the west to empty into the South Atlantic Ocean. Its major tributary, the Vaal River, is one of its northern headwaters. The Orange and the Vaal rivers together have a combined length of about 2,092 km.

Navigation is impossible throughout the river's course because of its irregular flow, its constant interruption by falls and rapids, and the silting that occurs in its channels and at the river mouth. Large irrigation and hydroelectric projects have been hampered on much of the Orange River by the enormous amount of waterborne silt that clogs up reservoirs and reduces the storage capacity of dams.

3.2.6 The Chad Basin

The Chad basin constitutes the largest inland drainage area in Africa. The basin's main water body is Lake Chad. It is a shallow lake on the borders of Chad, Niger, and Nigeria in north central Africa. Its size varies seasonally from about 10,360 km^2 to about 25,900 km^2. Lake Chad sits within the Sahel, a semiarid strip of land dividing the Sahara Desert from the humid savannas. Hence, it is being affected by high temperature of the region which leads to very high seasonal evaporation. Lake Chad is a shallow lake with a mean depth of 1.2 meters. Lake Chad is fed by three major streams, the Komadugu, Yobe, Logone, and Chari, but these are in danger of having their waters captured by the drainage systems of rivers that flow in opposite directions.

Cattle are the most important livestock raised in the Chad basin. Hence, pastoralists like the Fulani people and the Hausa agricultural communities from west Africa enter the Lake Chad lowlands on a seasonal basis. Generally, the economy of the people of the Lake Chad region is based primarily on fishing, subsistence and commercial agriculture, and animal husbandry. The people of the basin largely engage in the production of subsistence crops such as sorghum, corn (maize), millet, beans and vegetables. They also depend on forest products like gum *arabic*, honey, beeswax and firewood. Production of these products, however, has been adversely affected by the decline of the forested areas, aggravated by the explosive growth of cattle populations.

Lake Chad is little used for navigation, although there has been intermittent boat traffic between Bol and N'Djamena (Capital of Chad) when the volume of the lake increases. A variety of watercraft are used in fishing on the lake, including the papyrus-reed.

Activity 3.10

1. What important use of other river basins of Africa is absent in the Chad Basin?

Focus

Problems Facing African Water Resources Utilization and Its solutions

Problems faced	Solutions
Seasonal fluctuations of the volume of the rivers, due to; • *low rainfall, and* • *irregular rainfall* Excess flow of water in some rivers, • *great swamps exist, and* • *large areas suffer from periodic flooding.* Climate variation and change • *This is the main cause for the above two problems.*	Sustainable use of water resources • *efficient use of water* • *recycling of waste water* • *reducing water loss in irrigation* • *storage of water in dams and ponds*

3.3 MAIN TYPES OF SOILS AND MINERAL RESOURCES IN AFRICA

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

- *describe the major soil and mineral resources of Africa.*

KEY TERMS

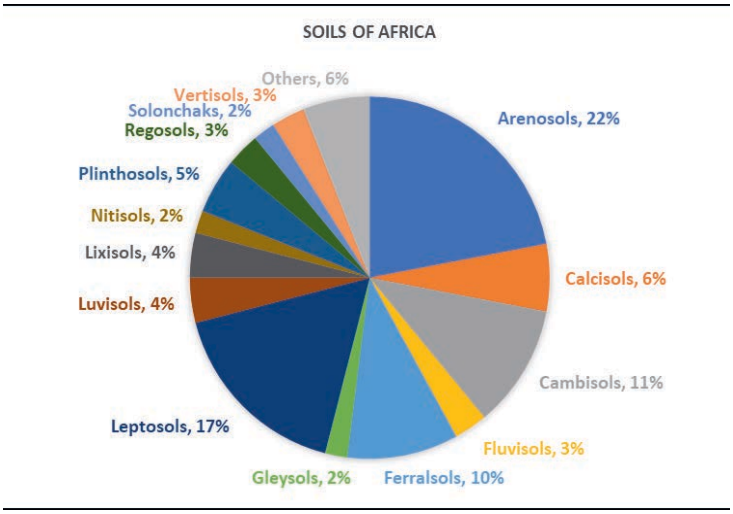
- *Arenosols*
- *Calcisols*
- *Cambisols*
- *Ferralsols*
- *Leptosols*
- *Mineral*
- *Parent material*
- *Soil*

3.3.1 Soils of Africa

Soil is a complex mixture of weathered minerals, organic and inorganic compounds, living organisms, air and water. Soil is a product of their interactions. Soil forming processes are dependent on these interactions. Processes are generally significant up to 1-2 meters below the ground surface. The material below this depth is known as the soil **parent material**.

Soil has also a number of key environmental, social and economic functions that are vital to life on Earth. It supplies water and nutrients to plants, at the same time soil protects water supplies by storing, buffering and transforming pollutants. Soil is the medium that enables us to grow our food, natural fiber and timber and it supports wildlife habitats. Soil is also a habitat that provides raw materials, preserves the past history and reduces the risk of floods. Without soil, the planet would not function.

Africa has very diverse soil types and soil qualities. While many areas have naturally productive soils, large areas of Africa have severe limitations for growing crops because the soils are too shallow, too wet, too dry or lacking nutrients. These differences in soil types and qualities are mainly due to variations in the climate of the continent. Extreme climates of Africa lead to significant variation in the biological activities and the availabilities of essential nutrients in the soils. In hot, dry regions, the most productive agricultural soils are to be found along the major river valleys or around wells or oases. Therefore, many African farmers traditionally maintained soil fertility by practicing shifting cultivation or applying mineral fertilizers on their farmlands.



The chart shows the share of the major Soil Groups for Africa. Reference Groups occupying 1% or less have been combined as 'Other'. The total area comprises some 30 million km^2 or about 20% of the global soil cover.

Figure 3.5: *Soils of Africa*

Based on the areas they cover the major soil types of Africa are arenosols, leptosols, cambisols, ferralsols, and calcisols. The distribution and characteristics of the soils are discussed below.

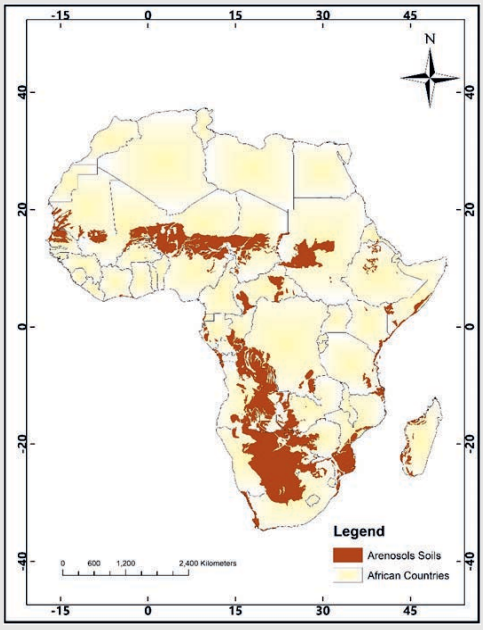


Figure **3.6:** *Distribution of Arenosols in Africa*

1. Arenosols

Easily erodible sandy soil with low water and nutrient holding capacity (from Latin, arena, meaning sand).

Arenosols develop as a result of the in-situ (being in the original position; not having been moved) weathering of quartz-rich parent material or in recently deposited sands (e.g., dunes in deserts and beaches). They are among the most extensive soil types in the world and are the dominant soil in Africa. It covers 22% of soils of Africa. The Kalahari Sands is the largest body of sand on Earth. Soil formation is often limited by a low weathering rate. If vegetation has not developed, they can be prone to wind erosion. Once vegetated, the accumulation of organic matter, clay bands or the formation of humus-aluminum complexes can occur.

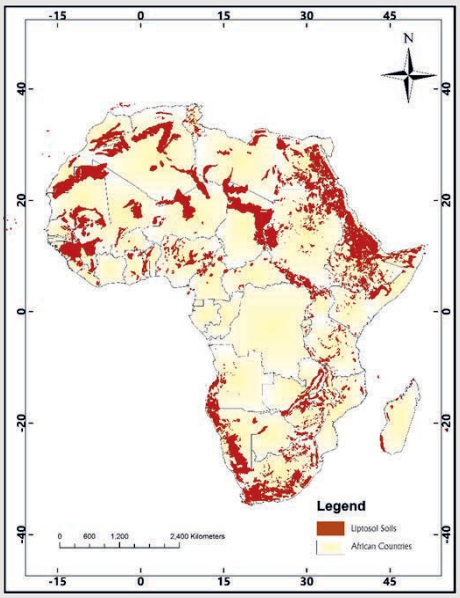


Figure 3.7: *Distribution of Leptosols in Africa*

2. Leptosols

Shallow soil over hard rock or gravelly material (from Greek leptos, thin).

Leptosols are shallow soils over hard rock, very gravelly material or highly calcareous deposits. Because of limited pedogenic development, leptosols have a weak soil structure. Leptosols occur all over Africa, especially in mountainous and desert regions where hard rock is exposed or comes close to the surface and the physical disintegration of rocks due to freeze/thaw or heating/cooling cycles are the main soil forming processes. It covers 17% of soils of Africa.

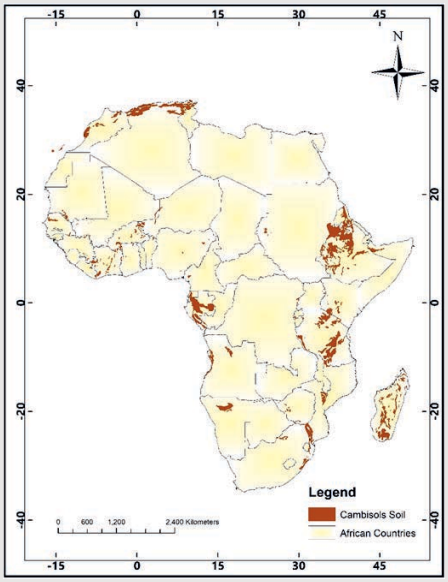


Figure 3.8: *Distribution of Cambisols in Africa*

3. Cambisols

Soil that is only moderately developed on account of limited age (from Latin cambiare, to change)

Cambisols are young soils. Generally lacking distinct horizons. Cambisols exhibit only slight evidence of soil-forming processes usually through variations in color, the formation of structure or presence of clay minerals. They are extensive throughout Africa and constitute 11% of soils of the continent. It can have varied characteristics depending on the nature of the parent material, climate and terrain.

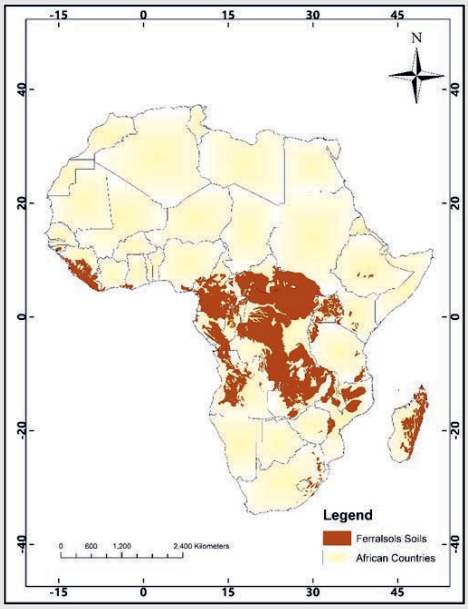


Figure 3.9: *Distribution of Ferralsols in Africa*

4. Ferralsols

Strongly weathered soils with low nutrient-holding capacity (from Latin ferrum, iron and alumen, alum)

Ferralsols are widespread in Central, Eastern and Southern Africa covering 10% of the soils of Africa. Mostly associated with high rainfall areas and very old (Tertiary) land surfaces, they are strongly leached soils that have lost nearly all of their weatherable minerals over time. As a result, they are dominated by stable products such as aluminum oxides, iron oxides and kaolinite which give Ferralsols their strong red and yellow colors. Levels of calcium and magnesium are very low. The binding of particles by iron oxides gives ferralsols an apparent sandy or silty feeling (pseudo-sand).

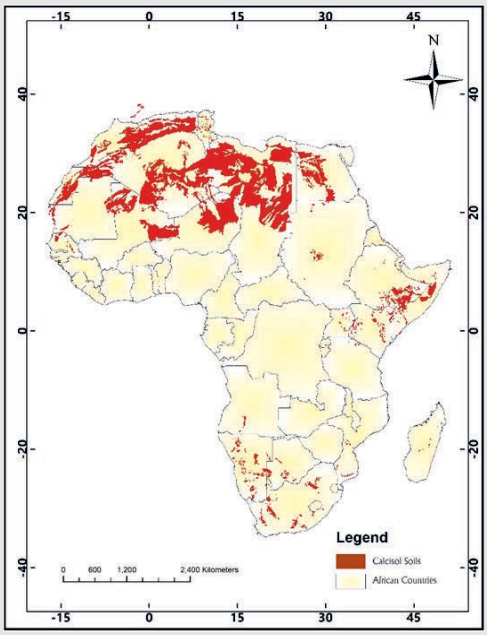


Figure 3.10: *Distribution of Calcisols in Africa*

5. Calcisols

Soil with significant accumulation of calcium carbonates, generally found in dry areas (from Latin calcarius, lime rich)

Calcisols occur in many parts of Africa, especially where the climate is dry enough to allow the accumulation of calcium carbonate in the soil. They form through the leaching of carbonates from the upper part of the soil which precipitate when the subsoil becomes oversaturated, from carbonate-rich water moving through the soil or by the evaporation of water which leaves behind dissolved carbonates. Precipitated calcium carbonate can fill the pores in the soil, thereby acting as a cementing agent, and can form a solid hard pan (calcrete) that is impenetrable to plant roots. It covers 6% of the soils of Africa.

Activity 3.11

1. From the figures above, which soil types are largely found in Ethiopia?
2. From the figures above, which of the soil types cover few areas in Ethiopia?
3. By searching the internet, identify other soil types largely found in Ethiopia.

3.3.2 Mineral Resources of Africa

Africa has huge mineral wealth as a result of its long geological history. The activities of mountains, rivers, volcanoes, lakes and forests further consolidate the appearance of minerals. Ancient woodlands have been transformed over millions of years into fossil fuels such as petroleum, natural gas, and coal. The courses of rivers and the disturbances of landforms have exposed to the surface deposits of metals such as uranium, iron, copper, zinc and tin, as well as rock minerals such as phosphates. Africa's rocks, soil, and volcanic activities are the source of some of the world's greatest treasures – for example, platinum and cobalt.

Industrial metals are a major industry in some African countries, making them key players in the global economy. Democratic Republic of Congo and Zambia produce more than half of the world's cobalt and a significant amount of its copper respectively. Other leading suppliers of industrial metals include Guinea of the bauxite (aluminum ore) and South Africa and Gabon of manganese.

Africa produces petroleum for the global market. Algeria and Libya together possess about 3 percent of the world's known petroleum reserves, and many North African countries earn much of their foreign income from petroleum and natural gas. However, the continent's largest petroleum producer is the West Africanountry Nigeria. Coal deposits exist in large reserves in the nations of Mozambique, Malawi, Tanzania, Zimbabwe, and South Africa.

Table 3.2: Africa's Leading Mineral Production and Reserves

Country	Mineral	Mine production (1000 tons) 2019	Rank of world production	Percent of world reserves
South Africa	Chromium	17,000	1	35.1
South Africa	Manganese	5,500	1	32.1
South Africa	Platinum	130,000	1	91.3
D.R. Congo	Cobalt	100,000	1	51.43
D.R. Congo	Tantalum	740	1	NA
Guinea	Bauxite	82,000	2	24.7
Rwanda	Tantalum	370	2	NA
Gabon	Manganese	2,400	3	7.5
D.R. Congo	Diamonds (Industrial)	12	3	13.6
D.R. Congo	Copper	1,300	4	2.2
South Africa	Iron Ore	77,000	6	0.64
Ethiopia	Tantalum	40	6	NA
Ghana	Gold	130	7	2
Zambia	Copper	790	7	2.2
South Africa	Gold	90	10	6.4

Problems faced by Mineral Resources Utilization in Africa

Africa has vast mineral resources, but at present much of that potential is not being tapped and not being effectively used to benefit the peoples of the continent. This sector has suffered from the legacy of **colonialism**.

The Europeans involved in a frantic race to conquer all of Africa and to exploit its natural resources by the 1880s. Surveyors in South Africa had found astonishing sources of copper in 1854, diamonds in 1867, and gold in the 1880s. Then the Europeans established mines throughout Africa. In south-central Africa, a chain of major copper mines stretched from Zambia to Democratic Republic of Congo. In western Africa miners produced diamonds and gold in Ghana and Sierra Leone, and tin and coal in Nigeria. Mining supported the economies of many colonial powers; hence, the profits went back to the mining industry and its owners in Europe. European colonial powers invested their money mainly in mining. They focused on the development of transportation to exploit mineral resources. Railroads were built to carry minerals to ports on the coasts – not to link major cities, populations, or other industries.

The impact of colonial control on the mining industry continued after African nations won independence in the mid-1900s. Mines and miners kept working and producing. Now European owners often granted a share of the profits, as well as taxes, to African governments. In some nations, the new governments seized ownership of the mines. But the results were often disastrous. The industries suffered from **poor management**, **lack of investment money**, **low selling prices**, **political turmoil**, **outdated machinery**, and general neglect of the sector. Labor disputes remained common. As African economies faltered in the 1970s and 1980s, their governments fell in debt to Western banks and international institutions such as the World Bank and the International Monetary Fund. These bodies pressured African nations to sell their mines and other industries to private investors, mainly international corporations.

Several other factors limited the profitability of African mining in the late 1900s. For the most part, the continent's raw ores are exported to other countries for manufacturing. **The ores are sold to other countries for much less than the price of the goods made from them.** Furthermore, changes in industrial processes worldwide have reduced the demand for copper, iron ore, and other metals. In Africa, the mining industry continues to be poorly connected to other industries and methods of transportation. In addition, diamond smuggling is widespread in illegal markets, drawing taxes and other profits away from African governments and companies. Finally, most mining operations in Africa today are on a large scale, and small companies find it hard to compete. Even so, small-scale mining – often for local use and not for profit, does exist in many African countries.

Activity 3.12

1. List the problems Africa faced in the utilization of its mineral resources
2. Provide possible solutions to effectively use the mineral resources

3.4 MAJOR VEGETATION AND WILDLIFE OF AFRICA

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

- *demonstrate the major vegetation distribution of Africa; and*
- *identify the major distribution of wildlife in Africa.*

KEY TERMS

Endemic
Flora
Forest
Mammals
Marine life
Parks
Steppe
Vegetation

i. Vegetation of Africa

Vegetation is the general term we use to refer to living plants – the trees and grasses that cover the earth's surface. Biologically, vegetation is known as **flora**. The plant communities such as forests, shrubs and grasses are distributed across the surface of the earth. The plant communities contain different plant associations such as deciduous broadleaves, and evergreen broadleaves. They are usually found in similar environments.

The distribution of the plants and the composition of plant associations affected by the following factors.

a. **Climate**: elements of climate such as, temperature, precipitation, humidity, light and wind are critical to the distribution of vegetation. Hence, the map of vegetation distribution is very similar to the map of the climate of an area.

b. **Landform**: elevation, slope orientation, degree of slope and variation in rock type significantly affect the distribution of plant communities or vegetation.

c. **Soils**: soils influence plant growth through their chemical constitutes, chemical reaction and capacity to hold water.

d. **Biotic factors**: living organisms – plants or animals, affect plant growth through competition for available water, shading, and enhancing soil fertility.

Distribution of Major Vegetation of Africa

Based on climate, the natural vegetation types and their distribution in Africa are divided into two broad categories. These are the tropical category and subtropical category.

I. Tropical Category

1. Tropical rainforest

The tropical rainforests are found in the central part of Africa, on both sides of the Equator and eastern coast of Madagascar. The rainforests are characterized by high rainfall, ranging from 1000 to more than 2000 mm/year, due to the permanency of the Inter Tropical Convergence Zone (ITCZ) on the Equator.

The most extensive formation of the rainforests is found in the Guineo-Congolian lowland, concentrated in the Congo Basin. There are tall dense forests, which are more than 30 meters high with emergents up to 50 – 60 meters forming several strata. Some canopy species are deciduous, but the forest is evergreen or semi-evergreen. There is also abundant growth of Epiphytes. These are plants which grow on trunks and limbs of trees. There short dry season in winter and the temperature is high always in the tropical rainforest areas.

Table 3.3: Natural Vegetation - Type and Area in Africa

Natural vegetation type	Surface area	
	Area (in Km^2)	Percent of total land area
Tropical rainforest	4,017,705	13.5
Tropical moist deciduous forest	4,661,180	15.6
Tropical dry forest	3,669,529	12.3
Tropical shrubland	5,977,939	20.0
Tropical desert	8,737,674	29.3
Tropical mountain forest	1,473,226	4.9
Subtropical humid forest	85,099	0.3
Subtropical dry forest	334,816	1.1
Subtropical steppe	456,663	1.5
Subtropical mountain systems	412,356	1.4
Total land area	29,826,187	99.9

2. Tropical Moist Deciduous Forest

This forest type is found around the Guineo-Congolian basin, along the south-eastern coast of Africa, as well as in the central part of Madagascar. The wet zone is bordered by an area where the dry season is always noticeable, for up to 6 months. There is a single rainy season, in summer, but there are obvious regional variations. Annual rainfall varies between 800 and 1500 mm, locally up to 2000 mm.

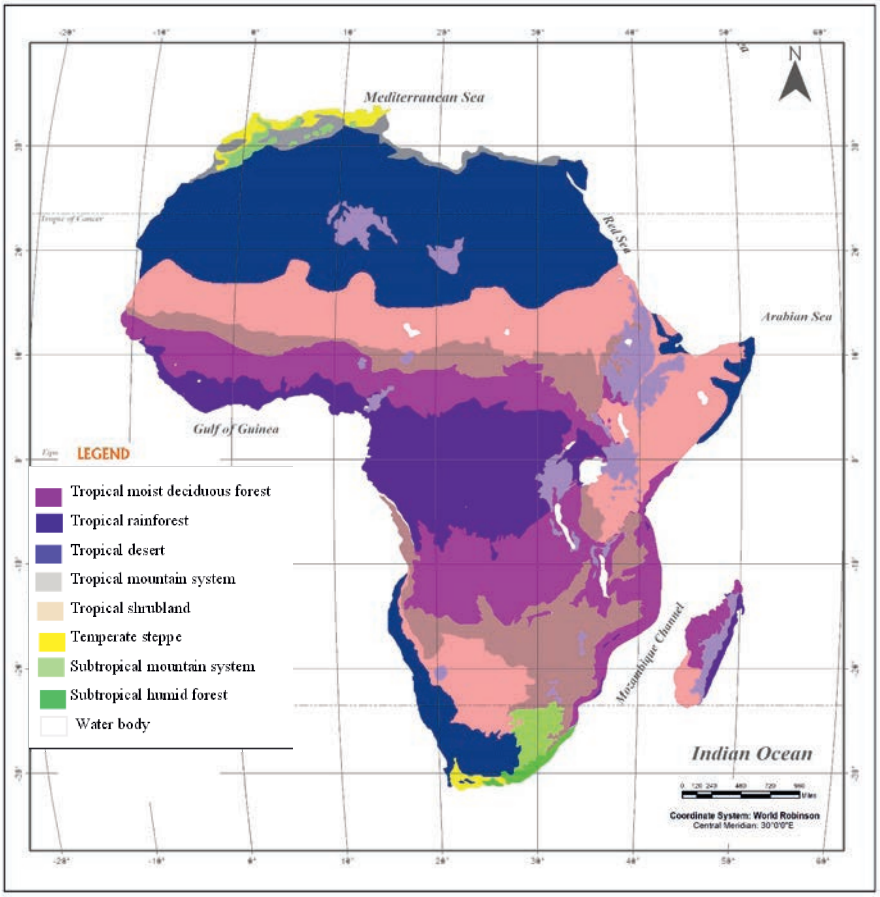


Figure 3.11: *Distribution of Major Vegetation Types of Africa*

3. Tropical Dry Forest

The tropical dry forests occupy an area further from the Equator and from the wet southeastern coast. Here, rainfall decreases and the dry season is always long, about 6 - 7 months. Rainfall varies between 500 and 1000 mm. Temperature is always high, with mean temperature of the coldest month of 20°C. In these drier conditions, the predominant vegetation type is woodland.

4. Tropical Shrubland

In these areas close to the tropics, rainfall becomes lower and lower, while temperatures are still high. It is the case in the Sahelian zone and Kalahari, as well as the southwestern part of Madagascar. Rainfall is always less than 1000 mm and scarcely reaches 200 mm in the drier parts of the Tropical Shrubland. The mean temperature of the coldest month is generally more than 20°C, except in Kalahari where, due to the proximity of the sea, temperatures are lower (the mean temperature of the coldest month may drop down to 10°C).

Tropical shrubland also covers a large part of Somalia. However, Somalia has a unique characteristic. Even if it lies across the Equator and not further than 12°N, the climate is semi-arid or arid. Whereas the trade winds direction is parallel to the coast and does not bring much humidity. Moreover, in winter, the Indian monsoon reaches this part of Africa after crossing large continents. As a result of these phenomena, Somalia is dry, with annual rainfall between 400 and 750 mm and very high temperatures due to low latitude. The tropical shrubland is dominated by deciduous shrubland and thicket with Acacia.

5. Tropical Desert

The tropical desert extends on the desertic African lands: Sahara, Karoo-Namib and the coastal zone of Somalia. Here, rainfall is lower than 200 mm and does not allow the growth of a continuous vegetation cover. Generally, only xerophytes or plants which grow in desert condition can be found in these areas. Meanwhile, woody vegetation can be found along the ***wadis*** in Sahara. The rest large surface is true desert.

6. Tropical Mountain Forest

This is limited to highland areas above 800 to 1200 m above sea level. Here, as elevation increases temperature decreases and vegetation changes. So, we define Tropical Mountain Forests as submontane, montane and high elevation vegetation. All of them correspond with tropical vegetation types. The main mountains systems of tropical Africa are the Cameroon highlands, the mountains of Kenya, the Kivu ridge ,and the Ethiopian highlands. Some lower and isolated hills occur, such as Fouta Djalon, Jos and Mandara plateau in West Africa, Hoggar in Sahara or Windhoek Mountain in southern Africa. The central part of Madagascar is formed of a high range separating the western wide lowlands from the narrow eastern coastal plain. The climatic type of each mountain is characterized by lower temperatures and, often higher rainfall.

Vegetation is extremely diverse and varies with climate. In most mountains, the lowermost vegetation is forest. Between the lowland forest and the rather different montane forest, there is a **submontane** transition zone. In many places, however, the vegetation of this transition zone has been destroyed by fire and cultivation. Montane forest, generally above 1500 - 2000 meters, is lower in structure than lowland and submontane forests. At the upper part of the montane level, an Ericaceous belt replaces the forest. Meanwhile, in an area above 3000 meters, it is followed by **Afro-alpine** shrublands and **grasslands**.

II. Subtropical Category

1. Subtropical Humid Forest

This vegetation zone is restricted in Africa to a narrow zone along the east coast of Southern Africa, roughly between 25°S and 34°S. The coastal regions of the zone have moderately high and well-distributed rainfall. Annual rainfall is 800 - 1200 mm and the mean temperature of the coldest month 7°C to 15°C. The mean annual temperature diminishes from 22°C in the north to 17°C in the south. Further inland, climate changes rapidly over short distances. The natural vegetation is evergreen or semi-evergreen forest. Where the rainfall is too low to support forest, the vegetation changes into evergreen and semi-evergreen bushland and thicket.

2. Subtropical Dry Forest

The subtropical dry forests are confined to the Mediterranean climates of North Africa and South Africa, in an area that has a long dry season, 3 to 6 months in **summer**. Most of the rainfall (400 - 1000 mm/year) occurs in **winter**.

3. Subtropical Steppe

The subtropical steppe forms a continuous transitional zone northern Africa to separate the subtropical dry forest from the Sahara Desert. Rainfall varies from 200 to 500 mm, with a long dry hot season of 6 to 11 months. The mean temperature of the coldest month is always more than 7°C. The vegetation is mostly dominated by acacia.

4. Subtropical Mountain Systems

This is found in both northern Africa and southern Africa. In northern Africa it is found in the Atlas Mountains area, which extend for over 3000 km from northern Morocco to Tunisia, parallel to the Mediterranean coast. Its altitude reaches 1500

meters in Tunisia, 2500 m in Algeria, and 4165 m in Morocco. In South Africa, it is found in the Highveld Region, which is more than 1000 m in altitude, bordered by the Ukhahlamba (Drakensberg) reaching more than 3000 m. In the northern Atlas ranges, the lower slopes are covered by mixed forest with deciduous oaks. While, in southern Africa, Highveld region is covered with grassland, but an evergreen montane forest with Podocarpus grows in on the Ukhahlamba slopes.

ii. Wildlife of Africa

Africa has more diverse wildlife than any other continent. The diversity and wealth of wildlife found in Africa is the result of diverse climate of the continent – which ranges from intense heat to bitter cold. Its varied vegetation has given rise to a wide range of animals, including mammals, birds, reptiles, fish, and insects. Africa is inhabited by the world's fastest land animal **cheetah**, the biggest bird **ostrich** and the largest land animal **elephant**.

1. Mammals

Africa is home to an astonishing variety of **mammals**. The continent's herbivores, or plant-eating animals, ranging from elephants, rhinoceroses, and hippopotamuses to hoofed mammals, such as the giraffe and the African buffalo. Vast herds of grazing animals, such as zebras and wildebeests, roam the open plains and savannas. Africa's many varieties of antelope include the hartebeest, gnu or wildebeest, dik-dik, gazelle, impala, springbok, oryx, reedbuck, and eland, the largest antelope. Africa is home to three kinds of large cats – lions, leopards, and cheetahs – and smaller felines such as the serval and wildcat, such as wild dogs, jackals, foxes, hyenas, civets, and weasels.

Different species of monkeys and two species of great apes, the chimpanzee and the gorilla, live in Africa. The continent also has many species of lemurs, small animals that belong to the primate family, like monkeys and apes. Most lemurs live in trees and are nocturnal, or active at night, although a few are active by day. The island of Madagascar has the largest variety of lemurs in the world.

Figure 3.12: *Chimpanzee*

Figure 3.13: *Gorilla*

Some of the mammals that live in Africa are endemic to Africa – i.e., found nowhere else in the world. These include Walia ibex, Nyala, giraffes, hippopotamuses, jumping hares, and the long-snouted, insect-eating tenrecs of Madagascar. Another animal unique to Africa is the aardvark, a large nocturnal animal with a piglike body, long tail, rabbit like ears, and a long snout. The aardvark rips open termite nests with its sharp claws, then uses its sticky almost one-footlong tongue to lap up the insects inside.

Figure 3.14: *Lemur*

Figure 3.15: *Jumping hare*

Figure 3.16: *Tenrecs*

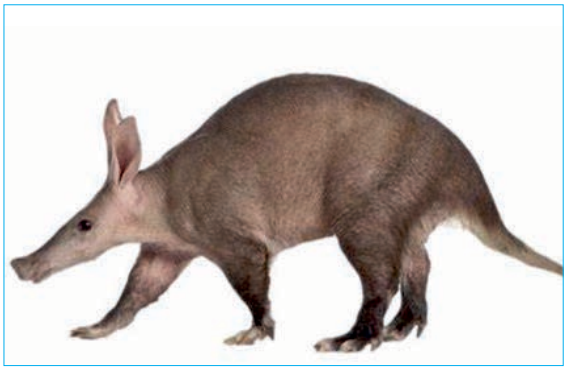


Figure 3.17: *Aardvark*

Figure 3.18: *Nyala*

Figure 3.19: *Walia ibex*

Activity 3.13

1. Which of the mammals mentioned in the text and figures above are found in Ethiopia?

2. Birds

Nearly 2,000 species of birds spend at least part of each year in Africa. In addition to varieties of hawks, eagles, owls, larks, kingfishers, and other birds found elsewhere in the world, several bird species are native only to Africa. These include the ostrich, Africa's largest bird; the hamerkop, which resembles a heron; and touracos, birds with brightly colored feathers. Several species of small, drab birds are called honey guides because people follow them to honeybee nests.

3. Reptiles

A great many **reptiles** and amphibians creep, slither, or hop along Africa's varied terrain. Reptiles include lizards, tortoises, crocodiles, and many types of snakes. Some snakes, such as the mamba and the Egyptian cobra, are venomous enough to be dangerous to humans. Boa constrictors and iguanas live only on Madagascar. Among Africa's amphibians are various salamanders and frogs, including the bizarre hairy frog of Cameroon.

4. Insects

Of, several are regarded as pests. Locusts devour crops and other vegetation; mosquitoes carry malaria; and tsetse flies carry trypanosomiasis, or sleeping sickness, a disease that harms both humans and livestock. Other African insects include various species of large butterflies, dung beetles, stick insects that resemble twigs or leaves, driver or safari ants that travel in huge columns, and termites that cooperate to build tall earthen mounds. Spiders are plentiful everywhere.

5. Marine life

A wide variety of **marine life** exists off the coasts of Africa, and the continent has more kinds of freshwater fish than any other – about 2,000 species. Some freshwater creatures are ancient varieties that have changed little over millions of years, such as lungfish, lobefins, and reedfish, which can breathe air. Certain types of African catfish not only breathe air but also move across the land during rainy weather. Lake Nyasa alone has about 160 species of fish found nowhere else in the world.

National Parks in Africa

Many African governments have established national parks to protect the wildlife from human impact, and other purposes such as for scientific study, and educational and recreational opportunities for both local people and visitors. The oldest of the parks is South Africa's **Kruger** National Park.

Africa's protected areas and parks vary greatly in number, size, and quality from country to country. Eastern and southern Africa are particularly well known for their wildlife parks. Tsavo in Kenya and Serengeti in Tanzania are among the continent's largest and most famous parks. Malawi, Namibia, Zambia, and Zimbabwe also have impressive preserves of wildlife. However, few countries in western Africa have significant parks.

Table 3.4: Major National Parks of Africa

National Parks	Country	Area (Km^2)
Selous Game Reserve	Tanzania	55,000
Central Kalahari Game Reserve	Botswana	52,000
Namib-Nankluft Park	Namibia	49,768
Niassa Reserve	Mozambique	42,000
Kafue National Park	Zambia	22,400
Etosha National Park	Namibia	22,270
Kruger National Park	South Africa	19,455
Luvushi Manda National Park	Malawi	15,000
Serengeti National Park	Tanzania	14,763
Hwange National Park	Zimbabwe	14,651

UNIT SUMMARY

Unit Three examined the natural resource base of Africa. Meanwhile, in order to have a better understanding of concepts related to natural resources an overview of the world's major natural resources has been thoroughly discussed. Our planet has huge supplies of natural resources that we need to survive. However, our biggest challenge is to use resources without destroying or degrading the environment. Our quality of life and survival depends on our ability to use, rather than abuse, the environment. Therefore, sustainable use is the use of resources is very important. Sustainable use refers to the use of resources in a way and at a rate that does not lead to the long-term degradation of the environment, thereby maintaining its potential to meet the needs and aspirations of present and future generations.

A drainage basin or watershed is an area of land where surface water from rain converges to a single point at a lower elevation. This usually appears at the exit of the basin, where the main river joins another water body. Africa has some of the world's largest and longest rivers. The Congo is the Earth's second- largest river by volume in the world. Whereas, the Nile is the longest river in the world. River basins are found in every direction in Africa. The Niger is found in the west, Zambezi and Orange are found in the southern part and the Chad basin is in the center of Africa. These basins face several problems such as seasonal fluctuations and excessive flows and the challenges posed by climate change. The best solution to these problems is planning and using the water resources in a sustainable manner.

Africa has very diverse soil types and soil qualities. While many areas have naturally productive soils, large areas of Africa have severe limitations for growing crops because the soils are too shallow, too wet, too dry, or lacking in nutrients. These differences in soil types and qualities are mainly due to variations in the climate of the continent. Extreme climates of Africa lead to significant variation in the biological activities and the availabilities of essential nutrients in the soils. Therefore, many African farmers traditionally maintained soil fertility by practicing shifting cultivation or applying mineral fertilizers on their farmlands.

Africa has also very diverse natural vegetation and wildlife. These diversities are the result of its climate landscape. Therefore, the continent is endowed with huge tropical forests found in the central part of Africa. Other varieties include; shrubs and steppe vegetation of arid and semiarid areas to humid subtropical forests. Africa has more diverse wildlife than any other continent. The diversity and wealth of wildlife found in Africa is the result of the diverse climate of the continent – which ranges from intense

heat to bitter cold. Its varied vegetation has given rise to a wide range of animals, including mammals, birds, reptiles, fish, and insects.

is the result of diverse climate of the continent – that ranges from intense heat to bitter cold. Its varied vegetation has given rise to a wide range of animals, including mammals, birds, reptiles, fish and insects.

REVIEW QUESTIONS

PART I: MATCHING ITEMS
Direction: Match the Items Under Column "A" with the Items Under Column "B"

"A"	"B"
1. Strongly weathered soils with low nutrient-holding capacity	**A.** Arenosols
2. Shallow soils over hard rock, very gravelly material or highly calcareous deposits.	**B.** Leptosols
3. Easily erodible sandy soil with low water and nutrient holding capacity	**C.** Ferralsols
4. Soil with significant accumulation of calcium carbonates, generally found in dry areas	**D.** Calcisols
5. Young soils which lack distinct horizons	**E.** Cambisols

PART II: MULTIPLE CHOICE ITEMS
Direction: Choose the correct word or phrase from the given alternatives.

6. Which of the following is an example of non-renewable natural resources?

A. Water
B. Solar energy
C. Wind
D. Coal and petroleum

7. From the total amount of water resources available on earth, the proportion of fresh water resources amounts to _____.

A. 5 percent
B. 50 percent
C. 2.5 percent
D. 20 percent

8. Which of the following is not considered as a key strategy for effective utilization of Sustainable management of resources?

A. Maintaining and enhancing water resources
B. Conserving and recovering biodiversity
C. Degrading the marine and coastal environment
D. Enhancing skills, capacity, and engagement of people

9. One of the following countries is not among the Nile basin countries?

A. Democratic Republic of Congo

B. Kenya

C. Burundi

D. Chad

10. The natural vegetation type which covers the largest surface area is _____?

A. The tropical rainforests

B. The tropical desert vegetation

C. The subtropical steppe

D. The subtropical dry forest

PART III: SHORT ANSWER ITEMS

Direction: Give a short Answer for the following questions.

11. Natural resources are parts of the environment that people can extract and exploit;

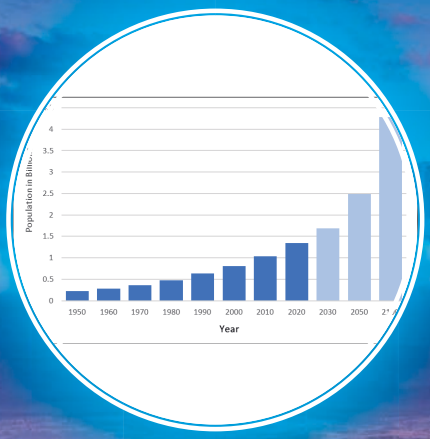
i. Based on the above statement, does natural resources utilization require ability?

12. What are some natural resources commonly found in your local environment?

13. Using Table 3.1 explain the importance of freshwater?

14. List major uses of the rivers of Africa?

15. Make debate on why Africa is poor while having abundant water and mineral resources.



UNIT FOUR

POPULATION OF AFRICA

INTRODUCTION

In the previous unit, you have learned about the natural resource base of Africa, such as drainage systems, soils, natural vegetation, wildlife and mineral resources. This unit deals with population and demographic characteristics of Africa. The major topics to be covered include the trends of population growth in Africa, population characteristics such as birth rates and death rates, population composition and methods of presenting sex and age distribution using population pyramids, population density, and settlement patterns of Africa's population.

Unit Outcomes

After completing this unit, students will be able to:

- *analyze the demographic structure of the population of Africa;*
- *examine the population characteristics of the African continent; and*
- *describe the population distribution and settlement patterns in Africa.*

Main Contents

4.1 OVERVIEW OF WORLD POPULATION GROWTH AND SIZE

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

- *describe the demographic characteristics of world population; and*
- *describe the demographic characteristics of African population.*

KEY TERMS

- *Birth rates fertility*
- *Demographic characteristics*
- *Migrations*
- *Mortality*
- *Population changes*
- *Population doubling time*
- *World population*

A. Global Population Trends

World population growth accelerated after World War II when the population of less developed countries began to increase dramatically. A billion people were added to the world's population between 1960 and 1975; another billion were also added between 1975 and 1987. The human population entered the twentieth century with 1.6 billion people and left the century with 6.1 billion.

Population growth and distribution differ significantly among the major regions. Asia, Africa, Latin America and the Caribbean all increased their share of the world population between 1970 and 2021. Asia's share of the world population rose from 58% to 61%, Africa from 10 to 13%, the Caribbean and Latin America from 8 to 9%. During the same period (1970 and 2021), the share of Northern America declined from 6% in 1950 to 5% in 1998, and Europe from 18% to 12% (Bureau of Census, 2000). According to Population Reference Bureau (2021), by the mid of 2020, the world has more than 7 billion people. The continent of Asia is the most populous comprising 59.4% of the world population followed by Africa (17.5%). Although Asia as a continent has a majority of the world's total population in 2020, estimated at 4.6 billion, the continent of Africa has contributed substantially to the rapid increase in the world's population during this time. On the other hand, the total number of inhabitants of Oceania was only 43 million making the continent the least populated.

Because of the large and increasing population size, the number of people added to the global population will remain high for several decades, even as growth rates continue to decline as it was observed in recent times. Table 4.1 below shows the growth of the world population from 1900 to 2021. There has been more population growth since 1950 than in the previous years of human existence.

Table 4.1: Population Size of the World by Regions from 1900-2021 (in million)

Regions	Year				
	1900	1950	1999	2020	2021
World	1,650	2,521	5,978	7,795	7,875
Africa	133	221	767	1340	1373
Asia	947	1402	3634	4641	4680
Europe	408	547	729	747.6	747.7
Latin America and Caribbean	74	167	511	654	660
North America	82	172	307	592	596.6
Oceania	6	13	30	42.7	43.2

Source: *UN World Population Data Sheet, 2021*

Our world has seen enormous changes in fertility rates and life expectancy over the past seven decades. For instance, in the early 1970s women had on average 4.5 children each; by 2015, total fertility for the world had fallen to below 2.5 children per woman. Meanwhile, average global lifespans have risen, from 64.6 years in the early 1990s to 70.8 years in 2020. However, although fertility levels have declined, they have not fallen at the same pace as mortality levels. Therefore, the world's population showed continued growth as indicated in figure 4.1 below.

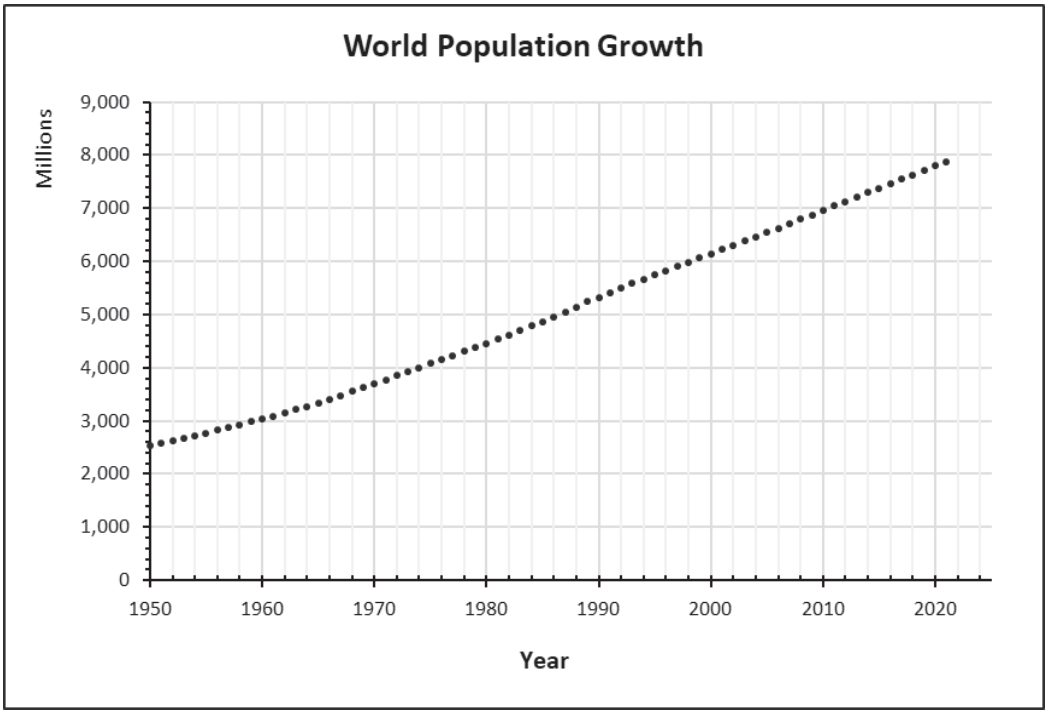


Figure 4.1: *World Population Growth from 1950 to 2021*

Why is the world population growing so rapidly?

The high growth in the world population over the past centuries is largely the result of advances in modern medicines and improvements in living standards. These have significantly reduced infant, child and maternal mortality and have contributed to an increase in life expectancy of people. This in turn increases the world population.

B. Population Size and Growth in Africa

I. Population Size

Africa has one of the world's largest populations. The continent is the world's second most populous next to Asia. According to the World Population Data Sheet, by the mid of 2020, the continent had a total population of more than 1.3 billion. This makes up 17.5 % of the world's total population. As Table 4.2 depicts, Africa's population is nearly one-third of Asia, the most populous, and 32 times that of Oceania, the least populous region in the world.

Table 4.2: Share of World Population by Regions

Region	Percentage of World Total
Asia	59.4
Africa	17.5
North America	4.8
Latin America & the Caribbean	8.4
Europe	9.4
Oceania	0.5
World Total	100

Source: *UN World Population Data Sheet, 2021*

Sub-Saharan Africa (SSA) is reputed to experience the world's highest rate of natural increase in population, about 3% per year. Its population is projected to grow from about 700 million in 1995 to 1.6 billion people by 2030. This large growth stems from the high total fertility rate (TFR) of about 6.0 children per woman, which is twice the world average. Table 4.3 is an illustration of the percentage distribution of population change (1900 - 2100), comparing that of Africa with other regions.

Table 4.3: Proportion of Population by Major Areas of the World, 1900-2050

Major World Regions	Percentage of World Population											
	1900	1950	1960	1970	1980	1990	2000	2010	2020	2030	2050	2100
Africa	8.0	9.0	9.3	9.8	10.7	11.8	13.2	14.9	17.2	19.7	25.6	39.4
Asia	57.4	55.4	56.2	57.9	59.4	60.6	60.9	60.5	59.5	58.2	54.3	43.4
Europe	24.7	21.7	19.9	17.8	15.6	13.5	11.8	10.6	9.6	8.7	7.3	5.8
Latin America & Caribbean	4.5	6.7	7.3	7.7	8.1	8.3	8.5	8.5	8.4	8.3	7.8	6.3
North America	5	6.8	6.7	6.2	5.7	5.3	5.1	4.9	4.7	4.6	4.4	4.5
Oceania	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.7
World	100	100	100	100	100	100	100	100	100	100	100	100

Source: *UN World Population Data*

II. Population Growth

Africa has one of the world's fastest-growing population. The continent has been experiencing rapid changes in its population size as a result of many factors including the interactions between fertility and mortality. Despite the gradual decline in the

birth and death rates globally, the continent continues to experience a high rate of population growth. As some historical sources indicate, Africa's population had been increasing very slowly until recent times. However, since 1950, the continent's population began to increase very rapidly. As a result, the continent's population experienced a rapid rise in number as opposed to other parts of the world. Figure 4.1 shows the trend in the population size of Africa between the years 1000 A.D and 2100 A.D.

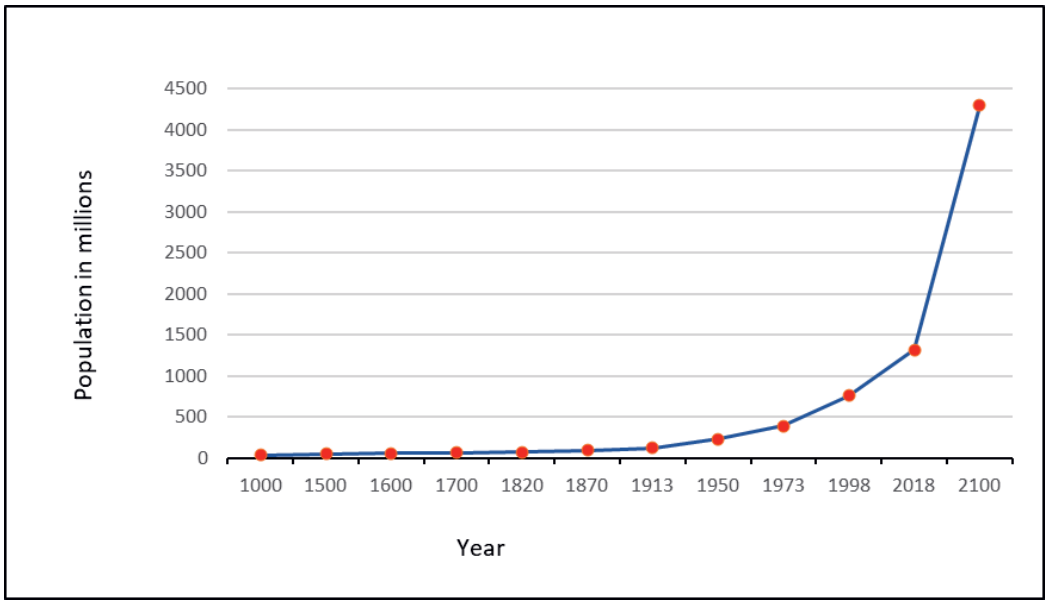


Figure 4.2: *Trends of African Population from 1000 A.D. to 2100*

Africa's population had been increasing very slowly until the early 1950s. It had taken more than 700 years to nearly double itself between 1000-1700 AD. Another nearly 200 years were passed until the 1700's population doubles itself again. Since the 1950s the continent's population began to grow faster, and it took on average only about 25 years to double itself.

Population doubling time is the time it takes for a population to double in size or value. This can be computed using the **Rule of 70**. It involves dividing 70 by the growth rate (r) of the population at a specific time. Therefore;

$$dt = \frac{70}{r}$$

where; **dt** is doubling time, **r** is growth rate of the population.

Example

If the population size of Ethiopia is 110 million in 2020 with a population growth rate of 2.5, how many years would it take for the population of Ethiopia to double itself?

$$dt = \frac{70}{2.5} = 28\ years$$

dt = 28. Therefore, it takes Ethiopia 28 years to double its population size to 220 million.

As a result, the population of Africa has grown rapidly over the past century and consequently shows a large youth bulge, further reinforced by a low life expectancy of below 50 years in some African countries. The total population as of 2018 was estimated to be more than 1.3 billion, with a growth rate of 2.5% per year.

This appears to be the highest rate in the world and twice as fast as the world's average growth rate. In terms of the period that Africa's population needs to double itself, the continent has the world's shortest doubling time. Such a rapid population growth rate and short doubling time is the result of the very high fertility rate that the continent has. Although birth rate is declining in the continent, it is still high when compared to the rest of the world. The declining mortality in the continent is also the highest in the world. The difference between the two has produced a very high rate of population growth and a short period of doubling time in Africa.

Africa's massive population growth in such a short period has also come with many interrelated challenges and opportunities. Some of the challenges include producing sufficient food to feed such a large number of people, providing healthcare, environmental degradation, increasing scarcity of freshwater, emigration of millions of Africans out of the continent, and providing adequate education to the hundreds of millions of young people living inside the continent.

A. Factors Responsible for Africa's Rapid Population Growth

Many interrelated factors have contributed to the rapid and consistent growth of Africa's population from 1950 to 2020. Many of these interrelated factors are demographic, while others are socioeconomic. Combined, these interrelated factors have come to be the engine behind Africa's rapid and massive population growth in the post-World War era.

The interrelated factors are:

- *high crude birth rates;*
- *high fertility rates;*
- *child birth at a young age;*
- *low rates of contraceptive use in most African nations;*
- *decline in infant mortality rates;*
- *decline in maternal mortality rates;*
- *decline in overall death rates; and*
- *increase in life expectancy; and decline in HIV/AIDS- related deaths.*

These interrelated demographic, social, and economic factors provide a comprehensive explanation for Africa's rapid and massive population growth in the post-World War II era.

III. Population Change in Africa

Activity 4.1

1. Do you remember what you learnt about population change in your previous grades?
2. Which demographic variables are responsible to bring population change in a given region or country?

Components of Population Change

Population change is a function of three variables: fertility (births), mortality (deaths) and migrations (immigration or emigration). There are four ways in which the number of people in an area can change:

- *someone may be* **born** *in the area;*
- *an inhabitant may* **die***;*
- *an outsider may* **move into** *the area; and*
- *a resident may* **move out**.

Consequently, population analysis requires methods that permit calculation of accurate rates of birth, deaths and in and out- migration. These three "facts of life" are called *demographic variables*. The first two (Births and Deaths) are sometimes combined to form a composite variable: natural increase, or the excess (or deficit) of

births over deaths. Consequently, Population changes in a given geographical area are affected by:

- *The difference between deaths and births also known as natural change*
- *The balance between immigration (coming in) and emigration (going out) also known as net migration*

Thus, the change in a population can be calculated by the Demographic Balancing Equation. It is an equation that is used to calculate population changes from one year to the next in a given area, based on the number of births, deaths, and migrations.

The general form of the equation is a mass balance equation, in which end population = starting population ± natural increase ± net migration, where natural increase = births – deaths, and net migration = immigrants – emigrants.

The Balancing Equation

$$P_t - P_o = B - D + I - O, \quad \text{or} \quad P_t - P_o = NI + NM$$

Where; P_t = *Population at the end of the period*

P_o = *Population at the beginning of the period*

B= Births

D = Deaths

I = In-migration

O = Out-migration

NI = Natural Increase (B-D)

NM = Net Migration (I-O)

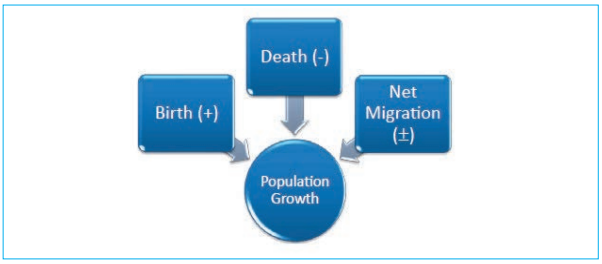


Figure 4.3: *Components of Population Change*

Activity 4.2

1. Which continent has a very short period of population doubling?
2. Rapid population growth rate has adverse effects on the quality of life of the people. Explain briefly.
3. Clarify the relationship between growth rate and period of population doubling in a given country.

4.2 AFRICA'S MAJOR DEMOGRAPHIC TRENDS

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

- *explain the demographic trends of African population.*

KEY TERMS

- *Crude birth rate*
- *Crude death rate*
- *Fertility patterns*
- *Infant mortality rate*
- *Life expectancy*
- *Maternal mortality*
- *Total fertility rate*

I. Fertility Patterns

Fertility refers to the occurrence of birth in the human population. It is a natural positive factor that tends to increase the human population size. Demographers use different measures to analyze human fertility. In this section, the fertility patterns of Africa are discussed using measures of fertility like Total Fertility Rate and Crude Birth Rates.

Definitions

Total Fertility Rate (TFR): is the average number of children a woman would give birth to during her lifetime if she were to pass through her childbearing years (15-49 years) experiencing the present-day age-specific fertility rates.

Crude Birth Rate (CBR): is the number of live births occurring among the population of a given geographical area in a given year, per 1,000 mid-year total population during the same year. For example, when we say the crude birth rate of Africa was 33/1000 by the mid of 2020, we mean that 33 births occurred for every 1000 people, on average, during the year under consideration.

Mathematically, $CBR = \left(\frac{Total\ annual\ number\ of\ live\ births}{Total\ mid-year\ population}\right) x\ 1000$

Example

Assume that a hypothetical African country 'X' had 2, 407,500 live births in 2020 and it also had a total of 53,500,000 mid-year population in that year. Calculate the crude birth rate (CBR) for the country.

Solution, $CBR = \frac{B_x}{P_x} x1000$

Where, B_X is the number of births in a year and P_X is the total mid-year population in the same year.

$$CBR = \frac{2,407,500}{53,500,000} x\ 1000 = 45$$

Therefore, Country 'X' had 45 births per 1000 of the mid-year population in the year 2020.

The total fertility rate (TFR) in Africa has steadily declined over the last two decades since 2004. For example, in 2004 TFR was 5.1 and stood at 4.7 children per woman in 2016 (Table 4.4). When compared with other continents, Africa's fertility rates of 4.5 children per woman in 2017 seem high. Indeed, it has been the highest in the world. However, that figure is low compared with Africa's birth rate in previous decades. For instance, the total fertility rate stood at an average of 6.6 children per woman in 1980.

In spite of these declines, compared with other regions of the world, as it has been indicated in the previous paragraph, African countries still experience relatively high fertility - explained as a function of early sexual debut among women due to early marriage and unmet need for family planning. The proportion of individuals below 15 years is also projected to decline gradually to 36% in 2030 from 46% in 1990; on the other hand, those aged 15 to 59 years will increase from 456 million people in 2010 to reach 758 million in 2030.

Table 4.4: Total Fertility Rate for Africa by Region

Major Regions	Year				
	2004	2008	2012	2016	2020
Northern Africa	3.4	3.0	3.1	3.4	2.9
Western Africa	5.8	5.7	5.4	5.4	5.1
Eastern Africa	5.7	5.4	5.1	4.8	4.3
Central Africa	6.4	6.1	5.9	6.0	5.8
Southern Africa	2.9	2.8	2.5	2.5	2.4

Source: Population Reference Bureau Reports (2019)

Although the overall TFR picture shows a steady decline within regions, the change in fertility has not been uniform. For example, Northern Africa has shown little change in the total fertility over the last two decades. In 2004, the total fertility for Northern Africa was 3.4 children per woman, which is the same in 2016 again even though it slightly declined to a TFR of 2.9 by 2020. Fertility change in Central Africa has stagnated at around 6 children per woman. The lowest fertility rate is in Southern Africa followed by Northern Africa while the highest is in Central Africa followed by Western Africa while in eastern Africa the total fertility rate stands at 4.3 in 2020 (Table 4.4).

In addition to TFR, the Crude Birth Rate can also be taken as a means of analyzing the fertility pattern of human population. The crude birth rate refers to the occurrence of the annual number of live births for every 1000 of the mid-year total population. Even by this measure, Africa has the highest fertility in the world. For instance, according to the UN World Population Data Sheet for the year 2020, the Crude Birth Rate (CBR) for Africa is estimated to be 33 per 1000 population. This is the peak even for the standard of less developed countries, which is 20 per 1000 population.

Although fertility is high in Africa, it still varies from country to country or region to region. The variation in crude birth rate is shown in Table 4.5 below.

Table 4.5: Highest and Lowest Crude Birth Rates for Major Africa's Regions, 2020

Major Region		Major Region	
Northern Africa	CBR (in 2020)	Central Africa	CBR (in 2020)
Sudan	31/1000	Chad	47/1000
Tunisia	16/1000	Sao Tome and Principe	28/1000
Western Africa		Eastern Africa	
Niger	47/1000	Somalia	49/1000
Cape Verde	18/1000	Ethiopia	32/1000
Southern Africa		Mauritius	11/1000
Namibia	27/1000		
South Africa	19/1000		

Source: UN World Population Data Sheet, 2021

There existed huge variation in the level of fertility between and among major regions in Africa's continent (Table 4.5). Both the highest and lowest levels of fertility were observed in Eastern Africa; Somalia being a country with the highest level of crude

birth rate (49/1000) as opposed to Mauritius which stood at 11/1000 population for the year 2020. Fertility for other African countries comprises rates ranging between the two extremes.

Although the crude birth rate in Africa has been gradually decreasing in recent decades, they are still relatively high compared with other regions of the world and the world average. This is due to the following factors;

- *less access to contraceptives;*
- *high level of poverty;*
- *low status of women;*
- *need for large number of children for the labor force;*
- *considering children as the symbol of virility;*
- *low educational background; and*
- *influence of traditions and cultures on family size.*

A. Future Fertility Trends

In projections to 2050, the African population is expected to peak at 2.5 billion from 1.0 billion in 2010 (Figure 4.3), which would represent 25% of the world's population. These projections rely upon assumptions about vital fertility and mortality rates. The fertility rate is assumed to decline at a varying pace by country and follow a trajectory similar to the one observed in other major global areas.

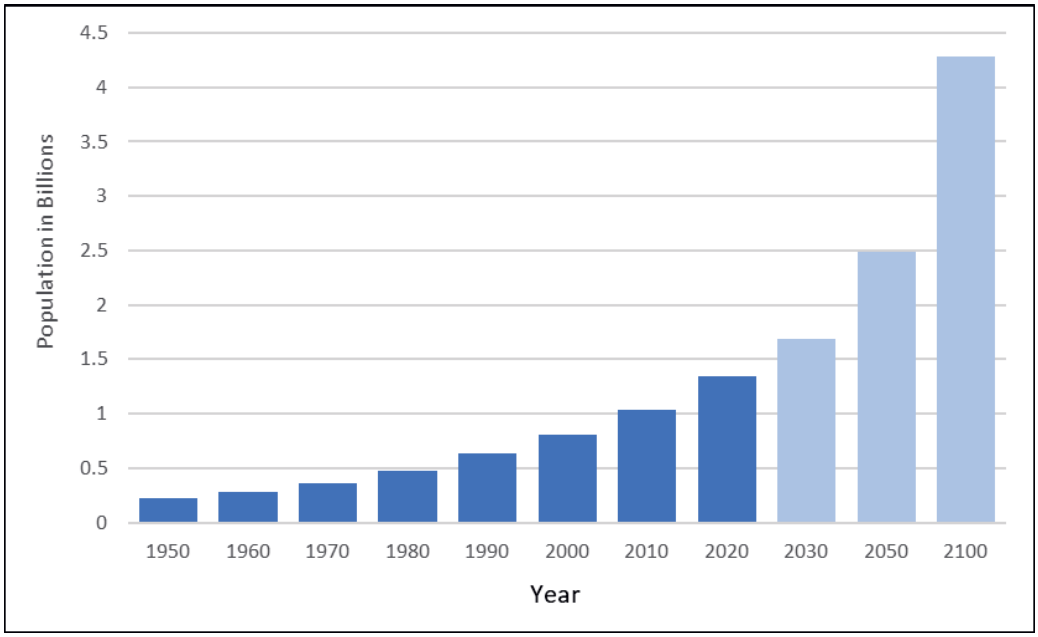


Figure 4.4: *Africa's Total Population (in billions) Source: Based on UN Population Division Data*

Lower fertility rates will lower Africa's overall annual population growth rate to 2% by 2030, compared to Asia at 1.0%, Latin America and the Caribbean at 1.2%, Eastern Europe-0.8%, and the world as a whole at 1.5%. The dynamics will be similar in all African sub-regions, except the North Africa region, where population growth will decline at about 0.8% a year by 2030 (Figure 4.4).

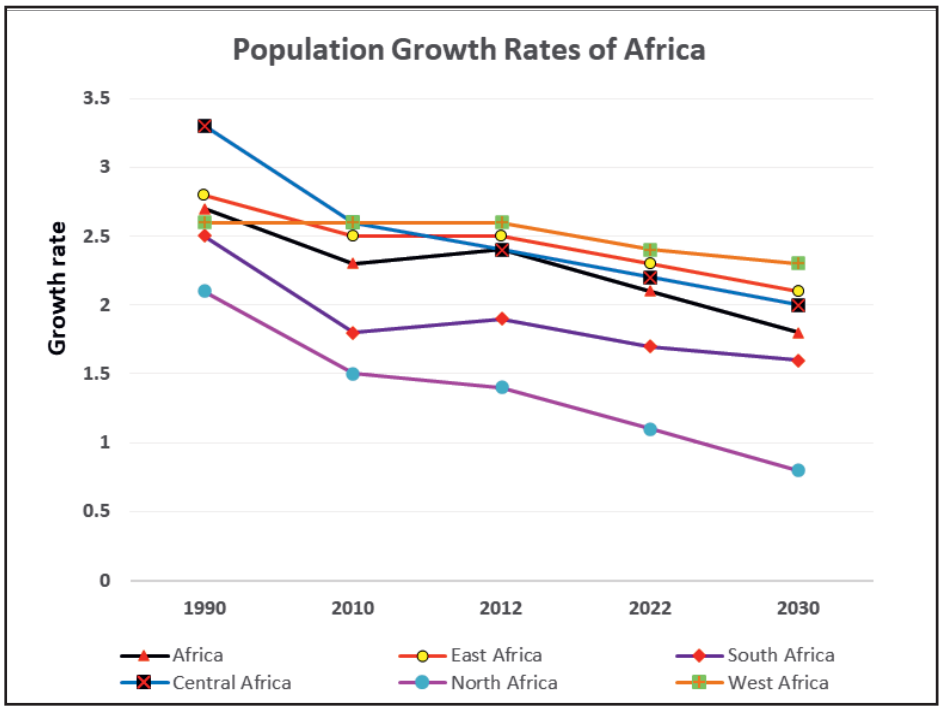


Figure 4.4: *Africa Population Growth Rates by Sub-Regions*

Source: Based on UN Population Division Data

II. Mortality Patterns in Africa

Mortality refers to the occurrence of death in the human population. It is a natural negative factor that tends to decrease the human population size. The level of mortality in a population can be measured by the crude death rate (number of deaths per thousand inhabitants), the infant mortality rate (number of infant deaths per thousand live births) and life expectancy (a summary measure of death risks/survival chances over different ages). Of these, the infant mortality rate is the most widely used indicator of the general health situation in a country.

In this section, mortality patterns in Africa are discussed using measures of mortality like Crude Death Rate (CDR), Infant Mortality Rate (IMR), Maternal Mortality Rate and Life Expectancy.

Definitions

Death Rate (DR): is the number of deaths per 1000 population in a year. For example, Africa's death rate was 8/1000 by the mid of 2020. This is to say that 8 deaths were occurred for every 1000 people on average during the year under consideration.

Crude Death Rate (CDR) is the number of deaths occurring among the population of a given geographical area during a given year, per 1,000 mid-year total population of the given geographical area during the same year.

Mathematically, $CDR = \left(\frac{Total\ annual\ death}{Total\ mid-year\ population}\right) x\ 1000$

Example

Assume that a hypothetical African Country 'X' had 856,000 deaths in 2020 and it also had a total of 53,500,000 mid-year population in that year. Calculate the crude death rate (CDR) for Country 'X'.

Solution,

$$CDR = \frac{D_x}{P_x} x1000$$

Where, D_X is number of deaths in a year and P_X is the total mid-year population in same year.

$$CDR = \frac{856,000}{53,500,000} x\ 1000 = 16$$

Therefore, Country 'X' had 16 deaths per 1000 of the mid-year population in the year 2020.

Infant Mortality Rate (IMR): is the death of an infant before his or her first birthday. It is measured as an annual number of infant deaths for every 1,000 live births during the same year.

$$\text{Mathematically, } IMR = \left(\frac{Total\ annual\ number\ of\ infant\ deaths}{Total\ annual\ live\ births}\right) x\ 1000$$

Example

Suppose that Country 'Y' in the year 2020 had 40,000 infant deaths while it had 5,000 newly born babies (live births) during the same year. Calculate the infant mortality rate (IMR) for Country 'Y' during that year.

$$\text{Solution, } IMR = \frac{D_0}{B_x}\ x1000$$

Where Do is total number of infants' deaths before age one during a year and B_X is the total number of live births in same year.

$$IMR = \frac{5,000}{40,000}\ x\ 1000 = 125$$

Therefore, Country 'X' had 125 infant deaths before age one per 1000 live births in the year 2020. The infant mortality rate is the most widely used indicator of the general health situation in a country.

Maternal Mortality: The annual number of female deaths from any cause related to or aggravated by the pregnancy or its management (excluding accidental or incidental causes) during pregnancy and childbirth or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy.

Demographers use ***Maternal Mortality Ratio*** to measure maternal deaths. Maternal Mortality Ratio is defined as the number of maternal deaths during a given time per 100,000 live births.

$$\text{Mathematically, } MMR = \left(\frac{Total\ deaths\ due\ to\ maternal\ causes}{Total\ annual\ livebirth}\right) x\ 100,000$$

Example

Suppose that Country 'Z' in 2020 had 3,500,000 live births while it had 10,000 maternal deaths during the same year. Calculate the Maternal Mortality Ratio (MMR).

Solution, $MMR = \frac{DMC}{B_x} x100,000$

Where DMC is total number of deaths due to maternal causes in a year and B_X is the total number of live births in same year.

$$MMR = \frac{10,000}{3,500,000} x100,000 = 286$$

Therefore, Country 'Z' had 286 maternal deaths per 100,000 live births in the year 2020.

Life Expectancy refers to the number of years a person can expect to live. Life expectancy is based on an estimate of the average age that members of a population group will be when they die.

Life expectancy at birth is the average number of years a newborn infant can be expected to live under current mortality levels.

What is the pattern of Mortality in Africa? Is it increasing or decreasing across time?

Deaths in Africa have reduced from an average of 14 persons per 1,000 population in 2007 to stand at 10 persons per 1,000 population in 2016. Africa further experienced decrease in death rate over the next five years. According to the World Population Data Sheet, the continent had a crude death rate of 8 deaths per 1000 population by the mid of 2020. When a regional comparison is made, the death rate ranges from 6/1000 in Northern Africa to 11/1000 in Southern Africa.

Changes in the death rates for the general population are also reflected in the infant mortality rates. In terms of infant mortality rate, which is the death of infants under one year per 1000 live births, the continent still has the world's largest rate of 47 deaths per 1000 live births. Infant mortality rates also vary from region to region. Accordingly, Central Africa has the highest rate of 62/1000 followed by Western Africa 55/1000 and Sub Sharan Africa50/1000 live births by the mid of the year 2020. The lowest Infant Mortality rate is in Northern Africa which was only 22/1000 during the same year. As it has been stated, despite these reductions, performance has

not been uniformed within and between regions.

The relatively high death rate, even though it is decreasing, in Africa is attributed to:

- *low standard of living;*
- *low access to health facilities;*
- *poor sanitary practices;*
- *civil war and political instability;*
- *widespread famine caused by recurrent drought;*
- *poor nutrition; and*
- *high incidence of disease and infections.*

Table 4.6: CDR and IMR by Regions in Africa (2020)

Region	Crude Death Rate per 1000 Population	Infant mortality Rate per 1000 Live Births
World	8	31
Africa	8	47
Northern Africa	6	22
Western Africa	10	55
Eastern Africa	6	42
Central Africa	9	62
Southern Africa	11	26

Source: *UN World Population Data Sheet, 2021*

A. Future Mortality Trends

As it is stated in the previous section, Africa's death rate is declining since World War II. This happened due to development in medical technology, and sanitary practices, and the discovery of medicines and vaccines for tropical diseases. Moreover, mortality rates are generally poised to improve over the coming decades as communicable diseases in Africa continue to be addressed, although malaria remains endemic in most African countries and continues to represent a major cause of morbidity and mortality. Much progress is nonetheless expected in child and infant mortality rates: child mortality (i.e. *death of children before reaching five years of age)* is projected to decline from 116 per 1000 live births in 2010 to 75 per 1000 live births in 2030 (Figure 4.4) due to better incomes, access to improved water supply and sanitation, and better health facilities.

The North Africa and East Africa sub-regions are projected to benefit more from reduced child mortality than other regions. The relative reduction of the impact of HIV/AIDS would influence this decline. In general, trends in deaths from main causes appear to be decreasing as a result of increasing attention to communicable and chronic diseases, which is having a positive impact on longevity.

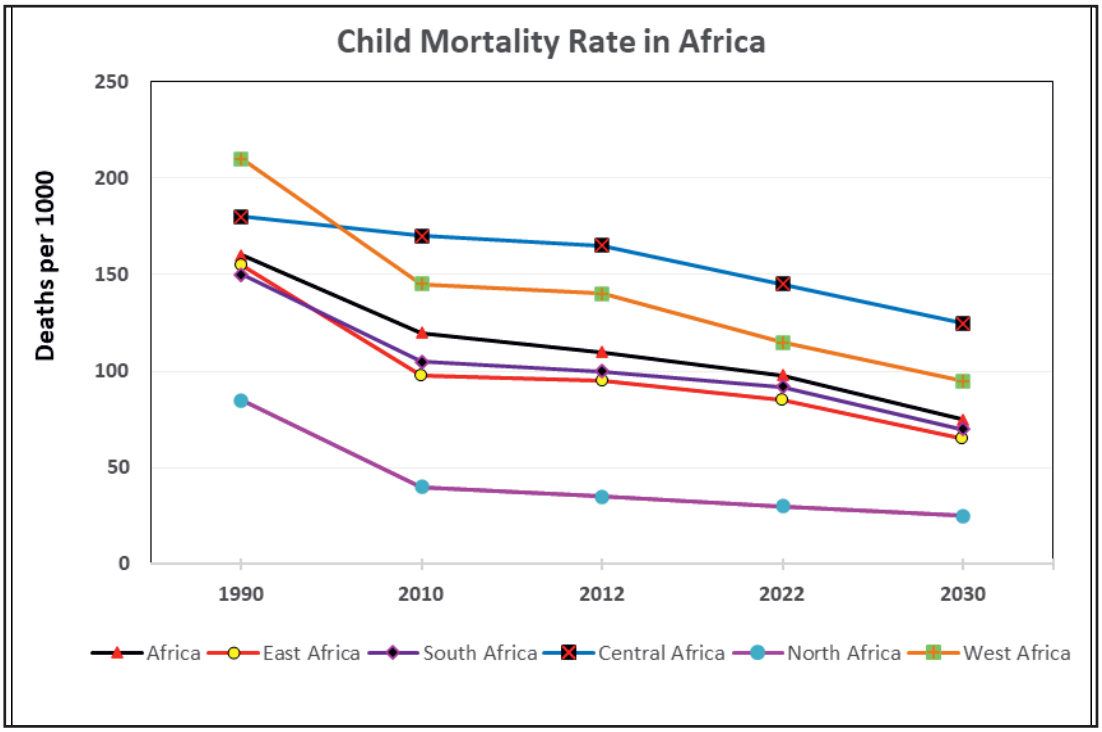


Figure 4.6: *Projected Child Mortality Rate in Africa*
Source: *Based on UN Population Division Data (2020)*

III. Life Expectancy

The current birth and death rates of Africa reflect a very young (and economically dependent) population with low life expectancy. Almost all sub-Saharan countries have a population of under 15 years of age- rated in percent of more than 40 percent. This has resulted in a high dependency ratio in the continent. The average life expectancy at birth for the whole continent is 64 years by the mid of 2020 (see Table 4.7). However, there exists variation in the level of life expectancy between and among major regions in Africa. North African countries have been successful in raising the life expectancy to an average of 74 years while Western African countries failed to do so where the average life expectancy stood only at an average of 59 years; a figure that is far below continental average. There also exists a marked disparity

in life expectancy between rich and poor countries. However, the gap between the poor and the rich countries in life expectancy has shown a significant reduction over the last 50 years despite the widening wealth gap between the two economic regions. With reduced mortality, Africa should expect and plan for an ageing population. By 2030, the average life expectancy in Africa is projected to surpass 64 years.

Table 4.7: Life Expectancy by Regions in Africa (2020)

Region	Life Expectancy at Birth (Years)
World	73
Africa	64
Sub Saharan Africa	62
Northern Africa	74
Western Africa	59
Eastern Africa	66
Central Africa	61
Southern Africa	62

Source: *UN World Population Data Sheet, 2021*

Activity 4.3

1. Africa's population growth rate is the highest in the world. What will happen if Africa's population growth rate continues in such a manner?

2. Some developed countries' population growth rate is stagnant. The old-age population number is growing from time to time. What sort of implication will this bring upon the socio-economic condition of these countries?

4.3 POPULATION STRUCTURE

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

- *describe the demographic structure of African population.*

KEY TERMS

- *Age dependency ratio*
- *Age structure*
- *Population pyramid*
- *Population structure*
- *Sex ratio*
- *Sex structure*

A. Age Structure

How do you describe the age composition of Africa's population?

The age structure of a population can be expressed by the distribution of population into young, working and old age groups. Thus, one can deduce that Africa is a continent that is characterized by the dominance of the young age population. The age structure of the population can also be expressed from the median age perspective. If the median age is low, it implies that the population is young. For example, Africa's median age has been 19.7 years by the mid of 2020. In contrast, if the median age is high, the population is likely to be adult and old age groups. For example, the median age for Europe has been 42.5 years by the mid of 2020. Low median age reflects high fertility and high population growth rates whereas high median age prevails in a population where the population growth rate is low and slow.

Table 4.8: Africa's Population by Age and Major Regions, 2020

Region	Age Category			Age Dependency Ratio (ADR) x 100
	Young Population (0-14 years)	Work Population (15-64)	Old Population (65+)	
Sub-Saharan Africa	43	54	3	85.2
Northern Africa	33	62	5	61.3
Western Africa	44	53	3	88.7
Eastern Africa	42	55	3	81.8
Central Africa	46	51	3	96.1
Southern Africa	29	65	6	53.8
Africa	41	56	3	78.6

Source: *UN World Population Data Sheet, 2021*

Africa is the continent that has high young population, but it has very low old age population. In developing continents like Africa, the level of fertility is very high; and the rate of population growth is high, too. This is readily attributed to their predominantly young age structure. As high fertility persists, the pressure on scarce resources for development increases. The demand for food, education, health facilities, employment opportunities, housing and other services also increases. In order to maximize these needs to meet the demand of the growing population, physical and institutional infrastructures have to be increased abundantly. The persisting high rate of population growth constantly dwarfs whatever is achieved in the economic sector. Resources, which could be used for development purposes, could be shifted to the provision of basic supplies for the additional members.

B. Sex Structure

The sex structure of the population can be expressed using a sex ratio. It refers to the proportion of males to females in the overall population of a given area. The sex ratio is expressed in terms of the number of males for every 100 females.

$$Sex\ Ratio = \left(\frac{Number\ of\ male\ population}{Number\ of\ female\ population} \right) x100$$

The proportion of the two sexes in the population of a region has an impact on other demographic elements such as marriage rate, fertility, occupational structure, growth, etc.

Example

Assume that a hypothetical country 'X' had a population of 3.6 million male and 4 million females. What is the sex ratio of the population of the country?

$$\text{Sex ratio} = \frac{NMP}{NFP} \times 100$$

Where, NMP is the number of male population in a given year and NFP is the number of female population of the same year. Then, the sex ratio of the population is given below.

$$\text{Sex ratio} = \frac{3{,}600{,}000}{4{,}000{,}000} \times 100 = 90$$

Therefore, Country 'X' had a sex ratio of 90 which means there are 90 males for 100 females.

C. Population Pyramid

A very effective and quite widely used method of graphically depicting the age-sex composition of a population is called a population's pyramid. A population pyramid is designed to give a detailed picture of the age-sex structure of a population, indicating either single age or 5-year groups, or other age combinations. The basic pyramid form consists of bars, presenting age groups in ascending order from the lowest to the highest pyramid horizontally one on another. The bars for males are given on the left of a central vertical axis and the bars for females are on the right of the axis.

The number of males or females in the particular age group is indicated by the length of the bars from the central axis. The age scale is usually shown stranding the central axis although it may be shown at the right or left of the pyramid only, or both on the right and left, perhaps in terms of both age and year of birth. In general, the age groups in a given pyramid must have the same class interval and must be represented by bars of equal thickness. Most commonly pyramids show 5-years age groups.

Types of Population Pyramids

While all countries' population pyramids differ, three types have been identified by the fertility and mortality rate of a country.

i. Expansive pyramid

A population pyramid showing a broad base, indicating a high proportion of children, a rapid rate of population growth, and a low proportion of older people.

This wide base indicates a large number of children. A steady upward narrowing pyramid shows that more people die at each higher age bond. This type of pyramid indicates a population in which there is a high birth rate, a high death rate and short life expectancy. It is the typical pattern for less economically developed countries, due to little access and incentive to use birth control, negative environmental factors and poor access to health care.

ii. Constructive Pyramid

With a population pyramid showing lower numbers or percentages of young people (ages 1 -14), the country will have a large elderly or aging population. Such a population pyramid usually displays a population percentage of ages 1-14 fewer than 30% and ages 75 and above over 6%. This is considered as an "aging population" that generally occurs in developed counties with adequate health services.

iii. Stationary Pyramid

A population pyramid showing an unchanging pattern of fertility and mortality (fertility and mortality are balanced), i.e., B = D, where, B = Birth, D = Death and Population growth rate is zero.

As a result of the nature of population distribution into different age categories (i.e., young, working and old), most developing countries are characterized by expansive type of population pyramid which is almost triangular by shape. This kind of population pyramid has a broad base and tapering apex. The broader base is due to a high level of fertility among the population that results in high population growth rate. On the other hand, the tapering apex is typically indicative of low life expectancy. The population pyramid of most developing countries resembles the one indicated in Figure 4.7.

Contrary to developing countries, since the level of fertility is less and life expectancy is high in most developed countries, they are best expressed by the type of population pyramid that is narrower at the base and that becomes wider at the top.

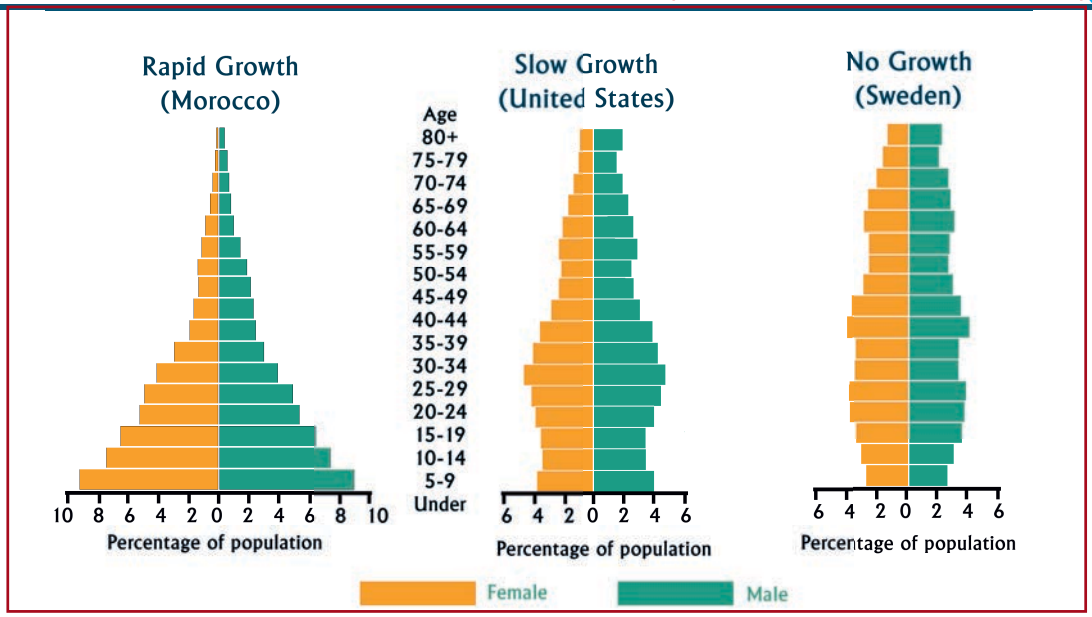


Figure 4.7: *Model Population Pyramids*

Generally, the following are among the major characteristics of the African Population

- *High fertility and mortality rates;*
- *Generally young population;*
- *Triangular population pyramid indicating the prevalence of high fertility and mortality rates;*
- *High age dependency ratio and youth dependency ratio and low old dependency ratio;*
- *Low life expectancy; and*
- *High population growth rate.*

Activity 4.4

1. Which continent is characterized by the highest percentage of the young population? Why?
2. Explain briefly the impact of having a high percentage of the young population on socio- economic changes.
3. Why is a large elderly dependent population generally viewed as a problem?
4. Compare and contrast (the shape and characteristics) of expansive, stationary and constructive population pyramids.

4.4 DISTRIBUTION AND DENSITY OF AFRICA'S POPULATION

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

- *demonstrate distribution and density patterns of African population using graphs, charts, and maps.*

- *Population distribution*
- *Population density*
- *Spatial variation*

Population distribution refers to the way people inhabit and occupy the earth's surface. As elsewhere in the rest of the world, Africa's population distribution is uneven. As a result, there are areas of high and low population density. Some parts of the continent, particularly the vast Sahara, have few permanent residents. While others rank among the world's most densely populated areas. The Nile Valley of Egypt, Mauritius, Rwanda, and Burundi are among the most densely populated areas in the continent. According to World Population Prospects Data, the continent's average crude population density during the mid of 2019 was about 44 people/km^2.

Certain human and physical factors are responsible for such spatial variation in the distribution of population in the continent. Among the physical factors, some are climate, relief, availability of water, fertility of the soil, distribution of minerals and the like. On the other hand, the human factors that determine the extent to which humans inhabit a certain place include economic conditions, political situations and other social factors.

However, there exists a significant regional variation in population density. As it can be seen from the following Table 4.9, both Eastern and Western Africa have the continent's highest crude density of 65 Persons/Km^2 followed by Sub Saharan Africa with 49 Persons/Km^2. Contrary to this, Southern Africa has the continent's lowest crude density of 25 Persons/Km^2 followed by Central Africa (27Persons/Km^2) and Northern Africa (31Persons/Km^2).

On a country level, the most populous countries are Nigeria, Ethiopia, Egypt, the Democratic Republic of the Congo (DRC), and the Republic of South Africa (RSA). However, being populous does not necessarily mean being densely populated. The most densely populated countries in Africa include; Mauritius, Rwanda, Burundi, Comoros, and Seychelles.

Table 4.9: Population Density by Major Regions of Africa, 2019

Region	Crude Population Density (Persons/Km^2)
Sub-Saharan Africa	49
Northern Africa	31
Western Africa	65
Eastern Africa	65
Central Africa	27
Southern Africa	25
Africa	44

Source: *UN World Population Prospects, 2019*

4.5 URBAN AND RURAL SETTLEMENT PATTERNS IN AFRICA

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

- *discuss the urban and rural settlement patterns in Africa.*

KEY TERMS

- *Rural*
- *Settlement*
- *Urban*
- *Urbanization*

Africa offers stark contrasts in terms of urbanization compared to other regions of the world. For example, Burundi, Rwanda, Malawi, Ethiopia and Burkina Faso are still predominantly rural, while Gabon and Western Sahara, more than 80% of their population lives in urban areas. African urban growth, which reflects sizeable

migration flows from rural areas, presents major challenges for development, as migrants into cities require access to land, infrastructure and basic services. This has also stretched health care services.

The top 20 countries in urbanization have at least 50% of the population in urban areas while the bottom 10 countries have less than a quarter of their population living in urban areas. Generally, countries in Northern and Western Africa regions are more urbanized compared to countries in the Eastern Africa region. The top countries include Gabon almost 90% of its population in urban areas. Other countries with a high rate of urbanization are Western Sahara, Libya, Djibouti, Algeria, Tunisia, Sao Tome and Principe, Cape Verde, Congo, South Africa, Angola, Morocco, Gambia, Mauritania, Botswana, Seychelles, Cameroon, Cote D'Ivoire, Ghana and Liberia. The bottom 10 countries in urbanization are Kenya, Eritrea, Chad, Niger, Swaziland, Ethiopia, Uganda, South Sudan, and Malawi while Burundi is the least urbanized at only 12%.

Eastern Africa seems to be the least urbanized region while the most urbanized region is Southern Africa. The population in urban areas is currently estimated to be 41% of total and is projected to increase further, which will create an urban population larger than the rural population in about two decades (See Figure 4.8).

Table 4.10: Proportion of Population in Urban Areas by Region (2016)

Major Region	Percent of Urban Population
Northern Africa	51
Western Africa	45
Eastern Africa	26
Central Africa	47
Southern Africa	62

Source: **Based on UN Population Division Data**

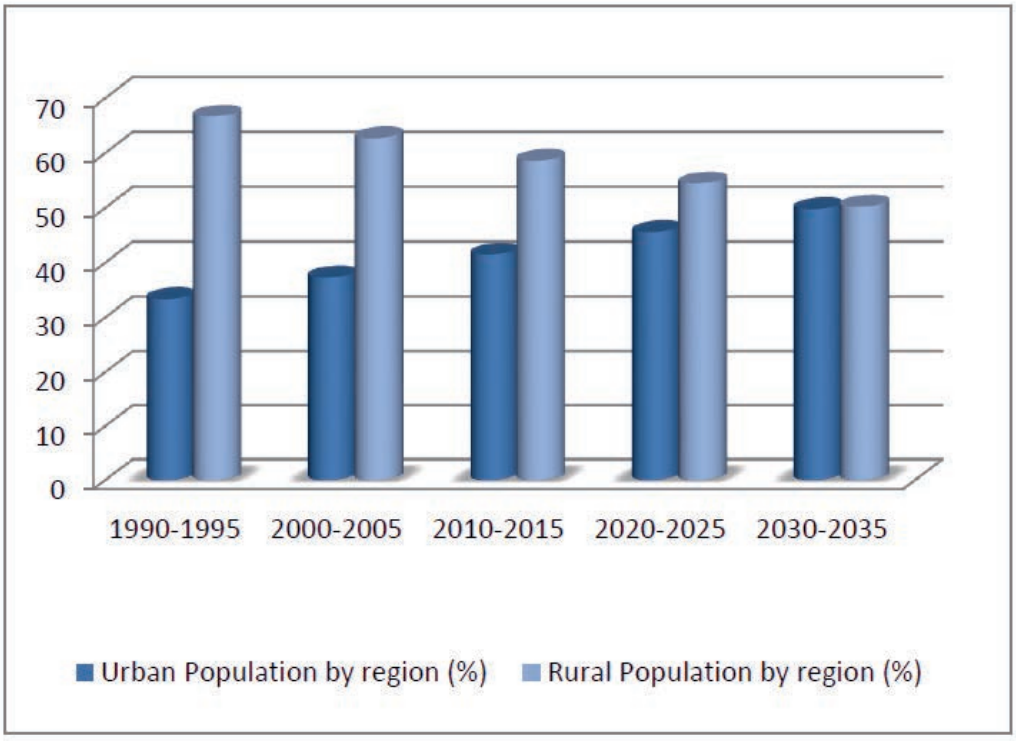


Figure 4.8: *Projected Africa's Urban – Rural Population Distribution (2030-35)*

UNIT SUMMARY

Africa and other developing regions make up an increasing share of the world population. The world population has shown a tremendous increment from 1950 to 2020. Africa, Asia and Latin America/Caribbean contribute the highest proportion to this share.

The growth rate of the population is a vital demographic feature that can help us understand the population change that a given society has undergone and will undertake in the future.

Africa is the only continent whose population is growing faster than other continents.

There is not an even distribution of population in the world. Deductively, Africa's population distribution is uneven. The unevenness of African population distribution is attributable to human and physical factors.

The three major components that bring about a change in matters related to population in any country are fertility, mortality and migration.

Africa's rapid population growth and backward socio-economic development have turned Africa into the world's lowest social amenities. As a result, poor health, inadequate education, deficient nutrition and inferior housing facility widely tangle the people of the continent.

Africa's rate of urbanization is the highest in the world. Currently, uncontrolled and rapid urbanization has depopulated rural areas. This has crippled agricultural production, especially the production of food crops.

Generally speaking, rapid urban growth has become a major cause of growing poverty both in rural and urban areas in Africa.

REVIEW QUESTIONS

PART I: TRUE OR FALSE ITEMS

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

1. Both fertility and mortality levels of the African population have significantly declined over the past decade.
2. Population growth and distribution of Africa varies across regions and countries.
3. Africa's rate of urbanization is the highest in the world.
4. The age and sex composition of African population can be depicted by a stationary pyramid.
5. Fertility, mortality and migrations are the three components of population change.
6. Maternal Mortality is the death of mothers due to old age.

PART I: MULTIPLE CHOICE ITEMS

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

7. Africa has relatively high death rate due to one of the following factors;
   - A. high standard of living
   - B. high access to health facilities
   - C. better sanitary practices
   - D. high incidence of diseases
8. Which of the following countries has the lowest Crude Population Density in 2019?
   - A. Algeria
   - B. Kenya
   - C. Ghana
   - D. Republic of South Africa

9. Which of the following statement is true about the age structure of the population of Africa?

A. Africa has large old age population

B. Africa's median age is high implying that the population is young

C. High fertility and growth rate of population in Africa is attributed to young age population structure

D. All of the above

10. Which of the following components of population change results in either positive or negative growth?

A. Birth

B. Death

C. Immigration

D. Net migration

UNIT FIVE

MAJOR ECONOMIC AND CULTURAL ACTIVITIES OF AFRICA

INTRODUCTION

In this unit, you will learn about the way of life of the peoples of Africa. These include economic activities, social and cultural diversities in the continent. Africa is very resourceful region in the world. Nevertheless, the continent faces huge economic problems. Its economy is not as diversified as other diversities we find in the continent. Therefore, its people are largely engaged in primary economic activity.

Africa needs a very strong commitment to come out of the cycles of poverty, high unemployment, and economic problems. Specially, it has to seek solutions to the problem of unemployment. Therefore, the leaders of Africa have come together and set goals called Agenda 2063. The agenda aims to foster economic development, political integration, improvements in democracy and justice, establishment of security and peace on the entire African continent.

Culture is a manifestation of socio-religious and economic condition, the standard of living, level of technology and people's environmental perception. It is abstract or intangible; however, it can be defined by elements like language, religion, ethnicity, rituals, customs, traditions, and tools. The society has the maximum bearing of religion. It is the religion which compels people to adopt certain kinds of economies, dresses, food habits, and beliefs. It also commands people to learn certain languages, and provides some restrictions at the time of cultural mingling. All other variables are directly or indirectly controlled by religion.

Unit Outcomes

After completing this unit , you will be able to:

- *summarize the employment structure in the world;*
- *identify the major economic activities in Africa;*
- *identify the major cultural landscapes in Africa;*
- *describe linguistic and religious diversity of Africa;*
- *assess the pillars of Africa's Agenda 2063 and their implication for the socio-economic transformation of the continent; and*
- *compare and contrast the indicators of Agenda 2063 with those of Sustainable Development Goals (SDGs).*

Main Contents

5.1 OVERVIEW OF EMPLOYMENT STRUCTURE IN THE WORLD

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

- *describe the major employment structures of the world.*

KEY TERMS

- *Developing country*
- *Economic activity*
- *Employment structure*
- *Lower middle-income*
- *Middle-income*
- *Upper middle-income*

Focus

Main Types of Economic Activities

- *Primary sector: involves extracting raw materials, rearing animals, and growing crops.*
- *Secondary sector: involves changing of raw materials into new products (finished products). Hence, it is called 'manufacturing'.*
- *Tertiary sector: involves activities of people in the service sector, such as education, health, tourism, and banking.*
- *Quaternary sector: is based on knowledge. It includes activities such as information and communication technology (ICT), research & development, education, financial planning, etc. It mostly engages people in information generating and sharing.*

The employment structure of a country, a region or the whole world shows how the labor force is divided between **primary**, **secondary,** and **tertiary** economic activities. These three types are commonly used classification systems; while, **quaternary** is a newly emerging system, hence it is not included in the assessment of economies of countries. Different countries have different employment structures. Therefore, the

employment structure of a given country can reflect many things about the country's economy.

Such economic activities provide people with job opportunities. Then the people can purchase the goods and services they need through the earnings. Note that all countries of the world do not have the same share of these economic activities. The percentage of each sector varies from one country to another depending on its level of development. Developed countries have more people who work in the tertiary sector, whereas, developing countries have more people engaged in the primary sector, particularly in agriculture.

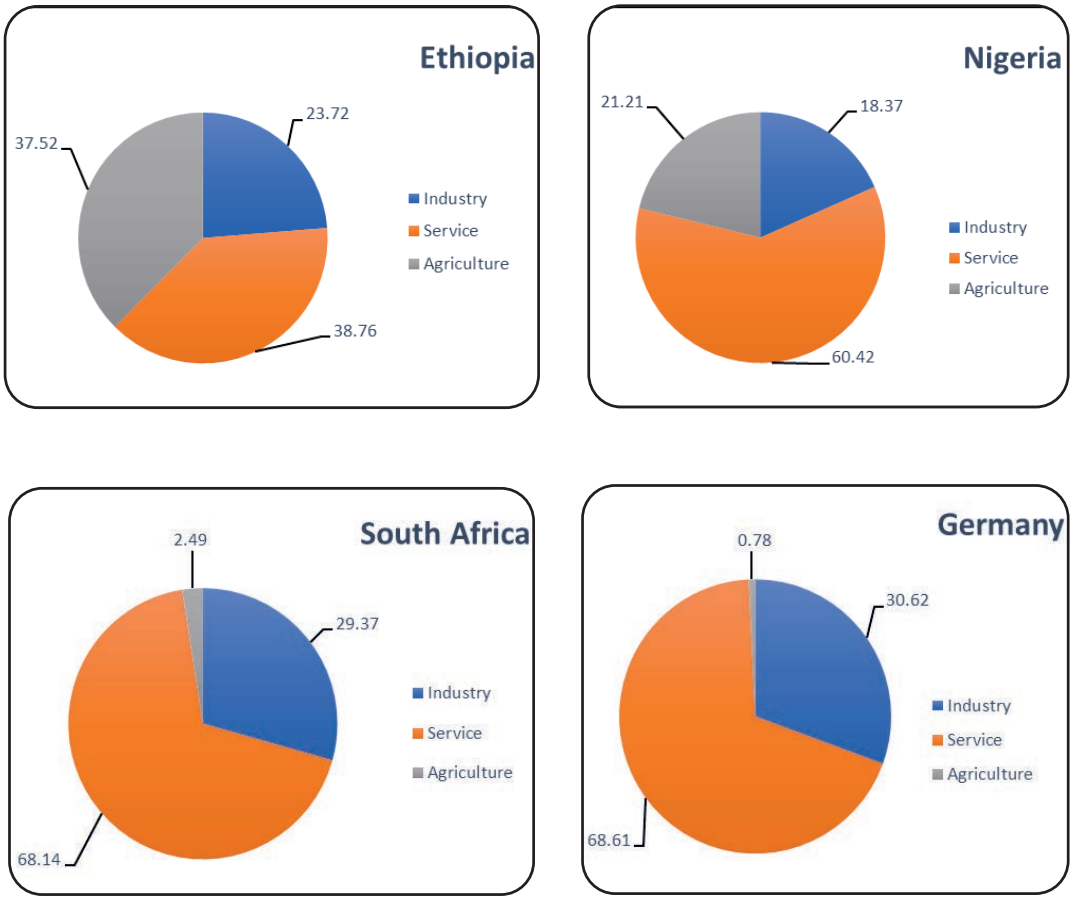


Figure 5.1: *Percentage Share of Economic Activities by Countries*

Focus

Developing Countries (DVCs)

Developing countries (DVCs) are the world's least industrialized nations heavily committed to agriculture. They have low level of literacy, high unemployment, rapid population growth and their exports are largely agricultural or raw materials. Capital equipment is scarce, production technologies are primitive, and productivity is low. More than 60% of the world's population lives in these nations, which can be divided into two groups.

a. The first group consists of middle-income countries. These are home to 75% of the world's population and 62% of the world's poor in 2020. They are further divided into two: lower middle-income and upper middle-income economies based on their gross national income (GNI).

- lower middle-income economies - those with a GNI per capita between $1,036 and $4,045 in 2021.
- upper middle-income economies - those with a GNI per capita between $4,046 and $12,535 in 2021.

b. The low-income countries are countries with GNI per capita of $1,025 or less in 2018. Dominating this group in 2020 are Afghanistan, Bangladesh, and the sub-Saharan African nations.

Many DVCs such as China, Malaysia and Thailand have achieved high annual growth rates in their GDPs in recent decades and have moved out of low-income to lower middle-income. Meanwhile, previous DVCs, such as South Korea, and Singapore have achieved impressive success and became high-income countries.

5.2 MAJOR ECONOMIC ACTIVITIES IN AFRICA

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

- *describe the major economic activities of Africa.*

KEY TERMS

- *Foreign aid*
- *Gross domestic product*
- *Poverty trap*
- *Primary sector*
- *Secondary sector*
- *Technological capacity*

Africa is home to about 1.3 billion people. Hence, it has large working age population. It is also a diverse continent offering human and natural resources which have the potential to yield inclusive growth and eradicate poverty in the region. Therefore, Africa has very good opportunities for economic growth and development. At present time, Africa is composed of low, lower-middle, upper-middle, and high-income countries. However, Africa faces huge economic hurdles created largely by its **historical past**, widespread conflicts and bad economic policies pursued by its inexperienced leaders. Nevertheless, economic growth should focus on enabling Africans to live healthier and prosperous lives by harnessing the potential of its resources and people.

Activity 5.1

1. Which of the following Africa's historical past has an effect on its economy?

A. Slave trade

B. Colonialism

C. Both of the above

5.2.1 Economic Activities in Africa

Africa largely depends on the primary sector or the extraction of basic materials from the natural environment. When an economy highly relies on the extraction of basic natural resources through mining, fishing, agriculture, and forestry it faces several challenges.

A. Primary Sector in Africa

i. Agriculture

Agriculture is by far the single most important economic activity in Africa. It provides employment for about two-thirds of the continent's working population and it contributes on average 30 to 60 percent of gross domestic product (GDP) and about 30 percent of the value of exports to each country. However, most agriculture in Africa is rain-fed and therefore very vulnerable to climate variability that is characterized by frequent droughts and occasional floods, which at times destroy crops and livestock.

ii. Mining

Mining is one of the major economic activities in Africa. Africa has huge mineral resources (see Unit Three). Therefore, due to Africa's mineral wealth and the global demand for mineral resources such as copper, gold, platinum, diamonds, etc. the mining sector actively operates in Africa.

iii. Forestry

Africa is rich in forests and woodlands. Africa has 624 million hectares under forests, which comprise 20.6 percent of the continent's land area and 15.6 percent of the world's forest cover. Forests and trees support many African national economies by supplying a variety of products and services to rural and urban communities. In addition, many wildlife and game parks are in forested areas.

iv. Fishery

Fish, fishing and fisheries are an integral part of the culture and economy of Africa. Fisheries play significant economic and nutritional roles in the continent. The sector contributes to food and nutrition security, and provides jobs, in particular for coastal populations, which are often among the poorest and most vulnerable.

Focus

Challenges of Primary Sector

Reliance on the extraction of basic natural resources or primary sector have the following challenges:

- *Productivity and reliability in these industries vary because they depend on weather and natural elements (soil fertility and adequate rainfall.).*
- *Products of the natural environment are also dependent upon* **exchange rates** *and other industries to set their prices because the manufacturers have more economic power than the producer of raw materials.*
- *Primary sector workers often work for* **extremely low wages.**
- *Moving out of the primary sector into the secondary sector is the* **hardest of all moves**, *as governments may not have enough money for investment in the manufacturing sector.*

B. Secondary Sector in Africa

The sector is made up of activities that process basic materials obtained by the primary sector, and turn them into new goods and products. An example could be copper ore transformed into an electric cable. In Africa the secondary sector is growing at a rapid pace in recent decades, but Africa is not keeping up with worldwide improvements in the manufacturing industry. Africa has a large selection of manufacturing consisting of textiles, clothing, footwear, and the manufacturing of basic woods and metals. Electricity, gas, and water industries in the secondary sectors have been markedly *fluctuating* over the past decades. They appear to be very sensitive to changing economic trends.

C. Tertiary Sector in Africa

The tertiary sector consists of a range of *service activities. It involves the selling of services and skills. Meanwhile, selling goods and products from primary and secondary industries are also involved in the service sector.* Services related to transport, storage, communication, and real estate have shown significant improvement in Africa in recent decades. The growth in the hospitality industry, represented by hotels and restaurants, indicates the growing importance of tourism in many African countries. Hence, tourism in Africa depends directly on the continent's natural resources and biodiversity base.

Activity 5.2

1. Which of the following cannot be included under tertiary activity?

A. Transportation
B. Education
C. Entertainment
D. Retail
E. Tannery

5.2.2 Major Factors Hindering Growth of Economy of Africa

Several factors hinder the growth of African economy. Some of the problems include limitations in technological capabilities, overdependence on aids, poor economic structure, and poor education, among others.

1. Limitations in Technology

Improvements in technological capacity are the key to development. It helps countries to create, access and use Information Communications Technology (ICT) in solving socio-economic problems. In addition, innovation in science and technology is bringing significant changes in agriculture, medicine, and transportation among other sectors. Technological capability, therefore, brings the major difference between the developed and developing countries in the world. Hence, developed countries in Europe, North America and Asia have transformed their economies through the advancement of their technological capacities and improvement in human capital. Therefore, to be successful, African countries should invest in technology because limitation in technology capabilities is among the factors that hinder economic growth in Africa.

2. Over-dependence on Foreign Aids

In Africa, many countries highly depend on development partners to finance their development projects. Some sectors such as education, health and agriculture rely on foreign development partners to function. Over-relying on foreign aid leads to the stagnation of the economy of a country. Many African countries now have large percentages of their budgets financed by foreign donations. The main problem such as dependence on aid is that instead of engaging in activities that facilitate economic growth, the countries wait for aids to enhance their education and infrastructure. Therefore, African countries should engage in activities that generate revenue through trade and investment rather than depending on foreign aids.

Activity 5.3

1. Prepare a debate note on one of the following issues:
   i. Foreign aid is good for Africa.
   ii. Foreign aid is bad for Africa.

3. Poor Structures of the Economy

Since most African countries could not adopt improved science and technology, they have not changed their economic structures since the time of independence. Therefore, they are still exporting raw materials that include cocoa, diamond, gold, bauxite, and gold in their raw forms. Thus, they do not **add value** to raw materials as a way of increasing their earnings in a global market. African countries still import products of light industries like toys, matches, and toothpicks among other products from other regions. This will in turn hinder its economic growth. Therefore, African countries should take the initiative to embrace technology in the manufacturing sector and establish better economic structures.

4. Poor Education

Education is very important for the development of a country. Education promotes entrepreneurship by producing a skilled workforce. Countries get the knowledge and skills for manufacturing from quality education. However, the current education that the African countries are offering to students is yet to produce graduates that can take up the task of enhancing the African economy. African education system should, therefore, be changed to equip students with the information and skill that can help them to be competent in the global market activities.

Generally, the poor status of the economy of Africa has led the continent to face high **unemployment**. The Africa has the world's highest rate of working poverty – people who are employed but earning less than US$2 a day. Youth unemployment and underemployment are among the main barriers to development in Africa. The exclusion of young people from the labor force causes generational cycles of poverty to continue and put countries into **vicious cycles of poverty**. It also breaks down social cohesion and can be associated with higher levels of crime and violence among idle youth. It also leads a large number of the youth to migrate taking very dangerous routes towards the developed regions.

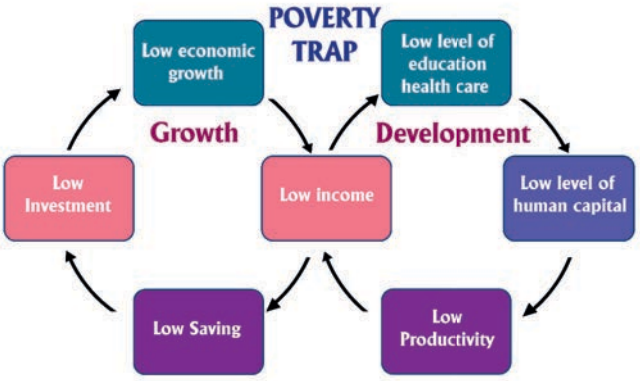


Figure 5.2: *The Poverty Trap*

5.3 POSSIBLE SOLUTIONS TO THE PROBLEM OF UNEMPLOYMENT

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

- *forward solutions to the problem of unemployment.*

KEY TERMS

- *Active job seeking*
- *Employment*
- *Employability*
- *Job opportunities*
- *Sustainable development*
- *Unemployment*

I. Main Features of Unemployment

Employment is tied to wages or money that is paid regularly for doing work. If someone is employed, he/she has to be willing to work for the prevailing wage being offered to do the job. If someone is unemployed, he/she is unable to work or unwilling to do that same job. There are two ways of being unemployed.

- **Voluntary unemployment** occurs when a person is jobless by choice, rather than due to a lack of employment opportunities. Quitting a job because someone has just started his/her own small business is one example of voluntary unemployment.

- **Involuntary unemployment** occurs when a person is willing and able to work for a given wage but cannot find a job. When university graduates could not get a job, as the economy fails to hire, is an example of involuntary unemployment.

Therefore, unemployment is a term referring to individuals who are **employable** and **actively seeking** a job but are unable to find a job. Unemployment is usually measured by the unemployment rate.

Unemployment is calculated by:

$$\frac{\text{the number of unemployed people}}{\text{The total number of people in the workforce}} \text{ x100}$$

Unemployment rate serves as one of the indicators of a country's economic status.

Activity 5.4

1. "Unemployment rate serves as one of the indicators of a country's economic status." What can you infer from this statement about the economic status of Africa?

II. Effects of Unemployment

Unemployment affects both the workers and the economy of a country or region. It causes workers to suffer financial hardship. Then, it affects families, relationships, and communities. Unemployment results in reduced demand for goods and services. Low level of consumption and buying power of citizens, in turn, causes lower profits for businesses. Finally, businesses may disappear and governments may reduce budget and workforce as they lose income from taxes.

III. Solutions for Unemployment

1. The Creation of more Job Opportunities

The workforce of any country usually makes up a large part of its population. In order to satisfy the needs of its people, all countries should ensure that they create many job opportunities so that the people who are eager to work, get the chance to do so. In addition, governments should ensure that people are paid adequately for the services which they provide so that no person feels like he or she has been overworked and paid less.

2. Individuals should be Encouraged to Enter Diverse Fields

Many of us grew up having been told to choose from very specific job options starting at a very young age. Most often, our parents encouraged us to become either a doctor or pilot. Everyone cannot be a doctor or pilot. Therefore, from a very young age, kids should be encouraged to broaden their choices and horizons. As they grow up, they can be innovative in different fields and the economy of the country becomes more diverse.

Activity 5.5

1. What do you want to be in the future? What field of study do you want to study?

3. Sustainable Development

Africa should pursue the principles of sustainable development to come out of poverty and solve the problem of unemployment. It is the overarching paradigm of the United Nations. The concept of sustainable development was described by the Brundtland Commission Report (1987) as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

There are four dimensions to sustainable development – **society**, **environment**, **culture,** and **economy** – which are intertwined, not separate. Sustainability is a paradigm for thinking about the future in which environmental, societal, and economic considerations are balanced in the pursuit of improved quality of life. For example, a prosperous society relies on a healthy environment to provide food and resources, safe drinking water and clean air for its citizens. Sustainable development integrates many processes and pathways to achieve it (e.g., sustainable agriculture and forestry, sustainable production and consumption, good governance, research and technology transfer, education, and training, etc.). Therefore, sustainable development leads to sustainable employment.

Figure *5.3: Dimensions of Sustainable Development*

5.4 AFRICA'S AGENDA 2063 AND ITS IMPLICATIONS

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

- *describe Africa's Agenda 2063 and its implications.*

KEY TERMS

- *African Union (AU)*
- *Agenda 2063*
- *Economic development*
- *Flagship Programs*
- *Organization of African Unity (OAU)*

Africa has multiple socio-economic problems that need urgent solutions. To that end, African leaders have launched Agenda 2063. It is Africa's blueprint and masterplan for transforming Africa into the global powerhouse of the future. It is the continent's strategic framework that aims to deliver on its goal for inclusive and sustainable development and is a concrete manifestation of the pan-African drive for **unity**, **self-determination**, **freedom**, **progress,** and **collective prosperity** pursued under Pan-Africanism and African Renaissance.

The main aim of Agenda 2063 was to refocus and reprioritize Africa's agenda from the struggle against apartheid and the attainment of political independence for the continent (which had been the focus of the Organization of African Unity (OAU), the predecessor of the African Union (AU) and instead to prioritize on:

- *inclusive social and economic development;*
- *continental and regional integration;*
- *democratic governance; and*
- *peace and security.*

Agenda 2063 is the concrete manifestation of how the continent intends to achieve this vision within a 50 year from 2013 to 2063.

Activity 5.6

1. Where is the headquarter of the AU? Who is the current chairperson of the Union?

The need to envision a long-term, 50-year, development plan for Africa is important as Africa needs to revise and adapt its development agenda – mainly for the following initiatives:

- *renewed economic growth and social progress;*
- *the need for people - centered development;*
- *gender equality and youth empowerment; and*
- *changing global contexts such as increased globalization and the ICT revolution.*

Therefore, Agenda 2063 does not only express these essential features of Africa's aspirations for the future but also identifies key **Flagship Programs** which can boost Africa's economic growth and development and lead to the rapid transformation of the continent.

Focus

Agenda 2063 - Flagship Programs

The flagship programs include:

1 *Integrated high-speed train network*
2 *Formulation of an African commodities strategy*
3 *Establishment of the African continental free trade area (AfCFTA)*
4 *The African passport and free movement of people*
5 *Silencing the guns by 2020*
6 *Implementation of the Grand Inga Dam project*
7 *Establishment of a single African air transport market (SAATM)*
8 *Establishment of an annual African economic forum*
9 *Establishment of the African financial institutions*
10 *The pan-African e-network*
11 *Africa outer space strategy*
12 *An African virtual and e-university*
13 *Cyber security*
14 *Great African Museum*
15 *Encyclopedia Africana*

Activity 5.7

1. Which of the Flagship Programs has already missed a target year?
2. Do you think that all the intended projects can finally be realized?

5.5 AFRICA'S AGENDA 2063 *VIS-À-VIS* SUSTAINABLE DEVELOPMENT GOALS (SDGS)

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

- *compare and contrast the indicators of Agenda 2063 with those of Sustainable Development Goals (SDGs).*

KEY TERMS

- *Affordable and clean energy*
- *Agenda 2030*
- *Climate action*
- *Consumption*
- *Gender equality*
- *Hunger poverty*
- *Inequality*
- *Infrastructure*
- *Innovation*
- *Pan-African Ideals*
- *Production*
- *Sustainable city*
- *Sustainable Development Goals (SDG)*

The goals of the Agenda 2063 are economic development, political integration, improvements in democracy and justice, the establishment of security and peace on the entire African continent. It aspires to the strengthening of cultural identity through an "African renaissance" and pan-African ideals. It also gives priority to gender equality and political independence from foreign powers.

The Sustainable Development Goals (SDG) or Global Goals are a collection of 17 interlinked global goals designed to be a "*blueprint to achieve a better and more sustainable future for all*". These goals provide a shared blueprint for **peace** and **prosperity** for people and the planet, now and into the future. SDGs recognize that ending poverty and other deprivations must go together with strategies that improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve our oceans and forests.

The SDGs were set up in 2015 by the United Nations General Assembly and are intended to be achieved by the year 2030. They are included in a UN Resolution called the Agenda 2030 or what is simply known as Agenda 2030. The SDGs were developed in the Post-2015 Development Agenda as the future global development framework to succeed the Millennium Development Goals (MDG) which ended in 2015.

Activity 5.8

1. What are some of the basic similarities and differences between Africa's Agenda 2063 and Agenda 2030 of the SDG?

Sustainable Development Goals

Goal 1 **No poverty**	**Eradicating poverty in all its forms and dimensions by 2030.** Large number of people are in the world are deprived of the most basic human needs. They live in absolute poverty or earn less than US$1.90 a day. They lack food, clean drinking water and sanitation. Thus, this goal targets the most vulnerable in the society by increasing basic resources and services and supporting communities affected by conflict and climate-related disasters.
Goal 2 **Zero hunger**	**The SDGs aim to end all forms of hunger and malnutrition by 2030** by making sure that all people – especially children, have sufficient and nutritious food all year round. This involves promoting sustainable agriculture, supporting small-scale farmers and equal access to land, technology, and markets. It also requires international cooperation to ensure investment in infrastructure and technology to improve agricultural productivity.
Goal 3 **Good health and well-being**	**Good health is essential to sustainable development.** The Agenda 2030 reflects the complexity and interconnectedness of the two. It takes into account widening economic and social inequalities, rapid urbanization, threats to the climate and the environment, the continuing burden of HIV and other infectious diseases, and emerging challenges such as non-communicable diseases. Multisectoral, rights-based and gender-sensitive approaches are essential to address inequalities and to build good health for all.

Sustainable Development Goals

Goal 4 Quality education	Achieving inclusive and quality education for all reaffirms the belief that education is one of the most powerful and proven vehicles for sustainable development. **This goal ensures that all girls and boys complete free primary and secondary schooling by 2030.** It also aims to provide equal access to affordable vocational training, eliminate gender and wealth disparities, and achieve universal access to quality higher education.
Goal 5 Gender equality	**Ending all discrimination against women and girls is not only a basic human right, it is crucial for a sustainable future.** It is proven that empowering women and girls helps economic growth and development. Therefore, it is vital to give women equal rights of land and property. In addition, encouraging more women to become leaders will help achieve greater gender equality.
Goal 6 Clean water and sanitation	**Safe and affordable drinking water for all by 2030** requires countries to invest in adequate infrastructure, provide sanitation facilities, and encourage hygiene. Protecting and restoring water-related ecosystems is essential.
Goal 7 Affordable and clean energy	The world population is continuing to grow at a rapid rate. Hence, there is high demand for cheap energy. Many economies which depend on fossil fuels are creating drastic changes to climate. Therefore, investing in solar, wind and thermal power, improving energy productivity, and **ensuring energy for all is vital to achieve SDG 7 by 2030**.
Goal 8 Decent work and economic growth	The SDGs promote sustained economic growth, higher levels of productivity and technological innovation. Encouraging entrepreneurship and job creation are key to this, as are effective measures to eradicate forced labor, slavery, and human trafficking. With these targets in mind, the goal is to achieve **full and productive employment, and decent work, for all women and men by 2030**.
Goal 9 Industry, innovation, and infrastructure	Technological progress is the key to finding lasting solutions to both economic and environmental challenges. However, it requires providing new jobs and promoting energy efficiency. Therefore, **promoting sustainable industries, and investing in scientific research and innovation**, are all important ways to facilitate sustainable development.

Sustainable Development Goals

Goal 10 **Reduced inequalities**	Income inequality has increased nearly everywhere in recent decades, but at different speeds. It is lowest in Europe and highest in the Middle East. Income inequality requires global solutions. This involves improving the regulation and monitoring of financial markets and institutions, encouraging development assistance, and **foreign direct investment** to regions where the need is greatest. Facilitating the safe migration and mobility of people is also a key to bridging the widening divide.
Goal 11 **Sustainable cities and communities**	Sustainable development cannot be achieved without significantly transforming the way cities are built and managed. The rapid growth of cities – a result of rising populations and increasing migration, has led to a boom in mega-cities, especially in the developing world, and slums are becoming a more significant feature of urban life. Therefore, it requires governments to make sustainable cities by creating career and business opportunities, safe and affordable housing, and building resilient societies and economies. It also involves investment in public transport, creating green public spaces and improving urban planning and management in participatory and inclusive ways.
Goal 12 **Responsible consumption and production**	Achieving economic growth and sustainable development requires that we urgently reduce our **ecological footprint** by changing the way we produce and consume goods and resources. The efficient management of our shared natural resources, and the way we dispose of toxic waste and pollutants, are important targets to achieve this goal. Encouraging industries, businesses, and consumers to recycle and reduce waste is equally important, as is supporting developing countries to move towards more sustainable patterns of consumption by 2030.
Goal 13 **Climate action**	Every country is experiencing the drastic effects of climate change. Supporting vulnerable regions will directly contribute not only to Goal 13 but also to the other SDGs. These actions must also go hand in hand with efforts to integrate disaster risk measures, sustainable natural resource management, and human security into national development strategies.
Goal 14 **Life below water**	The SDGs aim to **sustainably manage and protect marine and coastal ecosystems from pollution**, as well as address the impacts of ocean acidification. Enhancing conservation and the sustainable use of ocean-based resources through international law will also help mitigate some of the challenges facing our oceans.

Sustainable Development Goals

Goal 15 **Life on land**	Human life depends on the earth for sustenance and livelihoods. There is rapid a rate of deforestation, land degradation and desertification in many parts of the world. Therefore, **urgent action must be taken to reduce the loss of natural habitats and biodiversity,** which are part of our common heritage and support global food and water security, climate change mitigation and adaptation, and peace and security.
Goal 16 **Peace, justice, and strong institutions**	We cannot hope for sustainable development without peace, stability, human rights, and effective governance, based on the rule of law. Some regions enjoy peace, security, and prosperity, while others fall into seemingly endless cycles of conflict and violence. This is not inevitable and must be addressed. The SDGs aim to significantly reduce all forms of violence, and work with governments and communities to end conflict and insecurity.
Goal 17 **Partnerships for the goals**	The SDGs can only be realized with strong global partnerships and cooperation. The world is more interconnected than ever. Improving access to technology and knowledge is an important way to share ideas and foster innovation. Coordinating policies to help developing countries manage their debt, as well as promoting investment for the least developed, is vital for sustainable growth and development.

5.6 LINGUISTIC AND RELIGIOUS DIVERSITY IN AFRICA

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

- *identify the major cultural landscapes, and linguistic and religious diversities of Africa.*

KEY TERMS

- *Folk religion*
- *Modern language*
- *Religion*
- *Religious Diversity Index (RDI)*
- *Sacred texts and objects*

5.6.1 Language Diversity in Africa

Africa has a long history of human habitation; hence, it is home to numerous cultural and linguistic groups. The African continent is home to one-third of the world's 6,000 languages, but less than one seventh of the world's population. Hence, Africa is the most linguistically diverse continent.

Many African countries are highly multilingual. There are more than 2000 living languages in Africa. A living language is simply a language that is still spoken in the current time. It is sometimes referred to as a **modern language** and is currently in use. A living language must have at least one speaker whose first language is the language in question.

The list below shows in just 22 countries about 2,086 languages are spoken in Africa.

Table 5.1:Number of Major Languages in Africa

S.N.	Country	languages
1.	Nigeria	514
2.	Cameroon	278
3.	Democratic Republic of Congo	215
4.	Chad	131
5.	Tanzania	128
6.	Ethiopia	86
7.	Ghana	79
8.	Côte d'Ivoire	78
9.	Central African Republic	71
10.	Kenya	69
11.	Burkina Faso	68
12.	Congo (Brazzaville)	62
13.	Mali	57
14.	Benin	54
15.	Gabon	42
16.	Togo	39
17.	Liberia	30
18.	Botswana	29
19.	Guinea-Bissau	21
20.	Equatorial Guinea	14
21.	South Africa	11
22.	Gambia	10

5.6.2 Religious Diversities in Africa

The major religions of the world (Hinduism, Buddhism, Islam, Confucianism, Christianity, Taoism, and Judaism) differ in many respects, including how each religion is organized and the belief system each upholds. Other differences include the nature of belief in a **supernatural power**, the history of how the **world and the religion began**, and the use of **sacred texts and objects**. Therefore, there is a very diverse religious system in the world.

Africa is home to many religions and beliefs. It contains a mixture of both local beliefs and global beliefs. Although religion in Africa is multifaceted, it has largely influenced the art, philosophy, and culture of the continent. In today's Africa, various individuals adhere to mostly **Christianity**, **Islam**, and **traditional** African beliefs (folk religions). African religions are as diverse as the continent is varied. Nevertheless, long cultural contact, in degrees ranging from trade to conquest, has mixed some fundamental principles of the religions through generalizations, with indigenous religions of Africa.

Many African countries have high scores of religious diversity index (RDI). The RDI calculates scores for countries, based on the shares of eight major world religions (**Christians**, **Muslims**, **Buddhists**, **folk religions**, **Hindus**, **Jews**, **other religions** considered as a group, and the **religiously unaffiliated**). The index is on a scale from 0 -10, with 10 being the maximum possible diversity if each of the eight groups constitutes an equal share of the population. The RDI is divided into four ranges: **very high** (scores 7.0 and higher), **high** (scores from 5.3 to 6.9), **moderate** (scores from 3.1 to 5.2) and **low** (scores from 0 to 3.0). This score estimates the number of people in a country who view themselves as belonging to one religious' group.

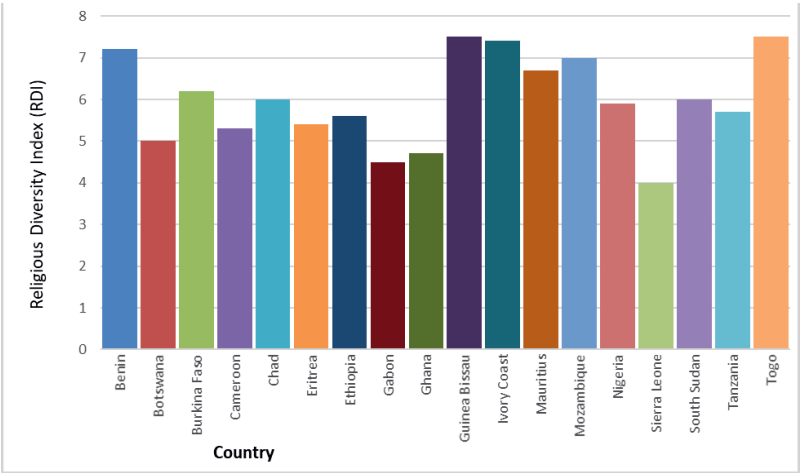


Figure 5.3: *Religious Diversity in Africa*

Activity 5.9

1. Based on Figure 5.3 above, categorize the countries into three RDI score levels.

Very High	High	Moderate

Therefore, in Africa Guinea Bissau and Togo with RDI 7.5 each and Ivory Coast (7.4), Benin (7.2) and Mozambique (7.0) are high religious diverse countries. However, religious diversity is not only limited to Africa. It is also common in the whole world. Some countries host one or two religions. While others have many religions fairly-well distributed in their territories and coexist peacefully.

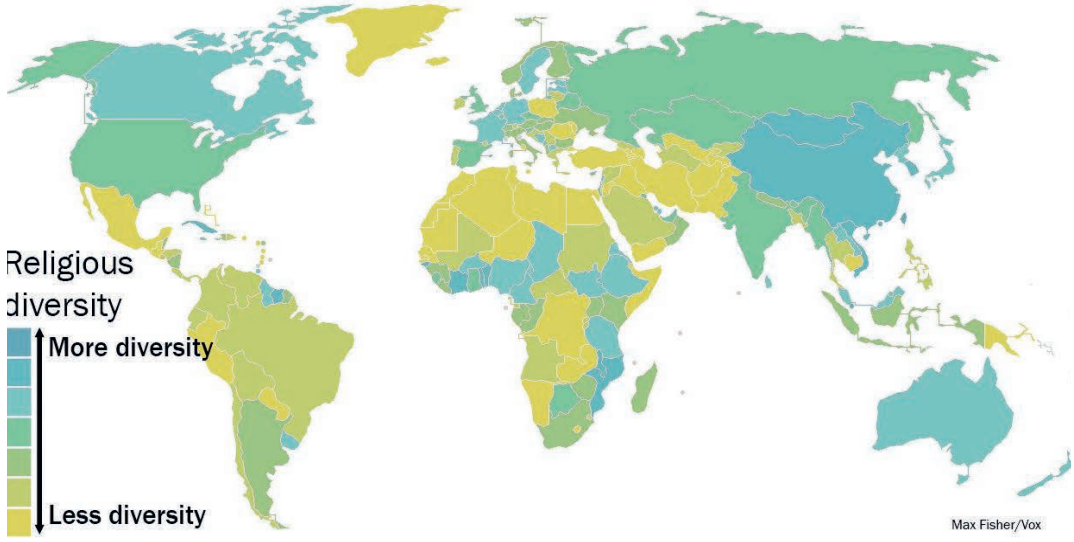


Figure 5.4: *Religious Diversity in the World*

UNIT SUMMARY

In unit five, we examined the economic activities, social and cultural diversities in the continent of Africa. This resourceful continent faces serious economic problems. Hence, it largely engages in the extraction of raw materials from the natural environment. Overdependence of such economic activities widely exposes countries to fluctuations in earnings or national income. Thereby the economy suffers from stagnation and countries will be forced to heavily depend on foreign aid. Then they will be left in a poverty trap.

Therefore, to address the factors that hinder economic growth in Africa, African leaders need to avoid over-relying on donations. Instead, they should take initiatives that will enable African countries to fund their budgets. Africa should also embrace technology because technology will enhance the growth of the economy especially in the manufacturing sector. It is only by embracing modern technology the African countries will stop importing products that they can produce and start adding value to raw materials before exporting them. The structures of the economies of African countries should also be designed in a way that it favors sectors that are important for the growth of the economy. Particularly investing in the industrial or manufacturing sectors is very important. The African education system should be changed to equip students with the right information so that they can participate in global market activities.

In addition, a stronger system of assessing unemployment should be put in place to determine its causes and how to address it better. Once more job opportunities are created, the unemployment rate is sure to come down a great deal.

As a possible solution to the multifaceted economic problems of Africa, its leaders have come up with the formulation of Agenda 2063. The Agenda re-dedicates Africa towards the attainment of the Pan African Vision of "An integrated, prosperous and peaceful Africa, driven by its citizens, representing a dynamic force in the international arena." It is also aligned with the UN's Agenda 2030.

Africa is a very diverse continent in terms of language and religion. Africa is the most linguistically diverse continent. Many African countries are multilingual. There are more than 2000 living languages in Africa. Meanwhile, Africa is home to many religions and beliefs. It contains a mixture of both local beliefs and global beliefs.

REVIEW QUESTIONS

PART I: TRUE OR FALSE ITEMS

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

1. Secondary sector involves activities of people in the service sector.
2. Primary sector involves changing of raw materials into new products.
3. Primary sector involves extracting raw materials.
4. Africa is home to many religions and beliefs.
5. Africa is the most linguistically diverse continent.
6. Many African countries are highly multilingual.

PART II: MULTIPLE CHOICE ITEMS

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

7. How many living languages are there is Africa?

   A. 100
   B. 200
   C. 1000
   D. 2000

8. Which of the following economic activities is based on knowledge?

   A. Primary
   B. Secondary
   C. Tertiary
   D. A and B

9. Developing countries (DVCs) are characterized by one of the following?

   A. they are the world's unindustrialized nations
   B. they are the world's heavily industrialized nations
   C. their economy largely depends on service sector
   D. no developing country is found in Africa

10. "Ending all discrimination against women and girls is not only a basic human right, it's crucial for sustainable future." This goal of SDG is related to one of the following.

    A. Reduced inequalities
    B. Decent work and economic growth
    C. Gender Equality
    D. Responsible consumption and production

UNIT SIX

6 HUMAN – NATURAL ENVIRONMENT INTERACTIONS

INTRODUCTION

In unit five you have studied major economic and cultural activities in Africa. Hence, you have learned that people use resources obtained from natural environment. Meanwhile, in unit six you will learn about why and how people interact with their environment while using the resources.

The world's population is rapidly increasing. Today over 7 billion people live on the planet. This figure has far-reaching implications as humans put a huge impact on the natural environment. Therefore, providing space, food and resources for a large world population in a sustainable way into the distant future is the most serious challenge. Africa in particular, coupled with its low level of economic development and very rapid population growth rate, will be highly affected. However, this challenge can be overcome if natural resources are sustainably used. Besides, the environment allows humans to make certain modifications for their survival. Hence, humans have made significant changes to the environment in a way that suits them.

As the global human population continues to grow, so do human impacts on the environment. Therefore, sustainable and equitable solutions are required to address the interconnected challenges of protecting the natural environment. In this regard, the indigenous knowledge and good practices of the African people are very important.

Unit Outcomes

After completing this unit , you will be able to:

- *analyze why human beings depend on environment;*
- *explain how human beings modify the natural environment;*
- *identify humans' adaptation strategies to environmental changes; and*
- *elaborate the significance of indigenous knowledge and practices of African people in natural resources conservation.*

Main Contents

6.1 OVERVIEW OF GLOBAL POPULATION CHANGE

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

- *describe the characteristics of global population change.*

KEY TERMS

Birth
Colonization
Deadly diseases
Death
Living standards
Migration
Population change
Slave trade

Population change is the difference in the size of the population from the beginning to the end of a certain period. The change in the population also changes the composition of the population because of **birth** and **death** rates, **sex ratios**, **life expectancies** and **migration** rates. Meanwhile, population growth is the increase in

the number of individuals in a population. The two factors involved in the increase in the number of individuals in a population are **fertility** (birth**)** and **immigration** (in migration**)**. On the other hand, mortality (death) and emigration (out migration) decrease the number of individuals in a population. Understanding these changes at different spatial scales (local, national, regional and global scales) is very important for development planning.

Therefore, understanding global population trends and anticipating the demographic changes to come is crucial to the achievement of development goals that countries, regions or global communities plan. One among such plans is **the 2030 Agenda for Sustainable Development**. The 2030 Agenda emphasizes that people are at the center of sustainable development. Population trends observed over the past few decades point to substantial progress made towards several of the Sustainable Development Goals (SDGs) so far. Examples include reduced **mortality**, particularly among children, as well as increased **access** to sexual and reproductive health care as a result of population policies and family planning programs.

Recent demographic trends in different countries and regions of the world are **challenges** to sustainable development. For example, countries experiencing rapid population growth, most of which are in sub-Saharan Africa, must provide **schooling** and **health** care to growing numbers of children, and ensure **education** and **employment** opportunities to increasing numbers of youth. Countries where population growth has slowed or ceased must prepare adequate health care for an increasing proportion of older persons. These and other challenges can be addressed in part by anticipating the future demographic trends and incorporating that information into policies and planning.

Slave trade, colonization, and the spread of deadly diseases are the causes for population stagnation in Sub-Saharan Africa. Africa experienced stagnation of population size between 1500 and 1900. Its population size increased by only 20 million people from 80 million in 1500 A.D. to 100 million in 1900 A.D. Meanwhile, during this period population size of other regions (e.g., Asia, South America and North America) has increased three to fivefold.

The twentieth century witnessed the “demographic explosion” of the developing world. Between 1900 and 1980, all developing regions including sub-Saharan Africa experienced high population growth. In particular, in sub-Saharan Africa population kept increasing. As a result, the population growth of the region stood at 2.8% per year on average. The three major sub regions of sub-Saharan Africa, namely Eastern

Africa, Central Africa, and Western Africa, represented about 93.5% of the population of the continent in 2015. In the period between 1980 – 2015, they had high rates of population growth of 2.9%, 3.0% and 2.7% per year on average respectively. During the same period, a lower rate of population growth was observed in the Southern sub-region of Africa with a rate of growth of 1.8% per year. Hence, by mid-2015, the sub-Saharan Africa population was estimated at 962 million, i.e., about ten times its 1900 level. Now the total population of the continent is more than 1.3 billion and increasing at an annual rate of 2.45 percent.

Asia is the most populous continent in the world, with 4.68 billion people accounting for 59.5% of the world population as of 2021. **Africa** is the second largest continent by population, with around 1.37 billion people, or 17.2% of the world's population. Only these two continents have crossed one billion people milestone. Asia and Africa, together share about 77% of the global population. **Europe** has a population of around 748 million (9.59%), **North America** is home to around 597 million (7.60%), and **South America**, the second least populated continent, has about 434 million inhabitants (5.53%). **Oceania** (43 million) is the smallest continent with 0.55% of the world population.

Table 6.1: Continents by Population

Rank	Continent	Population		Share (%)	Growth (2021)	
		2020	2021		Net Change	Rate (%)
1	Asia	4,641,054,786	4,679,660,580	59.54	38,605,794	0.83
2	Africa	1,340,598,113	1373486472	17.20	32,888,359	2.45
3	Europe	747,636,045	747,747,396	9.59	111,351	0.01
4	North America	592,072,204	596,591,192	7.60	4,518,988	0.76
5	South America	430,759,772	434,260,138	5.53	3,500,366	0.81
6	Oceania	42,677,809	43,219,954	0.55	542,145	1.27
		7,794,798,729	7,874,965,732		80,167,003	

Activity 6.1

1. Based on the Table above and using the doubling time formula given in Unit four, How many years will it take to double the population of Africa and Europe, respectively?

The high growth in the world population over the past centuries is largely the result of advances in modern **medicines** and improvements in **living standards**. These have significantly reduced infant, child and maternal mortality and have contributed to an increase in life expectancy of people. This in turn increases the world population.

6.2 HUMAN-ENVIRONMENT RELATIONSHIP

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

- *explain the human – environment interactions.*

KEY TERMS

- *Adaptation*
- *Adaptation responses*
- *Adaptation strategies*
- *Adjustment*
- *Autonomous adaptation*
- *Climate change*
- *Dependence*
- *Environment*
- *Environmental changes*
- *Environmental determinism*
- *Environmental possibilism*
- *Modernization*
- *Modification*
- *Physical environment*
- *Planned adaptation*
- *Shocks and stresses*
- *Spontaneous adaptation*
- *Technological advancement*

Environment is defined as the surroundings or conditions in which persons, animals, or plants live or operate. It refers to all of the external factors affecting an organism. Therefore, environment is a multidimensional system of complex relationships in a continuing state of change.

Why do humans interact with the environment?

The objective of human interaction with the environment is to satisfy human being's increasing **needs**. In order to satisfy the needs, the relationship that exists between human beings and the environment is a two-way or **reciprocal** direction. That is, human beings and the environment affect each other. However, the role of humans in the interaction, especially how humans affect the environment, was understood differently at different times. Therefore, different theories were put forward to explain the role of human beings in human environment interaction. The two most popular theories are – **environmental determinism** and **environmental possibilism**.

1. **Environmental determinism**: is the idea that the natural or physical environment shapes and creates cultures; in other words, the environment essentially **dictates** culture. It is the doctrine that asserts economic growth and other activities of human beings are controlled by the **physical environment**. This view was commonly propagated by Europeans in the 19th century. However, the view that human activities are governed by the environment, primarily by the physical environment, was rejected in 1950s and substituted by environmental possibilism.

2. **Environmental possibilism:** is the theory that asserts people can adapt to diverse environmental conditions and choose from many alternatives (possibilities), despite the **limitations** that the environment poses. Possibilism is the opposite of environmental determinism. Possibilism is a doctrine which claims that human beings have the capacity to choose between a range of possible responses to physical conditioning (environment). Therefore, the degree of influence of the natural environment declines with increasing **modernization** and **technological** advancement.

Activity 6.2

1. Which of the two thoughts – environmental determinism or environmental possibilism, do you support? Why?

Human environment relationship refers to the interaction human beings have with their environment. Human beings cannot survive without some form of interaction with the environment. Interaction is understood in the ways people adapt and modify the environment. There are three types of human environment interaction. These are: dependence, modification, and adaptation to the environment.

6.2.1 Dependence on the Environment

Every living thing on the Earth depends on the environment. The dependence is basically to obtain the essential resources for survival. Therefore, human beings depend on the environment such as air, water, food or shelter they obtain from the environment.

- **Food:** Without food, life would not exist. The environment provides food since plants grow from the soil. Plants growing from the soil are also eaten by certain animals like goats, sheep and cattle which are all considered as food

for human being.

- **Water:** This is the element of life without which all things would die. The environment provides this element in various ways including rain, rivers, lakes and oceans. Human beings use water for drinking, washing, irrigation and power generation.
- **Shelter:** Some of the materials used in construction include sand, stones and trees. The environment has an abundance of these raw materials and that is why human beings are able to build shelters.
- **Clothing:** Without clothing, human beings would find it difficult to cope with the harsh elements of the climate. The environment provides raw materials, such as silk and cotton, which are all used in the manufacture of clothing products.

Moreover, the natural environment plays an important role in supporting **economic activities**. Its contributions include:

- **directly** by providing resources and raw materials such as water, timber and minerals that are required as input for the production of goods and services; and
- **indirectly** through services provided by ecosystems including carbon sequestration, water purification, managing flood risks and nutrient cycling.

Therefore, the environment is vital for securing economic growth and development by providing natural resources. The provision is not just for present generations but also for future generations. As a result of this, human beings extremely dependent on the environment.

6.2.2 Modification of the Environment

Humans modify their environment **negatively** or **positively**. The main purpose of the modification is to fulfill their needs. The modification allows them to extract and utilize natural resources. Some of these modifications include:

- *Cutting down the forests to increase agricultural land and grow more crops*
- *Construction of dams to store water for hydroelectricity, irrigation and avoiding floods*
- *Drilling of the holes in the ground to extract oil or other natural resources*

Human activities lead to the modification of the environment. Specially, as the number of people in a country or region increases, more food is needed to feed the people. This in turn forces people to utilize more natural resources for survival. Then humans cause impacts on the environment in such ways as overpopulation, pollution,

burning fossil fuels, and deforestation. Changes like these have triggered **climate change**, soil erosion, poor air quality, and undrinkable water. On the contrary, the environment also casts a negative impact on the lives of people. Natural calamities like floods, drought, wildfires, earthquakes, and tsunamis are a few examples of nature's negative impacts. Consequently, these negative impacts on the environment can cause large-scale migrations and death of people.

Humans also have positive effects on the environment. Some human activities bring positive changes to the environment. For example, through afforestation and conservation , humans have greatly contributed to the functioning of the environment. Thus, humans can contribute to better air quality and make efforts to reduce the levels of carbon dioxide in the atmosphere as well as protect endangered species.

6.2.3 Adaptation to the Environment

People adapt to the environment when changes occur to the existing environment or when they move to a new environment. Adaptation refers to an adjustment to a new environment so as to improve the chances of survival in that environment. The main purpose of the adaptation is to fulfill the needs and survival of people.

Adaptation requires an **adjustment** in natural or human systems in response to actual or expected stimuli or their effects (for example, increasing temperature, flooding, etc.). Adaptation makes people get prepared for the following actions:

- *Reducing vulnerability (e.g., to climate change),*
- *Identifying the most vulnerable people,*
- *Building adaptive capacity,*
- *Reducing exposure or sensitivity to impacts, and*
- *Ensuring sustainable development.*

Activity 6.3

1. How do people in hot deserts adapt to the harsh climate?
2. How do people in cold areas adapt to the harsh climate?

The adaptation of human systems is a process which requires the engagement of a wide range of stakeholders. The stakeholders can be governmental or nongovernmental organizations. It also requires analysis of **current** exposure to different **shocks** and **stresses**, as well as analysis of future impacts of **environmental**

changes (e.g., climate change, deforestation, desertification, etc.). Therefore, it demands an understanding of the existing vulnerability of individuals, households and communities. Moreover, the adaptation process requires that the most critical issues identified are addressed.

Next to the analysis of impacts, **adaptation strategies** should be designed and implemented. Then it is followed by **monitoring** and **evaluation** of the effectiveness of activities planned. Finally, sharing knowledge and lessons learnt are the last part of the adaptation process.

Well-planned adaptation strategies result in **adaptation responses**, that is an implementation action to respond to the impacts of environmental changes that already took place, as well as for future impacts.

Adaptation responses can be grouped into the following broad categories:

- *Technological solutions – grey measures;*
- *Ecosystem based adaptation options – green measures; and*
- *Behavioral, managerial and policy approaches – soft measures.*

Green and **soft** measures aim at decreasing the sensitivity and increasing the adaptive capacity (adjust to the changes or using it as an opportunity and creating new mechanisms) of human and natural systems, hence, building resilience. They often provide low-cost solutions. There are also high-tech and innovative technological solutions which often need a large amount of funding and require more research, experience and training to be operated. Meanwhile, green measures result in nature-based solutions and ecosystem services to environmental problems. For instance, reforestation can stop desertification and recharge groundwater supplies in times of drought.

Types of Adaptations to Environmental Changes

1. **Autonomous adaptation**: It is an adaptation that does not constitute a conscious response to environmental change but is triggered by ecological changes in natural systems and by market or changes in ways of living in human systems. It is also referred to as **spontaneous adaptation**.

2. **Planned Adaptation:** It is an adaptation that is the result of a deliberate policy decision, based on an awareness that conditions have changed or are about to change and that action is required to return to, maintain, or achieve the desired state.

Can humans modify every environment?

There are some environmental conditions, which humans cannot modify. Hence, they adapt to such conditions for their survival. Some examples of such environmental conditions in which human beings make adaptations include:

- *taking benefit of the natural slope of the land for irrigation;*
- *building houses on higher ground to avoid flood;*
- *wearing thin clothes to survive in hot climates; and*
- *wearing warm clothes to survive in cold climate.*

6.3 INDIGENOUS KNOWLEDGE IN CONSERVATION OF NATURAL RESOURCES IN AFRICA

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

- *appreciate the role of indigenous knowledge in the conservation of natural resources.*

KEY TERMS

- *Biodiversity*
- *Biological resource*
- *Conservation*
- *Environmental degradation*
- *Indigenous knowledge*
- *Indigenous people*
- *Local community*

Africa is endowed with rich and highly diverse biological (natural) resources. In addition to the well-known uses of the biological resources for food, the building of houses, etc. the African people highly depend on biological resources for medicinal purposes. The heavy reliance on plant medicine in Africa is attributed to their local availability, low price, acceptance by local communities and the low number of health care centers and medical professionals, especially, in rural areas. Therefore, since ancient times plant medicine is an important part of the health care system in Africa.

The African people have an enormous amount of knowledge about biodiversity and its uses. Such indigenous knowledge has been accumulated among indigenous

peoples of the continent and has been orally transferred across many generations. Indigenous knowledge has been the basis for conservation of natural resources in Africa. Therefore, indigenous knowledge is valuable in managing environmental degradation and in the sustainable use of natural resources.

6.3.1 Case Study of the Practice of Indigenous Knowledge in Africa

Case study

Protection of sacred places, floral, faunal and water resources conservation (Teso community in Busia County-Kenya) By: Dominics Dan Ayaa and Fuchaka Waswa (2016: pp 471)

Among the Teso community members activities such as farming, grazing of animals or even settlements were prohibited in protected areas. The Teso community members had various beliefs and practices related to both the dead and the living that had some links to the conservation of the environment. For instance, since ancient times, the community members believe that the dead and long buried relatives had their spirits continuously haunt the living family members to free them from the graves. Thus, to refuse these dead relatives, there was a common practice of exhuming (digging out) the remains of the dead from the graves that were at least ten years old for preservation. This ceremony that is locally known as Ekutet / Epunyas was carried out by a special group of elderly men and women from the community and was done in the absence of children and foreigners. Accordingly, once all the remains had been recovered from the grave, special baskets are used to transfer the bodies to some special central site where such remains were stored in places that are strictly protected. Then, no human activity of any kind is carried out in such an area as it was believed that the spirits would attack anybody disturbing the peace of the dead. The area thus remained a very thick forest habiting a number of species or different organisms. Such sites and places were considered sacred and were thus protected from any internal or external interference thereby encouraging natural growth of the vegetation that later turned out to be dense forests that formed important habitats for a variety of flora and fauna.

Besides, the Teso community members greatly recognized the importance of rivers, marshes and swamps as important dwellings places for ancestors and "God's creatures" (biodiversity) since various species of plants and animals thrived in them. Thus, the conservation of water courses, streams, water pans and wells as well as the associated vegetation was protected through rules that ensured their sustainability. Again, reptiles such as snakes, frogs and toads that inhabited ponds, rivers and wells were protected from any harm due to the belief that they helped maintain / sustain the lives of these important water points. Also, the community members highly recognized and appreciated the importance of wells and rivers as crucial sources of water for livestock and human beings as well as a source of fish. Therefore, in order to conserve these resources, there were strong rules and beliefs that protected such sites for many generations.

UNIT SUMMARY

In unit six, we examined the current trend of world of population change, human environment interaction – the dependence, modification and adaptation, and exemplary practices of indigenous knowledge in Africa.

The world's population is rapidly increasing. Especially, the sub-Saharan Africa – having recovered from the past stagnation, very rapid population growth was observed. The trend in rapid population growth has far reaching implications. It affects economic development, employment, income distribution, poverty alleviation and social protections. It also affects efforts to ensure universal access to health care, education, housing, sanitation, water, food and energy. Therefore, to more sustainably address the needs of the society, policymakers must understand how many people are living in a country or region under consideration, where they are, and how old they are.

The rapid growth of the sub-Saharan African population is, in most countries, the result of the late adoption of population policies and family planning programs, and the poor implementation of these programs in societies that remain largely pronatalist.

Meanwhile, nature has provided human beings an opportunity with a sustainable and favorable environment. However, humans have destroyed the perfect balance of the natural environment by over utilizing the resources around them or using the resources in unsustainable ways. Therefore, although human-environment interactions are inevitable for co-existence, maintaining a suitable balance is the key to survival. The impact of humans on the environment was understood differently at different times. Two important theories tried to explain humans. These theories were environmental possibilism and determinism. The theories were put forth in order to comprehend and understand the role played by the physical environmental conditions in the emergence and progress of any human culture or society in a particular location.

Humans highly depend on the environment, modify and adapt to changes in the environment. These human activities are basically to draw maximum benefit out of it and meet their needs. However, it disturbs the natural balance of the environment and causes the destruction. Avoiding the damage or reducing it is very crucial for the survival of human beings. In this regard, the accumulated indigenous knowledge of the African people is inevitable.

REVIEW QUESTIONS

PART I: MULTIPLE CHOICE ITEMS

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

1. Which one of the following may be regarded as a hurdle for environmental sustainability of the world?

- **A.** providing food and water for humans
- **B.** rapid rate of population increase
- **C.** intensive use of non-renewable resources
- **D.** All of the above

2. One of the following is correct about Agenda 2030;

- **A.** it is set by African leaders to help solve problems of Africa
- **B.** it is formulated and spearheaded by the European Union
- **C.** it is an agenda for sustainable development
- **D.** it is a carbon copy of Agenda 2063

3. Why has Africa experienced population stagnation between 1500 and 1900?

- **A.** because of the absence of health facilities in the continent
- **B.** because it is located in the Tropical Zone or hot climate
- **C.** because its most fertile population were migrated to Europe and North America
- **D.** because of the effects of slave trade and widespread diseases

4. The role of the physical environment in relation to environmental determinism is;

- **A.** to control human activities
- **B.** to pose limitations on human activities
- **C.** to set alternatives out of which humans can choose
- **D.** to force humans to use advanced technology

5. Why do humans modify the environment?

A. they modify the environment to avoid negative impacts of their activities

B. they modify the environment to positively change the environment

C. they modify the environment since it is inevitable for their existence

D. they modify the environment by cutting trees in forests for firewood

PART II: SHORT ANSWER ITEMS

Direction: Define the following terms as used in this unit.

6. Adaptation

7. Environment

8. Mortality

9. Migration

10. Dependence

INSTRUCTION III: WRITE AN ESSAY

11. Write an essay on an exemplary (typical) indigenous knowledge of the people or community of your area used in conservation of natural resources.

UNIT SEVEN

GEOGRAPHIC ISSUES AND PUBLIC CONCERNS IN AFRICA

INTRODUCTION

In this unit , you will learn main geographic issues that affect the peoples of Africa. One such issue is unplanned urbanization. It is a process of increasing the area of urban centers and the proportion of people living in that area. The increase in population pressure causes the surrounding areas of town to change into urban areas. Hence, urbanization includes the urban area and the growth of population living there. Therefore, urbanization does not only denote the growth of the area of towns but also the growth of population. In big cities or small towns, there must be basic physical facilities like electricity, road, drinking water, communication, health, and education facilities. Such infrastructure can be found when effective management comes before rapid urbanization. But Africa is facing the problem of effective management.

Migration is the movement of people from one place to another; they do this to establish

their permanent or semi-permanent residence at the destination. Immigration is an essential component of change and structure; whereas population growth, is related to birth rates and mortality. The causes of migration vary from the pure desire to experience life in another place to the obligation to move to avoid risks found in an area of origin. Africans are facing serious coastal pollution. The pollution of coastal waters can originate from land-based sources (industrial, municipal, agricultural run-off), shipping activity (accidental or deliberate discharges, garbage, and dumping). Therefore, this unit explores the nature and effects of unplanned urbanization, migration ,and coastal pollution in Africa.

Unit Outcomes

After completing this unit, you will be able to:

- *explain the cause and consequences of unplanned urbanization in Africa;*
- *analyze the factors and impacts of migration in Africa; and*
- *describe the causes and effects of coastal pollution on African population.*

Main Contents

7.1 UNPLANNED URBANIZATION

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

- *explain the causes and consequences of unplanned urbanization.*

KEY TERMS

- *City*
- *Legacy of colonialism*
- *Slum*
- *Social instability*
- *Social unrest*
- *Squatter settlement*
- *Town*
- *Unplanned urbanization*
- *Urban primacy*
- *Urban violence*
- *Urbanization*

Urbanization refers to the population shift from rural to urban areas. It involves the corresponding decrease in the proportion of people living in rural areas. It also relates to the ways in which societies adapt to these situations. It is predominantly the process by which **towns** and **cities** are formed and become larger as more people begin living and working in them.

As cities grow in population size, spatial extent and density, their environmental and ecological footprints increase (i.e., human impact on the environment increases). Urban expansion that takes place in forests, wetlands and agricultural systems leads to habitat clearing, degradation and fragmentation of the landscapes. Urban lifestyles, which tend to be consumptive, requiring great natural resources and generating increasing amounts of waste also lead to increased levels of air, water and soil pollution. Therefore, unplanned urbanization is the root cause of damage to the environment and nature.

However, urbanization is by no means bad per se. It brings important benefits for economic, cultural and societal development. Well managed cities are both efficient and effective, enabling economies of scale (the term "economies of scale" refers to the advantages that can sometimes occur as a result of increasing the size of a business). Furthermore, the proximity and diversity of people can spark innovation and create employment as exchanging ideas breeds new ideas.

Those ideal concepts however are threatened by some of the factors driving rapid urbanization. For example, one of the main factors is rural-urban migration; which is driven by the prospect of greater employment opportunities and the hope of a better life in cities. A rapid increasing population density can create severe problems, especially if planning efforts are not sufficient to cope with the influx of new inhabitants. The result may, in extreme cases, be widespread poverty. Finally, unplanned urban expansion creates big slums, exacerbating socio-economic disparities and creates unhealthy or poor sanitary conditions that facilitate the spread of diseases.

To sum up, carefully considered urban planning and good governance with effective regulatory frameworks are required for rapid urbanization to provide opportunities to all.

Focus

Unplanned Urbanization

Key features of unplanned urbanization

- *Urban sprawl and compactness*
- *Unplanned urban growth*
- *Land use change*
- *Accelerated poverty*
- *Environmental degradation*
- *Poor air and water quality*
- *Insufficient water availability*
- *Waste-disposal problems*

7.1.1 Causes of Unplanned Urbanization in Africa

Though Africa is still largely rural, it is one of the fastest urbanizing continents in the world. Africa's urban population is expected to reach 2.5 billion in 2050. This accounts for 21% of the world's projected urban population. Currently, the continent has seven megacities, that is cities with populations over 10 million: Cairo, Kinshasa, Lagos, Accra, Johannesburg–Pretoria, Khartoum, and Nairobi.

Despite high rates of urban population growth, many African countries still have a high degree of **urban primacy**. That is, one city - usually the capital, has the population, economic activity, and political power that are several times greater than the next largest city. Although Africa's high urbanization rates make it similar to other rapidly urbanizing places in the world, it is important to underscore that the underlying processes that shape urbanization in Africa are vastly different from those experienced elsewhere. Much of urban expansion in Africa is characterized by unplanned and unregulated growth, exacerbated by the **legacy of colonialism**, structural adjustment program, and effects of neoliberalism that spawned weak urban

planning institutions.

Focus

Causes of Unplanned Urbanization in Africa

Unplanned urbanization in Africa is the result of:

- *Unplanned and unregulated growth*
- *The legacy of colonialism*
- *The policy pressure of international institutions (e.g., the structural adjustment program of IMF)*
- *Pressure of developed countries (e.g., neoliberalism policies towards developing countries)*
- *Weak urban planning institutions*

7.1.2 Consequences of Unplanned Urbanization

The cost of living in urban areas is very high. Urbanization has a lot of effects on the living conditions of the inhabitants. Some of the consequences of unplanned urbanization are discussed as follows:

1. Development of Slums and Squatter Settlement

When urbanization takes place as a result of a random and unexpected growth it leads to the spread of unlawful residential settlements represented by **slums** and **squatters**. The growth of slums and squatters in urban areas is even further exacerbated by fast-paced industrialization, lack of developed land for housing, large influx of rural immigrants to the cities in search of better life, and very high prices of land beyond the capability of the urban poor.

2. Poor Infrastructure

The quality of city's infrastructure is central to the residents' quality of life, social inclusion and economic opportunities. It also determines the city's resilience to a number of common risks such as economic, environmental, social and health-related risks. The availability and quality of infrastructure are at the core of many of the challenges faced by rapidly urbanizing cities in African countries.

As cities expand rapidly, the rate at which infrastructure growth does not keep pace with the growth or the increased demands of populations. Therefore, action is

urgently needed to close the infrastructure gap and reduce the potential risks that have negative effects. Moreover, many African countries face tight budget constraints and they tend to allocate much of their national income to meet the basic needs of their population.

Focus

Characteristics of Urban Infrastructure in Africa

Urban infrastructure in Africa is characterized by the following features:

- *Infrastructure investments in urban areas in most African countries are insufficient to maintain the quality of infrastructure.*
- *Transportation infrastructure (roads, railroads, airports, and ports) is very weak.*
- *Electric power supply and distribution are inadequate.*
- *Water supply and sewage are in serious shortage.*
- *Communications infrastructure is very weak.*

3. Economic Problem

Residents in many urban centers in Africa face huge economic problems. The costs of housing, food and transportation is very high in the urban centers. In addition, in urban areas, unemployment rates are high and about 60 percent of jobs are in the informal or grey economy which are neither taxed nor monitored by the government.

4. Health Problem

Urbanization creates opportunities but also exacerbates health risks, (e.g., obesity, respiratory diseases, etc.). Moreover, large proportion of urban dwellers in Africa lack adequate sanitation and are exposed to high health risks. Such risks happen at a rapid speed hence it puts the capacity of the health sector to plan and adapt under big challenge. This is particularly true in Africa. Therefore, unplanned urbanization in combination with high population density, poverty and lack of infrastructure can have adverse effect on the health of residents by fostering conditions for communicable diseases.

5. Social Instability

Rapid and unplanned urbanization can also quickly lead to urban violence and social unrest. This could be because of widening inequalities largely observed in urban than rural areas. The combination of inequality, competition for scarce resources such as land, violation of law and weak city governance increase the risk of violence and potential breakdowns in law and order.

Activity 7.1

1. Where is crime more prevalent, urban or rural areas?
2. What types of crime can you identify in urban and rural areas?

Urban	Rural

Moreover, unplanned urbanization can accelerate social instability. For example, high population density fuels the price of house. When there is a shortage of affordable housing, it contributes to the disregard of urban poor residents. This in turn may increase social instability and the prevalence of crime in urban centers.

Focus

Climate Change and Unplanned Urbanization in Africa

Climate change poses serious problems on urban centers in Africa.

Rapid, inadequate and poorly planned expansion of cities in Africa leave urban populations highly exposed to the effects of climate change. For instance, the migration of large number of people from rural areas to cities is at least partially driven by the increasing prevalence of extreme weather. Moreover, cities located near the sea or natural waterways, are at more risk of flooding. Therefore, making cities more resilient to extreme weather events should be a priority for both local governments and the private sectors in African countries.

Case study

Unplanned Urbanization in Africa: the case of Addis Ababa city

Rapid and unplanned urbanization is a common phenomenon in Africa which results in poor social, economic, and environmental outcomes due to inadequate and overburdened infrastructure and services. The outcome has led to congestion, worsening air pollution, and a shortage of adequate housing, and other infrastructures. Ethiopia has experienced the fastest rates of urbanization, and one of the major challenges of urban development in the country has been spontaneously emerging settlements, which have contributed to the country's increasing and unplanned urban growth trends.

Addis Ababa, Ethiopia's largest city, is a fast-growing city that is overwhelmed by many problems, including unplanned urban development and inefficient land uses, extensive urban poverty, joblessness, inadequate housing, congestion and underdeveloped infrastructure.

Historically, Addis Ababa was established from villages that evolved into major urban settlement without master plan. Informal settlement is at the heart of the genesis and development of the city of Addis Ababa. The informal settlements in Addis Ababa were spontaneously emerged and grown around the major centres of the city. The settlements lack basic municipal services such as water, sanitation, waste collection facilities that remain to be the hallmarks of such settlements.

Unplanned and informal settlements in Addis Ababa are of two types. The first one is commonly known as the slums which are located in the highly congested areas marked by deteriorated infrastructure and unsanitary environment. The dwellings are also built out of substandard materials. Their physical characteristics is visible from the poorly planned settlements largely inhabited by low-income group. More than two-third of the population of the city are believed to be living in slum. The second type of unplanned urban settlement is the squatter settlement which denotes the settlements illegally built due to urbanization in an open space, farmland, steep slope, along river buffer and road sides without legal title deed particularly in the urban periphery. Such settlements in Addis Ababa city are characterized by low-quality housing, occupied by the poor.

Therefore, the proliferation of informal settlement in Addis Ababa has negatively affected proper land use and adequate provision of municipal services. The unplanned development of such settlements has prohibited a planned development of the city and promoted spontaneous horizontal expansion of the city from time to time.

Figure 7.1: *Slum and Squatter Settlements in Addis Ababa*

7.2 MIGRATION – FACTORS AND IMPACTS ON AFRICA

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

- *describe the patterns and impacts of internal and international migration in Africa.*

KEY TERMS

- *Destination*
- *Forced migration*
- *Internal migration*
- *International migration*
- *Origin*
- *Pull factor*
- *Push factor*
- *Voluntary migration*

Human migration is the permanent change of residence by an individual or group of people. It can occur within a country or international boundary. Migration falls into several broad categories. First, internal and international migration may be distinguished. Within any country there are movements of individuals and families from one area to another (for example, from rural areas to the cities), and this is distinct from movements from one country to another. Second, migration may be voluntary or forced. Most voluntary migration, whether internal or external, is undertaken in search of better economic opportunities or seeking good life. Forced migrations usually involve people who have been expelled by different factors, such as war, drought, famine, natural disasters, or other political conflicts.

The causes of migration are multitude since a complex web of factors underlie the process. There are **push** and **pull** factors of migration. In Africa multiple push factors spur migration both within the continent and to other regions. Some of the push

factors are economic in nature, like; poor socio-economic conditions, low wages, high levels of unemployment, and poverty. These factors are usually brought about by a mismatch between the rapid population growth and the available resources, low level of requisite technology and capacity to create employment **origin**.

In addition to economic factors, various political and social factors create fertile grounds for migration. Among these, poor governance, corruption, political instability, conflict and civil strife are major causes of migration for both skilled and unskilled workers. The real or perceived opportunity for a better life, high income, greater security, better quality of education and health care at the **destinations** influence decision to migrate.

Throughout its history, Africa has experienced important migratory movements, which have contributed to its present-day demographic landscape. This could be either voluntarily or in a forced manner. The forced act of slave migrations those compelled by European slave traders operating in Africa from the 16th to the 19th centuries had significantly reduced the total population of the continent. Moreover, in many parts of the continent, communities are found spread across two or three nation states as movement of people is often not limited by political boundaries.

7.3 COASTAL POLLUTION IN AFRICA

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

- *dentify the causes of coastal pollutions in Africa; and*
- *suggest solutions to the issue of coastal pollutions in Africa.*

KEY TERMS

- *Discharge*
- *Industrial waste*
- *Marine environment*
- *Municipal sewage*
- *Oil spills*
- *Sea coast*

The major of pollutants that make their way into the ocean caused by human activities along the coastlines and far inland. Pollution of coastal waters may arise from various sources, such as: the discharge of sewage and industrial waste from coastal channels,

the dumping of wastes at sea, the discharge of sewage and rubbish from ships, the handling of cargo, the exploration and exploitation of the sea bed and ocean floor, accidental pollution by oil spills, and other substance of pollutants from the land by air and other routes. Undoubtedly the most frequent cause of coastal pollution problems is the **discharge of municipal sewage and industrial wastes** into coastal waters or into estuaries through low quality disposal facilities. If wastes contain persistent pollutants, discharge into rivers even at considerable distances upstream from the mouth can result in substantial quantities reaching the sea. The major classes of pollutant reaching coastal waters are decomposable organic materials, heavy metals and other toxic matter, dissolved and suspended non-toxic inorganic substances, and pathogenic organisms.

Many factors such as dilution, temperature, adsorption, sedimentation and nutrient deficiencies negatively affect self-purification of the sea. The marine environment is generally unfavorable to the survival of most pathogenic organisms. Under special circumstances, particularly in temperate and warm coastal waters near large cities, pathogenic agents may be found in marine waters in the proximity of the coastline and in estuaries.

The many people living in coastal zones, and even those located far inland, generate large quantities of wastes and other polluting substances that enter the seas directly or through coastal watersheds, rivers and precipitation from polluted air. Coastal pollution is rising rapidly as a result of population growth, urbanization, and industrial development along many coastal areas of Africa. Hence, its coastlines and marine protected areas of Africa are under a high degree of threat from industrial wastes. The coastal marine environment is clearly being affected by the modification and destruction of habitats, over-fishing, and pollution. Many of these impacts can be traced back to land-based human activities located far from the sea.

Many coastal waters carry excessive sediment and are contaminated by microbes and organic nutrients. Nitrogen, resulting from sewage discharges, agricultural and urban run-off, and atmospheric precipitation, is a common problem. The destruction of wetlands and mangroves, which act as natural filters for sediment, excessive nitrogen and wastes, has also accelerated nutrient buildup. Additional pollution sources are oil leaks and accidental spills from shipping, discharge of bilgewater, oil drilling and mineral extraction. Some persistent pollutants are even reaching deep ocean waters.

Activity 7.3

1. Why does the pollution of the vast ocean matter for humanity?

Case Study

The Impacts Plastic Pollution in Seas and Oceans: A Case from Coastal Africa

Plastic pollution is one of the greatest threats to lives in oceans and seas worldwide. It contributes to impacts on human health, loss of livelihoods, greenhouse gases emission, loss of biodiversity and compromises ecosystem functioning in all Africa's land and seascapes.

The United Nation Environment Program's (UNEP) estimates show that the total global plastic production in 2020 was over 400 million tons. Most of the plastics are produced in China (28%), North America (19%) and Western Europe (19%). Interestingly, the same countries or regions are the leading consumers of plastics, with China accounting for 20%, North America 21% and Western Europe 18%. With 1.3 billion people living in Africa as of 2020 (16% of the world's population), Africa produces 5% and consumes 4% of global plastic volumes. Plastic consumption in Africa in 2015 was 16 kg per person, compared to the global average of 45 kg per person and 136 kg per person in Western Europe.

For example, in 2010, South Africa ranked 11th in the list of the worst offenders regarding plastic pollution in the Ocean. According to World Wildlife Fund (WWF) over 80 percent of marine pollution in South Africa originates from land-based sources. In South Africa, 16% of plastic is recycled; the rest of the plastic (about 8 million metric tons discarded plastic) ends up in rivers due to wind, littering, improper waste management, overflowing landfills and eventually ends up in the ocean.

The complexities of plastic pollution in coastal areas and estuaries requires multi stakeholder interventions and coordinated actions.

Figure 7.2: *Plastic Clogs Cuttings Beach near Durban, South Africa*

Activity 7.4

1. In groups, discuss the causes, consequences, and solutions of coastal pollution.
2. What do you think is your personal role in reducing environmental pollution (including rivers and lakes)?

UNIT SUMMARY

In unit seven, we examined the major geographic issues and public concerns of our continent - Africa. Africa is facing serious challenges as a result of rapid and unplanned urbanization, migration and coastal pollution.

If cities are well organized and efficient, they have many benefits for the residents and the overall economy of a country. However, it should be recognized that rapid, often unplanned urbanization brings risks of profound social instability, risks to critical infrastructure, potential water crises and the potential for devastating spread of disease.

As the world continues to urbanize, power will increasingly be concentrated in cities. This power – ranging from economic to social – not only makes cities the center of gravity, but offers greater scope to find practical solutions to the most pressing challenges. Indeed, many observers and organizations are now focusing on cities and the connections between them rather than directing their attention at the national level. The strength of city-level institutions and national institutions if they are capacitated to be flexible, innovative and dynamic, and effectively involve multiple stakeholders in governance they will largely determine whether urbanization makes the Africa more resilient or more vulnerable to face several risks and problems it poses.

As these risks are interconnected, a holistic view and approach are keys to mitigating them. They can affect all of us in unpredictable ways, and they are our shared concerns. The risks should be carefully managed. The very first step to manage those risks is creating awareness – so it is necessary to highlight and discuss the challenge of interconnected risks on a broader level to ensure adequate levels of public awareness. Then, the next step is creating close contact between business, governments, communities, city councils, and academic institutions to bring effective solutions that will foster an environment where innovative public private partnerships can develop. Such partnership makes cities both efficient and resilient.

Migration involves the movement of people leaving their place of birth for temporary or permanent change of residence. It may take the form of internal and international migration, resulting from push or pull factors through voluntary or forced decisions of the immigrants.

Africa's coasts are being highly affected by coastal pollutions. In recent times, the problem has become serious problem in recent times as a result of rising rapid population growth, urbanization and industrial development along many coastal areas of Africa.

REVIEW QUESTIONS

PART I: MULTIPLE CHOICE ITEMS

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

1. One of the following is not among the key features of unplanned urbanization.

A. Monitored land use change
B. Environmental degradation
C. Unregulated urban growth
D. Urban sprawl

2. Which of the following best describes the characteristics of African urbanization?

A. Infrastructure development is in pace with rapid urban growth
B. Inadequate and poorly planned expansion of cities
C. Fast growth of employment opportunities
D. Indigenous urbanization and social stability

3. The pull factors of migration in Africa at the place of destination includes all of the following except;

A. Conflicts and political instability
B. Better job opportunities
C. Better infrastructure
D. Better quality of education and health services

4. Which of the following was not among the major characteristics of migratory movements in Africa?

A. It involved both voluntary and forced migration
B. It was influenced by the external forces
C. It was limited by a political boundary
D. It contributed to the present-demographic landscape of Africa

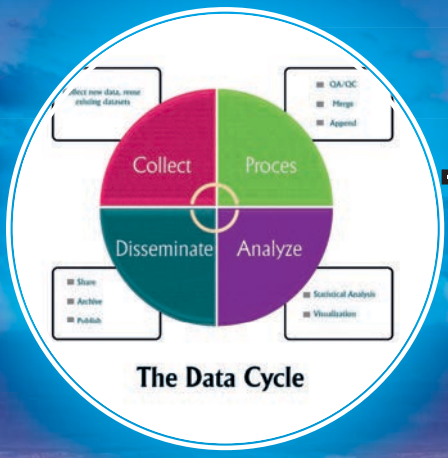
5. Coastal pollution in Africa becomes one of the major environmental challenges due to;

A. Africa's fast development in wetland ecosystem
B. Discharge of municipal and industrial wastes
C. Improvement in waste management infrastructure
D. Improvement in per-capita income of households

PART III: SHORT ANSWER ITEMS

Direction: Give a short Answer for the following questions.

6. Explain the causes of unplanned urbanization in Africa
7. Explain the consequences of unplanned urbanization in Africa
8. What are the major pushing and pulling factors of migration in Africa?
9. Describe the effect of Slave Trade on population of Africa.
10. What are possible solutions to avoid coastal pollution in Africa?



UNIT EIGHT

GEOSPATIAL INFORMATION AND DATA PROCESSING

INTRODUCTION

In this unit, you will study how geographic data are gathered, compiled, and used. However, before the output reaches the end user a lot of steps, tools and processes are involved. Hence, the overall process of geospatial information and data processing depends on geographic data. The sources of the data could be from direct and remotely sensed sources. There are different types of tools or hardware that help us to collect data. The two most important tools include a global positioning system (GPS) and digitizers.

The geographic data gathered through the methods and tools mentioned above helps us to answer basic geographic questions such as 'what is where?', and 'why is it there?' Answering these questions helps us to identify risk areas and solve critical problems.

The result or the output of geographic data analysis can be a representation of data in numeric values, displayed on maps, graphs, charts, and diagrams.

Unit Outcomes

After completing this unit , you will be able to:

- *recognize ways of presenting geographic information;*
- *explain the concepts of geospatial information;*
- *identify sources and tools of geographic data;*
- *describe ways of geographic data representations; and*
- *produce graphs, charts and diagrams from raw data.*

Main Contents

8.1 BASIC CONCEPTS OF GEOSPATIAL INFORMATION

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

- *describe the main concepts of geospatial information.*

KEY TERMS

- *Attribute*
- *Attribute information*
- *Continuous data*
- *Data*
- *Discrete objects*
- *Geographical data*
- *Geospatial data*
- *Information*
- *Location information*
- *Observations*
- *Qualitative variable*
- *Quantitative variable*
- *Temporal information*
- *Visualization*

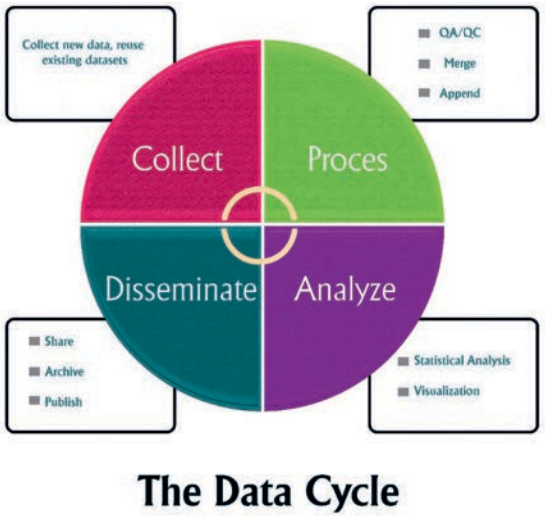
8.1.1 The Similarity and Difference between Information and Data

Although ***data*** and ***information*** are often used interchangeably, they are not the same. They both have specific meanings.

I. Data

Data refer to different **observations** which are collected and stored as numbers, characters, images, facts and symbols. They describe a feature, idea, status, or situation that we want to focus on or are interested in. Therefore, data are sets of values of **qualitative** or **quantitative** variables about one or more persons or objects. Data can be meaningful when it is further processed by human interpretations or input into a computer and the results disseminated.

Data has important lifecycles. It begins with data collection. At this stage ,we may collect new data (primary data) from a study area or existing secondary data obtained from different offices (e.g., Central Statistical Agency). The second stage in the data lifecycle is data processing. This stage involves checking for data quality such as quality assurance (QA) and quality control (QC), merging duplicate variables, and appending new information into the data. The third stage involves the analysis of data. Here different statistical analyses can be used to identify meaningful relationships between or amongst variables, and then the results can be displayed in tables, charts ,and graphs for visualization.



The final stage is the dissemination of results. This stage involves sharing results with the general public through conferences, workshops, and publishing the results in known journals ,and archiving the results so that they can be accessible for future use.

Figure 8.1: *The Data Cycle*

II. Information

Information: is the result of processing, manipulating, and organizing data in a way that adds to the knowledge of a receiver. In other words, it is the context, in which data is taken.

Table 8.1: Some Differences between Data and Information

Data	Information
▪ Data is used as an input for the computer system. ▪ Data is unprocessed facts or figures. ▪ Data does not depend on information.	▪ Information is an output of data. ▪ Information is processed data ▪ Information depends on data

8.1.2 Basic Concepts of Geospatial Data

Geospatial data: is data about objects, events or phenomena that have **location** information of the surface of the earth they represent. Geospatial data typically combines **location information** (usually coordinates on the earth) and **attribute information** (the characteristics of the object, event or phenomena concerned) with **temporal information** (the time at which the location and attributes existed).

Geographical data links **place**, **time**, and **attributes**. Geographical data is at the heart of map making. Without geographical data events, or phenomena of an area of our interest (AOI) cannot be visualized and analyzed.

A. Place

Place or location is essential in the collection of geographical data. Locations are the basis for mapping an area of our interest. Based on the location we can link different kinds of information to it, and measure distances and areas. Without locations, data are said to be "**aspatial**" or or non-spatial, and have no value at all.

B. Time

Time is an optional element. Many aspects of the earth's surface are slow to change and can be thought of as unchanging. For example, height above sea level changes slowly because of erosion and movements of the earth's crust, but these processes

operate on scales of hundreds or thousands of years and for most applications (except geophysics) we can safely omit time from the representation of elevation. On the other hand, temperature changes daily and dramatic changes sometimes occur in minutes with the passage of a cold front or thunderstorm, so time is very important.

C. Attributes

Attributes refer to descriptive information about the objects, events or phenomena that we try to map. There is a lot of attribute information an area may have. Some attributes are **physical** or **environmental** (e.g., temperature or elevation), while others are **social** or **economic** (e.g., number of populations, or income).

8.1.3 Visualizing Geographic Data

There are two fundamental ways of visualizing geographic data. It can be visualized as a discrete object or as continuous data.

A. Discrete objects represent an area as objects with well-defined boundaries in open space. Hence, a **discrete object** has known and definable boundaries. It is easy to define precisely where the object begins and where it ends. For example, a lake is a discrete object within the surrounding landscape.

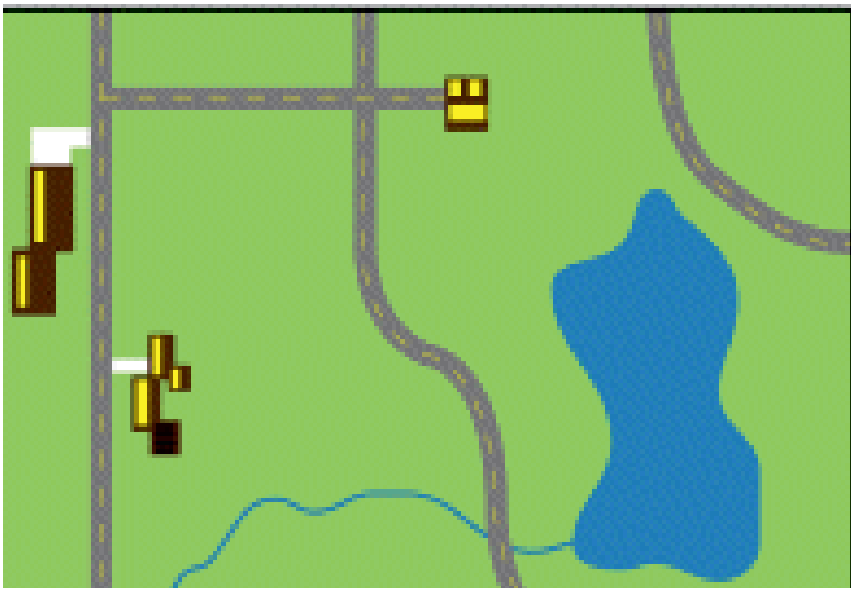


Figure 8.2: *An Example of Discreet Object – Lake*

B. Continuous data represents areas or phenomena that progressively vary across a surface or a location. The values of a measure of variables may vary from point to point. Continuous data is also referred to as field, non-discrete, or surface data.

An example of continuous data is elevation. The starting point being sea level, the elevation of an area varies across the surface.

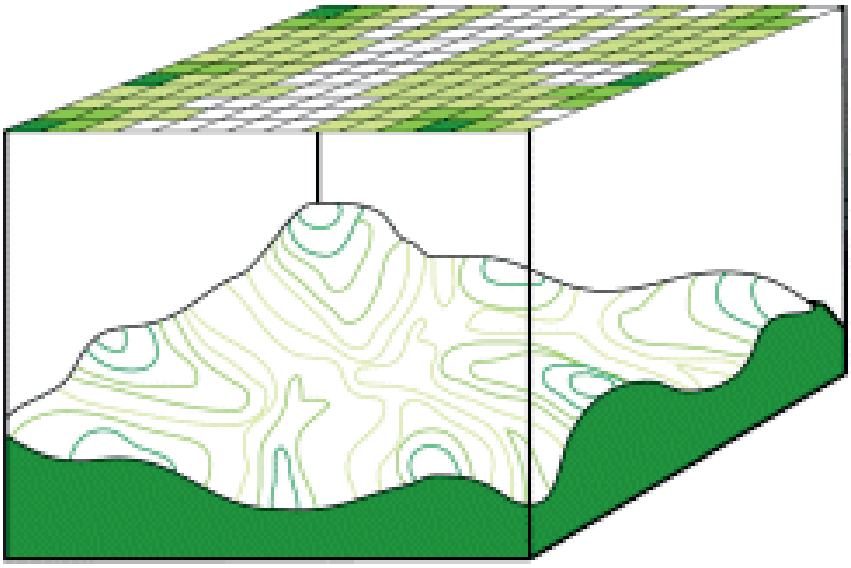


Figure 8.3: *An example of Continuous Data – Altitude*

8.2 SOURCES AND TOOLS OF GEOGRAPHIC DATA

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

- *acquire and present spatial data using geo-spatial tools.*

KEY TERMS

- *Base map*
- *Data collection*
- *Data format*
- *Digitizer*
- *Field survey*
- *Global Positioning System (GPS)*
- *Primary sources*
- *Remote sensing*
- *Secondary sources*
- *Sources of data*

8.2.1 Sources of Geographic Data

Geographic data are collected from a variety of **sources** and in different **formats**. The data can be collected using instruments that measure natural phenomena (e.g., temperature, rainfall, humidity, etc.) as well as by advanced satellites (e.g., remote sensing). Therefore, geographic data come from two important sources:

a) Directly Collected
b) Remotely Sensed

A. Directly collected data are generated at the source of the phenomena being measured. Examples of directly collected data include measurements such as temperature readings at specific weather stations and elevations recorded by visiting the location of interest. Data can also be obtained through **surveys** (e.g., the census and sample surveys) or **observation** (e.g., counting the number of trees in a farmland).

B. Remotely sensed data are measured from remote distances without any direct contact with the phenomena or a need to visit the locations of interest. Satellite images are examples of remotely sensed data.

Focus

Sources of Geographic Data

The most common general sources for geographic data are:

- *hard copy maps (analogue maps);*
- *aerial photographs;*
- *remotely-sensed imagery;*
- *point data samples from surveys; and*
- *existing digital data files.*

8.2.2 Tools for Geographic Data Collection

Data collection is the process of gathering and measuring information on variables of our interest. It is usually carried out systematically so that it enables us to appropriately map the area of our interest. Therefore, the first step in making a map is to complete a **field survey**. Surveyors observe, measure, and record what they see in the specific area.

Activity 8.1

1. What is the purpose of geographic data collection?

Geographic data is collected, to create **a base map of an area.** Then other information about the layers which are going to overlap on the map will be collected. The data needed for the base map belong in a category named "**primary sources**" because these spatial and location data are received for direct use in making the map. The

other category of data is called "**secondary sources**" and refers to data of general interest gathered for many reasons which can further be used by end users, based on their interest.

Hard copy maps (analogue maps) can be used as a secondary source. The information on these sources can be used by **enlargement** of a map of the area of our interest on paper or by digitizing on a computer in a digital format. However, whenever we use data from secondary sources, we should be very careful and check if the data are right and **up-to-date**. Otherwise, our final result will be wrong and outdated.

Today, most mapping is done by remote sensing the gathering of geographic information from a distance by an instrument which is not physically in contact with the mapping site. These data are gathered primarily by aerial photography or satellites. The data gathered includes information such as elevation, differences in land cover, and variations in temperature. This information is recorded and converted to a digital format. Cartographers or mapmakers then use these data and computer software to make maps.

There are different types of tools or hardware that help us in data collection. The tools include: **global positioning system** (GPS) and **digitizers**.

I. Global Positioning System (GPS)

A global positioning system is a satellite network that is used to determine the exact location of a place. It communicates with GPS receivers accessed by individual users on the surface of the Earth. The GPS receiver needs to connect with four or more satellites orbiting the Earth, as a reference to calculate the precise location of the user within a few meters.

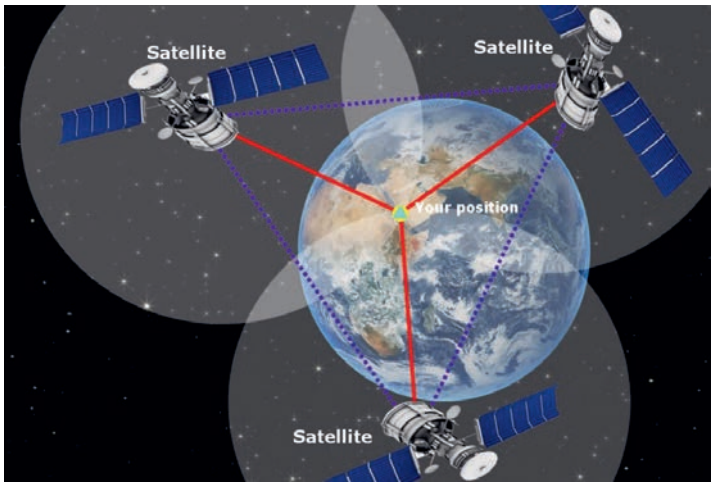


Figure 8.4: *Global Positioning System*

Figure 8.5: *GPS Receiver*

GPS receivers are widely used in cars and smartphones to provide directions to specific locations. The GPS receiver is very valuable for documenting information about a place. It provides latitudinal and longitudinal coordinate values of an area and the elevation value of the area.

II. Digitizers

A digitizer is a tool used to change images on an analogue form or paper into a digital form on a computer. Therefore, digitization is the process of converting information into a digital (i.e. computer-readable) format. The result is the representation of an object or image in a digital format. Instruments that are used in digitation include: table digitizer, scanner and smartphones. Data generated by digitizer provides geo-referenced information of an area. Whereas images generated by scanners and smartphones should be geo-referenced. Georeferencing means that the internal coordinate system of a map or aerial photo image can be related to a geographic coordinate system of an area being scanned.

Figure 8.7: *Table Digitizer*

Figure 8.6: *Scanner*

8.3 GEOGRAPHIC DATA REPRESENTATIONS

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

- *describe and explain how to present geographic information.*

KEY TERMS

- *Analogue format*
- *Data representation*
- *Digital format*
- *Geographic data structure*
- *Grid-cell data*
- *Node*

Geographic data representation involves graphical visualization of the data or producing map of an area. Maps are used in order to gain better insight and understanding of the area of our interest. There are two main forms of geographic data representations. These are hardcopy also known as **analogue** format and **digital** format. The digital format is becoming increasingly important in the world today. The digital representation of geographical data has enormous advantages over paper maps. It can be used in digital devices such as personal computer (PC), and information providers such as the internet, or mass storage devices for many purposes. Digital data are also easy to copy and transmit at very high speeds. Moreover, digital data can be stored at high density in very small spaces, and it is less subject to the physical deterioration that affects paper format. Finally, data in digital form are easy to transform, process and analyze.

Activity 8.2

1. Describe the advantages of digital data formats and storage facilities over hardcopy, or analogue format?

A map is composed of different geographic features represented either as **points**, **lines**, and/or **areas**. Each feature is defined both by its location in space (with reference to a coordinate system), and by its characteristics (typically referred to as **attributes**). Therefore, map is a model of the real world where all geographic

features on the earth's surface can be characterized and defined as one of the three basic features – point, line or area.

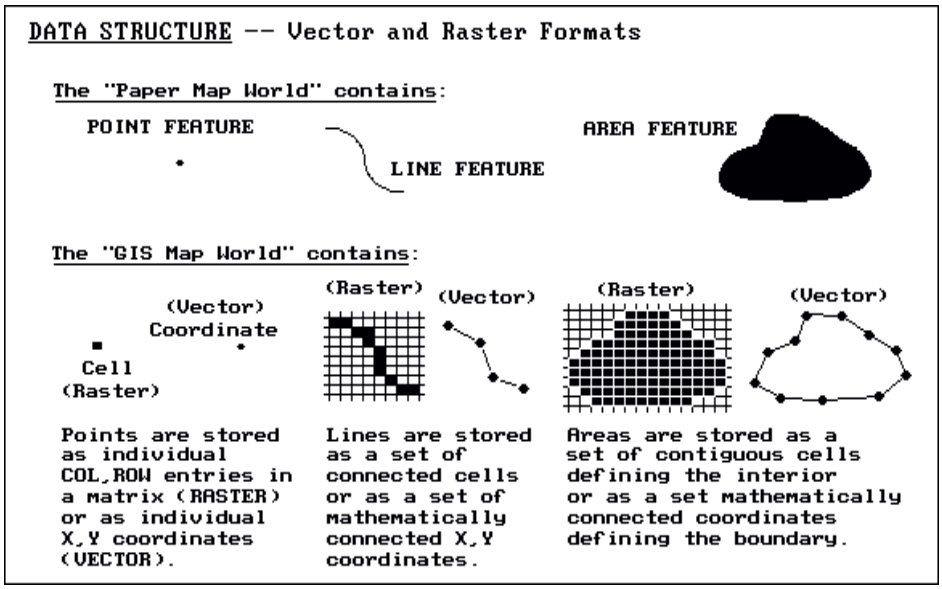


Figure 8.8: *Geographic Data Structure*

i. Point data exists when a feature is associated with a single location in space. Examples of point features include a telephone network tower, water well and a weather station.

ii. Line data exists when a feature's location is described by a string of spatial coordinates. Examples of linear data include rivers, roads, pipelines, etc.

iii. Area data exists when a feature is described by a closed string of spatial coordinates. An area feature is commonly referred to as a polygon. Examples of polygonal data include forest stands, soil classification areas, administrative boundaries, and climate zones. Most polygon data are considered to be homogeneous, and thus they are consistent.

Meanwhile, in the digital format, the same geographic features outlined above are stored and displayed in three basic types of spatial data models.

- *Vector*
- *Raster*
- *Image*

The following diagram reflects the two primary spatial data storage techniques in the computer. These are **vector** and **raster**. Whereas, images reflect **pictures** or **photographs** of the landscape.

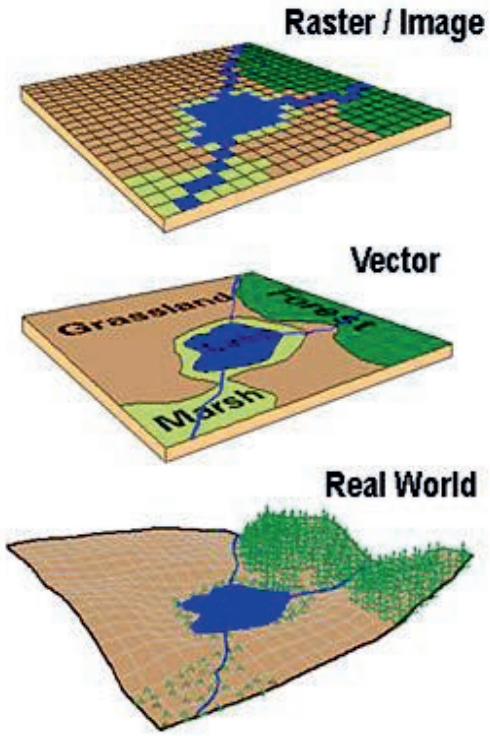


Figure 8.9: *Digital forms of digital data representation*

Activity 8.3

Determine whether the following statement is correct or incorrect.

1. Whatever we can draw on a paper map using point, line, or polygon can also be drawn by vector and raster models in a computer.

1. Vector Data Models

Vector storage implies the use of vectors (directional lines) to represent a geographic feature. Vector data is characterized by the use of sequential points or vertices to define a linear segment. Each vertex consists of an X coordinate and a Y coordinate or latitudinal and longitudinal values. Hence, **point** feature is defined by one coordinate pair of X and Y. Vector lines are also referred to as ***arcs*** and consist of a string of vertices terminated by a ***node***. A node is defined as a vertex that starts or ends an arc

segment. **Polygonal** (area) features are defined by a set of closed coordinate pairs.

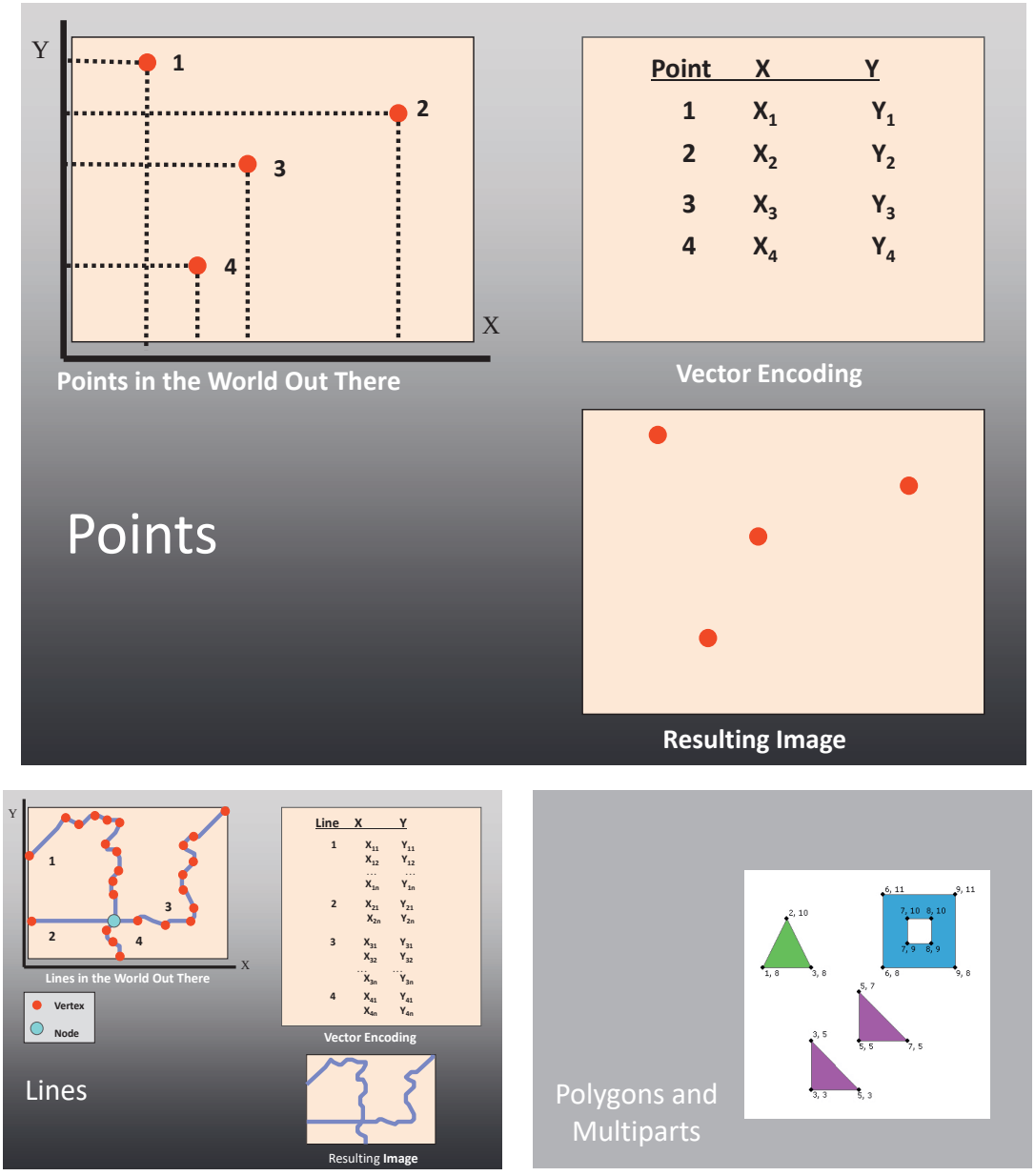


Figure **8.10:** *Vector Representation of the Real-World Features*

2. Raster data models

Raster data models incorporate the use of ***a grid-cell*** data structure where the geographic area is divided into ***cells*** identified by row and column. This data structure is commonly called a **raster**. The size of cells in a tessellated (characterized by a pattern of repeated shapes, especially polygons, that fit together closely without gaps or overlaps) data structure is selected based on the data accuracy and the resolution

needed by the user. Since geographic data is rarely distinguished by regularly spaced shapes, cells are classified based on the most common attribute of the cell.

Therefore, raster data represent **points** by a single cell, **lines** by sequences of neighboring cells, and **areas** by collections of contiguous cells.

Figure 8.11: *Representation of Point, Line and Area Features (Raster versus Vector)*

8.4 ADVANCES IN MAPMAKING AND THE BIRTH OF GEOGRAPHIC INFORMATION SYSTEM

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

- *describe the developments in map making.*

KEY TERMS

- *Components of GIS*
- *Data analysis*
- *Data interpretation*
- *Data storing*
- *Data visualization*
- *Geographic Information System (GIS)*
- *Mapmaking*

8.4.1 Historical Development of Mapmaking

Mapmaking has been an integral part of human history for thousands of years. It is believed that the human activity of graphically representing one's perception of the world is a universally acquired skill and one that pre-dates virtually all other forms of written communication. From cave paintings to ancient maps of Babylon, Greece, and Asia, right into the 21st century, people have created and used maps as an essential tool to help them define, explain and navigate their way through the world.

Mapping represented a significant step forward in the intellectual development of human beings and it serves as a record of the advancement of knowledge of the human race, which could be passed from members of one generation to those that follow in the development of culture.

Early maps were a garbled or distorted mass of land that bear no resemblance to the actual world. As the centuries passed, maps became larger, more detailed and more accurate.

Several technical advances since the 18th Century helped mapmakers to accurately draw the general outline of the continents and locate their precise positions. The advances in mathematics and astronomy and dividing the Earth into lines of longitude and latitude were among the most notable advances.

There has been an ever increasing demand for maps and greater reliability on maps in the 21st Century. Specially, improvements in printing and photography, the mass production of maps and the ability to make accurate reproductions from more accurate data, as well as, the availability of airplanes and satellites made it possible to photograph and provide images of large areas at a time. In particular, the role of satellites is very important. Satellites perform continuous scans to provide detailed up-to-date maps of nearly the entire Earth.

Activity 8.4

1. ***"There is an ever-increasing demand for maps and greater reliability on it."*** Why do you think the demand for maps and its reliability are highly increased?

8.4.2 Geographic Information System (GIS)

It is interesting that during the last few decades more sophisticated mapping systems appeared. It was mainly due to the advancement of geographic information system (GIS). The geographic information system is a computer-based system that enables us to **store**, **visualize**, **analyze**, and **interpret** geographic data.

Figure 8.12: *Components of GIS*

8.4.3 The Components of GIS

1. Hardware

The hardware is the computer and other devices (printers, plotters, scanners, etc.) attached with it. The hardware helps the GIS to operate..

2. Methods

Methods are well-designed plans and application specific procedures and rules describing how the technology is applied. This includes the following:

- *guidelines;*
- *specifications;*
- *standards; and*
- *procedures.*

3. Software

GIS software provides the functions and tools users need to store, analyze and display geographical information. The key software components are:

- *GIS software;*
- *database software;*
- *operating system (OS) software; and*
- *network software.*

3. People

GIS technology is clearly of limited value without people to manage the system and to develop plans for applying it. Users of GIS range from highly qualified technical specialists to planners, foresters, etc. to help with everyday work.

- *Administrators*
- *Managers*
- *GIS technicians*
- *Application experts*
- *End users*
- *Consumers*

4. Methods, procedures and applications

Methods are well-designed plans and application specific procedures and rules describing how the technology is applied. This includes the following:

- *guidelines;*
- *specifications;*
- *standards; and*
- *procedures.*

5. Data

Geographic data (also called spatial, or geospatial data) identifies the geographic location of features. One of the most important components of GIS is the data. It is very important that data must be accurate. There are different types of data:

- *vector data;*
- *raster data;*
- *image data; and*
- *attribute data.*

Focus

Some basic GIS data can be obtained from the following web sites.

- *(https://africaopendata.org/dataset/ethiopia-shapefiles)*
- *https://maps.google.com/*
- *https://earth.google.com*
- *https://www.diva-gis.org/gdata*

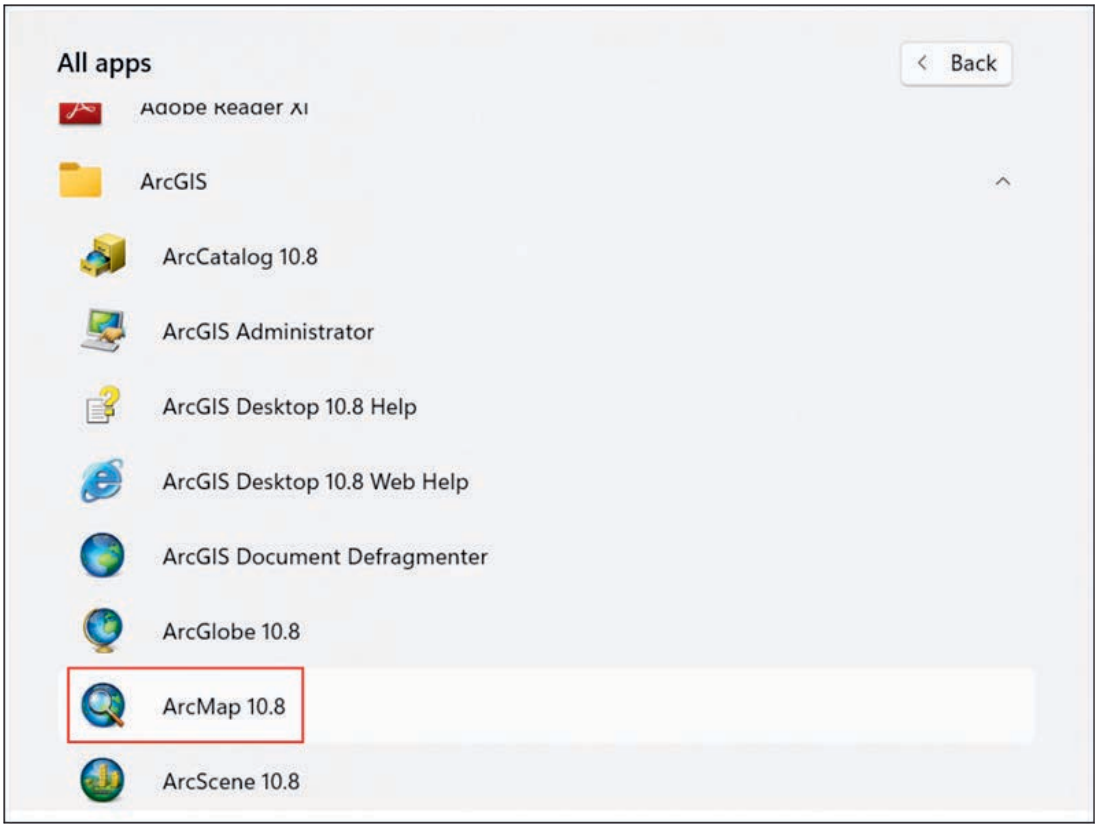
8.4.4 Creating a Local Administrative Map with ArcMap

Step 1: Starting ArcMap, and adding data layers

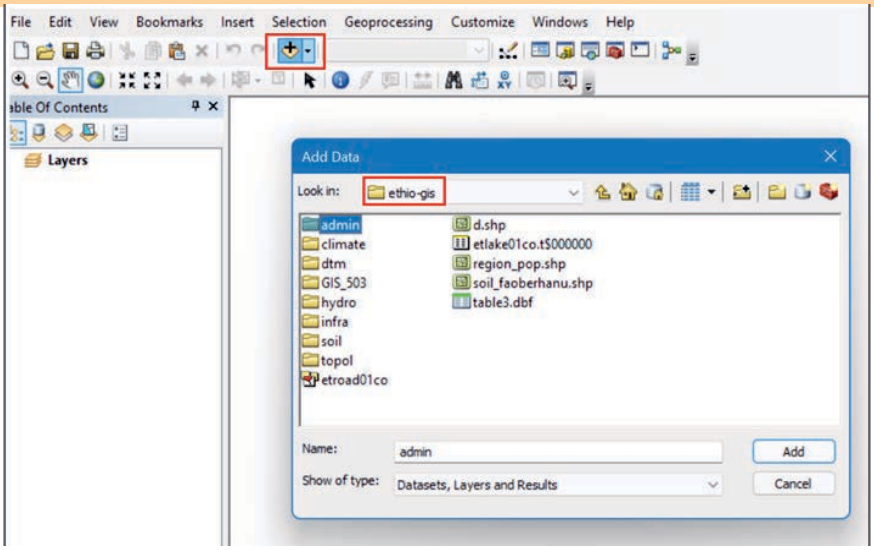
To start ArcMap choose start ➡ all programs ➡ ArcGIS ➡ ArcMap 10.x.

N.B. The data to produce an administrative map can be obtained from different sources. One of the sources is from the internet using the following link (https://africaopendata.org/dataset/ethiopia-shapefiles). Then download the data and extract the file in a folder. It is very important to create a folder and save the data on a hard drive of a computer. From the folder using the following steps it is possible to create an administrative map of area of our interest.

For example, to create an administrative map of Oromia National Regional State, we follow the following steps.

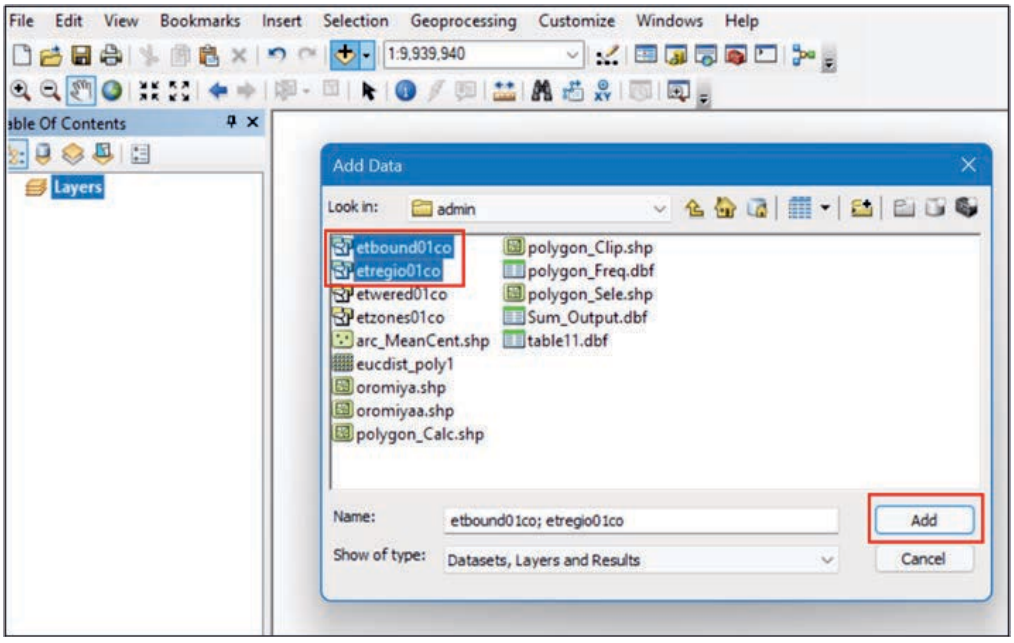


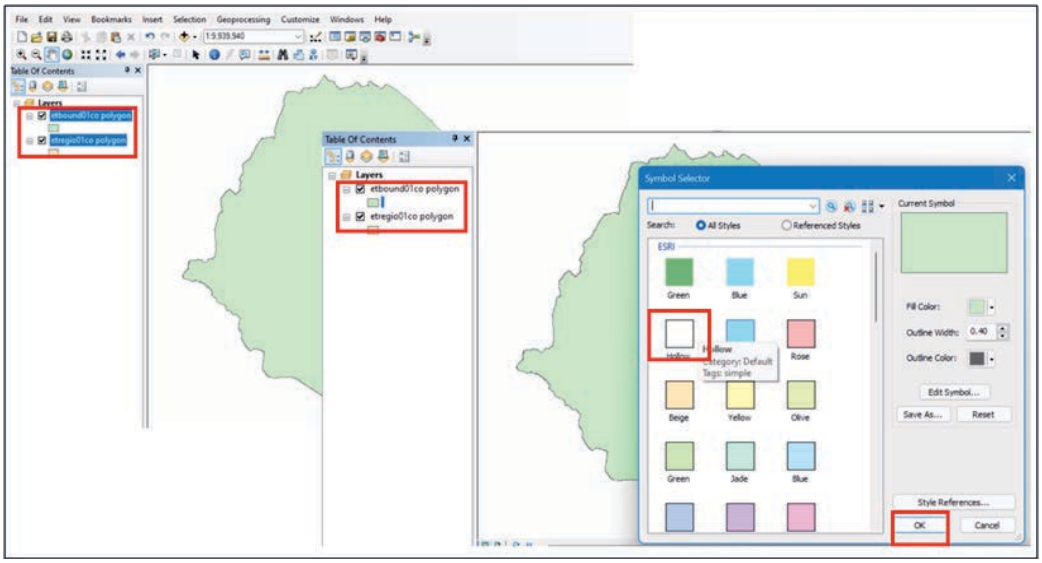
Step 2: Click the connect to folder icon. This allows you to access a folder where the Ethio-GIS data is located.



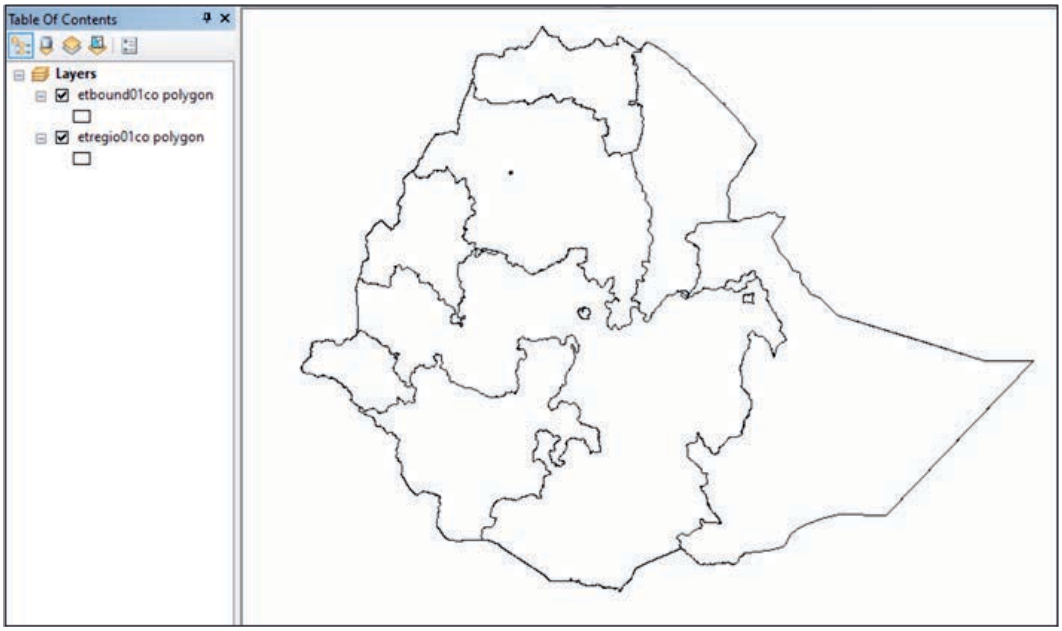
Step 3: By clicking on the admin folder, select etbound01co and **etregio01co.** Then, click on the **add** button.

Once the selected shapefiles are added, it is important to remove the background shade of the files by clicking on the small squares, then choosing hollow from symbol selector and click on ok button.

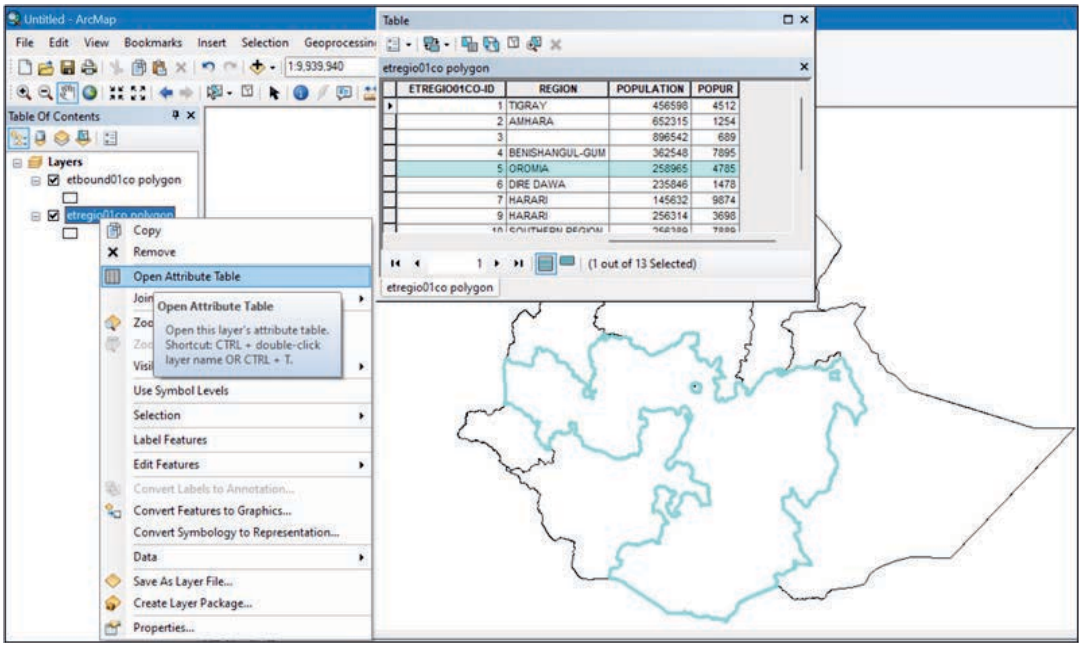




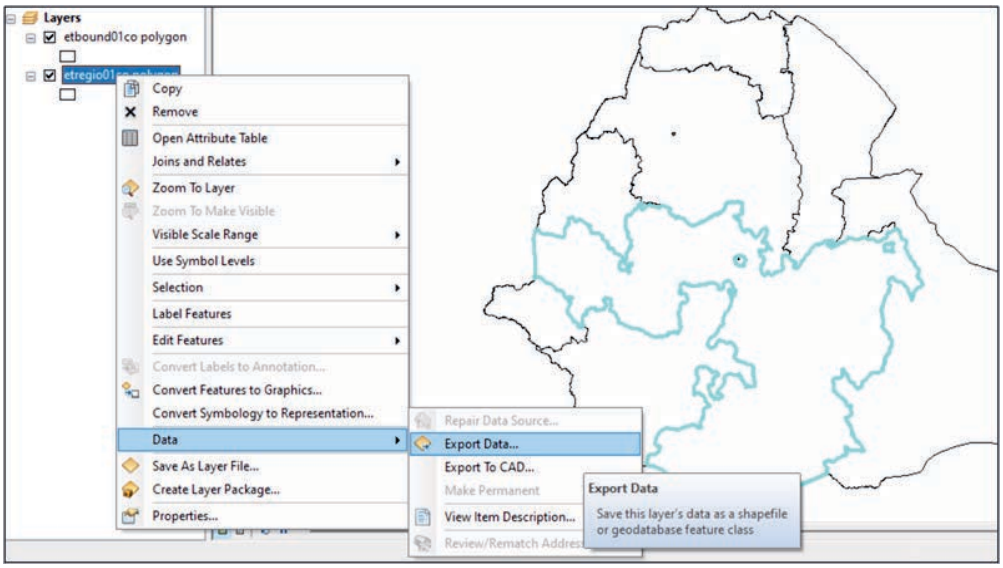
Now the in the window the image should appear as follows.



To select the area of your interest, (Oromia National Regional State), right click on **etregio01co** layer open attribute table click on the left margin of the table where Oromia is found in the list of tables, then check that Oromia is selected and highlighted.



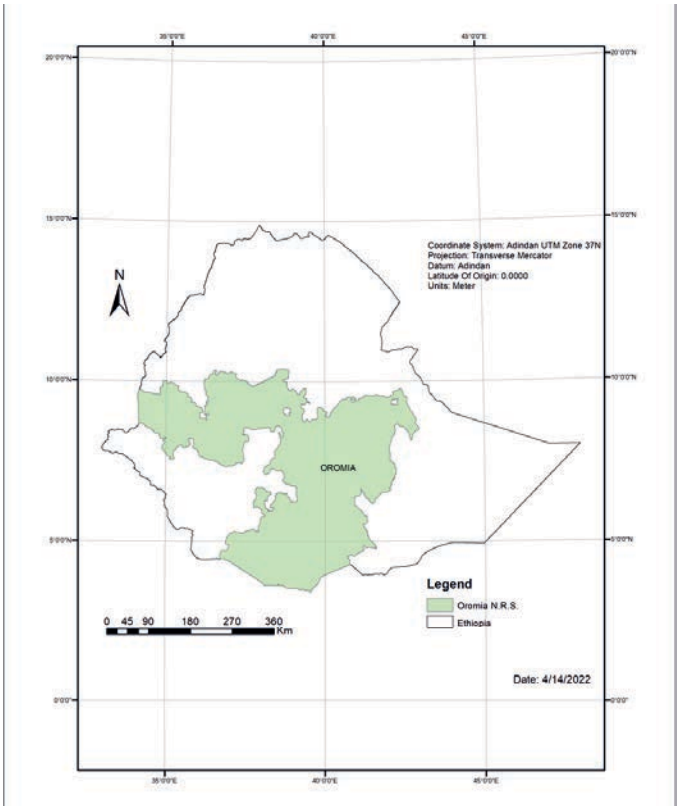
Then right click on **etregio01co** layer and click on data, export data and save in a folder. It will prompt you to add the data in your project, click **yes**.



Now the map of the region appears as follows, after being renamed to its proper name, and unticking the other layers we do not want for the moment.

Finally, by clicking on a layout view we should include the necessary marginal information such as:

- *legend;*
- *scale bar;*
- *north arrow;*
- *coordinate information;*
- *gridlines; and*
- *date of map compilation.*



Match items under column 'A' with its appropriate descriptions under column 'B'

Column A	Column B
1. Vector data	A. Characteristic feature of a data
2. Raster data	B. Uses of grid-cell
3. Image data	C. Not a geo-referenced data
4. Attribute data	D. Uses sequential points or vertices to define a line segment

8.5 MAKING AND INTERPRETATION OF GRAPHS, CHARTS AND DIAGRAMS

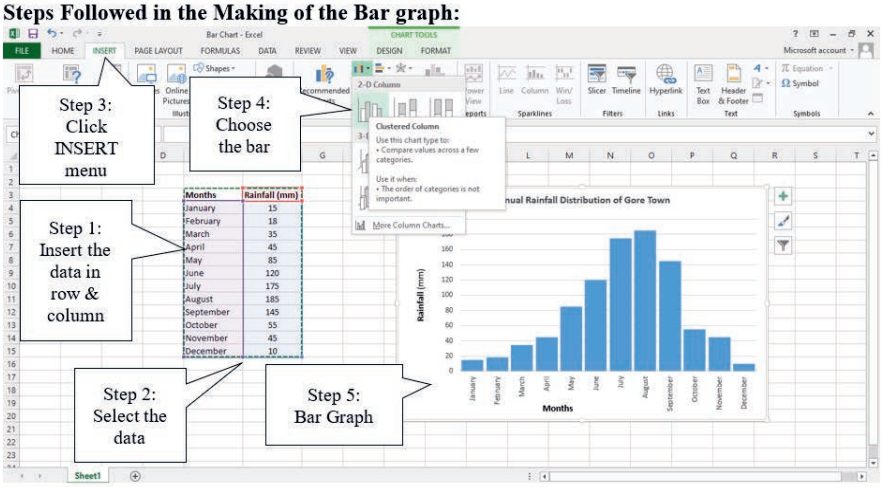
Many studies, researches and textbooks use data and numbers. Hence, presentations using charts, graphs, and diagrams can help the presenter draw and keep the attention of the listeners. Presentation using graphs, charts and diagrams also helps the presenter to have a profound evidence-based work. People will also understand and memorize at least the main points from the presentation. Moreover, they are very important in describing trends, making a comparison, or showing relationships between two or more items.

Computer programs such as Microsoft Excel, Microsoft Word and other spreadsheets like SPSS (statistical package for social sciences) are widely used for making graphs, charts and diagrams. There are so many types of graphs, charts and diagrams that can be produced on a computer. Therefore, the main task of the user is to choose the right one. Here are some common types out of which the user can make his or her choice. Bar graph, line graph and pie chart can be prepared in Microsoft Excel. Meanwhile, diagrams can be drawn in Microsoft Word using the steps indicated below.

1. Bar Graph

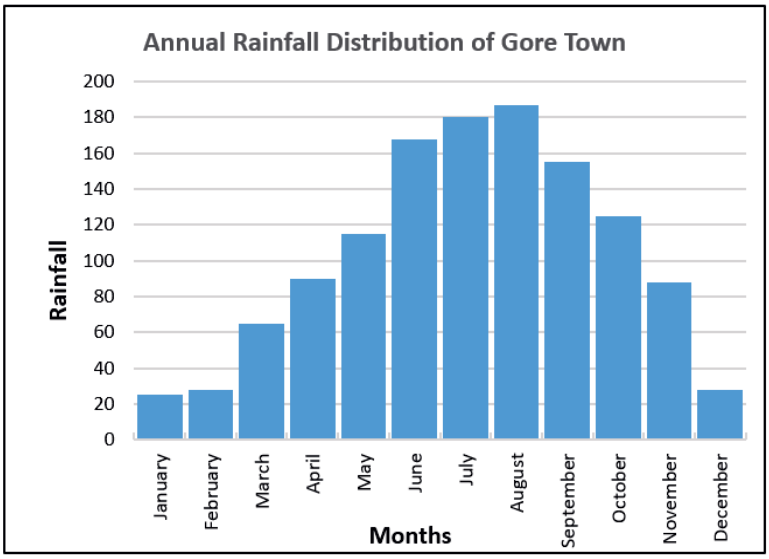
Bar graph is used to show relationships between different data series that are independent of each other. In this case, the height or length of the bar indicates the measured value or frequency. Below, you can see the example of a bar graph which is the most widespread visual for presenting rainfall data at Gore Town.

Steps Followed in the Making of the Bar graph:



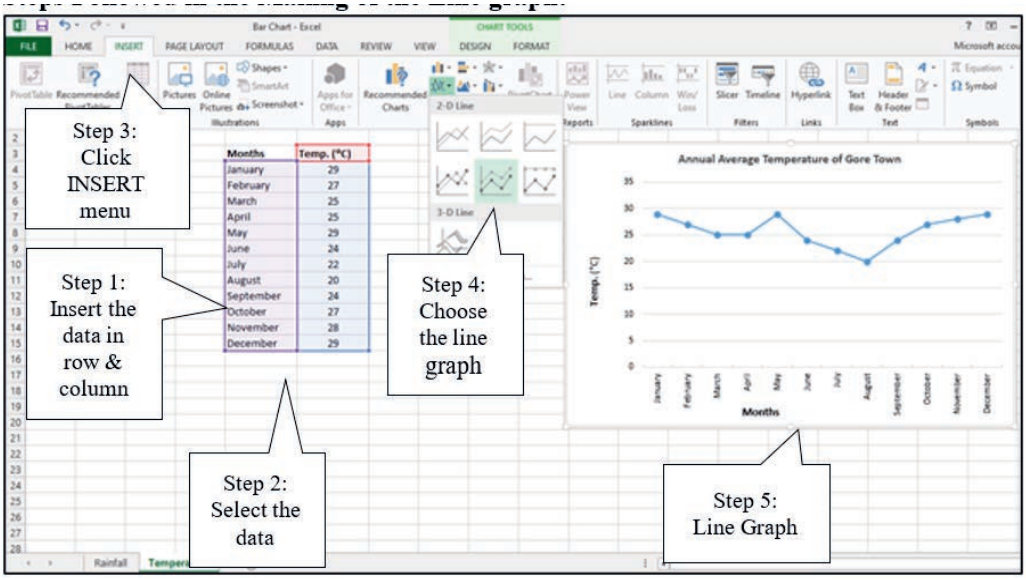
Raw Data and Final Output

Months	Rainfall (mm)
January	25
February	28
March	65
April	90
May	115
June	168
July	180
August	187
September	155
October	125
November	88
December	28



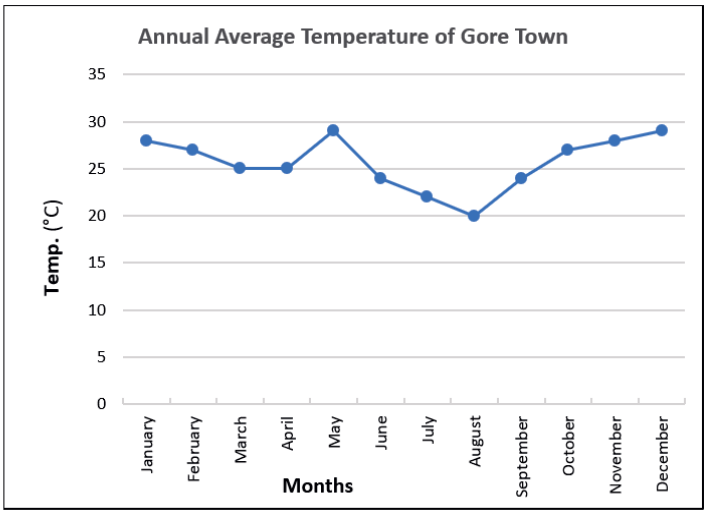
2. Line Graph

Line graph represents how data has changed over time. This type of charts is especially useful when we want to demonstrate trends or numbers that are connected. For example, how temperature varies within one year.



Raw Data and Final Output

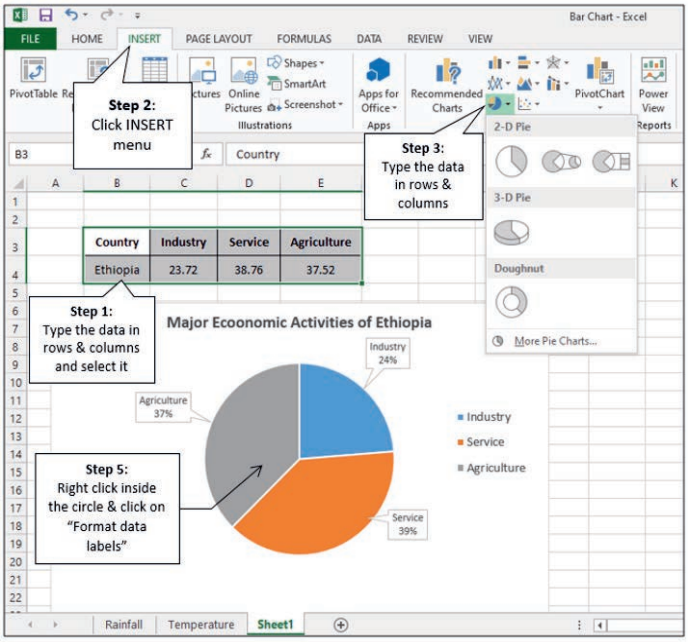
Months	Temp. (°C)
January	29
February	27
March	25
April	25
May	29
June	24
July	22
August	20
September	24
October	27
November	28
December	29



3. Pie Chart

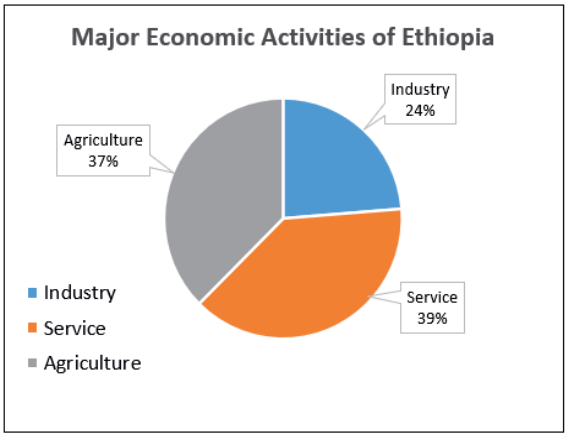
Pie chart is designed to visualize how a whole is divided into various parts. Each segment of the pie is a particular category within the total data set. In this way, it represents a percentage distribution of the variables under study.

Steps Followed in the Making of Pie Chart:



Raw Data and Final Output

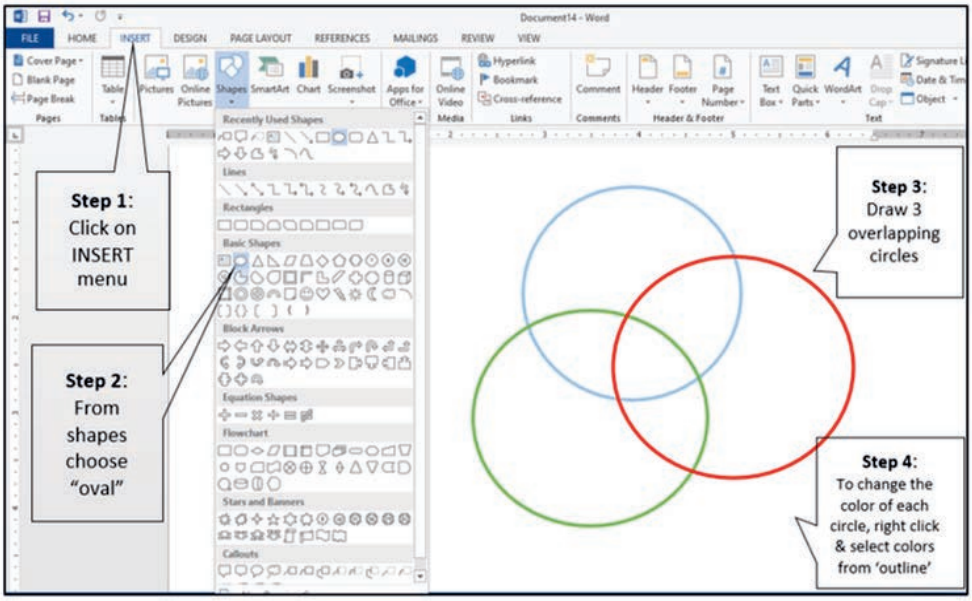
Country	Industry	Service	Agriculture
Ethiopia	23.72	38.76	37.52



4. Diagram

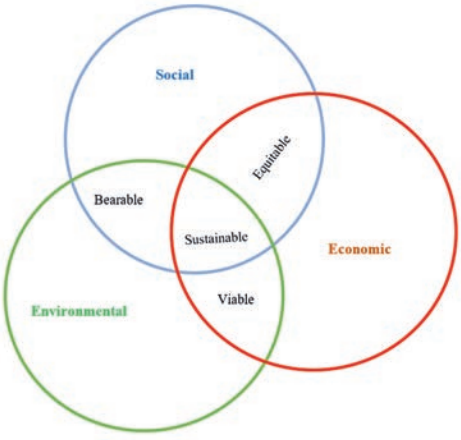
Diagram is a plan, drawing or outline created to illustrate how separate parts work and overlap at the connecting points. For example here is how we can draw the components of sustainable development in Microsoft Word.

Steps Followed in Making the Diagram:



Note also that you can insert texts that describe the contents you wanted to show. In the example above, each word is written inside the circles as shown in the steps below.

Final Output



❑ Glossary of basic terms used in the chapter

The following terms are commonly used in this unit and you need to understand their meanings:

Variable	Data item that can take more than one value. For example, in qualitative data, a variable could be color (e.g., black, red, etc.) whereas in quantitative data it could be real numbers (e.g., number of students in a class can be 27 Male and 23 Female).
Field survey	Collection and gathering of information at the local level by conducting primary surveys. These are an essential component of geographic enquiry and are carried out through observation, interviews, sketching, measurement, etc.
Data	Facts and statistics collected together for reference or analysis.
Information	Facts provided or learned about something or someone. It is associated with data. Data represents values attributed to parameters, whereas, information is data in context and with meaning attached.
Base map	The graphic representation at a specified scale of selected fundamental map information; used as a framework upon which additional data of a specialized nature may be compiled
Area of our interest	The geographic extent of the job we want to do (e.g., area we want to map, study, survey, etc.) This helps us to confine the unit of work to a geographic area. It also helps us to continuously edit.
Primary source	A document, first-hand account, or other sources that constitute direct evidence of an object of study.
Secondary source	A book, article, or other source that provides information about an object of study but does not constitute direct, first-hand evidence.
End user	A person who uses the final output of a map or research.
Hard copy map	A map which is printed on physical material, such as on a paper, book or textbook.
Enlargement of a map	Making a new, proportionally larger map, out of the original map.
Reduction of a map	A reduction gives the same map that is proportionally smaller than the original.
Digital map	The process of collection, compiling and formatting of data into a virtual image. The primary function of this technology is to produce maps that give accurate representations of a particular area, detailing major road networks and other points of interest.

UNIT SUMMARY

In unit eight, we examined geospatial information and data processing. Such a process is very important to analyze and understand socioeconomic and environmental problems. The solutions to these problems require spatial thinking and geographic data analysis. Therefore, geographical data is the basis to provide answers to the problems.

Data can represent all types of information and may consist of numbers, text, images and many other formats. A wide variety of data sources exist for both spatial and attribute data. Some geographic phenomenon is well placed in discrete object while other phenomenon is well placed in continuous field.

Spatial data is collected in many different ways. The oldest method is the ground survey. The dimensions of geographic features are measured, such as length, size and direction by surveying equipment. These days, those surveying equipment have been increasingly replaced with GPS. Other methods are remote sensing. Remote sensing allows for collecting spatial data without direct contact with the object of our interest.

Digital technology has driven the need for putting reality into the computer. In other words, human conceptualization or representation of geographic data largely depend on digital format. Hence, data structure can be seen as the digital representation of an area of our interest which the computer can understand. For example, lines are stored as a set of points where points have x, y coordinates. Areas or polygons by connected lines. The shapes could appear in a vector or raster formats.

Moreover, geographic representation in a digital form is becoming increasingly important in our world today. Digital representations have enormous advantages over paper maps, written reports, or spoken accounts. As a result of this and other advances in technology during the last few decades more sophisticated mapping systems came into existence. Particularly, the advancement of geographic information system (GIS) played a great role in the improvements of mapping. The geographic information system is a computer-based system that enables us to store, visualize, analyze, and interpret geographic data.

Developing technical skills such as making graphs, charts and diagrams are very important. Because, many studies, researches and textbooks use data and numbers. Hence, presentations using these tools can help the presenter draw and keep the attention of the listeners. Presentation using graphs, charts and diagrams also helps the presenter to have a profound evidence-based work.

REVIEW QUESTIONS

PART I: TRUE OR FALSE ITEMS

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

1. Data is an output of a computer system where as information is an input to the system.
2. Attributes data refer to descriptive information of physical and socio-economic objects and subjects that we try to map.
3. The vector data model represents features' shape accurately than the raster data model.
4. The analogue representation of geographical data is becoming increasingly important in the world today than the digital method.
5. Bar graph is used to show relationships between different data series that are independent of each other.

PART II: MATCHING ITEMS

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

Column "A"	Column "B"
6. An area feature described by a closed string of spatial coordinate	A. Hardware
7. Provides the functions and tools users need to store, analyze and display geographical information	B. Methods
8. Observations collected and stored as numbers, characters and images	C. Data
9. A well-designed plans and procedure	D. People
10. Objects that can be seen and counted	E. Observation
11. A tool used to change images on an analogue form or on a paper into a digital form	F. Attributes
12. System managers and developers of the plan	G. Information
13. Tools that help us in data collection and run functions of GIS	H. Software
14. A processed, manipulated and organized data.	I. Polygon
15. Basic characteristics of an area of our interest	J. Digitizer

PART III: PROJECT WORK

16. Collect the sex and age data of students in your class and work on the following.

a) Draw a pie chart showing the sex distribution of students in your class