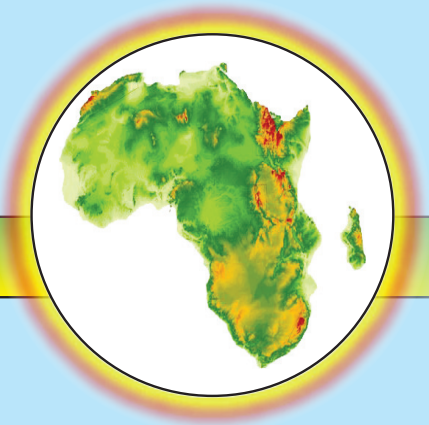







Unit 3



AN OVERVIEW OF PHYSICAL GEOGRAPHY OF AFRICA

Unit Outcomes

After completing this unit, you will be able to:

-  understand the locational and geological aspects of Africa;
-  recognize the climatic characteristics of Africa;
-  know and appreciate the characteristics of the drainage patterns and other water resources of Africa;
-  appreciate the wildlife resources of Africa; and
-  distinguish the soil resources of Africa.

Main Contents

- 3.1 POSITION, SIZE AND SHAPE OF AFRICA
- 3.2 GEOLOGICAL HISTORY AND RELIEF STRUCTURE OF AFRICA
- 3.3 CLIMATE OF AFRICA
- 3.4 DRAINAGE IN AFRICA
- 3.5 NATURAL VEGETATION AND WILD ANIMALS OF AFRICA
- 3.6 SOILS OF AFRICA
 - ⇒ *Unit Summary*
 - ⇒ *Review exercise*








INTRODUCTION

In the previous unit, you have learned about map reading and interpretation. There, issues related to relief representation on contour maps, representation of drainage on maps, human-made features on maps and the geographic information system were discussed.

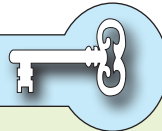
In this unit, you are going to learn about Africa. The unit will give you an overview of the location, size and shape of the continent and its regional divisions, its geological history and relief structure, and the continent's climate and related issues. In addition, the drainage of Africa and its wildlife resources will be discussed. Also, the soil resources of the continent will be emphasized.









3.1 POSITION, SIZE AND SHAPE OF AFRICA

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

-  demonstrate the relative and absolute location of Africa using world map;
-  compare the size of Africa with other continents;
-  discuss the impacts of the coastal and continental shape of Africa on its development;
-  describe the regional division of Africa;
-  show the geographical location of each region;
-  relate the sub regions in terms of size, access to the sea and major relief structure; and
-  analyze the socio-economic and geo-political similarities of each region.

Key Terms



- | | |
|---|---|
|  Absolute location |  Area size |
|  Relative location |  Shape |
|  Latitude |  Region |
|  Longitude |  Epeirogenesis |

3.1.1 Position of Africa

Brainstorming



- 1 What is location? How is it described?
- 2 Where is Africa located?
- 3 Can you state the relative and absolute locations of Africa?

Africa's location can be expressed in two ways, namely, absolutely and relatively.

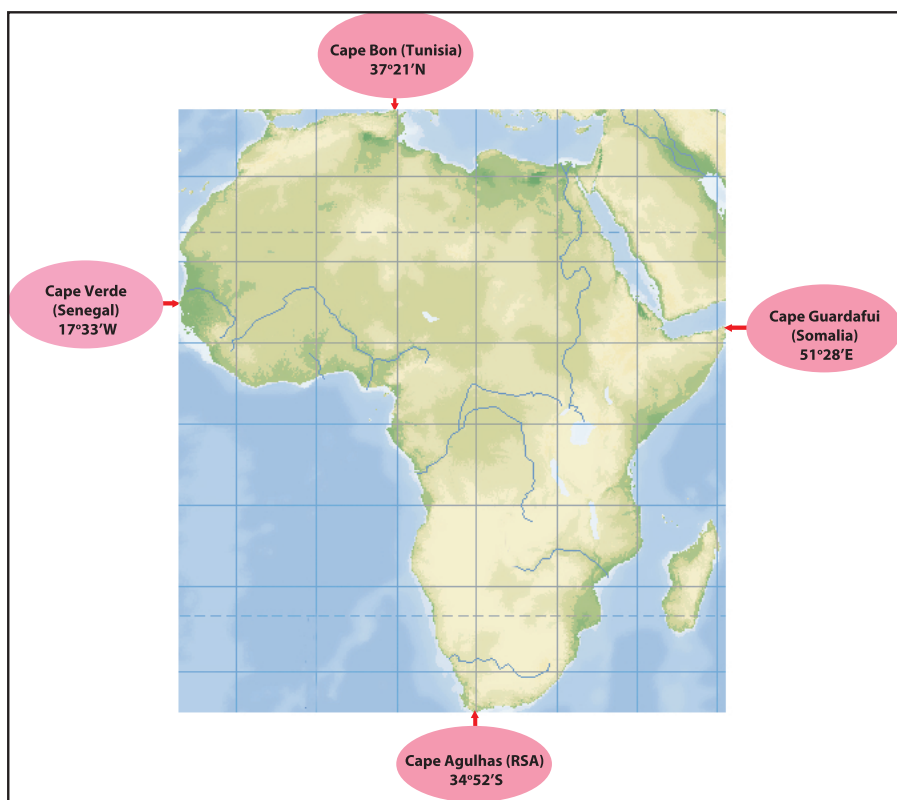


Figure 3.1: Africa's Astronomical Location

As you can see from **Figure 3.1**, Africa lies between $37^{\circ}21'N$ and $34^{\circ}52'S$ latitudes and between $17^{\circ}33'W$ and $51^{\circ}28'E$ longitudes. This means that the continent extends for about 37° to the north of the equator and 35° south of it. Similarly, Africa extends for about 17° west and 51° east of the Greenwich Meridian. From this absolute location, we can understand that the continent stretches in all the four hemispheres.

The four extreme points of the continent, which mark the extreme points of Africa are the following.

- ⇒ *Extreme North - Cape Bon (Tunisia) - 37°21'N*
- ⇒ *Extreme South - Cape Agulhas (Republic of South Africa (RSA)) - 34°52'S*
- ⇒ *Extreme East - Cape Guardafui (Somalia) - 51°28'E*
- ⇒ *Extreme West - Cape Verde (Senegal) - 17°33'W*

Activity 3.1



In a small group, study Figure 3.1 and answer the following questions.

- 1 What unique features do you observe about Africa's absolute location?
- 2 What impacts has Africa's absolute location on its climate, natural vegetation, fauna, agriculture, and human settlements?

From the map that shows the absolute location of Africa, we can learn that:

- ⇒ *when we measure Africa's greatest north-south and east-west extents, we find that they are almost equal:*
 - ∞ *north-south – approximately 8000 kilometers*
 - ∞ *east-west – approximately 7,600 kilometers*
- ⇒ *the equator crosses Africa almost at its north-south center. The north-south extents above and below it are almost equal, although the northern area is greater than the southern one. The land area north of the equator is about twice that of the south.*
- ⇒ *Africa is the only continent crossed by all of the following: the Tropic of Cancer and Tropic of Capricorn, the Equator and the Prime Meridian.*
- ⇒ *almost ¾ of the continent's total area is found within the tropics, and therefore much of the continent experiences tropical climates.*

When Africa's position is expressed in relation to the major landmasses and water bodies that are close to it, it can be described as follows. Africa is found to the:

- ⇒ *South of Europe*
- ⇒ *Southwest of Asia*
- ⇒ *South of the Mediterranean Sea*
- ⇒ *West of the Indian Ocean*
- ⇒ *East of the Atlantic Ocean*
- ⇒ *North of the Southern Ocean*



Figure 3.2: Africa's Relative Position in the world

Activity 3.2



- 1 By referring to Figure 3.2, describe the relative location of Africa in relation to the features mentioned above.
- 2 Where is Africa closest to:
 - a Europe?
 - b Asia?

As the map shows, Africa gets closest to Europe across the **Strait of Gibraltar**, which is about 22 kms wide between Morocco and Spain. With relation to Asia, the continent comes closest across the **Strait of Bab-el Mandab**, which is about 40 kms wide. A narrow stretch of land called the **Isthmus of Suez**, which is cut into two by an artificial canal called the **Suez Canal**, connects Africa with Asia.

Activity 3.3



Refer to the above Figure 3.2 and using an atlas perform the following activities.

- 1 Locate the Strait of Gibraltar, the Strait of Bab-el Mandab and the Isthmus of Suez.
- 2 Find the four extreme points of Africa.

The relative position that Africa has, in relation to the rest of the world, gives the continent many advantages. The following are the most important ones.

- ⇒ *The continent occupies a central location in the world. This makes the continent close to the rest of the world, providing it geographical accessibility.*
- ⇒ *The geographical proximity that the continent has with Europe and Asia has resulted in socio-cultural contacts. This has encouraged socio-economic and cultural exchange and integration among the three continents.*

3.1.2 Size of Africa

Brainstorming



- 1 How large is Africa's land area?
- 2 What percentage of the world's landmass is Africa's?

Africa is the second largest continent in the world, following Asia. The continent's total area is about 30,335,000 km². This constitutes 20.2% of the earth's total land surface. With this area, the continent is about two-thirds of the size of Asia and 3.36 times larger than Europe. **Table 3.1** indicates the sizes of the world's continents.

Table 3.1: Area of the Continents

Continent	Area (000' km ²)	% of World Area
Africa	30,335	20.2
Asia	45,000	30.0
Europe	10,000	6.67
Australia and Oceania	8,700	5.8
N. America	24,200	16.14
South America	17,000	11.34
Antarctica	14,000	9.3
World total	149,900	100

Africa's large area gives the continent several advantages, including the following:

- ⇒ *A large area of land that can be used for settlements, agriculture, and other economic activities.*
- ⇒ *Huge resource potentials in terms of resources like soil, water, minerals, flora and fauna and the like, which are vital for its development.*

However, Africa's large size also has disadvantages. For example, it makes geographical connectivity difficult among the people of the region and of the world. As a result, there are problems related to integration among peoples of the continent and others outside, making both integrated development and international trade a challenge.

3.1.3 Shape of Africa

What is shape? What is its significance?

How do you describe Africa's shape?

Shape is defined as the geographical form of an area. In other words, it is the external geographical appearance of a place. It has great impact on the socio-economic integration and flow of goods and services within each region.

The *shapes* of places can be described in different ways for example, as moderately compact, elongated, fragmented, perforated, and the like. A *moderately compact shape* is close to that of a circle. An *elongated shape* is a shape with one side longer than the other. A place with a fragmented shape is made up of multiple disconnected areas. For example, some countries are composed of islands.

Africa has a relatively compact shape. This means that the continent's longest east-west and north-south distances are almost the same. The following evidence supports the above statement.

- ⇒ *The east-west and north-south extensions are almost equal, with a minor difference.*
- ⇒ *Africa has a fairly unbroken coastline. The continent's coastline does not have many indentations, inlets, bays or gulfs. This condition creates a relatively smooth coastline, compared to those of other continents, and therefore a relatively short one. For example, if we compare Africa and Europe, the coastline of the latter is, by far, longer than the former.*

- ⇒ *The unbroken coastline of Africa makes the continent poor in natural harbors.*
- ⇒ *Many places in Africa are not very far from the coast. Almost all places are at most located 1500 km from the coast. Therefore, many countries of the continent are not very far from the sea.*
- ⇒ *The unbroken coast line discourages external communication.*

3.1.4 Regional Division of Africa

The mainland of Africa has five major regions. They are defined in terms of socio-economic and cultural similarities. Each region consists of a number of countries with their own regional variations. The regions are

- ⇒ *Eastern Africa*
- ⇒ *Central Africa*
- ⇒ *Northern Africa*
- ⇒ *Southern Africa*
- ⇒ *Western Africa*

The geographical location of these regions and their political units are given in the following figures. A brief description of the socio-economic conditions of each region is also made below the figures.

Study them carefully and try to identify each region's relative location as well as the countries that constitute the region.

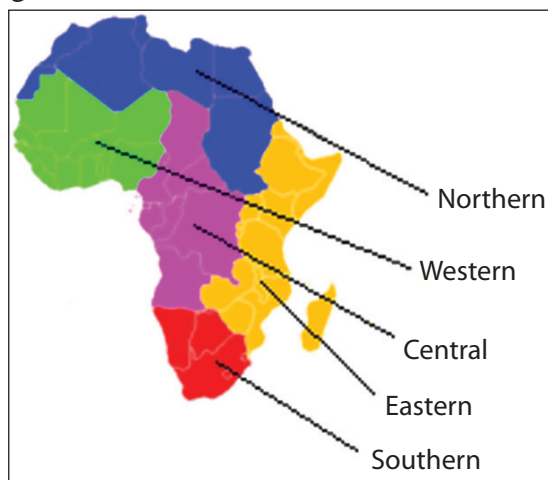


Figure 3.3: Regional division of Africa



Figure 3.4: Political Map of Africa

Table 3.2: The regions of Africa

Name of region	Area (km ²)	Population (2009)	Population Density (per km ²)	Number of Countries
Eastern Africa	6,384,904	316,053,651	49.5	18
Central Africa	6,613,253	121,585,754	18.4	9
Northern Africa	8,533,021	211,087,622	24.7	11
Southern Africa	2,693,418	56,406,762	20.9	5
Western Africa	6,144,013	296,186,492	48.2	17
Africa Total	30,368,609	1,001,320,281	33.0	61

N.B: The total number of countries and the total area given in the above table include the insular/island states of Africa and their area.

As shown in **Table 3.2**, Northern Africa is the largest in terms of its territorial size followed by Central and Eastern Africa. In terms of population size, Eastern Africa is the most populous followed by Western and Northern Africa. Likewise,

there are significant differences in the population densities of the various regions. Eastern Africa has the largest population density 49.5 people per km² followed by Western Africa. Central Africa has the continent's lowest population density, 18.4 people per km².

The following discussion provides you with a brief description of the Socio-economic conditions of the regions of Africa.

Eastern Africa

Eastern Africa is the region that is located between 18°N – 27°S latitudes and 22°E – 51°28'E longitudes. The region is the third largest in terms of its area accounting for about 21% of the continent's total area. A total of 18 countries, of which seven are landlocked, constitute the region. The physiographic of eastern Africa is characterized by diverse relief. Very high volcanic mountains, extensive plateaus, great rift valleys and low depressions dominate the region's topography. Such diversity in surface configuration has resulted in the presence of diverse climate that ranges from desert and semi-desert type to high altitude alpine climate. This, in turn, has helped the development of varied vegetation zones of tropical grasslands, forests, alpine vegetations and desert and semi-desert vegetations making the region rich in flora and fauna resources. Eastern Africa is drained by the Nile, Wabishebelle and Genale river basins. It is also the region where most of Africa's highland and rift valley lakes are found.

In terms of population, Eastern Africa is the most populous of all the regions accounting for about 31.3% of Africa's total population in 2009. Nearly 22% of the region's population is urban. Life expectancy averages 51 years. Agriculture is the most dominant economic activity in the region. Commercial cash crops such as coffee, tea, sisal, and sugar cane, are the most important agricultural products. Livestock resources are also important sources of income. The mining and industrial sectors are little developed in the region.

Northern Africa

Northern Africa is the largest region in terms of area. It covers nearly 1/3rd of the continent's total area. There are seven countries in the region, two of which namely Sudan and Algeria are among the largest states in Africa. All the states of this region have direct access to the sea. Northern Africa is characterized by desert climate. In addition, the Mediterranean type of climate also dominates the Maghreb region. The region's topography is dominated by mountains and plains.

The Atlas Mountains and the Sahara Basin and uplands are the most common features. Much of Northern Africa is covered by desert vegetation. However, Mediterranean vegetation is also found in areas where Mediterranean climate dominates.

In 2009, the population of northern Africa accounted for about 20.5% of Africa's total population. Nearly 50% of the region's population is urban and life expectancy averages 69 years. The Economy of northern Africa is dominated by agriculture, industry and mining.

Western Africa

The region of Western Africa is stretched between 4°N – 25°N latitudes and 17°33'W – 16°E longitudes. Accounting for about 20% of Africa's total area, a total of 17 countries constitute the region. Highlands and lowlands make up a good part of the relief of Western Africa. The Guinea highlands, the Fouta Djallon and Jos plateau form higher parts of the region. The Niger, Benue, Volta, Gambia and Senegal rivers drain the region. The climate of the region shows great variation, while the western coasts experience tropical humid climates with very high rainfall and temperature, the interior lowlands are characterized by low rainfall and high temperature. These climatic conditions have resulted in the presence of diverse vegetation that includes tropical forests, tropical woodlands and grasslands.

Western Africa is the second most populous region in the continent. In 2009 the region accounted for about 29.7% of the total population of Africa. Africa's most populous country, Nigeria, is found in this region. About 42% of the region's population lives in urban areas and life expectancy averages 51 years.

The economy of Western Africa is dominated by agriculture. Coffee, Cacao, Palm oil, rubber and ground nuts are among the most important agricultural cash crops produced in the region. Industrial development is limited to coastal areas. In some countries like Nigeria, Ghana and Guinea, mining is the most important economic activity.

Central Africa

Central Africa is located between 23°30'N – 15°30'S and 8°E – 32°E. Covering about 22% of Africa's total area and possessing 9 countries, Central Africa is the

second largest region in Africa. A good part of Central Africa, nearly 2/3rd of the region, is a vast depression that is drained by the Congo basin. Highland areas in the region include the Cameroon mountains and Ruwenzori Range.

Central Africa experiences almost all types of climates of the continent, except the Mediterranean type. Equatorial, tropical savanna, mountain (highland) and desert climates are among the most dominant ones. The diverse climatic conditions of the region make Central Africa rich in bio-diversity. Equatorial rainforests, Savanna woodland, Gallery (Riverine) vegetation, Desert and semi-desert vegetation are among the most common vegetation covers of the region.

Central Africa accounts for about 12.5% of the total population of Africa. The region is characterized by low population density due to its climatic conditions. 41% of the region's population is urban. The average life expectancy in Central Africa is about 51 years.

Agriculture, forestry, mining and manufacturing constituted a good part of Central Africa's economy. However, the dominant economic sector that supports the lives of the majority of the population in the region is subsistence agriculture. Central Africa has huge potential for commercial crop production. The region owns about 30% of Africa's tropical woods. The region also has large reserves of different types of minerals such as copper, zinc, aluminum, diamond, gold, and oil. A number of oil refineries and timber processing plants are found in the region. Angola, Gabon and Cameroon are the richest countries in petroleum resources in the region.

Southern Africa

The absolute location of Southern Africa is between 18°S – 34°52'S and 7°E – 32°E. The region is divided into five sovereign states. Accounting for about 8.9% of Africa's total area, Southern Africa is the smallest region in the continent. The topography of Southern Africa is dominated by high plateaus of over 300 m high. Among the highest areas in the region are the Drakensberg mountains. The region is drained by major river basins that include the Limpopo, Orange, and Vaal. There are also major inland basins in the region including the Ngami-Kalahari, Makarikari and Okovango basins.

The climate of Southern Africa is highly diverse. There are tropical, desert, alpine and Mediterranean climates. The Mozambique and Benguela currents produce

greater impact on the climate of the east and west coast of the region, respectively. As a result of the diverse climate, the region is endowed with different species of flora and fauna.

Accounting for about 5.8% of Africa's total population, Southern Africa is the least populous in the continent. Nearly 56% of the regions population resides in urban areas and the region's life expectancy averages 52 years.

Southern Africa has the most diverse economy in the continent. Agriculture, mining, manufacturing and tourism form the major occupation of the region's population. Agriculture in the region is highly mechanized and commercialized. The region is also rich in terms of mineral resources. Gold, diamond, and coal are among the most important ones. The region has most of the major mining and manufacturing industries in the continent.

Content Check







Fill in the blank spaces.

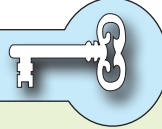
- 1 The exact location of a place that is expressed by using latitudes and longitudes is know as _____.
- 2 The two water bodies that are connected by the straight of Bab-el-Mandeb are _____ and _____.
- 3 Africa's shape can be described as _____.
- 4 The most populous region of Africa is _____
- 5 The Northern and Southern extreme points of Africa are _____ and _____, respectively.

3.2 GEOLOGICAL HISTORY AND RELIEF STRUCTURE OF AFRICA

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

-  reconstruct the geological history of Africa;
-  identify major relief structures of Africa on a map;
-  appreciate the unique relief features of Africa; and
-  compare the relief of Africa with other continents.

Key Terms



- | | | |
|-------------------------|--------------------|-----------------|
| ↪ Geological history | ↪ Denudation | ↪ Fluvial rains |
| ↪ Geological time scale | ↪ Peneplanation | ↪ Relief |
| ↪ Orogenesis | ↪ Basement complex | ↪ Rift valley |

3.2.1 Geological History of Africa

Brainstorming



- 1 What is geology?
- 2 What does geological history mean?
- 3 How do geologists study the earth's past?
- 4 Do you know the major geologic events that took place in Africa?
- 5 How did they affect the present surface structure of the continent?

The present relief structure of Africa is the result of long, complex and continuous processes that have taken place for several millennia.

In this lesson, we will consider the geological history of Africa. Throughout the 4.5 billion year history of the planet, several geologic processes acted on the planet and formed its relief. In this process, Africa underwent several major geological events and changes.

The continent of Africa was part of the old continent that we call *Pangea*. In the Jurassic period of the Mesozoic era, some 200 million years ago *Pangea* broke into two, forming **Laurasia** and **Gondwanaland**. Laurasia was the northern continent, and Gondwanaland was the southern. Africa was part of Gondwanaland. As time passed, each of these continents was further broken down, forming the seven present-day continents.

In this process of change, the planet experienced several geologic events that resulted in the formation of the world's present surface structure. In Africa, major geologic events and processes acted on the continent's surface and left their scars, forming the continent's diverse relief.

Now let us see the major events that took place in the African continent in each era.



Activity 3.4

In a small group, discuss to answer the following questions.

- 1 What were the major geologic events that took place in the Pre-Cambrian era in Africa?
- 2 What were the major geologic events that took place in the Paleozoic era in Africa?
- 3 Identify the major geologic processes that took place in the Mesozoic and Cenozoic eras in Africa.

Precambrian Era (4.5 billion - 600 million years before the present)

This era is the oldest and largest division of the geological time scale. It covers almost 5/6th of the geological history of the planet. Due to its remoteness in time and lack of fossil evidences, not much is known about this era. However, two processes are believed to have been dominant. These are *orogenesis* (a series of mountain-forming processes) and *metamorphism*.

For Africa, the following events are assumed to have been dominant in this era.

- ⇒ **Formation of the Basement Complex Rocks:** *the oldest rocks of the continent, which are called Precambrian or crystalline basement complex rocks, were formed during this era. These rocks cover nearly two-thirds of the continent. Precambrian rocks are rich in metallic mineral deposits, such as gold and copper.*
- ⇒ **Orogenesis:** *is a mountain-forming process. In this era, many mountains that make the face of the continent very rough and undulating, were formed.*

Focus



Orogenesis (mountain building): changes in the level of the earth's crust in which rocks are thrown up into folds or blocks to form ranges of mountains. In course of time, the mountains may be considerably denuded and may there after be depressed or elevated by Epeirogenesis.

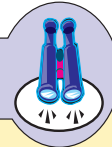
Paleozoic Era (600 - 250 million years before the present)

This is the second-longest and second-oldest era in geological history. This era witnessed no major rock formation processes. As a result, it is a gap, relative to

rock formation in Africa. However, several other important events took place during this era. The following are the most important ones.

- ⇒ **Series of denudation and peneplanation:** *during this era, internal and external forces acted on the face of Africa, resulting in denudation and peneplanation of its surface. Denudation is the lowering of the earth's surface, while sinking of land and its resultant peneplanation refers to the formation of almost level surfaces as a result of lowering in altitude.*
- ⇒ **Heavy erosion:** *the denudation and peneplanation processes were facilitated by the heavy erosion that affected many places in Africa. The eroded materials accumulated in the Maghreb region, the western Sahara, and the Southern Cape. From Eastern Africa, sediments were taken to Southern Africa and the Middle East. These sediments finally formed sandstones, shale and limestone. Also during this era, fold mountains that run parallel to the Great Karroo, the interior plateau, formed.*
- ⇒ *Formation of coal during the Carboniferous period.*

Focus



Carboniferous period: The coal Age: is that part of the Paleozoic Era when coal was extensively formed. Thick layers of partially decayed swamp vegetation, covering coastal lowlands were buried under marine deposits when the coastal lands sank. More swamps were formed when the water grew shallower and the process was repeated. As the deposits became compressed and hardened, the vegetation matter formed coal.

Mesozoic Era (250-70 million years before the present)

The Mesozoic era is the third-largest and third-oldest era in the geological history of the earth. For Africa, the era was a time of alternate sinking and rising of the land. The era is divided into three periods. These are the **Triassic**, **Jurassic** and **Cretaceous**. During the first period, the Triassic, there was sinking of the land in the eastern part of the continent. The land remained under the sea during the Jurassic period. Rising (uplifting) of the land began in the Cretaceous.

The following are the most important events that took place during the Mesozoic era in Africa.

- ⇒ *Sinking of the Horn of Africa resulted in the gradual transgression of the sea during the early years of the Triassic period;*

- ⇒ Formation of sedimentary rocks like those in eastern Africa, which were the results of the alternate sinking and rising of the land;
- ⇒ Uplifting of the land in the Horn of Africa, resulted in the regression of the sea during the Cretaceous period;
- ⇒ The flooding of the Sahara region, by water that advanced from **Tethys** (a sea that separated Laurasia from Gondwanaland), and the subsequent accumulation of sediments.

Cenozoic Era (70 million - present)

This era is the most recent and the shortest era in the geological history of the earth. It covers the time from 70 million years ago to the present. As a result, the era is sometimes called *the living era*. There are two periods in this era. These are the *Tertiary* and *Quaternary* periods. A number of geologic events that changed the face of the continent took place in this era. The major geologic events of this era are the following.

- ⇒ Formation of the Mediterranean Sea, the Great East African Rift Valley, the Red Sea and the Gulf of Aden.
- ⇒ Formation of many of the volcanic mountains, plateaus and young fold mountains (Atlas Folds) of Africa. The volcanic mountains that shape the landscape in eastern Africa were formed during this era.
- ⇒ Climatic change that resulted in the cooling and later warming of the earth's climate. The cooling of the climate resulted in the Pluvial (Fluvial) rains in tropical Africa, which caused heavy erosion in many parts of the continent. Later, warming of the climate resulted in heavy evaporation and drying up of many water surfaces. In some instances, such a change resulted in the formation of extensive salt plains like the one in northeastern Ethiopia (Afar).

NOTE

The Cenozoic Era is responsible for the formation of the present surface configuration of the African continent. The present shape, position and relief of Africa was formed during this era. The very high volcanic mountains, the extensive plateaus, the plains and drainage basins of Africa were all formed as a result of the series of geologic events of this era.



The various geological events and processes that took place in the four major eras of the geological time scale have affected the African landmass. The diverse landscapes that we see today in Africa are the results of these processes. **Table 3.3** gives a summary of the major geologic events that took place in Africa during the four eras and during their periods and epochs.

Table 3.3: Summary of the Geological History of Africa

Era	Period	Epoch	Geologic Events in Africa
Cenozoic	Quaternary	Recent	River terraces and raised beaches formed; glaciations in Eastern African mountains; down-warping of the Chad basin; heavy deposition in basins such as the Kalahari basin.
		Pleistocene	
	Tertiary	Pliocene	Mountain building (for example, the Atlas Mountains); intense volcanic eruption in East Africa.
		Miocene	
		Oligocene	East African Rift Valley developed; extensive lava flows in Ethiopia
Eocene			
Mesozoic	Cretaceous		Marine sediments deposited in many areas, e.g., southern Nigeria.
	Jurassic		Mountain ranges uplifted, e.g., Cape Mountains.
	Triassic		
Paleozoic	Permian		Central and Southern Africa in grip of ice age .
	Carboniferous		
	Devonian		
	Silurian		
	Ordovician		
	Cambrian		Ice age in parts of Northern Africa.
Pre-Cambrian			Mountain building; oldest rocks (4 billion years) in Southern Africa.

3.2.2 The Relief Structure of Africa

What is relief? How do you describe the relief of Africa?

Africa's relief is made up of huge mountains, extensive plateaus, deep valleys and gorges, plains, and the like. However, much of Africa is plateau. The continent's relief consists of 71% plateaus, 25% plains and 4% mountains. Africa is the only continent that is predominantly covered by plateau lands, and that has only a small proportion of plains.

The relief of Africa ranges from 5,895 m above sea level (at Mt. Kilimanjaro in Tanzania) to 132 m below sea level (at the Qattara Depression in Egypt). This makes the maximum relief of Africa to be 6027 m. The plateau nature of Africa can be seen in the [Table 3.4](#).

Table 3.4: Percentage distribution of major landforms of the earth, by continent

Continent	Landform Types (%)		
	Mountains and Hills	Plateaus	Plains
Africa	4	71	25
Asia	44	24	32
Europe	25	8	67
North America	24	24	52
South America	20	24	56
Oceania	28	24	48

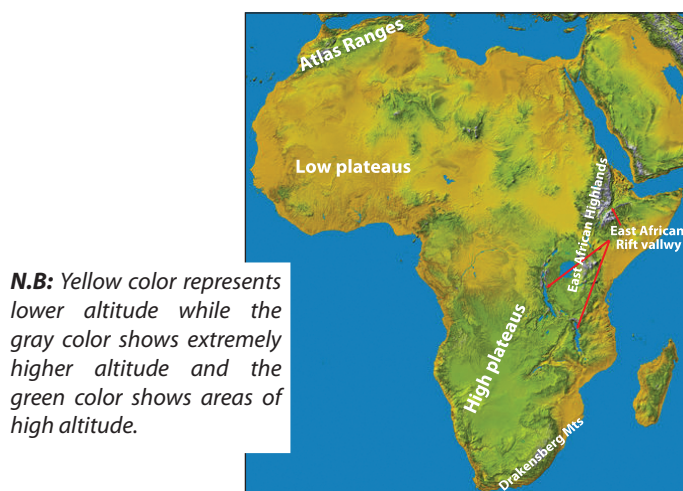
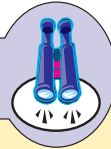


Figure 3.5: The Topography of Africa

As the [Table 3.4](#) indicates, much of Africa is composed of plateau landscape. In contrast to the rest of the continents of the world, Africa has the greatest part of

its relief as plateau. However, other features also dominate the continent. These are mountains, plains and the Rift Valley. Now, we shall discuss each of these relief features.

Focus



Maximum relief is the difference in altitude between the highest and lowest points of a place.

Plateaus

What is Plateau?

In most parts of Africa, areas above 300 m above sea level altitude are considered to be *plateaus*. Their altitude reaches its maximum in Eastern Africa, and the Ethiopian plateaus reach over 2000 m above sea level.

Africa's average altitude, 700 m, is a dividing line for plateau types. The continent's landmass can broadly be divided into two types of plateaus **high plateau** and **low plateau**.

High plateaus: are extensive plateaus that lie above 700 m, and their general elevation is above 2000 m. They are found in southern and eastern Africa. The East African plateau, the Bihe (Bie') plateau, the Southwest African highlands and the Malagasy highlands are included in this group. The Kalahari in the west and the Great Karoo in the south are the two major *basins* in this plateau.

Low Plateaus: lie between 300 and 700 m above sea level. The northern and western parts of Africa are predominantly areas of low plateau. As they are surrounded by high plateaus, they form inland basins, such as the Chad, Libyan and Sudd basins. The surrounding uplands of the low plateaus include the Fouta Djallon Mountains, the Jos plateau (Bouchi plateau), the Adamawa uplands, the Ahagar Mountains, the Tibesti and Red Sea hills.

Mountains

What is a Mountain? Where are most of the Mountains of Africa found?

A *mountain* is a high land with steep slopes and a peak. Africa's landform is dominated by two major types of mountains. These are volcanic and fold mountains.

Volcanic mountains: were formed as a result of the great volcanic activities that took place in the Tertiary period of the Cenozoic era. They constitute the highest points (peaks) of the continent, with many of them being above 4,000 m above sea level. Many of the volcanic mountains of the continent are concentrated in Eastern Africa. **Table 3.5** shows you the major volcanic mountains of the continent with their heights and locations.

Table 3.5: Volcanic Mountains of Africa

Mountain	Elevation (m)	Location
Killimanjaro	5895	Tanzania
Kenya	5200	Kenya
Ras Dejene/Dashen	4620	Ethiopia
Meru	4567	Tanzania
Elgon	4321	Uganda and Kenya border
Cameroon	4070	Cameroon

N.B. Mount Ruwenzori (5119 m) is among the highest mountains in Africa the formation of which was associated with tectonic movement.

Fold Mountains: are found in the northern and southern extremes of Africa. They are of two types: young and old. The *young fold mountains* are located in northwestern Africa, particularly in the Maghreb region, a region that covers areas in Morocco, Algeria and Tunisia. They are called the **Atlas Mountains**. These mountains are contemporary to the Alps of Europe and the Himalayas of Asia, and they were formed during the Alpine orogenesis during the Cenozoic era. Their general elevation declines from west to east. The *old fold mountains* are found in South Africa. They were formed during the Hercynian orogeny in the Mesozoic era. They are contemporary to the Australian Alps. They are called the **Cape Ranges**.

Focus



Fold mountains are formed as a result of compressional forces. When the earth's crust is compressed due to horizontally moving surface, the land between two places will be forced to bend up wards and forming fold mountains as a result.

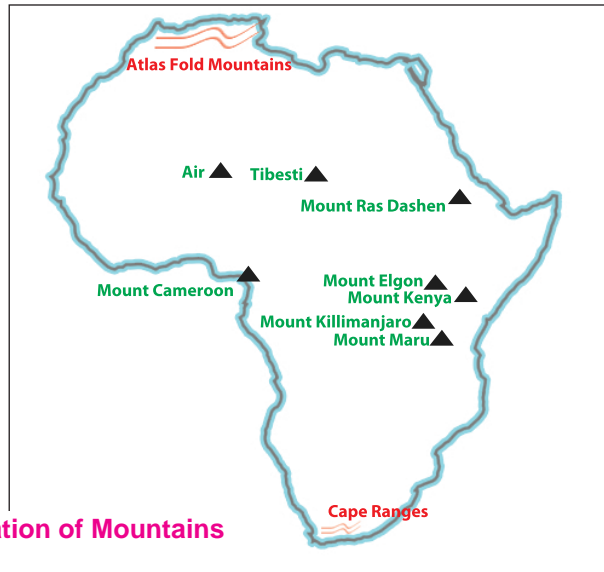


Figure 3.6: The Location of Mountains in Africa

Plains

Plains are areas of low relief with more or less flat surface configurations. In Africa, places that lie below 300 m above sea level are generally considered plains. Plains are confined to the coastal areas of eastern, northeastern, southeastern and western Africa. They are very narrow structures that account for about 25% of Africa's relief. They are very small in size, hot dry, poorly vegetated and sparsely inhabited. In addition, their shores, are smooth and regular, and therefore without large bays or gulfs. As a result, the continent lacks good natural harbors.

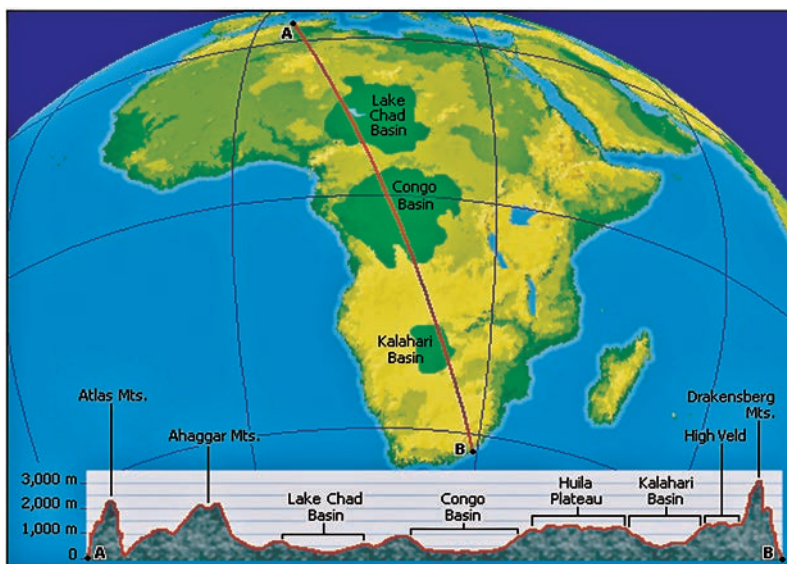


Figure 3.7: Cross-section of Africa

NOTE

The topography of Africa features a series of relatively flat plateaus and saucer-shaped basins, broken by highlands, mountain ranges, and valleys. Northern and western Africa, widely known as *Low Africa*, has much lower mean elevations than the south and east, that is often called *High Africa*. As a result, while the northern and western plateaus area are called *low plateau*, the eastern and southern parts are called *high plateau*.



The Great East African Rift Valley

What is a rift valley? How do you describe the Great East African Rift Valley?

The East African Rift Valley is part of the world's Great Rift Valley system, which stretches from Syria, in the Middle East, to Mozambique, in Southeastern Africa, over a distance of about 7,200 km. It was formed in the Tertiary period as a result of faulting processes that acted on the crust of the earth in the region. This rift system extends a distance of about 5600 km in Africa, touching 15 countries in the continent. The Rift Valley has four trenches (branches). These are:

- ⇒ *Ethio-Eritrea-Djibouti-Northern Somalia Branch*
- ⇒ *Western Branch*
- ⇒ *Eastern (Gregory) Branch*
- ⇒ *Malawi Rift Valley*

Ethio-Eritrea-Djibouti-Northern Somalia Branch

As the name itself implies, this branch runs through the four countries of the Horn of Africa. It is the northern most part of the African Rift Valley, extending north from Lake Turkana in Kenya. It branches out into three trenches at the Afar Triangle, forming the Red Sea and the Gulf of Aden. It has many lakes, including Ethiopian Rift Valley lakes like Lakes Hawassa, Langano, Shalla, Abijata, and Ziway.

Western Branch

This part of the Rift Valley runs from Uganda in the north, southwards through the Democratic Republic of the Congo, Rwanda and Burundi to Tanzania. This part of the Rift Valley hosts the continent's highest block (horst) mountain, Mount Ruwenzori, and also lakes such as Lake Edward, Kivu and Tanganyika.

Eastern (Gregory) Branch

It runs from Lake Turkana in northern Kenya, crossing Tanzania to the east of Lake Victoria. Lakes such as Turkana, Naivasha, Norton, Manyari and Eyasi are located in it.

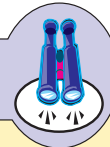
Malawi Rift Valley

This part of the Rift Valley exists where the Western and Eastern Branches converge. It runs through Tanzania and Mozambique, and ends at port Biera of Mozambique. Lakes Malawi, Rukuwa and Chilwa are among the major lakes in this part of the system.



Figure 3.8: The East African Rift Valley

Focus



The Great Rift Valley is a geologic depression that extends from Syria in southwestern Asia to Mozambique in southeastern Africa. It takes the form of a series of valleys and bodies of water that are bounded by parallel fault lines. The Great Rift Valley is widening, slowly but surely, and in the process is causing many volcanic eruptions and earthquakes in the area.

Africa's largest lake, Lake Victoria (83,000 km²) is found trapped between the western and eastern trenches of the Rift Valley.

The following are the major characteristics of the East African Rift Valley:

- ⇒ *It is bounded by steep escarpments (edges);*
- ⇒ *It has numerous active and dormant volcanoes;*
- ⇒ *It is often affected by earth tremors like earthquakes, volcanism and landslides, making the Rift Valley very unstable;*
- ⇒ *Has a hot and dry climate in its many parts, making the place difficult for human habitation;*
- ⇒ *Many structural basins (lakes) occupy the floor of the Rift Valley.*

Activity 3.5



In a small group, discuss the major characteristics that distinguish the East African Rift Valley region from the rest of Africa.

Content Check












Give short and precise answers for the following questions

- 1 What is the geologic time scale?
- 2 Write five geologic events that took place in the Cenozoic era in Africa.
- 3 Where do we have the high plateaus of Africa?
- 4 Which areas of Africa are dominated by fold mountains?
- 5 Describe the great East African Rift Valley.

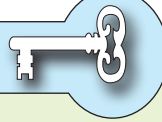
3.3 CLIMATE OF AFRICA









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

-  review the elements of weather and climate;
-  identify the major climatic controls of Africa;
-  describe the seasonal temperature conditions of Africa;
-  explain the seasonal distribution of rainfall in Africa;
-  locate the climatic regions of Africa;

-  compare and contrast the different climatic regions of Africa;
-  relate climatic data with the different climatic regions of Africa;
-  explain the causes and consequences of drought in Africa; and
-  locate drought-prone areas of Africa.

Key Terms



- | | |
|---|---|
|  Weather |  Elements of climate |
|  Climate |  Drought |
|  Climatic region |  Famine |
|  Controls of climate |  Sahel |

Activity 3.6



Discuss the following questions.

- 1 What do we mean by climate?
- 2 What constitutes the climate of a certain place?
- 3 Why do different places have different climates?
- 4 How do you describe the climate of Africa?

3.3.1 Controls of Weather and Climate in Africa

Brainstorming



- 1 Do all places in Africa have the same climatic conditions? Why or why not?
- 2 What are the factors that affect the nature of the atmosphere in a certain place?
- 3 Which of these factors, do you think, are the most important ones in Africa? Why?

Africa has varied climatic conditions. *Why are there varied climates in Africa?* The answer is that the variation in the climatic conditions of the different places in Africa is due to the intervention of weather and climate controls. The most

important factors that are responsible for this variation include latitude, altitude, distance from the sea, mountain barriers, ocean currents and major planetary winds and pressure belts. These factors are called climate controls because they regulate the conditions of the elements to produce different weather and climatic conditions. They are discussed below in detail.

Latitude

What is latitude? How does it affect the climate of Africa?

Latitudes indicate the distance places have from the equator. A place's latitudinal location affects the amount of incoming solar radiation the place receives, and thereby its temperature. As we discussed earlier, much of Africa (nearly 2/3rd) lies within the tropical latitudes. Hence, the continent receives high sun angles throughout the year. Due to its latitudes, Africa is the hottest of all the continents.

Altitude

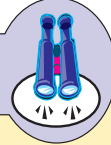
What is altitude? How does it affect the conditions of temperature and rainfall in Africa?

Much of Africa is plateau. There are also high mountains in many parts of the continent, especially in Eastern Africa. These plateaus and mountains have great impacts on the continent's climate.

The plateaus and high mountains reduce maritime influence. This condition reduces temperature. For instance, Eastern Africa, despite its closeness to the equator, experiences highland climates. Similarly, the Atlas Mountains of North Africa and the Cape Ranges of South Africa experience the coldest temperatures in the continent. There are several reasons for this. One of the reasons that temperature is low in higher altitudes is that the air is very thin. This reduces the temperature-retention capacity of the air. The other reason is that, when air rises, it cools.

The third factor is the fact that the atmosphere is heated from below (by the earth) directly, not by the sun. These are some of the factors why we feel colder at mountain tops than in valley bottoms.

Focus



In Africa, the impact of altitude on climate is highly pronounced in the areas of the Atlas mountains, the Cape Range-Fold Mountains, and the extensive East African Highlands.

Distance from the Sea

How do you describe the impacts of the Sea on the climate of Africa?

Water bodies that are adjacent to land masses have great impacts on the temperature and rainfall conditions of those places. Africa in its northern part is very wide. This makes much of the area far from the sea. In addition, the extensive plateaus of Africa, which almost reach the coast with steep edges, form barriers greatly reducing the influence of the sea. Furthermore, the continent's relatively straight and smooth coastline also reduces the impact of the sea in the interior areas. As a result, many parts of interior Africa experience continental climates with insignificant maritime influence.

Ocean Currents

What is Ocean Current? Which ocean currents affect the climate of Africa?

Oceanic water moves in two dimensions, vertically and horizontally. The horizontal movement of oceanic water is called *ocean current*. Based on their origin, ocean currents are of two types. These are **warm** and **cold**. *Warm ocean currents* have high temperatures and high moisture content, and therefore they have warming effect. They also tend to bring moisture to the coastal areas.

In contrast, *cold ocean currents* have cool temperatures and low moisture content. Therefore, they have cooling effects on the areas that they blow over. They also bring no rain to adjacent areas, making places over which they blow very dry and desert.

Three major ocean currents affect the African continent. These are the **Canary Cold Current**, the **Benguela Cold Current** and the **Mozambique Warm Current**. The first two make the northwestern and southwestern parts of Africa both cool and dry. On the other hand, the Mozambique warm ocean current makes Southeastern Africa warm and wet.

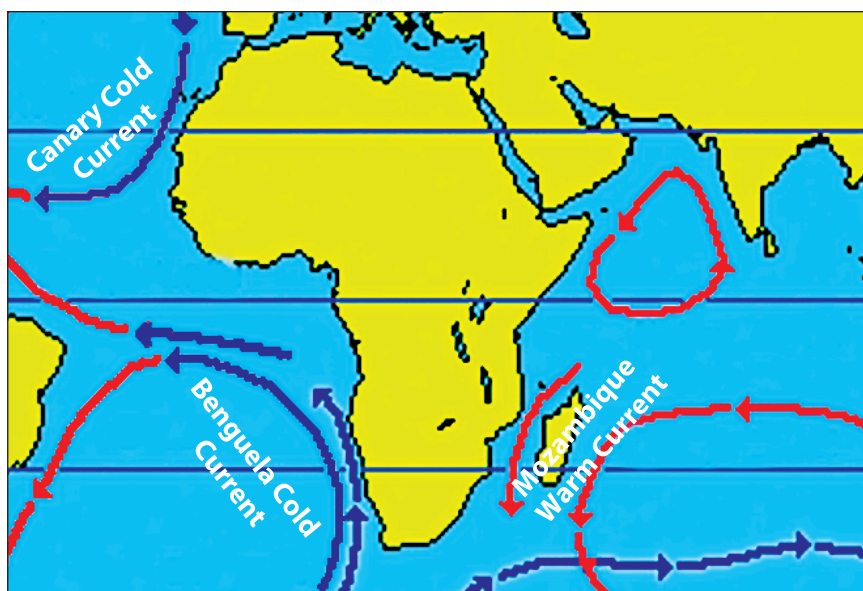


Figure 3.9: The major ocean currents affecting the climate of Africa

Major Planetary Winds and Atmospheric Pressure

What is wind? What about atmospheric pressure?

What are the major winds and pressure systems that affect Africa?

Most of Africa lies within the tropics. Hence, much of it lies within the trade-wind belts. The **southeast trades** and **northeast trades** dominate the climate of tropical Africa. The westerly winds from the subpolar high-pressure belts of the world reach the southern and northern tips of the continent. The Guinea monsoon winds (equatorial westerlies) also have significant impacts on the climate of equatorial Africa.

Of the global pressure belts, the subtropical highs (around 30°N and S) and equatorial lows (doldrums) (between 5°N and 5°S latitudes) are the main pressure belts that affect the climate of the continent. In addition, the Inter Tropical Convergence Zone (ITCZ), which is the zone of convergence between the trade winds, regulates the winds that blow into Africa at different seasons. The ITCZ moves between the tropics of Cancer and Capricorn, following the overhead sun, pulling winds towards it. Hence, it controls the distribution of rainfall in Africa.



Figure 3.10: Major winds that affect the climate of Africa

Activity 3.7



- 1 In a small group, discuss the following questions.
 - a How do the ocean currents that blow over the coastal areas of Africa affect its climate?
 - b Identify the global winds that blow over Africa and explain how they influence the continent's climate.
 - c What is the ITCZ? How does it influence the climate of Africa.
 - d How does altitude control the temperature and rainfall conditions of Africa in general, and of Eastern Africa in particular.
- 2 Answer the following questions.
 - a How does altitude affect the climate of Africa?
 - b What are the major ocean currents that affect the climate of Africa?
 - c What are the major planetary winds that affect the distribution of rainfall in Africa?
 - d Account for the impact of distance from the sea on the climate of Africa.

3.3.2 Temperature Conditions in Africa

Brainstorming



- 1 How is the spatial and seasonal distribution of temperature in Africa?
- 2 Which areas in Africa are the hottest? What about the coldest ones?
- 3 Why does such a variation in temperature occur?

Spatially, lowlands (coastal areas) and the desert and semi desert areas of Africa experience the highest temperatures in the continent. The Sahara, the largest desert in the world, has the highest temperature. The Kalahari Desert in the south has relatively cooler temperatures as a result of the cold Benguela ocean current. The Ethiopian and East African highlands, on the other hand, have lower temperature condition as a result of their high altitude. The **Atlas of Morocco** and **Cape Ranges** of south Africa have the lowest temperature in the continent as a result of their high altitudinal and latitudinal location.

The distribution of temperature in Africa also has seasonal variation. Such variation is the result of the apparent movement of the overhead sun between the two tropics. The months of December, January and February constitute the summer season in the southern hemisphere. During this time, the sun is overhead, south of the equator. As a result, areas of high temperature are found in Southern Africa. The Northern and northeastern parts of the continent remain relatively cool and dry at this time.

Similarly, the summer season in the northern hemisphere corresponds with the months of June, July and August. This season is a season of high sun angle in Africa north of the equator. Hence, the Sahara and other parts of Northern Africa experience high temperature conditions. In contrast, the areas south of the equator are characterized by lower temperatures at this time.

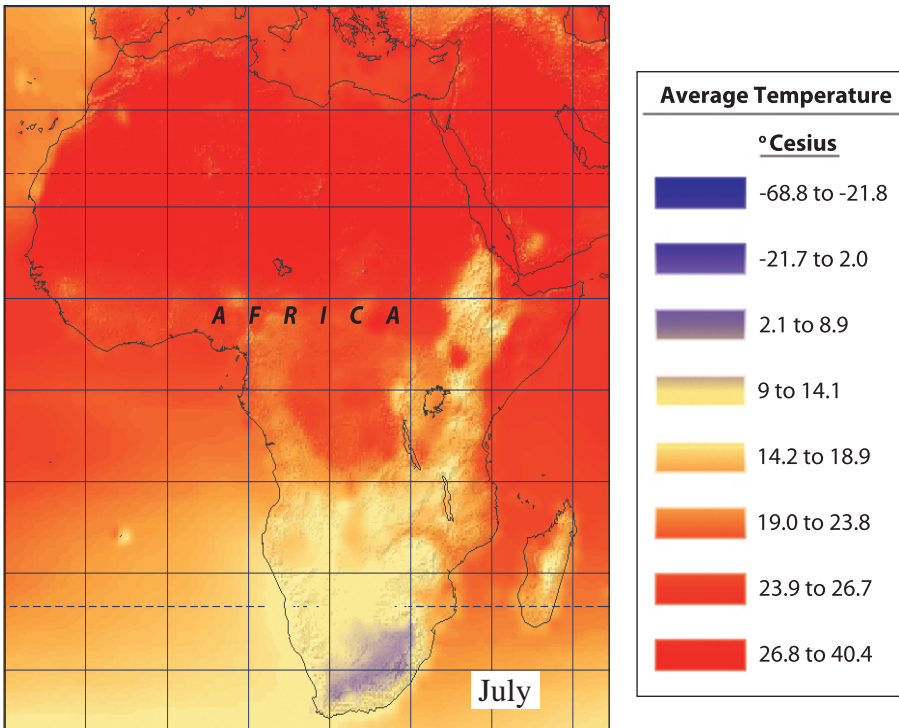
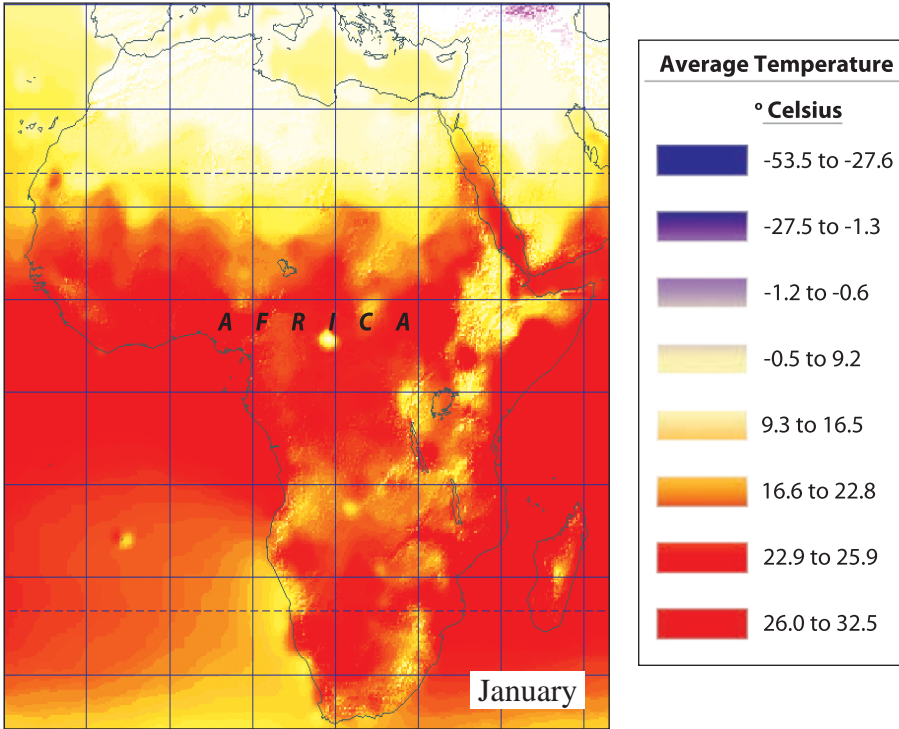


Figure 3.11: The Seasonal Distribution of Temperature in Africa (the red color Indicates Areas of High Temperature)

3.3.3 Rainfall Distribution in Africa

The distribution of precipitation (rainfall) in Africa is controlled by the Inter Tropical Convergence Zone (ITCZ). The position of ITCZ is, in turn, determined by the position of the overhead sun. For instance, in July the overhead sun is located near the Tropic of Cancer. Hence, winds that carry moisture from the Atlantic and Indian Oceans, the Guinea monsoon (equatorial westerly) and the southeast trade winds, invade parts of Africa north of the equator, causing the region to receive high rainfall. In this season, West African coastal areas, the Ethiopian highlands, and eastern Madagascar get their heavy rainfall.

In January, the sun is overhead near the Tropic of Capricorn, pulling the northeast trade winds southward over Africa. These winds are continental in origin, carrying limited or no moisture. In this season, therefore, Northern Africa remains dry, except for the Maghreb region, where the Mediterranean type of climate dominates. Southern Africa, however, gets its maximum rainfall from the southeast trades of the Indian Ocean. The Congo Basin gets rainfall from the moist winds of the Atlantic Ocean. To better understand the points so far discussed, study the following points.

- ⇒ *The Guinea monsoon (equatorial westerly) winds from the Atlantic Ocean bring rainfall to the north of Africa up to the southern fringes of the Sahara in July;*
- ⇒ *Moist winds from the Atlantic Ocean and the southeast monsoon winds from the Indian Ocean bring rainfall to Southern Africa in January;*
- ⇒ *The westerly winds bring rainfall to the Maghreb region of North Africa and the Cape Province of South Africa in their respective winter seasons. Summer is not the wettest season in these places;*
- ⇒ *Summer is a season of heavy rainfall in all parts of Africa, except in the Sahara desert and the Mediterranean-climate regions;*
- ⇒ *Winter is dry in all parts of Africa, except for the equatorial and Mediterranean climate regions.*

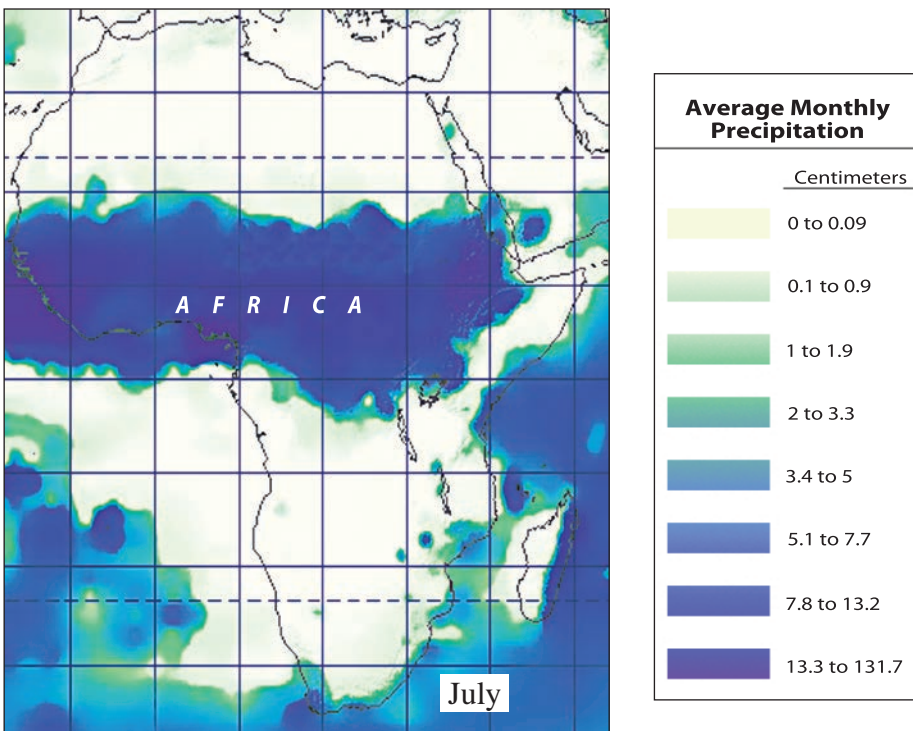
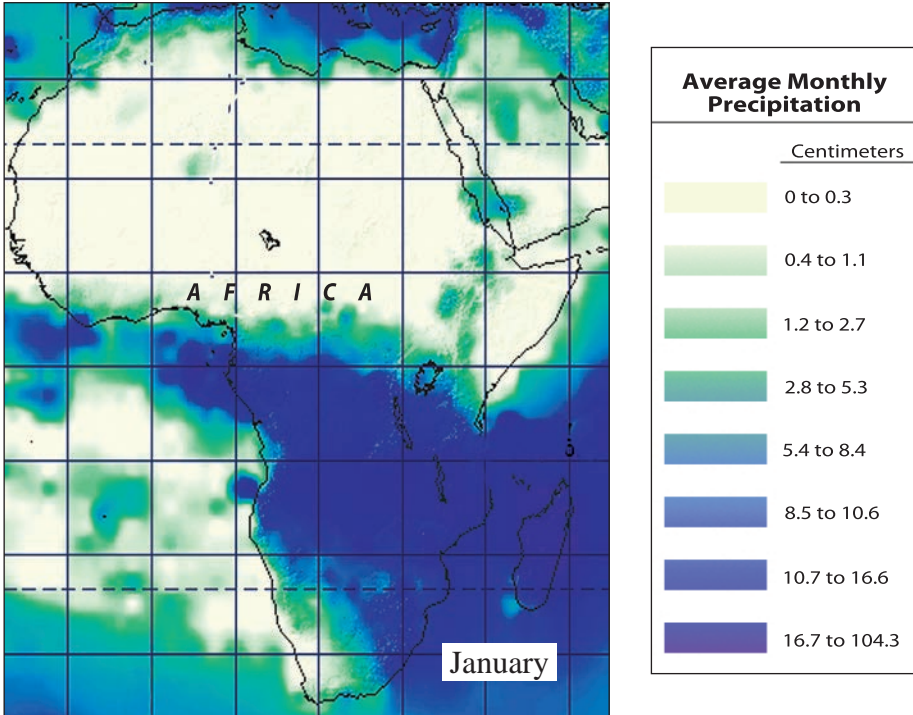


Figure 3.12: Seasonal distribution of rainfall in Africa

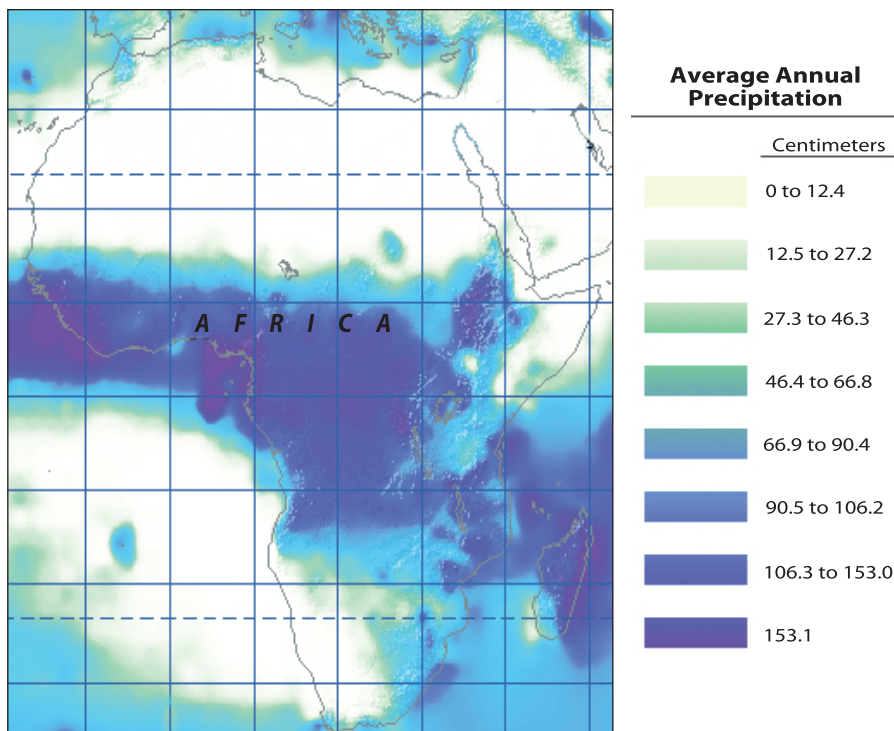


Figure 3.13: Annual precipitation

Activity 3.8



By studying the preceding precipitation maps of Africa, answer the following questions.

- Which areas of Africa get maximum rainfall in the months of January, and which in July?
- Relate the annual precipitation map of Africa with the political map of the continent, and identify the countries that receive the highest annual rainfall in Africa.
- Describe the distribution of temperature in the month of July in Africa.
- Account for the spatial distribution of temperature in the African continent.
- What are the dominant rainfall types in Africa?
- Discuss the distribution of rainfall in the month of December in Africa.
- What are the major winds that bring summer rainfall to most African countries?

3.3.4 Climatic Regions of Africa

Brainstorming



- 1 Do you think that all places in Africa have similar climatic conditions? Why or why not?
- 2 What are the different climatic regions of Africa?
- 3 Which of these climates is/are dominant in your area? Ethiopia?
- 4 Can you list the major characteristics that distinguish each climatic region?

The distribution of temperature and rainfall show great spatial and seasonal variations in Africa. As a result, many different climatic regions are established by these variations. A climatic region is a geographical area with more or less similar climatic characteristics mainly of temperature and rainfall. Multiple areas can be characterized by a single climatic region,

There are seven main climatic regions in Africa. These are:

- ➔ Equatorial
- ➔ Tropical continental (savanna)
- ➔ Tropical desert and semi-desert
- ➔ Tropical maritime (monsoon)
- ➔ Warm temperate continental
- ➔ Highland (mountain)
- ➔ Mediterranean

The following map shows the locations of the major climatic regions of Africa. Study it carefully and try to identify the geographical locations of each region.

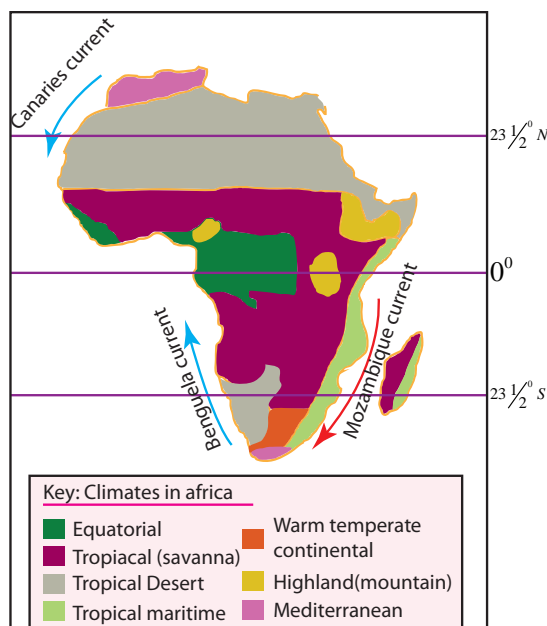


Figure 3.14: Climate Regions in Africa

Figure 3.14 shows the geographical locations of the various climatic regions in Africa. Now let us discuss the major characteristics and distinguishing features of each climatic region.

The Equatorial Climate

Which part of Africa has equatorial type of climate? What climatic characteristics does this type of climate have?

The parts of Africa that are found around the equator have this type of climate. The region surrounds the equator extending between 6° or 7°N and S latitudes. This climatic region is dominant in Western and Central Africa. The region has a high mean annual and mean monthly temperature due to the high angle of the sun. Temperatures remain high throughout the year, averaging more than 27°C annually, and rarely falling below 21°C. Most of the time, the annual range of temperature of this region is between 1°C to 3°C.

This climatic region is particularly known for its wetness. Rainfall is high, normally exceeding 1,500 mm per year, and it reaches 3,200 mm in some places. The region receives extremely high amount of total annual precipitation throughout the year. In this region, the convective type of rainfall is dominant.

The region is characterized by:

- ⇒ High sun angle throughout the year;
- ⇒ High mean monthly and mean annual temperatures;
- ⇒ High daily and low annual range of temperature; and
- ⇒ High total annual rainfall, with rain falling throughout the year.

Tropical Continental (Savanna) Climate

Where in Africa do we have the savanna climate? What climatic features characterize this type of climate?

This climatic region is found between 5° and 15° north and south latitudes. It occurs north and south of the tropical wet zone, in many parts of Western Africa and Southern Africa and in most of Madagascar. The region is situated between the wettest and driest climate zones of the continent. As a result, it is said to be the *zone of transition* between the equatorial and the desert climatic regions of Africa. In this region, summer is very hot, with an average temperature of 25°C, and winter is cool, with an average temperature of slightly above 15°C.

The region is characterized by:

- ⇒ a well-defined dry season of three to eight months, with annual rainfall ranging between 500 and 1,500 mm;
- ⇒ a progressive decline in total annual rainfall, north and south wards;
- ⇒ that part of the savanna which borders the equatorial rainfall region receives high rainfall, with that amount decreasing as distance from the equator increases.
- ⇒ slightly higher ranges of temperature than the equatorial climatic zone, with the range increasing with distance from the equator; and
- ⇒ high daily temperatures averaging more than 30°C in its northern section throughout the year, with relatively lower temperatures in its Southern and eastern sections, due to higher altitudes.

The Tropical Desert and Semi-desert Climate

What characterizes the desert and semi-desert climatic regions? Where in Africa are these types of climate found?

This type of climate is found bordering the tropical savanna climatic region, especially in north central and Southern Africa. There are two types of deserts in Africa. These are the *coastal* and *continental* deserts. The coastal type includes deserts that are found along the western coast of the continent, like the Namib and western Sahara.

In contrast, the Sahara, which constitutes Africa's continental type of desert, is located north of the equator.

The following characteristics distinguish the tropical-desert and semi-desert climatic region from the others.

- ⇒ *A short rainy season of up to three months. There are about 250 to 500 mm of rain per year in the semi-desert areas and less than 250 mm in the desert regions;*
- ⇒ *Variable, unreliable and insufficient precipitation, which hinders plant growth;*
- ⇒ *High daily average temperature, which ranges between 25°C and 36°C;*
- ⇒ *Significant annual temperature variations and also extreme fluctuations in temperature over the course of a day. For instance, in the Sahara desert, daytime summer temperatures exceed 50°C, but winter night temperatures drop below freezing.*

Tropical Maritime (Monsoon) Climate

Where is the location of monsoon climates in Africa? What features characterize it?

The tropical monsoon climatic region is found only in the southern hemisphere, dominating areas that are located on the southeast coast of Africa. The region extends roughly between Durban in South Africa and Dar-es-Salaam in Tanzania. The region's characteristics are similar to those of the tropical climates, with heavy rainfall almost throughout the year. This characteristic is the result of the warm Mozambique Ocean Current, which brings warm and moisture. Summer is the wettest season of the region. Temperature is high throughout the year, with summer being the hottest season, and winter being warm. Temperature ranges are greater than in the equatorial areas, though they are not as high as in the tropical continental climates.

The region is characterized by the following conditions.

- ⇒ *The impact of the warm Mozambique ocean current on temperature and rainfall conditions;*
- ⇒ *High total annual rainfall throughout most of the year, due to the wetting effect of the warm Mozambique current;*
- ⇒ *High temperature throughout the year, due to the warming effect of the warm Mozambique current; and*

- ⇒ *Low annual range of temperature, which is similar to, but relatively higher than, that of the equatorial climatic regions.*

Warm Temperate Continental Climate

Which parts of Africa are having this type of climate? What climatic characteristics does it have?

This climatic region is confined to the southern part of Africa, especially to the high veld (temperate grasslands) of the Republic of South Africa. The region is the smallest of all the climatic zones in the continent. Higher rainfall and cooler temperature conditions characterize it. The region's climate is influenced by the high altitude of the area. Rainfall is controlled mainly by the onshore winds that blow from the Indian Ocean.

This climatic region has the following distinguishing features.

- ⇒ *Great influence of the high altitude of the region on its temperature and rainfall conditions; and*
- ⇒ *Great influence of onshore winds that originate from the Indian Ocean.*

Highland (Mountain) Climate

Which parts of Africa have mountain climate? What makes this climatic region different from others?

The *highland climate* type is predominantly found in areas where altitude is relatively high. It is dominant in the equatorial and tropical highlands and plateau regions of the continent. For example, the Ethiopian and East African highlands and the higher parts of South Africa (The Drakensberg mountain region) and the Atlas mountains region of northern Africa have this type of climate.

The climate is similar to the *temperate climate* of the world. The tropical nature of the regions' climate is modified by high altitude. Temperature is cool, with small annual ranges. Some areas are covered by permanent snow, as on Kilimanjaro and Kenya mountains. The region also experiences high rainfall, mainly of orographic origin. The rainfall increases with the rise in altitude.

Mediterranean Climate

Which parts of Africa are known for their Mediterranean climate? What unique features does this type of climate have?

The *Mediterranean climatic region* is found in the northern and southern tips of Africa. The Maghreb region in the north, from Morocco to northern Libya

and the Cape Province of South Africa are the main areas that have this type of climate. In this region, summer is not the rainy season. Most of the rain falls in winter, with a total annual rainfall that ranges from 250 mm to 1000 mm. This makes the region unique in its climatic characteristics. As a result, the region is one of the most attractive climatic zones in the continent. Many tourists visit the region every year.

The following conditions characterize the Mediterranean climatic region of Africa.

- ⇒ *A hot, sunny, bright, dry summer season; and*
- ⇒ *A mild wet winter season.*

3.3.5 Drought in Africa

Brainstorming



- 1 What is drought?
- 2 What do you think are some of the causes of drought?
- 3 Which areas in Africa are drought-prone?

Drought is a condition of unusually dry weather within a geographic region. Expected rainfall does not occur during drought. Therefore drought conditions differ greatly from conditions in an area that is normally, or at least seasonally, dry.

The term is usually applied to a period in which an unusual shortage of rain causes a serious hydrological imbalance a situation whereby water-supply reservoirs empty, wells dry up, and crop damage follows. The severity of a drought is measured in terms of the degree of moisture deficiency, its duration, and the size of the area affected.

Droughts tend to be more severe in some areas than in others. Disastrous droughts occur mostly at latitudes of about 15°-20°, in areas bordering the permanently arid regions of the world. As most parts of Africa lie within these latitudes, the continent is one of the most drought-affected areas in the world. Repeated drought is common in many areas.

Major causes of drought in Africa include unwise use of natural resources,

including deforestation, overgrazing and over cropping, expansion of farm lands and settlements, and the resultant environmental degradation.

The repeated drought that occurs in many areas of the continent causes environmental degradation, habitat destruction, shortage of water and famine (shortage of food). This, in turn, results in the displacement/migration and death of people and animals. The huge displacement of people and the high rural-urban migration that occurs in many countries of Africa is associated with this phenomenon. Drought also affects the biodiversity of a place. As drought prevails, plants and animals may fail to survive. As a result, some species of plants and animals may become extinct or be exposed to danger of extinction. This is happening in the drought-affected areas of the continent.

The Sahel region of Africa is one of the extremely drought-affected areas in the continent. The region is a transitional zone between the Sahara on the north and the wetter tropical areas to the south. Desertification of the Sahel was aggravated by extended drought between the late 1960s and early 1980s, the worst in 150 years. The stress of increasing human and livestock populations is another major contributor.

Desertification is the process whereby soil loses its ability to retain moisture , and then desert encroaches on arable land. Desertification is shrinking the size of the Sahel and causing famine in many parts of the region. This climatic condition covers many countries that are found to the south of the Sahara desert. As a result, they are among the areas repeatedly affected by drought.

The following figure shows you the drought-prone areas of Africa. Study it carefully and try to identify the countries that are found in the zone. To do so, cross-reference between the figure and the political map of Africa **Figure 3.15**.

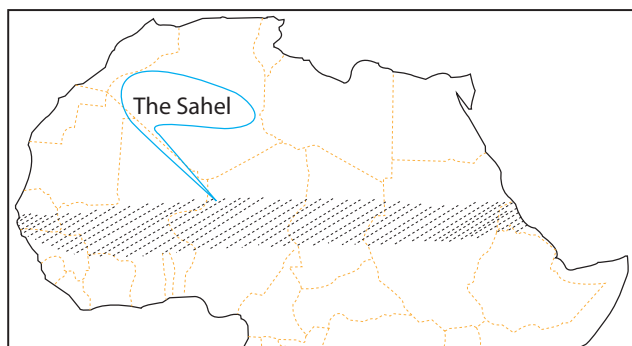


Figure 3.15: The Sahel, drought-prone areas in Africa



Figure 3.16: Sahel drought devastation

NOTE

The drought in the Sahel region of West Africa, which began in the late 1960s and lasted until the early 1980s, was the worst drought of the 20th century. The agriculture and livestock of much of Mauritania, Mali, Burkina Faso, Niger, and Chad were devastated, and the countries' economies suffered.

Content Check



I *Define the following.*






- | | | | |
|---|---------|---|----------------------------------|
| a | Climate | c | Drought |
| b | Weather | d | Elements and controls of climate |

II *Give short answers for the following questions.*

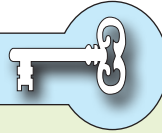
- 1 What are the major factors that affect the climate of Africa?
- 2 Write at least four characteristics of Equatorial climates.








3.4 DRAINAGE SYSTEMS OF AFRICA

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

-  demonstrate the major rivers and drainage systems of Africa;
-  discuss the characteristics of the major African rivers;
-  identify the location of lakes and swamps in Africa;
-  realize the economic significance of African rivers and lakes; and
-  analyze the hydro-politics of the Nile River.

Key Terms



- | | |
|--|--|
|  Drainage system |  Swamp |
|  Discharge |  Lake |
|  Catchment area |  Drainage Density |
|  Seasonal fluctuation | |

Africa is rich in terms of water resources. Thousands of rivers that originate in African highlands drain the extensive landmass of the continent. Furthermore, large numbers of lakes are found in the continent. Swamps are also dominant drainage features in Africa. These resources have tremendous potential. However, the people of the continent are far behind the developed world in terms of their socio-economic status, and therefore also in the technology and other resources needed to develop this potential.

3.4.1 The Major Rivers and Drainage Systems of Africa

Brainstorming



- 1 What is meant by drainage basin, drainage system and discharge?
- 2 What factors affect the drainage systems of Africa?
- 3 Which are the major river basins and drainage systems of Africa?
- 4 Why does the Congo basin experience low annual fluctuation in its discharge/volume?

The entire area that a river drains is called its *catchment area* or *drainage basin*. A group of *drainage basins*, which are supplied by multiple rivers, with common characteristics, such as a common destination, form a *drainage system*.

Nine major rivers drain the African continent. These are the Nile, Congo, Zambezi, Limpopo, Orange, Niger, Volta, Gambia and Senegal rivers. These basins are categorized into four major types of drainage systems, based on their flow direction. These major drainage systems are

- ⇒ Atlantic Ocean drainage system;
- ⇒ Indian Ocean drainage system;
- ⇒ Mediterranean Sea drainage system; and
- ⇒ Closed (Inland) drainage system.

The following discussion provides you with some facts about each drainage system. **Figure 3.17** shows you the locations of these systems.



Figure 3.17: Major Rivers in Africa

A *The Atlantic Ocean Drainage System*

What are the major rivers that constitute this system?

This system is made up of all major rivers that drain westward and southward and empty into the Atlantic Ocean. The system is the largest in terms of catchment area, annual discharge and drainage density. It accounts for about 90 percent of the continent's surface flow. The major river basins that constitute this system are the Congo, Niger, Volta, Gambia, Orange and Senegal basins. Several other, small rivers are also found in this system. **Table 3.6** shows you the major river basins and their tributaries.

Table 3.6: Major rivers in the Atlantic Drainage system

River Basin	Length (Km)	Remark
Congo	4,380	Largest river in Africa in terms of total annual discharge, 2 nd longest river in Africa and 2 nd largest in the world.
Gambia	1,130	One of the smallest major river basins of Africa
Senegal	1600	Has two major dams. the Manantali Dam in Mali, and the Maka-Diama dam on the Mauritania-Senegal border.
Niger	4000	Drains Guinea, Mali, Niger, Benin and Nigeria. 3 rd longest in Africa.
Volta	1500	Has Africa's largest artificial lake, Lake Volta; has three major parts. Black Volta, White Volta and Red Volta.

B *The Mediterranean Sea Drainage System*

Which river is the most important in this system? Why?

This drainage system includes all the major rivers that flow northwards into the Mediterranean Sea. However, the system has only one major river basin, which is the Nile. The **Nile** is the longest river in the world.

Two major tributaries, namely the White Nile and Blue Nile, form the Nile proper when they converge in the Sudan, at Khartoum. The White Nile originates from Lake Victoria in Uganda, while the Blue Nile emerges from Lake Tana in Ethiopia, near Bahir Dar.

The Nile flows generally northwards through the Sudan and Egypt and empties into the Mediterranean forming an extensive delta in north Egypt.

C *The Indian Ocean Drainage System*

Which rivers of Africa form the Indian Ocean Drainage System?

The *Indian Ocean Drainage System* includes all the major rivers that flow eastwards into the Indian Ocean. This system is the second largest system, in

Africa in terms of drainage density, catchment area and annual discharge. The Zambezi, Wabishebele and Juba river basins are the major basins in this system.

Table 3.7: Major River Basin of the Indian Ocean drainage system

River Basin	Length (Km)	Remark
Zambezi	2750	Has Africa's largest waterfall, Victoria Falls; has two major dams: Kariba (Zambia and Zimbabwe) and Cabora Bassa (Mozambique)
Wabishebele	2000	Has High seasonal variation, and therefore usually fails to reach the Indian Ocean in winter. However, it manages to reach the ocean during the summer season.
Jubba	1600	Forms one of Somalis most fertile agricultural region in its lower valley.

D *The Closed (Inland) Drainage System*

What are the rivers that form the Inland drainages system of Africa?

The rivers of Africa that do not have direct access to the sea form this drainage system. Most of the rivers in this system have multiple flow directions. This makes the system different from the rest of the drainage systems in Africa. This drainage system covers nearly 32% of the total area of the continent. It receives nearly 4% of the continent's total annual runoff.

The Awash and Ghibe/Omo rivers in Ethiopia, the Okovango Swamp in Botswana, the Sudd Basin in the Sudan, the Danakil Basin in Ethiopia and Eriterea and Lake Chad Basins are among the major inland drainage basins of the continent. The Chad Basin is the largest inland basin in Africa.

Table 3.8: Catchment Areas and Lengths of Some of the major Rivers of Africa

River	Length (km)	Catchment Area ('000' km ²)	Main Tributaries
Nile	6650	2862	Blue Nile, White Nile, Sobat, Atbara
Zaire/Congo	4380	3700	Kassai, Ubangi
Niger	4000	1112	Benue
Zambezi	2700	1300	Cubango, Cuando
Ghenale/Juba	1600	168	Dawa, Weyb, Mena, Welmel
Wabeshebele	2000	205	Erer, Fafen, Ramis

3.4.2 General Characteristics of African Rivers

Brainstorming



What factors affect the economic utilization of African rivers?

What major features characterize African rivers?

Most African rivers share some common characteristics:

- a **Steep long profile:** Most of the rivers in Africa have steep courses, as a result of the continent's relief. Furthermore, most of the rivers empty into the major water bodies by falling from the edges of interior plateaus of the continent. This affects the navigability of many of the rivers of the continent.
- b **Waterfalls and Rapids:** Many African rivers are interrupted by waterfalls and rapids, which impede navigation. The waterfalls and rapids are due to Africa's number of plateau lands, with their steep sides, and strong erosion-resistant rock, which the rivers encounter in their courses. Some examples of rivers with these features are the Congo, Nile, Niger, Zambezi, Orange and Cunnen Rivers.

Study the following table, which presents Africa's major waterfalls.

Table 3.9: Major Waterfalls in Africa

Name and Location	Height of Falls (m)
Tugela, South Africa	614
Chirombo, Zambia	268
Kalambo, Tanzania, Zambia	221
Maletsungane, Lesotho	192
Victoria, Zimbabwe, Zambia	108
Tis Isat, Ehtiopia	45

- c **Seasonal Fluctuation:** Many of the rivers of Africa have their origins in areas of seasonal rainfall distribution. As a result, there are variations in their volumes between the wet and dry seasons. The Nile and Niger Rivers are good examples of this phenomenon. Both originate in wet highlands with seasonal rainfall. In contrast to the other African rivers, the Congo River does not show significant volume variation. It is the only African

river with a steady volume throughout the year. This characteristic is due to the fact that it has tributaries running from both with in and south of the equator.

- d **Deltaic Mouths and Mangrove Swamps:** Many of the African rivers have low pressure force along their lower courses. This allows the rivers to branch out into distributaries, and results in the formation of deltas and mangrove swamps at the mouths of the rivers. For instance, the Nile, Niger and Zambezi rivers have extensive deltas and are swampy at their mouths. Such conditions affect the penetrability of the rivers from the coast.
- e **Exotic Nature of the Rivers:** Many of the rivers of Africa, like the Nile, Senegal and Orange, travel across different physiographic regions that range from cool to extremely hot climatic conditions. As a result, they lose much of their water through evaporation and seepage before they reach their final destinations. The Nile River faces the greatest impact in this case. It loses nearly 64% of its total run off through evaporation and seepage. The Senegal River loses 54%, and the Orange River has a total loss of 44% in its runoff.

NOTE

Deltaic mouths, mangrove swamps, the fluctuation regime of the rivers, and waterfalls and rapids across the major rivers of Africa hinder the navigability of their courses. However, these rivers have high HEP potential. The water falls of Africa, if regulated, could produce enormous amounts of hydro-electric energy.



Activity 3.9



Discuss the following questions.

- 1 Identify the major rivers that constitute the Indian Ocean drainage system.
- 2 Why do African rivers show high seasonal variations?
- 3 What are the major factors that affect the navigability of African rivers?
- 4 Define drainage basin and drainage system.
- 5 Compare the major drainage systems of Africa in terms of their catchment areas and annual discharge.

3.4.3 Lakes and Swamps of Africa

What is a lake? What about swamps?

Where are most of the lakes of Africa found?

Africa has many lakes and swamps. Some of them are natural, and others are human-made (artificial). The lakes differ in their size and depth. For instance, lakes Tanganyika and Malawi are deep and large, while Victoria and Tana are wide and shallow, respectively.

Lakes of Africa

The lakes are divided into two types-*natural* and *artificial (anthropogenic)*. *Natural lakes* are formed by tectonic, volcanic and/or denudation processes. Anthropogenic lakes are formed when water is accumulated at the backs of dams that are constructed across rivers for various purposes, including hydro-electric production and irrigation.

Natural Lakes

What is a natural lake? How are lakes formed naturally?

These are lakes that are formed under natural conditions. Based on location, natural African lakes are divided into two groups: *Rift valley* and *Non-Rift Valley* lakes. The first group includes all the lakes that occupy the floor of the Great East African Rift Valley. Lakes, like Turkana, Tanganyika, Kivu, Albert, Malawi, Edward and the numerous Rift Valley lakes in Ethiopia belong to this group.

The major non-Rift Valley natural lakes include Victoria, Chad and Tana.

Table 3.10 Presents the major natural lakes of Africa and some of their characteristics.

Table 3.10: Natural Lakes of Africa

Lake	Area (km ²)	Maximum depth (m)	Type	Remark
Victoria	83,000	92	Non Rift valley	Largest in Africa, largest tropical lake in the world, 2 nd largest freshwater lake in the world and 3 rd longest in the world
Tanganyika	32,890	1435	Rift valley	World's longest fresh water lake, Africa's deepest lake and second in the world, Africa's second largest lake
Malawi	30,800	706	Rift Valley	The most southern lake in the Great African Rift Valley system
Chad	18,000	12	Non-Rift valley	-
Turkana	8,660	72	Rift valley	-
Albert	5,500	17	Rift valley	The northernmost of the chain of lakes in the Great Rift Valley
Meru	4,920	NA	Rift valley	-
Tana	3,600	9	Non-Rift valley	Shallowest in Africa
Edward	3,550	NA	Rift valley	-
Kivu	2,650	475	Rift valley	-

Focus



Most of the African lakes that are found along the Rift Valley are long and narrow. Many of them that mark the western branch of the Rift Valley have outlets to the ocean through rivers. For example, Lakes Edward and Albert empty through the Nile River, and Lake Tanganyika empties through the Congo. In contrast, most of the lakes that mark the eastern branch of the Rift Valley participate in the Inland Drainage System. Lake Malawi, which is also a member of the eastern-branch lakes, is an exception, as it drains into the Indian Ocean through the Shire river.

Artificial (Anthropogenic) Lakes

What are artificial lakes? How and why are artificial lakes formed?

Africa has large numbers of rivers that have enormous hydro-electric power and irrigation potential. To utilize the rivers for these and many other purposes, large dams have been constructed across their courses. The major *anthropogenic lakes* in Africa are Nasser, Koka, Volta, Kaindji and Kariba. **Table 3.11** presents the major artificial lakes in Africa.

Table 3.11: Artificial lakes of Africa

Lake	Dam	River	Country
Nasser	Aswan High Dam	Nile	Egypt
Koka	Koka	Awash	Ethiopia
Volta	Akosombo	Volta	Ghana
Kaindji	Kaindji	Niger	Nigeria
Kariba	Kariba	Zambezi	Zambia and Zimbabwe



Activity 3.10

In a small group discuss the following questions.

- 1 Why do people construct dams across rivers?
- 2 What are the impacts of dam construction on local populations and the environment?

Swamps of Africa

What is swamp? How are they formed?

There are many seasonal and permanent swamps (marshes) in Africa. They develop mostly in depressions and areas of seasonal flooding along the courses of the major rivers. The major swamps of Africa include

- ⇒ *Sudd swamps, along the Nile river basin;*
- ⇒ *Kamulando swamps, in the Congo Basin;*
- ⇒ *Batorse and Kafue swamps, in the Zambezi Basin;*

- ⇒ Okovango swamps, in Botswana;
- ⇒ Swamps adjacent to lake Chad;
- ⇒ Mangrove (coastal) swamps along the deltaic mouths of the major rivers;
- ⇒ Timbukto swamps, in Mali along the Niger river.

3.4.4 The Uses of African Rivers and Lakes

Brainstorming



- 1 What are some important socio-economic features of Africa's rivers and lakes?
- 2 How far are these resources exploited in Africa?
- 3 Why are the rivers and lakes of Africa underutilized?

The rivers and lakes of Africa have great potential for development. They can contribute to the socio-economic development of the continent if they are properly developed and utilized. Some of their uses are discussed below.

Hydro-Electric Power (HEP)

Africa has about 40% of the world's HEP potential. The steep profile of the rivers and the waterfalls and rapids that develop along their actual and potential courses make the continent rich in this respect. Although, very little (about 5%) of this potential is actually being utilized, large dams have been constructed for this purpose. For example, see **Table 3.12**.

Table 3.12: Major Dams of Africa

Dams	River	Location
Aswan High Dam	Nile	Egypt
Owen Falls	White Nile	Uganda
Koka	Awash	Ethiopia
Akosombo	Volta	Ghana
Kaindji	Niger	Nigeria
Kariba	Zambezi	Zambia and Zimbabwe
Inga I and II	Congo	Congo, DR
Cabora Bassa	Zambezi	Mozambique
Ghibe I and II	Gilgel Ghibe	Ethiopia
Tekeze	Tekeze	Ethiopia

Irrigation

The rivers and lakes in Africa have great potential for irrigation. However, what has been utilized so far is insignificant compared to this huge potential. Lack of technology, capital and skilled human power, as well as conflicts and political unrest, are among the factors that result in low development of irrigation in Africa. Among the major irrigation schemes, some are the Gezira and Kenana irrigation in Sudan, Nile Delta and lower Nile irrigation in Egypt; Fish river, Orange and Pongola irrigation in RSA.

Fishing

What is fishing?

Africa's rivers and lakes are rich in fish resources. There are about 2,000 different species of fish in the continent.

The most widespread human use of lakes in Africa is for fishing, but this economic sector is poorly developed. Most fish production in the continent is for home consumption. As a result, very little is taken into the market. This situation is primarily due to insufficient technical skills in the continent.

Navigation (Inland Waterways)

Most of the rivers in Africa are characterized by waterfalls, rapids, steep profiles, deltaic mouths and seasonal volume fluctuation. These conditions hinder their navigability. However, the Nile, Niger, Senegal and Gambia Rivers are navigable along parts of their courses, especially in summer. The Congo River is navigable for a good part of its course throughout most of the year. Lakes like Chad, Victoria, Tana and Malawi also provide transport services for a good number of people.

Tourism and Recreation

In many countries in Africa, rivers and lakes are good tourist destinations and centers of recreation. The waterfalls along the rivers and the birds of the lakes are attractive. The Nile in Egypt, Victoria Falls on the Zambezi River, and Lake

Nakuru in Kenya and Lake Malawi in Malawi and Tis Abay on the Abbay River, and Awash Falls in Ethiopia are good examples.

Fresh-Water Supply

The rivers and lakes in Africa constitute most of the continent's fresh-water resources. The piped water supplies for urban Africa and the water supply for the rural population, are all dependent on the rivers and lakes of the continent.

Source of Minerals and Construction Materials

Rivers and lakes carry various rocks and their fragments that are good sources of minerals and construction materials. For instance, the alluvial deposits along the major rivers of Africa contain gold and diamonds, as well as other minerals, for example, tin in Ghana and Namibia. Salt and potash as well as sand and gravel can be obtained from rivers and lakes.

The Hydro Politics of the Nile River

The Nile River is one of the most politically significant rivers in Africa. In its basin countries have significant interest over its water. The countries that are found in the Nile basin are Ethiopia, Egypt, Kenya, Sudan, Uganda, Rwanda, Burundi, Democratic Republic of Congo, Eritrea and Tanzania. Based on the general alignment of the river these countries are categorized into two as upper course and lower course countries. The upper course countries are those that contribute the water for the river and are generally found at higher altitude where the major tributaries of the Nile originate. On the other hand, the lower course countries, namely Sudan and Egypt, are those that are found at lower elevation where the water of the river flows gently over vast plains.

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Figure 3.18: The Nile basin

Blue Nile is the largest contributor of water to the Nile proper. Together with Baro-Akobo and Tekeze rivers, Ethiopia accounts for about 84% of the water of the Nile.

The Hydro-politics of the Nile is, therefore, related with the degree to which the Nile river is utilized in its upper and lower courses. Of the total estimated 110 bn m³ of annual water resource, nearly 65% (72 bn m³) occurs in the Ethiopian portion of the Nile basin. Of this, about 52.6 bn m³ is accounted by the Abay river alone.

Historically, the two countries, Egypt and Sudan have been the most benefited of all the countries in the Nile basin. This is especially true for Egypt where the Nile River's water and alluvial soil along its flood plain have become the source of life in the desert affected Egypt. The Aswan high dam that is constructed along the Nile River in Egypt has been the most important source of water, energy, fish and recreation for the Egyptians. In Sudan, too, the river has been developed to a greater extent. Contrary to this, the upper course countries have been the least benefited. This unbalanced and unfair utilization of the river between the upper and lower course countries has been a great area of interest.

Focus



The Aswan high dam

- ⇒ Was started in 1960 and completed in 1967.
- ⇒ Its purpose was to create an artificial lake of high capacity.
- ⇒ Its lake is 10 km wide and 500 km long of which 350 km is in Egypt and the rest 150 km in Sudan.
- ⇒ Has a total capacity of storing about 160 bn m³ water
- ⇒ Has the following functions.
 - ☞ Protection against floods
 - ☞ Generating HEP of about 10 bn kwh/day
 - ☞ Irrigation
 - ☞ Reduces salt intrusion in the agriculture field.

However, the countries of the basin are now in a situation where by they are working together to bring about equitable utilization of the river. The Nile basin initiative is a good example in this case. Through the initiative, the countries are working together to maintain balanced utilization of the river in the upper course and lower course countries.

Content Check






Answer the following questions.

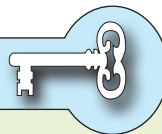
- 1 Name three major rivers of the Atlantic ocean drainage system in Africa.
- 2 Discuss the major characteristics of African rivers.
- 3 Write the major rivers across which major dams are constructed.










3.5 NATURAL VEGETATION AND WILD ANIMALS OF AFRICA

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

-  relate natural vegetation and wild animals with climatic regions;
-  appreciate the types and economic uses of wild animals in Africa; and
-  show interest in implementing natural-vegetation and wild-animals conservation measures.

Key Terms



- | | |
|--|---|
|  Natural vegetation |  Poaching |
|  Alpine vegetation |  Reforestation |
|  Wild animal |  Afforestation |
|  Endemic |  Conservation |
|  Xerophite | |

There are different types of climates in Africa. As a result, varied types of natural vegetation develop over the landmass of the continent. There are also various species of wild animals that inhabit the various physiographic regions of the continent.

3.5.1 Major Vegetation Zones of Africa

What is Natural Vegetation? What are the major vegetation types that develop in Africa? What causes a variation in vegetation type and distribution in Africa?

The type of natural vegetation that develops in a certain environment is a reflection of the climatic characteristics of that place. Africa has a number of different climatic regions with their own distinguishing climatic features. As a result, we have various types of natural vegetation covering the different geographic regions of the continent. In general, five different vegetation zones can be identified in Africa. These vegetation types are discussed below.

- ⇒ *Tropical rainforests*
- ⇒ *Tropical grassland (savanna)*
- ⇒ *Desert and semi-desert vegetation*
- ⇒ *Afro-montane (Afro-alpine) vegetation*
- ⇒ *Mediterranean vegetation*

Brainstorming



- 1 To what type of natural vegetation, is each climate type conducive?
- 2 What are the dominant types of natural vegetation that could develop in each climatic region?
- 3 Is there any correspondence between climatic regions and vegetation zones in Africa?

Tropical Rainforests

What is a rainforest? Where in Africa do we have rainforests?

What unique features do rainforests have?

Tropical rainforests develop in areas with equatorial climates. In Africa, they are confined to Central and Western Africa, and eastern Madagascar. In these places, the climate is typically tropical, with high rainfall and high temperatures throughout the year. Tropical rain forests are also known as *equatorial broad leaf evergreen forests*. Africa's most extensive rainforest is found in the Congo Basin.

The following points give you some ideas about the nature of these forests.

- ⇒ *Rain forests are complex, with these three distinct layers:*
 - ☞ *Top layer – made up of tall trees (30 - 50 m) with buttress roots;*
 - ☞ *Middle layer – made up of tree ferns, lianas (creepers), epiphytes, and trees with heights of 19 - 34 m; and*
 - ☞ *Bottom layer – consists of ferns, herbaceous plants, saprophyte (plants which live on dead plants) and trees with heights of up to 17 m.*
- ⇒ *They contain broad-leaved evergreen trees (green throughout the year);*
- ⇒ *Different plants exhibit different stages of growth at the same time, due to the absence of climatic seasons. Some are in flower, some in fruit, and others in the leaf-fall stage;*
- ⇒ *They have little undergrowth, as the canopies of the tall trees prevent light penetration;*
- ⇒ *Most of the trees are hardwood, like mahogany, ebony, ironwood, rosewood and green heart;*
- ⇒ *They have high species diversity and thick growth.*

Study sketch given below to learn what the vegetation in tropical areas looks like.

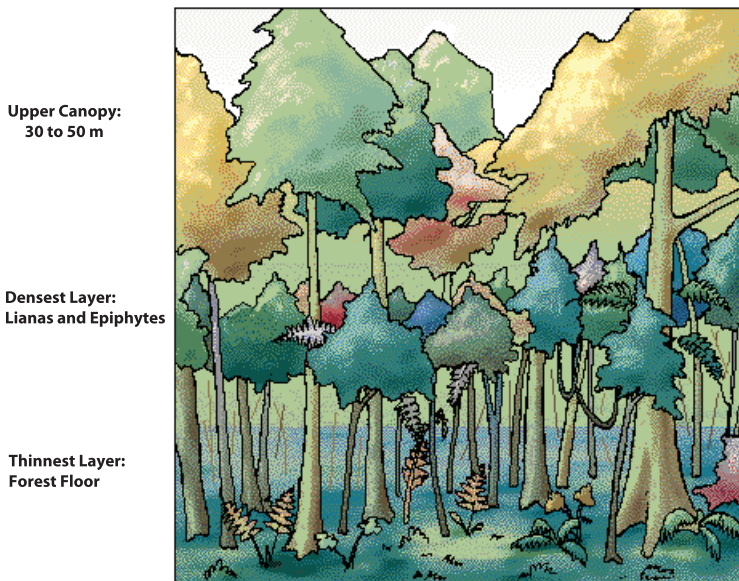


Figure 3.19: A Sketch of the Tropical Rainforest

Tropical Grassland (Savanna)

What is a Savanna? Which parts of Africa have savanna vegetation?

This kind of vegetation develops in areas of seasonal rainfall. Tropical grassland vegetations are extensively developed in areas that have wet summers and dry winters.

Tropical grasslands exist in Northern and Southern Africa, and they encircle the equatorial rainforests. Rainfall in savanna areas varies, decreasing over the range from the forest margins to the edges of the desert. Savanna areas that are close to the equatorial rainforests receive more rainfall, compared to the areas at the edge of the desert. This results in the development of three Savanna zones in Africa. These are:

- i **Park (Wetter) Savanna:** it is found close to the rain forests and made up of many trees and grasses. Geographically, it is found in Western Africa, northern Congo, southern Sudan and central Malawi.
- ii **High (True) Savanna:** this type of grassland is developed between the wetter and drier savannas. It is made up of more grasses than park-savanna areas, and contains scattered trees only. It is found in Zimbabwe, Malawi, southern Kenya, eastern Tanzania and Western Africa.
- iii **Thorn Scrub (Drier) Savanna:** this savanna zone is developed along the desert margins and is made up of short grasses with widely scattered thorny trees, thorn bushes and low scrub. It is common in the semi-arid areas of the Sahel region that extends from Senegal to Ethiopia, Northern Kenya, Angola and Botswana.

The main features of savanna vegetation include the following.

- ⇒ They have tall grasses that are often as tall as 2 m;
- ⇒ Trees are more common than grasses in areas bordering the forest, and grasses are more common than trees in areas bordering the desert;
- ⇒ Most of the grasses wither and turn brown in the dry season and regain in the wet season;
- ⇒ The trees survive the dry season by shading their leaves, storing water, having long roots, thorny leaves, and only a small number of leaves.

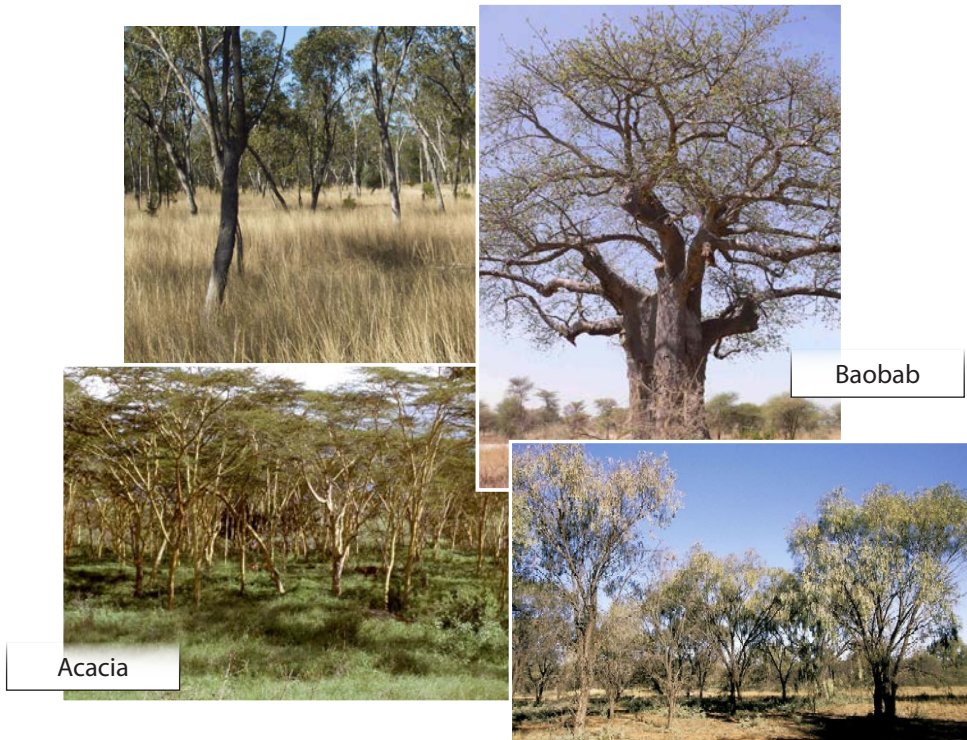


Figure 3.20: Tree types in the savanna lands

Desert and Semi Desert Vegetation

What is a desert? What about a semi-desert climate? What type of vegetation develops in such climatic regions? In which parts of Africa do we have desert and semi-desert vegetation? Why?

Desert and semi-desert vegetation is developed in areas where rainfall is scant. This climatic condition is found in the driest areas of the continent. The Sahara, the largest desert in the world, the Namib deserts and the Sahel region of Africa have such vegetation.

You may think that deserts are devoid of natural vegetation. The reality, however, is that it is different in Africa. The continent's drier areas have high species diversity. For instance, more than 3,000 species of plants (about 20% endemic) are found in the desert and semi-desert zones of Northern Africa. Even the southern deserts support plants. Cactus, thorn bushes and coarse grasses are among the most common plants in this vegetation zone.

The desert and semi-desert climatic regions are characterized by very low rainfall, extremely high evaporation and low humidity. The plants that develop in such regions are xerophytes with high drought resistance. To withstand such problems and survive in deserts, desert plants have different mechanisms of adaptation. For example,

- ⇒ *They have long roots that can penetrate to great depths to reach the underground water table;*
- ⇒ *They store water in their spongy leaves, stems, roots, fruits, and the like (example, cactus);*
- ⇒ *They have waxy or needle-shaped leaves to reduce water loss through transpiration;*
- ⇒ *They produce seeds that lie dormant for several years during extreme dry seasons until rain falls;*
- ⇒ *Their leaves are small in size and few in number, reducing water loss through transpiration; and*
- ⇒ *They have thorny leaves to protect them from being eaten by herbivores, etc.*

Afro-Montane (Afro-Alpine) Vegetation

What type of vegetation is Afro-Alpine vegetation? In which parts of Africa do we have this type of vegetation?

This type of vegetation develops over the tropical highlands of Africa, mainly over the Ethiopian and Eastern African highlands. In these areas, the climate is highly modified by altitude, with temperature decreasing as altitude increases. As a result, the vegetation that would have existed in the tropical climate at lower temperatures is replaced by vegetation typical of temperate regions. The vegetation consists of highland (temperate) forests and temperate grasslands. As altitude decreases, vegetation varies. For example, alpine (cold-resistant) plants like *Asta* and *Gibera* (in Ethiopia) grow in areas with altitudes above 3000 m. Afro-montane forests grow in altitudes up to 3000 m. Bamboo forests are found at 2000 – 2500 m. Then we find temperate evergreen (coniferous) forests of trees such as *Tid*, mountain grassland, and heath.

Mediterranean Vegetation

Which parts of Africa have this type of vegetation? What are the common trees of the Mediterranean vegetation in Africa?

As the name indicates, this type of vegetation develops in the northwestern and southwestern extremes of the continent, where Mediterranean climate is dominant. The region is rich in plant species. Evergreen and deciduous trees constitute a good part of the vegetation of this zone. Cork oak, maquis, and wild olive, are among the most common plant types in the region.

Mediterranean climatic regions have hot dry summer seasons. Thus, plants develop certain adaptation mechanisms to withstand the summer drought. Among others, the following adaptation mechanisms are common.

- ⇒ *Storing water in their leaves and bark and using it during the dry season;*
- ⇒ *Having waxy thick leaves to reduce water loss through transpiration;*
- ⇒ *Having spiny small leaves to reduce water loss through transpiration; and*
- ⇒ *Having long roots to tap underground water.*

NOTE

In addition to the five major vegetation zones of Africa, there are also other vegetation areas. Most important of these is the Mangrove vegetation zone. Such vegetation grows in the swampy areas of Africa, especially along lake shores, deltaic mouths and flood plains of the Congo and Niger rivers, tropical coasts and the Okavango swamps. The vegetation includes both trees and grasses.



Factors Affecting The Natural Vegetation Of Africa

Despite the richness of the continent in terms of natural vegetation, the resource is far from being properly utilized. Deforestation, overgrazing, burning (wildfire), and the expansion of settlements and farmlands are among the major problems affecting natural vegetation in the continent.



Activity 3.11

Answer the following questions.

- 1 What is deforestation, overgrazing and wildfire?
- 2 Why do people encroach into naturally vegetated areas?
- 3 What are the impacts of human encroachment on vegetation areas, humans and the environment?
- 4 What should be done to minimize human impact on the natural vegetation of Africa?

Of all the challenges of natural vegetation in Africa the most serious one is deforestation. *Deforestation* is indiscriminate cutting or over-harvesting of trees.

The deforestation rate in the continent is both very high and escalating. In the late 1970's, for instance, the annual rate of deforestation in the continent was about 3.6 million hectares per year. Slightly less than a decade and a half later, this rate (according to 1993 FAO estimations) had reached 4.3 million hectares/year. At the present time, the figures are even greater than what we have seen above.

Clearance of tropical forests for various reasons is a common practice in many African countries where rainforests develop. People clear the forest for many reasons. The major ones, however, are the following.

- ⇒ *They clear the land for shifting cultivation, especially in the equatorial areas where soil leaching is a common problem;*
- ⇒ *The need for land for permanent agriculture;*
- ⇒ *The increased need for fuel wood - nearly 90% of African energy demands are satisfied by using fuel wood that is collected from forests;*
- ⇒ *Extractive forest uses, such as selective forestry, to get logs for industries.*

Deforestation has multifarious impacts. Forests regulate the climatic conditions of the earth and reduce soil erosion. Thus, deforestation can cause climatic change, resulting in problems like desertification and soil loss through erosion.

In addition, where the forest habitats are destroyed, the animals that live in the forests are affected. As a result of habitat destruction, animals may migrate and

even die. Deforestation results in the extinction of some of the wild animals and plants of the continent. There are also many endangered plants and animals in the continent due to deforestation and related impacts.

Possible Conservation Measures

The problem of deforestation can be reduced through the application of different forest-conservation measures. These measures include reforestation, afforestation, agro-forestry and social forestry.

Reforestation: is planting trees in areas where the original forest cover has been removed. It is done to replace the trees that have been cut by humans for different purposes.

Afforestation: is planting trees in areas where there was no original forest cover. For example, afforestation is appropriate for areas where the land is left empty and therefore is exposed to erosion.

Agroforestry: is forestry combined with farming. It is a practice of integrating the planting of trees into farming to provide fuel, fruit, forage, shelter for animals or crops, and other benefits. In short, it refers to associating crop production with forest development.

Social forestry: refers to planting trees in urban areas in association with human settlements.

NOTE

The problem of deforestation is very serious in Africa. In addition to the above-mentioned measures, raising the people's awareness of the importance of forests is crucial. In addition, changing the way people make their living at the present time is also important, as poverty is one of the factors that escalate deforestation.



3.5.2 Wild Animals of Africa

What are wild animals? Do you think that Africa is rich in terms of wild animal resources? Why?

Brainstorming



- 1 What is meant by wild animal?
- 2 What are some of the major types of wild animals found in Africa?
- 3 Is there any relationship between the distribution of climate, natural vegetation and wild animals in Africa? How do you describe that relationship?

It is a well known fact that natural vegetation serves as habitats for wild animals. Thus, the different vegetation zones of Africa, together with the varied climate and topography of the continent, create an ideal situation for wild-animal diversity.

For example, the equatorial rainforests of Africa are habitats for different species of wild animals. The region hosts different kinds of tree climbing (arboreal) animals like monkeys, apes, baboons, and gorillas, as well as birds. The aquatic environment of this zone hosts large animals like hippopotamus and crocodiles.

The region has the highest species diversity in Africa. Most of the time wild animals that live in the equatorial rainforest have small body sizes. This is because the thick and dense forest of the region limits movement in the forests.



Gorilla



Baboons

There are also large numbers of herbivorous and carnivorous animals in the Savanna lands of the continent. The herbivore animals include numerous species of antelope, zebra, giraffe, buffalo, African elephant, and rhinoceros. The carnivore wild animals include the lion, leopard, cheetah, hyena, jackal and mongoose.



Savanna Elephant

African elephants live in grassy regions south of the Sahara Desert. The savanna elephant is the largest of the three species of elephants. They live in grasslands and drier woodlands throughout Kenya, Tanzania, Botswana, Zimbabwe, Namibia, and South Africa.



Black Rhinoceros



Black Rhinoceros and Calf

*The black rhinoceros (*Diceros bicornis*) once ranged from Southern Africa to Western and north-eastern Africa. Today, only fragmented populations remain in Southern, Eastern, and Central Africa. The black rhino has two horns, the front one usually larger than the rear one.*

NOTE

Rhinoceroses are among the most seriously affected wild animals in Africa. People hunt rhinos for their horns. A single rhino horn can bring thousands of dollars on the black market. Consequently, the black rhinoceros and its close relative, the white rhinoceros, have been hunted nearly to extinction. Black rhinos once ranged throughout Africa south of the Sahara but are now restricted to parks scattered throughout that range. To prevent inbreeding and to ensure the survival of the species, park personnel truck rhinos between isolated reserves for mating.



Pride of Lions

This group of lions lives in the savanna region in Masai Mara, Kenya, in Africa. The grasslands are ideally suited to the needs of these carnivores.



Oryx, Mago National Park, Ethiopia



Zebras in Serengeti National Park

Zebras drink and graze near a river in Tanzania's Serengeti National Park. Millions of animals spend the rainy season in this grassland reserve. When the rivers dry up at the end of the rainy season, the animals migrate to Kenya's Masai Mara Game Park, where more abundant water conditions enable them to survive the dry season. Established in 1941, the Serengeti is one of Africa's largest nature reserves.



Some animals of Kruger National Park

One of the ten largest national parks in the world, Kruger National Park in RSA covers 19,485 sq km.





Spotted Hyena, found in many areas of Africa

There are also various species of wild animals in the desert and semi-desert areas of the continent. The desert fox, hares, gazelles, jerboa, the wild ass and different reptiles like snakes, lizards and tortoises are among the most common species.



Wild Ass in the Afar area

The marabou stork of Africa is the largest member of the stork family. Marabous soar for long distances searching for carrion, often feeding on carcasses with vultures and hyenas.

Marabou Stork





Green Mamba

A mamba is a poisonous member of the cobra family. Mambas live in tropical areas of Africa and are one of the world's fastest-moving snakes.

Jerboa

Jerboas are jumping rodents capable of covering a distance of 3 m with one leap. Jerboas live primarily in the arid regions of Africa and Central Asia and feed on plants, seeds, and insects.



Desert Dwelling Fennec Fox

The desert dwelling fennec has the largest ears of any fox, in proportion to body size. It uses its ears to cool itself and to detect the sounds of predators and prey.



Black-Backed Jackal Scavenging

A black-backed jackal in Hwange National Park, Zimbabwe, flees with a piece of scavenged meat.



Similarly, the rivers, lakes and swamps of the continent are inhabited by different species of aquatic animals. There are crocodiles like the Nile crocodiles, hippopotamuses, fish (about 2,000 different species), and different species of birds like the guinea fowl (the leading game bird in Africa), pelicans, goliath herons, flamingos, storks, egrets, and the ostrich, mainly in Eastern and Southern Africa.



Nile Crocodile

*One of the largest reptiles on the earth today, the crocodile is also one of the most ferocious. The crocodile of the Nile, *Crocodilus niloticus*, pictured here, is one of the best known of the 12 species of crocodile.*



Ostriches

Native to Africa, the ostrich is the largest living species of bird, growing to a height of 2.4 m and a weight of 150 kg. Although flightless, the ostrich can run at speeds as high as 65 km/hr .

Flamingos

They are found in shallow alkaline soda or salt lagoons and lakes in parts of Africa. Flamingos feed on microscopic algae, diatoms, and invertebrates that they strain from the water and mud with their sieve-like bills.



In addition to the above wild animals, the continent also has a variety of destructive insects, notably mosquitoes, driver ants, termites, locusts, and tsetse flies.

South African Tsetse Fly



The South African tsetse fly, common to Central Africa, is responsible for transmitting the parasitic protozoan that causes sleeping sickness, a disease that can be fatal to humans and domestic cattle.

Female Mosquito Sucking Blood

There are approximately 2,000 species of mosquitoes ranging from the tropics to the Arctic Circle and from sea level to mountaintops. Female mosquitoes have hypodermic mouthparts which enable them to pierce the skin and suck the blood of mammals, birds, reptiles, and other arthropods. Female mosquitoes of the genus Anopheles are responsible for transmitting the malaria parasite from person to person.



This wild-animal resource of Africa is of great importance for the people of the continent. They serve a wide range of purposes, including the following. They:

- ⇒ *are used as sources of animal protein in many countries of Africa;*
- ⇒ *help to maintain the balance of nature by feeding on each other and plants;*

- ⇒ serve as source of income through tourism, legal hunting and legal sale of live wild animals;
- ⇒ provide scientific and educational opportunities to researches, students and the like;
- ⇒ provide inputs (industrial raw materials such as skins and excreta) for various industries;
- ⇒ add aesthetic value to the environment, hence serving as source of recreation for people;

Factors Affecting Wild Animals

Despite all these and many other advantages that wild animals provide to the people of Africa, the attention paid by the people to animal conservation is inadequate. Many animals face serious problems that emanate from human interference-for example, with their habitats. Such interventions threaten many species. As a result, some animals and birds are extinct and still others, like the Mountain Nyala and Walia Ibex in Ethiopia, and the Ostrich in Algeria, are endangered or threatened.

Activity 3.12



In a small group, discuss the following issues.

- 1 What are the problems of wild animals in your area? What about in Africa in general?
- 2 What, do you think, should be done to conserve the wild animal resources of Africa?
- 3 Are there any measures being taken by the local government or population in your area to conserve wild animals? If yes, mention some of the measures.

Wild animals in Africa are facing different challenges. The following are the most serious ones.

- ⇒ **Illegal hunting (poaching):** *In many parts of Africa, poaching, or illegal hunting, is a common practice. People hunt wild animals for many reasons. While some are economic, others are socio-cultural. For instance, elephants are hunted for their tusks, rhinos for their horns, lions, and cheetah, for their skins etc. This activity threatens some species like the African elephant and black rhinoceros. Some animals in Africa are also brutally exterminated for several reasons. For example,*

animals are killed because they are considered to be pests. They are also killed for food. People also kill animals to be honored by society, as there are cultural group that attach bravery/heroism to killing large dangerous wild animals. This practice exists particularly in the very traditional parts of the continent.



African Elephant Killed by Poachers

Elephant populations are on the brink of extinction due to poachers who kill elephants for their ivory tusks

⇒ **Human Encroachment:** in many areas of Africa, people encroach into the natural habitat of wild animals. For instance, many people in Ethiopia enter into the habitats of wild life in the Bale Mountains, Semien Mountains and Awash National Parks and disturb the habitat. The encroachment is the result of the increased need of human populations for farm and grazing land, settlement areas, fuel wood and the like. Such increased needs result in:

- ☞ Deforestation – people in Africa clear forests for shifting and permanent cultivation, fuel wood, charcoal, settlement and the like. This disturbs the habitats of wild animals and causes the migration and death of wild animals.
- ☞ Burning of vegetation cover in order to obtain land for shifting or permanent agriculture, people set fire to vegetated areas.
- ☞ Overgrazing – When land is grazed beyond its carrying capacity, overgrazing occurs. This, in turn, leads to environmental degradation.
- ☞ Desertification – it is the expansion of desert-like climatic conditions, which occurs as a result of changes in the characteristics of the local climate.
- ☞ Drought – is extreme shortage of rainfall. It occurs when expected rains fail to fall in an area.

Possible Conservation Measures

These and many more challenges are affecting Africa's wildlife resources. Animals migrate, and even die due to the disturbance of their environment as humans encroach. To curb the situation the following measures can be taken.

- ⇒ **Conserving natural vegetation:** *the conservation of one type of natural resource means the conservation of others. Conserving natural vegetation that serves as habitats and sources of food for wild animals can ultimately help with their conservation.*
- ⇒ **Establishing national parks, game reserves and sanctuaries:** *these areas provide protection and conservation for wild animals. They are established to conserve wild animals and their habitats so that they have a secure environment that is safe for their survival. In this regard, Kenya, Tanzania, the Republic of South Africa and Uganda are significant. In Ethiopia, too, nine national parks and many other sanctuaries and game reserves have been established to promote the conservation of the wildlife resources of the country.*
- ⇒ **Controlling illegal hunting:** *it can be done by developing strict legislation whereby illegal hunters are punished or penalized for their illegal acts. For instance, an international ban on ivory trade, instituted in 1989 by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and supported by over 120 countries, has diminished the illicit ivory trade and reduced the related wild-animal killing.*
- ⇒ **Raising the people's awareness:** *this can be done by educating the people about the uses of wild animals so that their attitudes and activities change. This is the most important conservation measure, and it needs the closest attention, because nothing can be done without getting the support of local communities.*
- ⇒ **Changing the economic condition of the people through good and applicable policies and programs.**

Content Check






Answer the following questions.

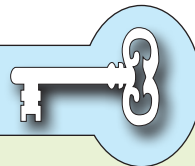
- 1 Describe the equatorial rain forest of Africa.
- 2 Discuss the major problems of natural vegetation in Africa.
- 3 What are the major problems that Africa's wild animals face?
- 4 Discuss possible measures of conservation for the wildlife resources of Africa.







3.6 SOILS OF AFRICA

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

-  state the major soils of Africa with their specific characteristics;
-  relate the soils of Africa with their respective climatic regions; and
-  analyze soil problems and measures of conservation in Africa.

Key Terms



- | | |
|--|---|
|  Soil |  Soil degradation |
|  Weathering |  Terracing |
|  Erosion |  Contour ploughing |

Soil is defined simply as a loose and unconsolidated material that overlies the crust of the earth. Soil is Africa's most important resource. This is because the majority of the people in the continent, and almost the entire economy of the continent, depend on activities that are directly or indirectly linked with this resource.

Brainstorming



- 1 What is soil? How is it formed?
- 2 What are the major soil types in Africa? What are the major soil types that are dominant in your locality?
- 3 Can you identify some of the problems of soil resources in Africa?
- 4 What measures, do you think, should be taken to conserve soil resources in Africa?

3.6.1 Major Soil Types of Africa

Why is Africa endowed with varied typed of soils? What are the most common soil types of Africa?

The diverse climatic conditions, natural vegetation and the geology of Africa result in the presence of different soil types. The Food and Agricultural Organization of the UN (FAO) has classified the soils of Africa into several groups, of which the following are the most important:

- ⇒ *Pedalfers (the largest group in Africa)*
- ⇒ *Pedocalcs*
- ⇒ *Hydromorphic soils*
- ⇒ *Azonal soils*

Based on their geographical distribution, the soils of Africa are classified into the following types. These are **Ferrasols**, **Nitosols**, **Acrisols**, **Lixisols**, **Plinthosols**, **Luvisols**, **Planosols**, **Vertisols**, **Calcisols**, **Solonchaks**, **Gleysols**, **Fluvisols**, **Arenosols**, **Regosols** and **Leptosols**. The geographical locations and characteristics of each of these soils is discussed in brief in the next sections.

A *Pedalfers*

Pedalfers are soils with aluminum deposits. They are soils without a layer of accumulated calcium carbonate. such soils have high content of iron and aluminum. Soils of this group include the following.

Ferrasols: are found in the central parts of Africa around the equatorial forests and savanna lands. They are red and yellow in color. Since they are found in areas

of heavy rainfall, they are affected by leaching. As a result, they are characterized by high concentrations of iron, clay and aluminum.

Nitossols: These soils mainly develop in humid climatic regions. Their parent materials are usually volcanic rocks. Such soils have a deep profile and are rich in humus content. Therefore, they are the most productive soils in Africa. As a result, they are ideal for crop production.

Acrisols: These are soils that develop in hilly areas with wet tropical and monsoon climates. These soils are weathered, acidic and shallow. As a result, they are unproductive. This soil type is found in Western Africa and the Lake Region of East Africa.

Lixisols: Lixisols are found in the savanna and semi-arid areas. These soils are reddish and sometimes yellowish in color. Geographically, they are abundant in the plains of Western Africa, Eastern Africa and east-Central Africa. Lixisols are more fertile than ferrasols and acrisols.

Plinthossols: these soils exist on plains and gently-sloped areas. They are soft and laterite. Such soils also develop in rainforest areas and the savanna regions, where marked dry and wet seasons characterize the climate.

Luvissols: these soils are developed in the Mediterranean climatic regions of the continent. They have high mineral reserves and are fertile.

Planossols: these soils dominate the High Veld of South Africa, particularly the waterlogged plains of the country. They are used mostly for grazing.

Fluvisols: fluvisols develop in seasonally flooded plains, valleys and tidal marshes. They are found in the Nile and Zambezi River Deltas, and the coasts of Western Africa and Lake Chad. They have a brown color. Most of these soils are young and fertile. As a result, they are suitable for large-scale irrigation.

B *Pedocals*

Vertisols: These are black basaltic soils with clay character. Due to their clay, they become sticky during the rainy season and crack during the dry season. As a result, working such soils is very laborious. They are found in the Sahel region at the southern border of the Sahara. In some parts of Africa, these soils are

cultivated with the help of irrigation and rainfed agriculture. However, generally they are used for grazing.

Calcisols: They are found in the Sahara and Namib deserts of Africa. Though they are potentially fertile in terms of mineral content, they are poor in humus. These soils are used mostly for grazing.

Solonchaks: these soils are found in inland river basins, bottoms of ancient lakes, depressions and coastal areas. They are saline and not very productive.

C *Hydromorphic Soil*

Gleysols: Like solonchaks, they are found in depressions and low-lying areas of shallow ground water. They are extensively found in the Niger Delta, the Congo Basin and interior parts of Angola. In Africa, these soils are used for the production of rice, sugar cane, yam and vegetables.

D *Azonal Soil*

Arenosols: They are found in the humid tropical parts of Africa, the semi-arid zones of the southern Sahara, southwest Africa and Africa's coastal plains. They are used mainly for grazing and dry farming.

Regosols: They are found in arid areas extending from West Africa to Ethiopia and Somalia. They are used for pastoralist grazing.

Leptosols: These are young, shallow and stony soils that are highly susceptible to erosion and drought. They are found in the strongly dissected uplands of Northern Africa, the Sahara, and in Southern, Central and Eastern Africa. Terracing is the most important mechanism for cultivating these soils. Otherwise, they are devoted to transhumance, forestry and tourism.

3.6.2 Problems and Conservation Measures of Soils in Africa

Problems of Soils in Africa

What are the major problems of soil in Africa? What measures, do you think, should be taken to conserve Africa's soil resources?

Soil erosion and environmental degradation are among the major problems concerning soils in Africa. The major causes of soil erosion and degradation in the continent include traditional farming practices, overgrazing, deforestation, and over-exploitation of vegetation for domestic uses. Due to these and many other factors, the continent loses huge amounts of soil every year to erosion. Also, such problems result in the deterioration of the quality and productivity of the soil.

Soil erosion is affecting Africa in many ways. Among others, the following are the major impacts. It results in the:

- ⇒ *deterioration and depletion of agricultural and range (pasture) lands;*
- ⇒ *decline of productivity of the major cereal crops;*
- ⇒ *the collapse of agriculture and thereby the migration of people;*
- ⇒ *downstream pollution, sedimentation, floods and damage to settlements, irrigation and farmlands;*
- ⇒ *consumption of national economic resources to control erosion. For example, Zimbabwe invests 3% of its total annual budget for applying fertilizer to replace nutrients lost through erosion.*

As we have said earlier, soil erosion is serious throughout Africa. However, the problem is more intense in some areas than others.

These areas are highly affected by the problem.

- ⇒ *Most of the Sahel Region of Western Africa, and the Sahara and Namib deserts of Africa where wind is the major agent of erosion;*
- ⇒ *The subhumid (savanna) regions and the tropical rainforests, where water is the main agent of erosion; and*
- ⇒ *The tropical highlands and mountain areas of Africa such as those of Ethiopia and other East African countries.*

Activity 3.13



In a small group, discuss the following points.

- 1 What are the impacts of soil erosion in your area? What about in Ethiopia and Africa?
- 2 What do people do to conserve soil in your area? What other measures do you suggest to better conserve soil resources in Africa?

Conservation Measures




Major soil conservation measures that could be taken to increase soil fertility in Africa include the following.















- ⇒ **Terracing:** *constructing stair like structures along hillsides to reduce the speed at which water flows down the slope, thereby reducing erosion.*
- ⇒ **Agroforestry:** *is associating agriculture with forest development.*
- ⇒ **Afforestation:** *is planting trees in areas which originally were not covered by forests.*
- ⇒ **Reforestation:** *is planting tree seedlings to replace cut forests.*
- ⇒ **Windbreaks and shelter-belt plantations:** *planting trees along a line to break the speed of the blowing wind and reduce its erosivity.*
- ⇒ **Check dams:** *are small ditches that are prepared along sloppy areas to reduce the impact of the down slope surface flow.*
- ⇒ **Strip cultivation:** *is planting two or more types of crops on the same farm, using a pattern of stripes of alternating crops. This approach reduces soil erosion because different types of plants use different ways of binding soil particles to themselves.*
- ⇒ **Contour plowing:** *is plowing the land sideways, following contours. It is commonly used in sloped areas, forming furrows perpendicular to the angle of the slope. These furrows act as blocks, slowing the flow of downhill water.*
- ⇒ **Crop rotation:** *planting different crops alternately on a farm.*
- ⇒ **“Green manure”:** *This approach uses plants that have soil-nutrient value to enrich the soil in the same way that animal faeces are used as fertilizer. The “green manure” plants are cultivated on the land and then ploughed under to mix them with the soil.*
- ⇒ **Mulching:** *is covering the soil with plant residue to let the soil regain some nutrients as the residue decays.*
- ⇒ **Fallowing:** *is leaving the farm idle for a while until the soil regains its fertility.*

Unit Review






UNIT SUMMARY

-  Africa is absolutely located between 37°21' N and 34°52' S latitude and 17°33' W and 51°28' E longitude.
-  As a result of the absolute location of Africa, the continent is characterized by almost balanced east-west and north-south extent, tropical location, and its being crossed by the equator almost at its half.
-  Relatively, the continent is close to Europe and Asia. It gets closer to Europe across the Strait of Gibraltar, which is about 22 kms wide between Morocco and Spain. With relation to Asia, the continent comes closer across the Strait of Bab-el Mandab, which is about 40 kms wide. A narrow stretch of land called Isthmus of Suez, which is now cut into an artificial canal called the Suez Canal, connects Africa with Asia.
-  Africa has a total area of 30.4 million sq. km. Accounting for about 20.2% of the world's total land area, the continent is the second largest in the world, next to Asia.
-  The presence of large area for settlement, high resource potentials, varied climate, and plant and animal life are among the advantages of Africa's large area.
-  The absence of smooth coastlines and more or less equal north-south and east-west distance makes Africa's shape relatively compact.
-  The continent of Africa is generally divided into five major regional units. These are Northern Africa, Southern Africa, Central Africa, Western Africa and Eastern Africa.
-  Serious of denudation and peneplanation activities dominated Africa's geological history during the Palaeozoic era.
-  Alternate sinking and rising of the land of the Horn of Africa had been a common geologic event of the Mesozoic era in Africa.
-  Most of the major landforms and relief features of Africa, including the Great East African Rift Valley and the very high volcanic mountains and plateaus, were formed during the Tertiary period of the Cenozoic era.
-  Much of Africa is dominated by plateau lands. Mountains and hills account only for 4% of Africa's relief while plains account for 25%.

-  Eastern Africa is the most elevated part of the continent having most of the very high mountains that rise over 2000 meters.
-  The Great East African Rift Valley is the world's largest rift valley system. It stretches from Port Biera of Mozambique to Syria in the Middle East travelling a total distance of about 7200 kms.
-  Africa is divided into seven major climatic regions. These are Equatorial Climate, Tropical Continental (Savanna) Climate, Tropical Desert and Semi-desert Climate, Tropical Maritime (Monsoon) Climate, Warm Temperate Continental Climate, Highland (mountain) Climate, Mediterranean Climate
-  Latitude, altitude, ocean currents, distance from the sea, winds and atmospheric pressure are among the factors that affect the climate of Africa.
-  Climatic change due to deforestation, overgrazing, and other unwise ways of using the natural environment is the common problem in Africa. This has resulted in repeated drought and other environmental hazards and problems.
-  Africa is rich in terms of water resources. The continent has thousands of rivers, many lakes and swamps. The rivers are generally categorized into four major drainage basins. These are the Atlantic Ocean, the Indian Ocean, the Mediterranean Sea and the Inland or Closed drainage system.
-  Presence of steep and long profile, rapids and falls, seasonal fluctuation of the rivers, presence of deltaic mouth and mangrove swamps and the exotic nature of the rivers are among the common characteristics of Africa's rivers.
-  Many lakes drain Africa. Most of these lakes are found in the rift valley region.
-  Hydro-electric power generation, irrigation, fishing, transportation, tourism and recreation are among the major uses of Africa's rivers and lakes.
-  The diverse nature of Africa's climate has resulted in the presence of different vegetation zones. Forests, grasslands, desert and semi-desert vegetations, high altitude plants, Mediterranean vegetation, etc are among the major vegetation zones.
-  Deforestation, overgrazing, wild fire, shifting cultivation, etc are among the major problems of natural vegetation in Africa.
-  Africa is also rich in terms of wild animal resources. Different species of wild animals inhabit the continent.
-  Illegal hunting, human encroachment, deforestation, overgrazing, wild fire and the like are among the major challenges that Africa's wildlife face.
-  Conservation of the natural environment, establishing wildlife conservation areas, controlling illegal hunting and raising people's awareness could be

among the major conservation measures of wild animals.

-  Different soils with varied characteristics and agricultural potential cover the continent of Africa.
-  Soil degradation due to soil erosion and unwise agricultural practices is the most important problem of soils in Africa.
-  Terracing, crop rotation, green manure, mulching, strip cropping, contour ploughing, and fallowing are among the possible soil conservation measures.



REVIEW EXERCISE FOR UNIT 3

I *True or False: Write true for correct statements and false if otherwise.*

- 1 The north-south and east-west extensions of Africa are almost equal.
- 2 Being the world's second largest continent, Africa covers nearly 20% of the world's total landmass.
- 3 Though larger than Europe in terms of land area, Africa has a shorter coastline.
- 4 Periods are the largest time divisions of the geological timescale.
- 5 The Great East African Rift Valley was formed during the Mesozoic era.
- 6 Mountains are the most dominant relief feature in Africa.
- 7 The Atlas fold mountain ranges are found at the southern tip of Africa.
- 8 June, July and August are months of heavy rainfall in Africa north of the equator, except in the Mediterranean climate.
- 9 The equatorial climatic region is wet all the year round with high total annual rainfall.
- 10 The Sahel is the area of Africa that is most affected by drought.

II *Multiple Choices*

- 11 Which one of the following factors affects the climate of East Africa the most?

A	Distance from the sea	D	Ocean currents
B	Latitude	E	Winds
C	Altitude		

- 12 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
- 13 Which one of the following was an event of the Cenozoic era in Africa?
- A Formation of the basement complex rocks
 - B Formation of many of the recent volcanic mountains of Africa
 - C The denudation and peneplanation of the African landmass
 - D Alternate sinking and rising of the land in the Horn of Africa
 - E None of the above
- 14 One among the following is false about Africa. Which one is it?
- A Nearly 2/3rd of Africa lies within the tropics.
 - B Much of Africa gets 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.
- 15 Which one of the following rivers is not part of the Atlantic Ocean Drainage System in Africa?
- A Limpopo
 - B Niger
 - C Volta
 - D Senegal
 - E Congo
- 16 The largest lake in Africa is Lake:
- A Tanganyika
 - B Malawi
 - C Chad
 - D Victoria
 - E Tana
- 17 Identify the wrong pair.
- A Zambezi River-Kariba Dam
 - B Niger River-Kaindji Dam

- C Volta River-Akosombo Dam
 - D Nile River-Aswan High Dam
 - E Ghibe River-Koka Dam
- 18 The equatorial rain forest of Africa is characterized by:
- A Broad-leafed evergreen trees
 - B Hardwood trees
 - C Three canopies
 - D A small amount of undergrowth
 - E All of the above
- 19 Of the major problems of wild animals in Africa one is:
- A Afforestation
 - B Illegal hunting
 - C Reforestation
 - D Wildfire
 - E “B” and “D”
- 20 A method of soil conservation that involves the construction of fence-like structures along hillsides to reduce erosion is:
- A Contour plowing
 - B Mulching
 - C Strip cropping
 - D Terracing
 - E Fallowing

III Fill in the blank spaces with appropriate answers.

- 21 Africa gets closer to Europe across the Strait of _____.
- 22 The natural land bridge that used to connect Africa with Asia is called _____.
- 23 Africa’s shape can be described as _____.
- 24 The northernmost point of Africa is called _____.
- 25 The narrow body of water that connects the Red Sea and the Gulf of Aden is called _____.
- 26 The easternmost point of Africa is known as _____.
- 27 Africa’s total area accounts for about _____% of the world’s land area.
- 28 Much of Africa’s relief is dominated by _____.
- 29 The highest block mountain in Africa is Mount _____.
- 30 The lowest place in Africa is called _____.
- 31 Africa’s young fold mountains are found in the region called _____.

- 32 The part of the Ethio-Eritrea-Djibouti Rift Valley that branches out into three at its northern end forms the _____.
- 33 _____ is the climatic region found along the southeast coast of Africa.
- 34 The wettest climatic region in Africa is _____.
- 35 In March, the ITCZ is located around _____.
- 36 The climatic region in Africa that is characterized by a mild wet winter season is _____.
- 37 The wetness of the tropical monsoon climate in Africa is attributed to _____.
- 38 Rainfall in the Mediterranean climatic region is brought by the _____ winds.
- 39 The climate of the equatorial and tropical highlands of Africa is highly dominated by _____.
- 40 The most dominant type of rainfall in equatorial Africa is _____.
- 41 The Mediterranean type of climate in Africa is located in the _____ and _____ regions.

IV *Arrange the following geologic events according to their reverse chronological order, from the most recent to the oldest.*

- a Formation of the Rift Valley.
- b Formation of the Atlas Mountains.
- c Occurrence of pluvial rains in Tropical Africa.
- d Formation of the Red Sea.
- e Formation of the basement complex rocks.