GEOGRAPHY

Distance Learning Material

Grade 10

Module I

Geography

Distance Learning Material

Grade 10

MODULE ONE

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I. General Module Introduction

Hello, dear learner, welcome! This is a Geography Module for grade 10 distance learners. Geography is one of the core courses taught at the high school level in Ethiopia and the rest of the world. The study of geography can be described as *the study of the earth's surface, focusing on the space within which the human population lives*. It has three key characteristics: an emphasis on **location** and **spatial** variations; **people-environment** relationships; and **regional analysis**. Hence, by studying geography, you will acquire knowledge, skills, attitudes, and values on the variations of human and natural phenomena about the surface of the earth through its study and practice.

Dear learner! In the previous grade, (i.e., grade 9), you studied many important geographical concepts, ideas, and features about our country, **Ethiopia**. Here in grade ten, you will mainly study about the geography of **Africa**. While focusing on Africa, this module will also provide you with an **overview** of basic geographic concepts around the **world**. This is important because we live in an interrelated and interdependent world; hence, we should learn some basic concepts about it.

Dear learner! By the successfully completing grade 10, you will be able to demonstrate the following key competencies.

- Locate the major landform in Africa
- Explain the spatial variations in the distribution of the major landforms in Africa
- Identify the climate types and regions of the world
- Describe the major climate types and regions of Africa
- Explain benefits of climate for life of people in Africa
- Explain the major challenges of climate change on African development vision
- Describe the locations of major natural resources in the world
- Describe the major drainage systems and water resources of Africa
- Demonstrate the major vegetation and wild life distribution zones of Africa
- Identify the main soils types and mineral resources in Africa
- Describe the demographic characteristics of the African population
- Explain why the population of Africa has the structure it has now
- Discuss the impact of colonialism on the current settlement patterns of Africa
- Describe Africa's Agenda 2063 and its implications
- Compare and contrast the indicators of Agenda 2063 with those of SDGs
- Compare and contrast the major economic activities of Africa with those of other continents
- Identify the cultural landscape of Africa
- Explain why Africa is a home of diverse languages and religions
- Compare and contrast pattern of population growth in Africa and other continents
- Explain how population density affects the degradation levels of natural resources (vegetation, water and soils) in Africa
- Identify different adaptation strategies to the local environment character
- Analyze the impacts of rapid population growth on environment and socio-economic conditions of Africa

- Explain the causes and consequences of unplanned urbanization
- Describe the pattern of internal and international migration in Africa
- Identify the causes of coastal pollutions in Africa
- Suggest solution to the issue of coastal pollution in Africa
- Acquiring and presenting spatial data using geospatial tools
- Describe ways of representing geographic data on maps
- Enlarge and reduce maps using GIS
- Describe and explain how to present geographic information
- Making and interpreting graphs, charts, and diagrams
- Making administration map using geographical information system (GIS).

Therefore, out of these competencies are derived eight main units of the models. These include;

1. Landforms of Africa
2. Climate of Africa
3. Natural Resource Base of Africa
4. Population of Africa
5. Major Economic and Cultural Activities of Africa
6. Human – Natural Environment Interaction
7. Geographic Issues and Public Concerns in Africa
8. Geospatial Information and Data Processing

Dear learner, the module is written in such a way that it is suitable for self-learning. Unnecessary details and jargons have been left out. In fact, you may face many challenging issues that may hamper your progress. Whenever you face challenging cases in the module, do not worry. If such cases encounter you, try to record and bring them to your tutorial class to discuss with your tutor on the issue. If you want to understand and exhaustively exploit the contents of the module, you are advised to have your own study plan. It is evident that unless and otherwise, you have your own study plan, it is very difficult to complete the module properly. Therefore, your conviction towards having a study plan is highly important for your success.

Dear learner, the grade 10 geography consists of eight chapters, which are organized into two modules. Each module has four units. The units are further divided into sections and subsections. Moreover, in the module you will find in-text questions, activities, and self-test exercises. At the end of each unit, you will find self-test exercises. Hence, try to go through the questions that are provided at the end of each chapter. However, once you begin doing the exercises, you are advised not to look at your reading material till you have tried all the questions by yourself. First, try by yourself and then check your answers going back to your reading material. You must begin doing your assignment after you have completed reading your module. As you attend your education in the absence of teachers, it is advisable to have your own dictionary on hand to check up vocabularies whose meanings you are unfamiliar. Meanwhile there is a glossary of terms at the end of each module that you should refer. Dear learner, please also note that as a distance student, you are entirely responsible for your own learning. Hence, for the two modules you need to allocate at least 44 hours of study time.

Key terms: landform, environment, geographic, natural resources, population

II. Introduction to Module One

Dear learner! At this level, you may ask what key geographical aspects of Africa or the rest of the world that geography at grade ten teaches. That is great! In this module (Module 1), you will study about the nature of Africa's landforms, climate, natural resource bases, and population. In the meantime, a concise overview of the world for each of those issues is provided. Therefore, the module will cover the following key geographical aspects and the benefits of studying about them.

- **Locations and places–** to establish a framework for geographical events to help you understand basic spatial relationships;
- **Major natural systems of the world –** to help you understand how ecosystems interact;
- **Major socioeconomic systems of the world –** to help you develop a sense of place; and
- **The diversity of peoples and societies–** to help you understand the cultural richness of humanity and global interdependence.

This knowledge is expressed in the form of facts about places; key concepts that guide geographical inquiry (e.g., location, pattern, and region); and generalizations that explain patterns, evaluate consequences, and solve social and environmental problems. Therefore, a successful completion of Geography Module One of grade ten, helps you to develop an understanding and acquire knowledge of basic geographic concepts, principles, and theories focusing on Africa and summarizing basic facts of the rest of the world.

Dear learner, please note that for this module (Module One) alone you need to allocate at least 22 hours of study time. Moreover, you should thoroughly read the module as you attend your distance education program under conditions where additional reading materials may not be available. It is also assumed that you shoulder many other social and family responsibilities. Thus, you should try to learn in a demanding environment. Therefore, to complete the module properly, and become successful, you need to study hard and have planned time to read the module and complete exercises incorporated in it and do your assignment on time. Therefore, it is good to give adequate attention to the assignment. Do not copy it from your friends. They may give you the answers, but not their mind. You must do it yourself.

Finally, wishing you a happy time, we would like to present to you Module One starting from the objectives of the module.

III. Objectives for Module One

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

- *identify major landforms of Africa;*
- *explain factors affecting the climate of Africa;*
- *describe the potential of Africa's wealth of natural resources; and*
- *discuss factors affecting Africa's population growth, distribution, and its settlement patterns.*

IV. Contents for Module One

Unit One*: Landforms of Africa*
Unit Two*: Climate of Africa*
Unit Three*: Natural Resource Base of Africa*
Unit Four*: Population of Africa*

V. Assessment Methods for Module One

In this module there are **activities** with a lot of questions useful to check the progress of your learning. Therefore, whenever you come across the following assessment methods try to answer the questions.

Formative assessment

Brainstorming questions
Activities
Essays
Self-test exercises
Feedback on learning-in-process
Self-evaluation

Summative assessment

Assignment
Final examination

Table of Contents for Module I

UNIT ONE

LANDFORMS OF AFRICA

Unit Introduction

Required study time: 3 hours

Dear learner! In this unit, you are going to become acquainted with the major issues of landforms in Africa. However, before identifying the major landforms of Africa, an overview of the landforms of the world is presented in a concise form. Landforms are physical features on the Earth's surface that form the **terrain** of an area. Mountains, plateaus, and plains are the three major types of landforms. Minor landforms include hills, gorges, valleys, and basins. Tectonic plate movement and volcanic activities (internal processes) under the Earth can create landforms by pushing up mountains and hills. Erosion by water and wind (external processes) can erode land and create minor landforms like gullies, river valleys, and gorges. Both processes happen over a long period of time, sometimes millions of years.

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

Africa is a very large continent. It is the second largest continent next to Asia. Most of the continent is found between the Tropic of Cancer ($23\ ^1/_2^\circ$N) and the Tropic of Capricorn ($23\ ^1/_2^\circ$S). There are several recognizable major landforms in Africa. We can identify four significant landform regions in the continent. Each landform region contains recognizable physical regions. Therefore, there are eight physical regions in Africa. These are: the Atlas Mountains, the Sahara Desert, the Sahel, the savanna, the tropical rainforest, the Rift Valley, and the African Great Lakes, the Ethiopian and Eritrean Highlands, and mountains and desert systems of South Africa.

Learning Outcome

After completing this unit, you will be able to:

- *Develop a general idea about the major landforms of the world;*
- *Identify the major landforms and their spatial distribution in Africa;*
- *Describe the major landscape features of Africa; and*
- *Recognize the spatial variations in the distribution of the major landforms in Africa.*

Contents of Unit One

The Required Study Time

Dear learn, on your study plan consider devoting adequate time for study, doing in-text exercises and review questions. Therefore, please allocate 3 hours of study time for unit one.

Learning Strategies of Module One

Dear learner! A learning strategy is a way of organizing and using a particular set of skills in order to learn content or accomplish other tasks more effectively and efficiently while covering the contents of this course or other courses. It involves an active learning process or a method that engages you in the learning process beyond listening and passive note-taking. Active learning approaches promote skill development and higher-order thinking through activities that might include reading, writing, and/or discussion. Therefore, learning strategies will help you learn and use what you have learned to solve problems and be successful. This type of self-regulated learning is the key to successful **life-long learning** and includes the development of such strategies as goal setting, self-instruction, and self-monitoring.

Therefore, for module one your **learning strategies** should include:

- *reading,*
- *writing and taking notes,*
- *studying and remembering information,*
- *improving assignment and test performance,*
- *time management and organization, and*
- *self-advocacy (the ability to effectively communicate, convey, negotiate, or assert one's interests, desires, needs and rights).*

Section 1.1 Overview of the World's Major Landforms

Section Overview

Required study time: 1 hour

Dear learner! In this section, you will learn that landforms are divided into two categories: major and minor landforms. Major landforms include **mountains**, **plateaus**, and **plains,** whereas minor landforms include hills, gorges, valleys, and basins. The major landforms, mentioned above, are widely distributed on the earth's surface. The surface of the Earth is covered by land and water.

Section Learning Outcomes

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

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

Key terms in the section

- *Continents*
- *Landforms*
- *Mountains*
- *Oceans*
- *Peninsula*
- *Plain*
- *Plateaus*
- *Tectonic plate movement*
- *Volcanic activities*

Dear learners, before you start reading the next content, please attempt the following question.

BRAINSTORMING QUESTION

1. Dear learner! Is a mount or plain found in your area part of a land form?

_____

_____

Dear learner, have you tried the activity? That is great. Now let's identify main types of landforms across the world.

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

Activity 1.1

1. Dear learner, how do the major and minor landforms occur? Let you try to answer it below and compare against what you will read in the subsequent paragraphs.

   _____

   _____

Have you tried? Good. Tectonic plate movement and volcanic activities (internal processes) in the Earth's interior can create landforms by pushing up mountains and hills. Erosion by water and wind (external processes) can erode land and create minor landforms like gullies, river valleys, and gorges. Both processes happen over a long period, sometimes millions of years. For example, it took a very long period to cut the deep Abbay Gorge between the towns of Goha Tsiyon in North Shewa, Oromia, and Dejen in East Gojjam, Amhara National Regional State. The Abbay Gorge thus cuts down about 1000 m deep between the two towns mentioned above (see figure 1.1).

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

Similar deep gorges were created by other rivers in Ethiopia (e.g., Genale, Tekkeze, Ghibe/Omo rivers have cut deep gorges). Hence, we have deep gorges like Genale, Limalimo, and Gibe.

Activity 1.2

1. Dear learner, what important (specific) landform features can you indicate from Figure 1.1 above? _____

   _____

Dear learner, have you tried the activity? That is great. The major landforms (mountains, plateaus, and plains) are widely distributed on the earth's surface. The surface of the Earth is

covered by land and water. The landforms make up continents and large waterbodies form oceans. Continents are the largest landmasses in the world. The Earth is divided into seven continents, from largest to smallest are; Asia, Africa, North America, South America, Antarctica, Europe, and Oceania (Australia).

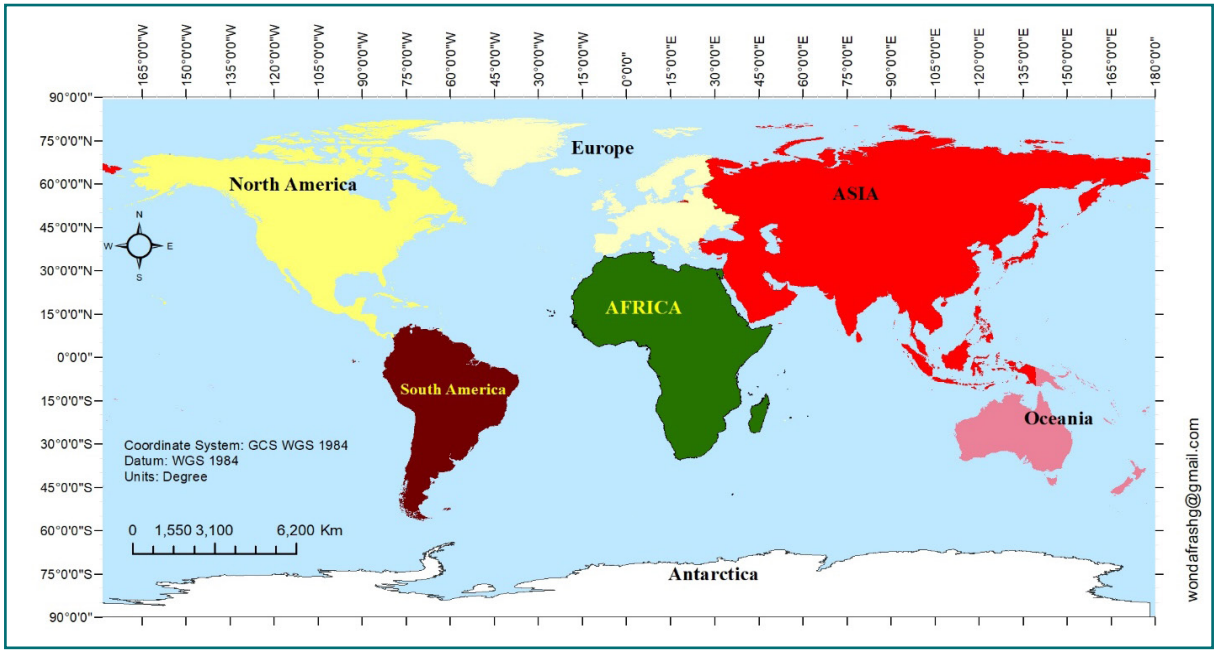


Figure 1.2: Map of the World

Activity 1.3

Dear learner! Have a look at Figure 1.2 and answer the following questions.

1. In which of the continents is our country – Ethiopia found?

   _____

2. Can you indicate Ethiopia on the map in Figure 1.2 above?

   _____

3. Can you indicate Japan on the map in Figure 1.2 above?

   _____

Dear learner! Have identified the oceans of the world from the above Figure 1.2, (Map of the World)? Great. **Oceans** are large areas of salt water between the continents. Although all the oceans are connected, making them one big ocean, they are divided into five smaller oceans that are separated by their location and the way the water in them moves. These oceans are the **Arctic** Ocean, the **Atlantic** Ocean, the **Indian** Ocean, the **Pacific** Ocean, and the **Southern** Ocean. The oceans together cover huge areas of the Earth. They cover seventy one percent of the Earth. The Pacific Ocean is both the largest and the deepest ocean, which covers one-third of the Earth's surface.

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

Activity 1.4

1. Dear learner, can you list sovereign island countries of the world within their respective continents in the following table?

Africa	Asia	Europe	North America	Oceania

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

Activity 1.5

Dear learner! Let you try the following questions before you read the next paragraph.

1. What are the three major landforms of the world?

   _____

   _____

2. Why is it important to study about landforms?

   _____

   _____

Have you tried? If so, that is good. The major landforms of the world create unique areas that people around the world want to know, explore, and visit. These landforms generally divide continents and countries into different physiographic divisions. Let us find out important physiographic regions formed by these landforms in the world.

i. Mountain

Dear learner, we hope you are familiar with mountains.

Mountains are the largest elevated and most recognizable landforms on the Earth's surface. They have steep sides, and high peaks, that stand out from the surrounding land. Around mountains, we may find smaller, less steep landforms called **hills**. Mountains are usually formed when rock layers are pushed together from opposite sides. Thus, the pressure exerted from the movement forces the land in the middle to rise. The low areas between mountains are called **valleys**. Mountains may also be formed by volcanic activity when lava and other materials build up on the surface, but mountains are not the only landforms that can be made by volcanoes.

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

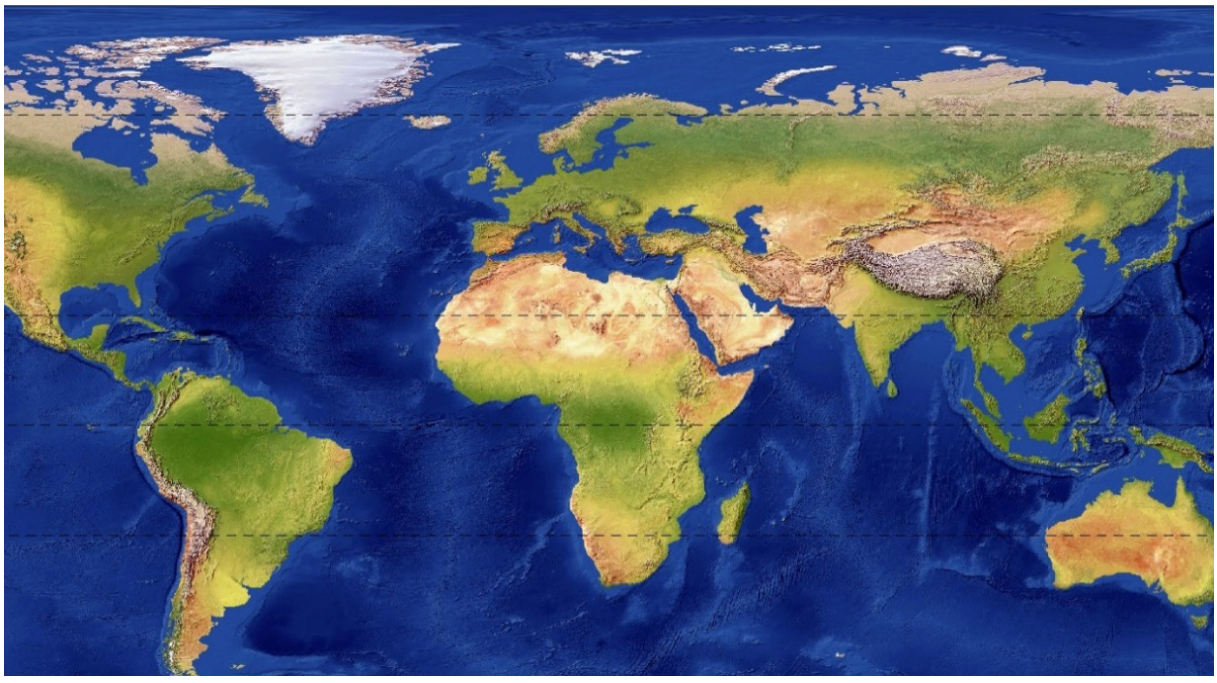


Figure 1.3: Landforms of the World – Mountains

Landforms can also exist under oceans in the form of mountain ranges and basins. The Mariana Trench, for example is the deepest under ocean landform on Earth. It is found in the South Pacific Ocean near Philippines.

Dear learner! Have you enjoyed learning how mountains formed? Now, let as study other landforms such as plain and plateaus.

ii. Plain

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

iii. Plateaus

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

Activity 1.6

1. Use Figure 1.3 and mark or sketch the following;
   - Himalayas
   - Plain areas
   - Mariana trench

Checklist

Dear leaner, please put a tick mark (✓) in the boxes given to prove that you have understood the respective issues well.

I can:

- ☐ 1. deferentiate mountain, plain, and plateau
- ☐ 2. list the oceans of the world
- ☐ 3. locate Ethiopia on a map of Africa
- ☐ 4. explain the formations of major landforms of the world
- ☐ 5. locate the major landforms of Africa on a map
- ☐ 6. explain the spatial variations in the distribution of the major landforms in Africa

Is there any box that you did not mark (✓) under it? If there is, please go back to your text and read about it before you go to the following exercises.

SELF-TEST EXERCISES OF SECTION 1.1

The following questions can help you to study Section 1.1.

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

1. The Himalayan fold Mountains were formed when the Indian tectonic plates collided with the Eurasian plate.
2. Africa's largest lake, Lake Victoria, is found within the floor of the Great East African Rift valley.
3. A peninsula is a piece of land that has water on three sides but it is connected on the fourth side to a land.
4. A mount can be part of a landform, but a landform cannot be part of a mountain.
5. The Red Sea is one of the main oceans of the world.
6. Landforms can divide a country into different physiographic divisions.
7. Both Australia and Greenland are considered as a continent and an island.
8. The landforms make up continents and large waterbodies form oceans.
9. Hills, gorges, valleys, and basins can form minor landforms of an area.
10. Continents are the main factor for the formation of coastal land features such as islands, and peninsulas.

Resources for further reading

http://worldlandforms.com/
Landform - National Geographic Society
10 Famous Landforms In The U.S. - WorldAtlas
Hess, D., & Tasa, D. (2011). *McKnight's physical geography: a landscape appreciation* (p. 688). Upper Saddle River, NJ: Prentice Hall.
Mason, J. A., Muller, P., & de Blij, H. (2016). *Physical geography: The global environment.* Oxford University Press.

Section 1.2 Location and Related Features of Africa

Section Overview

Required study time: 1 hour

Dear learner! In this section, section describes the location of Africa and other significant features of the continent. Hence, you will learn the relative location of Africa as compared to other continents, and its major natural features. Other important concept in this section includes are; the size of the continent in terms of area and population, the number of sovereign countries that Africa has and how the Equator divides the continent into almost half.

Section Learning Outcomes

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

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

Key terms in the section

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

BRAINSTORMING QUESTIONS

Dear learners, before you start reading the next content, please attempt the following questions.

1. How large is Africa?
2. Is Africa bigger or smaller than Europe?

Have you tried? Great, the continent of Africa is bounded by the Mediterranean Sea, the Red Sea, the Gulf of Aden, the Indian Ocean, and the Atlantic Ocean. It is divided in almost half by the **Equator**.

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

Figure 1.4: Africa - Location and Countries

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

Checklist

Dear learner! Now it is time to check your understanding. Put a tick mark (✓) in the boxes given to prove that you have understood the perspectives and issues of the section well.

I can:

- ☐ 1. tell the number of independent or sovereign countries in Africa
- ☐ 2. explain the role of the equator on Africa
- ☐ 3. tell the percentage share of Africa's population in the world

Is there any box that you did not mark (✓) under it? If there is please go back to your text and read about it before you go to the following exercise.

SELF-TEST EXERCISES SECTION 1.2

The following questions can help to study Section 1.2.

Direction: For the following questions Choose, the correct answer from the given alternatives.

1. Which one of the following ocean or sea **does not** border Africa?

   A. Atlantic Ocean
   B. Indian Ocean
   C. Pacific Ocean
   D. Red Sea

2. In terms of population, Africa ranks____ in the world.

   A. first
   B. second
   C. third
   D. fourth

3. One of the following is true about the Equator in its relation to Africa.

   A. The Equator divides Africa into eastern and western hemispheres.
   B. The Equator divides Africa into three parts; north, central, and southern parts.
   C. The Equator divides Africa into northern and southern hemispheres.
   D. All of the above are true.

Resources for further reading

Africa | History, People, Countries, Regions, Map, & Facts
Africa Map and Satellite Image - Geology

Section 1.3 Major Landforms of Africa

Section Overview

Required study time: 1hour

Dear learner! In this section, you will study about landforms of Africa. In the meantime, you will identify how landforms are formed, the importance of studying landforms, and major landform regions in Africa. Africa is a continent of landform diversity. It has vast deserts, and arid and semi-arid grasslands. The continent contains volcanic mountains, and valleys and lakes that add to its varied landscape.

Section Learning Outcomes

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

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

Key terms

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

Dear learners, before you start reading the next content, please attempt the following question.

BRAINSTORMING QUESTION

Dear learners, before you start reading the next content, please attempt the following question.

1. Since Africa has deserts such as the Sahara, Namib and Kalahari, all places in the continent are very hot. Do you agree?

Dear learner, do you know how landforms are formed? Alright, if your answer is yes, it is great, if not do not worry we are here to help you understand.

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

Dear learner! Have you understood the importance of understanding landforms? If so, that is great. Here you are going to study the effects of landforms on ecosystem.

The Effects of landforms on ecosystem pattern and processes include:

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

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

Table 1.1: Major Regions of Landform in Africa

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

1. African Alpine System

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

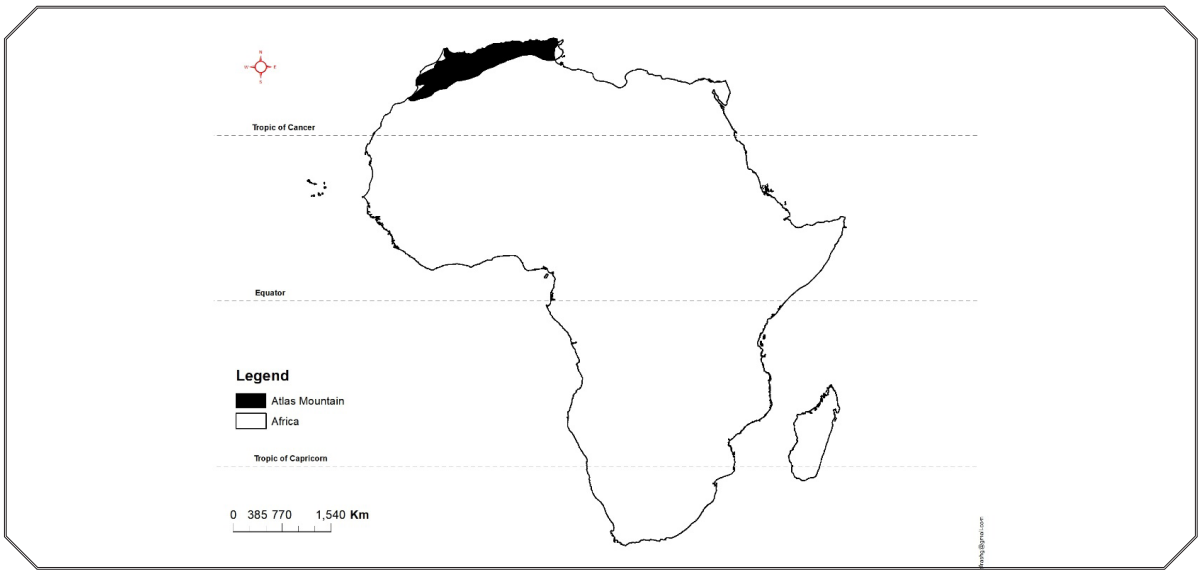


Figure 1.5: Atlas Mountain

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

Activity 1.7

1. Dear learner! The Atlas Mountain covers part of the countries of Algeria, Morocco, and Tunisia. Please, arrange the countries that the Atlas covers from the largest to the smallest based on *Figure 1.4* and *Figure 1.5* above.

   _____

   _____

Have you tried? If so, that is great. Now let you study the African Massif.

2. African Massif

i. The Sahara Desert:

The Sahara is a desert on the African continent. With an area of 9,200,000 square kilometers, it is the largest hot desert in the world. It covers the entire region of North Africa, from the Atlantic coast in the west to the Red Sea in the east. The Sahara borders the Mediterranean Sea and the

Atlas Mountains in the north, extending south into **Sudan** and a region known as the **Sahel**. The Sahara encompasses whole or large parts of ten countries in North Africa. These countries are Algeria, Chad, Egypt, Libya, Mali, Mauritania, Morocco, Niger, Sudan, and Tunisia.

Figure1. 6: Desert landscape

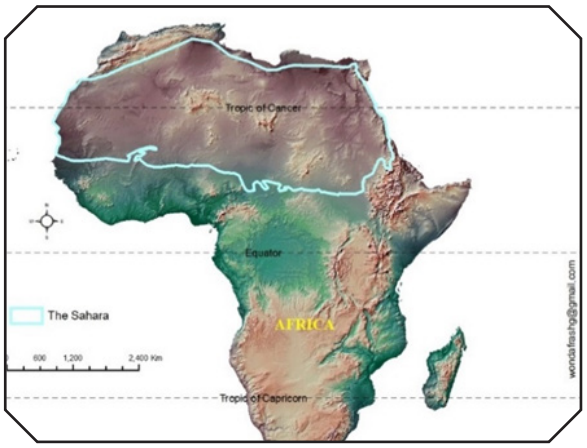


Figure 1.7: Location of the Sahara

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

Figure1. 8: erg - in the Sahara Desert

Figure 1.9: reg - in the Sahara Desert

Activity 1.8

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

ii. The Sahel Region:

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

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

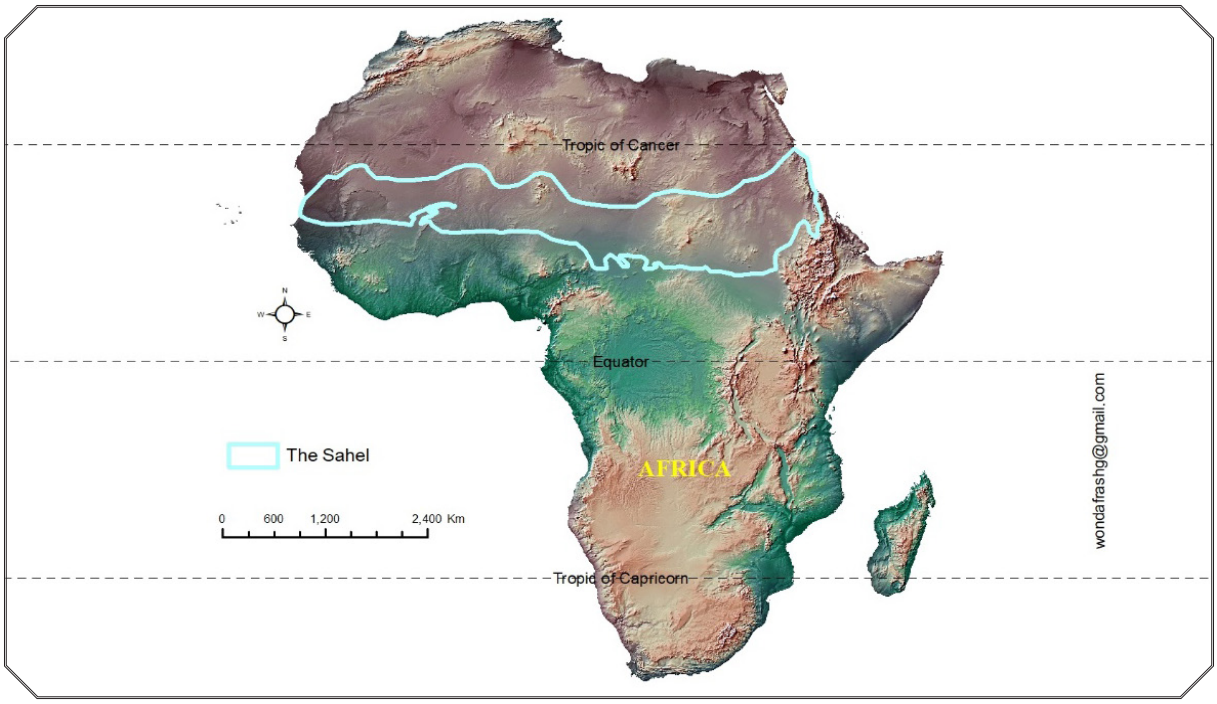


Figure 1.10: The location of the Sahel

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

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

Activity 1.9

1. Dear learner! Can you describe what desertification is? How can desertification be a problem in the Sahel Region? _____

_____

Did you try it? Good. Now look at the following paragraph to understand the concept of Savanna.

iii. The Savanna

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

Figure 1.11: The Savanna Region

Figure 1.12: The Savanna Woodland

Figure 1.13: Thorn tree tall grass Savanna

Based on vegetation types, the Savanna region has two important parts – woodland and thorn tree tall grass Savana. In *Savana woodland*, the trees are widely spaced because there is not enough soil moisture during the dry season to support a full tree cover (***Figure** 1.13*). The open spacing lets a dense lower layer where grasses develop. The woodland has an open, park-like appearance.

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

Activity 1.10

1. Dear learner Why do you think we find many parks in the Savanna region in Africa? __

_____

_____

_____

_____

Have you answered? If so, that is great. Let you continue reading the Tropical Rainforest in the following paragraph.

iv. The Tropical Rainforest:

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

Six African countries – Cameroon, Central African Republic, Republic of the Congo, Democratic Republic of the Congo, Gabon, and Equatorial Guinea makeup the **Congo Basin** of the Tropical Rainforest. Other areas where the rainforest is found include; Ghana, Ivory Coast and Madagascar.

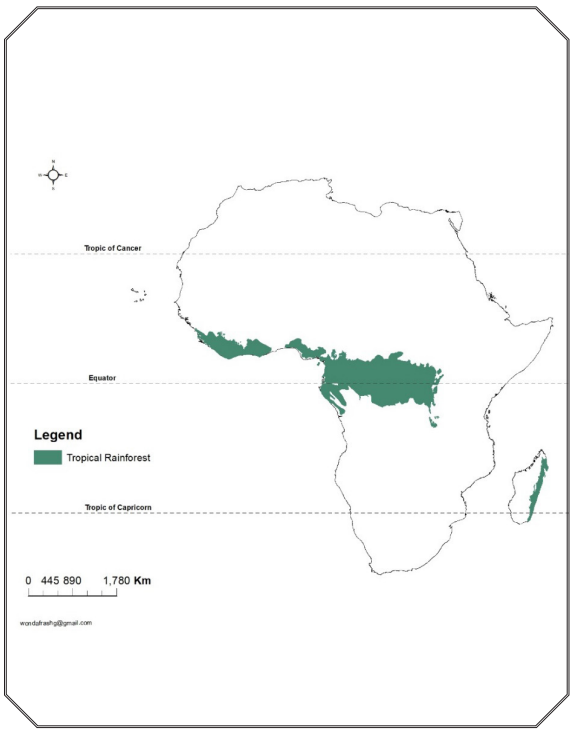


Figure 1.16: The Location of Tropical Rainforest in Africa

Figure 1.14: Typical Rainforest

Figure 1.15: Buttress of tall tree

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

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

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

Activity 1.11

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

_____

_____

_____

Have you tried? Good. Now let you study about East African Highlands and Rift System described in the following paragraphs.

3. East African Highlands and Rift System

i. The Rift Valley and African Great Lakes

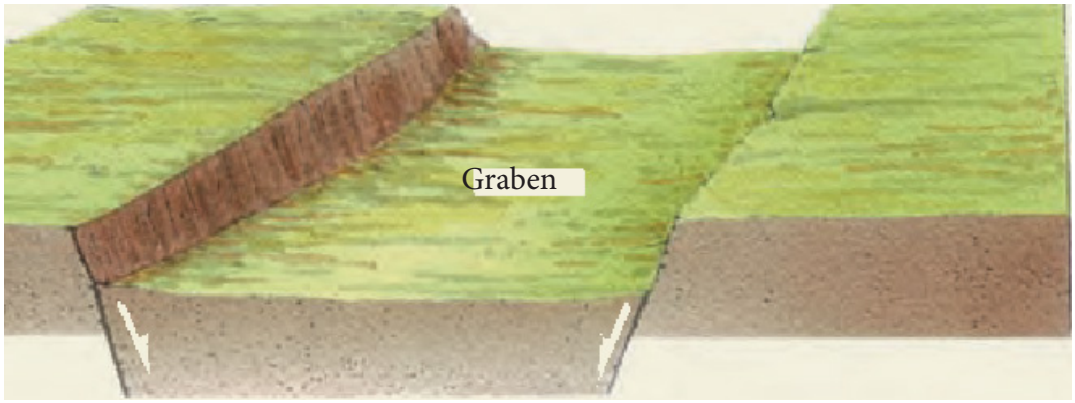


Figure 1.17: Formation of Graben or Rift

The Rift Valley of East Africa was formed by normal **faulting**. It was formed as the land stretched by forces moving in the opposite direction creating rupture and splitting apart the land in between. This creates an area called **graben**. This is an elongated block of the earth's

crust lying between two faults and displaced downward relative to the blocks on either side in a rift valley.

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

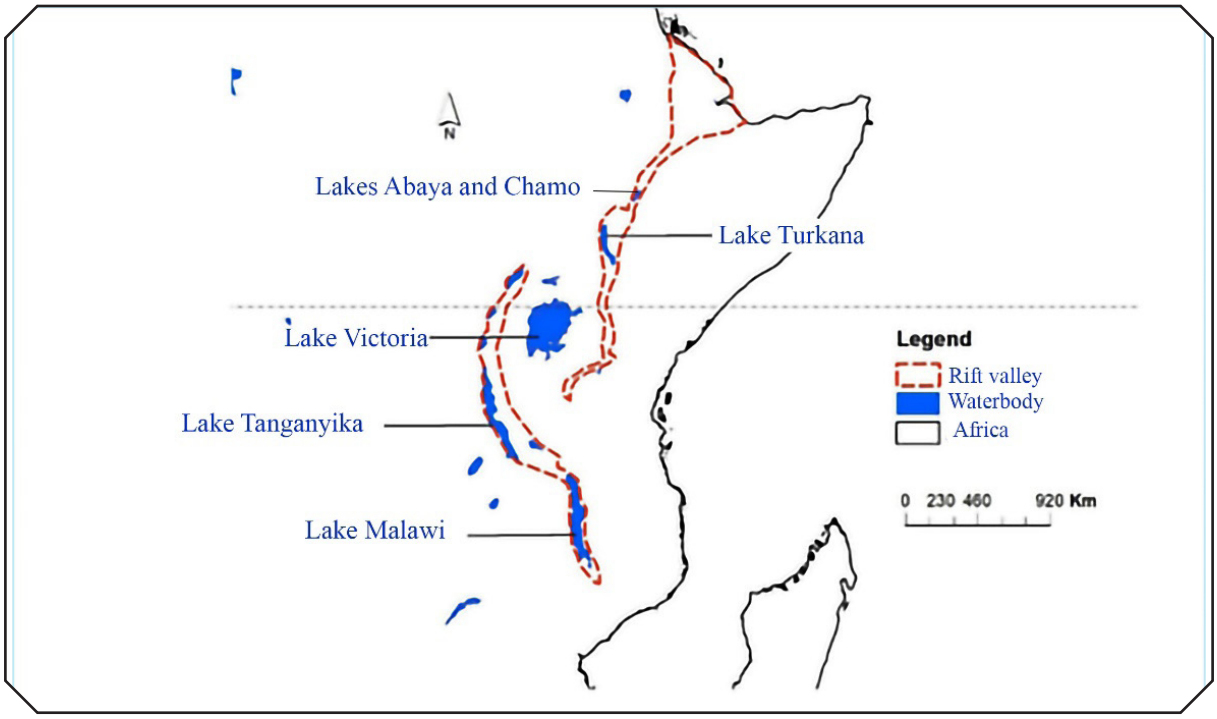


Figure 1.18: The Rift Valley and African Great Lakes

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

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

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

ii. The Ethiopian and Eritrean Highlands

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

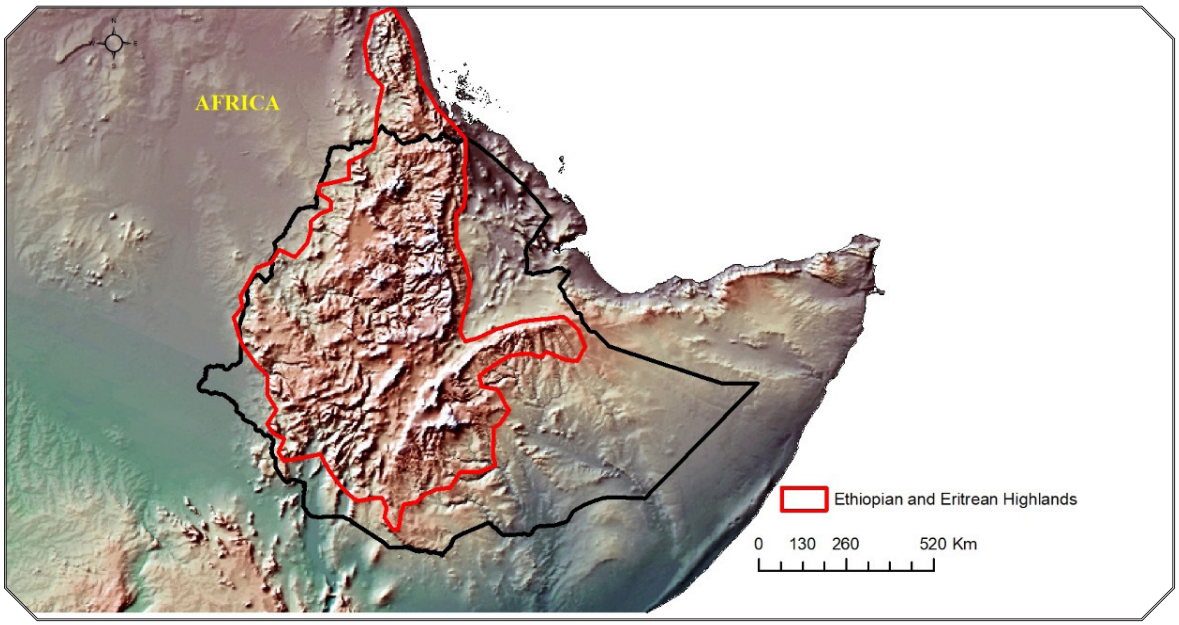


Figure 1.19: Ethiopian and Eritrean Highlands

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

Activity 1.12

1. Dear Learner! What is the role of Rift Valley in the classification of Ethiopia into different physiographic regions? Please try on the following spaces.

_____

_____

_____

Have you tried? If so, that is good. Now, let you continue studying about Southern Africa Platform in the subsequent paragraphs.

4. Southern Africa Platform

i. Mountains and Desert Systems of Southern Africa

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

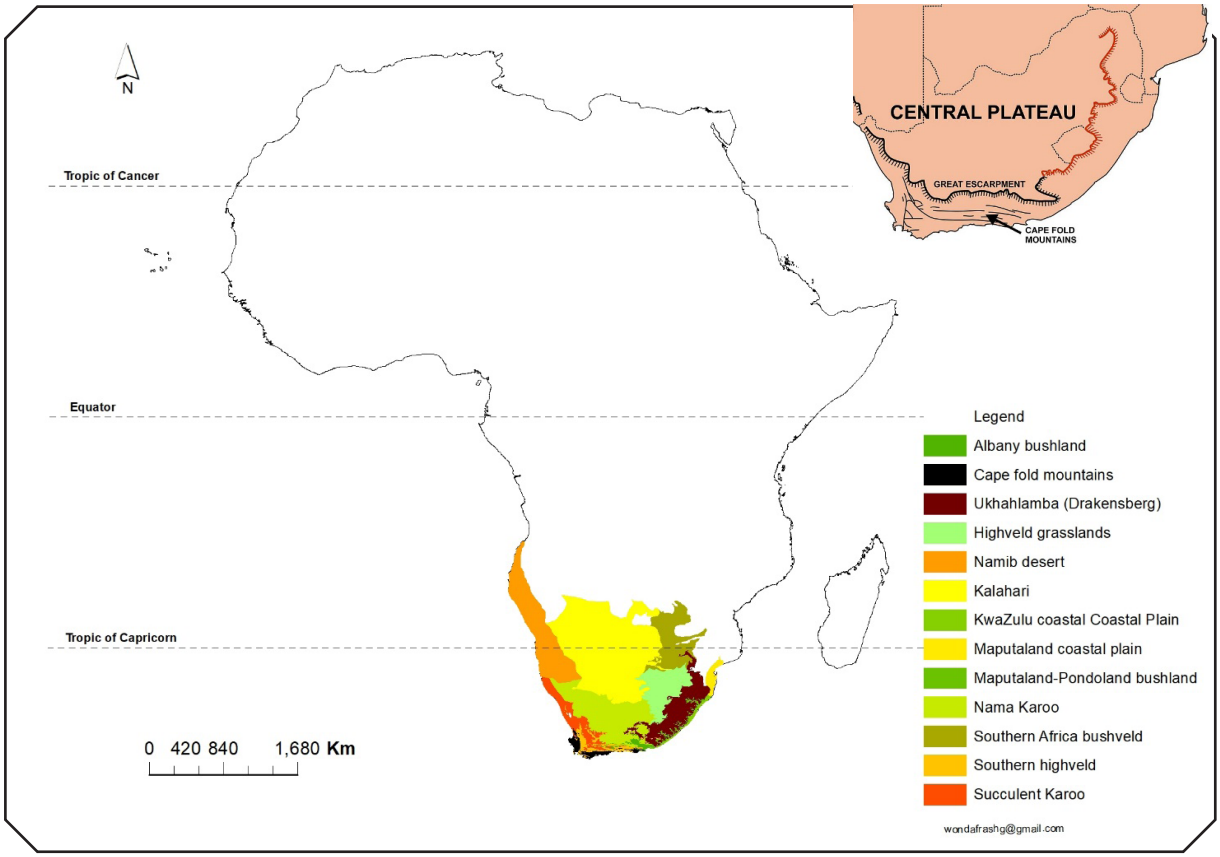


Figure 1.20: Landforms of Southern Africa

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

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

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

the Bushveld to the north. The highveld is home to some of the South Africa's most important commercial farming areas, as well as its largest concentration of metropolitan centers, especially the Gauteng conurbation, which accommodates one-third of South Africa's population.

The continuation of the **Great Escarpment** to the south separates the Highveld from KwaZulu-Natal. The southeastern portion of the Great Escarpment or the Ukhahlamba (Drakensberg) forms the boundary between KwaZulu-Natal and Lesotho.

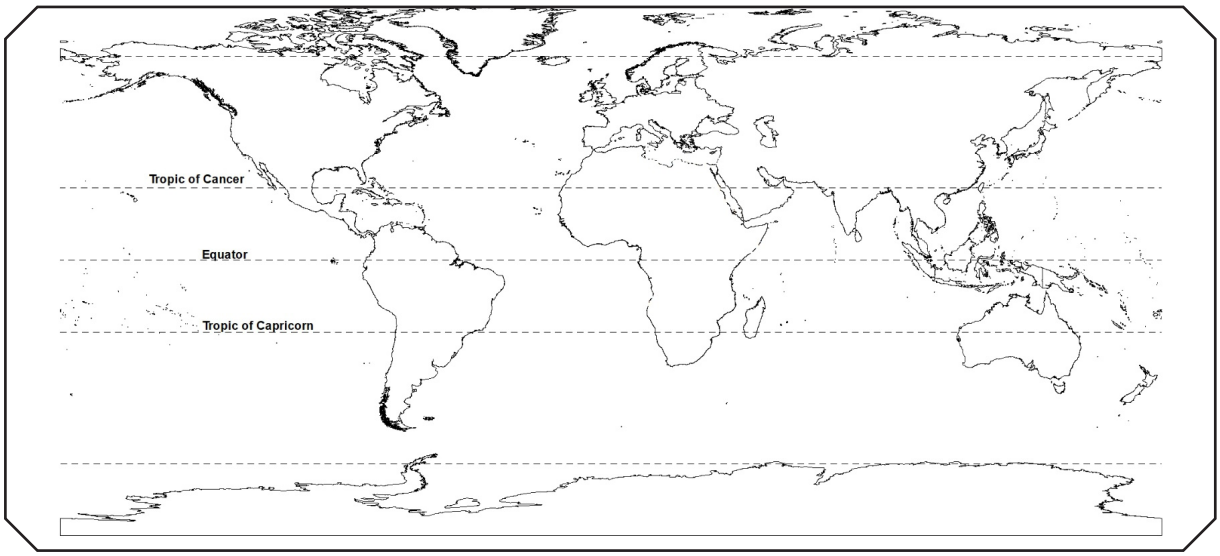


Figure 1.21: World Map for Exercises

Checklist

Put a tick mark (✓) in the boxes given to prove that you have understood the perspectives and issues of the section well.

I can:

- ☐ 1. explain the spatial variations and distributions of the major landforms in Africa
- ☐ 2. describe the effects of landforms on ecosystem pattern and processes
- ☐ 3. explain the importance of landforms for human beings
- ☐ 4. identify the major regions of landforms in Africa
- ☐ 5. locate the following landforms on a map of Africa
  - ☐ Atlas Mountains
  - ☐ The Sahara Desert
  - ☐ The Sahel
  - ☐ The Savanna
  - ☐ The Tropical Rainforest
  - ☐ The Rift Valley
  - ☐ Southern Africa Platform
- ☐ 6. describe the role of Rift Valley in the classification of Ethiopia into different physiographic regions

Is there any box that you didn't mark (✓) under it? If there is please go back to your text and read about it before you go to the following exercise

SELF-TEST EXERCISES SECTION 1.3

The following questions can help to study Section 1.3.

PART I: MULTIPLE CHOICE ITEMS

Direction: For the following questions, choose the correct answer from the given alternatives.

1. Which of the following is not the characteristics of the tropical rainforest of Africa?
   A. Confined to areas with equatorial climates both in the north and south of the equator
   B. Different plants exhibit different stages of growth at the same time, due to the absence of the climatic season.
   C. Some species of trees are xerophytic forms – adapted to the dry environment with small leaves and thorns
   D. Trees have little undergrowth, as the canopies of the tall trees prevent light penetration.

2. Which of the following is considered as the effect/s of landforms on ecosystem patterns and processes?

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

PART II: FILL IN THE BLANK SPACES ITEMS

Direction: Fill in the blank spaces with appropriate word(s).

3. _____ and are the two deserts that form a large part of southern Africa.
4. _____ are a mixture of sand and gravel, often described as desert pavement of pebbles on top of vast flat surfaced sheet of sand.

PART III: SHORT ANSWER QUESTIONS

Direction: Write short answer the following questions.

5. What are the major landforms of the world

   _____

   _____

6. Why is it important to study about landforms?

   _____

   _____

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

   _____

   _____

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

   _____

   _____

Resources for further reading

https://geography.name/africa-landforms-and-resources/
https://teaching.berkeley.edu/resources/course-design-guide/active-learning
https://cambriancollege.ca/glenn-crombie-centre/learning-strategy/
https://education.nationalgeographic.org/resource/africa-physical-geography/
https://education.nationalgeographic.org/resource/landform/
https://www.diva-gis.org/gdata
https://mapcruzin.com/free-africa-arcgis-maps-shapefiles.htm
Smithson, P., Addison, K., & Atkinson, K. (2008). *Fundamentals of the Physical Environment*: Fourth Edition (4th ed.). Routledge. https://doi.org/10.4324/9780203070123

UNIT SUMMARY

- Dear leaner! We hope you enjoyed the contents of the unit. Unit one examined the nature of Africa's landforms in detail. However, in order to have a better understanding of concepts related to landforms, an overview of the world's landforms was discussed. The major landforms of the world create very unique areas that people around the world want to know, explore and visit. Hence, landforms generally divide continents and countries into different physiographic regions or divisions.
- Landforms are the results of volcanic and tectonic processes or internal and external processes that make up landforms. These processes form major landforms of the world. Understanding landforms is very important because as part of a landscape, landforms greatly affect human perception and interactions with the environment.
- Africa has several recognizable major landforms. The landforms of our continent can broadly be categorized into four major regions – African Alpine System, African massif, East African Highlands and rift system and Southern Africa Platform. Each of the regions has a unique landform feature that distinguishes it from the others. The regions also vary in terms of the area they cover. Hence, the African Alpine System covers a small area compared to the African massif which covers a very large area of the continent.

SELF-ASSESSMENTS IN THE MODULE

Dear learner! You are an intrinsic part of the information sharing process for the success of your learning. Self-assessment is an effective report on the extent of taking responsibility for your learning. Hence, you should reflect on your learning for each section in the modules (Module 1 and 2). It will help your tutor to be involved in a number of ways, and assist you during the tutorial. However, before you respond to the self-assessment items, you need to be clear about: what you have learnt, whether you have used the learning strategies successful, and attempted all activities and self-test exercises.

Checklist

Put a tick mark (✓) in the boxes given to assess that helped you understand the concepts of the section well.

- ☐ 1. I feel good about the contents I learnt in the unit
- ☐ 2. I have used all the learning strategies given in the unit
- ☐ 3. I had a study plan and strictly followed it
- ☐ 4. I have identified questions or concepts I will ask the tutor
- ☐ 5. I frequently use a dictionary for new words
- ☐ 6. I have attempted all the activities and self-test exercises

Put a tick mark (✓) in the boxes given to prove that you have understood the perspectives and issues of the module well.

SELF – ASSESSMENT QUESTIONS OF THE UNIT

Part I: Determine whether each of the sentences below is True or False

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

Part II: Matching items.

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

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

Part III: Choose the correct answer

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

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

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

11. Which of the following is not the characteristics of the tropical rainforest of Africa?
    A. Confined to areas with equatorial climates both in the north and south of the equator
    B. Different plants exhibit different stages of growth at the same time, due to the absence of climatic season.
    C. Some species of trees are xerophytic forms – adapted to the dry environment with small leaves and thorns
    D. Trees have little undergrowth, as the canopies of the tall trees prevent light penetration.

12. Which of the following is considered as the effects of landforms on ecosystem patterns and processes:
    A. Landform attributes produce different patterns which determine the ecological potential of an area.
    B. Landform regions affect the flow of organisms, energy and material.
    C. Landform regions affect the spatial pattern of non-geomorphic disturbance by fire and wind.
    D. All

ANSWER KEY FOR SELF-TEST EXERCISES

I. Self-test exercises of section 1.1

PART I. TRUE OR FALSE ITEMS

1. True
2. True
3. True
4. True
5. False
6. True
7. False
8. True
9. True
10. False

II. Self-test exercises of section 1.2

PART I. MULTIPLE CHOICE

1. C
2. B
3. C

III. Self-test exercises of section 1.3

PART I. MULTIPLE CHOICE

1. C
2. D

PART II. FILL IN THE BLANK SPACES

3. Kalahari and Namib Deserts
4. *Reg*

PART III: SHORT ANSWER QUESTIONS

5. The major landforms of the world are mountains, plateaus, and plains.

6. The significance of the study of landforms is very diverse. The key significance of landforms is to have a basic understanding of the general configuration of landforms and the surface processes. It also helps us to improve and maintain the sustainability of our environment and predict and reduce the impact of contemporary earth surface processes that lead to natural hazards (such as land degradation).

7. Most of Africa's national parks are found in plain and mountains areas where endemic and other game animals are abundant.

8. The Rift Valley is the most important landform that divides Ethiopia into different physiographic regions. Hence, west of the rift valley is Western highlands and associated lowlands, and east of it is Southeastern highlands and associated lowlands.

ANSWER KEY FOR UNIT LEVEL SELF-TEST EXERCISES

PART I. TRUE OR FALSE ITEMS

1. True
2. False
3. True

PART II. MATCHING

4. E
5. A
6. B
7. F
8. D
9. C

PART III. MULTIPLE CHOICE

10. B
11. C
12. D

UNIT TWO

CLIMATE OF AFRICA

Unit Introduction

Required study time: 5 hours

Dear learner! In inunit one, you have learnt about landforms of Africa. In this unit, you will study about the climate of Africa. The first section of the unit presents the climate types or zones and regions of the world. In the second section, you will study the features of the climate of Africa. Dear learner, do you enjoy the climate of your local area? Great! Below are the key concepts you need to know about climate.

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

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

Unit Learning Outcomes

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

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

Unit Contents

The Required Study Time

Dear learn, on your study plan consider devoting adequate time for study, doing in text exercises and review questions. Therefore, please allocate 5 hours of study time for unit two.

Learning Strategies of Unit Two

Dear learner, your learning strategies of the unit should include:

- *reading,*
- *writing and taking notes,*
- *studying and remembering information,*
- *improving assignment and test performance,*
- *time management and organization, and*
- *self-advocacy (the ability to effectively communicate, convey, negotiate, or assert one's interests, desires, needs and rights).*

Section 2.1 Overview of World Climatic Regions and Types

Section Overview

Required study time: 2 hour

Dear learner, in this section you are going to study about the global climate. Do you know that global climate is a description of the climate of a planet, with all the regional differences averaged? The world has several climatic zones. Geographers and climatologists define the climatic region based on different climatic **elements**. In fact, the Earth's climate is driven by energy from the sun which arrives in the form of heat. Therefore, the description of the global climate refers to the climate of our planet or the Earth as a whole. It takes all the regional differences into account to calculate the average of the climatic conditions.

Section Learning Outcomes

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

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

Key terms

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

BRAINSTORMING QUESTION

1. Dear learner, why do you think scientists classify climates?

_____

_____

Have you tried the activity? Good. Now let's proceed to the concept of climate classification. Dear learner, do you enjoy the climate of your local area? Great! Below are the key concepts you need to know about climate.

2.1.1 Climate Classifications

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

Activity 2.1

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

_____

_____

_____

Have you tried the activity? That is great. There are various classification schemes used by climatologists for categorizing the world's climate into different regions. Perhaps the first attempt at climate classification was made by the ancient Greeks, who divided each hemisphere into three zones: torrid (tropical), temperate, and frigid. You can look at the illustration (See Figure 2.1).

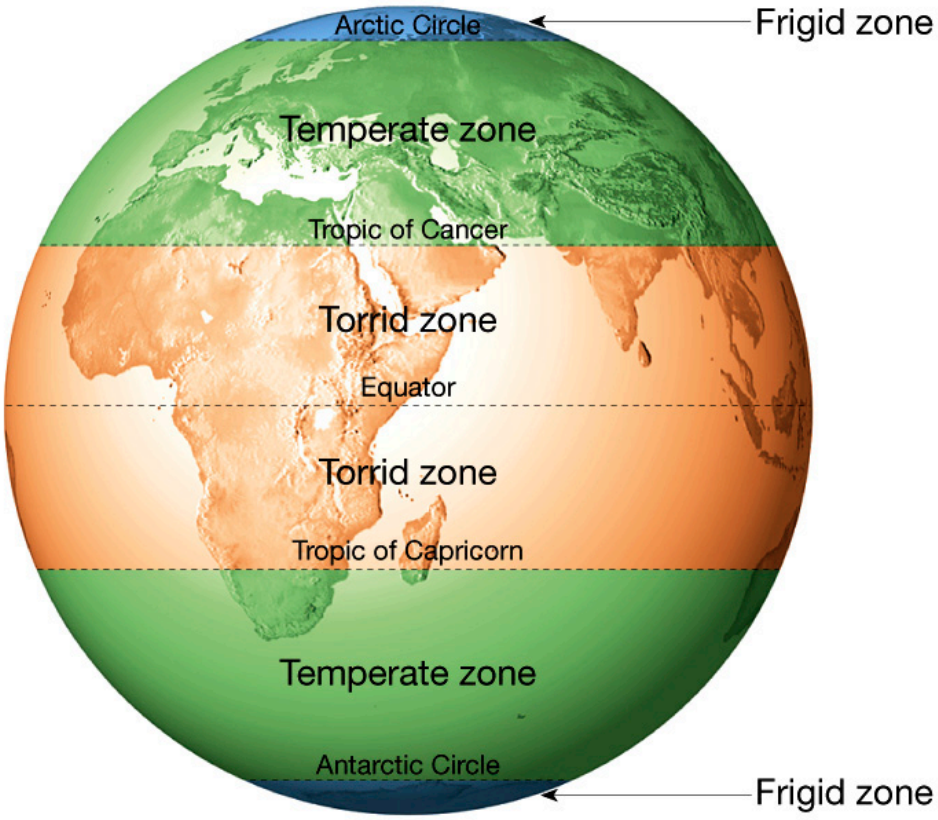


Figure 2.1: World Climate Zones according to Ancient Greeks

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

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

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

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

A (humid tropical), **B** (dry), **C** (humid middle-latitude, mild winters), **D** (humid middle-latitude, severe winters), **E** (polar), and **H** (highland). Four groups (A, C, D, E) are defined

by temperature. The fifth, (group B), has precipitation as its primary criterion, while **H** is determined by altitude.

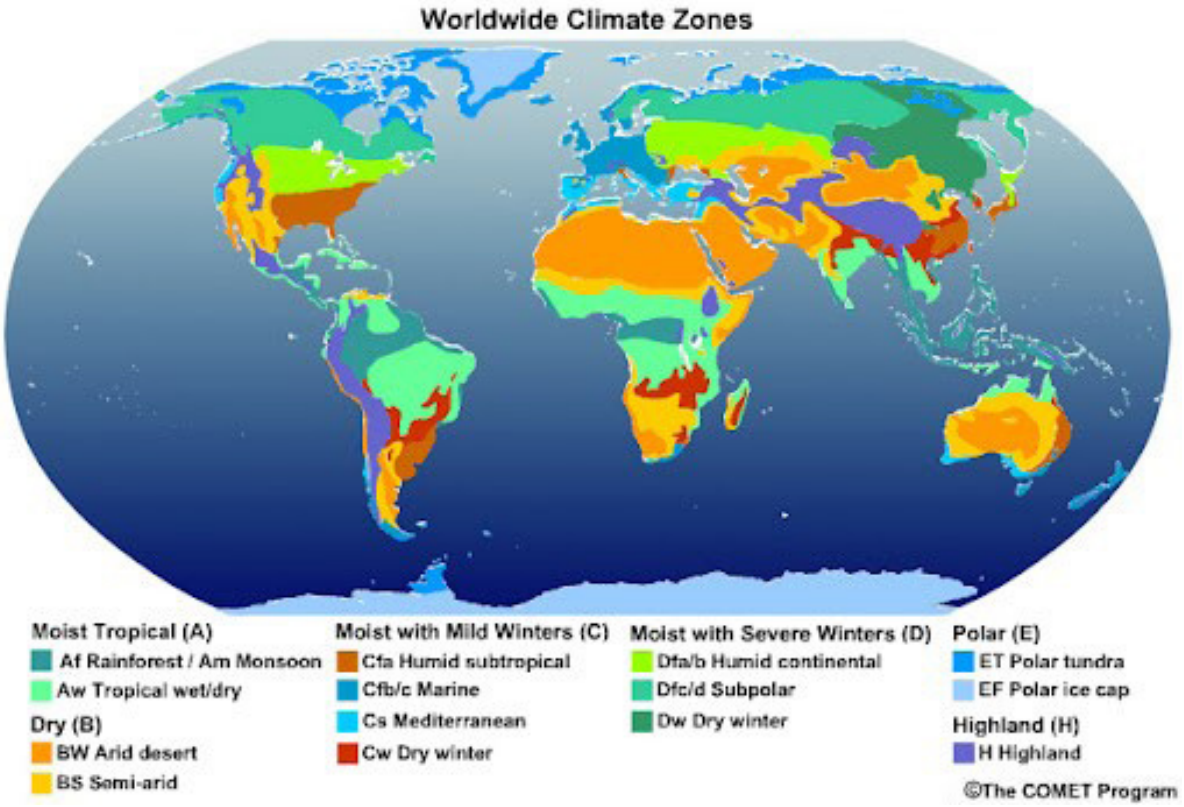


Figure 2.2: Map of Köppen's Five Principal Climate Groups

Activity 2.2

1. **Dear learner**, please prepare blank paper and list and describe the characteristics of each one of the climate types in Köppen's classification scheme. What other classification schemes do you know?

_____

_____

_____

Dear learner! Have you listed all the climate types in Koppen's classification scheme correctly? If so, that is very good. Let's now proceed to world climate zones and regions.

2.1.1. World Climate Zones and Regions

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

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

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

Dear learner! Have you understood how climatic conditions are formed? Good. Now let's identify the climate zones of the world.

There are four major global climate zones:

1. **Tropical Zone from 0° – 23$^{1}/_{2}$° (between the tropics)** - In the regions between the equator and the tropics (equatorial region), the solar radiation reaches the ground nearly vertically at noontime during almost the entire year. Thereby, it is very warm in these regions. Through high temperatures, more water evaporates and the air is often moist. The resulting frequent and dense cloud cover reduces the effect of solar radiation on the ground temperature.
2. **Subtropics Zone from 23.5° – 40°** - The subtropics receive the highest radiation in summer, since the Sun's angle at noon is almost vertical to the Earth, whilst the cloud cover is relatively thin. These regions receive less moisture (see trade winds), which increases the effect of radiation. Therefore, most of the deserts in the world are situated in this zone. In winter, the radiation in these regions decreases significantly, and it can temporarily be very cool and moist.
3. **Temperate Zone from 40° – 60°** - In the temperate zone, the solar radiation arrives at a lower angle, and the average temperatures here are much cooler than in the subtropics. The seasons and day length differ significantly in the course of a year. The climate is characterized by less frequent extremes, more regular distribution of the precipitation over the year and a longer vegetation period – therefore, it is named "temperate".
4. **Cold Zone from 60° – 90°** - The polar areas between 60° latitude and the poles receive less heat through solar radiation since there is a very low angle of the Sun. Because of the changes of the Earth axis angle to the Sun, the daylength varies most in this zone.

For instance, in the summer, polar days occur. Vegetation is only possible during a few months per year and even it is often sparse. The conditions in these regions make life very challenging.

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

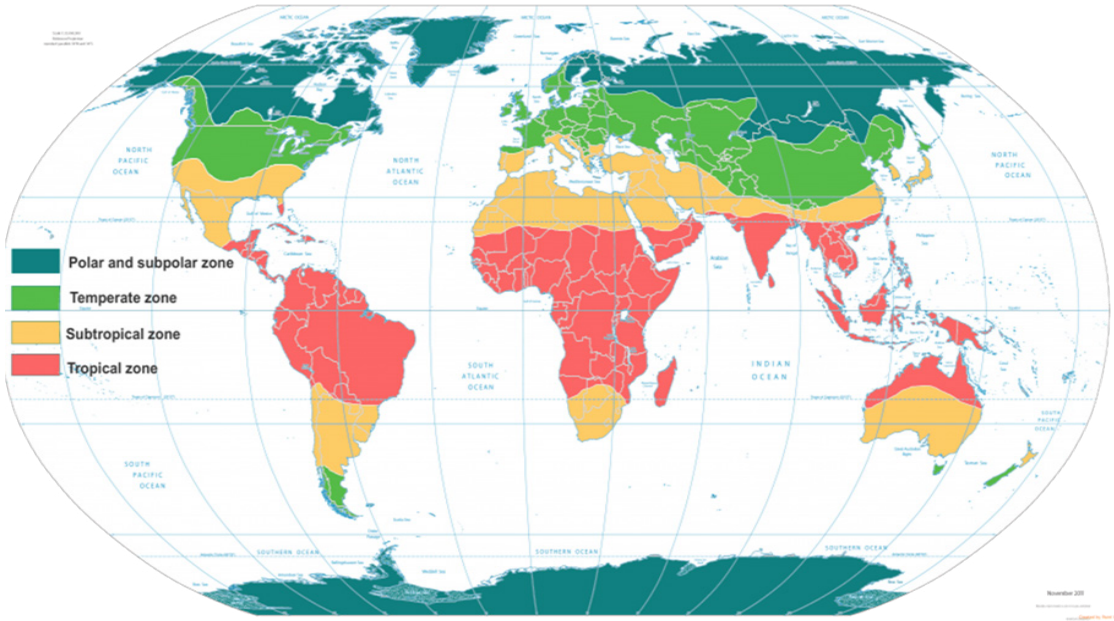


Figure 2.3: World Climate Zones

Checklist

Dear leaner! Now it is time to check whether you understood the contents of the section. Therefore, please put a tick mark (✓) in the boxes given to prove that you have understood the respective issues well.

I can:

- ☐ 1. identify the major climate types of the world
- ☐ 2. identify the major climate regions of the world
- ☐ 3. distinguish the different climate classification schemes of the world
- ☐ 4. explain the similarities and differences between climate and weather
- ☐ 5. describe the importance of climate classification
- ☐ 6. list all the principal climate groups of Koppen

Is there any box that you didn't put the mark (✓) under it? If there is any, please go back to the text and read about it before you go to the following exercise.

SELF-TEST EXERCISES OF SECTION 2.1

The following questions can help you to study Section 2.1.

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

1. Climate of an area can only be regarded as cool, cold, or warm based on an analysis of at least 30 years data.
2. Climate zones and climate regions are measures of climate similarity.
3. Climate classifications help people to know the types of conditions a region may usually experience.
4. According to Köppen the distribution of natural vegetation was the best expression of climate of an area.
5. Since it arises from the sun, solar radiation reaches the ground or the Earth's surface at the same angle.

Resources for further reading

Ackerman, S., & Knox, J. (2011). *Meteorology*. Jones & Bartlett Publishers.

Ahrens, C. D. (2015). *Meteorology today: an introduction to weather, climate, and the environment.* Cengage Learning Canada Inc.

Barry, R. G., & Chorley, R. J. (2009). *Atmosphere, weather and climate*. Routledge.

Section 2.2 Climate Types and Zones of Africa

Section Overview

Required study time: 1 hour

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

Section Learning Outcomes

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

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

Key terms

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

Dear learner, before you start reading the next content, please attempt the following question.

BRAINSTORMING QUESTION

1. Dear learner! Can we find all the entire world's climate in Africa?

_____

_____

Dear learner, you should realize that due to Africa's position across equatorial and subtropical latitudes in both the northern and southern hemisphere, several different climate types can be found within the continent.

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

Activity 2.3

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

_____

_____

_____

Dear learner! Have tried? That is great. Now compare your ideas with the following paragraphs. The equator runs through the middle of Africa, as do the Tropic of Cancer and the Tropic of Capricorn, making Africa the most tropical of all the continents. Africa's position is relatively

unique in the sense that it almost has a mirror image of climate zones to the north and south of the Equator with regard to latitude. When considered in detail, the movement of air masses and their effects provide the basis for a division of the continent into eight climatic regions. These are;

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

Activity 2.4

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

_____

_____

2.2.1. Types and Characteristics of Climate Zones in Africa

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

I. The Equatorial Climate Region

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

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

II. The Tropical Wet-and-Dry Region

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

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

Marked variations in the rhythm of the equatorial climates sometimes occur. For example, the rainfall may be monsoonal or the second rainy season may not exist at all. However, the most notable variation can be observed on the western African coast

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

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

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

climates. Clear and blue skies are the common characteristics of this climate region.

III. Semi-arid Climatic Region

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

IV. The Hot Desert Climatic Region

Hot deserts are places where there is little or no rainfall. The hot desert region consists of the Sahara and Kalahari deserts, which are always under the influence of dry continental tropical air masses, and the northern Kenya–Somali desert, the aridity of which is principally caused by the stable nature of the maritime air masses that pass over it throughout the year. The stability of these maritime air masses is induced by their passing over the cool body of water offshore. In addition to aridity, the desert climate is characterized by high mean monthly temperatures; the diurnal (daily) temperature range is, however, greater than the annual range of the mean monthly. The day time temperatures are extremely high; temperatures usually range between 30°C - 40°C, some places in the Sahara Desert experience above 40°C, the highest ever recorded temperature in the region, and also in the world, was 58°C in **Azizia**, Libya. At night, temperatures are very low, dropping to below 10°C. The skies are clear and because of this, the heat received from the sun during the day is quickly lost back into the atmosphere at night.

V. Humid Subtropical Climatic Region

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

VI. Mediterranean Climate Region

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

VII. The Warm Temperate East Coast Climate Region

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

VIII. Warm Temperate Continental Climate Region

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

IX. The Mountain Climatic Region

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

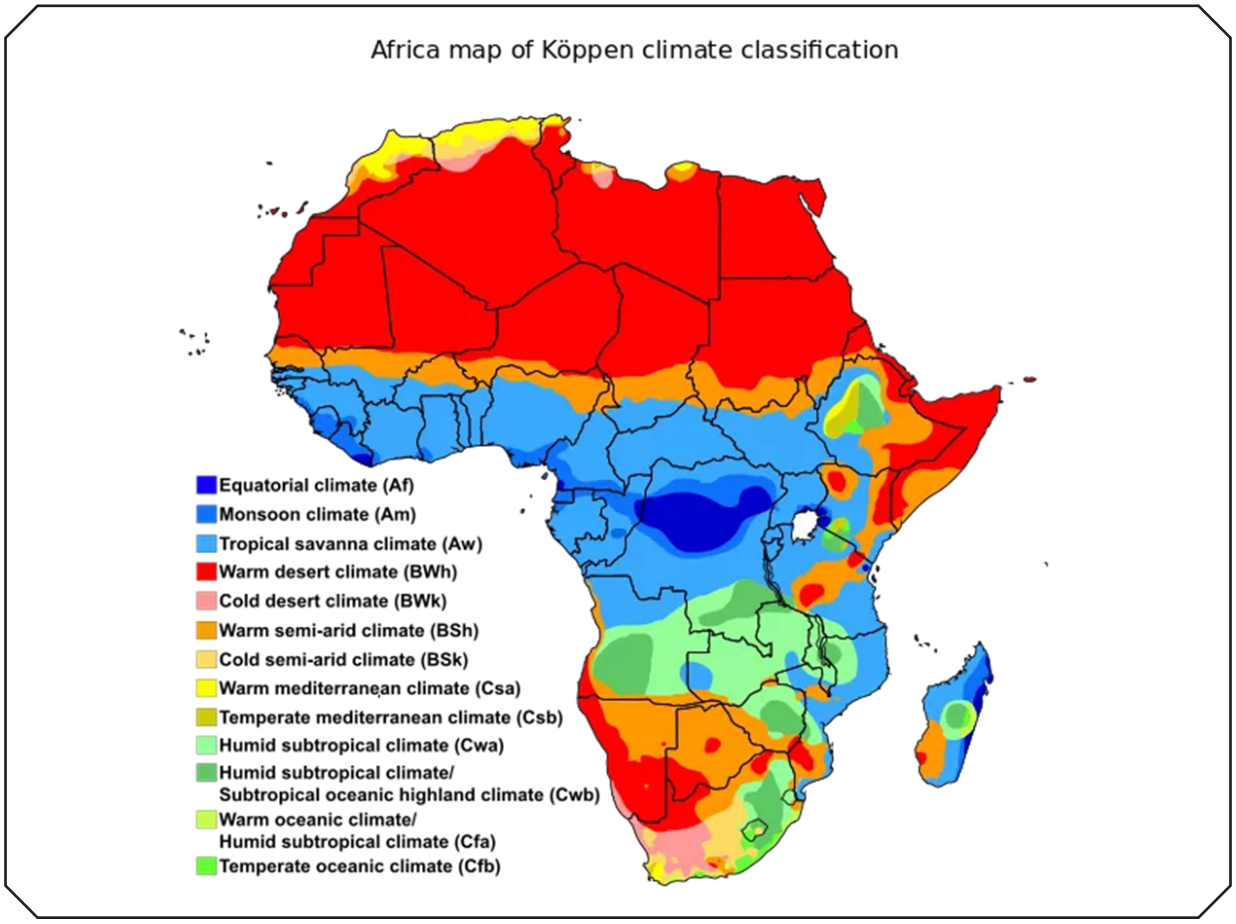


Figure 2.4: Climate Zones of Africa based on Köppen's Classification

2.2.2 Factors Controlling the Climate of Africa

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

Activity 2.5

1. Dear learner! Can you list the factors that control climate of Africa? How do these factors control the continent's climate? _____

_____

_____

_____

Have you tried? If so, that is great. Now compare with the following points.

These factors determine the amount of temperature and precipitation. Below is the description of each one of the factors.

1. Latitude and its influence on Solar Radiation received

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

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

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

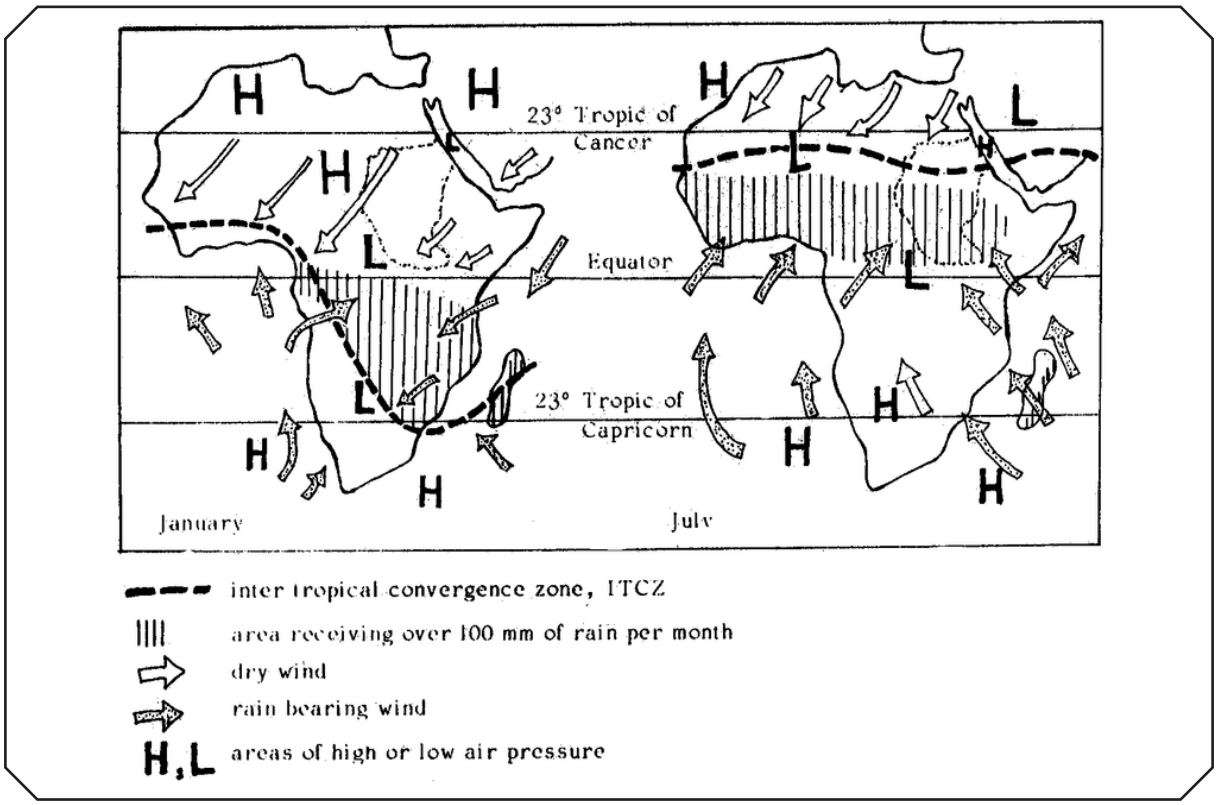


Figure 2.5: The Position of I.T.C.Z in Africa January and July

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

In **June**: the northern summer season, the ITCZ is located at about 13 degrees of latitude in North Africa at the southern boundary of the Sahara.

In **December**, the Northern winter season, the ITCZ moves southward along the West African Coast and to the northern and eastern margins of the **Congo** basin and continues to Madagascar.

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

3. Major Ocean Currents

Winds that tend to blow persistently over the ocean tend to drag a thin surface

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

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

4. Distribution of Land and Water

Large water bodies such as the oceans and huge lakes modify climates in adjacent lands. In the continental interior, where there are no large bodies of water, temperatures get **very warm** in summer or during the day. The land is solid, so it heats up more rapidly during the day. The compact nature of the land means that only a thin surface gets heated. As a result, heat absorbed into the thin layer of surface rocks is released very rapidly. The land surface is, therefore, **very cool** at night and in winter. The interior location does not also allow rainfall to reach such

places thereby creating warm, humid, hot and dry climates. These extremities in climate affect all states located in the interior of continents. Such climates are called **Continental Climates** as against **Maritime Climates** experienced on lands located along coasts. In places such as Timbuktu in Mali, the diurnal and annual ranges in temperature are very high because of continentality.

5. Altitude

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

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

Checklist

Dear learner! Now it is time to check whether you understood the contents of the section. Please, put a tick mark (✓) in the boxes given to prove that you have understood the perspectives and issues of the section well.

I can:

- ☐ 1. identify the major climate types and regions of the climate of Africa
- ☐ 2. explain the controls of climate of Africa
- ☐ 3. list the main climate regions of Africa
- ☐ 4. describe the types and characteristics of climate zone of Africa
- ☐ 5. explain the factors controlling the climate of Africa
- ☐ 6. discuss the role of the I.T.C.Z on the climate of Africa
- ☐ 7. identify the type of local climate I live in

Is there any box that you didn't put the mark (✓) under it? If there is any, please go back to the text and read about it before you go to the following exercise.

SELF-TEST EXERCISES SECTION 2.2

The following questions can help you to study Section 2.2.

PART I: MULTIPLE QUESTION ITEMS

Direction 1: Choose the correct answer from the given alternatives.

1. Which one of the following climatic type is missing in Africa?

   A. equatorial climate
   B. desert climate
   C. polar climate
   D. highland climate

2. Which one of the following false about the climate of Africa?
   A. Africa is the coldest continent
   B. Africa has the hottest summer climate
   C. Africa has the highest sunshine duration
   D. All of the above

PART II: MATCHING ITEMS

Direction 2: Match items listed under column 'A' with appropriate responses under column 'B'

column 'A'	column 'B'
3. Tropical Wet Climate	A. mainly limited to the interior of South Africa
4. the Tropical Wet-and-Dry Region	B. has cooler winter and hotter summer climate
5. Semi-arid Climatic Region	C. transition zone between the desert and tropical wet
6. Hot Desert Climatic Region	D. has the harmattan is a warm, and dry season
7. Humid Subtropical Climatic Region	E. common in the Equatorial region
8. Mediterranean Climate Region	F. the driest climate
9. Warm Temperate Continental Climate Region	G. characterized by rain shadow slopes
10. The Mountain Climatic Region	H. found in Eastern side of Africa between 20° and 35° north and south latitudes

Resources for further reading

Donald Ahrens, C., & Henson, R. (2015). *Meteorology today*: an introduction to weather, climate and the environment.

https://www.britannica.com/place/Africa/Climate

https://www.coursehero.com/study-guides/geophysical/controls-of-climate/

Section 2.3 Benefits of Climate for Life of People of Africa

Section Overview

Required study time: 1 hour

Dear learner, this section describes the benefits of climate to the peoples of Africa. Climate affects nearly every aspect of our lives from our food sources to our transport infrastructure; from what clothes we wear, to where we go for recreation. It has a huge effect on our livelihood, our health, and our future. People's settlement and living are hugely associated with climate types. For instance, some places are overpopulated due to the better climate and associated factors. On the other hand, regions of extreme climatic conditions like deserts, rainforests, and polar regions have fewer people.

Section Learning Outcomes

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

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

Key terms

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

BRAINSTORMING QUESTIONS

Dear learners, before you start reading the next content, please attempt the following questions.

1. How does the daily weather condition affect your life?

   _____

2. Can you list down five effects of climate on living things in your surrounding?

   _____

Activity 2.6

1. Dear learner! Please describe the benefits of climate to the life of the people of Africa in your notebook.

   _____

   _____

2. Do you think that climate has advantages and disadvantages on the life of the people of Africa?

   _____

   _____

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

Dear learner! Have you mentioned the benefits of climate on the lives of Africans? If so, that is great. Here you are going to study climate and its relations to physical and socioeconomic variables such as agriculture, health, and water resources in Africa.

2.3.1. Climate and Agriculture in Africa

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

2.3.2. Climate and Health in Africa

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

Humans have understood the importance of climate to human health since ancient times. In some cases, the connections appear to be obvious. For instance, a flood can cause drownings, a drought can lead to crop failure and hunger, and temperature extremes pose a risk of exposure. In other cases, the connections are obscured by complex or unobserved processes, such that the influence of climate on a disease epidemic or a conflict can be difficult to diagnose. In reality, however, all climate impacts on health are mediated by some combination of natural and human dynamics that cause individuals or populations to be vulnerable to the effects of a variable or changing climate.

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

2.3.3. Climate and Water Resources in Africa

Activity 2.7

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

   _____

   _____

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

Checklist

Dear leaner! Now it is time to check whether you understood the contents of the section. Therefore, please put a tick mark (✓) in the boxes given to prove that you have understood the respective issues well.

I can:

- ☐ 1. explain the benefits of climate for the life of people of Africa
- ☐ 2. describe the relationship between climate and agriculture in Africa
- ☐ 3. explain the relationship between climate and health in Africa
- ☐ 4. explain the relationship between climate and water resources in Africa

Is there any box that you didn't put the mark (✓) under it? If there is any, please go back to the text and read about it before you are going to do the following exercises.

SELF-TEST EXERCISES SECTION 2.3

The following questions can help you to study Section 2.3.

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

1. In Africa, people's settlements and lifestyles are hugely associated with climate types.
2. The deserts, and rainforests of Africa host the largest population density in the continent.
3. Africa is a continent with a diversity of climate landscapes, and agroecological zones.
4. Agriculture has always been deeply dependent on the weather in Africa or elsewhere in the world.
5. The Sub-Saharan Africa is a highly climate dependent region as marked by its dependence on rain-fed agriculture.
6. Africa is commonly described as a "climate-vulnerable" continent.
7. Water resources of Africa are heavily dependent on the types of climates and water availability.

Resources for further reading

Donald Ahrens, C., & Henson, R. (2015). *Meteorology today*: an introduction to weather, climate and the environment.

https://www.britannica.com/place/Africa/Climate

https://www.coursehero.com/study-guides/geophysical/controls-of-climate/

Conway, G. (2009). The science of climate change in Africa: impacts and adaptation. *Grantham Institute for Climate Change Discussion Paper*, *1*, 24.

https://education.nationalgeographic.org/resource/africa-resources/

Section 2.4 Climate Change and its Challenges to Africa's Development Vision

Section Overview

Required study time: 1 hour

Dear learner! This section describes the challenges that climate change poses to Africa's development. Climate change in Africa is an increasingly serious threat for Africans because Africa is among the most vulnerable continents to climate change. Anthropogenic climate change is already a reality in Africa, as it is elsewhere in the world. According to the Intergovernmental Panel on Climate Change (IPCC), the vulnerability of Africa to climate change is driven by a range of factors that include weak adaptive capacity, high dependence on ecosystem goods for livelihoods, and less developed agricultural production systems. The risks of climate change on agricultural production, food security, water resources and ecosystem services will likely have increasingly severe consequences on lives and sustainable development prospects in Africa.

Section Learning Outcomes

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

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

Key terms

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

BRAINSTORMING QUESTIONS

Dear learners, before you start reading the next content, please attempt the following questions.

1. What is anthropogenic caused climate change?

   _____

2. What is the similarity and difference between climate change and climate variability?

   _____

Have you tried? If so, that is great. Now read the following paragraph.

In many cases, climate variability and climate change are interchangeably used. However, there is a clear demarcation between the two. Climate variability may be due to natural internal processes within the climate system or to variations in anthropogenic (caused by human)

external forcing. In other words, climate variations occur with or without our actions. It is critical to assess precisely which human actions affect climate and those that do not. Climate change, on the other hand, is a change in the state of the climate system, identified by changes in the average conditions and the variability of its properties, that persists for an extended period, typically decades or longer, due to natural and/or anthropogenic processes and drivers.

Activity 2.8

1. Dear learner! Have you understood climate change? How does climate change affect Africa's development vision?

_____

_____

_____

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

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

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

Resources for further reading

Donald Ahrens, C., & Henson, R. (2015). *Meteorology today*: an introduction to weather, climate and the environment.
https://www.britannica.com/place/Africa/Climate
https://www.epa.gov/climatechange-science/causes-climate-change
https://www.coursehero.com/study-guides/geophysical/controls-of-climate/
https://iri.columbia.edu/our-expertise/climate/climate-variability/
https://education.nationalgeographic.org/resource/africa-resources/

Checklist

Dear leaner! Now it is time to check whether you understood the contents of the section. Therefore, please put a tick mark (✓) in the boxes given to prove that you have understood the respective issues well.

I can:

- ☐ 1. differentiate climate change and climate variability
- ☐ 2. explain the major challenges of climate change on African development vision
- ☐ 3. explain the importance of adaptation to climate change
- ☐ 4. explain why Africa is most vulnerable to climate change

SELF-TEST EXERCISES SECTION 2.4

The following questions can you help to study Section 2.4.

PART I: SHORT ANSWER QUESTIONS

Direction: Write short answers to the following questions.

1. List and describe the potential impacts of climate change on Africa's population.
2. Why does adaptation to climate change important in Africa?
3. Africans have been seriously affected by climate change than any other continent in the world. What do you think are the reasons?

UNIT SUMMARY

- Dear learner, we hope you enjoyed the contents of the unit. Unit two started by differentiating weather and climate. The two terms are essential concepts that are interchangeably used in the scientific study of climate. However, there is a clear boundary in meaning between the two. Weather refers to a short-term atmospheric condition – for example, the temperature and precipitation on a certain day, the state of the atmosphere with respect to heat or cold, wetness or dryness, calm or storm, clearness or cloudiness. On the other hand, a climate is an average of weather conditions in a place over a long period of time – 30 years or more. A climate, however, is more than just a generalization of weather, it includes extreme events and probabilities, and it is the sum of all statistical weather information describing a place or region.
- There are various classification schemes used by climatologists for categorizing the world's climate into different regions. The ancient Greeks classified the world's climates into three: torrid, temperate, and polar. Later, since the beginning of the twentieth century, however, many climate-classification schemes have been devised that used long-term records of temperature and precipitation.
- The most widely used and popular climate classification scheme is developed by the German Climatologist and Botanist Wladimir Köppen (1846-1940). Köppen classified the world climate regions into five. He used temperature for four of the climate regions and precipitation for the fifth one. In general, there are 4 (four) major global climate zones; namely the Tropical zone from 0°– $23^1/_2$° (between the tropics), the Subtropics from $23^1/_2$°– 40°, the Temperate zone from 40°–60°, and the Cold zone from 60°–90°. The characteristics of the climate zones change with great altitude differences within a small area, like in mountain areas, since temperatures decrease rapidly with altitude.
- The climate of Africa is characterized by a range of climates such as the equatorial climate, the tropical wet and dry climate, the tropical monsoon climate, the semi-arid climate (semi-desert and steppe), the desert climate (hyper-arid and arid), and the subtropical highland climate. The equator runs through the middle of Africa, as do the Tropic of Cancer and the Tropic of Capricorn, making Africa the most tropical of all the continents.
- Its position is relatively unique in the sense that it almost has a mirror image of climate zones to the north and south of the Equator with regard to latitude. There are a number of factors that influence the climate of the African continent. These include the angle of the sun, latitude, air pressure, wind system and the ICTZ, major ocean currents, land and water (maritime versus continental) influence, and altitude. These factors determine the amount of temperature and precipitation.
- The movement of air masses and their effects provide the basis for a division of the continent into eight climatic regions. These are the equatorial (tropical wet), semiarid, tropical wet-and-dry, hot desert, Mediterranean, humid subtropical marine, warm

temperate upland, and mountain regions.

- Climate affects nearly every aspect of our lives from our food sources to our transport infrastructure; from what clothes we wear, to where we go for recreation. It has a huge effect on our livelihood, our health, and our future. People's settlement and living are hugely associated with climate types. However, climate change in Africa is an increasingly serious threat for Africans as Africa is among the most vulnerable continents to climate change. Many climate models predict the negative impacts of climate change on agricultural production and food security in large parts of sub-Saharan Africa (SSA).
- As far as development is concerned, climate change will have a strong impact on Africa's ability to achieve the Millennium Development Goals (MDGs) and the Africa 2063 goal and on its development policies in general, with increased pressure on agriculture, water supply and demand, health, and political stability. One of the most important reasons for this is the continent's low adaptive capacities to withstand the ever-changing climate conditions.

SELF-ASSESSMENT QUESTIONS OF THE UNIT

PART I: MULTIPLE CHOICE ITEMS

Direction: For the following questions, Choose the correct word or phrase from the given alternatives.

1. Which one of the following is not among the common classification of world broad climatic conditions?

   A. Hot climates
   B. Warm climates
   C. Cool climates
   D. Cold climates
   E. None of the above

2. Which one of the following factors most affects the climate of East Africa?

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

3. 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

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

   A. Nearly 2/3rd of Africa lies within the tropics.
   B. Africa gets much of its rainfall in the winter season.
   C. The Mediterranean climatic region has mild wet winters.
   D. Eastern Africa is characterized by the Great Rift Valley system.
   E. Africa has a short smooth coastline, which contributes to the fact that its shape is compact.

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

   A. Warm Mozambique current
   B. Cool Benguela Currents
   C. Warm Guinea Currents
   D. None of the above

PART II: SENTENCE COMPLETION ITEMS

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

6. _____ is the climatic region found along the southeast coast of Africa.
7. The wettest climatic region in Africa is _____
8. In March, the ITCZ is located around _____
9. Rainfall in the Mediterranean climatic region is brought by the_____ winds.
10. The climate of the equatorial and tropical highlands of Africa is highly dominated by _____.
11. The most dominant type of rainfall in equatorial Africa is _____.
12. The Mediterranean type of climate is located in the _____ and _____ Africa.

PART III: SHORT ANSWER ITEMS

Direction: Give a short Answer to the following questions.

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

    _____

    _____

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

    _____

    _____

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

_____

_____

_____

ANSWER KEY FOR SECTION LEVEL SELF-TEST EXERCISES

I. Self-test exercises of section 2.1

PART I. TRUE OR FALSE ITEMS

1. True
2. False
3. True
4. True
5. False

II. Self-test exercises of section 2.2

PART I. MULTIPLE CHOICE

1. C
2. B

PART II. MATCHING

3. E
4. D
5. C
6. F
7. H
8. B
9. A
10. G

III. Self-test exercises of section 2.3

PART I. TRUE OR FALSE ITEMS

1. True
2. False
3. True
4. True
5. True
6. True
7. True

IV. Self-test exercises of section 2.4

PART I. SHORT ANSWER

1. List and describe the potential impacts of climate change on Africa's population.

Increasing temperatures and sea levels, changing precipitation patterns and more extreme weather are threatening human health and safety, food and water security and socio-

economic development in Africa. Moreover, Climate change has a growing impact on the African continent, hitting the most vulnerable hardest, and contributing to food insecurity, population displacement and stress on water resources.

2. Why does adaptation to climate change important in Africa?

The current and projected severe impacts of climate change in Africa make adaptation an urgent priority. This is because, climate change is one of the greatest environmental, social and economic threats facing Africa. The impact of climate change is more serious on the world's poorest countries, most of which are found in Africa. Poor people already live on the frontlines of pollution, disaster, and degradation of resources and land.

3. Africans have been seriously affected by climate change than any other continent in the world. What do you think are the reasons?

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

UNIT THREE

NATURAL RESOURCE BASE OF AFRICA

Unit Introduction

Required study time: 7 hours

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

Natural resources are parts of the environment that people can extract and exploit or use. The natural resources provide fundamental life support in the form of both **consumptive** use and **public-good** services. However, the sustainable and wise use of natural resources is more important than the existence of the resources.

The major life sustaining resources of the world are: water, soil, forest, minerals, and oil. In this unit you will also study the major resource bases of Africa. Hence, the drainage basins of Africa, and its water resources, soils and mineral resources, vegetation and wildlife will be discussed in detail.

Unit Learning Outcomes

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

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

Unit Learning Strategies

Dear learner, the following learning strategies are suggested for your study:

- *Reading;*
- *writing and taking notes;*
- *studying and remembering information;*
- *improving assignment and test performance;*
- *time management and organization; and*
- *self-advocacy (the ability to effectively communicate, convey, negotiate, or assert one's interests, desires, needs and rights).*

Unit Contents

The Required Study Time

Dear learner! On your study plan consider devoting adequate time for study, doing in text exercises and answering review questions. Therefore, please allocate 7 hours of study time for unit three.

Section 3.1 Overview of Major Natural Resources of the World

Section Overview

Required study time: 1.30 hours

Dear learner! In this section you will study natural resources. Natural resources are parts of the environment that people **can** extract and exploit (use or manipulate to their advantage). People do not make natural resources. They gather natural resources from the environment. Natural resources are categorized into two types: **renewable** and **nonrenewable** resources. Renewable resources can be replenished by natural processes as quickly as humans use them. Examples of renewable resources include *sunlight* and *wind*. Whereas nonrenewable resources are natural resources that exist in ***fixed amounts*** and can be used up sometime in the future. Examples include fossil fuels like petroleum and coal.

Section Learning Outcome

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

- *describe the major natural resources of the world, and*
- *Identify renewable and nonrenewable natural resources.*

Key terms

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

BRAINSTORMING QUESTION

1. Dear learner! How important is a natural resource? What are some common natural resources found in your local area?

_____

_____

Have you tried the activity? If so, that is good. Now let us see how our planet is endowed with natural resources. The earth has huge supplies of natural resources that everyone on it needs to survive. However, the world peoples biggest challenge is to use the resources without destroying or degrading their environment. Hence, the biggest quality of life and survival of the world's population depend on its citizens' ability to sustainably use the resources, rather than abuse them.

Activity 3.1

1. Dear learner! Categorize the following natural resources into **renewable** and **nonrenewable**.

Wood, water, iron, oil, hydroelectricity, uranium and, the energy of the wind and sun

Renewable	Nonrenewable

Have you done this activity? If so, that is great. Dear learner, ideally, the **sustainable** use of resources is very important. Sustainable use of natural resources refers to the use of resources in a way and at a rate that does not lead to the **long-term degradation** of the environment, thereby maintaining its **potential** to meet the needs and aspirations of present and future generations. It is a way that meets the needs of the present and also preserves the resources for future generations.

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

Key Strategies for Sustainable Natural Resource Management

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

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

3.1.1. The Major Natural Resources of the world

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

i. Water

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

Activity 3.2

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

Have you listed down? Good. While it is technically a renewable resource, the amount of fresh or drinkable water is very small in amount. There is only about 2.5% freshwater from the total amount of water on Earth. Most of the freshwater cannot easily be accessed since it is found underground or in the form of ice and snow in remote areas. In addition, the water in seas and oceans is **saline** hence, it cannot be directly used for household use or drinking purposes. Of course, there are systems in place to purify non-drinkable water into water safe for consumption through filtration methods.

Table 3.1: The Earth's Water Resources

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

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

Activity 3.3

1. Dear learner! From the table above, extract freshwater sources of the world and list down measures for their effective utilization below.

Freshwater sources	Measures for effective utilization

Have you done the activity? If so, that is good. Now let you continue studying other resources about air.

ii. Air

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

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

Activity 3.4

1. Dear learner! Write some concrete examples of how you can reduce air pollution (your roles). _____

   _____

   _____

Have you done the activity? If so, that is good. Now let you continue studying other resources about soil.

iii. Soil

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

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

iv. Forest

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

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

v. Minerals

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

Activity 3.5

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

_____

_____

_____

vi. Oil

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

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

Checklist

Dear leaner! Now it is time to check whether you understood the contents of the section. Therefore, please put a tick mark (✓) in the boxes given to prove that you have understood the respective issues well.

I can:

- ☐ 1. describe the major natural resources of the world
- ☐ 2. explain the importance of natural resources
- ☐ 3. distinguish the difference between renewable and nonrenewable resources
- ☐ 4. explain the importance of freshwater in the world
- ☐ 5. discuss the role of sustainable use of natural resources

Is there any box that you didn't put the mark (✓) under it? If there is any, please go back to the text and read about it before you go to the following exercise.

SELF-TEST EXERCISES OF SECTION 3.1

The following questions can help you to study Section 3.1.

PART I: MULTIPLE CHOICE ITEMS

Direction: For the following Questions, choose the correct word or phrase from the given alternatives.

1. Which of the following is not a natural resource?

   A. Car
   B. Soil
   C. Forest
   D. Mineral

2. Which of the following can be categorized as a **nonrenewable** natural resource?

   A. timber
   B. wind
   C. solar radiation
   D. coal

3. One of the following can be a solution to the degradation of the environment.

   A. resource destruction
   B. sustainable use of resources
   C. unwise use of resources
   D. all of the above

4. The percentage share of freshwater on the earth accounts;

   A. 71%
   B. 29%
   C. 96.5%
   D. 2.5%

5. One of the following is true about air as a natural resource.

   A. It is needed by some living things.
   B. It is a nonrenewable resource.
   C. It holds moisture and hence regulates temperature.
   D. Air is the same as oxygen.

Resources for further reading

https://www.usgs.gov/special-topics/water-science-school/science/how-much-water-there-earth
https://www.conserve-energy-future.com/list-10-natural-resources.php
https://earthandhuman.org/list-of-natural-resources/
https://www.worldatlas.com/articles/what-are-natural-resources.html

Section 3.2 Major Drainage and Water Resources in Africa

Section Overview

Required study time: 1.30 hours

Dear learner! In this section you will study about major drainage and water resources in Africa. A drainage basin is an area of land where surface water from rain converges to a single point at a lower elevation. This usually appears at the exit of the basin where the main river joins another water body such as a river, lake, reservoir, estuary, wetland, sea, or ocean. Meanwhile, a watershed refers to a divide that separates one drainage area from another drainage area (see figure 3.1). Other terms that are alternatively used to describe a **drainage basin,** are catchment, catchment area, catchment basin, drainage area, river basin and water basin. A drainage basin also consists of parts such as tributaries, confluences and an outlet.

Section Learning Outcomes

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

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

Key terms

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

BRAINSTORMING QUESTION

1. Dear learner! Is there a watershed in your local area? What are some big river basins in Ethiopia? Please list on the space provided below.

_____

_____

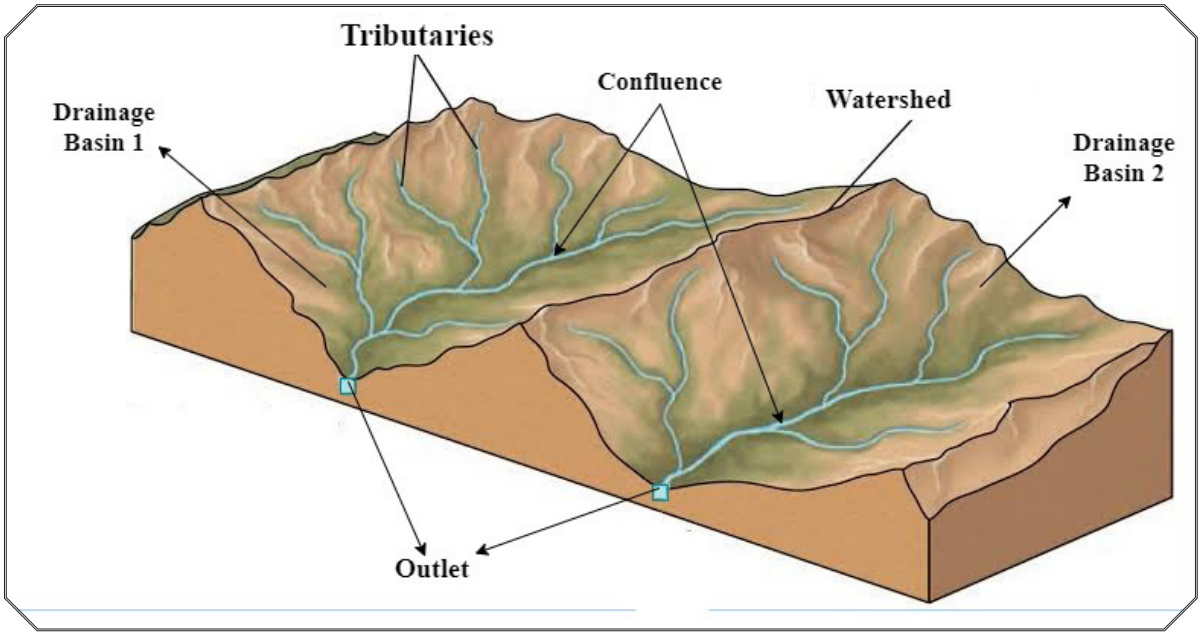


Figure 3.1: Drainage Basin and its Parts

There are six major drainage basins in Africa, which together cover over half of the African continent. Most large river basins in Africa are transboundary (pass through more than one country), historically forming the borders between neighboring countries.

The Major Drainage Basins of Africa

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

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

Figure 3.2: Major Drainage Basins of Africa

3.2.1. The Nile Basin

The Nile is about 6,650 kilometers long making it the longest river in the world. Its main headstream rises from Lake Victoria in Tanzania and Uganda and the left-wing tributary called **White Nile**. While the rightwing tributary of the Nile originates in Ethiopia and contributes the largest amount of the Nile's water. Eighty-six percent (86%) of Nile water comes from Ethiopia. The main right-bank tributaries are the Baro River, the Abbay (Blue Nile) River, and the Tekeze River. These rivers meet in Sudan and flow into Egypt, finally emptying into the Mediterranean Sea.

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

The Nile Basin Countries

The Nile basins contain 11 countries, these are:

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

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

Activity 3.6

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

_____

_____

_____

Have you tried? That is good. Now, let you read about the Congo Basin on the paragraph below.

3.2.2. The Congo Basin

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

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

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

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

The Congo is an important navigational system in Africa. Within the territorial limits of the Democratic Republic of the Congo alone, there are some 14,000 km of navigable waterways. Unlike other rivers of Africa, the Congo is accessible in all seasons due to its high volume of water content. In addition, because large sections of the river basin lie above and below the equator, its flow is stable, and at least one river experiences a rainy season. Hence, river transport remains essential for communications with regions that are inaccessible by road transport.

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

Activity 3.7

1. Dear learner! What similarities and unique differences can you identify between the Congo and Nile Basins?

3.2.3. The Niger Basin

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

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

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

Activity 3.8

1. Dear learner! What unique differences can you identify between the Nile Basin and Niger Basin?

_____

_____

_____

3.2.4. The Zambezi Basin

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

Figure 3.4: Victoria Waterfall

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

Activity 3.9

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

_____

_____

_____

3.2.5. The Orange Basin

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

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

3.2.6. The Chad Basin

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

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

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

Activity 3.10

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

_____

_____

_____

Problems facing African Water Resources Utilization and its solutions

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

Checklist

Dear leaner! Now it is time to check whether you understood the contents of the section. Therefore, please put a tick mark (✓) in the boxes given to prove that you have understood the respective issues well.

I can:

- ☐ 1. describe the major drainage systems and water resources of Africa
- ☐ 2. describe parts of the drainage basin
- ☐ 3. list the major drainage basins of Africa
- ☐ 4. enumerate the countries in the Nile basin
- ☐ 5. discuss the main uses or potentials of the river basins in Africa
- ☐ 6. explain problems facing African water resources utilization and forward solutions to the problems

Is there any box that you didn't put the mark (✓) under it? If there is any, please go back to the text and read about it before you go to the following exercise.

SELF-TEST EXERCISES OF SECTION 3.2

The following questions can help you to study Section 3.2

PART I: MATCHING ITEMS

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

"A"	"B"
1. Has a tributary called the Vaal River	A. Nile basin
2. Hosts the Victoria Falls	B. Congo basin
3. The largest river basin in western Africa	C. Niger basin
4. The second largest river by volume in the world	D. Orange basin
5. The longest river in the world	E. Zambezi basin

Resources for further reading

https://www.usgs.gov/special-topics/water-science-school/science/how-much-water-there-earth

https://www.grida.no/resources/5176

Barron, Jennie & Noel, Stacey & Soussan, John & Rockström, Johan. (2023). *Water and Poverty Linkages in Africa.*

Section 3.3 Main Types of Soils and Mineral Resources in Africa

Section Overview

Required study time: 2 hours

Dear learner, in this section, you will study about the soils and mineral resources of Africa. Soil is a complex mixture of weathered minerals, organic and inorganic compounds, living organisms, air and water. Soil is a product of their interactions. Soil forming processes are dependent on these interactions. Processes are generally significant up to 1-2 meters below the ground surface. The material below this depth is known as the soil **parent material**. Soil also has a number of key environmental, social and economic functions that are vital to life on Earth. It supplies water and nutrients to plants, and at the same time soil protects water supplies by storing, buffering and transforming pollutants. Soil is the medium that enables us to grow our food, natural fiber and timber and it supports wildlife habitats. Soil is also a habitat that provides raw materials, preserves past history and reduces the risk of floods. Without soil, the planet would not function.

Africa contains an enormous wealth of mineral resources, including some of the world's largest reserves of fossil fuels, metallic ores, and gems and precious metals. This richness is matched by a great diversity of biological resources that includes the intensely rich equatorial rainforests

of Central Africa and the world-famous populations of the wildlife of the eastern and southern portions of the continent.

Section Learning Outcomes

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

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

Key terms

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

BRAINSTORMING QUESTION

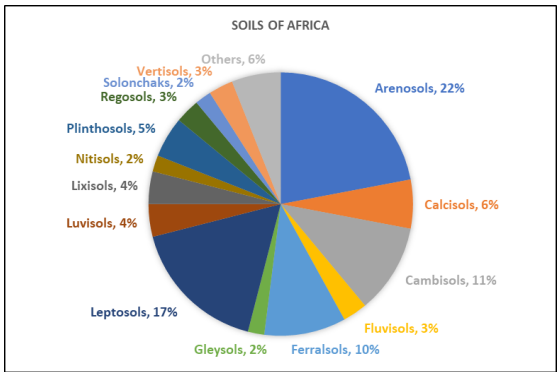
Dear learners, before you start reading the next paragraphs, please attempt the following question

1. Have you ever considered soil as a natural resource? _____

_____

3.3.1. Soils of Africa

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



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

Figure 3.5: Soils of Africa

Based on the areas they cover the major soil types of Africa are arenosols, leptosols, cambisols,

ferralsols, and calcisols. The distribution and characteristics of the soils are discussed below.

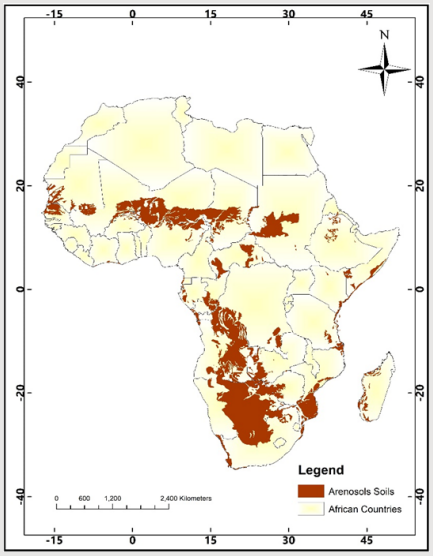


Figure 3.6: Distribution of Arenosols in Africa

1. Arenosols

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

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

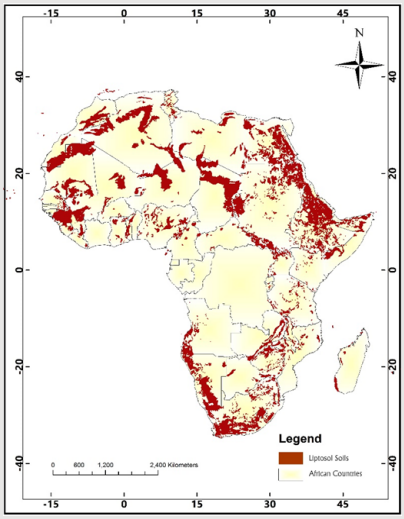


Figure 3.7: Distribution of Leptosols in Africa

2. Leptosols

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

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

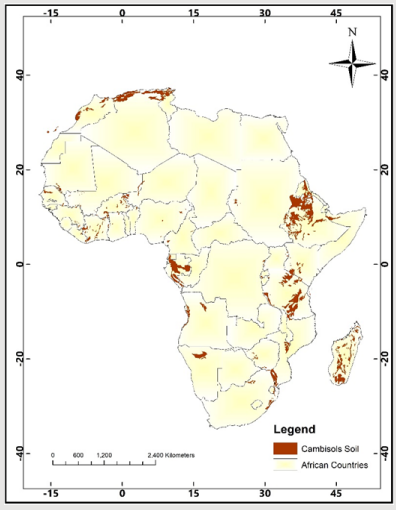


Figure 3.8: Distribution of Cambisols in Africa

3. Cambisols

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

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

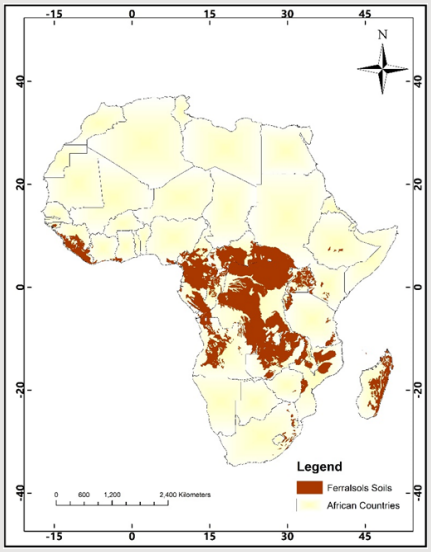


Figure 3.9: Distribution of Ferralsols in Africa

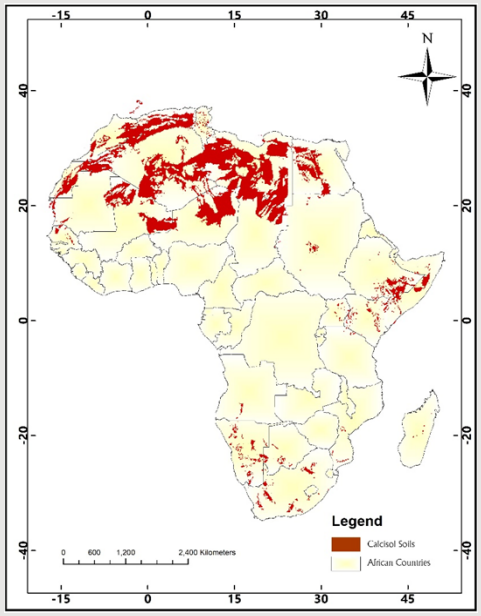


Figure 3.10: Distribution of Calcisols in Africa

4. Ferralsols

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

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

5. Calcisols

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

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

Activity 3.11

Dear learner, answer the following questions based on figures 3.6 to 3.10.

1. From the figures above, which soil types are largely found in Ethiopia?

2. From the figures above, which of the soil types cover a few areas in Ethiopia?

3. By searching different sources, identify other soil types largely found in Ethiopia.

3.3.2. Mineral Resources of Africa

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

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

Table 3.2: Africa's Leading Mineral Production and Reserves

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

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

Problems faced by Mineral Resources Utilization in Africa

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

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

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

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

Activity 3.12

1. Dear learner, please exercise the following problem vs solution activity carefully.

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

Checklist

Dear leaner! Now it is time to check whether you understood the contents of the section. Therefore, please put a tick mark (✓) in the boxes given to prove that you have understood the respective issues well.

I can:

- ☐ 1. describe the major soil and mineral resources of Africa
- ☐ 2. explain the diverse soil resources of Africa
- ☐ 3. describe the mineral wealth of Africa
- ☐ 4. explain the problems of the mining sector in Africa

Is there any box that you didn't mark (✓) under it? If there is, please go back to the text and read about it before you go to the following section.

SELF-TEST EXERCISES SECTION 3.3

The following questions can help you to study Section 3.3.

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

1. Soil is abundantly found everywhere, hence it is not natural resource.
2. Too wet, dry or shallow soils pose serious limitations for crop growth.
3. Africa is a continent with a diversity of climate landscapes, and agroecological zones.
4. Nitisols are the most extensively found soil type in Africa.
5. Soils are formed from rocks or parent materials.
6. Although Africa is rich in mineral resources, it does not produce petroleum.
7. Africa has huge mineral wealth because of its political history.
8. The mining sector in Africa suffered from lack of capital investment and good management.

Resources for further reading

https://www.britannica.com/place/Africa/Geologic-history
https://www.fao.org/3/T1696E/t1696e07.htm#:~:text=The%20major%20lowland%20soils%20which,waterlogged%20and%20are%20often%20flooded.
https://www.unep.org/regions/africa/our-work-africa#:~:text=The%20continent%20has%2040%20percent,internal%20renewable%20fresh%20water%20source.

Section 3.4 Major Vegetation and Wildlife of Africa

Section Overview

Required study time: 2 hours

Dear learner, in this section you will study about the vegetation and wildlife resources of Africa. Africa's vegetation, like its climate, is almost mirrored north and south of the equator. Africa's vegetation consists of grasslands, rainforests, and a wide variety of other plant life. African vegetation develops in direct response to the interacting effects of rainfall, temperature, topography, and type of soil; it is further modified by the incidence of fire, agriculture, and grazing and browsing by livestock. Meanwhile, Africa has diverse range of wildlife. Some of the well-known of Africa's large mammals such as lions, elephants and leopards are found in habitats ranging from very arid to marshes and swamps.

Section Learning Outcomes

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

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

Key terms

- *Endemic*
- *Flora*
- *Forest*
- *Mammals*
- *Marine life*
- *Parks*
- *Steppe*
- *Vegetation*

BRAINSTORMING QUESTION

1. Dear learner! What are some key benefits of natural vegetation and wildlife?

_____

_____

Have you tried the activity? That is very good. Now let's discuss the type and distribution of vegetation and wildlife in Africa.

3.4.1. Vegetation of Africa

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

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

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

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

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

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

3.4.1.1 Distribution of Major Vegetation in Africa

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

I. Tropical Category

1. Tropical Rainforest

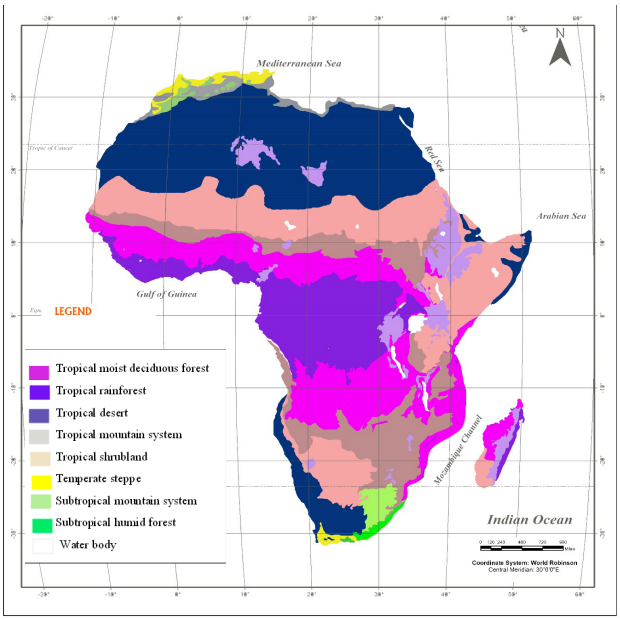
The tropical rainforests are found in the central part of Africa, on both sides of the Equator and eastern coast of Madagascar. The rainforests are characterized by high rainfall, ranging from 1000 to more than 2000 mm/year, due to the permanency of the Inter Tropical Convergence Zone (ITC) on the Equator.

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

Table 3.3: Natural Vegetation - Type and Area in Africa

Natural vegetation type	Surface area	
	Area (in Km²)	Percent of total land area
Tropical rainforest	4,017,705	13.5
Tropical moist deciduous forest	4,661,180	15.6
Tropical dry forest	3,669,529	12.3
Tropical shrubland	5,977,939	20.0
Tropical desert	8,737,674	29.3
Tropical mountain forest	1,473,226	4.9
Subtropical humid forest	85,099	0.3
Subtropical dry forest	334,816	1.1
Subtropical steppe	456,663	1.5
Subtropical mountain systems	412,356	1.4
Total land area	29,826,187	99.9

2. Tropical Moist Deciduous Forest



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

Figure 3.11: Distribution of Major Vegetation Types of Africa

3. Tropical Dry Forest

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

Activity 3.13

1. Dear learner! What is the relationship between vegetation and wildlife? _____

_____

_____

_____

4. Tropical Shrubland

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

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

5. Tropical Desert

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

6. Tropical Mountain Forest

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

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

II. Subtropical Category

1. Subtropical Humid Forest

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

2. Subtropical Dry Forest

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

3. Subtropical Steppe

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

4. Subtropical Mountain Systems

This is found in both northern and southern Africa. In northern Africa it is found in the Atlas Mountains area, which extends for over 3000 km from northern Morocco to Tunisia, parallel to the Mediterranean coast. Its altitude reaches 1500 meters in Tunisia, 2500 m in Algeria, and 4165 m in Morocco. In South Africa, it is found in the Highveld Region, which is more than 1000 m in altitude, bordered by the Ukhahlamba (Drakensberg) reaching more than 3000 m. In the northern Atlas ranges, the lower slopes are covered by mixed forests with deciduous oaks. While, in southern Africa, the Highveld region is covered with grassland, an evergreen montane forest with Podocarpus grows on the Ukhahlamba slopes.

Activity 3.14

1. Dear learner! What are some the endemic animals in Ethiopia? What are some endemic animals of Africa?

_____

_____

_____

3.4.2. Wildlife of Africa

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

1. Mammals

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

Figure 3.12: Chimpanzee

Figure 3.13: Gorilla

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

lemurs in the world.

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

Figure 3.14: Lemur

Figure 3.15: Jumping hare

Figure 3.16: Tenrecs

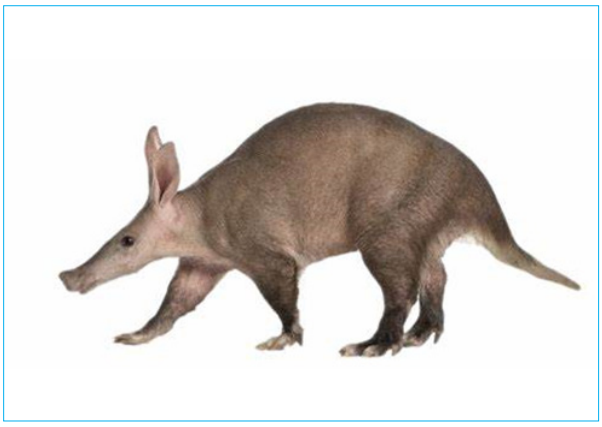


Figure 3.17: Aardvark

Figure 3.18: Nyala

Figure 3.19: Walia ibex

Activity 3.15

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

_____

_____

_____

Have you listed down the mammals found in Ethiopia? That is good. We have to protect those endemic mammals from danger of extinction or disappearance from the surface of the earth!

2. Birds

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

3. Reptiles

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

4. Insects

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

5. Marine life

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

3.4.3. National Parks in Africa

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

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

Table 3.4: Major National Parks of Africa

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

Checklist

Dear leaner! Now it is time to check whether you understood the contents of the section. Therefore, please put a tick mark (✓) in the boxes given to prove that you have understood the respective issues well.

I can:

- ☐ 1. demonstrate the major vegetation distribution of Africa
- ☐ 2. identify the major distribution of wildlife in Africa
- ☐ 3. identify factors that affect the distribution of plants and their composition
- ☐ 4. describe why Africa has many national parks

Is there any box that you didn't mark (✓) under it? If there is any, please, go back to your text and read about it before you go to the following exercises.

SELF-TEST EXERCISES OF SECTION 3.4

The following questions can help you to study Section 3.4.

Direction: Fill in the black spaces with an appropriate word of phrase.

1. Vegetation develops in direct response to the interacting effects of natural factors such as; _____, _____, _____, and _____.
2. Biologically, vegetation is known as_____.
3. _____ are plants that grow on trunks and limbs of trees.
4. _____ region does not allow the growth of a continuous vegetation cover.
5. _____ is the oldest National Park in South Africa.

Resources for further reading

https://www.safari.co.za/African-Wildlife-Guide-travel/wildlife-of-africa.html
https://geography.name/africa-climate-and-vegetation/

UNIT SUMMARY

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

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

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

Africa also has very diverse natural vegetation and wildlife. These diversities are the result of its climate landscape. Therefore, the continent is endowed with huge tropical forest found in central part of Africa. Other varieties include; shrubs and steppe vegetation of arid and semiarid areas to humid subtropical forests. Africa has more diverse wildlife than any other continent. The diversity and wealth of wildlife found in Africa is the result of diverse climate of the continent – that ranges from intense heat to bitter cold. Its varied vegetation has given rise to a wide range of animals, including mammals, birds, reptiles, fish and insects.

SELF – ASSESSMENT QUESTIONS OF THE UNIT

PART I: MATCHING ITEMS

Direction: The following are main types of soils in Africa, match the items under column "B" with its unique features Under "A"

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

PART II: MULTIPLE CHOICE ITEMS

Direction: For the following questions, choose the correct answer from the given alternatives.

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

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

7. From the total amount of water resources available on earth, the proportion of freshwater resources amount to_____.

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

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

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

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

   A. Democratic Republic of Congo
   B. Kenya
   C. Burundi
   D. Chad

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

    A. The tropical rainforests
    B. The tropical desert vegetation
    C. The subtropical steppe
    D. The subtropical dry forest

PART III: SHORT ANSWER ITEMS

Direction: Give a short answer to the following questions.

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

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

12. What are some natural resources commonly found in your local environment?
13. Using Table 3.1 explain the importance of freshwater.
14. List major uses of the rivers of Africa?

ANSWER KEY FOR SECTION LEVEL SELF-TEST EXERCISES

I. Self-test exercises of section 3.1

PART I. Multiple choice answer key

1. A
2. D
3. B
4. D
5. C

II. Self-test exercises of section 3.2

PART I. MATCHING ANSWER KEY

1. D
2. E
3. C
4. B
5. A

PART II. MATCHING ANSWER KEY

3. E
4. D
5. C
6. F
7. H
8. B
9. A
10. G

III. Self-test exercises of section 3.3

PART I. TRUE OR FALSE ITEMS ANSWER KEY

1. False
2. True
3. True
4. False
5. True
6. False
7. False
8. True

IV. Self-test exercises of section 3.4

PART I. ANSWER FOR FILL IN THE BLACK SPACES

1. rainfall, temperature, topography, and type of soil.
2. flora
3. Epiphytes
4. Desert
5. Kruger

ANSWER KEY FOR UNIT-LEVEL SELF-TEST EXERCISES

I. PART I: MATCHING ITEMS ANSWER KEY

1. C
2. B
3. A
4. D
5. E

PART II: MULTIPLE CHOICE ITEMS ANSWER KEY

6. D
7. C
8. C
9. D
10. B

PART III: SHORT ANSWER TYPE

11. Yes, natural resources utilization requires some form of ability. This is because the over-exploitation of natural resources harms the health of ecosystems and the wellbeing of people. In the face of environmental crises and growing inequality, we need to act, including developing extended producer responsibility and supply chain legislation, guaranteeing green public procurement, supporting technical innovation to enhance resource circularity, and adopting decision-making processes that include and respect women, Indigenous Peoples, and local communities.

12. Dear learner, this question is intended to encourage you to identify the natural resources of your local area. Therefore, please list them down on a separate paper.

13. Freshwater is vital for life, supporting ecosystems and human civilizations. We use freshwater in many aspects of daily life including food production, power generation, manufacturing, and sanitation. However, it is becoming increasingly threatened. Although the Earth's surface is two-thirds water, less than three percent is fresh. Pollution in the world's rivers, streams, and lakes renders water undrinkable and harms local wildlife. Overuse, triggered in part by population growth, causes water shortages and dries up lakes, rivers, or streams before they reach the sea or downstream neighbors, sometimes causing conflict.

14. Here are some uses of rivers in Africa.
    - *Hydroelectric power production,*
    - *Alluvium, which is deposited by the river during flooding, result in fertile soil that is exploited for agriculture,*
    - *Some rivers can be used as a fishing ground.*
    - *Used to transport people and goods (navigation)*

UNIT FOUR

POPULATION OF AFRICA

Introduction

Required study time: 7 hours

Dear learner! In the previous unit, we hope that you carefully studied about the natural resource base of Africa such as its drainage systems, soils, natural vegetation, wildlife and mineral resources. In this unit you are going to study the population and demographic characteristics of Africa. The major topics to be covered include the trends of population growth in Africa, population characteristics such as birth rates and death rates, population composition and methods of presenting sex and age distribution using population pyramids, population density, and settlement patterns of Africa's population.

Unit Learning Outcomes

After completing this unit, you will be able to:

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

Unit Learning Strategies

Dear learner, your learning strategies for this unit should include:

- *reading;*
- *writing and taking notes;*
- *studying and remembering information;*
- *improving assignment and test performance;*
- *time management and organization; and*
- *self-advocacy (the ability to effectively communicate, convey, negotiate, or assert one's interests, desires, needs, and rights).*

Unit Contents

The Required Study Time

Dear learner! On your study plan, consider devoting adequate time for studying, doing in text exercises, and answering review questions. Therefore, please allocate 7 hours of study time for unit four.

Section 4.1 Overview of World Population Growth and Size

Section Overview

Required study time: 1.30 hours

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

Section Learning Outcomes

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

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

Key terms

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

BRAINSTORMING QUESTION

Dear learner! Do you think that population growth of countries or regions should be controlled?

Have you tried the activity? Very good. Let's now explore the trends in world population growth.

Global Population Trends

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

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

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

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

Source: UN World Population Data Sheet, 2021

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

Activity 4.1

1. Dear learner! Why is the world population growing so rapidly? Please describe your reasons on the following spaces and compare it with the subsequent paragraph.

_____

_____

_____

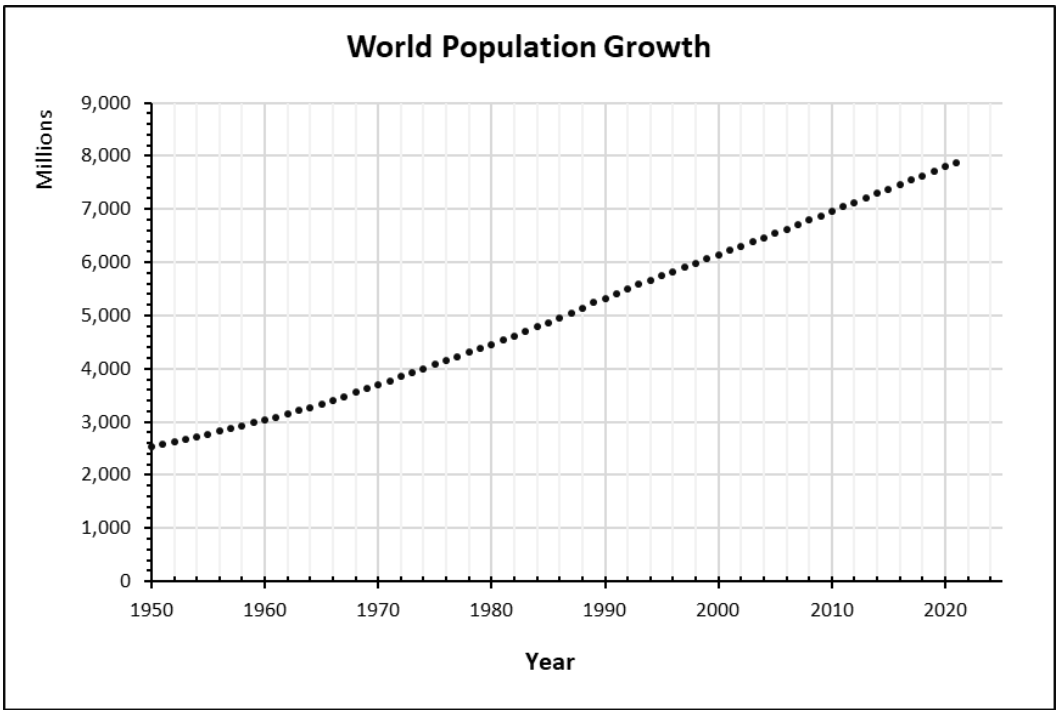


Figure 4.1: World Population Growth from 1950 to 2021

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

A. Population Size and Growth in Africa

Population Size of Africa

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

Table 4.2: Share of World Population by Regions

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

Source: UN World Population Data Sheet, 2021

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

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

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

Source: UN World Population Data

Population Growth in Africa

Africa has one of the world's fastest-growing populations. The continent has been experiencing rapid changes in its population size as a result of many factors including the interactions between fertility and mortality. Despite the gradual decline in the birth and death rates globally, the continent continues to experience a high rate of population growth. As some historical sources indicate, Africa's population had been increasing very slowly until recent times. However, since 1950, the continent's population has begun to increase very rapidly. As a result, the continent's population experienced a rapid rise in number as opposed to other parts of the world. Figure 4.1 shows the trend in the population size of Africa between the years 1000 A.D. and 2100 A.D.

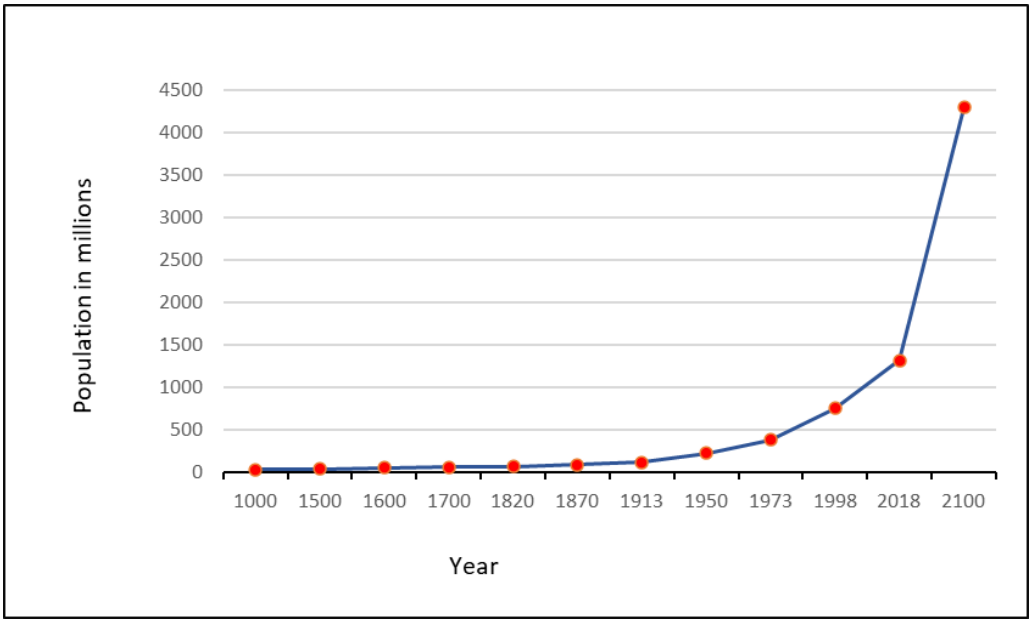


Figure 4.2: Trends of African Population from 1000 A.D. to 2100

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

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

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

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

Example

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

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

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

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

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

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

A. Factors Responsible for Africa's Rapid Population Growth

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

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

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

Activity 4.2

Dear learner! Please answer the following question.

1. If country X has a population size of 20,000,000 in 2023 with an annual growth rate of 2%, what will be the size of the country's population after five years?

_____

_____

_____

Population Change in Africa

Components of Population Change

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

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

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

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

Thus, the change in a population can be calculated by the Demographic Balancing Equation. It is an equation that is used to calculate population changes from one year to the next in a given area, based on the number of births, deaths, and migrations. The general form of the equation is a mass balance equation, in which end population = starting population ± natural increase ± net migration, where natural increase = births – deaths, and net migration = immigrants – emigrants.

The Balancing Equation

$$P_t - P_0 = B - D + I - O,$$

or

$$P_t - P_0 = NI + NM$$

Where; P_t = Population at the end of the period

P_o =*Population at the beginning of the period*

B= Births

D = Deaths

I = In-migration

O = Out-migration

NI = Natural Increase (B-D)

NM = Net Migration (I-O)

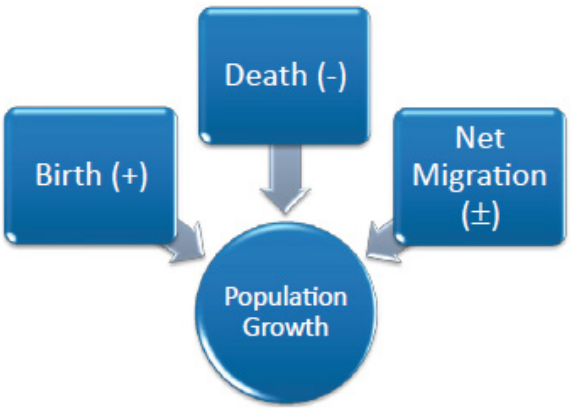


Figure 4.3: Components of Population Change

Checklist

Dear leaner! Now it is time to check whether you understood the contents of the section. Therefore, please put a tick (✓) in the boxes given to prove that you have understood the respective issues well.

I can:

- ☐ 1. describe the demographic characteristics of world population
- ☐ 2. describe the demographic characteristics of African population
- ☐ 3. explain the trends in global population
- ☐ 4. describe the population size and growth in Africa
- ☐ 5. calculate the population doubling time using the Rule of 70
- ☐ 6. explain the factors responsible for Africa's rapid population growth.
- ☐ 7. analyze the components of population change

Is there any box that you didn't put the mark (✓) under it? If there is any, please go back to the text and read about it before you go to the following exercise.

SELF-TEST EXERCISES OF SECTION 4.1

The following questions can help you to study Section 4.1.

PART I: TRUE OR FALSE ITEMS

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

1. Asia is the most populous continent and followed by Africa.
2. The average global lifespan has increased due to the rise in birth and death rates.
3. The advances in modern medicines and improvements in living standards have resulted in high growth rate for the world's population.
4. Africa has one of the world's fastest-growing populations.
5. The decline in the birth and death rates globally, has manifested itself in the decline of population growth in Africa.

Resources for further reading

https://www.unfpa.org/world-population-trends
https://pdp.unfpa.org/?~ga=2.253142593.916671673.1679993491-1697933947.1679993491#indicators https://www.statista.com/statistics/1121246/population-in-africa-by-country/
https://worldpopulationreview.com/countries/ethiopia-population

Section 4.2 Africa's Major Demographic Trends

Section Overview

Required study time: 2 hours

Dear learner! In terms of population, Africa is the fastest growing and youngest region in the world. However, there is great diversity of demographic trends among African countries and regions. The region has the highest urban growth rates in the world, but a relatively low share of its population living in urban areas. Hence, in this section we will explore the fertility and mortality patterns, future fertility and mortality trends, and life expectancy in Africa.

Section Learning Outcomes

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

- *explain the demographic trends of the African population.*

Key terms

- *Crude birth rate*
- *Crude death rate*
- *Fertility Patterns*
- *Infant Mortality Rate*
- *Life Expectancy*
- *Maternal Mortality*
- *Total Fertility Rate*

BRAINSTORMING QUESTION

1. Dear learner! How does the population of an area increase, or decrease?

_____

_____

_____

Have you tried the activity? That is fantastic. Now let's discuss the demographic trends in Africa.

Fertility Patterns

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

Definitions

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

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

Mathematically, CBR = (Total annual number of live births/Total mid-year population) X 1000

Example

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

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

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

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

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

The total fertility rate (TFR) in Africa has steadily declined over the last two decades since 2004. For example, in 2004, TFR was 5.1 and stood at 4.7 children per woman in 2016 (Table 4.4). When compared with other continents, Africa's fertility rates of 4.5 children per woman in

2017 seem high. Indeed, it has been the highest in the world. However, that figure is low compared with Africa's birthrates of previous decades. For instance, the total fertility rate stood at an average of 6.6 children per woman in 1980.

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

Table 4.4: Total Fertility Rate for Africa by Region

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

Source: Population Reference Bureau Reports (2019)

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

Activity 4.3

Dear learner, attempt the following questions on a piece of paper.

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

In addition to the TFR, the Crude Birth Rate can also be used as a means of analyzing the fertility pattern of human population. The crude birth rate refers to the occurrence of the annual number of live births for every 1000 of the mid-year total population. Even by this measure,

Africa has the highest fertility in the world. For instance, according to the UN World Population Data Sheet for the year 2020, the Crude Birth Rate (CBR) for Africa is estimated to be 33 per 1000 population. This is the peak even for the standard of less developed countries, which is 20 per 1000 population.

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

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

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

Source: UN World Population Data Sheet, 2021

There was huge variation in the level of fertility between and among major regions in Africa's continent (Table 4.5). Both the highest and lowest levels of fertility were observed in Eastern Africa; Somalia having the highest level of crude birth rate (49/1000) as opposed to Mauritius that stood at 11/1000 population for the year 2020. Fertility in other African countries comprises rates ranging between the two extremes.

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

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

Future Fertility Trends

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

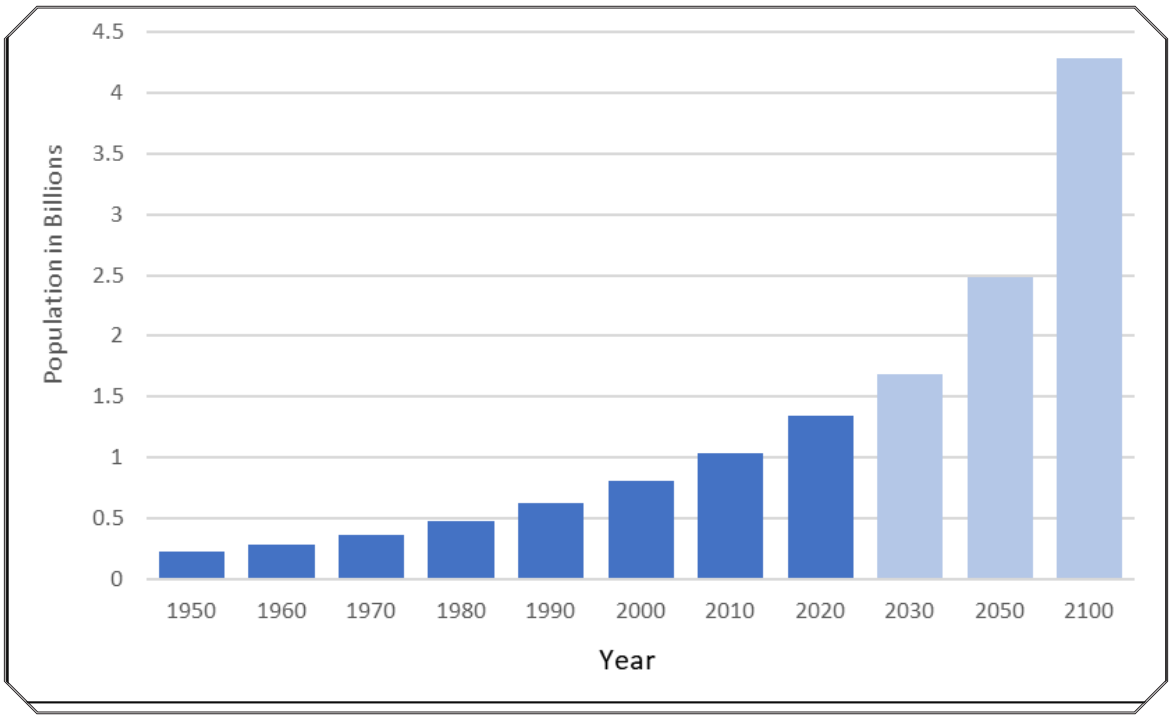


Figure 4.4: Africa's Total Population (in billions) Source: Based on UN Population Division Data

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

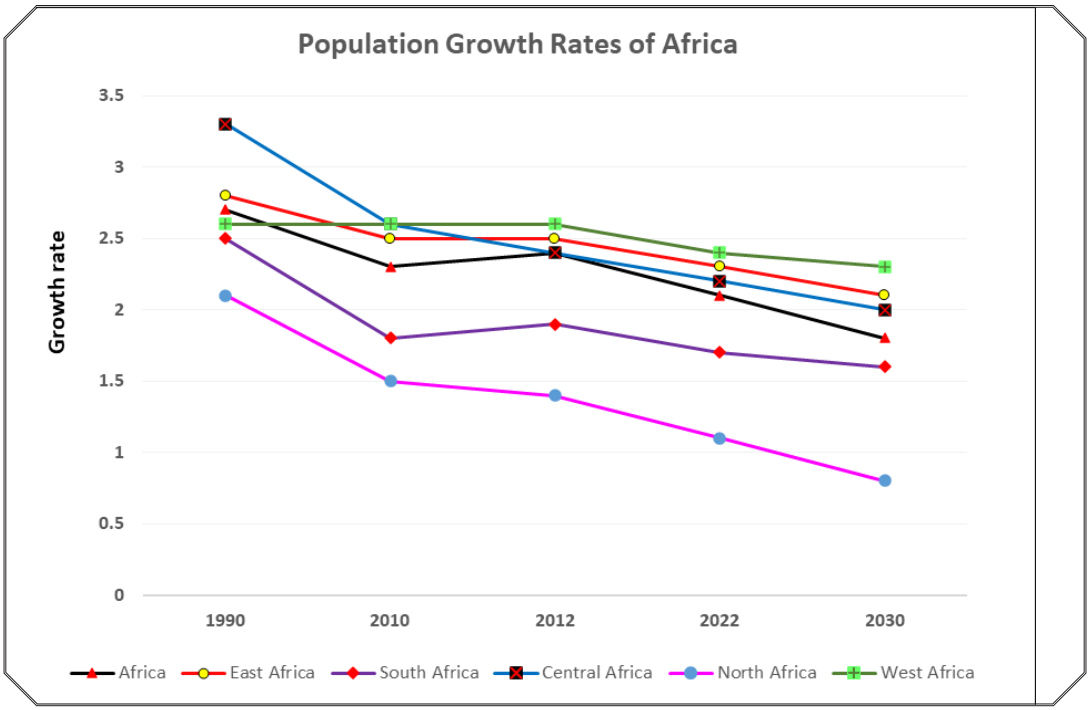


Figure 4.5: Africa Population Growth Rates by Sub-Regions

Source: Based on UN Population Division Data

Mortality Patterns in Africa

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

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

Definitions

Crude Death Rate (CDR) is the number of deaths occurring among the population of a given geographical area during a given year, per 1,000 mid-year total population of the given geographical area during the same year. For example, Africa's crude death rate was 8/1000 by the mid of 2020. This is to say that 8 deaths occurred for every 1000 people on average during the year under consideration.

$$Mathematically, CDR = \frac{Total\ Annual\ deaths}{Total\ mid\text{-}year\text{-}population} \times 1000$$

Example

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

Solution,

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

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

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

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

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

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

Example

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

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

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

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

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

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

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

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

Example

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

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

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

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

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

Definition

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

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

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

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

Changes in the death rates for the general population are also reflected in the infant mortality rates. In terms of infant mortality rate, which is the death of infants under one year per 1000 live births, the continent still has the world's largest rate of 47 deaths per 1000 live births. Infant mortality rates also vary from region to region. Accordingly, Central Africa has the highest rate of 62/1000 followed by Western Africa 55/1000 and Sub Sharan Africa50/1000 live births by the mid of the year 2020. The lowest Infant Mortality rate is in Northern Africa which was only 22/1000 during the same year. As it has been stated, despite these reductions, performance has not been the same within and between regions.

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

- low standard of living;
- low access to health facilities;
- poor sanitary practices;
- civil war and political instability;
- widespread famine caused by recurrent drought;

- poor nutrition; and
- high incidence of disease and infections.

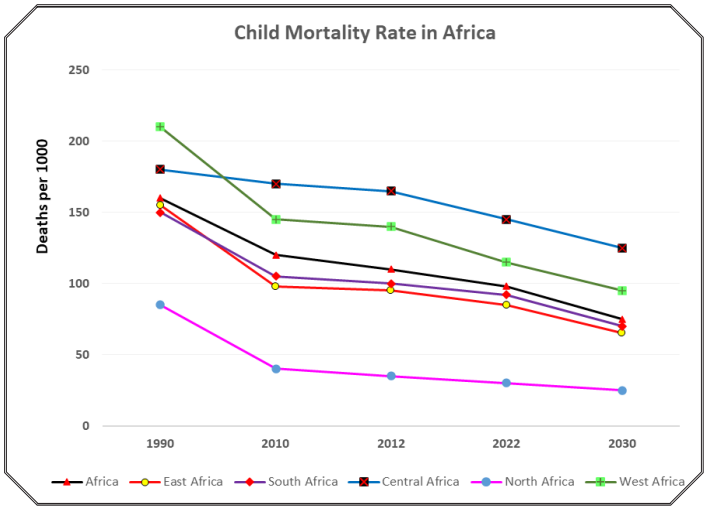
Table 4.6: CDR and IMR by Regions in Africa (2020)

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

Source: UN World Population Data Sheet, 2021

Future Mortality Trends

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



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

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

Activity 4.4

Dear learner, attempt the following questions on a piece of paper.

1. What are some major causes of death in Africa?
2. What are the consequences of the high death rate in Africa?
3. Why does Africa still have a high birth rate? Life Expectancy

The current birth and death rates in Africa reflect a very young (and economically dependent) population with low life expectancy. Almost all sub-Saharan countries have a population of under 15 years of age- rated in percent at more than 40 percent. This has resulted in a high dependency ratio in the continent. The average life expectancy at birth for the whole continent is 64 years by the mid of 2020 (See Table 4.7). However, there is variation in the level of life expectancy between and among major regions in Africa. North African countries have been successful in raising the life expectancy to an average of 74 years while Western African countries failed to do so where the average life expectancy stood only at an average of 59 years; a figure that is far below the continental average. There is also a marked disparity in life expectancy between rich and poor countries. However, the gap in life expectancy between the poor and the rich countries has shown a significant reduction over the last 50 years despite the widening wealth gap between the two economic regions. With reduced mortality, Africa should expect and plan for an ageing population. By 2030, the **average life expectancy** in Africa is projected to surpass 64 years.

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

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

Source: UN World Population Data Sheet, 2021

Checklist

Dear leaner! Now it is time to check whether you understood the contents of the section. Therefore, please put a tick mark (✓) in the boxes given to prove that you have understood the respective issues well.

I can:

- ☐ 1. explain the demographic trends of the African population
- ☐ 2. describe the fertility patterns of the African population
- ☐ 3. calculate crude death rate
- ☐ 4. calculate maternal mortality rate
- ☐ 5. explain life expectancy
- ☐ 6. discuss the future trends of fertility and mortality in Africa

Is there any box that you didn't put the mark (✓) under it? If there is any, please go back to the text and read about it before you go to the following exercise.

SELF-TEST EXERCISES OF SECTION 4.2

The following questions can help you to study Section 4.2.

PART I: MULTIPLE CHOICE ITEMS

Direction: For the following questions, choose the correct word or phrase from the given alternatives.

1. _____ is the average number of children a woman would give birth to children during her lifetime.

   A. Total Fertility Rate
   B. Crude Death Rate
   C. Crude Birth Rate
   D. Total Mortality Rate

2. Which one of the following regions of Africa has the highest infant mortality rate in 2020?

   A. Western Africa
   B. Eastern Africa
   C. Central Africa
   D. Southern Africa

3. Compared with other regions of the world, crude birth rate is high in Africa due to:

   A. less access to contraceptives
   B. high level of poverty
   C. low status of women
   D. all of the above

4. Which of the following region of Africa has the highest rate of life expectancy in Africa in 2020?

A. Northern Africa
B. Eastern Africa
C. Central Africa
D. Southern Africa

5. _____ is the average number of years a newborn infant is expected to live under current mortality levels.

A. Life expectancy
B. Life expectancy at birth
C. Maternal Mortality
D. Survival chance of an infant

Resources for further reading

https://2022-wpds.prb.org/africa/
https://ourworldindata.org/fertility-rate
https://population.un.org/wpp/

Section 4.3 Population Structure, Distribution and Density in Africa

Section Overview

Required study time: 1.30 hours

Dear learner! In this section, you will study about population structure, distribution and density in Africa. Population structure is expressed using age and sex structure of a given population. The age structure of a population can be expressed by the distribution of population into **young**, **working,** and **old age** groups. Meanwhile, the sex structure of the population can be expressed using a sex ratio. These structures can be graphically depicted using a graph known as a **population pyramid**. Hence, the population pyramid is the most effective and quite widely used method of graphically depicting the age-sex composition of a population. A population pyramid is designed to give a detailed picture of the age-sex structure of a population, indicating either single age or 5-year groups, or other age combinations.

Section Learning Outcomes

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

- *describe the demographic structure of the African population.*

Key terms

- *Age Dependency Ratio*
- *Age Structure*
- *Population Pyramid*
- *Population Structure*
- *Sex Ratio*
- *Sex Structure*

BRAINSTORMING QUESTION

1. Dear learner! Do you think the population growth and density of Africa are both high?

_____

_____

Have you tried the activity? That is very good. So, now let's see the concepts in detail.

Age Structure

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

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

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

Source: UN World Population Data Sheet, 2021

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

Resources, which could be used for development purposes, could be shifted to the provision of basic supply for the additional members.

Sex Structure

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

$$Sex\ ratio = \left(\frac{Number\ of\ male\ population}{Number\ of\ female\ population} \right) \times 100$$

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

Population Pyramid

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

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

Types of Population Pyramids

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

i. Expansive Pyramid

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

ii. Constructive Pyramid

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

iii. Stationary Pyramid

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

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

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

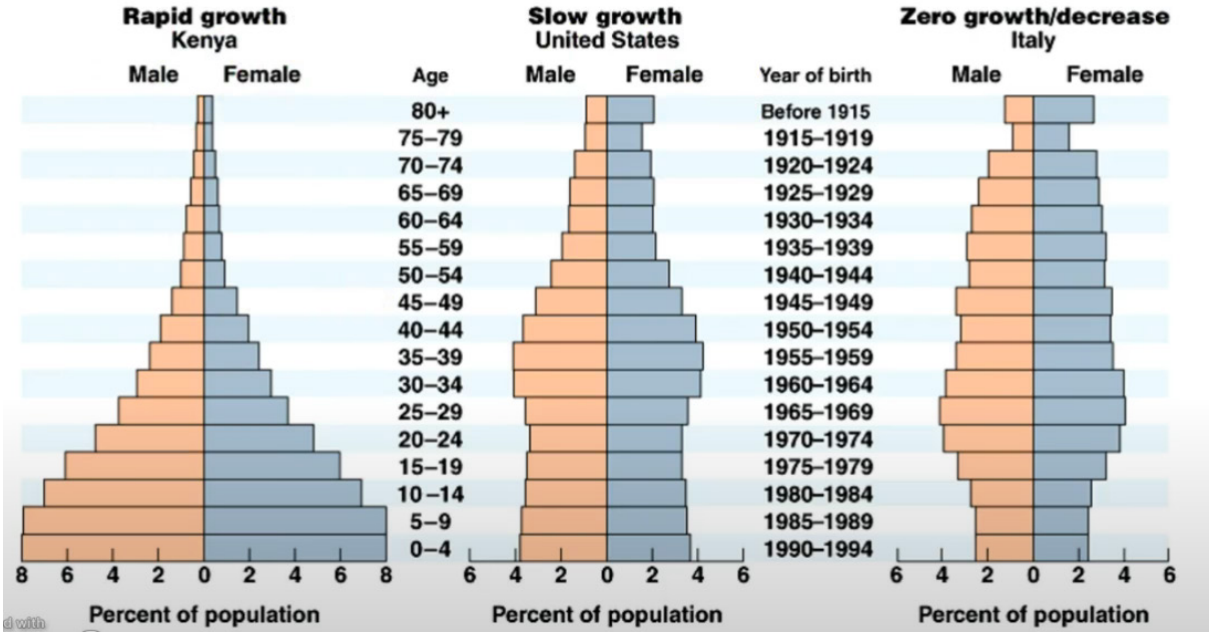


Figure 4.7: Model Population Pyramids

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

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

Activity 4.5

Dear learner! Attempt the following questions on a separate piece of paper.

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

Checklist

Dear leaner! Now it is time to check whether you understood the contents of the section. Therefore, please put a tick mark (✓) in the boxes given to prove that you have understood the respective issues well.

I can:

- ☐ 1. describe the demographic structure of African population
- ☐ 2. explain the age structure of population of Africa
- ☐ 3. sex structure of the population
- ☐ 4. discuss the function of population pyramid

Is there any box that you didn't put the mark (✓) under it? If there is any, please go back to the text and read about it before you go to the following exercise.

SELF-TEST EXERCISES OF SECTION 4.3

The following questions can help you to study Section 4.3

PART I: MATCHING

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

"A"	"B"
1. The number of males for every 100 females.	A. Age structure
2. The proportion of males to females in the overall population of a given area.	B. Population pyramid
3. The characteristics of population in age and sex.	C. Population structure
4. A graph used to describe population structure.	D. Sex ratio
5. The distribution of population into young, working, and old age groups.	E. Sex structure

Resources for Further Reading

https://www.youtube.com/watch?v=xMdv4IXy3Lw
http://www.stats.gov.cn/english/pdf/202010/P020201012524687421440.pdf
https://ourworldindata.org/age-structure

Section 4.4 Distribution, Density, and Settlement Patterns of Africa

Required study time: 2 hours

Section Overview

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

Section Learning Outcomes

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

- *demonstrate distribution and density patterns of the African population using graphs, charts, and maps.*
- *discuss the urban and rural settlement patterns in Africa.*

Key terms

- *Population Density*
- *Population Distribution*
- *Spatial Variation*
- *Rural*
- *Urban*
- *Settlement*
- *Urbanization*

BRAINSTORMING QUESTION

Dear learner! Before you start reading the next content, please attempt the following question.

1. Is Africa the most densely settled continent? _____

_____

Have you tried the tried answering the question? If so, that is great.

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

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

Activity 4.6

Dear learner! Attempt the following question on a separate piece of paper.

1. Which of the following countries may have the densest population distribution in Africa?

A. Libya
B. Rwanda
C. Botswana
D. Namibia

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

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

Region	Crude Population Density (Persons/Km²)
Sub-Saharan Africa	49
Northern Africa	31
Western Africa	65
Eastern Africa	65
Central Africa	27
Southern Africa	25
Africa	44

Source: UN World Population Prospects, 2019

4.4.1. Urban and Rural Settlement Patterns in Africa

Africa offers stark contrasts in terms of urbanization compared to other regions of the world. For example, Burundi, Rwanda, Malawi, Ethiopia and Burkina Faso are still predominantly rural, while in Gabon and Western Sahara, more than 80% of their population lives in urban areas. African urban growth, which reflects sizeable migration flows from rural areas, presents major challenges for development, as migrants into cities require access to land, infrastructure and basic services. This has also stretched healthcare services.

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

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

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

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

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

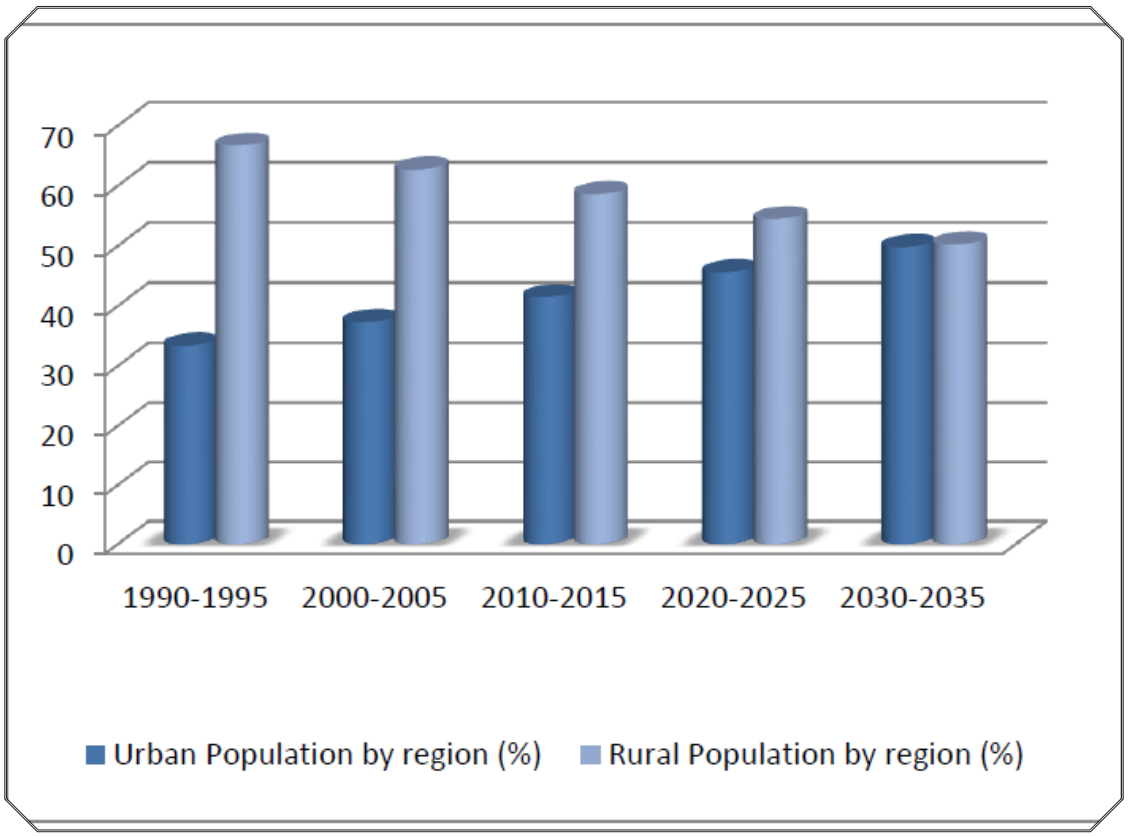


Figure 4.8: Projected Africa's Urban – Rural Population Distribution (2030-35)

Checklist

Dear leaner! Now it is time to check whether you understood the contents of the section. Therefore, please put a tick mark (✓) in the boxes given to prove that you have understood the respective issues well.

I can:

- ☐ 1. demonstrate distribution and density patterns of African population using graphs, charts, and maps
- ☐ 2. discuss the urban and rural settlement patterns in Africa
- ☐ 3. describe the urban and rural settlement patterns in Africa

Is there any box that you didn't put the mark (✓) under it? If there is any, please go back to the text and read about it before you go to the following exercise.

SELF-TEST EXERCISES OF SECTION 4.4

The following questions can help you to study Section 4.4

PART I: SHORT ANSWER QUESTIONS

Direction: Fill in the blank spaces provided with appropriate words or phrases.

1. List the five most densely populated areas in Africa?
   i. _____
   ii. _____
   iii. _____
   iv. _____
2. _____ is a measurement of population per unit land area.
3. _____ is the pattern where people live on the land surface.
4. _____ a difference in terms of population distribution, population density, or life expectancy over an area of the earth's surface.
5. _____ decrease in the proportion of people living in rural areas, and the ways in which societies adapt to this change.

Resources for Further Reading

https://www.internetgeography.net/topics/what-is-population-distribution/
https://www.statista.com/statistics/1218003/population-density-in-africa-by-country/
https://eros.usgs.gov/westafrica/settlements-growth

UNIT SUMMARY

- Dear leaner! We hope you enjoyed the contents of the unit. Africa and other developing regions make up an increasing share of the world population. The world population has shown a tremendous increment from 1950 to 2020. Africa, Asia and Latin America/ Caribbean contribute the highest proportion to this share.
- The growth rate of the population is a vital demographic feature that can help us understand the population change that a given society has undergone and will undertake in the future.
- Africa is the only continent whose population is growing faster than other continents.
- There is not an even distribution of population in the world. Deductively, Africa's population distribution is uneven. The unevenness of African population distribution is attributable to human and physical factors.
- The three major components that bring about a change in matters related to population in any country are fertility, mortality and migration.
- Africa's rapid population growth and backward socio-economic development have turned Africa into the world's lowest social amenities. As a result, poor health, inadequate education, deficient nutrition and inferior housing facility widely tangle the people of the continent.
- Africa's rate of urbanization is the highest in the world. Currently, uncontrolled and rapid urbanization has depopulated rural areas. This has crippled agricultural production, especially the production of food crops.
- Generally speaking, rapid urban growth has become a major cause of growing poverty both in rural and urban areas in Africa.

SELF – ASSESSMENT QUESTIONS OF THE UNIT

PART I: TRUE OR FALSE ITEMS

Direction: Write true if the statement is correct and write false if it is wrong.

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

PART I: MULTIPLE CHOICE ITEMS

Direction: Direction: For the following Questions, choose the correct word or phrase from the given alternatives.

7. Africa has relatively high death rate due to one of the following factors;

   A. high standard of living
   B. high access to health facilities
   C. better sanitary practices
   D. high incidence of diseases

8. Which of the following countries has the highest Crude Population Density in 2019?

   A. Algeria
   B. Kenya
   C. Ghana
   D. Republic of South Africa

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

   A. Africa has large old age population
   B. Africa's median age is high implying that the population is young
   C. High fertility and growth rate of population growth in Africa is attributed to young age population structure
   D. All of the above

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

    A. Birth
    B. Death
    C. Immigration
    D. Net migration

ANSWER KEY FOR SECTION LEVEL SELF-TEST EXERCISES

I. Self-test exercises of section 4.1

PART I. TRUE OR FALSE ITEMS

1. True
2. False
3. True
4. True
5. False

II. Self-test exercises of section 4.2

PART I. MULTIPLE CHOICE ITEMS

1. A
2. C
3. D
4. A
5. B

III. Self-test exercises of section 4.3

PART I: MATCHING

1. D
2. E
3. C
4. B
5. A

IV. Self-test exercises of section 4.4

PART I: SHORT ANSWER QUESTIONS

1. List the five most densely populated areas in Africa?
   i. The Nile Valley of Egypt,
   ii. Mauritius,
   iii. Rwanda, and
   iv. Burundi
2. Population Density
3. Population Distribution
4. Spatial Variation
5. Urbanization

ANSWER KEY FOR UNIT-LEVEL SELF-TEST EXERCISES

I. PART I. TRUE OR FALSE ITEMS

1. False
2. True
3. True
4. False
5. True
6. False

PART II. MULTIPLE CHOICE ITEMS

7. D
8. D
9. B
10. D

GLOSSARY OF TERMS IN MODULE ONE

Unit One

Continent : a continent is an expanse of land. The term refers not only to the main landmass but also to any islands that may be linked to it. The seven continents of the world include Africa, Antarctica, Asia, Australia, Europe, North America, and South America.

Landform: – a recognizable, naturally formed feature on the Earth's surface. Landforms have a characteristic shape and can include such large features as plains, plateaus, mountains, and valleys, as well as smaller features such as hills, and canyons.

Mountain :– a landform that rises prominently above its surroundings, exhibiting steep slopes, a confined summit area, and considerable local relief.

Ocean :– an ocean is a continuous body of saltwater that is contained in an enormous basin on Earth's surface. The major oceans and their marginal seas cover nearly 71 percent of Earth's surface. Examples include, Atlantic, Pacific, and Indian oceans.

Peninsula :– a peninsula is a piece of land that is almost entirely surrounded by water but is connected to the mainland on one side.

Plain :– a plain is a broad area of relatively flat land. Plain landforms cover more than one-third of the world's land area.

Plateau: - a plateau is an elevated landform with a more or less large flat or leveled area on top. Plateaus are also called high plains or tablelands as they have a large area on top and a steep slope on the sides.

Tectonic plane movement :– The heat from radioactive processes within the planet's interior causes the plates to move, sometimes toward and sometimes away from each other. Earthquakes and volcanoes are the short-term results of tectonic movement. The long-term result of plate tectonics is the movement of entire continents over millions of years.

Tectonic plate:– a tectonic plate (also called lithospheric plate) is a massive, irregularly shaped slab of solid rock, generally composed of both continental and oceanic lithosphere. Example; African, Antarctic, Eurasian, Indo-Australian, North American, Pacific and South American plates.

Volcanic activity:– Volcanic activity refers to the movement of molten lava from beneath the crust reaches the surface of the Earth. Volcanic activity ranges from emission of gases, non-explosive lava emissions to extremely violent explosive bursts that may last many hours. The types of eruptions determine the relative volumes and types of volcaniclastic material and lava flows, consequently the shapes and sizes of volcanoes.

Unit Two

Climate:- Climate is the long-term weather pattern in a region, typically averaged over 30 years Examples: maritime climate, cold-dry desert climate, tropical climate. Global climate classification maps highlight the high variety of climates.

Climate change : refers to long-term shifts in temperatures and weather patterns. Such shifts can be natural, due to changes in the sun's activity or large volcanic eruptions or anthropogenic (human activities).

Climate classification: the formalization of systems that recognize, clarify, and simplify climatic similarities and differences between geographic areas in order to enhance the scientific understanding of climates.

Climate region: refers to a continuous geographic area in which similar climate characteristics are observed. Examples; Equatorial Climate, Tropical Monsoon Climate, Tropical Marine Climate, Desert Climate, Tropical Savanna / Sudan Climate, Warm Temperate / Mediterranean Climate, Temperate Continental Grasslands / Steppe Climate, ..., etc.

Climate zone : a climate zone is a world area or region distinguished from a neighbor by a major physical climatic characteristic that is of global scale. Climate zones are bounded by limits that parallel lines of latitude to form "belts" that mostly extend around the globe. Examples of climate zone include Tropical climates, dry climates, temperate climates, polar climates..., etc.

Weather : Weather is the state of the atmosphere, describing for example the degree to which it is hot or cold, wet or dry, calm or stormy, clear or cloudy. Weather is influenced by latitude, altitude, and local and regional geography.

Unit Three

Ecosystem services : Ecosystem services are the direct and indirect contributions of ecosystems to human well-being, and have an impact on our survival and quality of life. There are four types of ecosystem services: provisioning, regulating, cultural and supporting services.

Natural resources : Natural resources are resources that are drawn from nature and used with few modifications. Natural resources are used to make food, fuel and raw materials for the production of goods. Example, sunlight, atmosphere, water, land, all minerals along with all vegetation, and wildlife. All of the food that people consume comes from plants or animals.

Non renewable resources :- These resources are formed over a long geological time period in the environment and cannot be renewed easily. Minerals are the most common

resource included in this category. From the human perspective, resources are non-renewable when their rate of consumption exceeds the rate of replenishment/ recovery; a good example of this are fossil fuels.

Renewable resources: These are resources that can be replenished naturally. Some of these resources, like solar energy, air, wind, water, etc. are continuously available.

Sustainable use : Sustainable use refers to the use of resources in a way and at a rate that does not lead to the long-term degradation of the environment, thereby maintaining its potential to meet the needs and aspirations of present and future generations.

Unit Four

Birth rates : The birth rate is the ratio between the number of live-births in the year and the average total population of that year. It is the total number of live births per 1,000 population for a given period divided by the length of the period in years.

Demographic characteristics : refer to the characteristics of a group of people which includes population size, population density, age structure, sex ratio, and ~etc.

Fertility: In demographic contexts, fertility refers to the actual production of offspring, rather than the physical capability to produce which is termed fecundity. It is one of the principal components of population change.

Migration: Migration is usually defined as a geographical movement of people involving a change from their usual place of residence. But it is distinguished from temporary and very short distance moves. Migration can be internal (within the national boundaries) or international (across the international borders).

Mortality: mortality, as one of the components of population change, refers to the total deaths that occurred particularly on a large scale such as in a population or geographical area. It is usually depicted in the form of mortality rate.

Population changes: population change, sometimes called population dynamics, is the difference in the size of a population between the end and the beginning of a given time period (usually one year).

Population doubling time: Doubling time is the amount of time it takes for a given quantity of population to double in size or value at a constant growth rate. We can find the doubling time for a population undergoing exponential growth by using the Rule of 70. To do this, we divide 70 by the growth rate (r).

World population: world population refers to the entire number of people of all ages, living in all countries throughout the world. For example, the size of world population by 2020.

FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA
MINISTRY OF EDUCATION
DISTANCE AND CONTINUING EDUCATION COORDINATION

GEOGRAPHY GRADE 10

ASSIGNMENT FOR SUBMISSION

Name of the Student: _____
ID. No.: _____
Grade: _____
School: _____
Signature: _____

General Direction

1) This "assignment for submission" is to be completed and submitted to invigilators during final exam session along with the final exam of geography grade 10.

2) This assignment accounts for 30 percent of your total mark. Thus, please do not forget to allocate enough time for your assignment. Before you begin to give answers, make sure that you have already covered all activities and review questions included into the module.

3) Give your answers on the space provided in question paper.

4) Your hand writing should be as legible as possible.

Wish you the best of study time!

SAMPLE ASSIGNMENT QUESTIONS BASED ON UNITS 1– 4

Part I: Multiple Choice Type Questions

Instruction: Choose the correct answer from the given alternatives and write the answer on the space provided in front of each question.

1. Which of the following is a major landform region in Africa?
   (A) Atlas Mountains
   (B) The Sahara Desert
   (C) The Sahel
   (D) African massif

2. Which of the following is **not** a desert in Southern Africa?
   (A) Kalahari Desert
   (B) Namib Desert
   (C) Great Escarpment
   (D) A and B

3. Which of the following is **not** a part of the South African inland plateau?
   (A) Highveld
   (B) Great Karoo
   (C) Kalahari Desert
   (D) Bushveld

4. Which of the following is **not** part of the savanna region?
   (A) woodland
   (B) thorn tree tall grass
   (C) tropical rainforest
   (D) broad-leaved deciduous trees

5. Which of the following is not a continent: Asia, Africa, or Australia?
   (A) Asia
   (B) Africa
   (C) Australia
   (D) Atlantic

6. Which of the following is the key factor in determining climate regions of the world?
   (A) average temperature
   (B) precipitation
   (C) wind patterns
   (D) all of the above

7. Which of the following descriptor used in the Köppen's climate classification system is related to severe winter?
   (A) moist
   (B) dry
   (C) warm
   (D) cold

8. Which of the following is **not** among the major controls of climate of Africa?
   (A) population distribution
   (B) air pressure
   (C) wind patterns
   (D) latitude

9. Which one of the following countries is **not** part of the Nile Basin?
   (A) Djibouti
   (B) Ethiopia
   (C) Kenya
   (D) Sudan

10. Which of the following is **not** a characteristic of a population pyramid?
   (A) It shows the age distribution of a population.
   (B) It shows the distribution of male population.
   (C) It shows the distribution of population into young, working, and old age groups.
   (D) It shows the distribution of population into single age or 5-year groups.

Part II: Fill in the Blank Spaces with Appropriate Words or Phrases

11. The Congo River is the largest river in Africa, and the second largest in the world after _____ River.

12. The continent with the least population in the world is _____.

13. Sub-Saharan Africa experiences the world's highest rate of natural increase in population, which is about _____% per year.

14. Africa's population is projected to reach _____ billion by 2030.

15. The growth of Africa's population since 1950 can be attributed to factors such as high _____ rates and low contraceptive use.

Part III: Short Answer Type Questions

Instruction: Write an essay (short answer) on the following questions.

16. What are the main factors that contribute to the high population growth rate in Africa?

_____

_____

17. What are the implications of the high population growth rate in Africa?

_____

_____

18. What are some possible solutions to the high population growth rate in Africa?

_____

_____

Geography

Distance Learning Material
Grade 10

Module I