

Geography and Environment

Senior 3

Student's Book

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FOREWORD

Dear Student,

Rwanda Basic Education Board is honoured to present to you Geography book for Senior Three which serves as a guide to competence-based teaching and learning to ensure consistency and coherence in the learning of geography subject. The Rwandan educational philosophy is to ensure that you achieve full potential at every level of education which will prepare you to be well integrated in society and exploit employment opportunities.

The government of Rwanda emphasizes the importance of aligning teaching and learning materials with the syllabus to facilitate your learning process. Many factors influence what you learn, how well you learn and the competences you acquire. Those factors include quality instructional materials available, assessment strategies for the learners among others. Special attention was paid to activities that facilitate learning process develop your ideas and make new discoveries during concrete activities carried out individually or with peers.

In competence-based curriculum, learning is considered as a process of active building and developing knowledge and meanings by the learner where concepts are mainly introduced by an activity, a situation or a scenario that helps the learner to construct knowledge, develop skills and acquire positive attitudes and values. For effective use of this textbook, your role is to:

- Work on given activities which lead to the development of skills
- Share relevant information with other learners through presentations, discussions, group work and other active learning techniques such as role play, case studies, investigation and research in the library, from the internet or from your community;
- Participate and take responsibility for your own learning;
- Draw conclusions based on the findings from the learning activities.

To facilitate you in doing activities, the content of this book is self-explanatory so that you can easily use it by yourself, acquire and assess your competences. The book is made of units whereby each unit comprises: the key unit competence, followed by the introductory activity before the development of geography concepts that are connected to real world situation.

I wish to sincerely extend my appreciation to REB staff who organized the editing process of this textbook. Special gratitude also goes to lecturers,

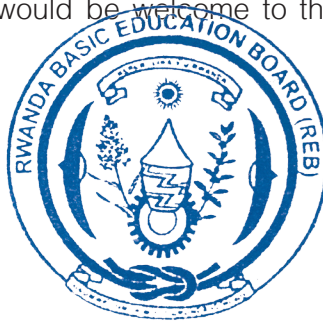
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teachers, illustrators and designers who supported the exercise throughout. Any comment or contribution would be welcome to the improvement of this textbook for the next edition.



Dr. MBARUSHIMANA Nelson

Director General, REB



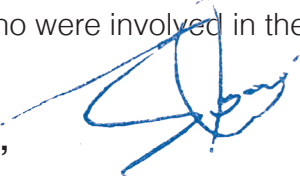
ACKNOWLEDGEMENT

I wish to express my appreciation to all the people who played a major role in editing process of this Geography book for Senior three. It would not have been successful without their active participation.

Special thanks are given to those who gave their time to read and refine this textbook to meet the needs of competence based curriculum. I owe gratitude to different Universities and schools in Rwanda that allowed their staff to work with REB to edit this book. I therefore, wish to extend my sincere gratitude to lecturers, teachers, illustrators, designers and all other individuals whose efforts in one way or the other contributed to the success of this edition.

Finally, my word of gratitude goes to the Rwanda Basic Education Board staff particularly those from Curriculum, Teaching and Learning Resources Department who were involved in the whole process of editorial work.

Joan Murungi,



Head of Curriculum, Teaching and Learning Resources Department / REB

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Map Work Interpretation

Key unit competence

By the end of this unit, you should be able to interpret the relationship between physical and human features on maps and draw sketch diagrams of a map.

Introduction

Activity 1.1

1. Use the knowledge gained from S1 and S2 about map work to explain what you understand by the following terms:
 - (a) A map
 - (b) Map interpretation
2. Explain why maps are important.

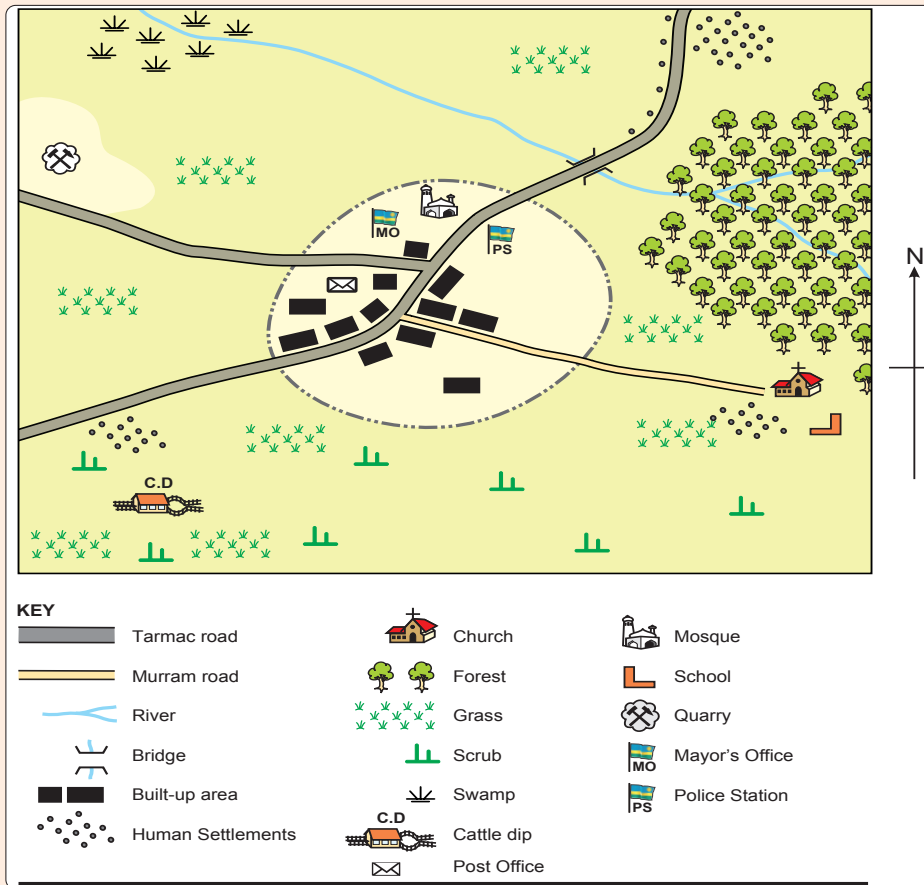
In this unit, we will learn more about human and physical features on a map by studying the following sections:

1. Identifying human and physical features on a map.
2. Relationships between different features (human and physical aspects).
3. Drawing sketch maps or sketch diagrams.
4. Reduction and enlargement of maps.

From **Activity 1.1**, you will realise that a map is important because it can be used by a map reader to identify various features on the earth's surface. In addition, it can be used to show the relationship between physical and human features.

Activity 1.2

During their Geography lesson, Jane Mutesi was given the following sketch map by her teacher. She was to explain to her classmates how she would identify human and physical features represented.

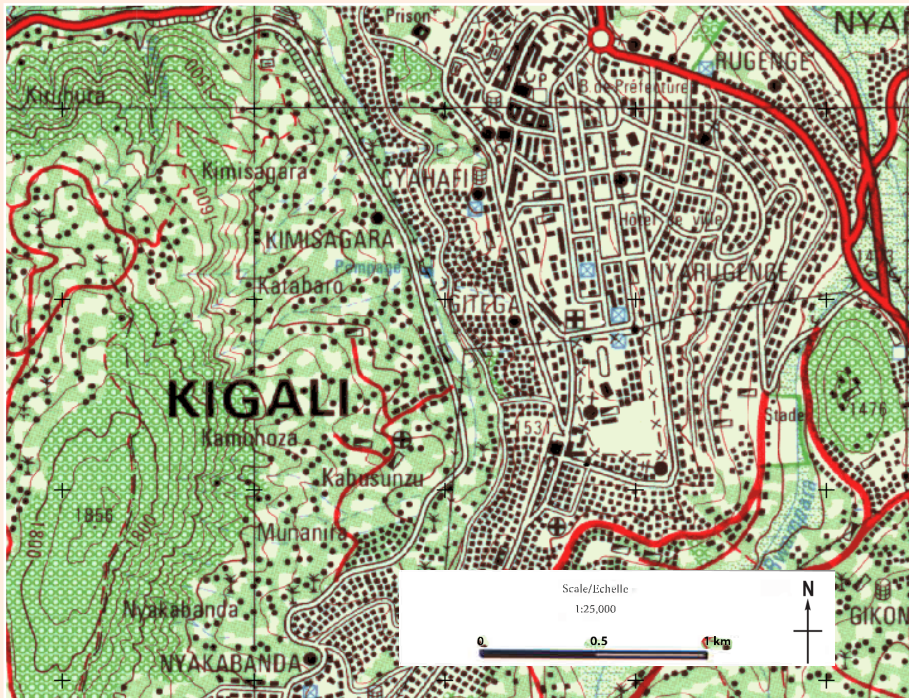


1. Suggest the physical features she could identify.
2. List down human made features she could see on the map.
3. Using evidence from the map, suggest the activities taking place on the map Jane may have identified.ⁿ

Activities 1.1 and 1.2 show that a map has both human and physical features which relate to each other.

Activity 1.3

Identify human and physical features on the following topographic map of Kigali.



KEY

- Main tarmac road Route nationale asphaltée - Main murrum road Route nationale non asphaltée - Feeder road Route communale - Track Piste carrossable - Path Sentier - Boulevard/road lined with trees Route bordée d'arbres - Road under construction Route en construction - Power/electric line Ligne de transport d'énergie électrique - Bridge, footbridge Pont en dur, pont en bois - Contours Courbe de niveau - Contours, contour intervals, depression Coubé de niveau, intercalaires, cuvette - Quarry, factory and/or industrial complex Carrière, usine et/ou complexe industriel	- Dense/nucleated settlement, sparse, scattered Habitat concentré, dispersé, remarquable - Hospital, health centre, dispensary Hôpital, centre de santé, dispensaire - Sectorial bureau, school, dipping tank Bureau de secteur, école, dipping tank - Religious edifices: church, temple, mosque Edifices religieux: église, temple, mosquée - Border post, market Poste de douane, marché - International airport, aerodrome/air strip Aéroport international, aérodrome - River Rivière - Pond, marsh, a well Etang, mare, puits - Lake, swamp Lac, marais - Falls, dam Chutes, barrage - Border pillar, radio booster station Borne frontière, antenne relais de radio	- Natural forest, plantation Forêt naturelle, boisement - Savannah or pasture Savane ou pastoralage - Upland crops, valley crops Cultures des collines - Rangeland, cash crop Prairie, cultures industrielles - Papyrus Papyrus - Bananas, sugar cane, coffee Bananier, canne à sucre, café - Rice, tea, cotton Riz, thé, coton - Quinine, pyrethrum, bamboo Quinquina, pyrèthre, bambou - Terraces Talus - Rock, cliff Rocher, abrupt - Trigonometrical pillar Détail particulier - Mine 1 operational 2 derelict Mine 1 en activité 2 arrêtée
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Some of the features you will identify are shown in the following table.

Physical features	Human features
Ridges, ranges, hills, valleys, spurs, cliffs, plains, valleys, different types of vegetation, rivers, swamps, lakes, steep slopes	Settlements, transport systems (roads), crops, buildings, towns, boreholes, dams, pipes

1.1 Identification of human and physical features on a map

Topographic maps are often known as topo sheets. Simply, topographic maps are maps that show both human made and natural features. Because of the great variety of information included on them, topographic maps are most often used as general reference maps.

Topographical maps are used to show qualitative details as well as quantitative representation of natural and human made features.

How to identify physical features from a topographical map

Physical features include **relief**, **drainage** and **vegetation**.

1. Relief

- (a) Where contours form concentric circles they indicate a **hill** or a **mountain**.

Trigonometrical stations are used to show the actual height of the hill or a mountain.

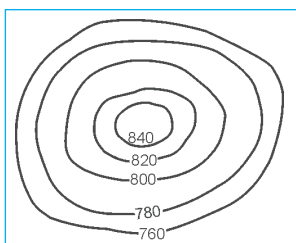


Fig. 1.1: A hill

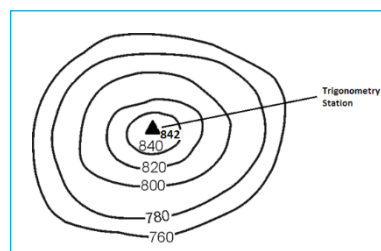


Fig. 1.2: Trigonometric Station

- (b) Where contours are close to one another, they indicate a **steep slope**. Where they are far apart, they indicate a **plateau, plain** or a **flat land**.

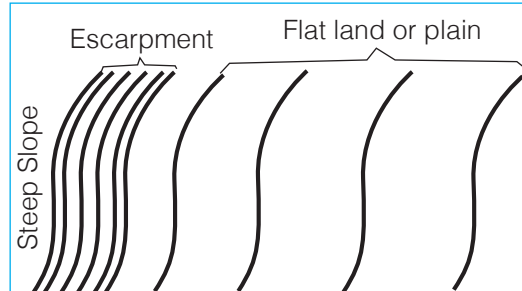


Fig. 1.3: A steep slope and a plain

- (c) Where contours are V or U shaped, they indicate a **valley**. The shape of contours usually point to the source of the river.

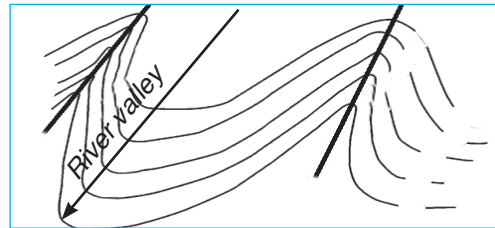


Fig. 1.4 : A valley

- (d) Where contours appear to overlap or cross each other, they form a **cliff**.

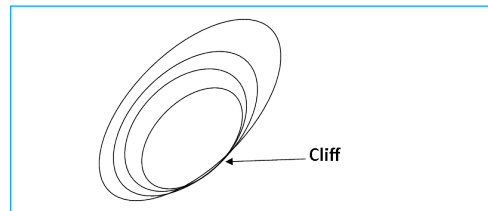


Fig. 1.5: A cliff

- (e) The following contours indicate a range or a **ridge**.

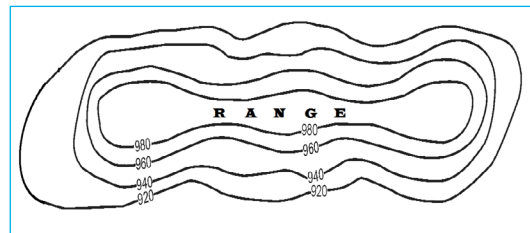


Fig. 1.6: A ridge

- (f) A **saddle** is a depression found between two hills. When represented on a map using contours, it appears as shown.

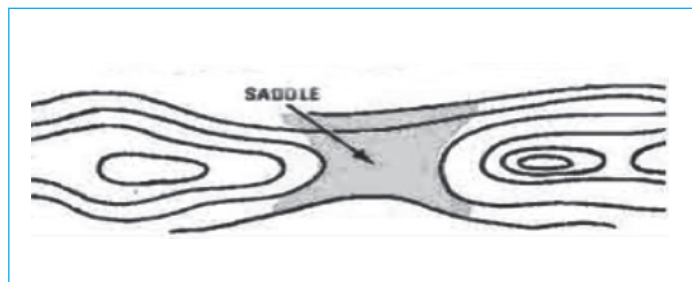
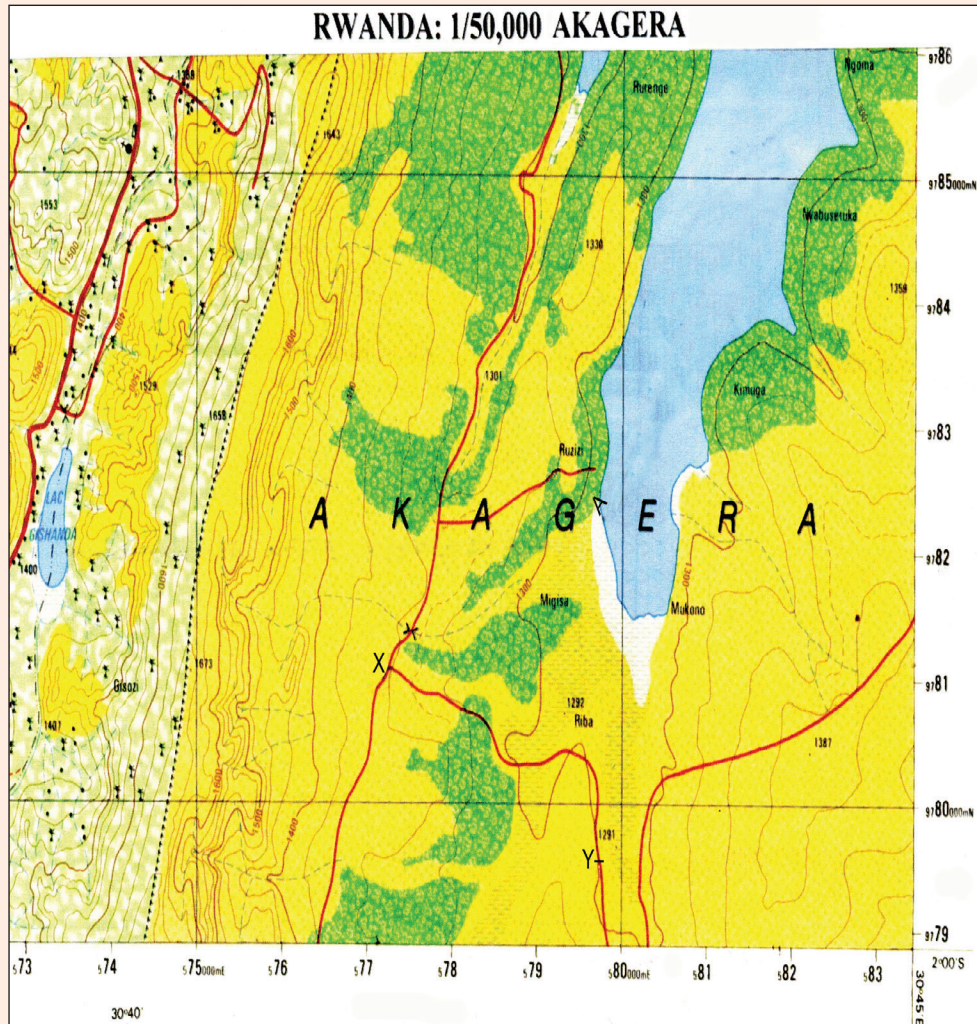


Fig. 1.7: A saddle

Activity 1.4

Identify relief features from the topographical map below.



Prepare a class presentation from your findings.

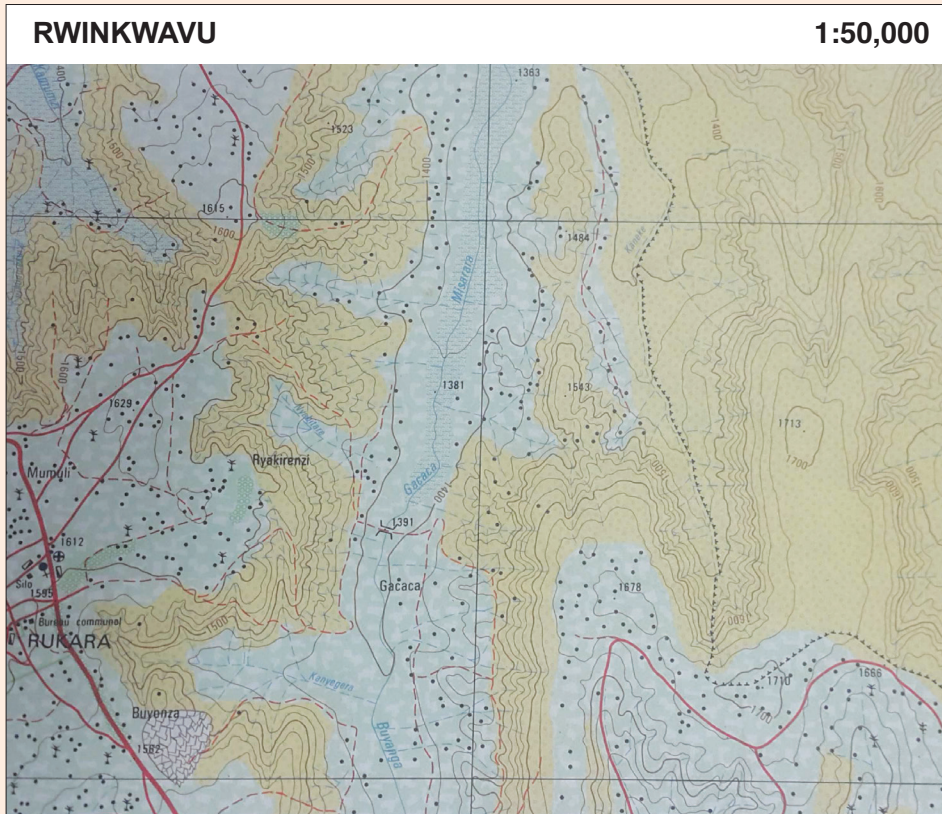
Activity 1.4 shows that a map can be used to give a detailed account of many relief features.

2. Drainage

Drainage refers to rivers, lakes, oceans, swamps, dams and wells. They are often represented on the map using a **blue colour**.

Activity 1.5

Analyse the drainage features shown on the map of Rwinkwavu shown below.



3. Vegetation

Vegetation is represented on a topographical map either in different colours or by the use of symbols.

Activity 1.6

Use the topographic map of Kigali (1:50,000) provided on page 3 under Activity 1.3 to identify different types of vegetation found on the map.

Human features shown on a topographical map

Activity 1.7

Suggest some of the human features found around your home and school.

Human features are made by people or come about as a result of people's activities.

Some of the human features commonly shown on the map are settlement, means of transportation, agriculture, trade and mining.

Activity 1.8

Carry out a research to find out how human and physical features influence economic activities.

In order to identify human and economic activities on a topographical map, you need to look for evidence from the map.

Activity 1.9

Copy and complete the following table in your notebooks.

Activity	Evidence
Trade	Market, shops, stores
	Railways, airstrips
Lumbering	
	Hotels, game parks, mountains
Fishing	
	Schools, colleges, university
Religion	
	Power lines
Livestock rearing	
	Quarry, name of minerals
Tea growing	Stadium, swimming pool

Activity 1.10

Study the map of Karongi (1:50,000) then answer the questions that follow:



- (a) Describe:
 - (i) Relief features on the map.
 - (ii) Human made features on the map.
- (b) Find out how relief features relate to human activities on the map of Karongi.

1.2 Relationships between different features (Human and Physical Aspects)

Introduction

Jane Mutesi from Bushoki decided to visit her aunt who lives in Cyeru. On the way, she noticed that where she comes from, land is steep and few people are settled there. As she moved towards Lake Ruhondo, the land appeared flat. There were many settlements there. Around Gakenke, there were several hills and on gentle slopes there were few houses. As she got near River Bahimba she noticed that the land was flat and swampy. There was no settlement in the swamp.

The other thing she noticed is that there were many people at the small shopping centres compared to the countryside.

To the eastern side of the River Bahimba the valley is steep and to the western side towards Gakenke the land started rising gently. As she approached the hilly areas, she noted that these areas had no settlement.

She also noticed that there were settlements along the shores of Lake Ruhondo and Lake Burera.

Activity 1.11

1. Discuss why you think people are not settled in swamps and on steep slopes.
2. Give reasons why there may be little or no people settled in forested areas.
3. Discuss why there are many people settled on flat land, gentle slopes and along the shores of lakes Ruhondo and Burera.
4. Identify and list down the physical features mentioned in the story above that can be shown on a topographic map.

The purpose of this topic is to relate the human and physical features. For instance what human activities are likely to be practised in hilly areas, mountain areas and in low lands? How a river or a mountain influences people living around ?

1.3 Drawing sketch maps and Sketch diagrams

Activity 1.12

Draw a sketch map of your school and its immediate environment. Insert man made features such as roads, fences and bridges. Also include physical features such as hills, flat land or plains and valleys.

A Sketch Map

A Sketch map is a map that is drawn without considering the scale of the area being represented.

You will notice that when drawing a sketch map, you need to be keen for you to observe as many features around you as possible. When drawing a sketch map from a topographic map, you need to be equally keen in order to identify all the things you will want to show.

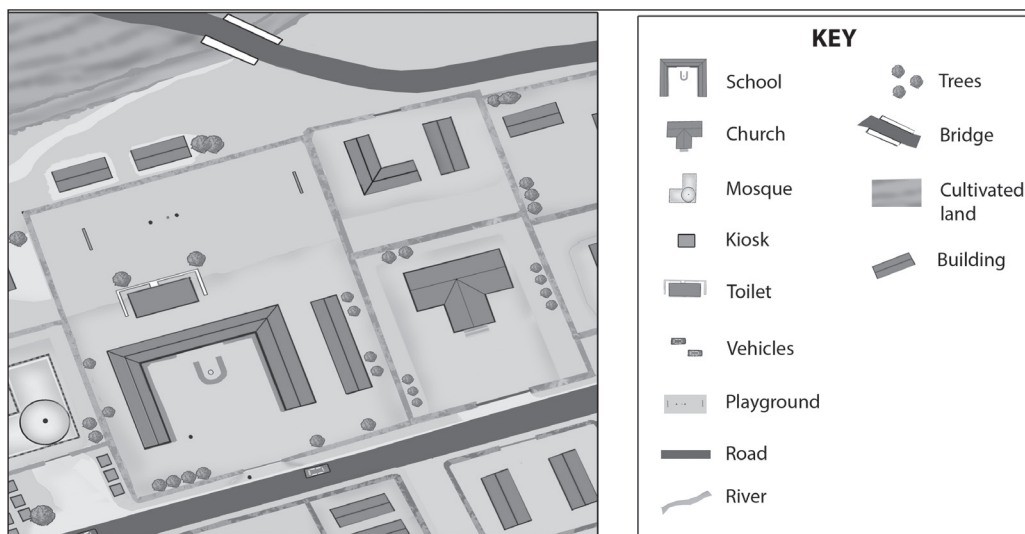
Sketch maps should be simple and clear. They should not be crowded.

A good sketch map must be well labelled.

Quick facts

A sketch map is drawn from observation rather than exact measurements representing the main features of an area. Sketch maps are drawn to show specific areas of information the users would require.

The following is a sketch map of Nzayisenga's school compound.



Activity 1.13

1. Draw a sketch map of your local environment showing major human activities such as trading centres and different modes of transportation.
2. Discuss the suitability of a sketch map compared to an ordinary map.
3. Using the topographical map of Akagera (1:50,000) on page 6, draw a rectangle measuring 16cm by 8cm representing a section of the map.
On your rectangle, show all the physical features within the area represented on the map in the rectangle you have drawn.

From **Activity 1.13** above, you will notice that the sketch maps you have drawn are clearer than the original areas because they only show the items the map reader wants to highlight.

1.4 Reduction and enlargement of a map

Reduction or **enlargement** is where a feature or area on a map is drawn either being smaller or bigger than the original size. Reduction or enlargement should result into shapes or areas that are identical to the original, without a change in form.

An enlargement provides the same map but proportionally larger than the original. A reduction gives the same map that is proportionally smaller than the original. If the map has been reduced by $\frac{1}{2}$. The amount of that original image/ map has been enlarged or reduced is called **a scale factor**, or **an enlargement** or **reduction factor**. It is the size you increase or decrease the shape.

We are now going to learn how to enlarge a region of a map and vice versa by use of the **method of squares** and the **method of similar triangle**.

(a) Method of squares

Activity 1.14

Using the map of Karongi (1:50,000) on page 9, we are going to enlarge and reduce a part of the water body found on the south western part of the map.

Procedure

1. Trace the same part of water body the way it is on a plain piece of paper. This is the actual size of the lake as per the map scale.
2. Draw grid squares on the map of the lake. The closer the grid, the more accurate will be the result.
3. Now draw another similar network of squares, enlarged or reduced as you desire and copy the details of the lake, square by square, by eye on to the drawing paper. Note every important intersection of the detail with the grid lines.
4. What do you see? Either an enlarged or reduced map of the water body.

This method of reducing a map or enlarging it is known as **the method of squares**.

Figure 1.8 shows how the original map of a lake, marked B can be enlarged to 1.5 of its original size by the method of squares. It also shows how the map can be reduced to 0.75 of its original size by the method of squares.

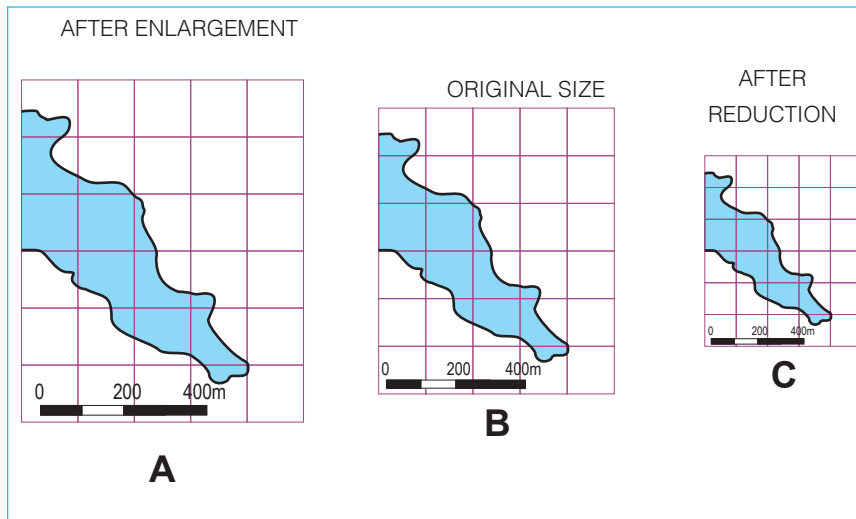


Fig. 1.8: Sketches showing enlargement and reduction by the method of squares

It is important to note that if you reduce an area too much, a lot of details may be lost. Therefore, it is important that you simplify, generalise or omit the small details. Words need not to be reduced or enlarged proportionally.

Some features on the map may not be enlarged or reduced by square method. Some of these features are normally narrow such as a road, railway or a river.

(b) Method of similar triangle

Procedure

1. Use a plain piece of paper to draw either a position of a river or a road on it running vertically.
2. Mark point A at the top and B at the bottom end.
3. Join the two points AB using a straight line to follow the major bends and curves.
4. Choose any point T at a convenient distance to the left of line AB.

5. Join each end A and B to T and any other significant point.

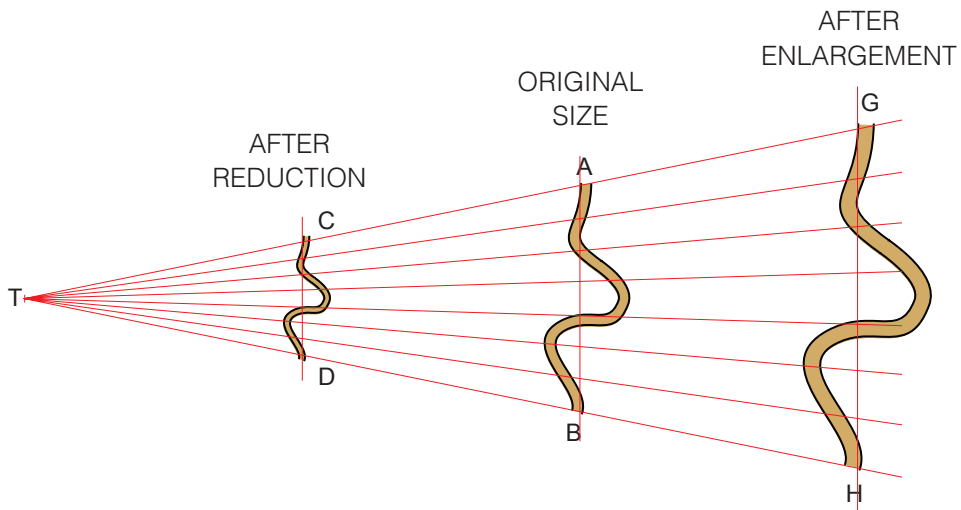


Fig. 1.9: Sketches showing enlargement and reduction by method of similar triangle

6. To reduce the size of road AB by half, measure distance TA and divide by 2 and mark the point C. Do the same for TB and mark point D. Notice line CD is parallel to line AB.
7. To enlarge the size of road AB, draw a parallel line to the right of guideline AB and label GH.
8. Trace the road using the points of relevant intersection of the road with lines originating from point T.
9. GH is an enlargement of AB.

This method of enlargement or reduction is known as **the method of similar triangle**.

Activity 1.15

Use the available topographical map to enlarge and reduce a region or feature of your choice.

END UNIT ASSESSMENT

1. With reference to the map of karongi name the main means of transport likelyt to be used in the area covered by the map.
2. Study carefully the map of Akagera then list the types of vegetations
3. Discuss the effects of vegetation on human settlement.
4. Explain why steep and hilly areas are sparsely populated

Relief in Africa and the World

Key unit competence

By the end of this unit, you should be able to analyse the impact of different relief features on climate and human activities in Africa and the world.

2.1 Introduction to Africa: Location, area and population in comparison to other continents of the world

Relief refers to the physical landscape with regard to the configuration of the surface into various landforms, and their variation in height above sea level. The major landforms of the world are **mountains, plateaus, plains, basins** and **valleys**. Along with these are relatively smaller features such as hills.

In this unit, we shall discuss the following sections:

1. Introduction to Africa
2. Major relief forms of Africa
3. Major relief forms of other continents
4. Impact of relief features on environment

Activity 2.1

Using the atlas or internet sources:

1. Describe the location of Africa using longitudes and latitudes.
2. Compare the size of Africa to:
 - (a) the largest continent of the world
 - (b) smallest continent of the world
3. Find out the average population of Africa.
4. Find out the names of the four farthest points of the African continent to the North, South, East and West.

(a) Location of Africa

The points whose names you have found out are located 37.3° North and 34.5° South of the equator. The farthest point to the east is 51° East and on the west is 23.6° West.

(b) Area (size) of Africa

Africa occupies approximately 30 300 300 square kilometres. It is the second largest continent in the world. This area is about 23% of the total land area of the world.

(c) Population of Africa

By 2016, Africa's population was estimated at 1.216 billion making it the second most populous continent in the world after Asia. It accounts for 16.1% of the world's population. (Source: USA Statistics Bureau)

Activity 2.2

Using the internet or geographical documents, find out and name the three most highly populated countries of Africa. Find out the estimated population of each country.

Population of Africa in comparison to other continents of the world

The table below shows the area and population of the world's six continents as estimated in 2016.

	Africa	Europe	Asia	North America	South America	Australia & Oceania
Area (million km ²)	30.4	10.2	44.6	24.7	17.84	8.5
Population (in millions)	1 216	743	4 436	579	422.5	41

(Source: CIA Factbook, 2016)

Table 2.1: Area and population of the world's six continents.

According to the table provided, above, Asia is the largest and the most populated continent in the world while Australia and Oceania is the smallest and the least populated continent.

2.2 Major relief forms of Africa

Activity 2.3

Using your atlas, identify and list the major relief features shown on the map of Africa provided in Fig 2.1.



Fig. 2.1: Map of Africa showing relief features

The relief of Africa consists of a series of plateaus that are higher in the east but become lower westwards. In many parts, these plateaus have been modified to form new landforms.

The major landforms of the continent are:

- Coastal plains
- Low plateau lands
- Basins
- High plateau lands
- Rift Valley system
- Mountains

2.2.1 The coastal plain

This is land bordering the ocean and is about 200 metres above sea level. In some parts of Africa, the coastal plain is narrow while in other parts it is relatively wide. Compared to other continents, the coastline of Africa has few inlets.

The common features along the coast are:

- Deltas
- Beaches
- Sand bars
- Estuaries
- Coral reefs.
- Lagoons

2.2.2 Low plateau lands

Activity 2.4

Using a physical map of Africa find out the locations of the low plateau lands. List the plateaus in your notebook and indicate their height above sea level.

The average height of the low plateau lands in Africa is 900 metres above sea level. However, others rise to above 1200 metres above sea level. The low plateau lands in Africa include Ahaggar (about 900 m high), Tibesti of the Sahara (cover 1200 m high), Fouta Djallon (900 m high), Jos Plateau (about 1280 m high) and Ennedi Plateau (about 1400 m high). These plateaus are not continuous. In some areas they are separated by broad basins.

2.2.3 The high Plateau lands

High plateau lands are on the eastern and southern areas of the continent. They include the Ethiopian Plateau which rises to about 4500 metres above sea level. Others are East African Plateau (1500 m), The Zimbabwean High Veld (rising to over 2500 m) and the Drakensberg (over 3400 m high). The plateau surface rises to over 900 metres above sea level.

2.2.4 Basins

Activity 2.5

1. Some of the basins found in Rwanda are the Nile River Basin and the Congo River. Use a map of Rwanda to identify and list other basins found in the country.
2. Using an atlas and geographical documents, identify and list other basins found in Africa.

Present your findings in class for further discussion.

Basins in Africa are quite widespread.

There are several types of basins. Some are high above sea level and are bordered by mountains, for example the Lake Victoria basin. Others are filled with sediments and may have an external drainage system like the Congo Basin. Others are basins of inland drainage such as the Chad basin.

The biggest basin in Africa is the Congo basin which is 4.1 million square kilometres. Other large basins include the El Djouf, Sudan and Kalahari basins.

Quick facts

Basins are broad but fairly shallow depressions on the earth's surface.

Examples of basins in Africa:

- Lake Victoria basin
- Congo basin
- Chad basin
- El Djouf basin
- Sudan basin
- Kalahari basin

2.2.5 The mountains of Africa

The mountains of Africa are scattered across the continent. There are four main types of mountains in the continent.

- (a) Fold mountains
- (b) Block mountains
- (c) Volcanic mountains
- (d) Residual mountains

a) Fold Mountains

These are mountains formed through folding. Folding occurs when compression forces within the earth's crust cause the layers of the upper part of the earth's crust to bend upwards.

There are two **fold mountains** on the continent namely:

1. The Atlas fold mountains in the North West Africa.
2. The Cape Ranges in South Africa.

b) Block Mountains

Block mountains occur when compression forces causes cracks (or faults) in the layers of the earth's crust. Continued compression results to some blocks of land being pushed above others, forming block mountains.

Block Mountains are associated with faulting that formed the rift valley. Examples of block mountains include Rwenzori on the border of Uganda and Democratic Republic of Congo, Pare and Usambara in north eastern

Tanzania and Damakil Alps in Ethiopia and Eritrea.

c) Volcanic mountains

Activity 2.6

Using your Atlas and Geographical documents, locate the various volcanic mountains in Africa. For each mountain, name the country where it is found.

Volcanic mountains usually form from magma that erupts from under the earth's surface. The magma piles and cools to form high mountains.

Volcanic mountains are more common and are scattered all over the continent.

In areas where vulcanicity has occurred, there are also other volcanic features such as ash and cinder cones, craters and calderas, lava plateaus and lava plains. Some of the features are shown on the diagram below.

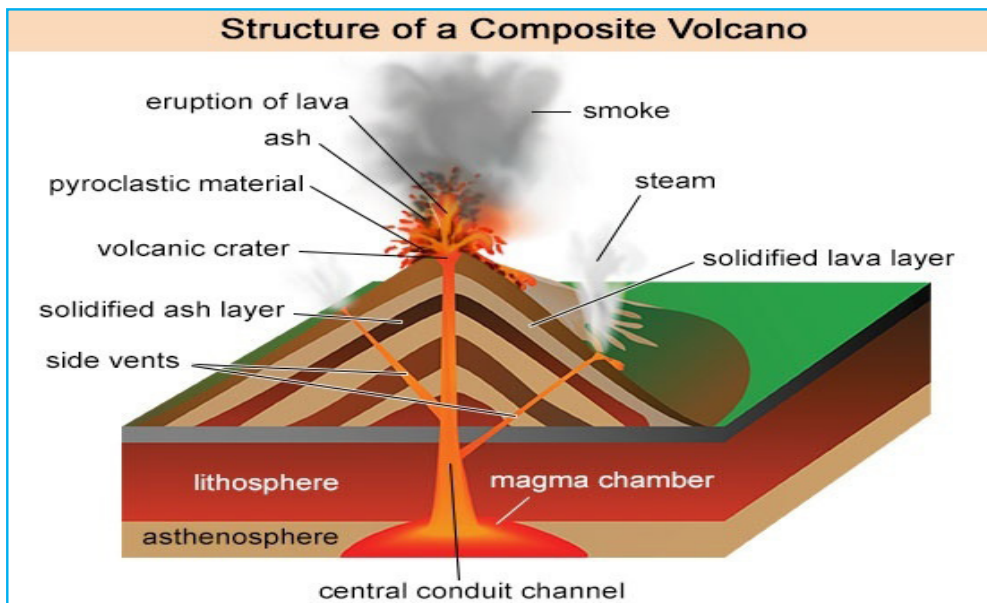


Fig. 2.2: Formation of a volcanic mountain

Prolonged erosion on mountains and highlands removes the weak rock

materials but the more resistant rocks remains to form residual mountains. Such mountains are not high in altitude and occur in many parts of Africa. Some of these residual mountains are referred to as **inselbergs**. Examples in Africa include Namuli Mountains in Mozambique and Brandberg in Namibia.

2.2.6 The Great Rift Valley

Activity 2.7

Using your atlas and geographical documents:

Draw a sketch map of Africa. On it, show the position of the Great Rift Valley.

Indicate the major lakes found in the rift valley.

The **Great Rift Valley** runs from the Red Sea in the north, through Ethiopia, Kenya, Tanzania, and Malawi and extends to Beira in Mozambique. There is a western branch along the Tanzanian border with Zambia and Congo and runs north along the Congo border with Uganda up to Southern Sudan. On the sides of the rift valley there are high block mountains and in some areas there are volcanic mountains.

Quick facts

The **Great Rift Valley** in East Africa forms two branches, that is the Western branch (Albertine Rift) along the Tanzanian boarder and the Eastern branch which is the main one.

2.3 Major relief forms of other continents

The major relief forms of other continents are the same as those found in Africa.

The map of the World



Fig. 2.3: Map of the world showing major relief forms

2.3.1 Coastal plains

Activity 2.8

Using your atlas, geographical documents and internet:

1. Locate the coastal plains in each of the continents other than Africa.
2. Copy and complete the table below by naming the continent where each feature is found.

Feature	Continent
(a) Mississippi delta	
(b) Ganges Delta	
(c) The great barrier reef	

Examples of the major coastal plains in the other continents include:

- (a) The Gulf Coast and the East coast lowlands of North America.
- (b) The Coastal lowland of Venezuela, Guyana, Suriname, Brazil and Argentina in South America.
- (c) Atlantic coastal lowlands of Western Europe.
- (d) The Arctic coastal lowlands of Russia, the lowlands of India, Bangladesh, Thailand, Indonesia and Northern China in the continent of Asia.
- (e) The lowlands found in southern New Guinea, North East coast and southern Australia.

2.3.2 Plateau lands

Activity 2.9

Using your atlas, geographical documents or internet:

1. Locate the areas with high plateaus of the other continents.
2. Compare the size of the high plateau lands in other continents to those of Africa.

The following are examples of plateau lands in each of the other continents with their approximate heights above sea level.

- (a) High Plateau (between 350m and 2400m), Yukon Plateau (over 950m), Plateau of British Columbia (over 6000m), Snake River Plateau (average height of 1000m), Colorado Plateau (over 3500m high), Plateau of Mexico (rises to about 2700m) and Allegheny in the Appalachians (over 1200m high) in **North America**.
- (b) Mato Grosso (over 600m high), Bolivian Plateau (average of 3750m) in **South America**.
- (c) The Spanish Meseta (average of 2165m), Middle Rhine Highlands (highest point at 900m), Fjeld Plateau (ranges between 1000m and 2500m) of Scandinavia in **Europe**.
- (d) Tibestan Plateau (over 4500m high), Iranian Plateau (over 5500 m high), Central Siberian Plateau (slightly over 1650m) in **Asia**.

2.3.3 Basins

Activity 2.10

Using your atlas, geographical documents or internet,

1. Locate the areas that are basins in the other continents.
2. Compare the size of the extent of basins in other continents to those of Africa.

Some of the areas in other continents where basins are found are:

- The Mississippi basin opens into the Gulf of Mexico in **North America**
- The Amazon Basin in **South America**
- The London Basin in **Europe**
- Murray-Darling basin, Lake Eyre basin in **Australia**.

2.3.4 Mountains in other continents

The following are some of the major mountains found in other continents:

In **North America**, the Rocky Mountains (over 4400m) and Appalachians (average of 2000m) are fold mountains which also host volcanic mountains for example, Mountain St. Hellens (2500m) in the Rockies. Mexico has also a variety of volcanoes including El Chichon (1200m) and Citlaltepetl (5400m). In **South America**, the most prominent are the Andes Fold Mountains (6900m).

In **Europe** there are series of high mountains such as the Pyrenees (3400m), Massif Central (1800m), the Alps (4800m), Apennines (2900m), Dinaric Alps (2600m), Sudeten Mountains (1600m), Carpathian Mts (2600m), Transylvanian Alps (2000m) and Balkan Mountains (2300m). Balkan Mts are all in the southern area while the Kjolen Mountains (2400m) are in Scandinavia. To the east are the Ural Mountains (1890m).

The Himalayan fold mountains (8800m). are centrally located in **Asia**.

In **Australia and Oceania**, the dominant mountains are the Great Dividing Range (2200m) on the east and the Southern Alps (3700m) of New Zealand.

2.4 Impact of relief features on environment

Activity 2.11

Using the internet and geographical documents discuss the positive and negative effects of relief features on the following giving specific examples from Africa.

- (a) Rainfall
- (b) Temperature
- (c) Settlement
- (d) Agriculture
- (e) Development of transport systems.

Present your answers for class discussion.

Relief features have a great impact on the environment. Their impact can be positive or negative. The features have an influence on physical environment and human activities such as settlement, agriculture and transport systems. They also influence tourism and mining activities.

The following are some of the examples: Alluvial plains are suitable for farming because of the fertile soils deposited by rivers when they flood. Plateaus are suitable for mechanised farming because of the leveled nature of the land. Gentler slopes of volcanic mountains are also suitable farming

lands because of their fertile volcanic soils. Mountains, wide valleys and escarpments are a barrier to construction of transport infrastructure. They can also be an obstacle to air transport. A large variety of relief features forms beautiful scenery for tourists to visit. These bring the much needed foreign exchange into the country they visit. Tourists also engage in other activities such as mountain climbing and skiing on the snow-covered slopes

END UNIT ASSESSMENT

1. “Africa occupies a central position among the continents”. Explain this statement using examples.
2. Draw a sketch map of Africa and on it, mark and label:
 - a) The fold mountains
 - b) Lake Victoria
 - c) The Great Rift Valley
3. Identify two lava plateaus in Africa and one in Asia.
4.
 - a) Explain six positive impacts of relief, two on the physical and four on the human environments.
 - b) Suggest three negative impacts of relief on the environment.

Soils in Africa

Key unit competence

By the end of this unit, you should be able to investigate the major types of soils in Africa and the world.

Introduction

Soil is made up of rock particles, minerals, water, organic matter and air. It forms a layer on the earth's surface that provides a foundation for plant and animal life on land.

In this unit, we shall discuss the following sections:

1. Major types of soils in Africa
2. Factors for soil formation in Africa
3. Major types of soils in other continents (Europe, North America, South America, Asia and Australia)

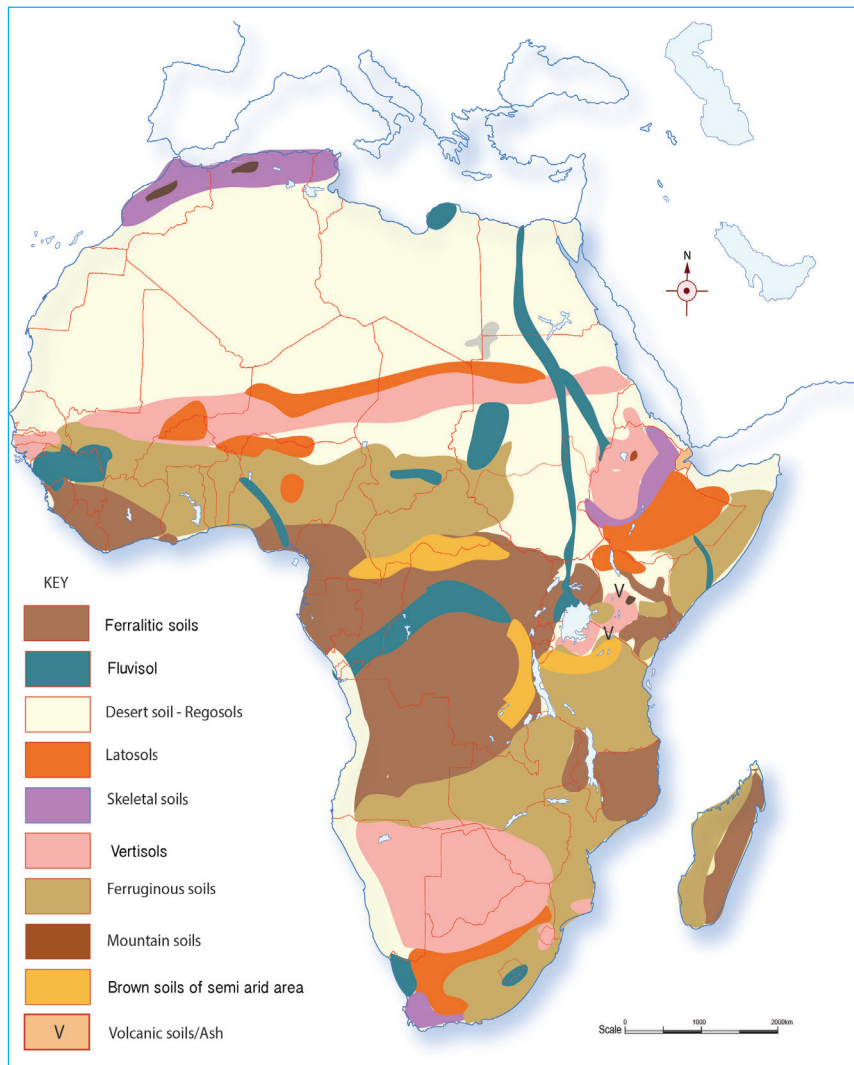
Quick facts

Soil is the upper layer of the earth in which plants grow. It may be black or brown, depending on the characteristics of the parent rock or materials it is formed from. It contains a mixture of organic remains, clay and rock particles.

3.1 Major types of soils in Africa

Soils in Africa vary from place to place. The vast land covered by the Sahara and the Kalahari deserts have desert soils that are mainly sand and stones. The rest of the continent has a variety of other soils whose characteristics depend on climate and vegetation types among other factors.

The map below shows the various types of soils found in Africa.



Source: Africa Soil Information Service (AfSIS), 2016

Fig. 3.1: Soils of Africa`

The major types of soils in Africa are:

- (a) Ferralitic and Ferruginous soils
- (b) Fluvisols
- (c) Regosols and brown soil of semi-arid areas
- (d) Latosols
- (e) Skeletal soils

- (f) Vertisols
- (g) Mountain and volcanic soils

(a) Ferralitic and Ferruginous soils

Ferralitic soils refer to any one of a group of soils that form in the humid tropics as a result of chemical weathering and by the collection of humus beneath forest vegetation. They are sometimes called lateritic soils.

Ferrallitisation is the process where iron and aluminium are removed through leaching, leaving the soil predominantly with silica. In tropical rain forests with rain throughout the year, ferralitic soils develop. In savannah areas, with alternating dry and wet climates, ferruginous soils occur.

(b) Fluvisols

Fluvisols are young soils in alluvial deposits. Apart from river sediments, they also occur in lacustrine and marine deposits. The good natural fertility of most fluvisols and their attractive dwelling sites on river levees and higher parts in marine landscapes have been occupied since prehistoric times.

Fluvisols are mainly found on alluvial plains, river fans, valleys and tidal marshes. Under natural conditions, periodical flooding is fairly common. The soils have a clear evidence of stratification. Soil horizons are weakly developed, but a distinct topsoil horizon may be present.

(c) Regosols and brown soil of semi-arid areas

Regosols are extensive in eroded lands, particularly in arid and semi-arid areas and in mountain regions.

Regosols and brown soils of semi-arid areas are reddish-brown and are common in arid climates. Areas where they occur experience a severe water deficiency. Otherwise, in terms of latitude, these reddish soils occupy the same global positions as areas of latosols and lateritic soils.

Red colour is evidence of an abundance of oxides of iron, which accumulate in warm climates where organic acids are not produced in large quantity.

(d) Latosols

Latosol is a name given to soils found under tropical rainforests with a relatively high content of iron and aluminium oxides.

(e) Skeletal soils

Skeletal soils refer to soils that contain a third of rock fragments, cobbles, gravel and ironstones having diameters greater than 2 mm, within shallow depths, usually less than 50 cm.

(f) Vertisols

Vertisols are soils with a high content of clay that forms deep cracks in drier seasons. Alternate shrinking and swelling causes self-mulching, where the soil material consistently mixes itself, causing vertisols to have an extremely deep A horizon and no B horizon.

(g) Mountain and volcanic soils

These are soils that are mainly found on mountain and hill slopes. They are formed due to mechanical weathering caused by snow, rain and temperature variation. The soils are rich in humus but are deficient in potash, phosphorus and lime. The soils change with an increase in altitude on the mountains depending on changes in climatic conditions.

Activity 3.1

Use the map of Africa showing distribution of soils in Africa to:

1. Identify the different types of soils found in different regions of Africa.
2. Draw the table below in your notebook and use the information from the map to complete the table you have drawn.

Regions of Africa	Dominant types of soils
Northern Africa	Desert soils
Central Africa	_____
Southern Africa	_____
Western Africa	_____
Eastern Africa	_____

3.2 Factors for soil formation in Africa

In Senior 2, you learnt how rocks break down as a result of **weathering** to form soil.

Activity 3.2

Use geographical documents or the internet to find out how the following processes lead to soil formation.

- (a) Humification
- (b) Leaching
- (c) Eluviation
- (d) Illuviation
- (e) Mineralisation

Prepare a presentation for class discussion.

Apart from weathering, there are several processes involved in soil formation. They include the following:

Humification

Humification refers to the process through which organic matter such as leaves and twigs is converted to humus by the action of decomposers such as bacteria and fungi. These micro-organisms in the soil turn the plant matter into humus. Humus is a black gel-like substance that is washed into the soil by rainfall.

Leaching

Leaching is a mechanism of soil formation that involves the loss of mineral and organic solutes due to very heavy rainfall, high temperature and percolation.

Leached materials tend to be lost from the topsoil and deposited in the subsoil. A soil horizon accumulating leached materials is referred to as a zone of illuviation.

Eluviation

Eluviation is the process of washing down of materials such as organic matter or minerals from upper layers of soil to lower levels. The process occurs through downward movement of water across soil horizons and accumulation of this material (illuvial deposits) in lower levels.

Illuviation

Illuviation is the deposition of colloids, soluble salts and suspended mineral particles in a lower soil horizon through the process of eluviation (downward movement) from an upper soil horizon.

Mineralisation

Mineralisation is the decomposition or oxidation of the chemical compounds in organic matter into plant-accessible forms.

There are several factors that influence the formation of different soils found in Africa and other parts of the world. These factors include:

1. Nature of the parent rock
2. Climate
3. Living organisms
4. Topography and Relief
5. Time

These factors of soil formation are interdependent. None of the factors acts independently and a region may have the influence of all the factors. However, one factor may be more dominant in a particular region as compared to another region.

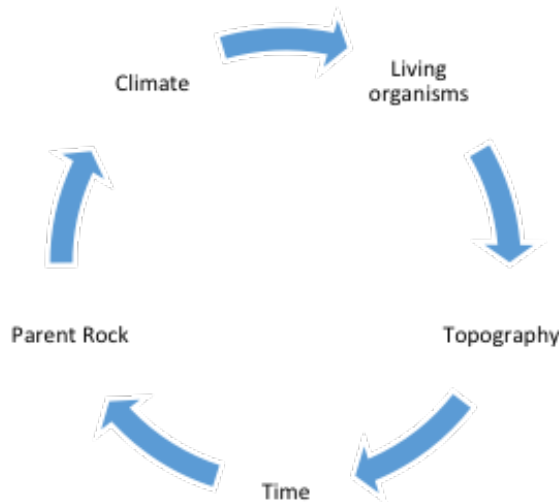


Fig. 3.2: Factors that influence soil formation

Activity 3.3

Carry out a research using geographical documents or the internet to find out how the following factors influence soil formation in Rwanda.

1. Climate
2. Human activities
3. Topography

Prepare a presentation for class discussion

3.2.1 Factors for soil formation in africa.

• Nature of the parent rock

The underlying rock is the origin of most of the soils. It breaks down into small particles which with time continue to break down until they become small grains and particles of sand. The size of the particles determines the soil texture. The type of rock determines soil colour and the mineral composition of the soil.

Weathering of the rocks is fast in areas within the tropics where temperature

and rainfall are high.

- **Living organisms**

The main organisms that influences soil formation includes plants, animals, bacteria and fungus. Through decay and decomposition of plants, organisms such as earthworms, termites, rodents assist in the mixing of inorganic matter (minerals) and organic matter (humus).

Human activities in a region helps to accelerate soil formation through breaking down the parent rock as well as tilling the land.

Quick facts

Vegetation plays an important role in soil formation. For instance, foliage (which includes leaves) may fall and rot, contributing to soil formation. Plant roots, as they penetrate the rocks, breaks them into smaller pieces. This, too, contributes to soil formation.

- **Time**

Soil formation takes time. Some soils have taken more than millions of years while others have only formed a few thousands of years ago. The time required for any soil to be formed will depend on all the other factors such as softness of the parent rock, the type of climate anywhere in the world, the living organisms in the ground or on land and their activities and the topography.

Soils can be referred to as mature, immature and young soils according to the time they have taken to be formed.

3.3 Major types of soils in other continents (Europe, North America, South America, Asia and Oceania)

Activity 3.4

Using the knowledge you have learnt about soils in Africa from Activity 3.1, name other parts of the world where the same types of soils are found.

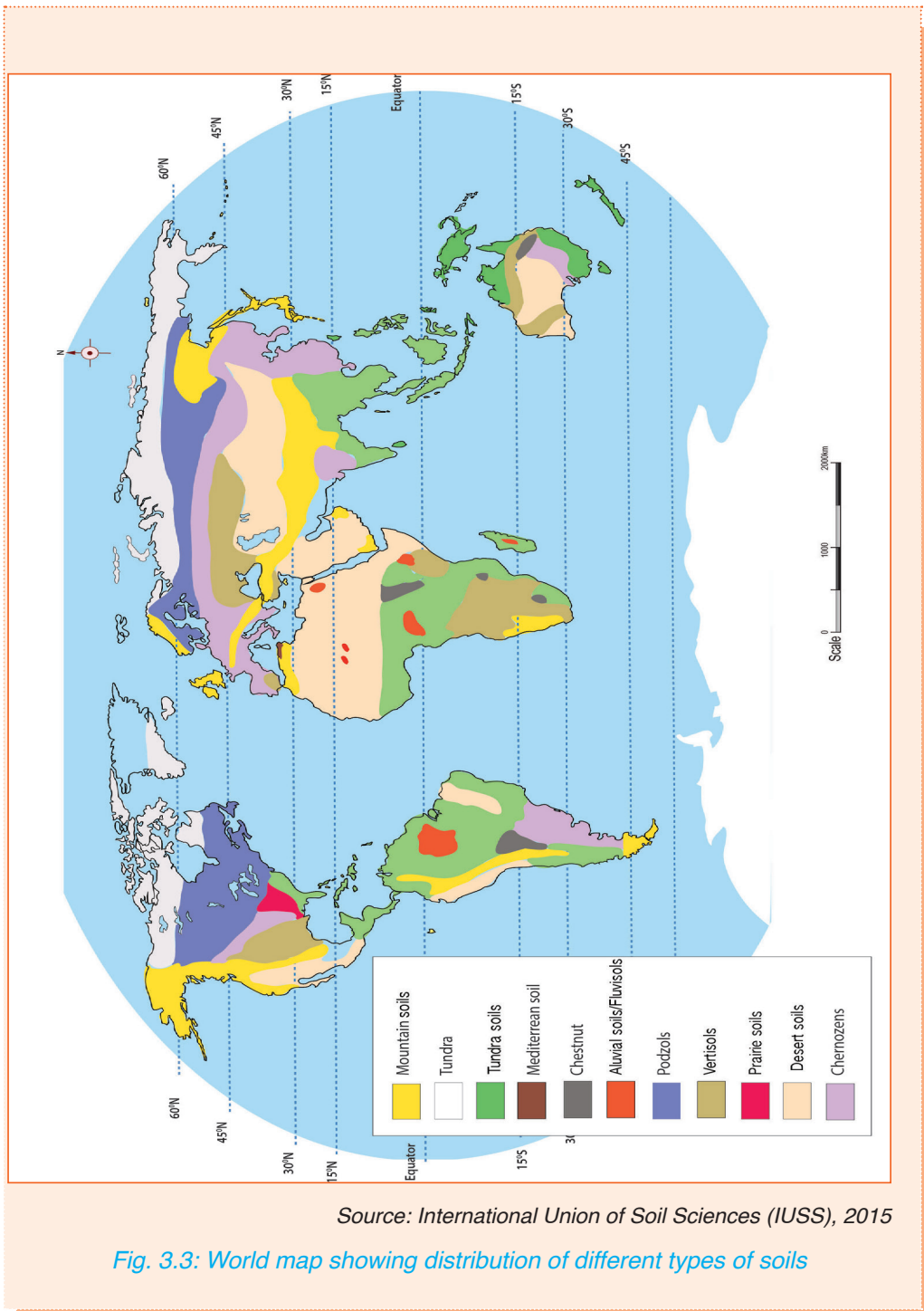
It is important to note that some of the soils that are found in Africa are also found in other parts of the world. For example, in continents that have deserts such as Asia (Gobi Desert), Australia (Australian Desert) and South

America (Atacama Desert) have desert soils. Most of the soils found in the continents that are far from the tropics are not found in Africa.

Activity 3.5

Study the map showing soils of the world in Fig 3.3 then use your Atlas to answer the following questions.

1. Identify and name the continents that have tundra soils
2. Which soils are dominant in the interior part of North America?
3. Which part of South America has mainly Latosols?
4. Describe the distribution of soils in Asia.



Activity 3.6

1. Use the internet or geographical documents to find out where in the world the following types of soils are commonly found.

(a) Prairie soils	(b) Volcanic soil
(c) Desert soils	(d) Mountain soils
(e) Vertisols	
2. Categorise the types of soils in the world found between the tropics and those found in high latitudes.

Prepare a presentation for class discussion.

Tundra soils: These are soils that are found in the polar regions. They are referred to as soils of the cold zones where polar tundra climate is experienced. Their formation is mainly influenced by the permanently cold climate which keeps the ground always frozen.

Podzols: These include peat soils and gray-brown podzolic soils. They are found in areas that experience very cold winters and short mild summers. They occur in areas immediately south of tundra regions.

Chestnut soils (clay loams): These type of soils are found in areas that experience tropical hot mid-latitude steppe climate.

Chernozems: These soils are found in areas that experience warm temperature continental climate such as the prairies of North America and the steppes of Asia.

END UNIT ASSESSMENT

1. Explain the main factors that lead to the formation of Latosols in Africa and the world.
2. Describe the distribution of Chernozem soils in Asia and South America.
3. Analyse the similarities of the soils found within the tropics.
4. Explain why we should conserve our soil.

Climate in Africa and the World

Key unit competence

By the end of this unit, you should be able to investigate the climate of Africa and the rest of the world and its impact on human activities.

Introduction

Climate is the average weather conditions of a place recorded over a period of about thirty years. The elements of weather are recorded consistently over the period. The average record is worked out to determine the climate. Climatic conditions vary from region to region. Within each continent, different areas experience different types of climate.

In this unit, the following sections will be covered:

1. Climate of Africa (regions, types and characteristics).
2. Climate of other continents (zones, types, location and characteristics).
3. Relationship between climate and human activities.

Quick facts

World climatic conditions are classified into four broad categories, namely:

1. Hot climates
2. Warm climates
3. Cool climates
4. Cold climates

Other continents extend further away from the equator with some areas lying within the Polar Regions. Some of the areas in other continents have very cold climates while others have very hot and wet climates.

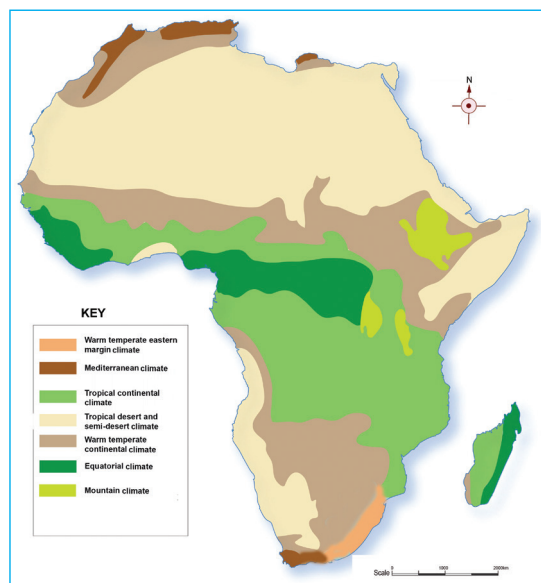
4.1 Climate of Africa (regions, types and characteristics)

Africa is the only continent that straddles the equator, having an almost equal south and north extent. This division of Africa into almost two equal parts across the equator makes the climatic and physical conditions in the north repeat themselves in the south. For example, the Kalahari Desert is the South's answer to the Sahara; the Karoo matches the Maghreb, while the conditions in the Cape area are almost identical to those of the Mediterranean region. A small difference exists due to the shape of the continent. For example, the shape of the northern half of Africa reduces any maritime influence. This shape difference results in a large desert, Sahara in the north and a much smaller one, Kalahari, in the south. The shape difference again makes the southern portion of Africa cooler than the northern section of the continent.

4.1.1 Climatic regions of Africa

Most of the continent experiences hot climate while the remaining small portion experiences warm temperate climate. Where there are high mountains, the climate is modified due to altitude.

Map 4.1 shows the major climate regions of Africa.



Source: Longhorn Publishers Geography Library

Fig. 4.1: Major climatic regions of Africa

Activity 4.1

Use the map showing the major climatic regions of Africa and your atlas to identify and indicate the types of climate experienced in each of the following countries. Ensure you give all the types of climate in each country as shown in the example.

Country	Types of climate
South Africa	Mediterranean, desert and semi desert, temperate continental, warm temperate eastern margin
Tanzania	
Chad	
DRC	
Nigeria	
Algeria	
Rwanda	

The following are the major types of climate in the various regions of Africa:

1. Hot climates

- a) Equatorial climate
- b) Tropical continental climate
- c) Tropical desert and semi-desert climates

2. Warm climates

- a) Warm temperate eastern margin climate
- b) Warm temperate western margin or Mediterranean climate
- c) Warm temperate continental climate

3. Mountain climates

4.1.2 Types and characteristics of climate in Africa

1. Hot climates

(a) Equatorial climate

Location

Lowlands within 10° north and 10° south of the equator.

Characteristics of Equatorial climate

- High temperature (24° - 27°C).
- Small annual range of between 3° - 5°C.
- Diurnal mean temperature of 26°C.
- Diurnal range of temperature of 6° - 7°C.
- Mean annual rainfall of 1500mm to 1800mm or more in some areas.
- Rainfall is evenly distributed throughout the year.
- Rainfall regime is a double maxima.
- Relative humidity is over 80% throughout the year.

(b) Tropical continental climate

Location

West, central, east and southern Africa and western Madagascar.

Characteristics of tropical continental climate

1. High temperatures throughout the year; 21°C during the cool season and 32°C during hot season.
2. Moderate annual range of temperature, 11°C.
3. Highest temperatures occur before the rainy season.
4. Moderate rainfall varying between 760mm and 1200mm.
5. Rainfall is more abundant in regions bordering the equatorial climatic belts and much less in regions of the outer margin of the belt.
6. Rainfall is seasonal and mainly convection type; falling during the hot season.
7. Where there are highlands, it is orographic.
8. There are three distinct seasons: a rainy season, a cool dry season and a hot season extending into rainy season.
9. Trade winds are the prevailing winds.

(c) Tropical desert and semi-desert climates

Location

- Desert areas include Sahara, Namib and Kalahari.
- Semi-desert areas include the Ogaden region covering Somalia, Ethiopia, parts of Eastern Africa and areas bordering the major desert areas.

Characteristics of tropical desert and semi-desert climates

1. High mean annual temperature of 27°C.
2. Annual range of temperature, sometimes reaching 28°C.
3. Diurnal range of temperature is large.
4. Very low annual rainfall, less than 250mm.
5. Rainfall is erratic and unreliable.
6. Humidity is very low.
7. Frequent strong winds.

Activity 4.2

Discuss:

1. Areas where **tropical desert** and **semi-desert climates** are found in Africa.
2. Characteristics of tropical desert and semi-desert climates in Africa

2. Warm climates

(a) Warm temperate eastern margin climate

This type of climate is also referred to as humid sub-tropical climate (China Type).

Location

Coastal belt of Natal.

Characteristics of warm temperate eastern margin climate

1. This climate is experienced in the south eastern part of Africa around Natal.

2. It is characterised by hot summers with temperatures of about 26° C and a mean annual rainfall of about 1000 mm per year. The rain is brought about mainly by onshore trade winds in summer. Winters are cool and dry.

Activity 4.3

With reference to the map of Africa showing major climatic regions, use of the internet or any geographical documents write down the location and characteristics of the following climatic regions in Africa

1. Tropical desert and semi-desert climates
2. Warm temperate western margin or Mediterranean climate
3. Warm temperate continental climate

(b) Warm temperate western margin climate

This type of climate is also called the mediterranean climate.

Location

Northern Africa bordering the Mediterranean Sea and southwest tip of South Africa around Cape Town.

Characteristics of warm temperate western margin climate

1. The hot season experience temperatures of about 21°C.
2. The cold season experience temperatures of about 10°.
3. Moderate annual range of temperature, about 11°C.
4. Mean annual rainfall between 500 – 900mm.
5. Rainfall is cyclonic, falling in showers during the cold season.
6. Trade winds are offshore during the dry season.
7. Westerlies dominate during the cold season and are onshore.
8. Hot and cold winds are also common.

(c) Warm temperate continental climate

Location

The high Veld of South Africa.

Characteristics of warm temperate continental climate

1. The dry season is hot, with average temperature of 26°C.
2. It experiences a mild, cold season with temperatures of about 10°C.
3. The annual range of temperature is moderate, about 16°C.
4. Mean annual rainfall is low to moderate, between 380 – 700mm.
5. It receives convectional type of rainfall and falls mainly during the dry season.

3. Mountain climates

Location

This type of climate is found in East African highlands, Ethiopian highlands, Drakensberg Mountains, Mount Cameroon and the Atlas Mountains.

Characteristics of mountain climates

1. Temperature decreases with increasing altitude.
2. In temperate regions, the equator-facing slopes are warmer than those facing the poles side.
3. Rainfall increases with increasing altitude up to 3000m above sea level, when it starts to decrease.
4. In general, windward slopes receive far much more rain than leeward slopes.
5. Atmospheric pressure decreases with increasing altitude.
6. Local winds blow upslope during the day and downslope at night.

Note: Within the tropics, snow can exist on top of very high mountains.

Activity 4.4

1. Using your atlas, identify some of the mountains that constitute the East African Highlands where mountain climate is experienced.
2. A tourist climbed the mountain shown in the photograph on page 46 starting from the bottom left slope to the highest peak.
 - (a) Explain the possible changes in weather that the tourist might have experienced while climbing the mountain.

- (b) Give examples of mountains in the East African region which may have similar characteristics to the mountain shown below.



4.2 Climate of other continents (Zones, types, locations and characteristics)

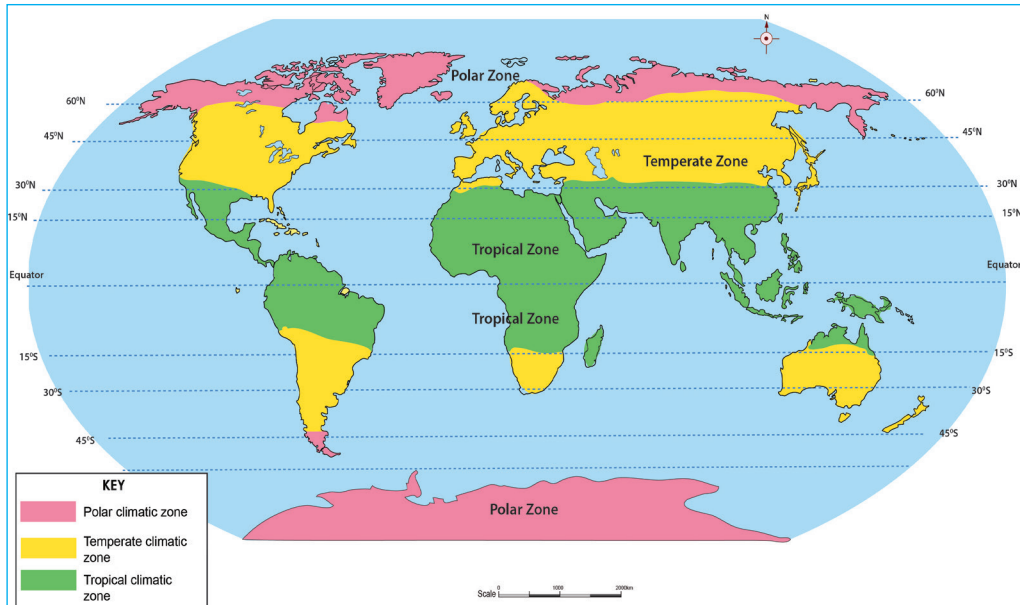
Activity 4.5

1. Use the map provided below to locate the areas that lie within the different climatic zones. For each continent (apart from Africa), describe the zone that appears to cover the largest part of the continent and the smallest area of the continent.
2. In which zones do the following areas fall?
 - (a) Africa
 - (b) Australia
 - (c) Antarctica

The climate experienced throughout the world can be divided into four zones. These are:

1. Tropical climate
2. Temperate climate
3. Arctic (very cold) climate
4. Mountain climate

The map below shows the climatic zones of the world.



Source: Longhorn Publishers Geography Library

Fig. 4.2: Climatic zones of the world

4.2.1 Tropical climate

This is the region found between the Tropic of Cancer and the Tropic of Capricorn.

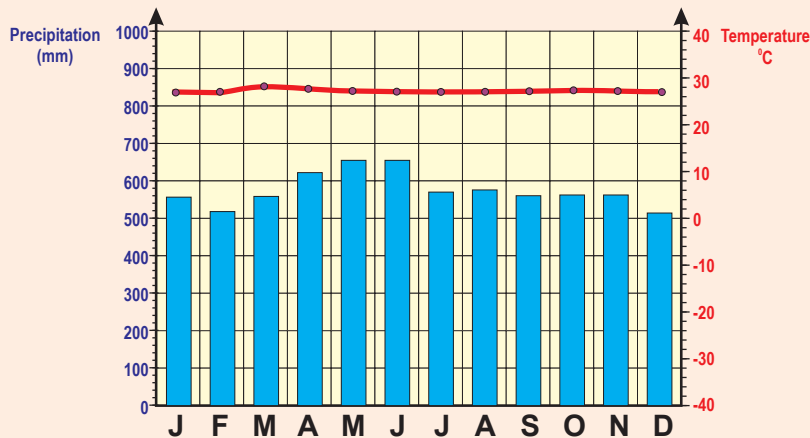
Categories within tropical climate are:

- (a) Equatorial climate
- (b) Tropical continental climate
- (c) Tropical marine (maritime) climate
- (d) Hot desert and semi-desert climate
- (e) Warm temperate western margin climate
- (f) Warm temperate continental climate

(a) Equatorial climate

Activity 4.6

Study the graph provided below and answer the questions that follow.



Source: Longhorn Publishers Geography Library

1. Explain why there is such minimal temperature variation within the twelve months.
2. Describe the rainfall pattern as shown in the graph.
3. Which parts of Australia and North America experience this type of Climate?
4. Explain why Europe does not have this type of climate.

Outside Africa, this type of climate is experienced in Central America and part of **North American** continent.

In **South America**, it is experienced in northern Colombia, Venezuela, Amazon Basin while in **Asia**, it is in the Islands of the East Indies.

(b) Tropical continental climate

This type of climate is in two types. The areas far from the sea experience tropical continental climate while those near the sea have tropical maritime climate.

Activity 4.7

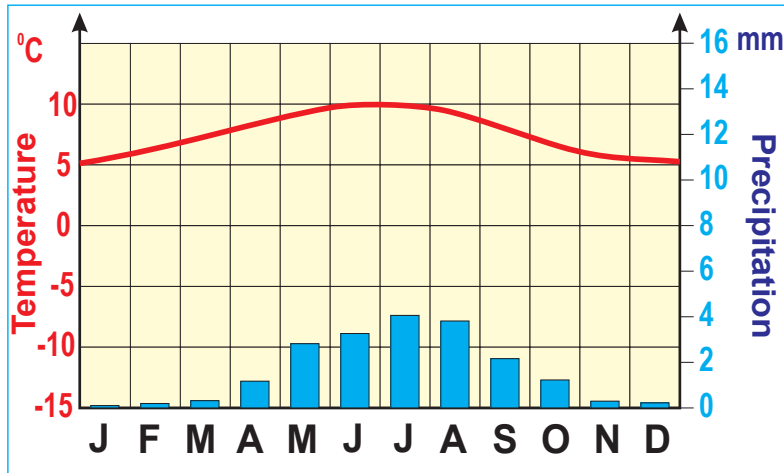
1. Research on the **characteristics of tropical continental climate**. Make brief notes from your findings.
2. Use Senior 2 textbook and other geographical documents to find out the various types of climate experienced in other continents.
3. Why is it that Rwanda climate is neither equatorial nor tropical continental?
4. Explain why there is more rain from May to October than in the rest of the year.

Present your findings in class for further discussion.

The following are the areas that experience tropical continental climate:

- In **North America** it is in Central and southern Mexico. In **South America** it is in Mato Grosso Plateau of Brazil, Colombia and Venezuela lowlands, Guyana highland.
- In **Australia** it is in the area between Tropical monsoon coast and Australian desert.

In the southern hemisphere, there is more rain from May to October than the rest of the year.



Source: Geo for CxC, 2017

Fig. 4.3: Graph showing temperature and rainfall within the tropical continental climate

(c) Tropical marine (maritime) climate

Activity 4.8

Using your atlas, find out the location of the areas listed above. Name the countries where they are found.

This type of climate is experienced in areas that are within the tropics and close to the oceans. The climate is influenced by the effects of the sea.

The regions are characterised by annual temperature which is high, about 25°C with an annual range of about 8°C. Rainfall is received throughout the year and the total is between 1100 – 2000mm per year. Tropical cyclones are common at the end of the hot season.

The areas that experience this type of climate include:

Central America Guatemala to Panama, the Caribbean Islands of Jamaica, Cuba, Puerto Rico and Haiti in **North America**. Others are Northern coast from Colombia to Surinam, east coast of Brazil in **South America**, the Philippines Islands in **Asia** and the east coast of Queensland in **Australia**.

(d) Hot desert and semi-desert climate

Outside Africa, hot deserts occur in the following parts of continents:

Asia

- Gobi Desert, the largest desert in Asia, covering 500,000 square miles. It extends from northern China into Mongolia.
- Karakum Desert, which covers 135,000 square miles in Turkmenistan, along the Caspian Sea.
- Kyzylkum Desert, which crosses over Kazakhstan into Uzbekistan, with an average coverage of 115,000 square miles.
- Takla Makan Desert, which is China's largest desert, and extends over 123,550 square miles of the Autonomous Region of Xinjiang in the Tarim Basin.
- Thar Desert, which covers 77,000 square miles in India and Pakistan.
- Monegros Desert, a semi-desert in Aragón, Spain.
- Oleshky Sands, a desert located in Ukraine near Askania-Nova biosphere reserve.

North America

- Chihuahua Desert in Mexico and USA.
- Great Basin Desert, which is part of the Great Basin between Sierra Nevada and Wasatch Range.
- Mojave Desert in USA.
- Sonoran Desert) in USA and Mexico. Colorado Desert is also part of this desert.
- Thompson Plateau, a desert in Canada.

South America

- Atacama Desert, a desert in Chile and Peru.
- La Guajira Desert, a desert in northern Colombia and Venezuela.
- Monte Desert in Argentina, a smaller desert above the Patagonian Desert.
- Patagonian Desert, the largest desert in the Americas, located in Argentina and Chile.
- Sechura Desert, a desert located south of the Piura Region of Peru.
- Jalapão, a desert park in Tocantins, Brazil.

Australia

- Central, Simpson and Gibson deserts, which are central Australian deserts.
- Great Sandy Desert, a north western Australian desert.
- Great Victoria Desert, the biggest desert in Australia.
- Little Sandy Desert, a western Australian desert.
- Strzelecki Desert, a south central Australian desert.
- Tanami Desert, a northern Australian desert.

(e) Warm temperate western margin climate

Location

North America: Central coast of California

South America: Central Chile

Europe: Southern Europe bordering the Mediterranean sea.

Australia: South-west around Perth and to the south around Adelaide.

(f) Warm temperate continental climate

Location

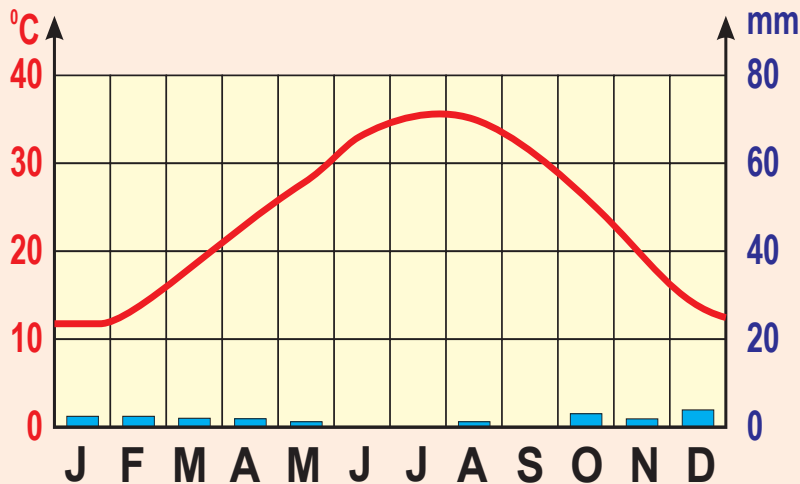
North America: Western Oklahoma into Texas

South America: Central Argentina and Paraguay

Australia: Murray-Darling basin

Activity 4.9

The graph below shows **characteristics of hot desert climate**. Use it to answer the questions that follow



Source: Geo for CxC, 2017

Explain the characteristics of the climate represented by the graph provided.

4.2.2 Temperate climate

This zone has three types of climate which are the warm temperate climate, the cool temperate climate and the cold temperate climate.

4.2.2.1 Warm temperate climates

This type of climate is experienced in areas that lie between 30° and 45° north of the Equator and 30° and 40° south of the Equator.

(a) Warm temperate western margin (Mediterranean type) climate

Mediterranean type of climate occurs in the following parts of the other continents:

- **North America:** Central coast of California.
- **South America:** Central Chile.
- **Europe:** Southern Europe bordering the Mediterranean Sea.

- **Australia:** South-west around Perth and to the south around Adelaide.

(b) Warm temperate continental climate

This type of climate is characterised by hot summers, with average temperature of 26°C and mild cool winters with temperatures of about 10°C. The annual range of temperature is moderate, about 16°C. Mean annual rainfall is between 380 – 700mm. Most of the rainfall is convectional type and falls mainly in summer.

Areas that experience this type of climate include the following:

- **North America:** Western Oklahoma into Texas
- **South America:** Central Argentina and Paraguay
- **Australia:** Murray-Darling Basin

Activity 4.10

*Use your atlases to identify the areas mentioned in **warm temperate western margin climate** and **warm temperate continental climate**.*

Find out the latitude where each one of them lies and suggest the reasons for the characteristics of this climate.

(c) Warm temperate eastern margin climate

Warm temperate eastern margin climate is similar to the one experienced in the south-eastern part of Africa around Natal.

The areas where it is experienced include the following:

South-eastern states of USA in **North America**, Southern Brazil and Uruguay, eastern Paraguay and coastal Argentina in **South America**. In **Asia**, the areas include South-east China and southern Japan. In **Australia**, the areas are south-east part of Australia and the North Island of **New Zealand**.

(d) Warm temperate desert climate

Warm temperate desert climates are also referred to as Mid-latitude desert climates.

They are found in areas such as Utah and Nevada states in USA, Patagonia in South America and the Gobi Desert in Asia.

Characteristics of warm temperate desert climate

1. Summers are very hot with temperatures ranging between 25°C and 37°C.
2. Winters are cold and temperatures drop below -7°C.
3. Diurnal and annual range of temperature is very large.
4. Annual rainfall is low, about 250mm, and is unreliable.
5. The rain season is experienced during late winter and early spring.

4.2.2.2 Cool temperate climates

Activity 4.11

Using available reference materials or the internet, explain the differences between the cool temperate western margin climate and the cool temperate continental climate.

These are experienced in latitudes between 35°C and 60°C in both hemispheres. There is a distinct seasonal variation in temperature. There are three types, namely:

- (a) Cool temperate western margin climate
- (b) Cool temperate continental climate
- (c) Cool temperate eastern margin climate

(a) Cool temperate western margin climate

Location

- **North America:** Coastal British Columbia in Canada, southwards up to the state of Oregon in USA.
- **South America:** The coastal parts of Chile.
- **Europe:** British Isles, central and western Europe, southern Scandinavia.
- **Oceania:** Tasmania and south island of New Zealand.

Characteristics of cool temperate western margin climate

1. Summers are warm with temperature between 13° - 15°C.
2. Winters are cool, between 2° - 7°C.
3. Rainfall vary between moderate to very high, that is, 760 – 2000mm.
4. Rainfall is well distributed throughout the year with maximum amounts received in winter.

(b) Cool temperate continental climate

Location

- **North America:** Canadian provinces of Alberta, Saskatchewan and Manitoba and the Midwest and north central USA.
- **Europe:** Central and eastern Europe and western Russia.

Characteristics of cool temperate continental climate

1. Summers are warm with temperature of about 18°C
2. Very cold winters with temperatures below -19°C
3. A large annual range of temperature, up to 37°C
4. Low annual rainfall (400 – 550mm)
5. Convectional type of rainfall received throughout the year.

(c) Cool temperate eastern margin climate

Location

- **North America:** maritime Provinces of Canada, north-eastern USA
- **Asia:** Northern China, Korea and central northern Japan.

Characteristics of cool temperate eastern margin climate

1. Warm to hot summers, 12° - 18°C (in North America) while in Asia they reach 24°C.
2. Winters are cool to cold with temperatures 4° - 15°C.
3. Annual range of temperature is large, 28° - 39°C.
4. Precipitation is mixture of snow and rain.
5. Precipitation is more than 1000mm in North America and northern Japan while in Asia, it is lower (700mm).
6. Precipitation occurs throughout the year.

4.2.2.3 Cold temperate climates

These are experienced between latitudes 55°N and 68°N. There are three types, namely:

- (a) Cold temperate western margin climate
- (b) Cold temperate continental climate
- (c) Cold temperate eastern margin climate

(a) Cold temperate western margin climate

Location

- **North America:** Alaska
- **Europe:** Central and northern Sweden and Norway.

Characteristics of cold temperate western margin climate

1. Cool but short summers with mean temperature of 12°C.
2. Long and cold winters with temperature between -2° and 4°C.
3. Mean annual rainfall is about 750mm which falls mostly in summer. Winters are characterised by snow fall.
4. Westerly winds are onshore and are dominant.

(b) Cold temperate continental climate

Location

- **North America:** A belt across the continent between 55°N and 68°N, from Alaska border in the west to Labrador in the east.
- **Eurasia:** From Finland, through Siberia to the Pacific coast in the east.

Characteristics of cold temperate continental climate

1. Summers are warm but short with temperatures not exceeding 21°C.
2. Winters are very cold and long with temperatures dropping to below -45°C.
3. Annual precipitation is little, about 380mm.
4. Rainfall is convectional type and falls in summer.
5. Winter precipitation is in form of snow.

(c) Cold temperate eastern margin climate

Location

Asia: North East Pacific coast of Russia.

Characteristics of cold temperate eastern margin climate

1. Short and hot summers, mean temperatures of 21°C.
2. Long but severe winters, with average temperatures of - 20 °C.
3. Annual range of temperature is very high.
4. Mean annual rainfall ranging from 500 to 1 000 mm.
5. Most rain falls in summer.
6. Prevailing winds are moist south easterly during summer.
7. Strong, dry and cold north westerlies blow in winter.

Activity 4.12

Explore reasons why the arctic climates are also referred to as cold deserts.

4.2.3 Arctic (very cold) climates

These are experienced in regions beyond the Arctic Circle ($66\frac{1}{2}^{\circ}$) in both hemispheres. These climates are also referred to as **polar desert climates**. They are two types namely **tundra climate** and **polar climate**.

(a) Tundra climate

Location

- **North America:** Along the coast bordering the Arctic Ocean, from Alaska, northern Canada including Baffin Island and south coast of Greenland.
- **Eurasia:** Along the Arctic Ocean coast from Scandinavia to the north-eastern coast of Russia.

Characteristics of tundra climate

1. Short and cool summers, with average temperatures of 20°C .
2. Long and very cold winters, temperatures varying between -29°C and -40°C .
3. Annual range of temperature is very high.
4. Mean annual rainfall is little, about 380mm.
5. Most rain falls in summer while snow falls in winter.
6. Rainfall is convectional type.

(b) Polar climate

Location

- **North America:** Interior of Greenland and the neighbouring islands as well as Iceland.
- **Antarctica:** The whole continent

Characteristics of polar climate

1. Very cold with temperatures below 0°C throughout the year.
2. Precipitation is in snow form.
3. Blizzards are very common.

Activity 4.13

Explain the factors that cause different climatic belts to develop on high mountains.

4.2.4 Mountain climate

It is experienced in mountainous areas in Africa. In other continents, it is found in:

- **North America:** The Rocky Mountains
- **South America:** The Andes Mountains
- **Europe:** The Alps, the Balkans, the Scandinavian and Ural mountains.
- **Asia:** The Himalayas

4.3 Relationship between climate and human activities

The influence of climate on human activities can be both positive and negative. On the other hand, human beings have also an impact on global climate, through their activities. This can lead to a change in the type of climate prevailing in a region.

Some of the activities in which climate has an influence include:

- Settlement
- Forestry
- Agriculture
- Fishing
- Tourism

Activity 4.14

Using the internet and geographical documents:

1. Describe how climate influences agriculture in Rwanda.
2. Discuss why the climate experienced in the Sahara desert is unfavourable for settlement and agriculture..
3. Describe how climate influences tourism.

- **Settlement**

Very hot or cold places are unfavourable for settlement. Warm regions are ideal for settlement. People living within the tropics prefer warm to moderately hot climates because they are naturally adapted to it. Those who live in temperate regions are adapted to cool conditions.

Activity 4.15

Use available resources including the internet to find out more relationships between climate and human activities and make a class presentation.

- **Forestry**

Tree species growing in a forest are determined by the climate of the region. There are species that thrive in hot tropical climates such as mahogany, ebony and ironwood. These would not grow in cool climatic regions. On the other hand, tree species such as pine and cypress which are exotic softwoods are indigenous in cool temperate lands. During colonial times, they were introduced into the highlands of East Africa where the climate is cool.

Did you know?

Human activities such as forest clearing and operating factories that emit fumes are leading to global warming and climate change. It is important that forests be conserved for environmental sustainability.

- **Agriculture**

The distribution of agricultural activities is to a large extent determined by climate. This affects animal rearing as well as crop cultivation. Crops, just like other plants, are adapted to particular climates. There are crops that grow well in hot places, others in warm areas and others in cool regions.

For this reason, crops that are grown in temperate regions can be planted in tropical regions but at high altitude where the climate is as cool as that of the cool temperate areas.

In a similar way the type of livestock reared in a region is determined by climate. Certain pure breeds of cattle and sheep are adapted to particular climatic conditions. Friesian cows that are reared in Denmark, for example, can only survive in the tropics in high altitude areas where the climate is cool. Certain exotic breeds of sheep that are imported into East Africa from Europe are reared within the highlands where it is cooler.

- **Fishing**

Climate determines the variety of fish species present in the ocean. In temperate areas, the cool temperatures of about 20°C favour growth of planktons on which fish feed. There is therefore an abundance of fish in the cool waters of temperate latitudes where the growth of plankton is high.

The high temperatures of the tropical latitudes result in continental shelves with inadequate planktons thus limiting the number of fish species available. The hot and moist tropical conditions cause rapid deterioration of the fish caught. Naturally, the cold winters provide natural ice for preserving fish. Besides, ice factories are still lacking in many parts of the tropics.

- **Tourism**

Climatic conditions can promote tourism in a variety of ways. Large herds of a variety of animals are found in the hot and warm parts of the world where rainfall is abundant to support a variety of plant species. Big forest trees and a variety of animals like baboons, elephants, buffaloes and many species of birds and butterflies exist in such areas.

Low rainfall results in extensive grasslands on which a large variety of herbivores live. Carnivores such as lions and cheetahs, which prey on the herbivores, are therefore found in plenty in the grasslands. The arid areas have limited plant cover and therefore few wild animals. The high and cold mountain regions are inhabited by a limited number of animals such as mountain gorillas.

END UNIT ASSESSMENT

1. In your notebook, draw a neat sketch map of Africa and on it mark and name the major climatic zones.
2. Discuss the ways in which Rwanda's climate is similar to some of the global climatic zones.
3. Explain the similarities between the tropical continental climate and the warm temperate continental climate.
4. Explain the differences in characteristics between the warm temperate western margin and the cool temperate western margin climates.
5. Discuss the impact of climate on the various human activities in Africa and the rest of the world.

Vegetation of Africa and the World

Key unit competence

By the end of this unit, you should be able to demonstrate an understanding of different vegetation types of Africa and the world.

Introduction

The term vegetation refers to all varieties of plants growing in a particular area. These plants can be classified into three categories namely:

- (a) Natural vegetation
- (b) Semi-natural vegetation, and
- (c) Planted vegetation.

In this unit, the followings sections will be covered:

- (i) Vegetation distribution in Africa (location, reasons for their distribution and characteristics).
- (ii) Major types of vegetation in other continents.
- (iii) The relationship between the different types of vegetation and human activities.

5.1

Vegetation distribution in Africa

The distribution of vegetation in Africa, and indeed in the rest of the world, is determined by several factors. Climate is a major factor influencing the type of vegetation growing in a region.

Activity 5.1

1. Apart from climate, use the Internet and Learner's Book Two to find out the other factors that determine the distribution of vegetation.
2. Discuss ways in which climate influences distribution of vegetation.

The map below shows distribution of vegetation in Africa.



Fig. 5.1: Map of Africa showing the major vegetation zones

Factors influencing vegetation distribution in Africa

(a) Climate

The main climatic factors that affect vegetation distribution are temperature and rainfall.

Both rainfall and temperature play an important role in the physiological processes in plants, including the rate of growth, fertilisation, seed germination and flowering.

Rainfall determines the type of vegetation growing in a place. It may cause the growth of forest, grassland or desert vegetation. This is because water is needed for plant growth. Areas with high rainfall therefore have a lot of vegetation, while those that receive little or no rainfall develop desert vegetation.

Temperature experienced in a certain place also determines the type of vegetation that grows there. For instance, areas where the mean monthly temperature remains above 21°C throughout the year have a continuous vegetation growth. With reliable rainfall, the areas support broad-leaved evergreen trees, which may develop into tropical rainforest.

(b) Soil

Plant growth is affected by soil texture, structure, acidity, organic content, depth, water and oxygen content and nutrients. Therefore, soil determines the vegetation of a given place. This is because different plants require different types of soil.

The soil also determines the amount of moisture it can hold. Dense vegetation is found in most fertile soils. Such a soil also allows different vegetation to grow. In poor soils, sparse vegetation grows.

(c) Relief

Some plants grow well on slopes while others need flat areas. Different plants also require different altitude for them to grow. In addition, some types of vegetation grow in lowland areas while others grow best in highland areas. Plant succession on a mountain demonstrates how relief (or altitude) affects plant growth.

(d) Drainage

Drainage determines the vegetation of a place. Different types of vegetation require different drainage systems. Some types of vegetation such as forests with many trees grows in well drained areas while others survive in swampy areas. Papyrus, for example, grows in swampy areas while mangrove grows in shallow salty sea areas. In some cases, there are those that grow in desert-like conditions. These include plants such as cactus.

(e) Human activities

Man also contributes to the distributions of vegetation in a given area through his many activities. Such activities include planting trees in a place that did not have any vegetation, irrigation and burning vegetation.

People also clear vegetation in some areas to obtain farmlands or to build infrastructure like roads. This makes an area to have few or no vegetation.

(f) Government policy

Government policy also affects vegetation distribution. For instance, the government may gazette some areas as forest reserves and National Parks. In such areas, vegetation tends to flourish.

Some policies such as 'By cutting one tree, you need to plant 10 trees' and re-forestation programmes have increased the distribution of vegetation in affected areas.

By cutting down vegetation for various activities like setting up buildings, farming and introducing infrastructure, reduces vegetation cover.

(g) Aspect (the direction in which a slope faces)

Aspect affects sunlight, temperatures and moisture at a given place. South facing slopes in the northern hemisphere are more favourable to plant growth than those facing north because they are brighter, warmer and drier.

(h) Wind

Wind affects the distribution of vegetation through the processes of pollination and seed distribution. Winds tend to transport pollens and seeds from one place to another, which leads the coverage of vegetation in particular area to be high than other areas.

In addition, places that experience strong winds have little vegetation. This is because sometimes, strong wind destroys vegetation.

Note: The vegetation belts shown on the map are what the vegetation should be under natural conditions. It is worth noting that the reality on the ground may be different because of human activities.

5.1.1 Types of vegetation in Africa, location and their characteristics

The following are the major types of vegetation in Africa.

1. Forest vegetation
2. Grassland vegetation
3. Desert vegetation
4. Mountain vegetation

Activity 5.2

Using geographical documents and the internet:

1. Explain the meaning of the term 'forest.'
2. Identify major forests in Africa.
3. Explain why Africa has few areas under forests.

1. Forest vegetation

In Africa, there are four main types of forests namely:

- (a) Mangrove forests
- (b) Tropical rain forests
- (c) Mediterranean forests
- (d) Temperate evergreen forests

(a) Mangrove forests

These are forests that grow in the salty muddy waters of tropical seas. They are at times referred to as mangrove swamps.

Activity 5.3

Study the photograph of mangrove forest provided below and answer the questions that follow.



1. Describe types of trees shown in the photograph.

2. Describe the appearance of the roots.
3. Discuss the characteristics of mangrove forests under the following subheadings.
 - (a) Height of the trees
 - (b) Number of tree species
 - (c) Roots of the trees.

Location of mangrove forests

The forests are common in shallow estuaries, bays and lagoons found in areas such as:

- The east coast from East Africa to Mozambique
- North west coast of Madagascar
- The Gulf of Guinea especially in the Niger delta
- The coast of West Africa from Gambia to Sierra Leone

Characteristics of mangrove forests

- Trees have special roots that are partly aerial.
- Roots grow horizontally above the water and then turn vertically into the muddy water.
- Some tree species grow horizontally in the mud and then bend upwards above the water as breather roots.
- At high tide the lower trunk and aerial roots are submerged.
- At low tide the trees appear to be supported on stilts of roots.
- Their roots are for anchorage and for breathing.

(b) Tropical rain forests

Tropical rain forests are also known as equatorial forests.

Location of tropical rain forests

These areas experience high temperatures of between 24° and 27 °C. There is very heavy rainfall throughout the year.

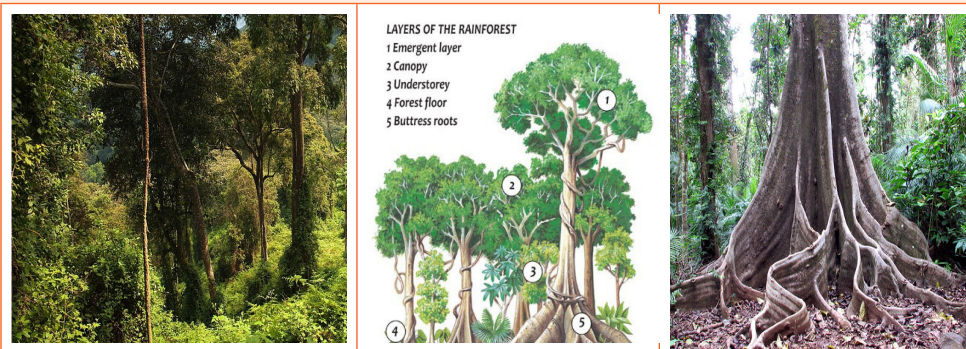
In Africa, they are found in the following equatorial lowlands:

- Congo basin
- West African coast from Senegal up to Ivory Coast
- Eastern Madagascar

Characteristics of tropical rain forests

Activity 5.4

Visit the library or use the internet to carry out a research on the characteristics of tropical rain forests. You may refer to the photographs below for more information.



Ask learners to draw a sketch of Africa and show natural forests in Africa.

(c) Mediterranean forests

Location of mediterranean forests

These forests are found in the areas that experience the Mediterranean type of climate. They include coastal lands of Morocco, Algeria and Tunisia in North Africa. The forests also occur in the southern tip of South Africa around Cape Town.

Characteristics of mediterranean forests

This type of forest includes the Mediterranean woodlands. It has greatly been influenced by human activities such that most of it is now secondary.

Activity 5.5

1. Use the internet and geographical documents to find out the characteristics of the Mediterranean type of forests.
2. Explain the adaptations of the tree species in Mediterranean forests.

(d) Temperate evergreen forest

Activity 5.6

Using the internet or geographical documents make a list of common tree species found in the temperate evergreen forests. Find out why the forests are evergreen

Temperate evergreen forests thrive in regions that experience the Warm Temperate Eastern Margin (China) type of climate.

Location of temperate evergreen forests

In Africa, they are found along the coast of Natal in South Africa.

Characteristics of temperate evergreen forests

- The forests are evergreen.
- Trees have broad leaves.
- Some areas of the forest have undergrowth of other plant species.
- Some trees are deciduous.
- Many evergreen tree species are hardwoods.

2. Grassland vegetation

Two types of grasslands are represented in Africa namely,

- (a) Tropical grasslands
- (b) Temperate grasslands

(a) Tropical grasslands

These grasslands are commonly referred to as **savanna**. They can be subdivided into two types. There are *open grasslands* with few scattered trees or no trees at all and the woodlands where trees dominate. **Woodlands** grow in wetter areas especially those bordering the rainforest.

Activity 5.7

1. Use the Senior 2 book to explain the characteristics of the grasslands in Rwanda.
2. Study the photograph of tropical grassland below and answer the question that follow.



- (a) Explain the characteristics of tropical grasslands shown in the photograph.
- (b) Compare and contrast the characteristics of the grassland in the above photograph with the grasslands in Rwanda.

Location of tropical grasslands

In Africa, the tropical grasslands are found in areas such as West Africa between the Sahel region and the Tropical rainforest and extends across Eastern and Central Africa.

Characteristics of tropical grasslands

- Some areas are dominated by open grasslands.
- Trees are of medium height and grow wide apart.
- Space between the trees is either occupied by grass or shrubs.
- Many trees have umbrella-shaped crowns.
- Most trees are deciduous and shed their leaves in the dry season.
- Trees have deep roots and thick barks.

- Grasses can grow up to 3 metres tall in wetter areas.
- The elephant grass variety grows up to 4.6 metres.
- Grasses dry off during the dry season but sprout at the onset of rains.
- Regions that receive rainfall below 750mm have much shorter grass and low growing trees and shrubs.

(b) Temperate grasslands

These are grasslands that grow in mid-latitudes.

Location of temperate grasslands

In Africa they are found in the Veld region in the central parts of South Africa. In this area the amount of rainfall ranges from 300 to 600 mm of rainfall per year.

Characteristics of temperate grasslands

- The grass spreads out over extensive areas.
- There is little or no mixture of trees and shrubs.
- The wetter areas support tall grasses.
- A 'carpet' of short **red oat grass** forms on the high plateau.

Activity 5.8

Compare tropical grasslands and temperate grasslands under the following sub-headings:

- (a) Areas where they are found
- (b) Their distinguishing characteristics

Present your findings in class for further discussion

Secondary vegetation with several plants and tufted **grass** exist where the red oat grass has been cleared.

3. Desert vegetation

Activity 5.9

Use geographical documents or Internet to:

1. Desert vegetation are not located everywhere. Why do you think they are located where they are?

Activity 5.9

2. Use the photographs below to describe the characteristics of hot desert vegetation.



Desert vegetation is found in the hot and dry regions of Africa, temperate regions that receive very low rainfall.

Characteristics of desert vegetation

- There are few varieties of plants in tropical deserts.
- Some plants are perennial and have succulent stems with spines but no leaves.
- The stems are used for breathing surfaces as well as for water storage.
- Shrubs and short stunted trees are evergreen with hard leaves.
- There are drought resistant deciduous shrubs.
- In areas of poor drainage, there are salt-tolerant plants.
- There are also short-lived plants that complete their life cycle during the short rainy period.
- Date palms are common where there are oases.

4. Mountain vegetation**Activity 5.10**

Use geographical documents and internet to draw a diagram showing the succession of vegetation on a mountain and locate mountain vegetation in Africa.

1. Label each zone of vegetation.
2. Why does the top of a high mountain have scarce vegetation?

Characteristics of mountain vegetation

- With a change in elevation (ascend or descend), there is rapid vertical change in dominant forms of plant cover. This is the reason why vegetation occurs in belts.
- Each belt of mountain vegetation includes several different plant communities because of the variety of local conditions related to relief, degree of weathering of surface rocks and variation in the physical and chemical composition of surface rocks.
- Plant cover is influenced by climatic conditions, ranging from the base of the mountain to their peaks. Other factors that influence plant cover on a mountain are levels of erosion (which occur in greater volume with descending altitude) and the history of the formation of the mountain.
- Vegetation is affected by light conditions, geographical latitude and exposure of the slopes. This mainly affects vegetation on mountains found in mid latitudes.

Quick facts

The sequence of vegetation on a mountain slope especially in tropical Africa is a product of:

- (i) Aspect
- (ii) Slope
- (iii) Altitude
- (iv) Temperature
- (v) Rainfall

The succession of vegetation types from bottom to the top of high mountains within the tropics is similar to latitudinal succession.

5.2 Major types of vegetation in other continents

Similar types of vegetation that are found in Africa and any other part of the world have the same characteristics.

The various types of vegetation in Africa and other continents are:

1. Tropical vegetation
2. Mediterranean vegetation
3. Temperate vegetation

5.2.1 Tropical vegetation

Tropical vegetation includes tropical rain forests, tropical monsoon forests, tropical grasslands and mangrove forests.

(a) Tropical rain forests

Activity 5.11

1. Using your Atlas or internet, draw a map of North and South America and shade the areas that have tropical rain forests.
2. Why does tropical rain forest occupy such small areas in Australia?

Location of tropical rain forests

- **North America:** Mainly Central America from Guatemala through Panama, Colombia up to Ecuador.
- **South America:** Amazon basin and east coast of Brazil
- **Asia:** Western India, Myanmar, Vietnam, Malaysia, Indonesia and Philippines.
- **Australia and Oceania:** Guinea Island and coastal region of Queensland.

Characteristics of tropical rain forests

- Closely growing trees with three canopies.
- Trees belonging to the lowest canopy reach up to 15 metres; the middle canopy up to 30 metres and the tallest can reach 50 metres.
- Most trees are hardwoods with smooth and straight trunks.
- Trees have broad leaves and buttress roots.
- Ferns, epiphytes and thick-stemmed creepers grow or entangle on the stems of the trees.
- The forest is evergreen and dense.
- There is little undergrowth because sunlight does not reach the ground.

(b) Tropical monsoon forests

Activity 5.12

1. Using your Atlas and internet, identify the areas that have tropical monsoon forests.
2. Describe the climatic characteristics in these areas.
3. Why does tropical monsoon forest occupy such small areas in Australia?
3. Using available resources and the internet, find out the tree species common in the tropical monsoon forests. List them down in your notebook.

These are forests adapted to the tropical monsoon type of climate where there is a marked dry season with high temperatures.

Location of tropical monsoon forests

- **North America:** southern and south west coast of Mexico
- **Asia:** North eastern India, Bangladesh, Myanmar and parts of Indonesia.
- **Australia:** Southern New Guinea, northern Australia.

Characteristics of tropical monsoon forests

- Most trees are deciduous.
- Tall trees grow up to 30m high but are a distance apart.
- The trees grow more branches than those of the tropical rainforest.
- There is less variety of tree species than in the tropical rainforest.
- Bamboo is abundant because more sunlight reaches the ground.
- There is a dense undergrowth on the forest floor.

(c) Tropical grasslands

Activity 5.13

Using available resources or the internet:

1. Find out more characteristics of the tropical grasslands.
2. Explain as many characteristics as you can.

Location of tropical grasslands

- **South America:** The Brazilian highlands, parts of Guyana, lowlands of Venezuela and Colombia.
- **Asia:** Most parts of India
- **Australia:** North east of the Australian desert

(d) Mangrove vegetation

Location of mangrove vegetation

- **South America:** Near the Amazon estuary
- **Asia:** Coast of Sumatra and Borneo.

5.2.2 Mediterranean vegetation

Location of mediterranean vegetation

- **North America:** Central coastal region of California
- **South America:** Central Chile
- **Europe:** Southern Europe lands bordering the Mediterranean Sea
- **Australia:** Southwest coastal area around Perth and to the south around Adelaide.

5.2.3 Temperate vegetation

(a) Temperate evergreen forests

Location of temperate evergreen forests

- **North America:** Southern and south eastern states of USA
- **South America:** Southern Brazil, eastern Paraguay and northern Uruguay
- **Asia:** Southern China and southern Japan
- **Australia:** South eastern Australia and New Zealand's North Island

Note: These forests do not occur in Africa.

There are four types of temperate evergreen forests, namely:

- (a) Tropical monsoon forest
- (b) Temperate deciduous forest
- (c) Coniferous forests
- (d) Mixed forests.

(b) Temperate deciduous forests

These forests exist mainly in regions experiencing cool temperate western margin climate. However, in some areas the forests extend into regions of the cool temperate continental as well as in the eastern margin within the same latitudes.

Activity 5.14

Use the photograph below to answer the questions that follow.



1. Explain why the vegetation is brownish in colour.
2. During which season was this photograph taken and why have the trees shed so much of the leaves?
3. Describe the type of trees compared with the tropical rain forest trees discussed earlier in the unit.

Location of temperate deciduous forests

- **North America:** Eastern states of USA
- **South America:** Chile
- **Europe:** Western and central Europe
- **Asia:** Northern Japan, Korea and north eastern China
- **Australia:** Tasmania and South Island of New Zealand

Characteristics of temperate deciduous forest

- Broad-leaved deciduous trees.
- Trees are hardwoods.
- Trees shed their leaves in autumn and remain bare in winter.
- Leaf buds appear in spring and in summer trees are green with foliage.
- The forests are quite open hence a rich undergrowth of smaller plants.
- Some areas have mixed tree species while other areas may have pure stands.

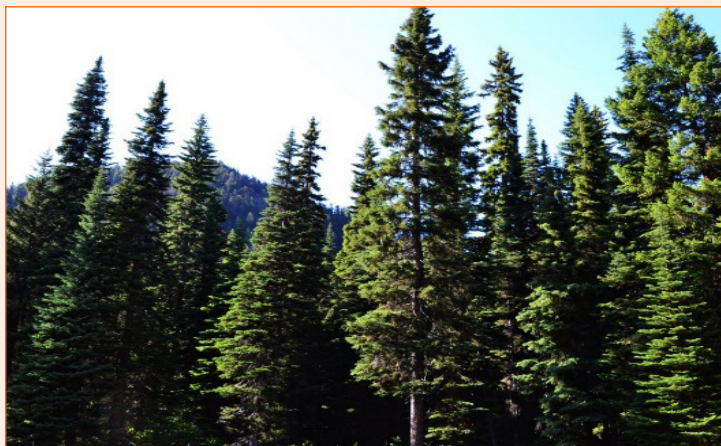
- Coniferous trees are also common in eastern Canada, Tasmania and south island of New Zealand.

(c) Temperate coniferous forests

These forests thrive in the cool and cold climates between 45° and 75 ° of latitude in both hemispheres.

Activity 5.15

1. Using your atlas and geographical documents, draw a sketch map of North America and shade the areas that have Coniferous forests.
2. Explain why such a large area of Canada is under this type of vegetation.
3. With reference to the photograph below, explain the characteristics of the vegetation shown.



Location of temperate coniferous forests

- **North America:** West coast of Canada to Hudson Bay and up to the east Atlantic coast.
- **South America:** Limited to a narrow portion of the continent beyond 45 °S.
- **Europe and Asia:** From Scandinavia, through Russia up to the Pacific coast.

Characteristics of temperate coniferous forests

- Most tree species are fast-maturing softwoods.
- Most trees are evergreen but a few shed their leaves in winter.
- Most trees have thin needle-like leaves.
- The leaves have tough and waxy skin.
- The leaves and branches form a conical shape.
- Trees have a big proportion of the stem compared to the leaves.
- The tree trunks are flexible.
- Trees have widely spread shallow root system.
- Trees occur in large pure stands.

(d) Mixed temperate forests

These are made up of a mixture of temperate deciduous and coniferous forest tree species. They are found in the border regions between the two types of forests, hence the name 'mixed forests'.

Location of mixed temperate forests

- **North America:** Alberta and Saskatchewan provinces as well as New Brunswick and Nova Scotia provinces of Canada. In USA the belt starts from north of New York into northern Pennsylvania, westwards up to Minnesota.
- **Europe:** The Scottish highlands. From the northern Alps through central and north Germany to south and central Sweden up to central Siberia.
- **Asia:** They are scattered. They are found in Northern and eastern Manchuria, North Korea, northern Kyushu and southern Hokkaido islands of Japan.
- Areas covered in **Chile, Tasmania** and **New Zealand** are too limited for effective mapping.

Characteristics of mixed temperate forests

- Forests comprise of a mixture of broad-leaved deciduous and coniferous trees.
- Tree species found in temperate deciduous and coniferous forests are present and have same characteristic as outlined above.

(e) Temperate grasslands

Temperate grasslands have different characteristics depending on location.

Location of tropical temperate grasslands

(a) North America

In North America, they are known as **prairies** and are found in the central lowlands, in the Canadian provinces of Manitoba, Saskatchewan and Alberta. They extend into the neighbouring states of USA.

Characteristics of temperate grasslands in North America

- Grasses form a continuous cover of green tuft grass known as *true prairies*.
- The grass is short with leguminous plants growing in-between. This is the *mixed prairies*.
- There are a mixture of grass species that grow to different heights.
- In wetter areas the grass grows quite tall although not reaching the height of those in the tropics.
- Tough and shorter grass grows where rainfall is below 500mm.
- Grass dries and dies in summer but grows again in spring.

(b) South America

In South America, they are found in Argentina where they are called **Pampas**.

Characteristics of temperate grasslands in South America

- Species of feather-like grass dominate.
- In most parts the grass forms tussocks in the wet areas, with patches of bare soil in between.
- Drought-resistant shrubs are common in the drier areas.
- Riverine forests are common along banks of big rivers.



Fig. 5.2: A section of the Pampas in Argentina

(c) Europe

A belt of grasslands extending from the interior of Europe into Asia. Here it is called **Steppes**.

Characteristics of temperate grasslands in Europe

- It is divided into three categories according to characteristics.
- The **wooded steppes** are found in areas that receive more than 500mm of rainfall.
- The vegetation forms a rich layer of grass resembling a carpet.
- Areas with rainfall between 250mm and 500mm have the **true steppes**.
- The vegetation comprises of grass and flowering plants.
- The **desert steppes** is characteristic of those areas receiving less than 250mm of rainfall.
- The vegetation is mainly coarse grass that grows in tufts.
- The grass is usually short and grows in tussocks.
- Some trees grow along water courses.

(d) Australia

The Murray-Darling basin has an extensive area covered by grasslands called the **Downs**. Only portions of it are found in New Zealand because most of it has been cleared for cultivation.

Characteristics of temperate grasslands in Australia

- Grass is tall and mixed with trees.
- Areas with little rainfall have patches of short grass.
- Vegetation is a mixture of tropical and temperate species.
- In New Zealand grass is in tussocks and uniform in structure.

Activity 5.16

1. Draw sketch maps to show where grasslands in North America, South America, Europe and Australia are found.
2. Explain the various uses of:
(a) Prairies (b) Pampas (c) Steppes (d) Downs

(f) Temperate and cold desert vegetation

Location of temperate and cold desert vegetation

Cold deserts are found in the Antarctic, Greenland, Northern and Western

China, Turkestan, Iran and the Nearctic area.

Although rainfall amounts in these deserts is as low as that in the tropical deserts, the lower temperatures result in reduced rates of evaporation. This leads to more abundant vegetation mainly of grasses and shrubs.

Characteristics of temperate and cold desert vegetation

- Vegetation comprises mainly grasses and woody plants.
- Many plants have spiny (needle-like) leaves and are drought resistant.
- Sagebrush shrub dominates in areas of the outer margins of the desert.
- Plants are xerophytic and where soils are salty, plants are halophytic.
- The vegetation of the tundra desert grows for only three months.
- Vegetation is composed of arctic meadow grass, mosses and small flowering plants.
- Shrubs have twisted and woody stems and shallow roots.

5.3 Relationship between the different types of vegetation and human activities

(a) Relationship between forests and human activities

Activity 5.17

Forests provide a whole range of goods and services of use to mankind. Outline the major products that people make out of forest products..

Forests and forest products are valuable. This explains why much of the forests world cover have been heavily exploited. The uses include the following:

- The tropical hardwoods from the tropical rain forests are valuable for their timber.
- The forests are a source of edible nuts and fruits, medicinal plants and fibres.
- Honey is commonly obtained from forests as bees inhabit the areas.
- Mangrove forests are a source of strong poles for building and construction while tannin is extracted from their bark and used for

tanning leather.

- In the Mediterranean forest, the bark of the oak tree provides cork for bottling wine.
- Olive oil is extracted from the fruits of the olive tree and has a variety of uses.
- Forests are a source of wood fuel that is used as firewood, charcoal and saw dust for cooking.

(b) Relationship between grasslands and human activities

Activity 5.18

Discuss the ways in which human activities have affected the distribution of vegetation in other continents.

Using available resources including the internet, explore other relationships between the grassland vegetation and human activities in other continents.

(i) Relationship between tropical grasslands and human activities

- The rotting grass adds humus to the soil making the land suitable for grain cultivation.
- They are a habitat for herbivores and carnivores, making the areas a tourist destination.
- Trees are a habitat for bees and therefore honey harvesting is an important activity.
- The grasslands are widely used for grazing livestock.



Fig. 5.3: A pastoralist grazing livestock in the grasslands

- Some shrubs and herbaceous plants are used by people for medicinal purposes.
- The trees are used as wood fuel directly as firewood or in form of charcoal.
- Some trees and shrubs provide fruits that are harvested for food.

(ii) Relationship between temperate grasslands (Veld) and human activities

Because of the nutritious grasses, many areas are turned into commercial livestock ranches.



Fig. 5.4: A ranch on a temperate grassland

For a long time the rotting grasses have added humus to the soils making them quite fertile. Many of these grasslands have been cleared and planted with cereals on commercial scale.

(c) Relationship between desert vegetation and human activities

- Desert areas are sparsely inhabited by people.
- The grasses that may exist in both the tropical and temperate deserts are used for grazing the few varieties of animals kept by the nomads. These include sheep and camels.
- Some shrubs provide edible fruits.
- Woody plants are used as a source of wood fuel for the inhabitants.
- Date palms growing around oases provide dates, which are eaten locally, and some are sold for money.

END UNIT ASSESSMENT

1. Suggest the characteristics of the tropical rainforest.
2. Compare the characteristics of the temperate deciduous and coniferous forests in Africa and other continents of the world.
3. Draw a sketch map of Africa and on it mark and name the major vegetation zones.
4. Explain the extent to which climate has influenced the distribution of vegetation in Africa.
5. Discuss how vegetation has influenced human activities in Africa.

UNIT

6

Drainage in Africa

Key unit competence

By the end of this unit, you should be able to explain the importance of water bodies and wetlands in Africa.

Introduction

Drainage refers to the layout of water on the earth's surface. In other words, it means the natural removal of water from the land through a system of rivers and streams and how it eventually collects in water bodies such as oceans, lakes, seas and ponds.

In this unit, we shall study more about drainage under the following subheadings:

1. Major rivers and lakes in Africa
2. Major lakes of Africa according to their mode of formation
3. Features related to rivers in Africa: Erosion and deposition features
4. Importance of rivers, lakes and wetlands in Africa
5. Challenges to obtain sustainable clean water in Africa: Water scarcity, pollution and silting/sedimentation

Quick facts

It takes many **tributary streams** to form a **river**. A river grows large as it collects water from more tributaries along its course. The great majority of rivers eventually flow into a larger body of water like a **lake**, **sea** or **ocean**. The end of a river is called its **mouth**.

Activity 6.1

Study the following map of Africa then identify the main drainage features shown.



6.1

Major rivers and lakes in Africa

6.1.1 Major rivers of Africa

Activity 6.2

The table below shows the major rivers of Africa. Copy it in your notebook, and using the Atlas, other relevant materials or the internet, complete the information missing in the table.

Major	Origin	Destination
Zambezi		
Limpopo		
Orange		
Congo		
Niger		
Volta		
Senegal		
Nile		

A river is a natural flow of water in a confined channel towards an ocean, sea, lake, swamp or another river. Major rivers in Africa are permanent and carry large volumes of water. Most of them support transport, irrigation, hydro-electric power generation and fishing.

The major rivers of Africa include the Nile, Senegal, Volta, Niger, Congo, Orange, Limpopo and Zambezi. Some slightly smaller rivers along the Western side of the continent include Gambia, Bandama, Ogooué, Cuanza and Cunene. In Eastern Africa, there are relatively smaller ones too namely Ruvuma, Rufiji, Pangani, Athi/Galana, Tana, Akagera, Nyabarongo, Juba and Shabeelle.



Fig. 6.1: Part of River Congo

Major river systems including Niger, Congo, Orange, Zambezi and the Nile have very large **drainage basins**. Other major rivers in, with neighbouring smaller ones, have combined basins as well. All these rivers drain their waters into oceans or seas.

There are also rivers that do not drain into the sea or ocean. They drain their waters inland in what is known as **areas** or **basins of internal drainage**. There are four major basins of internal drainage in Africa, namely, Chad basin, Okavango basin, western Tanzania basin and Lake Turkana basin.

Activity 6.3

Using available resources including the internet, find out the meaning of the following terms:

- (a) Drainage basin
- (b) Area of internal drainage.

The following table shows some of Africa's longest rivers. Note that Blue Nile is a tributary of River Nile.

River	Length (Km)
Nile	6 695
Congo	4 700
Niger	4 200

Zambezi	2 693
Ubangi-Uele	2 270
Kasai	2 153
Orange	2 092
Limpopo	1 800
Senegal	1 641
Blue Nile	1 600
Volta	1 600
Akagera	692

Source: Caitlin McCarter, 2017

Table 6.1: Some of Africa's longest rivers

6.1.2 Major lakes of Africa

A lake is a mass of water that occupies a large depression on the ground. Some lakes form in relatively smaller depressions or hollows in the ground. This depends on their mode of formation.

Quick facts

A lake is a drainage feature while a depression or hollow is a relief feature. It is therefore wrong to define a lake as a hollow in the ground occupied by water. It is a water body and NOT a depression.

Activity 6.4

1. What are 'Great Lakes of Africa'? Use your atlas to find out the lakes in this group and list them in your notebook.
2. Using your atlas or the internet, find out other natural lakes of Africa that are not among the Great Lakes. List them in your notebook.

There are very many lakes in Africa. A lot of lakes are concentrated on the eastern side of the continent. However, lakes are absent in most parts of the Sahara Desert as well as the north-eastern areas of the continent.

The following table shows some of the major lakes in Africa.

Name of Lake	Area (Km ²)
Victoria	69,485
Tanganyika	32,893
Malawi	30,044
Chad	25,760
Turkana	6,405
Albert	5,299
Kyoga	4,403

Source: Caitlin McCarter, 2017

Table 6.2: Major natural lakes of Africa

In addition to the lakes shown in the table above, there are other lakes like Rukwa, Mweru, Kivu and Edward which are also quite large.

Africa's lakes are mainly of two types, those that are formed naturally and those that are formed through human activities.

Did you know?

1. Lake Victoria is the second largest fresh water lake in the world.
2. Lake Tanganyika is the second deepest lake in the world.
3. Lake Malawi contains the largest number of fish species than any lake in the world.
4. Lake Volta in Ghana (8 502 km²) is the largest human-made lake in the world.

Source: Africafacts.org

In Africa, there are also very many human-made lakes that have been created for various purposes. Lake Volta in Ghana (8 502 km²) is the largest human-made lake in the world. Lake Kariba (5 580 km²) in Zimbabwe is fourth largest in the world while Lake Nasser (5 248 km²) is partly in Sudan and a larger part in Egypt, ranks sixth in the world. Other notable lakes include Kainji, Cabora Bassa, Masinga and Lake Kossou. There are many reservoirs that have been formed along Africa's rivers as a result of damming.

Activity 6.5

1. Use your atlas and go to a large map of Africa. Identify other human made reservoirs and the rivers on which they have formed. Many of these are known by the name of the dams that formed them. Note them down in your notebook.
2. Study the table below, and using an atlas, other reference materials and the Internet, identify the names of the dams and rivers over which these lakes have formed. Copy the table in your notebook and fill in the missing information.

Human-made lake	Name of river	Name of dam	Name of country
Volta			Ghana
Kariba			Zimbabwe
Nasser			Egypt/Sudan
Kainji			
Cabora Bassa			
Masinga			
Lake Kossou			

6.2 Major lakes of Africa according to their mode of formation

Activity 6.6

1. (i) Prepare a table in your notebook similar to the one shown below and fill the missing information
 (ii) In the second column, write down the corresponding names of lakes belonging to that category. In the third column, fill in the names of countries in which those lakes are found.

Mode of formation	Name of lake	Country
	Kivu	
	Victoria	
Crater lakes		
Lava dammed lakes		

- Discuss why glacial lakes are only found on mountains and not in the lowlands

6.2.1 Formation of lakes

Lakes are formed in a variety of ways. They can be classified according to the mode of formation of the depressions they occupy. Lakes of Africa were formed in the following ways:

Lakes formed by tectonic movements

Earth movements result into folding, faulting and warping of the earth's crust. This leads to formation of tectonic basins in which water collects to form lakes. Lakes formed as a result of tectonic movements are usually long, narrow and steep sided.

(a) Lakes due to faulting

These are very common in Africa. They are quite deep and long. Examples of these include lakes Kivu, Tanganyika, Malawi, Albert and Turkana.

(b) Lakes due to crustal warping

These are fairly shallow, wide and have several inlets. They include lakes Muhazi, Victoria, Kyoga and Chad.

Lakes formed by vulcanicity

These form in volcanic depressions such as craters and calderas as well as in valleys that were blocked by lava flows.

(a) Lava-dammed lakes

When a lava flow gets into a river valley, it may cool there as it accumulates and solidifies. It eventually forms a barrier in form of a natural dam. Water accumulating behind the dam of lava forms a lake. Lakes in this category include Ruhondo, Burera, Mutanda and Tana.

(b) Crater lakes

These occupy craters on top of volcanoes or at ground level (explosion craters). These are numerous in Africa. Lakes in **craters on top of volcanoes** include on Bisoke and Muhabura volcanoes. Lakes that have formed in **calderas** include lakes Magadi in Ngorongoro (Tanzania).



Fig. 6.2: Bisoke Crater Lake

Lakes formed due to erosion

They include the following:

(a) Lakes due to erosion by glaciers

Erosion by moving ice in highlands and lowlands creates depressions called cirques. These depressions, when occupied by water, form **cirque lakes** or **tarns**. In Africa, they are found on high mountains that have glaciers. Cirque lakes on Mount Ruwenzori include Lake Speke and Lake Catherine. On Mt. Kenya, there are lakes Hohnel, Gallery, Hidden, Hanging and Teleki. There are also **ribbon lakes** or **finger lakes** on mountains, such as Lake Vert and Lake Noir on Mt. Ruwenzori. On Mt. Kenya, they include Michaelson and Carr.

(b) Wind erosion lakes

Wind erosion in deserts may lead to formation of deflation hollows. When these hollows get filled with water, they form lakes. Notable desert lakes in Africa are found in Qattâra Depression in Egypt and Bodélé Depression in Chad.

(c) Solution lakes

These form in limestone regions and occupy depressions that were formed by weathering and erosion. In Namibia, there are Lakes Guinas and Otjikoto, while in the Middle Atlas of Morocco there is Lake Azigza.

Lakes formed by deposition

Some lakes form due to deposition of materials by rivers, waves and glaciers. There are numerous examples of such lakes in Africa.

(a) Lakes formed by river deposition

These are common on flood plains of rivers where a combination of erosion and deposition by rivers form **ox-bow lakes**. Examples of these lakes include Utange in Tanzania and Shakababo in Kenya. **Alluvial deposition** in deltas has created lakes such as Mugesera and Sake.

(b) Lakes formed by wave deposition

These form in lagoons that are cut off from the ocean or lake. In Africa, lagoon lakes include Nabugabo and Sare, both connected with Lake Victoria. Most are found in West Africa, for example Korle in Ghana.

(c) Lakes formed by glacial deposition

In Africa, these would also be found on mountains. In Ruwenzori, there is Lac Gris and Lake Mahoma. On Mt. Kenya, there is Tyndall and Hut among others.

(d) Lakes formed by mass movement

These form when a landslide blocks a river valley and huge quantities accumulate in the valley. Water accumulates behind this barrier, forming a lake. In this category are lakes Bujuku and Nyabihoko in Uganda, lakes Iyiocha and Agulu in Nigeria and Funduzi in South Africa.

Lakes formed due to human activities

These are formed when people build barriers such as dams across river valleys. They are referred to as **human-made lakes**. Examples of such lakes are Lake Kariba on River Zambezi (on the border of Zambia and Zimbabwe) and Lake Volta on River Volta in Ghana.

Lakes formed by meteorites

When a meteorite falls on the ground, it can create a sizeable depression in which water accumulates to form a lake. Lake Bosumtwi in Ghana is believed to have formed in this way.

Remember

Water bodies are very important to our lives and must be conserved.

Activity 6.7

Use geographical documents and other sources of information to discuss the features formed by river erosion and deposition.

6.3 Features related to rivers in Africa

The processes of river erosion and deposition produce a variety of features in Africa as well. Let us see examples of these features.

6.3.1 Features formed by river erosion

- **Stream-cut valleys:** They are formed through erosion of river channels in the upper stages. The resultant valleys are usually V-shaped. These river valleys are further excavated by running water. The numerous rivers in Africa flow through these valleys.
- **Gorges:** They are steep, rocky walls of a river channel. They form along river channels that experience vertical erosion due to resistant, rocky sides. Examples of these include Shiroro Gorge in northern Nigeria, Batoka Gorge in Zimbabwe, Fish River Canyon in Namibia, Manambolo Gorge in Madagascar and the Great Ruaha River Gorge in Tanzania.
- **Rapids:** These are areas of shallow, fast flowing water over protruding rocks along the river channel. They are also numerous on many of Africa's rivers. They are found on rivers Congo, Zambezi, Blue Nile and Orange among others.

- **Waterfalls:** These are areas along a river channel that are characterised by water flowing over a steep gradient, falling over to a plunge pool underneath. These too are numerous. Examples are Victoria Falls on River Zambezi.

6.3.2 Features formed by river deposition

- **Alluvial fans:** These are cone-shaped deposits of sediments that results when a river enters a region with gentle gradient. An example is Lume Fan on River Lume where it enters the Semliki Plains in western Uganda.
- **Flood plains:** These are areas adjacent to a river that stretches from the banks of its channel to the base of the enclosing valley walls. These areas experience flooding during periods when the river has a lot of water. These are also referred to as *alluvial plains*. They are found in the lower parts of Rufiji River, Chari in Cameroon and Chad, Nile valley in Egypt and Benue in Nigeria.
- **Meanders:** These are winding curves or bends along the course of a river, especially in its middle or lower course. These are common along the lower course of rivers such as Nzoia and Nyando in Kenya, Semliki in Uganda, Rufiji in Tanzania, Benue in Nigeria and Wilge in South Africa.
- **Ox-bow lakes:** These are lakes that form mostly in the old stages of a river. They form in meanders that get cut off from the main river channel through deposition. Examples of these are Lake Gambi on River Tana and Lake Manzala on the Nile Delta.
- **River braids:** These are a network of diverging and converging channels caused by a river splitting into separate channels and rejoining. They are common in the lower course of a river. In between the channels are small islands called **eyots** or **aits**. They can be seen on rivers Congo, White Nile and Orange among others.
- **Deltas:** These are found mostly at the river mouth where a river empties into the sea. Examples of these include the Nile, Niger, Zambezi and Volta. Some have formed inland, for example Okavango Delta in Botswana and the Niger Delta in Mali.

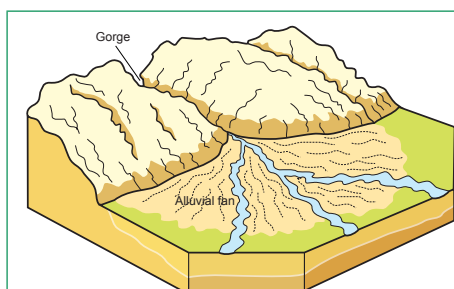


Fig. 6.3: An alluvial fan

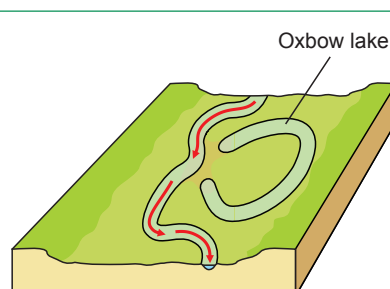


Fig. 6.4: An ox-bow lake

6.4 Importance of rivers, lakes and wetlands in Africa

Activity 6.8

Discuss the importance of rivers, lakes and wetlands (including swamps) in Africa.

Present your findings to the rest of the class for further discussion

As we already saw in Senior 2, rivers, lakes and wetlands are of great importance to Rwanda. In a similar way, these drainage features are very important in the rest of Africa especially as a source of water for various purposes, including fishing and tourism.

Following the class discussions, you should have found out that these water bodies are important in Africa in the following ways:

- (a) Water from some rivers, lakes and swamps is widely used for domestic and industrial purposes.
- (b) Water from rivers and fresh water lakes is widely used for irrigation. For instance, Egypt entirely relies on the waters of the Nile to grow her food. The waters of Lake Victoria are used to irrigate sugarcane plantations within its neighbourhood. Parts of some swamps are being cleared to grow crops such as rice in many parts of Africa.
- (c) River and lake water is usually harnessed to generate hydroelectric power. Rivers such as the Nile, Zambezi, Niger, Volta and Tana have

hydro-electric power generation dams. Lake Victoria is an example of a lake whose water is harnessed to produce hydroelectric power at the Nalubaale Falls Dam. Many other lakes are human made and are also a source of water for generating electricity for example, Lake Kariba and Lake Volta.



Fig. 6.5: H.E.P station on River Nyabarongo

- (d) Some sections of rivers are navigable and therefore are used for transport. This is true of sections of River Nile and some sections of Congo River. Many lakes, both natural and human-made, are also used for transport. Lakes Victoria, Tanganyika, Kivu, Albert and Volta are among many that are navigable.



Fig. 6.6: Transport on Lake Kivu

- (e) Many rivers and lakes as well as swamps are a source of fish that is exploited for domestic as well as commercial purposes. Many fresh water lakes and some alkaline ones have large stocks of fish. Lake Malawi is the world leading fresh water lake with the largest number of fish species.
- (f) Many water bodies including wetlands are natural habitats for a variety of unique plants and animals as well as birds, fish and reptiles. These attract tourists who come to see these natural plants and animals. Some tourists even do sport fishing, boat racing or boat trips along rivers and on lakes. Lakes Nakuru, Bogoria and Natron have flamingoes which are a tourist attraction.
- (g) Some river beds contain valuable minerals such as alluvial diamonds and gold while some lakes too contain valuable minerals. These include lakes Magadi and Natron which have trona.
- (h) Some river beds and banks have water-smoothened gravel and pebbles as well as clay that are used for building. Sand from the shores of some lakes and even clay are also excavated for building.
- (i) Alluvial soils deposited on the flood plains by rivers are generally fertile and therefore promote agriculture.
- (j) Some river mouths have formed good natural harbours. Many of Africa's harbours are built on river mouths, which may be at their estuaries and rias.
- (k) Some rivers are used as natural boundaries between countries, regions and administrative divisions.
- (l) Lakes and swamps play a great role of regulating rivers that flow through them and therefore control flooding on the downstream side.

These water bodies can also have negative effects, which include the following:

- (a) Swamps, rivers and lakes are a habitat for disease vectors such as mosquitoes and dangerous animals like crocodiles. These are harmful to people and domestic animals.
- (b) Some water bodies can also be a barrier to land transport. For example, there are those that are so wide that building bridges across them is impossible or would be too expensive. Human-made lakes have

displaced communities that used to be neighbours. For such groups to visit each other, they have to travel long distances to circumvent the water barrier.

- (c) When rivers and lakes flood, they displace many people and in some cases cause deaths by drowning as well as destroying property.

6.5 Challenges to obtaining sustainable and clean water in Africa

The challenges to obtaining clean water in Rwanda were discussed in Senior 2. These are not unique to Rwanda. They are indeed common all over Africa just like they are in other third countries of Africa.

Activity 6.9

1. Discuss the causes of lack of clean water in many parts of Africa. Suggest the steps that can be taken to provide clean water to the people.
2. Using available resources and the Internet, explore other challenges to obtaining sustainable and clean water in Africa. Discuss ways and means of conserving water in Africa.

Did you know?

There is a saying that 'water is life'. Our bodies need water for the body cells to be alive and to enable the body to absorb the food and other nutrients that we consume. However, this water must be clean and safe to consume and even use for other domestic and industrial purposes.

Large areas in Africa do not have quality water due to the following reasons:

- (a) The increase in population in the rural areas which are also the sources of water has led to interference with the natural water sources such as

rivers, swamps, ponds and lakes. The water is contaminated as people wash their clothes, vehicles and themselves directly in the water bodies. Those living on the downstream side of the rivers or other parts of lakes end up consuming this contaminated water.

- (b) Lack of proper sanitation such as pit latrines and toilets results in people urinating and defecating in the open. When it rains, this human waste is washed into water bodies, contaminating them. This is a common cause of the spread of diseases such as cholera and dysentery.
- (c) In urban and peri-urban areas there is careless discharge of sewage and industrial chemicals into water courses, making the water unsafe for human use.
- (d) Expansion of urban settlements has interfered with the normal infiltration of rainwater into the ground. This results in increased surface run-off and decreased volumes of underground water.
- (e) Expansion of agricultural farms has also seen an increase in the use of chemical fertilisers and pesticides. When it rains, these chemicals end up being washed into rivers and water reservoirs. They end up contaminating the water that is available for human use.
- (f) Large areas of wetlands are being reclaimed for agriculture while in semi-urban areas, they are reclaimed to set up settlements. This reduces the sustainable sources of water.
- (g) Climatic and periodic weather changes affect the quality of water. This is evident during floods when water is contaminated with silt and other pollutants from the land such as flooded pit latrines. During drought periods, the water becomes scarce and the available one may be also contaminated by substances such as salt.
- (h) Poor land use methods have led to serious soil erosion. The soil ends up in rivers, lakes and reservoirs causing sedimentation. This reduces the capacity of water bodies as well as increasing the dirt in the water.

Quick facts

Challenges of obtaining clean water include:

- Careless discharge of wastes into water bodies
- Climatic changes
- Poor land use methods which leads to soil erosion
- Reclamation of wet lands
- Encroachment on catchment areas
- Improper sanitation

Cleaning such water is expensive which many rural people may not afford the cost.

- (i) Where clean piped water is available, there is also a challenge of ensuring responsible use of the water. Many people leave taps running or use clean water to irrigate their lawns and vegetable gardens. Others merely waste it because they lack awareness and comprehensive information about the importance of careful use of water and water resources.
- (j) A lot of rainwater goes to waste as it is let to runoff into rivers, lakes and reservoirs. Many people in Africa do not have the infrastructure to harvest and store rainwater.

Activity 6.10

Using available resources or the Internet, explore other challenges to obtaining sustainable and clean water in Africa.

Discuss ways and means of conserving water in Africa.

END UNIT ASSESSMENT

1.
 - (a) Explain the meaning of a drainage basin.
 - (b) Name three major drainage basins in Africa.
2. Explain how the following lakes were formed:
 - (a) Lake Victoria
 - (b) Lake Tanganyika

For each of the lakes named above, name two examples of other lakes in Africa that were formed in a similar way.
3. Draw a sketch map of Africa and on it mark and label the following rivers: Nile, Niger, Zambezi, Orange and Volta. Explain the importance of these rivers in the development of the economies of the countries where they are found.
4. Explain the causes of water pollution in Africa.
 - (a) What role can you play as an individual in managing and conserving water in your locality?
 - (b) Suggest what individual governments should do to manage water resources in Africa.

Environmental Conservation

Key unit competence

By the end of this unit, you should be able to evaluate the methods of environmental conservation.

Introduction

Environment refers to things that surround us. These things may be human-made or natural. They include the houses we live in, vegetation, rivers, mountains, the air we breathe and the land on which we grow crops.

In this unit, we shall study more about environmental conservation under the following sub-headings:

1. Definition of environmental conservation
2. Effects of environmental degradation
3. Reasons for environmental conservation
4. Conservation measures for environmental resources
5. Challenges faced on the implementation of environmental conservation measures

Activity 7.1

With clear examples, find out things that surround us.

Remember!

The environment has an impact on us in many ways. For example, we get water from rain, springs, wells and rivers. If the water from springs, wells and rivers is polluted, it may make us sick. We also affect the environment for example by building houses, roads, planting trees and growing crops on land.

Activity 7.2

Using knowledge gained from environmental clubs at school and research from Internet:

- (a) Identify examples of
 - (i) Renewable resources.
 - (ii) Non-renewable resources.
- (b) Explain the meaning of environmental conservation.

Discuss the findings and make a class presentation.

7.1 Environmental conservation and effects of environmental degradation

Environmental conservation is the protection of things found around us. It requires the sensible use of all Earth's natural resources, which includes soil, minerals, wildlife and forests. Caring and conserving the environment is important because it ensures that natural resources are available today and in the future. It also keeps the environment clean and healthy.

Quick facts

Environmental conservation means the protection and preservation of natural resources from destruction, wastage and loss.

7.2 Effects of environmental degradation

Environmental degradation is the process through which the environment is damaged. The damage may be caused directly or indirectly by unsuitable human practices and activities.

Activity 7.3

1. Using your dictionary, find out the meaning of the following words:
 - (a) Resources
 - (b) Degradation

2. Study the photograph below and answer the questions that follow.



- (a) Describe the state of the land shown in the photograph.
- (b) Explain the reasons that may have made the land to become the way it is shown.
- (c) Identify the effects of this state of land to the local community.

Activities such as overstocking, overgrazing and deforestation may lead to land degradation. This may in turn lead to desert like conditions.

Activity 7.4

Study the photograph below and answer the questions that follow.



- (a) Describe what is shown in the photograph.
- (b) Explain what may have led to the situation shown in the photograph.

The following are some effects of environmental degradation:

1. Reduction in the quality of water due to discharge of harmful waste and toxic waste into water bodies.
2. Reduction in the quality of air due to pollution.
3. Loss of soil fertility due to soil erosion.
4. Poor crop production due to soil erosion.
5. Destruction of natural habitats which disrupts the survival of wild animals.
6. Climate change that leads to a rise in temperature and change in rainfall patterns.
7. Increased chances of flooding due to loss of vegetation cover.
8. Reduced water flow in some rivers due to deforestation.

7.3 Reasons for environmental conservation

Activity 7.5

Research from the Internet or textbooks the reasons for environmental conservation. Present your findings for class discussion.

The following are some reasons for environmental conservation.

- (i) **To sustain human life:** The environment contains all the resources that sustain human life. For example, it is important to conserve soils on which crops grow. Without good soils, there would be scarce food.
- (ii) **To protect endangered species:** Some species of animals and plants are being threatened with extinction due to environmental destruction. To ensure continuous survival of these species, conservation is necessary.
- (iii) **To make efficient use of resources:** There is need to control the way we use resources to avoid wastage and destruction. Some of these resources are renewable while others are non-renewable.

- (iv) **For the benefit of future generations:** The resources in the environment have always been important even to those who lived before us. It is therefore important for us to use the resources carefully. We should also improve them for future generations.
- (v) **For aesthetic value:** Human beings appreciate beauty. The environment contains features that people admire. It should therefore be conserved.
- (vi) **For economic value:** The wealth of a nation is measured in terms of the amount and value of resources found within its borders. It is therefore important to avoid over exploitation of available resources. The resources earn the country revenue.
- (vii) **To curb global warming:** Global warming is the general increase in average temperatures around the world. This causes climate change. However, environmental conservation reduces chances of global warming.

*Quick facts***Importance of environmental conservation:**

1. To sustain human life
2. To protect endangered species
3. To use resources efficiently
4. To benefit the future generation
5. For aesthetic value
6. For economic value
7. To curb global warming

Remember!

Some of the consequences of not conserving the environment include desertification of our country. There will be shortage of food and water that we need for survival. Urban centres will be polluted by industrial waste. People may become sick due to air and water pollution. Therefore, there is need for us to conserve the environment for a better tomorrow.

Source: UN Environment, 2017

7.4 Conservation measures for environmental resources

There are different conservation measures for environmental resources.

Activity 7.6

Using the knowledge gained from the previous class, explain different measures used for environmental conservation. Write down the findings for class presentation.

Some conservation measures for environmental resources include:

- (i) **Creating public awareness** - People are made aware of the need to conserve the environment. This is carried out through the mass media, public gatherings and seminars.
- (ii) **Participating in tree planting** - People are encouraged to plant trees. Farmers are encouraged to practice agro-forestry.
- (iii) **Introducing of environmental education** - Learners acquire knowledge about environmental issues. They also acquire skills to enable them solve the problems facing environmental resources. This can include introduction of environmental clubs in schools. Through these clubs, learners are encouraged to appreciate their environment. Learners also participate in conservation of the environment.
- (iv) **Enacting laws that govern environmental conservation** – These laws help in enforcing proper use of the environment. The laws help in enforcing protection of endangered resources and conservation of natural resources.
- (v) **Recycling of waste materials** – In order to keep the environment clean and healthy, waste materials such as scrap metals, papers and some types of plastics are being recycled.
- (vi) **Rehabilitating land after mining activities** – People involved in quarrying and mining activities are expected to rehabilitate such land. By doing this, piles of waste rock are flattened. Sometimes grass and trees are planted in such areas.
- (vii) **Setting up organisations and institutions to deal with matters related to environmental conservation.** United Nations Environment Programme (UNEP) is an international body which coordinates all matters related to environmental management and conservation. Some Non-governmental Organisations (NGOs) are also involved in the conservation of the environment.

Quick facts

Conservation measures

1. Creating public awareness
2. Planting trees
3. Enacting laws that govern environmental conservation
4. Recycling wastes
5. Rehabilitating land after mining
6. Setting up institutions that promote conservation

Remember!

World Environmental Day is celebrated every year on 5th June. This day was set aside by the United Nations Environment Programme (UNEP). On this day, people are reminded to participate in environmental conservation for its sustainability.

Source: UN Environment, 2017

7.5**Challenges faced in implementation of environmental conservation measures.****Activity 7.7**

Use knowledge from previous research to debate on challenges faced in implementation of environmental conservation measures. After the debate, make class presentation and engage in a question and answer session.

Challenges faced in implementation of environmental conservation measures include:

- (i) **Population increase leading to the need for land for settlement** – The need for land for settlement has led to deforestation in some areas. Some settlements are put up in steep slopes making such areas prone to soil erosion.
- (ii) **Expansion and extension of urban centres** – This has led to the reduction of agricultural land. This has led to over utilisation of the remaining agricultural land.
- (iii) **Need for wood fuel** – Need for charcoal and firewood has led to deforestation. This is a major problem because majority of people cannot afford alternative sources of energy.
- (iv) **Forest fires** – Forest fires that are either accidentally or deliberately started may destroy large areas of forests.
- (v) **Poaching** – Poachers kill wild animals especially elephants and rhinos for commercial reasons.

- (vi) **Human-wildlife conflicts** – These conflicts sometimes lead to the killing of either people or wild animals.
- (vii) **Inadequate public awareness** – Sometimes people are ignorant about the need to conserve the environment.
- (viii) **Climate change** – This sometimes lead to drought and floods.
- (ix) **Inadequate implementation of environmental laws and policies** – This sometimes may be due to insufficient finance and inadequate personnel.

Remember!

Despite these challenges, we all need to actively and positively participate in environmental conservation. Over-exploitation of natural resources results in an environment that is degraded. When we destroy the environment, then we destroy what we depend on for our existence.

END UNIT ASSESSMENT

1. Explain the meaning of environmental conservation.
2. Discuss four effects of environmental degradation.
3. Analyse the reasons for conserving the environment.
4. Explain three environmental conservation measures.
5. Explain challenges faced in implementation of environmental conservation measures.

Population in Africa

Key unit competence

By the end of this unit, you should be able to analyse population problems and solutions in Africa and the rest of the world.

Introduction

Population can be defined as the total number of people living in an area or region at a given period of time

Population in Africa is estimated to be about 1.216 billion people, according to the July 2016 United Nations estimates. This represents about 17% of the total world population, making it the second most populated continent after Asia.

Population distribution can be explained as the way people are spread across a given area.

Population density should be the number of people living in an area per square kilometer

We shall focus on other aspects of population in Africa and the rest of the world, by studying the following sections:

- Population distribution and density (Africa and rest of the world)
- Factors influencing population distribution.
- Population structure: composition, age and sex
- Population growth and explosion: birth rate, fertility rate, death rate, growth rate, and its effects in Africa
- Possible ways to control rapid population growth in Africa
- Migrations in Africa: types of migration, causes and effects of migration.
- Population problems: HIV and AIDS, poverty, overpopulation, famine, illiteracy, rural-urban migration, unemployment and possible solutions.

8.1 Population distribution and density (Africa and the rest of the world)

Population distribution refers to the spread of people (The way people are spread across a given area). **Population density** on the other hand refers to the number of people living in a particular area, per square kilometre.

Activity 8.1

Carry out a research using Internet or geography materials from the library to find out information about population distribution and density in Africa and the rest of the world. In particular, find out areas that:

- (a) Have low population
- (b) Have high population
- (c) Give reasons to explain why those areas identified above have low and high population.

Population distribution and density in Africa is uneven. People prefer areas that are agriculturally productive, have water, are urbanised or generally inhabitable. Other areas, usually where people may encounter hardships in survival, are avoided. Unfortunately, these areas cover the most parts of the continent.

Population distribution and density in Africa reflects the general settlement preferences in other parts in the rest of the world.

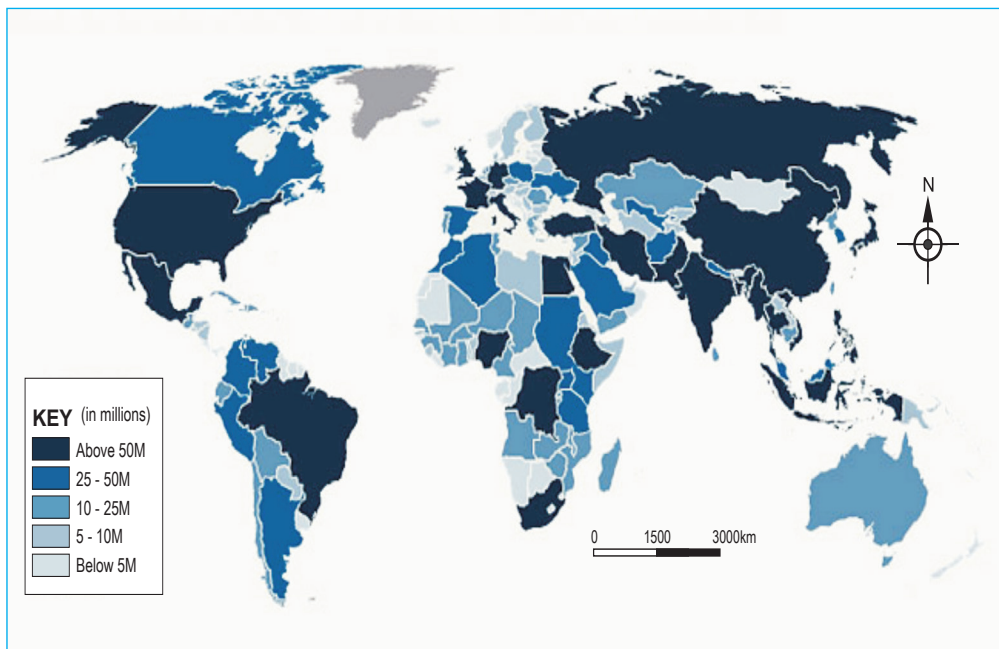
The distribution of population in Africa and the rest of the world and their varying concentration on land is dictated by a number of factors. This explains why some areas have few people while others have more and yet there are those with no people living in them.

Activity 8.2

Study the world map in Figure 8.1 showing world population distribution. Use it to fill in the missing information in the table below.

Continent	Countries with highest population
Africa	
North America	
South America	
Europe	
Asia	
Oceania	

The following world map shows population distribution on each continent.



Source: Population Reference Bureau

Fig. 8.1: World population distribution in 2015

Table 8.1 below shows the approximate population density per continent based on 2016 estimates.

Continent	Population (millions)	Density (people/km ²)
Asia	4 384	98.3
Africa	1 166	38.3
Europe	743	73.0
North America	576	23.3
South America	415	23.2
Oceania	39	39.0

Source: World factbook, 2016

Table. 8.1: Population of each continent based on 2016 estimates

Comparing the map of the world in **Figure 8.1** and the population density figures in the table above, it can be seen that people are spread everywhere on the land. From the table, it can also be seen that in Africa for example, there are about 38 persons per square kilometre of land.

Activity 8.3

Considering the population distribution map and the population density of the six continents given in the table above, discuss reasons why population distribution in different countries may not follow similar trends.

8.2 Factors influencing population distribution

Population distribution refers to the way people are spread out on land. In this case, we find some places are inhabited by very many people, others by few and yet others may have no people living there.

On the other hand, **population density** refers to the concentration of people per unit area of land. The density figures assume that people are evenly distributed all over the land area even in those places where people do not live like swamps, river valleys, steep slopes and forested areas.

Activity 8.4

1. *Use the internet and other Geographical sources of information to explain how the following resources influence population distribution: you should support your findings with illustrations and photographs..*
 - (a) Relief
 - (b) Climate
 - (c) Vegetation
 - (d) Soils
2. *Explain the physical and human factors responsible for population distribution. .*

Some of the factors influencing population distribution include physical and human factors.

8.2.1 Physical factors

These include; drainage, relief, climate, vegetation and soils.

- **Drainage**

Places with water bodies such as areas around lake victoria shores and the east african coast are highly settled because they are assured of getting benefits from the water bodies such as fishing and water for both domestic and industrial use, while areas with inadequate water supply witness low population.

Quick facts

Population distribution is influenced by physical and human factors.

Physical factors include:

- Relief
- Climate
- Vegetation
- Biotic factors
- Drainage
- Soils

Human factors include:

- Personal preferences
- Political and government policies
- Infrastructural development
- Security
- Historical events
- Economic activities such as trade and urbanisation, mining, agriculture and tourism



Fig. 8.2: A section of the Nyabarongo River Valley, with no human settlement

- **Relief**

Very steep slopes are avoided because of possible landslides. They are also difficult to cultivate. High altitude areas are uninhabited because they are very cold and unsuitable for crop growing and settlement. Gentle slopes attract large populations. While some flat areas have large numbers of people settled on them, and areas that are prone to flooding such as swampy flat areas are avoided.

- **Climate**

Areas receiving high rainfall attract people to settle and do farming while those with scanty or no rainfall have very few or no people at all. Places that experience extreme temperatures (very hot or very cold) are not attractive for living in while warm to cool areas are preferred for settlement.

- **Vegetation**

Within densely forested areas, there are few or no inhabitants while some woodlands such as the Miombo Woodlands of Tanzania are infested with tsetse flies and therefore unattractive for settlement. Grasslands which are easier to clear attract many people.

- **Soils**

Areas with fertile and well drained soils attract a lot of settlements

because they are agriculturally productive. That is why slopes of volcanic mountains such as Kilimanjaro, Kenya and Rwanda highlands have very many people. Areas with infertile soils are unsuitable for agriculture and attract very few people..

- **Biotic factors**

Areas with pests and diseases are less attractive to settlement and usually sparsely populated. On the other hand areas that are pests free are habitable and are highly populated.

8.2.2 Human factors

- **Historical events**

Slave traders invaded some areas. Others, over time, have had people displaced through tribal conflicts. During colonisation, large numbers of people were moved out of their ancestral land to reserved areas. These events are responsible for low population in some regions and high concentrations of people in others.

- **Political and government policies**

Political unrest in many parts of the world causes people to migrate and take refuge in other parts of a country or even in foreign countries. This reduces populations in parts of a country while increasing the numbers in other parts. If refugees are settled in a particular area, that part of the country becomes densely populated although initially it may have had scanty population.

Some government programmes may require people to move to other places so as to carry out development programmes in such areas. Building of dams results in formation of large water reservoirs that displace people. An area may be found to have valuable minerals and so people are displaced to give way for mineral exploitation.

- **Economic activities**

Large tracts of land that are owned by individuals or companies for **agriculture** are usually uninhabited because they are used for plantation farming. There are also other extensive areas that are set aside for conservation of wildlife.

These too remain without people. In such situations, very many people may concentrate on the much smaller areas that are available for settlement.

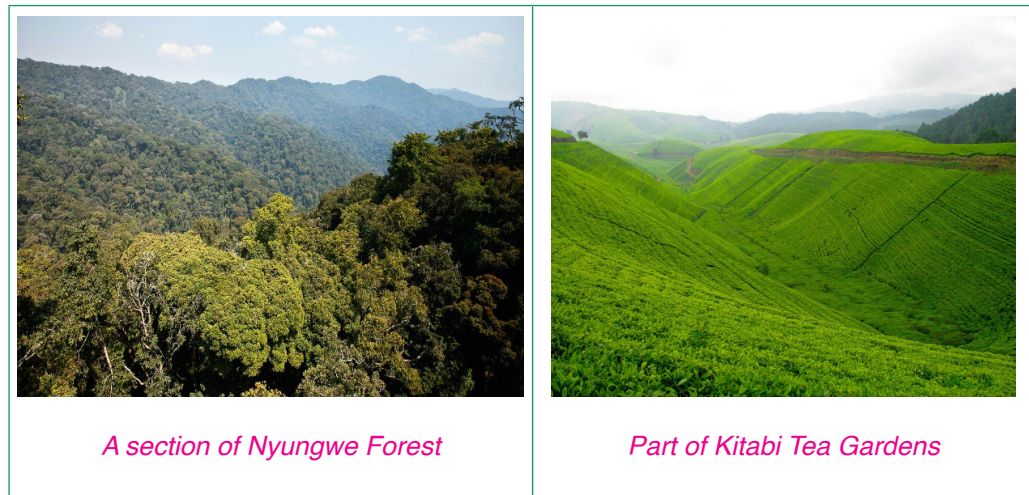


Fig. 8.3: Examples of areas in Rwanda with no human settlement

Other economic activities that attract many settlements include **mining**, **historical events**, **tourism** and **trade**.

8.2.2.4 Urbanisation

Establishment of towns attract large numbers of people because of the amenities there and modern lifestyle and jobs. Movement of people to towns increases the population in town areas.



Fig. 8.2: People on the streets of Kigali, Rwanda

Activity 8.5

- Discuss the factors that influence population distribution of an area.
- Analyse the impact of population distribution on the use of resources in the country.

8.3 Population structure: composition, age and sex in Africa and the rest of the world

Population structure refers to the statistical demographic representation of population of an area in terms of Age and sex (females and males). This information is summarized in a statistical graph called “Age-sex Pyramid” This helps to make population conclusions of a country.

8.3.1 General population structure of African countries

The population structure of Rwanda is a representative of many other countries of Africa. It is shown in Figure 8.5.

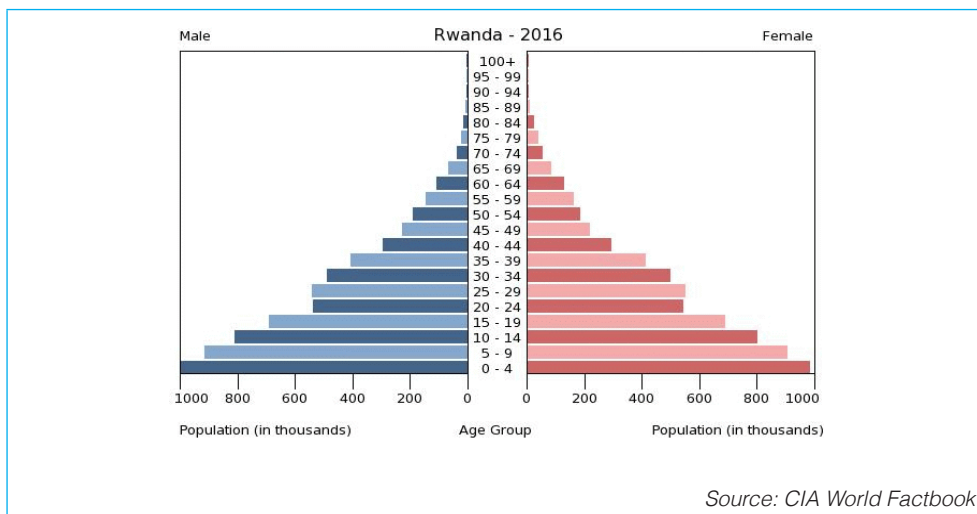


Figure 8.5 Population structure of Rwanda

From the pyramid above, we can see that people in age group 0-14 are regarded as **young dependents** who should be going to school. Those in age group 15-64 are the **working population**. The population of age 65 and

above is regarded as **old people** who are not expected to engage in active production. They are also considered as **dependents**.

Activity 8.6

Use the internet and other Geographical sources of information to find out the population structures of different African countries. Analyse the similarities and differences between the population pyramids of Kenya and Nigeria. Also compare those of Egypt and South Africa, Rwanda and Uganda.

From the activity above, you will realise that there exists no much difference between the population pyramids of Rwanda and other African countries. In fact, the following generalisations can be made from nearly all the population pyramids of different African countries:

- (a) About 45% of the total population is made up of children below 15 years.
- (b) The old people of over the age of 65 constitute about 3% of the total population.
- (c) A very broad base of the population pyramid is an indication of a large number of the young, meaning there is a high birth rate and there is a high population growth rate.
- (d) A large proportion of population under 15 years indicates a large number of potential parents.
- (e) There is a high number of dependents since the population consists of mainly the young ages i.e. 0 – 20 years of age.

Activity 8.7

A high proportion of young people in a population is as a result of:

- High fertility rate
- Declining mortality level

Discuss the steps that can be taken to lower the high fertility rate.

8.4 Population growth are explosion

Population growth is the increase or decrease in the number of people in a given region or country within a given period of time. It can be positive growth or negative growth. When we talk of '**population explosion**,' we are referring to rapid positive population growth.

Population growth can be determined by calculating the *numerical population increase*. It is calculated after every ten years, that is, the period between two censuses. (most countries hold a population census every 10 years). The population of Nigeria for selected years is given in Table 8.2 below.

Year	Population
2006	140 003 542
2013	172 816 517
2014	177 475 986
2016	177 155 754

Activity 8.8

Use the data in Table 8.2 to calculate the population increase between 2013 and 2014. This should give you the annual population growth rate.

Source: CIA World Factbook, 2016

Table 8.2: The estimated population data for Nigeria in different years

For the period between 2006 and 2016, the numerical population increase is:

$$177\,155\,754 - 140\,003\,542 = 37\,152\,212$$

This is the population increase over ten years.

The percentage population increase can be calculated as follows:

$$\frac{37\,152\,212}{140\,003\,542} \times 100 = 26.5$$

Therefore, the population increase is **26.5%** over a period of 10 years. Expressed this way, it is referred to as the *numerical population growth*. It can also be calculated every year based on population estimates.

Population growth is mainly influenced by the **birth rates**, **death rates**, **fertility rates** and **growth rates**.

- (a) **Birth rate:** This is the Number of children who are born alive per 1000 child bearing persons in a given period of time.
- (b) **Death rate:** This is the Number of people who die per 1000 of the total population in a given period of time.

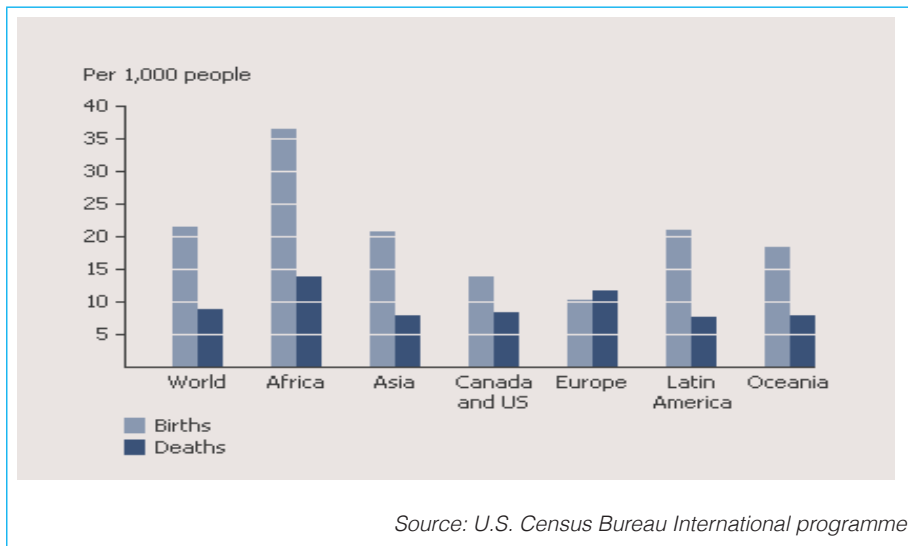


Figure 8.6: World birth and death rates in 2010

- (c) **Fertility rate:** This refers to the average number of children a woman would bear during her lifetime. or the ability of total number of children that would be born to each woman in her child bearing years.

It is important to note that:

- A rate of two children per woman is considered as the replacement rate for a population and results in relative stability of population numbers.
- Rates above two children is an indicator of a population that is growing in size.
- Higher rates may indicate families in difficulties such as to feed and educate children and for women to enter the job market.
- Rates below two children indicate that the population is decreasing in size and growing older.

- (d) **Population Growth rate:** • Population growth rate is the rate at which the number of individuals in a population increases in a given time period. It may be due to high birth rates and low death rate as well as increased immigrants than emigrants.

It can be determined by use of this formula:

$$\frac{\text{Birth Rate} - \text{Death Rate} * 100}{1000}$$

The growth rate can determine the burden that would be imposed on a country by changing needs of the people. This can be in terms of infrastructure (such as schools, hospitals, housing and roads, resources such as food, water and electricity and jobs). Rapid population growth is also a threat to neighbouring countries.

Activity 8.9

Discuss other factors that influence population growth and effects of population growth in Africa.

8.4.1 Effects of population growth in Africa

Population growth can lead to changes in a population of a given region or country. The effects of population growth in Africa include the following:

- Decline in GDP
- Slow economic development
- Unemployment
- Poor housing and health facilities
- Reduction in cash crop production
- Scarcity of amenities
- Slow industrial growth
- Underdevelopment

8.5

Possible ways to control rapid population growth in Africa

Activity 8.10

Explain ways of controlling rapid population growth in Africa. Note them in your notebooks and present them to the class for further discussion.

Most governments are conscious about the rapid growth of population in their respective countries and are taking measures to control it. These measures include the following:

- Introducing family planning programmes to Sensitize the masses and encourage families to use family planning methods to control births.
- Discouraging girls from early marriages by ensuring that they stay in school much longer to avoid early pregnancies.
- Advocating for small families and educate masses to change their tradition of having large families.
- Encouraging women to get involved in gainful employment and offering them career opportunities.
- Encouraging inducement to parents to have fewer children by offering free education and tax incentives for those with few children.
- Moral rehabilitation e.g. minimizing prostitution, premarital sex, pornography among others
- Encouraging celibacy
- Moral rehabilitation e.g. minimizing prostitution, premarital sex, pornography among others.
- Encouraging outward migration

8.6 Migrations in Africa: Types, causes and effects

Activity 8.11

Study the photograph below and use it to answer the questions that follow.

1. Describe what people are doing in **the** photograph shown above.
2. State any form of migration that can be witnessed in the photograph.
3. Explain why such a movement **occurs** and cite examples of countries where such cause have resulted in **migration** of people.
4. Analyse the effects of such a **movement** on the environment and **to** the area where it occurs.



Fig. 8.7: Refugees fleeing the South Sudan civil war

Migration is the movement of people from one region to another resulting in change of residence. It can be temporary or permanent.

When migration occurs within the same country, it is referred to as *internal migration*. When migration is across the country's borders, it is referred to as *international migration*.

Immigration is the movement involving people coming into a region or country. Such people are called *immigrants*. Where people move out of a region or a country, the movement is called **emigration** and the people involved are called *emigrants*.

8.6.1 Types of migration

There are two types of migration, **internal** and **external**.

(a) Internal migration

This involves people moving from one region to another within a country. It can be in the following forms:

- *Rural to urban migration*: This refers to the movement of people from villages to towns for short term or long term reasons.
- *Rural to rural migration*: This refers to the movement of people from village to village areas especially for work, for example, to work in plantations.
- *Urban to rural migration*: This refers to the movement of people from towns to villages. Others may be transferred from their places of work in the town to go and serve in the rural areas.
- *Urban to urban migration*: This refers to the movement of people from town to town. This may be caused by job transfer or search for better jobs.

(b) External or international migration

This type is also referred to as *inter-state* or *inter-regional migration*. It may be temporary (short term) or permanent (long term) where people end up settling permanently in the host country.

8.6.2 Causes of migration

In Africa, there are many reasons why people migrate to other places or countries. The following are some of them:

- (a) **Political persecution**: This has caused internal displacement of people commonly referred to as *internally displaced persons* (IDP's). It has also resulted in people fleeing their home countries across the borders to neighbouring countries while others even go overseas. These are called **international refugees**.

- (b) **Religious conflicts:** This is caused by persecution of members of a particular religion forcing them to move out of their homes to safer regions.
- (c) **Warfare:** Internal wars especially civil wars have caused displacement of people in many parts of Africa resulting in internal and external migration. For instance, the civil war in South Sudan has caused many refugees to flee the country to other neighbouring countries.



- (d) **Natural calamities:** These can include floods, volcanic eruptions and frequent droughts which cause mass exodus of people from the affected areas to places where life could be better.



- (e) **Pressure on land:** Densely populated rural regions have inadequate space for agriculture and additional settlements. Some people opt to migrate to other areas within the country where land is available for agriculture.
- (f) **Availability of employment:** This is one of the major causes of rural to urban migration. People have been known to migrate to places where they are capable of getting employment.

8.6.3 Effects of migration

Activity 8.12

Use the internet and other geographical sources to discuss the effects of migration to an individual and on the socio-economic development of a country. Make notes and share your findings with the rest of the class. Under the guidance of your teacher, write the correct ones in your notebook.

Migration has consequences on the place of origin as well as the destination of migrants. It also affects the migrant as well as the society. The following are some of the effects.

- Rural areas experience shortage of labour on the farms.
- Shortage of labour leads to general shortage of food grown in the rural areas.
- Emigration of people may lead to consolidation of land resulting in improved agricultural production.
- Imbalance in the female-male ratio may lead to families breaking up since the majority of migrants are male.
- General under-development of rural areas since most migrants are the able-bodied persons.
- Population density and fertility rate is lowered due to long absence of men from the rural areas.
- Some parts of a country may be depopulated due to forced migration.
- The purchasing power of the rural people may be raised when the migrants to towns send money home.
- A country faced with unemployment problem may be relieved when people seek employment outside the country.
- Overpopulation to the receiving areas and depopulation of some areas especially the source area
- Brain drain where people migrate to work in other areas.
- Environmental degradation due to high population growth that may cause deforestation.
- Conflicts may rise between migrants and natives due to shortage of enough land for accommodation.

8.7 Population problems and possible solutions

The problems of population are common all over Africa. The following are some of them and many have already been discussed in this chapter while others were discussed in Senior 2.

Activity 8.13

Explain possible solutions to the following demographic problem in Africa:

- (a) High fertility rates
- (b) High birth rates
- (c) High levels of poverty
- (d) Overpopulation
- (e) Illiteracy

Apart from the problems mentioned in **Activity 8.13** above, the following are other problems that face the population in Africa and their possible solutions:

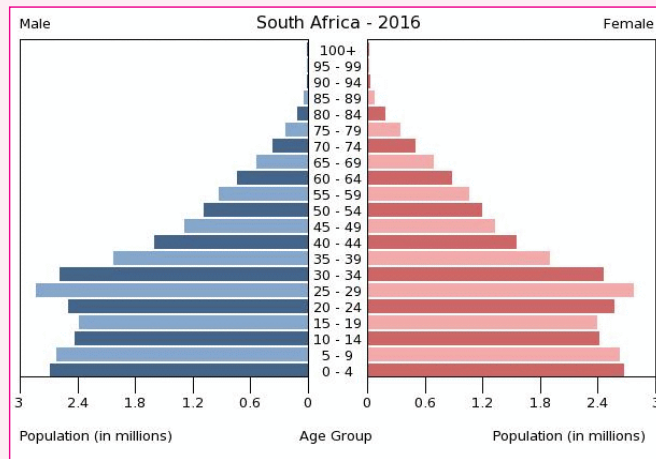
Problem	Explanation	Possible solution
Famine	This is caused by insufficient rainfall that results in prolonged drought and therefore shortage of food. This causes deaths and migration of people.	Proper planning and provision of water for drinking and irrigation to mitigate the ravages of drought which result in availability of food.
Rural to urban migration	People move to towns in search of employment and better lifestyles.	Provision of social amenities in the rural areas and decentralisation of industries to rural areas to reduce movement to towns.

Unemployment	This is due to rapid population growth and large numbers of people of working age but available jobs are few. Modernisation is also hurting the sector where machines are taking over jobs.	Enhancing training in skills so that people can be self-employed. Governments can negotiate with needy countries to employ their citizens as skilled labour.
High incidents of diseases and the HIV and AIDS pandemic	Spread of diseases such as malaria, diarrhoea and sexually transmitted diseases is attributed to the uneven spread of medical facilities, few medical personnel and ignorance of the majority of the population. The HIV and AIDS pandemic is also widespread because of obstacles such as cultural traditions and mythical attitudes.	There is need for massive education of the people on hygiene and preventive measures for such diseases. Governments need to make provision of medical services a priority including mobile clinics. There is need also for education about HIV and victims to come out in the open and embrace treatment.
High population pressure on the land	Many countries have limited areas for settlement because of presence of forests, mountains, swamps, lakes and arid regions. The available land supports millions of people leading to fragmentation of land and reducing its productivity.	Individualism is an obstacle to land consolidation and communal production of crops. However, efforts to lower the birth rate would ease the pressure in the long term.

END UNIT ASSESSMENT

- Discuss how the following factors influence distribution of population:
 - Climate
 - Soils
 - Political and government policies

2. Study the population structure of South Africa shown in the pyramid below and answer the questions that follow.



Source: CIA World Factbook, 2016

- (a) Describe the population structure of South Africa.
 - (b) Suggest reasons for the shape of the pyramid.
 - (c) Discuss the differences between the population structure of South Africa and that of Rwanda (Figure 8.5).
3. (a) Write brief notes on the causes of high birth rates in Africa.
 - (b) Suggest **four** ways of controlling rapid population growth.
4. Distinguish between *immigration* and *emigration*.
 5. Examine the problems facing population in Africa and suggest ways of overcoming them.
 6. What causes in human population size in a country?

Urban settlement in Africa

Key unit competence

By the end of this unit, you should be able to assess the impact of urban settlement on development in Africa.

Introduction

There are two basic types of settlements. These are rural and urban settlements.

Rural settlement refers to a group of houses in the countryside, which can take the form of a dispersed settlement, a hamlet or a village.

Urban settlement refers to concentrated settlements in towns and major trading centres. In urban settlements, people are mainly engaged in commercial, industrial and tertiary activities.

Quick facts

Settlement refers to how people organise themselves while inhabiting a place. It involves how people make a living out of their environment through social, economic, religious and political activities.

In this unit, we will discuss urban settlement in Africa, while focusing on:

- Characteristics of urban centres in Africa
- Functions and importance of urban centres
- Factors responsible for rapid urban growth
- Problems and solutions for urban centres in Africa
- Case studies: Nairobi, Kampala, Cairo and Johannesburg.

9.1 Characteristics of major urban centres in Africa

Activity 9.1

Copy the following map showing the major urban centres in Africa in your notebooks. Use your atlas and information from the internet to identify:

- (a) The name of each country shown.
- (b) The capital city indicated on the map.



- (c) Explain the characteristics of urban centres in Africa.

The following are some characteristics of urban centres in Africa:

- (i) They have large populations and high population densities.
- (ii) Settlements range from very low cost (slums) to high cost housing units.

- (iii) They have a variety of built up areas with tall buildings and little open space.
- (iv) Mobility of the people is high.
- (v) They experience traffic congestion especially when people are going to work or back home from work.
- (vi) Secondary and tertiary activities are dominant.
- (vii) Residents have extreme variations in their levels of income.
- (viii) Some are situated in areas where a number of roads converge.
- (ix) They perform many functions such as commercial, industrial and administrative.

Activity 9.2

Discuss the characteristics of Cairo City and make a class presentation from your findings. Cite examples where necessary.

9.2 Functions of urban centres

Urban centres have housing estates and apartments for different categories of people.

The following are some functions of urban centres:

- (i) *They are commercial centres* - A wide range of business and trading activities are carried out in urban centres.
- (ii) *They are administrative centres* - Most urban centres serve as centres of administration for the regions in which they are found. Some of them are capital centres.
- (iii) *They are transport and communication centres* - Urban centres serve as focal points for transport systems. Many radio, television stations and telecommunication facilities are found in some urban centres.
- (iv) *They are educational centres* - Some urban centres have several primary and secondary schools while others have higher learning institutions such as polytechnics and universities.

- (v) *They are residential centres* - Urban centres have housing units for people with different levels of income.
- (vi) *They are industrial centres* - Processing and manufacturing industries are located in the major urban centres.
- (vii) *They are recreational centres* - Most urban centres have recreational facilities such as cinemas, casinos, sport centres, clubs and hotels.

Did you know?

Urban centres have a wide variety of functions. Whatever their other functions are, they always have commercial functions.

9.3 Factors responsible for rapid urban growth

Activity 9.4

Discuss the factors that influence urban settlement in Africa and make a class presentation.

Africa has experienced very high urban growth in the last 20 years. Growth rates have been about 3.5% per year. There are many factors that are responsible for this rapid urban growth. Some of these factors are:

- (i) *Rural-urban migration* - People move from rural areas to urban areas to look for jobs. Some migrate because urban centres have better facilities than rural areas. The population in the urban centres increases due to the migration. This in turn leads to the expansion of urban centres.
- (ii) *Natural increase in the population* - There has been a decrease in death rates. This decrease has occurred due to improved nutrition and better health facilities. As the population increases, urban centres expand and new ones come up.
- (iii) *Development of trade and commercial activities* - Urban centres have a big population that has consequently increased demand for goods and services.

- (iv) *Industrial development* - Establishment of industries in urban centres attract job seekers. As more and more people come to the urban centres, a variety of businesses are set up. There is also construction of residential areas to accommodate the increasing population. All these lead to the expansion of urban centres.
- (v) *Administrative activities* - Establishment of administrative services in urban centres attract people who require the services. Some people also get employed. This eventually leads to the expansion of urban centres.
- (vi) *Availability of transport and communication facilities* - Areas with good transport and communication networks attract investors. Such areas expand and become large urban centres. Existence of road junctions attract settlements. These settlements later become urban centres.
- (vii) *Presence of mineral deposits* - Areas rich in mineral deposits which are of economic importance attract people. People go there in search of employment. The large population that is attracted to such areas require facilities such as housing, schools, electricity, hospitals, water supply and transport. As these facilities are provided and the mining activities expand, these areas develop into urban centres.
- (viii) *Availability of educational facilities* - Establishment of learning institutions such as colleges and universities has led to the growth of urban centres.
- (ix) *Agricultural activities* - Collection and distribution centres for agricultural produce may develop rapidly and become urban centres.
- (x) *Government policy*: - through establishing administrative headquarters, government influence development of urban center e.g. establishing capital cities in particular areas that led to the growth and development of some towns into large cities like Lusaka, Abuja, Dodoma,

Quick facts

Factors for urbanisation in Africa are summarised as follows:

1. Rural urban migration
2. Natural increase in population
3. Development of trade and commercial activities
4. Administrative activities
5. Transport and communication
6. Presence of minerals
7. Industrial development
8. Education facilities
9. Agricultural activities

etc.

Did you know?

Some urban centres may decline instead of growing. The decline may be caused by a number of reasons such as changes in the forms of transport, exhaustion of mineral deposits, relocation of government administrative functions to another town, decline of certain industries or as a result of competition from nearby urban centres.

9.4 Problems and solutions for urban centres in Africa

Urban centres in Africa face various problems. Some are problems brought about by increase in the population. Others are problems that are due to the physical expansion of the urban centres. These problems are being solved using various measures.

Activity 9.5

Apply knowledge from the previous class to discuss and note down problems associated with urbanisation in Africa. Suggest possible solutions to the problems. Present the information for class discussion.

The following table gives a summary of some problems facing urban centres in Africa and the possible solutions.

Problem	Possible solution
(i) Unemployment This results from too many job seekers competing for the few job opportunities.	- Creating suitable conditions for setting up industries in rural areas. These industries will offer job opportunities. - Encouraging expansion of informal sector to absorb the unemployed persons. - Developing an educational system aimed at producing more job creators than job seekers.

Senior 3 Geography and Environment

(ii) Inadequate social amenities The high population in urban centres makes it difficult to provide enough social amenities. This leads to overcrowding in hospitals and schools, water shortage and poor sanitation.	Improving social amenities in the rural areas to reduce the strain on social amenities in urban centres. This would limit rural to urban migration.
(iii) Traffic congestion - Heavy traffic congestion mainly occurs during rush hours. This is when people are going to work or home. It is worse during rainy seasons. - The Central Business Districts (CBDs) have the greatest traffic congestion. - Traffic congestion causes delays in movement.	- Constructing by-passes, subways, tunnels, flyovers or underpasses. - Constructing dual carriage ways. - Expanding existing road network to improve traffic flow. - Providing paths for cyclists and pedestrians.
(iv) Environmental degradation - Pollution of water, air, noise from industries and motor vehicles as well as fumes from motor vehicles. - Poor sanitation. - Uncollected heaps of garbage. - Spoilage of landscape by tip-heaps and derelict land.	- Enacting and enforcing laws on environmental management. - Treating industrial waste before disposal to reduce water pollution. - Promoting public awareness on the appropriate ways of waste disposal. - Recycling garbage for future use. - Privatising garbage disposal in order to make garbage collection more efficient. - Citizens to participate in the clean-up programmes.
(v) Poor planning - Most urban centres in Africa grow in unplanned manner. This has interfered with provision of access roads, electricity, water and sewerage. - Some buildings are erected without following the set standards and procedures. Such buildings sometimes collapse injuring people or even causing deaths. - Some residential areas do not have space for social amenities. - Most essential services are concentrated in the Central Business District (CBD). - Some urban centres have expanded beyond their boundaries into the surrounding agricultural land. - There are also many unplanned informal settlements.	- Enforcing laws which restrict unplanned developments. - Building skyscrapers to reduce the problem of space. - Preparing and applying urban spatial master plans.

(vi) High rate of crime • Due to the ever increasing population and high levels of unemployment, urban centres are faced with high criminal activities. • Widespread insecurity, fear, loss of life and property. • Urban centres are becoming targets of terrorist attacks. • Drug addiction and alcoholism amongst people especially the youth have increased incidences of crime.	• Increasing income generating activities to absorb those who are jobless. • Improving street lighting to reduce mugging. • Encouraging community policing to complement the efforts of police force. • Increasing the number of police officers on patrol. • Expanding the sewerage system in line with increased population. • Convicting drug barons. • Increasing taxation on alcoholic products to make them unaffordable.
(vii) Emergence of street families • Street children are common in most urban centres. These are mainly unemployed persons and also children who decide to live on the streets in order to beg.	• Establishing rehabilitation centres for street families. • Providing street family members with education and skills to sustain them. This would also keep them off the streets.
(viii) Inadequate housing facilities • Influx of many people into urban centres creates shortage of residential houses. • Shortage of houses has led to development of slums and a rise in house rent.	• Putting up more affordable houses. • Upgrading slums by constructing modern housing units.

Remember!

Most of the measures that could be used to solve the problems of urban centres require a lot of capital. Since African countries do not have adequate capital, implementation of some measures may delay.

9.5

Case Studies: Nairobi, Kampala, Cairo and Johannesburg

For each of these cities, we will discuss the following key areas:

- Characteristics of each city
- Functions of each city
- Factors influencing growth of each city
- Problems facing the city and possible solutions

Activity 9.6

Draw a map of Africa showing the position of Nairobi, Kampala, Cairo and Johannesburg in relation to countries in Africa.

9.5.1 Nairobi

Nairobi is the capital of Kenya and the largest city in the country. It is also one of the largest urban centres in East Africa with a booming economy. It also contributes to economic development of other cities in the region.

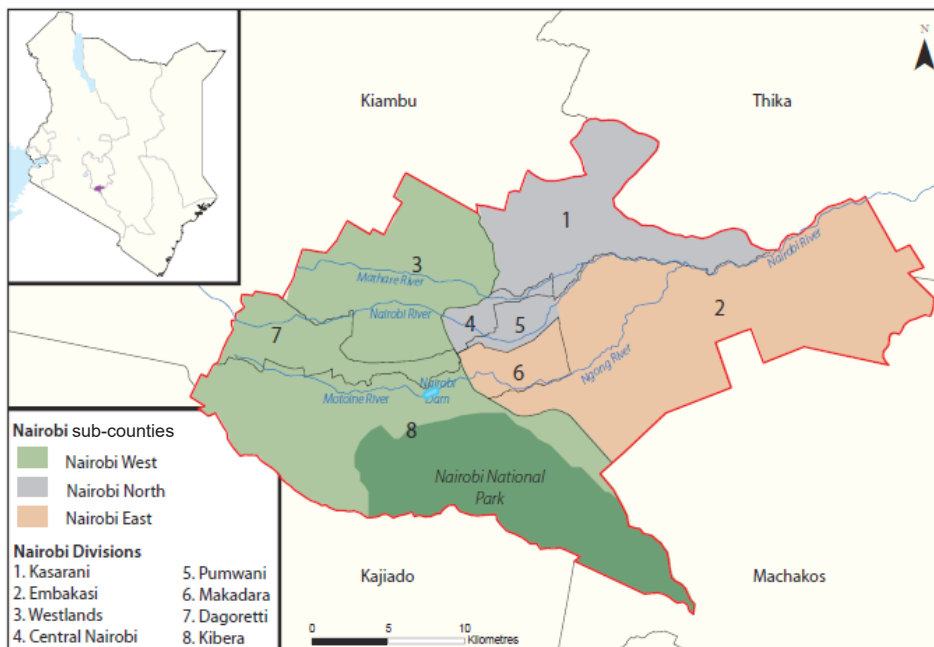


Fig. 9.1: Location and divisions of Nairobi city

Activity 9.7

Using information from the Internet, find out some other characteristics of Nairobi. Present your findings for class discussion.

9.5.1.1 Characteristics of Nairobi

The following are some of the characteristics of Nairobi:

- It is the capital and largest city of Kenya. It is the 13th largest city in Africa.
- It has an area of 696 square kilometres.
- In 2016, its population was about 3.4 million.
- It is famous for having the Nairobi National Park. This is the world's only game park found within a major city.

9.5.1.2 Functions of Nairobi

Activity 9.8

Use the Internet or geographical documents to research on functions of Nairobi. Make a class presentation.

Some functions of Nairobi are:

Administrative centre

Parliament and the headquarters of all government ministries are found in Nairobi. The President's office is also located here. The city is the headquarters of Nairobi County. It is the residential base for all foreign missions in Kenya.

International centre

It hosts a number of organisations for example, United Nations Environment Programme and United Nations Habitat. It also hosts international conferences.

Industrial centre

It is a leading industrial town in East Africa. Major industries are food and non-food processing industries, motor vehicle assembly, brewing and service industries.

Commercial centre

The Central Bank of Kenya and all commercial banks in Kenya have their headquarters in Nairobi. It also hosts the Nairobi Securities Exchange (NSE). This exchange is Africa's 4th largest in terms of trading volumes. Many other

Quick facts

Functions of Nairobi

1. Administrative centre
2. International centre
3. Industrial centre
4. Commercial centre
5. Tourist centre
6. Transport and communication centre
7. Education centre
8. Residential centre

trading activities are also carried out here. Insurance businesses are also found in Nairobi.

Tourist centre

The city has a number of tourist attractions for example, the Nairobi National Park, Animal Orphanage and National Museum. The availability of many hotels of international standards has made it a leading tourist attraction.

Transport and communication centre

Nairobi has road, railway and air links to the interior of the country and other parts of the region. It is served by Jomo Kenyatta International Airport which is the largest airport in East and Central Africa. There is also Wilson Airport which is a small and busy general aviation airport. There are many radio and television stations based in Nairobi.

Cultural and Education centre

Nairobi has many educational institutions. These include universities, colleges, secondary and primary schools.

Residential centre

There are many residential estates where people live. They range from high class to middle and low class estates. Some residential areas are slums.

9.5.1.3 Factors influencing growth of Nairobi

Activity 9.9

Use textbooks or the Internet to carry out a research to explain how each of the factors mentioned below influence the growth of Nairobi. Present your findings to class for discussion.

The following are some factors influencing the growth of Nairobi:

- Rural-urban migration
- Natural increase in population
- Demand for goods and services
- Development of industries
- employment opportunities
- Administrative activities
- Availability of transport and communication facilities
- Availability of educational institutions

9.5.1.4 Problems facing Nairobi

The following are some problems facing Nairobi:

- Unemployment
- Inadequate social amenities
- Inadequate housing facilities
- Influx of street families
- Traffic congestion
- Environmental degradation
- High rate of crime
- Poor planning

Activity 9.10

Discuss ways that can be used to solve the problems facing Nairobi city.

9.5.1.5 Efforts being made to solve problems facing Nairobi

- (a) Initiating developments in the rural areas in order to reduce rural-urban migration.
- (b) Setting up industries in rural areas through the policy of decentralisation of industries in order to create employment opportunities.
- (c) Rehabilitate street children, for example, through taking them to National Youth Service (NYS) and rehabilitation centres.
- (d) Modernisation of slum dwellings by the government and non-governmental organisations.
- (e) Encouraging foreign investors to start businesses in the major centres in order to create employment.
- (f) Setting up of industries far from residential areas to help reduce air and noise pollution.
- (g) Allowing private companies to participate in garbage collection.
- (h) Building low cost houses that are affordable to low income earners.

9.5.2 Cairo

Cairo is the capital and largest city of Egypt. The city's metropolitan area is the largest in the Middle East and the Arab world and 15th largest in the world.

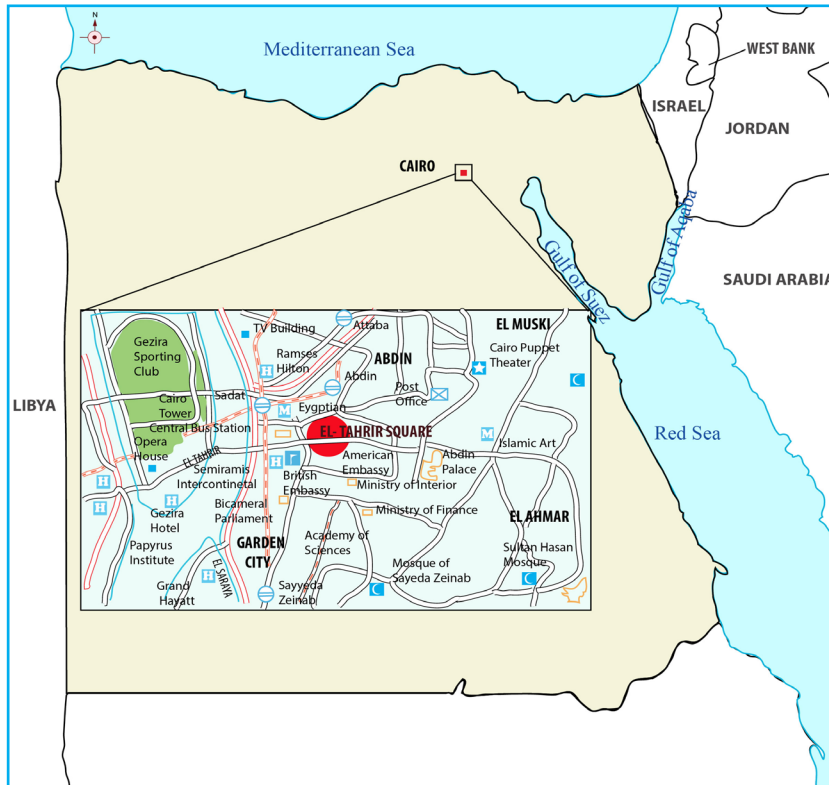


Fig. 9.2: Map showing the location of Cairo

9.5.2.1 Characteristics of Cairo

Activity 9.11

Carry out a research from the Internet and find out characteristics of Cairo. Note down the findings for class presentation.

Some of the characteristics of Cairo are:

- It is the capital and largest city of Egypt.
- It is located near River Nile and the Pyramids of Giza in the northern part of Egypt.
- It is one of the largest cities in Africa.
- It has an area of 528 square kilometres.
- In 2014, the population was about 12 million. It is one of the most populated cities in the world.

9.5.2.2 Functions of Cairo

Activity 9.12

Using information from Internet, find out the functions of Cairo. Present your findings to class for discussion.

Some functions of Cairo include the following:

Administrative centre

It is the political capital of Egypt. It is also the headquarters of the Arab League in Egypt.

Trade centre

There are many trading activities carried out in Cairo. For example, trade in horticultural crops, textiles, livestock products and metal products.

Tourist centre

The city has a number of tourist attractions. Examples are the Egyptian Museum, Cairo Tower, Old Cairo and Tahrir Square.

Industrial centre

Major industries include food processing, iron and steel production and textile industries.

Transport and communication centre

Cairo has an extensive road network, rail system, subway system and maritime services. The extensive road network connects Cairo to other major cities and villages in Egypt. Cairo also has many advanced communication facilities.

Medical centre

Cairo offers high level of medical facilities at relatively low prices.

Cultural and educational center.

It offers educational services for Egypt and the region. World's 2nd oldest institute of higher learning, Al-Azhar University, is located in Cairo.

Quick facts

Functions of Cairo:

1. Administrative centre
2. Medical centre
3. Industrial centre
4. Trade centre
5. Tourist centre
6. Transport and communication centre
7. Education centre
8. Residential centre

9.5.2.3 Factors influencing growth of Cairo

Activity 9.13

Discuss how each of the factors mentioned below influence the growth of Cairo. Make a class presentation.

Factors influencing growth of Cairo include:

- Rural to urban migration
- Availability of educational facilities
- Natural increase in population
- Availability of transport and communication facilities
- Investment opportunities
- Influx of tourists
- Administrative activities

9.5.2.4 Problems facing Cairo

The following are some of the problems facing Cairo:

- High levels of pollution
- Unemployment
- Traffic congestion
- Inadequate social amenities
- High rate of crime including terrorism
- Inadequate housing facilities

Activity 9.14

Discuss measures that could be used to solve the problems facing Cairo. Make a class presentation from your discussion.

Did you know?

Due to poverty and inadequate housing facilities, some of the urban poor in Cairo live in cemeteries and tombs.

Activity 9.15

Use maps, textbooks or the Internet to research on Kampala and Johannesburg. For each of these cities:

1. Draw a map showing their location in their respective countries.
2. Carry out a research on the following:
 - (i) Characteristics of each city
 - (ii) Functions of each city
 - (iii) Factors influencing growth of each city
 - (iv) Problems and solutions to the problems of each city.

9.5.3 Kampala

Kampala is the capital city of Uganda. It is found in the south central part close to the shores of Lake Victoria.

It is an administrative centre, housing the seat of government. It is also an education centre, with many education institutions including universities, colleges and schools.

Activity 9.3

Find out the functions of Kampala City. Present your findings to the class.

9.5.4 Johannesburg

Johannesburg is the largest city in South Africa and is one of the 50 largest urban areas in the world. Johannesburg, South Africa's biggest city and capital of Gauteng province, began as a 19th century gold-mining settlement. Johannesburg, just like Nairobi, Kampala and Cairo, is an administrative, educational and commercial centre.

END UNIT ASSESSMENT

1. Discuss the characteristics of urban centres in Africa.
2. Analyse the functions of major urban centres in Africa.
3. Discuss the factors influencing the growth of urban centres in Africa.
4. Assess the impact of urban settlement on development in Africa.

UNIT 10

Agricultural Systems in Africa

Key unit competence

By the end of this unit, you should be able to analyse the importance of various agricultural activities on sustainable development in Africa.

Introduction

Agriculture involves crop farming and animal keeping. There are different agricultural systems in Africa. They include **traditional methods of farming** or **subsistence farming** and **modern methods of farming**. The traditional systems of agriculture are slowly changing as governments intervene to educate communities on systems that provide higher crop and animal yields. However, the changes are gradual because people take time to adapt to the changes in things that they have done over the years. As a result, there are areas in Africa where traditional forms of agriculture are still practiced.

In this unit, the following key areas on agriculture in Africa will be covered:

- (i) Types of agricultural systems in Africa - Subsistence farming in Africa: Shifting cultivation, small holder farming and rotational bush following (characteristics, problems and solutions)
- (ii) Modern agriculture, plantation agriculture, green revolution and irrigation farming (characteristics, advantages and disadvantages)
- (iii) Livestock farming in Africa: nomadic pastoralism, ranching and dairy farming (characteristics, problems and solutions)
- (iv) Impacts of various agricultural activities on Africa's development
- (v) Case studies (Cotton growing in the lower Nile Valley, cocoa and rubber growing in west Africa, dairy farming in Kenya and livestock ranching in Botswana)

10.1 Types of agricultural systems in Africa

Read the following story by Kayitesi then attempt Activity 10.1 that follows:

Kayitesi's story

My name is Kayitesi. I am in Senior 3. Last holidays, I visited my grandparents at the countryside. All through my stay, we experienced rains on most days. Before I arrived, my grandmother told me that their farm had already been ploughed in readiness for the planting season.

On the evening after my arrival, my grandparents explained to me how they used to practice agriculture in the olden days.

"We used to have smaller parcels of land where we could work on with our hoes," said my grandmother.

"We could wake up very early in the morning to start working on the farm. Each one of us had a portion to plough. At daybreak, we were allowed to prepare to go to school, which was a mile away," she concluded, with a rare frown on her face.

"In our village," started my grandfather, "we were six boys. Each of us had two oxen which we were responsible for – grazing them as well as using them to plough the farm. Our farm was a little bigger than that of your grandmother," he said as our grandmother nodded as a sign of confirmation. "My father had a small herd of cattle to keep, apart from the oxen. In the herd were goats and sheep."

"So, what are some of the crops you used to grow, grandpa?" I asked.

"The farm was divided into many portions," he answered. "Each portion had its type of crop to grow. I remember I grew cassava on my portion. My elder brother grew groundnuts while my sister grew sweet potatoes. However, I could plant maize the next season to avoid planting the same crop for a long time," he concluded.

"Did you grow the same type of crops on your portion as well grandma?" I posed.

"No," she replied. "I tended yams and wild oat. My siblings preferred bananas, sorghum and millet. Remember, the land was fertile so we did not use fertilisers."

"None of you has mentioned tea and coffee. It is because you did not like such crops?" I asked.

"That's not the case Kayitesi," my grandmother replied. "Such crops were introduced by colonialists long after we had gotten married."

"However, it is what we are now growing because we later got tractors that could prepare large tracts of land for farming purposes."

Activity 10.1

In reference to the above story and with the help of textbooks, local environment, photographs and related documents, identify different methods of subsistence farming used in Burundi in the past. List the different types of subsistence crops grown in Burundi. Prepare a class presentation from your findings.

10.2 Subsistence farming in Africa

Traditional methods of subsistence agriculture in Africa are:

- (a) Shifting cultivation
- (b) Rotational bush fallowing
- (c) Small holder farming

10.2.1 Shifting cultivation

Shifting cultivation is a traditional way of growing crops for subsistence purposes. It is widely practiced in tropical Africa. People use natural conditions to grow food crops such as maize, yams, potatoes, beans, arrow roots, cassava, millet and bananas. After sometime, when the land gets exhausted, they shift to another area that is virgin. It is also known as **slash and burn agriculture**.

Characteristics of shifting cultivation

- Forested areas are usually cleared and burnt down by fire to create land for cultivation, thus slash and burn cultivation.
- The cultivated lands are usually very small.
- The cultivated plots are scattered and separated by a dense forest.
- It involves use of simple tools for digging such as sticks, pangas, etc. (elementary tools)
- It is labour intensive and which is provided by the family members.
- It involves mixed cropping and few crops are grown.
- Little attention is paid to the crops grown.

- When the crop yields decline the farmer abandons the plot and goes to search for a fresh piece of land.
- Due to low crop yields, the food supply is supplemented by fruit gathering and hunting.
- Settlements are temporary.



Fig. 10.1: An area freshly cleared for cultivation in Mecati Forest, Mozambique

Activity 10.2

1. Use geographical documents or the internet to research on the following characteristics of shifting cultivation. Write brief notes on each of the following sub-headings:
 - (a) Why it is only practiced in areas of sparse population
 - (b) How soil fertility is maintained
 - (c) Why the farms are always small
 - (d) The type of tools used
 - (e) Types of crops grown and their use
2. Carry out a research to find out the problems associated with shifting cultivation.
3. Find out examples of countries in Africa where shifting cultivation is carried out and where available, the names of the communities that are involved.

Advantages of shifting cultivation

- People are able to get food since constant abandoning of the plots ensures fresh sites with high productivity.
- Burning kills pests and destroys weeds hence making the crops grow well and work less tasking
- The ash got from the burning of the cleared vegetation adds humus to the soils hence maintaining soil fertility.
- Intercropping enables soil conservation.
- The nature of this type of farming enables the farmer to be engaged in other activities such as fruit gathering, fishing, hunting, etc.

Disadvantages of shifting cultivation

- Burning destroys large quantities of organic matter(green manure) hence interfering with soil formation process.
- Encourages environmental degradation since forested areas are cleared and involves bush burning.
- Wastage of time since the farmer keeps on shifting from one place to another forested area and then clearing a fresh piece of land.
- Discourages the development of monetary economy.
- Low crop yields are realized and can hardly support the entire family or the growing population hence there is no food security.
- It leads to poverty and low standards of living which in turn lead to low development of modernization since people cannot afford to buy modern equipment.
- Hinders the development of infrastructure such as schools, hospitals and roads due to mobility of the farmers.

10.2.2 Small holder farming

This is a form of cultivation that involves farming on small plots of land. As population increases, land to cultivate crops becomes less. Movement of people looking for virgin land decreases.

Characteristics of small holder farming

- Both subsistence and cash crops are grown.
- Land is subdivided into small uneconomical plots for farming.

- Simple tools are used.
- Mulching is a common practice and crop rotation is practiced to preserve soil fertility.



Fig. 10.2: Small holder farming in Antsirabe, Madagascar

Problems associated with small holder farming

- Pests and diseases sometimes destroy the crops reducing the yields.
- Constant tilling of the land causes exhaustion of the soil leading to soil erosion.
- Crop production per unit area keeps on decreasing.
- Use of simple tools also contribute to low crop yields.
- As population increases, land is further sub-divided to give room for settlement.

Activity 10.3

Use geographical documents or the internet to find out areas where small holder farming is carried out in:

- (i) Rwanda
- (ii) Africa

Discuss and write down possible solutions to problems facing small holder farming in Africa.

Solutions to problems associated with small holder farming

1. Applying pesticides to prevent and control the effects of pests and diseases.
2. Leaving the land under fallow for some time for it to regain fertility. This can be done by practising rotational bush fallowing/farming.
3. Using fertilisers to increase the productivity of the land.
4. Employing the use of modern farming tools and equipment that allow a large area to be put under farming.
5. Setting aside settlement areas, while leaving out specified areas for farming.

10.2.3 Rotational bush fallowing

Rotational bush fallowing is where an abandoned piece of land is left to regain its fertility before reverting back to it. The land is made to rest for some time before resuming cultivation.

Activity 10.4

Make a list of similarities and differences between shifting cultivation and bush fallowing. Prepare a class presentation from your findings.

Characteristics of rotational bush fallowing

- In these areas, settlement is more permanent. Each village has its own land to till. A bit of land ownership is practiced here as opposed to shifting cultivation.
- However, shifting cultivation and rotational bush fallowing use fire to clear the land. They also use simple hand tools such as hoes.
- In rotational bush fallowing, the land is never bare. Each village has its own land which is cultivated according to a fixed rotation. This does not allow the land to revert fully to a forest or a woodland.
- The time a bush fallower cultivates a particular piece of land may vary from one year to about ten years. The common period is between 3 – 5 years then the land is left to fallow for a number of years.

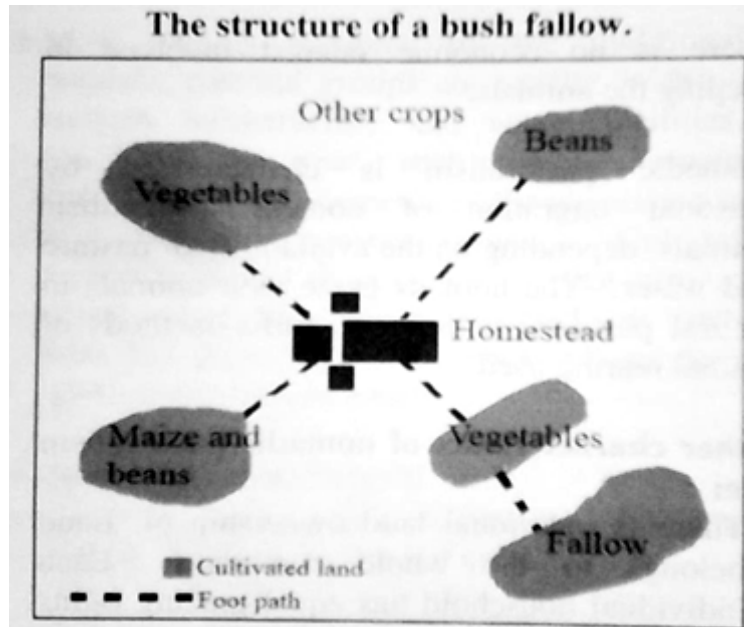


Fig. 10.3: A model of a farm where rotational bush fallowing is practiced

Activity 10.5

Imagine you are the minister for agriculture and some of the local communities practice bush fallowing. Study the following disadvantages of bush fallowing and for each, suggest the advice you would give to the communities so as to improve crop production.

- Burning destroys the ecosystem.
- The land gets exhausted fast leading to soil erosion before it is left to fallow.
- The land is never left to revert fully to forest or woodland.
- As population increase, there has been pressure on the available land resources.

10.3 Modern methods of agriculture in Africa

There are several modern farming methods that were introduced in Africa by colonialists. Some of these modern forms of agriculture are:

- (a) Plantation agriculture
- (b) Irrigation farming
- (c) Green revolution

10.3.1 Plantation agriculture

Plantation agriculture is the growing of one crop on a large piece of land for sale. It is also referred as a **monoculture**. Plantation agriculture is practiced mostly within the tropics in many parts of Africa, Asia and America. In Africa, some of the crops grown under plantation are rubber, oil palm, coffee, cocoa, tea, bananas, wheat, cotton, sugarcane and fruits.

Activity 10.6

Discuss and write brief notes on the conditions that favour the growth of tea.



Fig. 10.4: A person picking tea in Sorwathe tea plantation



Fig. 10.5: A cocoa plantation in Ondo, Nigeria

Activity 10.7

Discuss the main features of plantations.

Main features of plantations

- The farms are normally very large, sometimes to over 100 acres of land.
- Farmers only grow one type of crop in form of an estate.
- The farms require a large number of workers especially in coffee and tea plantations. Other crops do not need large number of workers such as wheat or maize.
- A lot of capital is required to construct roads and railways, clear the land, buy machineries to be used on the farm and buying farm inputs.
- They are normally run by skilled personnel.
- They conduct research and carry out pre-trials on demonstration farms before embarking on the actual crop to the plantation.
- Many plantations in Africa are owned by foreigners.
- High out-put is assured since a large area is cultivated.
- The farm out-put(yields) is purposely for sale in domestic and international market

Activity 10.8

1. Use the atlas and the internet to locate and list down different plantations in Rwanda.
2. Study the following photograph carefully then discuss the advantages of plantation shown to the people of Africa.



Disadvantages of plantation agriculture

Activity 10.9

Discuss the disadvantages of modernisation of farming in Africa. What can be done to overcome these disadvantages?

The following are some of the disadvantages of plantation farming:

1. Over production of a certain crop can lead to great losses in case of surplus production. This is because of possible price fluctuations.
2. The effect of pests and diseases in plantations, which spread very fast clearing the entire crop causing great losses.
3. Growing of one type of crop over many years leads to soil exhaustion. This reduces productivity.

4. It discourages the growing of food crops hence reducing food security since plantations grow mainly cash crops for sale.
5. It has led to population migrations hence leaving some rural economies stagnant since the able bodied young people migrate to plantations in search for employment opportunities and also leads to decline in food production since the old are left behind who cannot provide much labour force.
6. It leads to profit repatriation by the foreign investors who dominantly own the plantations in Africa
7. It requires a lot of initial capital and the huge sums of money for the day to day operations of the plantation which is very expensive.
8. Most of the plantation crops have a long gestation period hence during that period the crop yields no income.

10.3.2 Green revolution

Green revolution has led to an increase in crop production in developing countries. This has been achieved through the use of intensive research on different crops and use of fertilisers, pesticides and high yielding seed varieties. This has led to increased yield per unit area.

However, green revolution also has advantages as well as disadvantages.

Activity 10.10

Discuss:

1. (a) The major difference between modern methods of farming and traditional methods of farming.
(b) The advantages of modernisation of agriculture in Africa.
2. (i) Carry out a research on the characteristics of green revolution.
(ii) Discuss the advantages of green revolution.

Characteristics of green revolution

The main characteristics of green revolution include:

- There is constant research on the improvement of the crops, soil and chemicals used on the farms.
- More than two crops are grown on the same piece of land throughout the year in multiple cropping.
- There is no one time the piece of land is left to fallow.
- There is constant use of chemicals such as fertilisers to improve on plant nutrients in the soil.
- There is use of pesticides to control pests that would affect the desired crop.
- Synthetic herbicides are also used to control weeds on the farms hence increasing crop yields per unit area.
- There is constant training and supervision by experts on the farms to make sure the crops do well.
- There are high yields per unit area as compared to bush fallowing or shifting cultivation.
- As a result of research, there is always an improvement of seeds that can mature faster and yield more.

Activity 10.11

Using geographical documents and the internet, carry out a research on the disadvantages of Green Revolution.

10.3.3 Irrigation

Irrigation refers to the process of adding water artificially on farms to grow crops. It avoids relying on natural climatic conditions. Irrigation helps farmers to grow both food crops and cash crops. Irrigation improves food security in our country and Africa as a whole.

The main advantages of irrigation farming is that crops can be grown throughout the year. This is because each crop can be supplied with the ideal amount of water it requires for its growth..

Most of the major irrigation schemes in Africa are found along the major

rivers of Africa that pass through arid and semi-arid areas. Some of these are River Nile, River Orange, River Gambia and River Niger.



Fig. 10.6: Map of Africa showing the major dams and irrigation areas

Activity 10.12

1. Use the map in Fig. 10.7, your atlas and the Internet to identify the water projects on each of the following major rivers of Africa:
 - (a) River Nile
 - (b) River Orange

- (c) River Gambia
- (d) River Niger
- 2. Draw a sketch map of Africa showing where each of the rivers is found and the exact location where each project is found along the river.
- 3. In a table, show the countries through which each river passes and the country where the irrigation project along the river is found.

There are four main methods that are commonly used in irrigation farming. These are:

1. Canal irrigation
2. Sprinkler irrigation
3. Drip trickle irrigation
4. Bucket irrigation

Each method has been explained below:

Canal irrigation

This type of irrigation is practiced in areas that are gentle flowing. Canals are dug from the main source of water into the farms. Smaller canals are also constructed to redistribute water into different or several plots where crops are grown.

Its **main advantage** is that it provides a good control of water supply into the farms.

Its **main disadvantage** is that it causes water logging when used in soils that have a high clay content. This results into salinity in the soil.

It also requires a lot of water for it to be effective.

Sprinkler irrigation

Water from the source is pumped onto farms through pipes connected to sprinklers. The sprinklers are arranged in a certain way to ensure that water is evenly distributed. The water gets on the farm from above just like rain

drops.

There are different types of sprinklers. Some are fixed on the ground while others are fixed above the ground.

The **main advantage** of using this method of irrigation is that the farmer can control the areas to be put under irrigation from time to time. This is because sprinklers can be moved from one place to another on the farm.

The **main disadvantage** of this method of irrigation is that it is unsuitable on plantations as only a limited area can be irrigated at a time. It is also unsuitable during flowering of some crops.

Drip irrigation

In drip irrigation, a series of pipes with small holes at the required interval for a particular crop are used to supply water on the farm. A drop of water will fall at the bottom of a plant at a given interval of time. This method is also known as **trickle irrigation**.

Its **main advantage** is that even with a little amount of water, it can still be used to irrigate many crops.

Its **main disadvantage** is that it is not suitable for use on large farms as it is expensive to set up.

Bucket irrigation

This is where water is carried in buckets or watering cans to the field and each plant is watered at a time.

Its **main advantage** is that it is cheap and therefore can be used by small-scale farmers who cannot afford the other methods of irrigation.

Its **main disadvantage** is that it is time consuming and can only be used on small vegetable gardens very close to the water source.

Activity 10.13

1. Study photographs A, B, C and D provided and for each describe the method used to supply water to the farm.
2. Give the advantages and disadvantages of each method.
3. Give examples of irrigation farming methods used in Africa and places where each method is used.



A. Canal irrigation



B. Sprinkler irrigation



C. Drip irrigation



D. Bucket irrigation

Advantages of irrigation farming

Irrigation farming has had a positive impact on farming throughout Africa. Some of the advantages include:

- Both subsistence and cash crops can be grown throughout the year.
- The land that was termed as “useless” is now made useful by growing different types of crops.
- Many people are employed on the irrigation farms.
- The country earns foreign exchange when it exports the agricultural products grown under irrigation.
- Through irrigation, bush fallowing and shifting cultivation is controlled hence conservation of natural vegetation. This is because irrigation farming can be used to utilise marginalised areas, leading to protection of areas under natural vegetation.

- Areas where irrigation farming is practiced also experiences improvement of infrastructure such as roads, railways, electricity, water supply and other social amenities.
- Irrigation farming has led to growth of market centres and collecting centres.
- It has increased food security in the country.

Disadvantages of irrigation farming

Where irrigation farming is not well controlled, it may lead to the following problems:

- Since most irrigation farming is practiced in hot and dry areas, there is high evaporation rate leaving high concentration of salt in the soil. This makes the soil **saline** which is not good for agriculture. Other chemicals must be added to neutralise the salinity.
- Some areas become waterlogged hence destroying the crops in the farm.
- When water is constantly supplied to the farm, it may lead to accumulation in pools, causing waterborne diseases such as malaria from mosquitos and bilharzia from snails.
- Water from irrigation farms flowing back into rivers is polluted. Most of the chemicals used on the farms end up in the river killing most of aquatic

Quick facts

Negative effects of irrigation

1. Soil salinity
2. Water logging
3. Soil and water pollution
4. Breeding places for disease vectors such as snails and mosquitoes
5. Less water downstream
6. Siltation in rivers

life. Water from the farms should be treated before being released back into rivers.

- Water released from irrigation farms may carry silt and fine soil particles with it into rivers, causing siltation.

10.4 Livestock farming in Africa

Activity 10.14

- Identify and name the communities that keep large herds of livestock in Africa.
- Explain the importance of livestock to the communities you named in (i) above.
- How does the government assist the communities to improve livestock farming?

Livestock farming refers to keeping or rearing of domestic animals such as cattle, sheep, goats, pigs, camels and birds such as poultry. Livestock is kept for domestic or commercial purposes.

There are different types of livestock farming practiced in Africa. They include:

- (a) Nomadic pastoralism (b) Ranching (c) Dairy farming

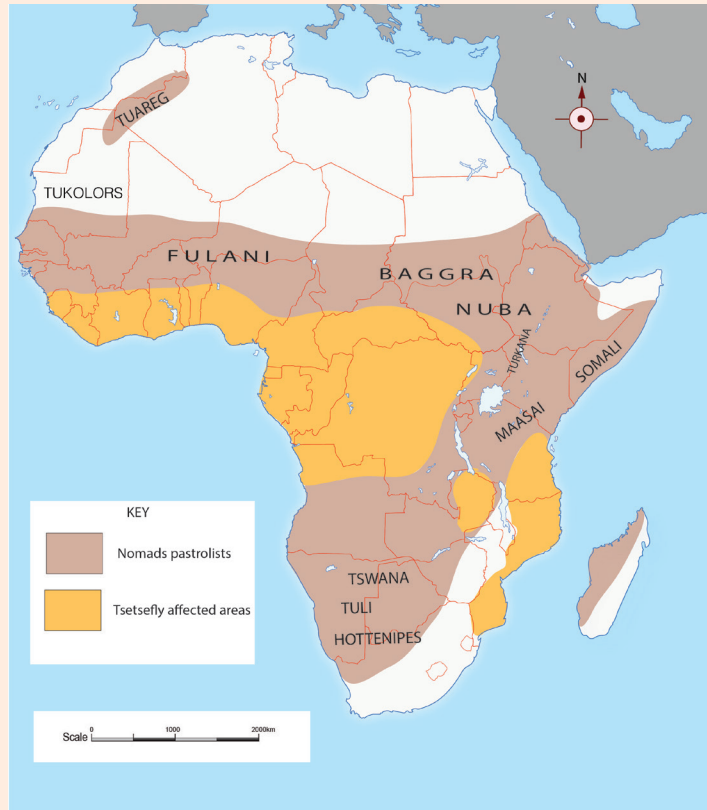
10.4.1 Nomadic pastoralism

Nomadic pastoralism refers to traditional extensive livestock grazing on natural pasture with constant migration from one region to another in search of water and pasture. Pastoralists also migrate to avoid areas that have pests that affect them as well as their animals.

Activity 10.15

1. Explain why nomadic pastoralism is absent in areas where land is individually owned.

Use the map provided below to answer the questions that follow:



2. Use your atlas to identify the countries where nomadic pastoralism is commonly practiced in Africa as shown on the map.
3. For each country identified, name the community involved in nomadic pastoralism.

Characteristics of nomadic pastoralism

- It is practiced in areas that are extensive and sparsely populated.
- They depend on natural vegetation in regions with grass and few

scattered acacia trees. Grasses grow very fast with little rainfall.

- The movement is done along traditionally established routes.
- They keep large herds of cattle, goats, sheep and camels which is also a symbol of their wealth and status in the community.
- Livestock keeping is the main source of their livelihood. Livestock provide the nomads with transport, clothing, food, milk, hides, blood and dowry.
- In tropical Africa, the major animals kept are mainly Zebu cattle.
- To the nomads in Africa, large herds of cattle is a symbol of wealth and status in the community.
- Grazing is done on communal land.
- They do not consider or recognise political boundaries.



Fig. 10.7: Nomadic pastoralism in Okakarara, Botswana



Fig. 10.8: Nomadic pastoralism in Bida, Nigeria

Problems facing nomadic pastoralists

One of the main problems facing nomadic pastoralism in Africa is **drought**.

Activity 10.16

1. Study the following photograph then answer the questions that follow:



- (a) Discuss how drought contributes to the problem shown in the photograph.
 - (b) Explain briefly some of the direct effects of drought on livestock and pastoralists.
 - (c) Assess the economic and social effects of drought on pastoralism.
2. Complete the table below by giving an explanation how each stated problem affects nomadic pastoralism and the possible solution.

Problem	How it affects nomadic pastoralism	Possible solution
Population increase		
Diseases		
Political boundaries		
Hostile neighbours		

10.4.2 Ranching

Ranching is the rearing of livestock on an extensive scale in paddocks for commercial purposes unlike nomadic pastoralism.

Most of the ranching schemes have either cattle, sheep, goats, horses or camels.

Ranches are found within the extensive tropical savanna where pasture is generally available. Some of the countries that practice cattle ranching in Africa are South Africa, Kenya, Zambia, Angola, Zimbabwe, Botswana, Somalia and Tanzania.

Activity 10.17

1. Using an atlas of Africa, locate different cattle ranching schemes within the countries that practice ranching.
2. Explain what makes the areas suitable for ranching.
3. Carry out a research to find out who owns each of the ranches.
4. Mention animals reared in each of the ranches named in 1 above.

Characteristics of ranching in Africa

- Grazing of cattle in the ranch is controlled by having several paddocks that can be hundreds of hectares.
- Animals are provided with veterinary care, water, salt and cattle dip.
- During the dry season, extra food is given to livestock.
- Ranches are owned by an individual, a group of people, the government or private companies.
- Much of the pasture in the ranches is **natural** grasses.
- The grazing land is owned by an individual, group of people or government and not the community.
- The type of livestock reared is the same and in most cases exotic breeds and cross breeds are reared..
- Rainfall is too low to support arable farming.
- Livestock kept in ranches are of high quality.



Fig. 10.9: Beef cattle in a ranch

Activity 10.18

1. Use geographical documents or the internet to find out problems facing cattle ranches in Africa.
2. Explain the similarities and differences between the problems affecting ranching and those affecting nomadic pastoralism.
3. Suggest possible solutions to the problems identified in question 1 above.

10.4.3 Dairy farming in Africa

This refers to the rearing of livestock for the production of milk which can be consumed directly or it is turned into products such as yoghurt, butter, Cheese, Ghee, powdered milk, etc.

Countries where dairy farming is practiced in Africa include South Africa (Natal) and Kenya.

Activity 10.19

1. Find out the areas where dairy farming is carried out in Africa.
2. What dairy cattle breeds are reared in Africa.
3. Explain why the areas you have named above are suitable for dairy farming.

Characteristics of dairy farming

- Dairy farming is better done in areas that experience cool and wet climatic conditions.
- Dairy animals are kept in the highlands that are cold and free of tsetse flies.
- Dairy farming is intensive where the animals require plenty of water and veterinary services.
- They use modern methods of breeding and management to ensure high yields.
- Dairy animals are selected for a particular region depending on their adaptations.
- Well established transport is required since milk is a perishable product.
- Proximity to major towns that provide market is an important consideration.

Activity 10.20

Copy and complete the table below with the possible solutions to the problems indicated.

Problems facing dairy farming	Possible solutions
Inadequate capital	
Poor transport systems	
Cattle diseases	

10.5 Impact of various agricultural activities on Africa's development

Agriculture is an important activity in Africa. Most people in Africa obtain their food directly from farms. Many are farmers while others are employed on the farms from where they earn their income.

Activity 10.21

Using the local environment and internet, find out and explain how agriculture has contributed to the following developments in Africa:

- (a) Development of roads
- (b) Source of raw materials for industries
- (c) Source of foreign exchange

Other benefits from agriculture are:

(a) Source of food and livelihood

Agriculture is the main source of food for the population in Africa. Crops and livestock provide people with different types of food.

The main source of livelihood for many people is provided by agricultural activities. Approximately 70% of the people directly rely on agriculture as a source of income. This is as a result of a slow pace in the development of non-agricultural activities to absorb the fast growing population.

(b) Contribution to national revenue

Agriculture is the main source of national income for most countries. For instance, the growing of cash crops for export earns the country foreign exchange. This is also the case when animal products are exported.

(c) Supply of food, fodder and manure

After harvesting maize, stalks provide fodder for cattle. Cattle on the other hand provide people with meat and milk. Moreover, livestock also meets people's planting requirements by providing manure.

Quick facts

Benefits of agriculture:

1. Source of food and livelihood
2. Source of revenue
3. Source of feeds for livestock
4. Contributes to export trade
5. Source of raw materials for the industries
6. Supports the transport sector
7. Contributes to infrastructural development
8. Source of employment
9. Supports savings and investments

(d) Significance to the international trade

Agricultural products like sugar, tea, rice, spices, tobacco and coffee constitute the major items of exports for countries that rely on agriculture. If there is development of agriculture, imports are reduced while exports increase considerably. This helps to reduce a country's unfavourable balance of payments as well as saving foreign exchange. This amount may be well used to import other essential inputs such as machinery and raw materials. The money can also be used to develop infrastructure that is helpful for the support of a country's economic development.

(e) Source of raw materials for industries

The main source of raw materials for major industries such as cotton, sugar, tobacco, edible as well as non-edible oils is agriculture. Moreover, many other industries such as processing of fruits as well as vegetables and rice husking get their raw materials from agriculture.

(f) Supports use and development of transport systems

In order to transport farm inputs and animal feeds from the market to places where farming is done, good roads and railway networks are required. When transporting the animals or their products and farm produce to the market or to processing industries, farmers and traders alike also require good roads and railways. Due to the importance of roads in the success of various agricultural needs, various governments have undertaken to construct and maintain roads as a way of supporting the important agricultural sector.

(g) Source of employment opportunities

Agriculture employs many people in Africa. This is both in livestock and crop farming. In addition, construction of irrigation schemes, drainage system as well as other such activities in the agricultural sector is important as it provides larger employment opportunities to even more people.

(h) Source of saving

Development in agriculture may also increase savings. The rich farmers we see today started saving particularly after mechanising their agricultural systems as well as employing modern methods in agricultural production. This surplus quantity may be invested further in the agriculture sector to develop the sector.

(i) Food security

A stable agricultural sector ensures a nation of food security. The main requirement of any country is food security. Food security prevents malnourishment that has traditionally been believed to be one of the major problems faced by the developing countries.

10.6 Case Studies

10.6.1 Cotton growing in the lower Nile valley

River Nile flows from Lake Victoria northwards through Uganda, South Sudan and Egypt into the Mediterranean Sea. It has two major tributaries; Atbara and Blue Nile.

Activity 10.22

1.
 - (a) Using your Atlas, draw a sketch map of Africa showing the course of River Nile.
 - (b) In one paragraph, describe the flow of River Nile while mentioning its main tributaries.
 - (c) Give the name of countries through which the Nile flows. Present your findings in class.
2. Explain ways in which cotton growing in the lower Nile benefits:
 - (a) The individual farmers
 - (b) The country

River Nile has been used for many years to provide water for growing both subsistence crops (such as maize, millet, sorghum and vegetables) and cash crops (such as wheat, barley, rice, vegetables, fruits and cotton).

Did you know?

1. The Nile is the longest river in the world.
2. Cotton is one of the major sources of raw materials for the textile industry.

Cotton is grown through irrigation in lower Nile valley in Egypt and Sudan. It is grown throughout the year by use of perennial irrigation. Egypt is the world's major producer of long staple cotton. This cotton is known as *Sakellarides* (*Sakel*). Cotton in the lower Nile is grown on large scale. There is plenty of cheap labour to pick the cotton.

Characteristics of cotton growing in the Nile region

- Cotton is normally planted in February.
- There is regular watering and weeding of the crop.
- Harvesting takes place from the month of August in Upper Egypt and September in Lower Egypt.
- The government controls the growing of cotton so that people may not fail to grow because cotton has good returns.
- Production per acre is very high, usually more than 7 bussels, which is more than double what is produced in America.
- With the introduction of diesel and electricity pumps on Aswan High Dam, more than 3.5 million hectares are under cotton.



Fig. 10.11: A cotton farm in the Nile Valley, Egypt

Ways in which cotton growing in the Lower Nile benefits farmers

- (a) It is a source of employment to cotton farmers.
- (b) Sale of cotton products earns farmers and those in the cotton industry a steady income.
- (c) It has improved the standards of living of the people, especially farmers who now have a regular income.
- (d) Because of cotton farming, there has been improvement of infrastructure in the areas where it is practiced. This has solved the problem of transportation.

Ways in which cotton growing in the Lower Nile benefits Egypt

- (a) Cotton farming has led to the improvement of infrastructure in the areas where it is grown.

- (b) Cotton provide raw materials needed in the textile industries.
- (c) Cotton growing companies provide social amenities like schools, hospitals and sports facilities to the workers and general population.
- (d) It has improved the means of transport in the cotton growing areas.
- (e) The Aswan High Dam, which support cotton farming, also produce electricity which is used in the factory and supplied to the national grid.
- (f) It has led to the establishment of other industries such as cotton seed processing industries.
- (g) Cotton growing saves the country's foreign exchange that would have been used to import cotton.
- (h) Cotton growing has led to better use of land that receives little rainfall.

Problems of growing cotton in the lower Nile

- (a) Presence of pests and diseases (ball weevils) which increases the cost of production.
- (b) Cotton exhausts soil fertility very fast. It also makes it unsuitable for growing of other crops, unless when fertilisers are heavily used.
- (c) There is increased salinity as a result of excessive irrigation.
- (d) Shortage of fertile soils (silt) since most of it is trapped in the Aswan High Dam.
- (e) Reduction of the water table due to high evaporation rate because of the Aridity.
- (f) The silting of canals due to high deposition.

Activity 10.23

Copy and complete the table below with the possible solutions to the problems indicated.

Problems facing cotton growing in the lower Nile	Possible solutions
Presence of pests and diseases	
Fluctuation of cotton prices	
Manual harvesting	
Soil exhaustion	

10.6.2 Cocoa growing in West Africa

Cocoa tree is a native crop of Amazon Basin (Brazi). It was first introduced in Africa on the island of Sao Tome, then in Nigeria and finally in Ghana by a Ghananian agriculturalists.

Most of West Africans produce cocoa but the major producing countries of West Africa are Ivory Coast, Ghana, Nigeria and Cameroon. These four countries produce 70% of the world's cocoa output. Ivory Coast and Ghana are by far the two largest producer cocoa, accounting for more than 50% of the world's cocoa in 2016.

Cocoa pods grow from the trunk and main branches of the tree. Pods become yellow-orange in colour when they are ripe. Labour for picking cocoa mainly comes from family members with their children.



Fig. 10.12: Cocoa plant with pods at Dimbokro, Ivory Coast

Activity 10.24

1. Using your atlas, draw a sketch map of West Africa showing countries where cocoa is produced. In each country, shade the cocoa growing areas.
2. Carry out a research from the internet and geographical documents to find out the conditions that suit cocoa growing in the areas identified in 1 above.

Uses of Cocoa

Activity 10.25

1. Use geographical documents or the internet to find out and explain the uses of cocoa.
2. Explain the ways in which cocoa growing benefits:
 - (a) The farmers
 - (b) The country

- It is used as a beverage.
- It is used in the manufacture of chocolate.
- It is used in the making of cocoa butter.
- It is used as oil.
- It is a source of medicine.
- It is used in making cakes.

Ways in which cocoa benefits farmers in West Africa

- (a) It is a source of employment to cocoa farmers.
- (b) Sale of cocoa earns the farmers and those in the cocoa industry a steady income.
- (c) It has improved the standards of living of the people, especially farmers.
- (d) Because of cocoa farming, there has been improvement of infrastructure in the areas where it is practiced. This has solved the problem of transportation.

Ways in which cocoa benefits West African countries

- (a) Cocoa farming has led to the improvement of infrastructure in the areas where it is practiced.
- (b) Cocoa produce provides raw materials needed in the beverage and confectionery industries.
- (c) Cocoa growing companies construct social amenities like schools, hospitals and sports facilities to the workers and general population.

- (d) It has improved means of transport in the cocoa growing areas.
- (e) It has led to the establishment of related industries such as cocoa processing industries.
- (f) Cocoa growing saves the country foreign exchange that would have been used to import cocoa and related products.
- (g) Cocoa growing has led to better use of land that receives little rainfall.

Processing of Cocoa

- Pods are cut from trees.
- They are then transported to splitting areas.
- They are split and opened using machetes.

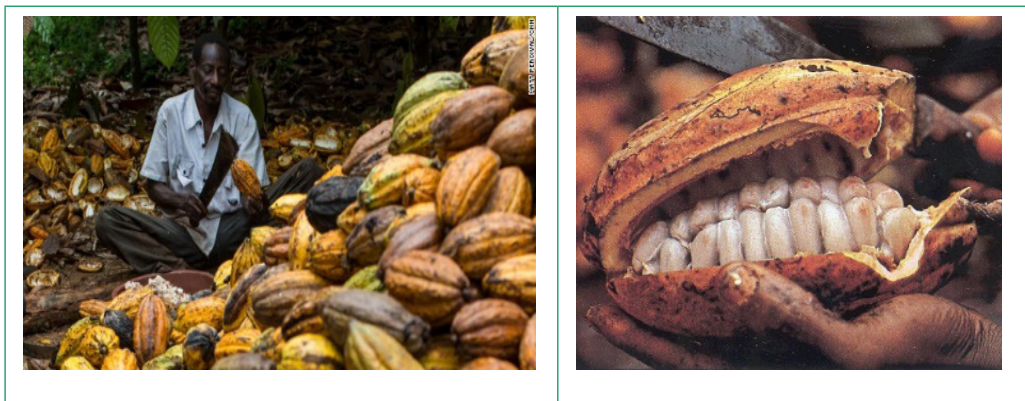


Fig. 10.13: Opening of cocoa pod in Gagnoa, Ivory Coast

- The cocoa beans are scooped out by hand. One pod can have 40 or more white beans that are covered by slimy juice pulp.
- The white beans are placed on banana leaves or a mat and later covered with banana leaves.
- After a period of about a week, the slimy juice pulp ferments and drains away.
- The beans are placed on tables or spread on the ground and covered with rush mats.



Fig. 10.14: Spreading cocoa beans to dry in Sunyani, Brong-Ahafo region in Ghana

- They are turned frequently as they dry in the sun until they slowly turn **brown** in colour.
- Dry beans are put in sacks and carried to government buying agents.
- They are weighed and graded. The farmer is paid according to the quality of their beans.
- Beans are loaded into lorries and taken to the main collecting centres for export to Europe.

Problems facing Cocoa farming in West Africa

- There are poor feeder roads that make transportation very difficult. Quite often, cocoa beans are carried by people to the collecting centres.
- Farmers are affected by tropical diseases such as malaria.
- Fluctuation of the world prices affect the growing of cocoa in West Africa by lowering people's morale of growing of cocoa.
- Cocoa plant diseases such as swollen shoot (that has no cure other than destroying the affected plants and black pod disease (that causes the pod to turn black destroying the beans inside).

Solutions to the problems facing Cocoa farming in West Africa

Some of the suggested solutions to the problems facing cocoa farming in West Africa are:

- (a) Constructing good roads to ease transportation of the produce.
- (b) Educating the farmers on the ways of preventing and controlling diseases such as Malaria.

- (c) Establishing of health facilities in the residential areas of cocoa farmers to offer health services.
- (d) The government should get involved in the value addition to enable the crop fetch better prices.
- (e) The government should lobby for better international prices through its various methods in the international market.
- (f) The produce should be campaigned for in the local market which will eliminate the expense of exports.
- (g) Agricultural extension services should be given to the farmers to help them cultivate a healthy crop.
- (h) Disease control methods and mechanism should be embraced, including availing insecticides and pesticides that will help control the effect of pests and diseases.

10.6.3 Rubber growing in West Africa

Rubber is a tree crop. It is grown both in plantation by large companies and by small scale farmers. Rubber is grown in Ivory Coast, Nigeria, Cameroon, Democratic Republic of Congo and Liberia. Liberia is the main producer of rubber in Africa. It is the main agricultural export crop in the country.

Activity 10.26

1. Using your atlas, draw a sketch map of West Africa and show the countries where rubber is produced. In each country, shade the rubber growing areas.
2. Carry out a research from the internet and geographical documents to find out the conditions that suit rubber growing in the areas identified in 1 above.

Rubber is obtained from mature trees of between 5 – 8 years. A slanting V-shaped cut is made on the outer bark without destroying the inner bark.

White latex flows to a spout that directs it to a collecting cup. Latex must be collected daily.



Fig. 10.15: Rubber tapping in Harbel, Liberia

Activity 10.27

1. Use geographical documents or internet to find out and explain the uses of rubber.
2. Explain the ways in which rubber growing benefits:
 - (a) The farmers
 - (b) The country

Uses of rubber

It is used in the following ways:

- Manufacture of erasers.
- Making of soles of shoes and sandals.
- Manufacture of different types of tyres for locomotives.
- Manufacture of rubber cups and soap.

Activity 10.28

Complete the table below with explanation of the problems facing rubber production and the possible solutions to the problems indicated.

Problems facing rubber growing in West Africa	Explanation of the problem	Possible solutions
Competition from synthetic rubber		
Fluctuation of rubber prices		
Manual harvesting		
Poor roads		

Processing of rubber

- The latex tapper gets the milky liquid from each plant.
- The latex is taken to the factory where there is a **tank with water** for mixing.
- **Acetic acid** is added into it to turn latex into a spongy coagulated mass known as **coagulated rubber**.
- It is then rolled into flat sheets between two rollers that squeeze out a lot of moisture.
- It is then dried on racks in a smoky shed.
- The coagulated rubber is rolled between two rollers.
- It is then air dried to get **crepe rubber** that can be put into different uses or exported to other parts of the world.

Conditions necessary for growing of rubber

For rubber trees to do well and produce a lot of latex, they require:

- Heavy rainfall which is well distributed throughout the year without a dry month of 1750 – 2500mm.
- High temperatures of not less than 21°C.
- Deep, fertile and well drained soils on undulating landscape.

Ways in which rubber benefits farmers

- (a) It is a source of employment to the farmers.
- (b) Sale of rubber latex earns the farmers and those in related industries a steady income.

- (c) It has improved the standards of living of many people, including the farmers.
- (d) Because of growing of rubber trees, there has been improvement of infrastructure in the areas where it is practiced. This has solved the problem of transportation.

Problems facing rubber growing in West Africa

- (a) Competition from synthetic rubber. Synthetic rubber is cheaper than the natural rubber. This is the main problem facing rubber growing in West Africa.
- (b) Fluctuation of rubber prices in the world market. When prices fall, they discourage the farmers.
- (c) Harvesting of rubber is done manually which requires a lot of labour.

Suggested solutions to the problems facing rubber growing in West Africa

- (a) Adopting modern and better farming methods that maximise on the production of latex. This may include grafting, using fertilisers and increasing on farm inputs in order to improve the overall output.
- (b) Advising farmers to engage in alternative ways of generating income. This will reduce overdependence on rubber farming.
- (c) Employing modern methods of harvesting, including mechanisation of the entire process.
- (d) Offering agricultural extension services to the farmers to help them achieve maximum output.

10.6.4 Dairy farming in Kenya

Introduction

Dairy farming is the rearing of cattle with the purpose of getting milk. The milk may be consumed directly or turned into dairy products such as yoghurt, butter, cheese or ghee.

Characteristics of dairy farming in Kenya

- Dairy farming is practiced in the Kenyan highlands that are cool and wet most times of the year. Temperatures range from 10°C to 18°C and rainfall is over 1000 mm annually.

- Dairy cattle are fed on high quality fodder that grows in the Kenya highlands that have deep, fertile, volcanic soils that ensures its continuous growth throughout the year.
- Farming is practiced in highlands where there are many permanent rivers that provide water to the dairy cattle.
- There are well developed infrastructure such as roads and railway networks to transport dairy products to the market or nearby towns.
- The highlands have high population that provides a ready market for milk and milk products.
- The highlands provide ideal climate for the growth of fodder crops and natural grasses.
- Veterinary services such as treating the animals and having cattle dips are available in these regions.

The map below shows the areas where dairy cattle farming is carried out in Kenya.

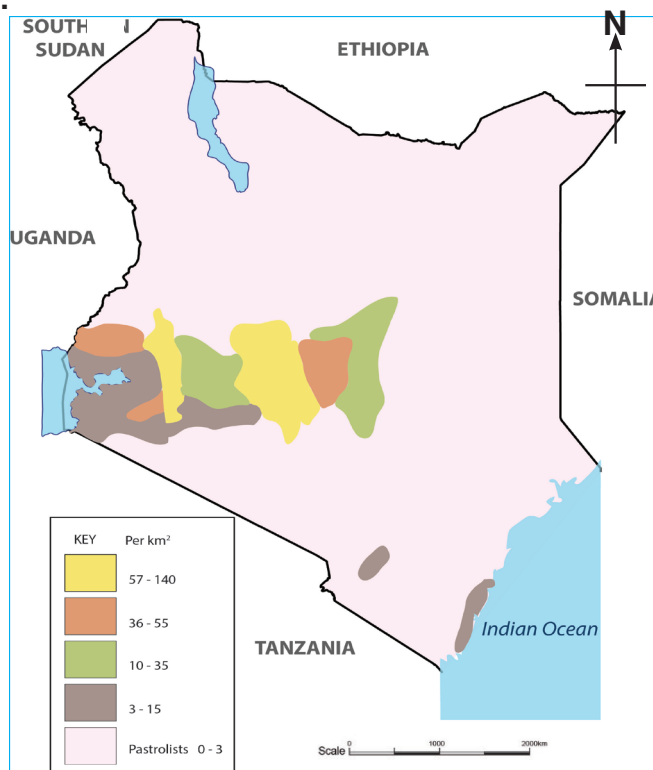


Fig. 10.16: Dairy farming areas in Kenya

Senior 3 Geography and Environment

In Kenya, dairy farming is a highly intensive form of livestock farming. It was introduced in Kenya by the whites from Europe. This means that dairy farming is based on exotic cattle that were imported into Kenya from Britain before independence.

The main breed of exotic cattle kept in Kenya are Friesians, Ayrshires, Jerseys and Guernsey. People also keep cross breed cattle that constitute about 50% of the dairy herd.



Fig. 10.17: Guernsey dairy cattle in Kenya at Lelgut Farm, Nakuru



Fig. 10.18: Friesian dairy cow in Kenya on Kibuku Farm, Ngong

Activity 10.29

- Use geographical documents or the internet to research on the conditions that favour dairy farming in Kenya.
 - How do you compare these conditions with those of Rwanda?
- Explain the ways in which dairy cattle farming benefits:
 - The farmers
 - The country

Problems facing dairy farming in Kenya

- Long periods of drought which cause a shortage of natural grass. This in turn leads to low milk production.
- The input required to maintain dairy cows is very expensive for small scale farmers. Some are not able to buy cattle feeds, drugs or veterinary services. This makes them realise marginal profits.
- There is shortage of cooling facilities before the milk gets to the processing factories. This makes the milk to go bad, leading to loss of income by the farmers.

- Diseases and pests are also a major problem. Diseases such as foot and mouth, rinderpest and East Coast Fever affect dairy cattle.
- Inadequate training for dairy farmers. When research to improve dairy animals is done, very little of it gets to the small scale farmers who keep one or two cows.
- There is also constant delay in payment of the milk delivered to the factory. This discourages farmers from keeping dairy cattle.

Suggested solutions to the problems facing dairy farming in Kenya

- Preparing and storing hay and dry fodder to be used during the dry season when there is shortage of natural grasses.
- Subsidizing cattle feeds, drugs and providing veterinary services, especially to small scale farmers to enable them engage in profitable dairy farming.
- Availing cooling facilities to farmers to avoid the milk going bad before reaching the processing factories or the market. This will reduce loss of income by the farmers.
- Offering extension services to farmers and helping them to fight animal diseases and pests.
- Training dairy farmers and availing to them research findings that can improve dairy farming.
- Advocating for prompt payment of the milk delivered to the factory.

10.6.5 Livestock ranching in Botswana

Botswana borders Namibia to the west, Zimbabwe to the east, South Africa to the south and Zambia to the north.

Much of Botswana is either arid or semi-arid. Vegetation is mainly savanna grassland which is ideal for the rearing of traditional and crossbreed cattle and other livestock such as sheep and goats.



Fig. 10.19: Cattle ranching areas in Botswana

Areas where livestock ranches are found in Botswana are mainly in the south and central parts. The north where there are national parks and game reserves are avoided because of foot and mouth disease. This is left for tourism.

Activity 10.30

1. Identify different types of livestock reared in the immediate area around your home.
2. Explain the benefits of demonstration farms in Botswana.

Most people in Botswana depend on livestock. The government of Botswana has set up demonstration ranches where pastoralists and beef farmers learn modern methods of keeping cattle. They learn how to build small

dams, paddock their land and how to use cattle dips to control pests and disease. They are also taught how to maintain the quality of their animals than just having quantity and protecting overgrazing of their land. They are encouraged to sell their animals regularly to have some income thus reducing the numbers of their livestock.

This has promoted setting up of modern ranches owned by farmers and the government and **tribal ranches** sometimes known as **cattle posts**.



Fig. 10.20: Cattle in a ranch



Fig. 10.21: Cattle in a traditional shed

The people have learned to pool their individual animals together which is economical and graze them in specified areas. Some of the cattle have been crossbred with exotic ones from Europe, Asia and other African countries.

The local breeds are mainly Tswana, Tuli and Brahman which are relatively hardy in arid and semi-arid conditions of the Kalahari.

In braying ranches, they keep Hereford, Simmental, Aberdeen and Charolaise.

It is important to note here that there are over 3 million animals in Botswana, about twice the population of people in the country.

Characteristics of ranching in Botswana

- (a) Apart from cattle, goat breeds are also kept. However, they are generally indigenous.
- (b) The beef sector has a highly cross-bred herd of cattle. This is due to the introduction of European, African and Asian breeds in order to introduce 'improved' production traits into the herd.
- (c) Different breeds are kept. Local cattle breeds include Tswana and Tuli. The Afrikaaner is found in many cross-bred animals. The Brahman is

relatively hardy in the arid and semi-arid conditions, is tick-proof and tends to eat grass and other herbaceous plants.

- (d) Botswana beef and livestock products such as hides, horns and hooves are sold both locally and overseas.
- (e) A large proportion of Botswana's meat is sold as boneless beef to the European nations.
- (f) The Commercial Agriculture Sector has been driven by the Regional and International Beef markets. The sector has been severely hampered, however, due to the presence of Foot and Mouth disease, in the northern areas bordering with National Parks and Game Reserves, and with the neighbouring countries of Zimbabwe and Namibia.
- (g) There are very strict regulations covering import and export of both livestock and fresh livestock products both internally, and across borders, into neighbouring countries.

Benefits of cattle ranching in Botswana

Cattle ranching in Botswana has benefits to the farmers and to the country.

Problems of ranching in Botswana

(a) Unpredictable weather patterns

The greatest limitation is the decreasing quality and quantity of forage and grazing, as affected by the highly variable rainfall. The irregularity of rainfall means that fodder production is seasonal and local. There is poor quality of the grasses that provide pasture and fodder due to irregular weather patterns.

Botswana has experienced many droughts on a regular basis. Given the repeating drought patterns there has been death of most of the stock.

The supply of fresh drinking water both to livestock and to the farmers is also a limiting factor.

(b) Fencing of some ranching areas by some farmers

The introduction of fencing to traditional livestock areas has led to livestock either starving to death, or having to be fed at great cost, during drought cycles. Most traditional farmers cannot afford feeds and therefore lose their livestock.

(c) Poor soils

Sandy soils, which result in trampled plants being physically removed from the soil, also contributes to poor pasture.

(d) Poisonous plants

There are several plants in the livestock producing areas that are poisonous to livestock and are responsible for causing deaths to the livestock when eaten.

(e) Livestock diseases

The most important restriction to commercial livestock production is the prevalence of Foot and Mouth disease in some areas. Contagious Bovine Pleuropneumonia is another endemic in the areas north of Botswana. Other diseases of livestock are Blackwater, Heartwater, Tuberculosis, Botulism and Human Tapeworm.

(f) Inadequate land

There is inadequate land for the creation of new ranches. Communal lands in some areas have been sub-divided and fenced in the recent past. This is meant to encourage a shift from the traditional multi-use system, to a cash-trade oriented production system. However, it leaves the few who are poor to struggle in raising their herds.

(g) Economic diversification within pastoral communities

Within Botswana, policies and economic directions have been started in recent years which conflict with the entrenched belief that beef and other livestock are the answer to the lack of economic diversification.

Possible solutions to the problems facing livestock farmers in Botswana

- (a) Development of alternative income generating activities to avoid overreliance on livestock.
- (b) Alternatives to changes in the land tenure system include the development of more diverse systems, such as mixed small-holder farming, communal game ranching and eco-tourism-based activities. This caters for the needs of small scale farmers.
- (c) Providing extension services to livestock farmers to help them understand how to prevent, fight and control livestock diseases.

- (d) Providing livestock insurance to the farmers to cushion them against massive losses due to effects of climate change.
- (e) Advocating for better prices for livestock products internationally.
- (f) Paying farmers promptly to help them manage their families and various farming activities.

Benefits of cattle ranching in Botswana

Cattle ranching in Botswana has benefits to the farmers and to the country.

1. It is a source of income to the Tswana people
2. It has led to an improvement in the living standards of the farmers and other people working in related industries.
3. It provides raw materials for the leather industry.
4. It earns the country foreign exchange through export of livestock and livestock products.
5. The semi-arid land is utilised and made productive as it is put under ranches.
6. It provides meat to the people, as an alternative source of proteins.

END UNIT ASSESSMENT

1. Compare and contrast shifting cultivation and bush fallowing.
2. Explain how small holding farming is practiced in Africa.
3. Suggest the impact of agricultural activities in Africa.
4. Discuss the importance of green revolution to the people of Africa.
5. Explain the major problems experienced by nomadic pastoralism and what would be the best solutions to the problems.
6. Explain the meaning of dairy farming.
7. Suggest the importance of growing cocoa and rubber in West African countries.
8. Draw a sketch map of Africa and on it indicate areas where plantation agriculture and subsistence agriculture are practiced.
9. Explain the ways in which cattle ranching in Botswana benefits:
 - (a) Individual farmers
 - (b) The country

UNIT 11

Forestry in Africa

Key unit competence

By the end of this unit, you should be able to analyse the impact of forestry and forest exploitation in Africa.

Introduction

Forestry is the science or practice of planting, managing, and caring for forests. It involves conservation and scientific management of forests where exploitation and conservation are balanced to ensure sustainability.

Forests are crucial to our overall survival because they play an important role in the formation of rainfall. Without rainfall, we neither have food nor other forms of vegetation we need.

Forests are also a source of medicine. They too provide a home to wildlife, which is important for tourism.

Forestry in Africa can be better understood by studying the following:

- (i) The major types of forests and their characteristics - Forest areas: Gabon, Democratic Republic of Congo, Cameroon, Nigeria and Ivory Coast.
- (ii) Factors favouring forest growth in Africa (physical and socio-economic factors).
- (iii) Forest exploitation in Africa: methods, factors favouring, problems and solutions.
- (iv) Desertification in Africa: areas affected, causes, effects and control measures.
- (v) Impact of forestry and forests on sustainable development in Africa.

Did you know?

Forests are the lungs of our planet. They play a crucial role in stabilising global climate by converting CO₂ into oxygen. As we pump more and more CO₂ into the atmosphere, the forests' ability to regulate the global climate is increasingly diminished. It is because of this that we need to conserve our forests and the environment in general. It is also our responsibility to advocate for cleaner sources of energy that do not pose pollution risks.

Activity 11.1

1. Use a dictionary of Geography or relevant textbooks to explain the meaning of the following words:
 - (i) Forest
 - (ii) Forestry
 - (iii) Silviculture
 - (iv) Agroforestry
2. Discuss the negative effects of clearing forests.

11.1 Major types of forests in Africa and their characteristics

The major forest types in Africa are:

- (i) Tropical rain forests
- (ii) Savanna woodlands
- (iii) Mountain forests
- (iv) Mangrove forests

11.1.1 Tropical rain forests

These are also known as **equatorial forests**. They are mainly found in areas which experience equatorial climate. The major areas in Africa where they are found are Gabon, Democratic Republic of Congo, Cameroon, Nigeria and Ivory Coast.

Activity 11.2

Carry out a research to find out the major forested areas in Africa. Draw a sketch map of Africa showing areas where tropical rain forests are found.

Characteristics of tropical rain forests

- Trees grow closely together and have three distinct layers or canopies.
- Some of the trees are tall. They may rise up to a height of 40 metres.
- Most of the trees found in these forests are hardwoods. They include mahogany, teak, ebony and camphor.
- The trees are straight and have smooth trunks.
- The trees are evergreen and have broad leaves.
- The forests support the growth of many species of plants.
- There are creepers which wind around the big trees to get to heights where there is sunlight.
- There is little vegetation under the trees.

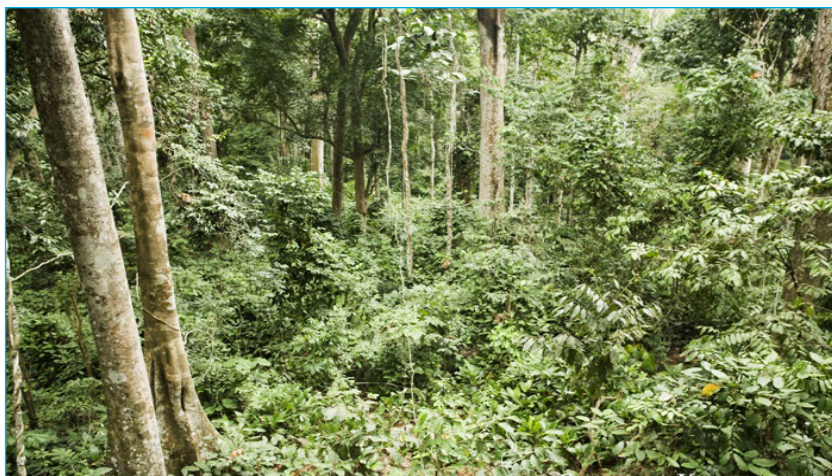


Fig. 11.1: A section of Congo forest

11.1.2 Savanna woodlands

Savanna woodlands are mainly found in north and south of Congo basin and in West Africa between the Sahel and tropical rain forest areas. They are also found in the plateau of East Africa. Miombo Woodlands in Tanzania are a good example of savanna woodlands.

Activity 11.3

Study the photograph below and summarise some of the characteristics of Savanna woodlands that you can identify.



Characteristics of savanna woodlands

- Trees are fairly closely spaced.
- Trees have open canopies that allow sufficient light to penetrate for growth of grass.
- Most trees are deciduous, shedding their leaves during the dry seasons.
- Trees have long tap roots.
- Most trees have thick barks.
- The leaves of some trees are leathery and hairy.
- Trees develop umbrella shaped crowns.
- Within the trees are shrubs and scattered bushes.
- Acacia species of trees are common.

11.1.3 Mountain forests

Mountain forests are found on the slopes of mountains and highlands. Such areas include Drakensberg Mountains in South Africa, Ruwenzori Mountains in Uganda, Mount Kilimanjaro, Mount Kenya, Adamawa Highlands in Cameroon and the Ethiopian Highlands.

Activity 11.4

Using the photograph in Fig. 11.2, textbooks, Internet and geographical documents, find out the characteristics of mountain forests.



Fig. 11.2: Forest vegetation on Ruwenzori Mountains, Uganda

Characteristics of mountain forests

- They grow in altitudes beyond 500 metres.
- They are dense with trees growing close to each other.
- They have thick undergrowth, which makes it difficult to penetrate them.
- They are made up of a number of tree species such as teak, oak, cedar, bamboo and pod.

11.1.4 Mangrove forests

These are found in the low lying muddy coasts along the East coast of Africa from Kismayu in Somalia to Mozambique. They are also found on the North West coast of Madagascar, along the coast of the Gulf of Guinea in West Africa especially in the Niger Delta and along the coast of Gambia up to Sierra Leone.

Activity 11.5

1. Use atlases to locate other areas where mangrove swamps are found in Africa. Draw an outline map of Africa on which you will show these areas. Ensure all the elements of a good map are observed on your map.
2. Use the photograph shown in Fig. 11.3 to identify some characteristics of mangrove forests. Present your findings in class for further discussion.



Fig. 11.3: Mangrove forest at Berbera on the northern coastline of Somalia

Characteristics of mangrove forests

- They are found in low lying coastal areas of Africa.
- They grow in areas that have an accumulation of mud, either in swamps or lagoons, where saline water is washed on-shore by waves.
- They have some of their roots above the water, enabling the trees to breathe. These “aerial roots” also hold the trees firmly against sea tides.
- The trees are slender and strong but do not grow tall.

11.2 Factors favouring forest growth in Africa

Activity 11.6

Use textbooks, Internet or geographical documents to find out how the following factors favour forest growth in Africa:

1. Human activities
2. Wild animals.

The following are some factors favouring forest growth in Africa.

- (i) **Climate:** Areas that receive high rainfall have thick forests. Areas with low, rainfall may only have few trees. Cold mountain tops have bare rocks.
- (ii) **Altitude:** As altitude increases, tree species become fewer, shorter and less dense.
- (iii) **Aspect:** This refers to the direction a slope faces in relation to rain bearing winds. In most cases, the windward slopes of high mountains are forested, while the leeward slopes have scrub and grassland vegetation.
- (iv) **Soils:** Deep fertile soils support tree growth that develop into dense forests.
- (v) **Human activities:** such as afforestation and reforestation can promote the growth of forests in a given area yet activities like cultivation, lumbering, tourism and mining lead to forests being destroyed.

Quick facts

Factors favouring growth of forests:

1. Climate
2. Altitude
3. Aspect
4. Soils
5. Human influence

11.3 Forest exploitation in Africa

This refers to making use of forest resources with a view of making money or earning a livelihood. It includes utilising forest resources through activities such as logging, lumbering, agroforestry, research and silviculture.

11.3.1 Methods of forest exploitation in Africa

Activity 11.7

Find out the process followed in forest exploitation within the forested areas in your local environment.

The processes used in forest exploitation varies from country to country depending on where the forests are located. The following are examples of processes used:

- Taking a survey of the area to be exploited. The area should have the required species.
- Creating or establishing possible routes of transportation.
- Preparing roads and tracks to ease the movement of loggers and the logs.
- Trees are cut using powered saws. Care is taken to avoid crushing the nearby trees. In most cases, trees are selectively cut.
- Branches are removed and the trunks cut into suitable lengths as logs.
- The logs are moved to collection points.
- Tractors or trucks take the logs to the riverside for floating downstream to the mills or exporting ports. Where there are no rivers, logs are carried by large lorries or railway trucks to the mills or exporting ports.



Fig. 11.4: Transporting trunks of trees with lorries after logging in the Congo Forest

11.3.2 Factors favouring forest exploitation in Africa

Activity 11.8

Use textbooks, the Internet or geographical documents to find out factors favouring forest exploitation in Africa.

Some of the factors are:

- (a) Luxuriant growth of trees due to heavy rainfall and constantly high temperatures in the equatorial regions.
- (b) Availability of rivers and lagoons for transportation of logs.



Fig. 11.5: Floating of logs after logging on a river to transporting points within Congo Forest

- (c) Some trees have straight and smooth trunks for saw milling.
- (d) High demand for forest products.
- (e) Forest exploitation requires little skill.
- (f) Forest exploitation is not capital intensive.

11.3.3 Problems that may occur due to forest exploitation in Africa

Activity 11.9

Discuss other problems that may occur due to forest exploitation.

(i) Soil erosion

Removal of trees exposes soil to agents of erosion such as wind and running water. On steep slopes, gullies may develop. Landslides may occur in sloppy areas. In areas where almost all the vegetation is removed, strong winds may blow away the top soil.

(ii) Climate change

Excessive and indiscriminate forest exploitation may lead to an increase in temperature. With high temperatures, there would be more evaporation. This may lead to drying up of rivers and lakes which are sources of water. There will be slow process of tree regeneration hence reduction in forested areas. There will also be a decrease in rainfall, which eventually may lead to desertification.

*Quick facts***Problems of forest exploitation in Africa**

1. Soil erosion
2. Climate change
3. Flooding
4. Landslides
5. Encroachment
6. Depletion of forest resources

(iii) Flooding

When trees have been cut, there is likely to be fast movement of rain water in form of a run-off. The water may collect in gullies, ditches, streams and rivers. The rivers may get too much water which may make them burst their banks. This results to flooding of the nearby areas. Sometimes, soils carried by rain water collect within river beds hence causing flooding.

(iv) Shrinking forest resources

Forests provide raw materials for making paper, furniture and medicine. They also provide many people with wood fuel. Hunting communities on the other hand depend on wildlife living in the forests. Research institutions that depend on forests are equally affected when they are overexploited.

(v) Landslides

Forests and other types of vegetation play an important role of holding the soil together with their roots. Clearing vegetation, which includes cutting trees without replacement, exposes the soil to landslides after heavy rainfall. This mainly happens in hilly areas without vegetation.

11.3.4 Solutions to the problems of forest exploitation**Activity 11.10**

Discuss measures that governments of various African countries has put in place to solve the problems of forest exploitation in the country.

Some of the solutions include:

- Planting trees in areas where forests have been destroyed. This is called **reafforestation**. The species should be fast growing and high yielding.
- Planting trees in areas where there were no trees. This is called **afforestation**.
- Regulating forest exploitation by enacting laws to effectively manage forests.
- Creating forest reserves in order to protect some tree species.
- Encouraging farmers to practice **agro-forestry**.
- Encouraging **use of alternative sources of energy** such as biogas to minimise use of wood fuel.
- Using fuel **efficient cooking stoves** to reduce the amount of wood fuel being used.
- Encouraging use of **efficient tree harvesting** methods.

11.4 Desertification in Africa

Desertification is the process of continuous degradation of vegetation cover as a result of climatic changes and negative effect of human activities. This is mainly due to climatic variations and human activities.

11.4.1 Areas affected by desertification in Africa

Some of the areas affected by desertification in Africa are semi-arid areas of West Africa, drier parts of Cameroon, Sudan, Ethiopia, northern parts of Kenya, northern Nigeria, Mauritania and Eastern Province of Rwanda.

Activity 11.11

Read the following excerpt (<http://www.ghanaiantimes.com.gh/fao-africa-leads-global-deforestation/>) then answer the questions that follow:

The Ghanaian Times

SEPTEMBER 9, 2015

FAO: Africa Leads Global Deforestation

Launching the report at the World Forestry Congress in Durban, South Africa on Monday, José Graziano da Silva, FAO Director-General, said what was undoubtedly the most comprehensive forest review to date had conveyed both good and bad news.

While deforestation was continuing, the rate of net global deforestation had slowed by 50 per cent over the past 25 years, according to the report entitled: Global Forest Resources Assessment for 2015.

Although about 129 million hectares of forest an area equivalent to the size of South Africa had been lost since 1990, an increasing number of forest areas had come under protection.

There were also indications of improved forest management through legislation, as well as the measuring and monitoring of forest resources and a greater involvement by local communities in planning and developing policies.

The FAO study, which covers 234 countries, indicated that the net yearly rate of forest loss had slowed, from 0.18 per cent in the early 1990s, to 0.08 per cent between 2010 and 2015.

While forests made up 31.6 per cent of the world's land areas in 1990, this had changed to 30.6 per cent by 2015. Today, the bulk, or 93 per cent, of the world's forest area is natural.

This covers primary forest areas where human disturbances have been limited, as well as secondary forest areas that have degenerated naturally.

Planted forest currently accounts for 7 per cent of the world's overall forest area, having increased by over 110 million hectares since 1990.

The study noted that planted forests were often established for production and, if managed well, could provide various forest goods and services and help reduce the pressure on natural forest.

Figures also needed to be considered in the context of an increase in global wood consumption and the continued widespread reliance on wood fuel, Mr da Silva said.

Commenting, Nkosazana Dlamini-Zuma, African Union (AU) Commission chairperson said deforestation needed to be viewed in the wider context of sustainable development.

Noting that it had been decided to develop a framework for forestry issues that would apply to the entire continent, she said it was important to ensure that productivity of existing agricultural land could be enhanced so that there was no need to cut down further trees to increase farm land. Madam Dlamini-Zuma said the AU was working hard to “get more energy into Africa” to minimise reliance on wood.

When fast-tracking industrialisation, she said Africa needed to leapfrog the mistakes of the past and use solar, geothermal, wind and hydroelectric technology so that development did not mean deforestation.

Madam Dlamini-Zuma said agriculture in Africa needed to be updated, mechanised and made more productive to reverse the current status quo where Africa imported 83 per cent of its food.

She stated that agriculture needed to be marketed as a business opportunity to young Africans with increased beneficiation presented as a wealth generator and job creator.

Higher yields would mean that existing land would be able to feed the rapidly growing population

Excerpts from the website of: The Ghanaian Times, IN BUSINESS / BY ADMIN / ON SEPTEMBER 9, 2015 AT 9:23 AM

From the Newspaper article above:

- (a) Explain the causes of deforestation in Africa mentioned in the article.
- (b) Summarise the effects of deforestation
- (c) Explain some of the measures put in place to protect forested areas in Africa.

Prepare a summary to be presented in class for further discussion.

11.4.2 Causes of desertification in Africa

Some of the causes of desertification in Africa are:

- (i) Deforestation
- (ii) Indiscriminate farming practices
- (iii) Urbanisation and other types of land development
- (iv) Climate change
- (v) Natural disasters

Activity 11.12

Research on some of the causes of desertification in Africa. Using photographs obtained from the internet, newspapers and geographical documents, prepare a class presentation showing specific areas in Africa affected by desertification.

Did you know?

While deforestation in other parts of the world is mainly caused by commercial logging or cattle ranching, the leading causes in Africa are associated with human activity. Developing countries rely heavily on wood fuel as the major energy source for cooking and heating.

11.4.3 Effects of desertification**Activity 11.13**

Use textbooks or the the Internet and geographical documents to find out effects of desertification.

- Destruction of water catchment areas. This reduces the amount of water in rivers.
- Increase in the incidences of drought which may lead to loss of animals and human life.
- Rural to urban migration occurs as rural lands become strained to support the same number of people who previously lived there. The migrants increase population in the urban areas.
- Decrease in food production due to land degradation.
- Loss of livestock leads to the need for food aid.
- Poverty as many people in the affected areas are unable to carry out their daily activities.

11.4.4 Control measures for desertification

Activity 11.14

Carry out a research using the Internet and from geographical documents on measures being used in Africa to control desertification.

Write down your findings for class presentation.

In your presentation, include photographs and newspaper cuttings where necessary

Various measures have been applied to control desertification. Some of these measures include:

1. Afforestation and reafforestation.
2. Reducing livestock numbers to avoid overgrazing.
3. Improving farming methods for example encouraging crop rotation.
4. Introducing alternative sources of energy to reduce the use of wood fuel.
5. Educating the public on the need to conserve the environment.
6. Reducing soil erosion through soil conservation measures.

11.5 Impact of forestry and forests on sustainable development in Africa

Activity 11.15

Use textbooks, the Internet and geographical documents to find out the impact of forestry on development.

If we manage forests well, they will give us goods and services that we cannot do without. If forests disappear, we lose these benefits and any other prospect of sustainable development.

The aim of any country in Africa is to reduce poverty. **Poverty reduction** means improving welfare and quality of life. This involves increase in consumption of especially food, shelter, energy and water. All these are extracted from the environment. With continued depletion and degradation of natural resources, the fight against poverty is undermined. As the population growth increases, the fight against poverty becomes worse.

There is need to control deforestation and land degradation in order to achieve sustainable development.

Remember!

Trees must be replaced if they are cut down. Trees must also be planted where none existed before.

END UNIT ASSESSMENT

1. Analyse the major types of forests in Africa.
2. Describe the characteristics of major forests in Africa.
3. Discuss three factors favouring forest growth in Africa.
4. Identify the effects of forest exploitation in Africa.
5. Explain the causes and effects of desertification in Africa.
6. Explain the impact of forestry and forests on sustainable development in Africa.

UNIT 12

Fishing in Africa

Key unit competence

By the end of this unit, you should be able to explain the impact of fishing on the sustainable development of Africa.

Introduction

In Africa, many communities depend on fish as their main source of food. To such communities, fishing is their main source of income.

To understand fishing in Africa, we will study the following key sections:

- The major fishing grounds in Africa: Morocco, South Africa, Angola and Nigeria
- Types of fish and major fishing methods (traditional and modern methods) in Africa
- Factors favouring the development of fishing in Africa
- Importance of fishing in Africa
- Problems faced by fishing in Africa and possible solutions

Quick facts

Fishing is an activity which involves extraction of valuable resources from water bodies. These resources include fish, crabs, lobsters, prawns and oysters. The water bodies include lakes, rivers, streams, ponds, swamps, oceans and seas.

Activity 12.1

Draw a sketch map of Africa showing major fishing areas.

12.1 The major fishing grounds and types of fish in Africa

Fishing grounds are areas where fishing is carried out. The major fishing grounds in Africa can be divided into two namely:

1. Inland or freshwater fishing grounds
2. Marine or saltwater fishing grounds

Fishing done on lakes and rivers and dams is what is referred to as **inland fishing**. Rivers, lakes and dams are called inland fishing grounds. Fishing carried out in the oceans and seas along the major coastlines of Africa is what makes up marine fishing. Oceans and seas constitute **marine fishing grounds**.

12.1.1 Inland or freshwater fishing grounds

Activity 12.2

Use atlases, maps, Internet and geographical documents to find out rivers of Africa where fishing is carried out and the main fish caught.

Inland fishing grounds are mainly the freshwater lakes, rivers and dams. The most important **inland fishing grounds** in Africa include lakes Victoria, Kivu, Malawi, Tanganyika, Albert, Kyoga, Mweru and Chad. Fishing is also carried out on **human-made lakes** such as Volta, Kainji, Nasser and Kariba. Orange.

Rivers in Africa which support fishing include the Nile, Congo, Niger, Zambezi, Ubangi and Orange.

The **main fish caught** in the lakes are Tilapia, Dagaa, Nile perch, herring, Cat fish and Shell fish.

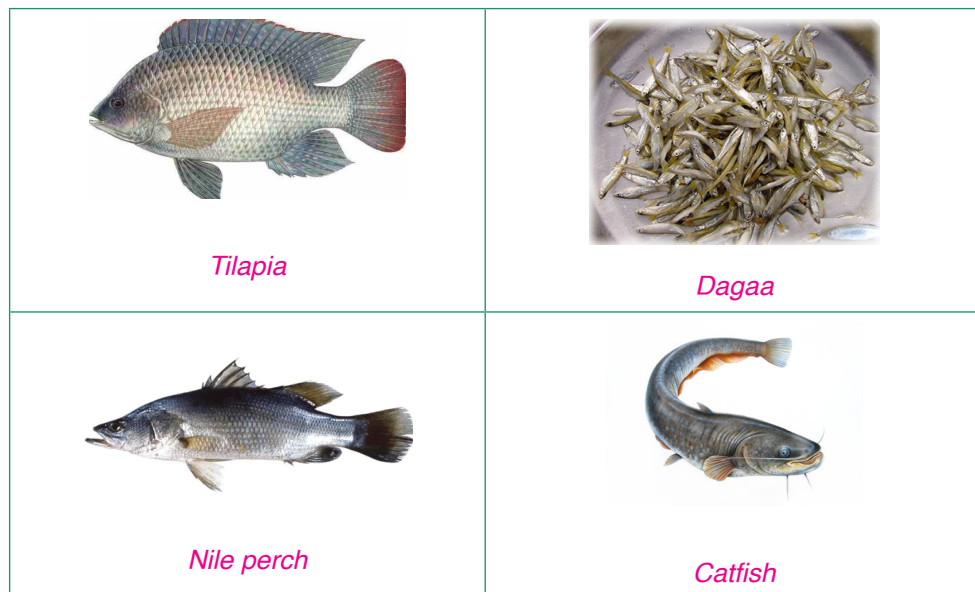


Fig. 12.1: Examples of fish caught in inland fishing grounds

12.1.2 Marine or saltwater fishing grounds

Activity 12.3

Draw a sketch map of Africa showing both inland and marine fishing grounds. Include the ocean currents.

Briefly explain the characteristics of ocean currents that sweep the coastlines that support marine fishing.

Marine fishing grounds in Africa are found in the seas and oceans along the coasts. The main areas are in the Indian and Atlantic oceans. Other marine fishing areas are in the Mediterranean Sea and the Red Sea.

The richest marine fishing grounds are located along the coast of Namibia, Morocco, South Africa, Angola and Nigeria. The **main fish caught** along these coasts are mackerel, tuna, sardines, crabs, stockfish, herring, lobsters and shrimps.

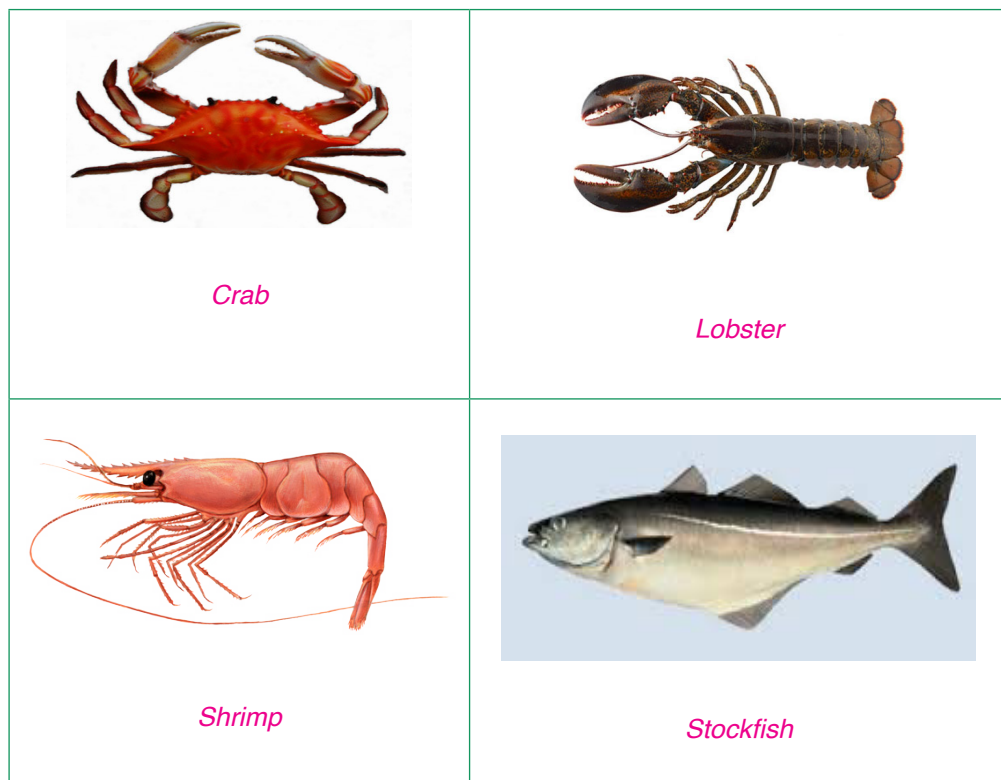


Fig. 12.2: Examples of products obtained from marine fishing grounds

12.2 Major fishing methods in Africa

Fishing methods used in Africa can be classified into two:

1. Traditional fishing methods
2. Modern fishing methods

Famous quote on fishing!

'The charm of fishing is that it is the pursuit of what is elusive but attainable, a perpetual series of occasions for hope.'

Activity 12.4

Write down some of the traditional and modern fishing methods used in Africa. Make brief notes on each of them.

12.2.1 Traditional fishing methods

Traditional fishing methods are very common in Africa. Some of these are:

- (i) Spearing method
- (i) Hook and line method
- (iii) Basket method
- (iv) Gill-net method
- (v) Use of herbs
- (vi) Trapping method
- (vii) Lamp attraction method

(i) Spearing method

Spearing involves the use of a spear, an arrow or a sharp ended stick. It is used in shallow waters. Once the fish is spotted, it is speared then lifted up.

In this method, the catch is limited. One may spend hours trying to catch fish and only get a few.



Fig. 12.3: The spear method of fishing

(ii) Hook and line method

A string attached to a strong stick is tied to a hook on its other end. A bait is tied to the hook. The person fishing holds the stick and throws the string into the water. One has to wait to feel the string being pulled as the fish tries to free itself from the hook. This is when the hook is pulled out of the water. Sometimes, strings are firmly fixed on canoes in this method of fishing.

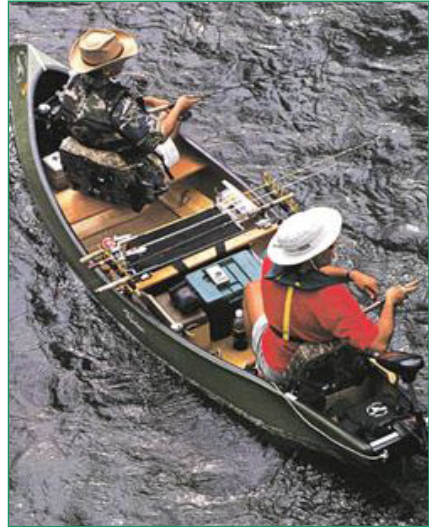


Fig. 12.4: The hook and line method of fishing

(iii) The basket method

- A basket made from straw or reed is placed in water. The basket has a wide mouth for getting in and a narrow mouth for getting out.
- Baits are put in the basket to attract fish.
- The basket is lowered into the water with the wide mouth facing the direction from which the water is flowing.
- The basket is held in position with ropes or stone to prevent it from being swept away.
- Sometimes, the fishermen walk in the water to scare the fish to swim downstream.
- The fish swim into the baskets and are attracted to the baits.
- The fish get trapped in the basket.
- The basket is then removed from the water.
- Fish is then removed from the basket.



Fig. 12.5: Fishermen using the basket method to catch fish on River Congo

(iv) Gill-net method

- A net is spread vertically in the water.
- The net has floaters on the top and weights at the bottom to hold the net vertically in the water.
- On the net, baits are placed to attract fish.
- The mesh of the net only allows the head of the fish to go through.
- The mesh then traps the fish by the gills.
- The net is removed from the water.
- Fish is then removed from the net.

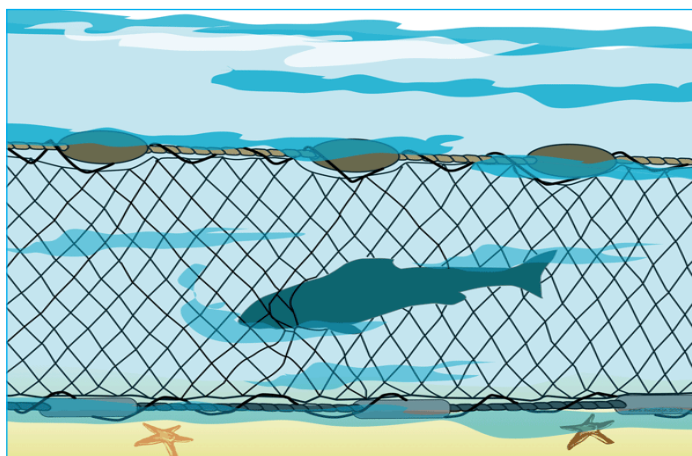


Fig. 12.6: A gill-net, which is a common means of fishing on Lake Kivu

(v) Use of herbs

- In areas where the river is calm or where there is stagnant water like in ponds, some fishermen crush some herbs and put in the water.
- The herbs make the fish immobile, and some may even float on the water.
- The fishermen collect the fish from the river or pond by hand.
- The herbs used are not harmful to human beings.

Activity 12.5

Use the Internet or geographical documents to research on the following traditional fishing methods:

1. Trapping method
2. Lamp attraction method

12.2.2 Modern fishing methods

These are also called **commercial fishing methods**. These methods are mainly applied within the major fishing grounds.

Activity 12.6

Use the Internet or textbooks to find out how haul seine net is used in fishing.

The modern fishing methods are:

- (i) Drifting method
- (ii) Trawling method
- (iii) Seining method
- (iv) Lining method

(i) Drifting method

- The net is held vertically in the water by floats at the top and weights at the bottom end of the net.
- The net is attached to a boat called a drifter.
- The boats drags the net across the water.
- As the fish swim into the net, some are caught by their gills, making them unable to free themselves.
- The fish are then removed from the net and put into the boat.

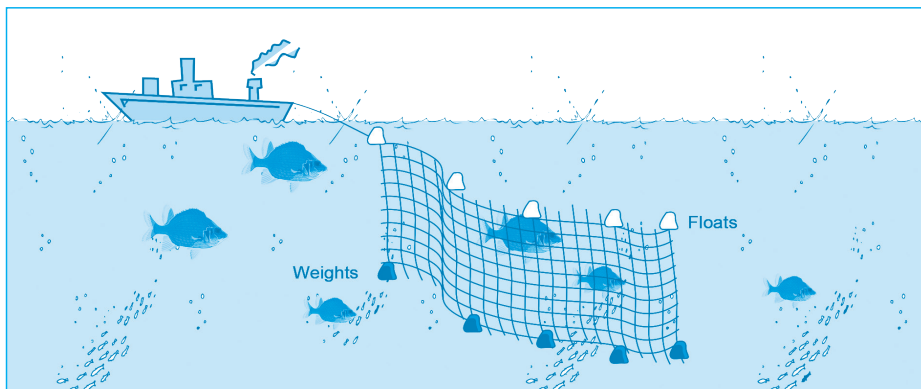


Fig. 12.7: Drifting fishing method

(ii) Trawling method

- In this method of fishing, a bag shaped net, also called trawl net, is used.
- The net is attached to a ship or trawler.
- The mouth of the net is kept open by either boards or head beams.
- The upper part of the net is kept to float by corks or floats.
- Weights are used to keep the lower part of the net at the sea bed.
- The trawler or ship drags the net along.
- After sufficient fish is caught, the net is lifted out of the water and put into the trawler or ship.

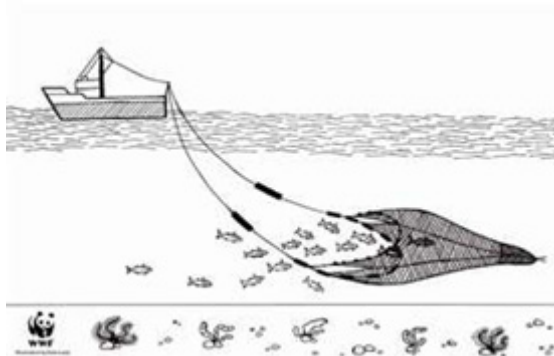


Fig. 12.8: Trawling fishing method

(iii) Seining method

Seining can be carried out in two ways; either by use of purse seine or haul seine net.

Purse seining

- This involves the use of two boats and a large net.
- One boat is large while the other one is small.
- Once an area with a large amount of fish is identified, the net is released into the water.
- The small boat goes around the fish and encloses them in the net.
- There is a string at the bottom of the net.
- The string is pulled to close the bottom end of the net. This is to make sure the fish do not escape.
- The net is then dragged to the large boat.

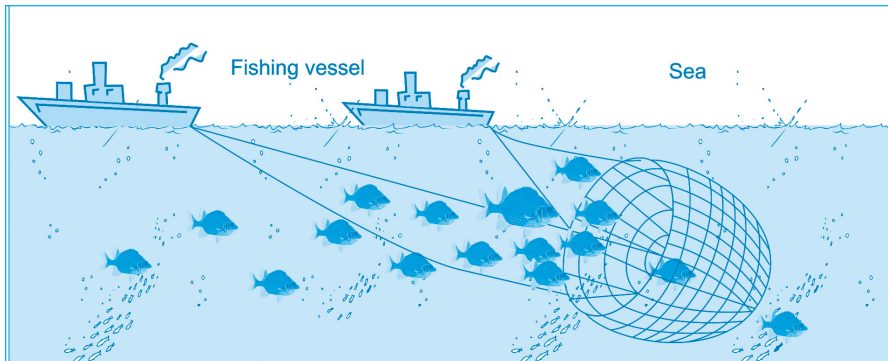


Fig. 12.9: Purse seining method

(iv) Long hook living method

The line and baited hook method is a strong line metal with many hooks on which baits are attached and attached to the boat used for catching fish

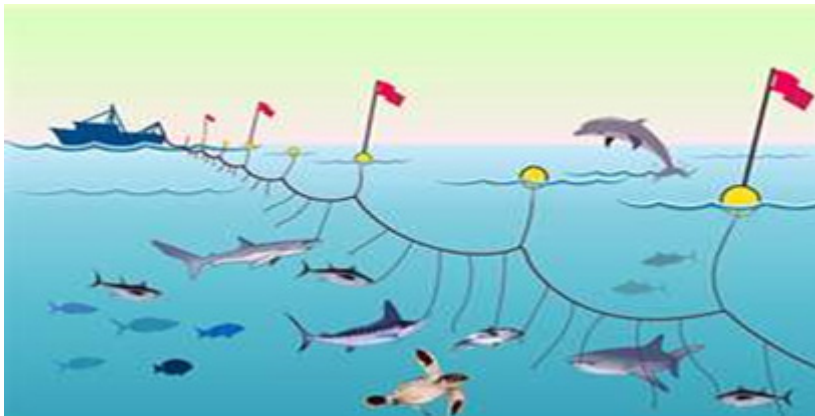


Fig. 12.10: long hook lining method

Activity 12.7

Use geographical documents or the Internet to research on the lining method of fishing is used in extraction of fish. Write down the findings

12.3 Factors favouring the development of fishing in Africa

Activity 12.8

Use the Internet or geographical documents to research on factors favouring development of fishing in Africa. Write down the findings for class discussion.

The following are some factors that favour development of fishing in Africa:

- Presence of many inland fishing grounds such as lakes, rivers and ponds.
- Indented coastlines in some areas which provide ideal fish breeding sites.
- Some areas have shallow continental shelves which allow sunlight to penetrate through the water encouraging growth of sea plants used as food by fish.
- The cold ocean currents like Benguela and Canary create cool conditions which encourage a wide variety of fish species to thrive.
- The mixing of warm Guinea current and cold Benguela current modifies the temperature of the ocean water making the areas nearby ideal for fishing throughout the year.
- The mixing of warm Guinea current and cold Benguela currents result in rising of ocean water which brings minerals for growth of food for fish (planktons) to the surface attracting a large number of fish to the area.
- The coastal areas of Morocco, Namibia, Angola and South Africa have cool waters due to the cold currents. These cool waters have a lot of supply of planktons which is the main food for fish.
- The dry climatic conditions in some areas limit agricultural activities so people turn to fishing as an alternative economic activity therefore provide labour force for the fishing industry.
- Existence of a variety of valuable fish species.

Quick facts

Factors favouring fishing:

- Presence of fishing grounds
- Indented coastline
- Favourable ocean currents
- Dry interiors that do not favour farming making people to opt for fishing
- Availability of labour
- Presence of planktons (food for the fish)

- Presence of improved Technology that support modern methods of catching fish.
- The availability of prevailing winds that keep waters well oxygenated hence survival for the fish.
- Availability of large sums of capital that is invested in fishing industry.
- Etc.

12.4 Importance of fishing in Africa

Activity 12.9

Discuss the importance of fishing in Africa.

The following are some of the reasons why fishing in Africa is important:

- It creates jobs for many people therefore improving their standards of living.
- Fish is a source of protein which improves the health of people.
- Fishing has led to the development of related industries. These include boat making and repair and manufacture of nets.
- Fish and fish products, when exported, earn countries foreign exchange.
- The fish wastes are made into fish-meals, glues and fertilisers.
- Fish oil is used in the manufacture of medicines.
- Fishing activities leads to the development and improvement of transport and communication facilities.
- Sport fishing attracts tourists and so makes the countries with fishing activities to earn foreign exchange.
- It has favoured and stimulated the development urban centers/areas/ ports such as Casablanca, Rabat, El Jadid, Etc in Morocco.
- Promoted better international understanding with the trading partners in fish.
- It leads to diversification of the country's Economy.
- Fish is used as animal feeds for example for pigs and hens.

12.5 Problems with fishing in Africa and possible solutions

Activity 12.10

Find out some of the problems affecting fishing in Africa.

12.5.1 Problems affecting fishing in Africa

- Some countries in Africa have straight coast lines which make it hard to set up fishing ports.
- Many people in Africa use poor fishing methods that sometimes lead to catching of immature fish.
- Poor storage and preservation methods causes wastage since fish get spoilt very fast. Sometimes high temperatures make the fish to rot faster.
- Sometimes, there is water pollution due to industrial wastes. Polluted water often kills fish.
- Many people in Africa are poor. This makes the fish market within the continent to be small. The export market is also small due to competition from other countries.
- The spread of water hyacinth and other weeds over many lakes in Africa has made it difficult to catch many fish. These weeds sometimes suffocate and kill the fish.
- Dangerous water animals in some lakes make fishing to be dangerous.
- Some rivers have rapids and waterfalls that make it difficult to do fishing.
- Most fishermen do not have enough money to buy modern fishing equipment. Due to this, they use poor fishing methods which prevent them from catching large quantities of fish.
- In some areas, there is overfishing due to limited control measures on fishing.
- Some fishing areas do not have good transport facilities. This makes the fish to go bad before reaching the market.
- There is loss of fish from the Atlantic and Indian oceans due to fishing done by non-African countries. These countries undertake fishing in sections that belong to the African continent.

12.5.2 Possible solutions to the problems affecting fishing in Africa

Activity 12.11

Find out how the problems affecting fishing in various countries of Africa are being solved.

Some problems affecting fishing in Africa may not be solved because they occur naturally. An example is straight coast lines. For some, there is a possibility of solving them.

The following are some possible solutions to the problems:

- Restricting fishing in the inland fishing grounds to specific seasons to avoid overfishing and allow fish breeding.
- Encouraging fishermen to form cooperative societies in order to get financial assistance for buying modern equipment.
- Introducing storage facilities near fishing grounds in order to reduce spoilage of fish.
- Improving transport facilities to ensure that fish reach the markets before getting spoilt.
- Enacting and enforcing laws against water pollution.
- Encouraging fish farming to ensure that there is sufficient supply of fish.
- Restocking the overfished inland fishing grounds.
- Issuing licenses to prospective fishermen to control their number and to ensure that there is no overfishing.
- Using effective navy patrol in order to control territorial waters. This would ensure that no illegal fishing is done by fishermen from other continents.
- Clearing water weeds to enable fishing activities in the water bodies.
- Educating the local people on the value of eating fish to promote local market.

END UNIT ASSESSMENT

1. Mention four major fishing grounds in Africa.
2. Identify the major fish species caught in inland fishing grounds.
3. Mention two traditional and two modern fishing methods.
4. Explain factors that favour the development of fishing in Africa.
5. Suggest why fishing is important in Africa.
6. Describe problems affecting fishing in Africa.
7. Explain possible solutions to the problems affecting fishing in Africa.

UNIT
13

Mining in Africa

Key unit competence

By the end of this unit, you should be able to explain the impact of mining on sustainable development in Africa.

Introduction

Africa has the largest mineral industries in the world. Being the second largest continent implies that it has large quantities of resources. For many African countries, mining is a significant part of their economies, which plays an important part in their overall economic growth.

Source: www.acaciamining.com

Quick facts

Mining is the extraction of valuable minerals that can either be in solid or liquid form from the earth's crust.

Africa is richly endowed with mineral reserves, and is highly ranked in quantity of world reserves of minerals such as bauxite, cobalt and diamond. Gold mining is Africa's main mining resource.

Mining in Africa can be looked at under the following sections:

- Various types of minerals in Africa (copper, gold, coal, diamond and petroleum)
- Major mining areas in Africa (South Africa, Copper belt in the Democratic Republic of Congo and Zambia, Nigeria, Angola and Libya)
- Methods of mining in Africa
- Factors favouring the exploitation of minerals in Africa
- Problems affecting mining and ways to enhance sustainable mining in Africa
- Impact of mining on sustainable development of Africa

Activity 13.1

1. List down different types of minerals mined in Africa.
2. Explain the effects of mining on the environment.

13.1 Various types of minerals in Africa

There are three main types of minerals found in Africa. These are:

- (a) Metallic minerals
- (b) Non-metallic minerals
- (c) Energy metallic minerals

13.1.1 Metallic minerals

Most metallic minerals occur as compounds such as carbonates, oxides or sulphides. Others like diamond and gold occur somehow in pure states.

The metallic minerals may be classified as **ferrous** and non-**ferrous** minerals. Ferrous minerals (or iron ores) are those minerals that have iron in them. For example, haematite has 70% iron, limonite about 50-60% iron and siderite less than 30% iron. Non-ferrous materials lack iron. Examples of non-ferrous minerals are coal, copper, aluminium, tin, lead and zinc.



Fig. 13.1: Iron ore is an example of a ferrous mineral

13.1.2 Non-metallic minerals

There are very many non-metallic minerals found in Africa. Some of these minerals are found nearly in every country in Africa. These minerals include Sulphur, Asbestos, Salt, Phosphates, Graphite and other common ores such as stones that are used in building houses.



Fig. 13.2: Salt



Fig. 13.3: Sulphur



Fig. 13.4: Phosphate



Fig. 13.5: Building stones

13.1.3 Energy metallic minerals

The most common energy metallic minerals are petroleum, natural gas, coal and uranium. Except uranium, the other three are formed from the remains of living organisms that died millions of years ago. Uranium is a radio-active metal which gives off energy in form of alpha, beta and gamma rays.



Fig. 13.6: Coal is an example of an energy metallic mineral

13.2 Major mining areas in Africa

Some of the major mining areas in Africa include South Africa, Copper Belt in Democratic Republic of Congo and Zambia, Nigeria, Angola and Libya.

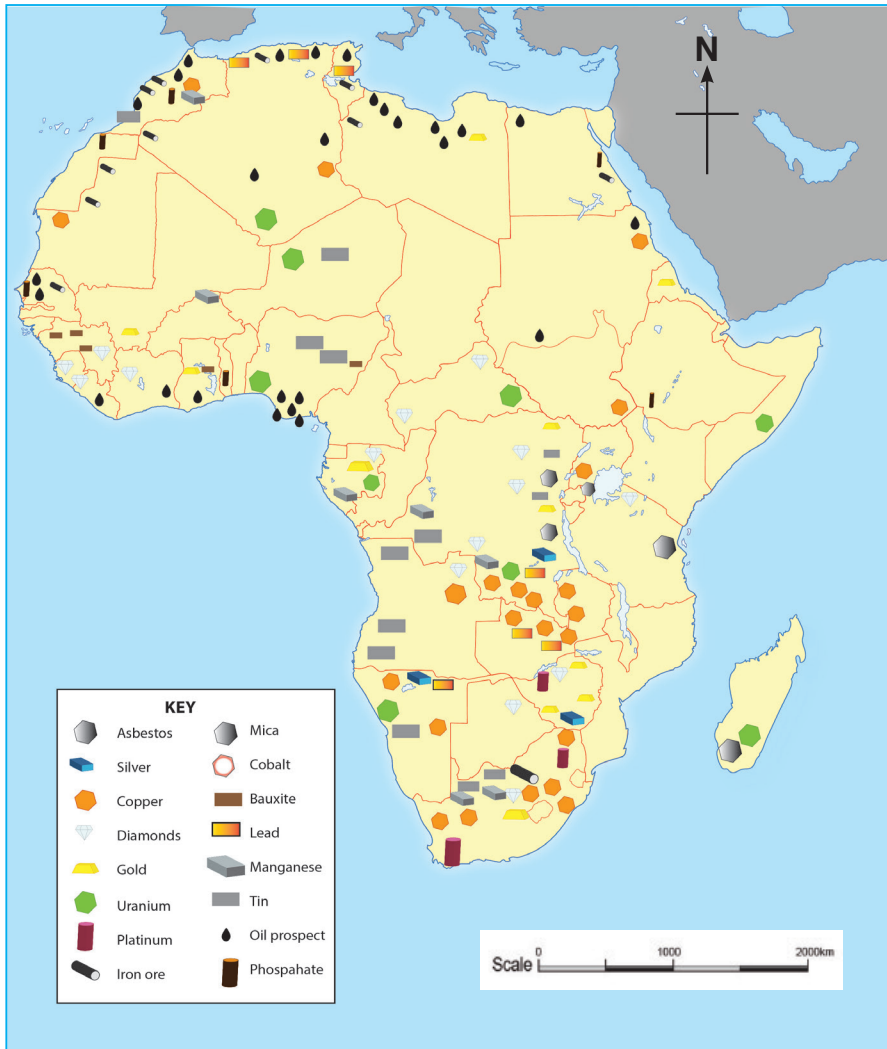


Fig. 13.7: Map showing the counties in Africa where major minerals are found

13.2.1 Mining in South Africa

South Africa is the richest country in Africa. It has several valuable minerals such as gold, uranium, diamond, iron, phosphate, lead, zinc, copper, tin, chrome and asbestos.

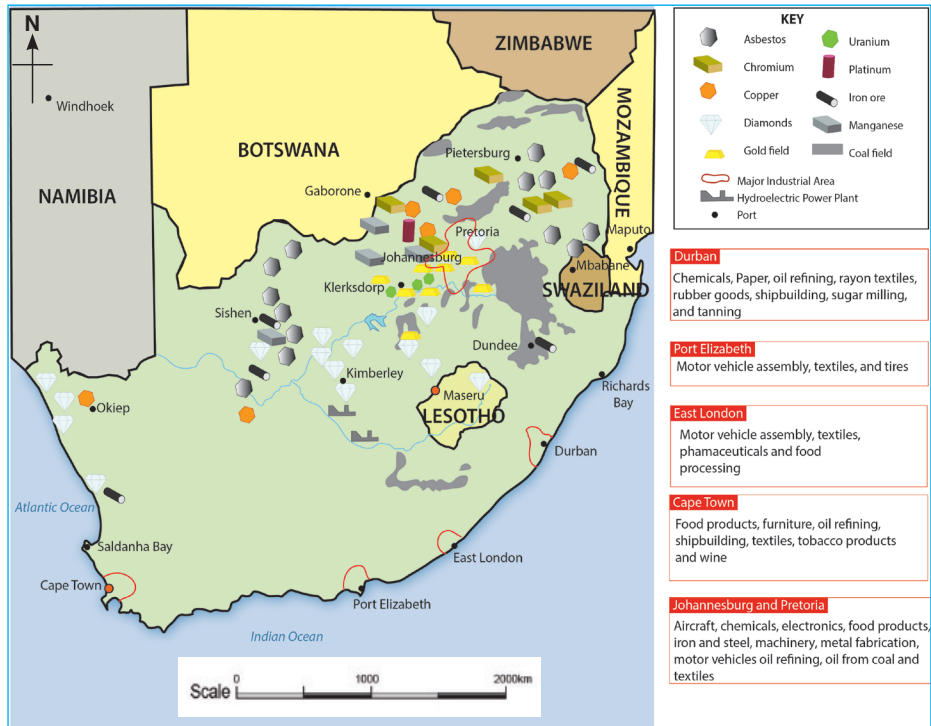


Fig. 13.8: Map of South Africa showing major minerals

(i) Gold in South Africa

Gold is a shiny yellow metal that is very valuable. It is used today as the basis of world's currencies and making of jewellerys. Other uses of gold include coating other metals, making championship medals and as a foreign reserve.



Fig. 13.9: Gold Ore



Fig. 13.10: Jewelry made of gold

Until 2006 South Africa was the leading producer of gold in world.. The main producing area is Witwatersrand, that is, the area around Johannesburg city. Mining of gold in South Africa is through underground mining methods where shafts are sunk more than 2000 metres (2 kilometres) deep into the crust. Conveyor belts and shafts are then used to bring the ore to the surface.

At the surface, the ore is crushed. Sodium Cyanide is added to crushed gold ore, which after dissolving, is stirred to form a solution. Zinc dust is mixed with the cyanide solution causing gold to precipitate. Finally, it is smelted and moulded into bars for sale.

(ii) Uranium

During the process of purifying gold, uranium (which occurs in association with gold), is extracted. It is a radioactive metal which gives off energy. Uranium is mainly used in production of atomic energy as well as producing electricity.



Fig. 13.11: Uranium Ore

(iii) Diamond

Diamond is the hardest known metal in the world. Diamond mining in South Africa is done around Kimberley.

Diamond deposits are mainly found in two states: Alluvial diamond, usually found on river beds and the one found deep into the crust. Alluvial diamond is mined using the placer or panning method while the shaft or underground method is used to mine the one found deep into the crust.

Alluvial diamonds are found along the Vaal-Hartz-Orange valleys, dried up water courses, river terraces as well as beach deposits at the coast. Diamond

mining areas where underground mining is practiced are associated with vulcanicity. In such areas, the mineral is found in igneous rocks called the **kimberlite** (also known as blue ground). Other areas where diamonds are found in South Africa include Pretoria, Bloemfontein, Jagersfontein and Koffiefontein.

Diamond is used in making of jewelry, cutting and drilling instruments (such as glass cutters and steel bits for drilling) and dust for polishing.



Fig. 13.12: Diamond

(iv) Coal

Coal in South Africa is produced mainly in three states of Transvaal (that produces the largest amount), Orange Free State and Natal. Coal is found in seams or layers which are nearer the surface, about 20 metres deep. In Transvaal Province, coal is mined at Vereeniging, Bethal, Belfast, Ermelo, Boksburg Spring and Witbank. In Orange Free State, coal mining is confined around Vierfontein, Klerksdorp and Sasalburg. In Natal, coal is found in Vryheid, Utrecht, Dundee and Newcastle.

Coal has been used in steam railway engines and some industries (iron and steel) to produce heat energy and power.

(v) Copper Belt in the Democratic Republic of Congo and Zambia

In Africa, copper is mined mainly in Zambia and Democratic Republic of Congo in large quantities. Its concentration is within the Copper Belt that covers, over a distance of about 360 km. The copper belt extends from Ndola in Zambia through Lubumbashi to Kolwezi in southern Katanga Province.

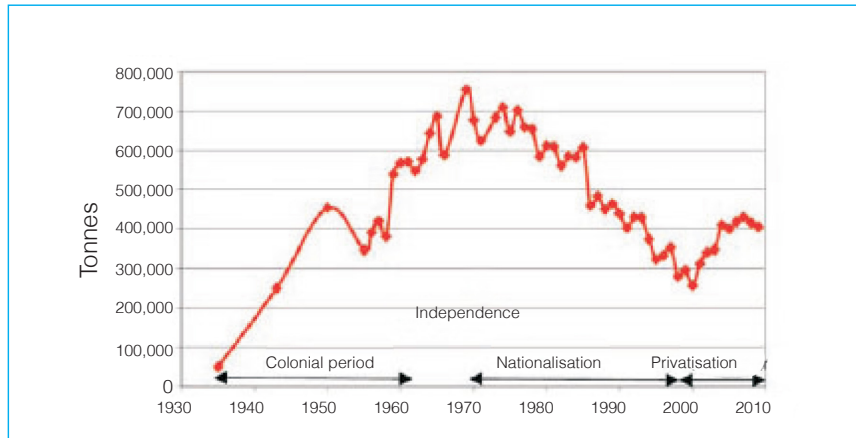
The Democratic Republic of Congo and Zambia depend on the exploitation and export of copper. Zambia is the second world exporter of copper followed by the Democratic Republic of Congo. Chile is the world's largest exporter of copper.



Fig. 13.13: Map showing the Copper Belt

Methods used to mine copper ore are both open cast and underground shaft mining. The ore is blasted, crushed and then transported to the surface. At the surface, the crushed ore is taken to one of the refineries in the copper belt.

Between 1970 and 1988, copper production in the Democratic Republic of Congo increased from 400,000 tonnes to 500,000 tonnes of copper per year. But between 1992 and 2001, copper production dropped to about 50,000 tonnes per year as a result of price fluctuations in the world market. However by 2008, production reached 300,000 tonnes. (Source: www.miningafrika.net)



(Source: Journal of the Southern African Institute of Mining and Metallurgy)

Fig. 13.14: A graphical representation of copper production in Zambia

Activity 13.2

1. Discuss the method of copper mining in Zambia.
2. Carry out a research from the internet to obtain copper production export in tonnes for DRC. Using the model of the graph shown above for Zambia, draw a graph showing copper exports from The Democratic Republic of Congo.

13.2.3 Mining areas in Nigeria

Nigeria is the leading producer of mineral oil in Africa. It is the main export of Nigeria. Much of the oil is found at the Niger delta.

Oil in Nigeria is found both on land and offshore in Southern Estate of Port Harcourt and Bedel.

Much of the oil produced in Nigeria is exported as crude oil. Only 10% is refined locally.

Other minerals found in Nigeria include coal along river Benue, Tin and Iron Ore to the north, limestone to the west of River Niger and Phosphate to the northwest.

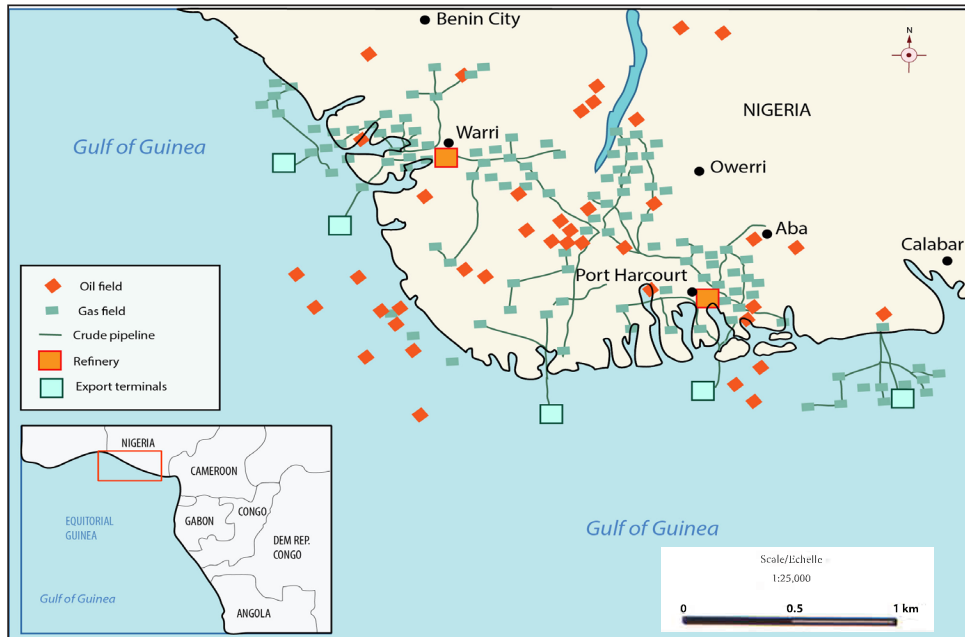


Fig. 13.15: Map of Nigeria showing major minerals

How oils is extracted

Oil (Crude oil) is usually found between two layers of hard rocks which are impermeable. By drilling the hard rock, crude oil is normally found in the permeable rock as follows: At the top is the gas, followed by oil then water as shown in the diagram below.

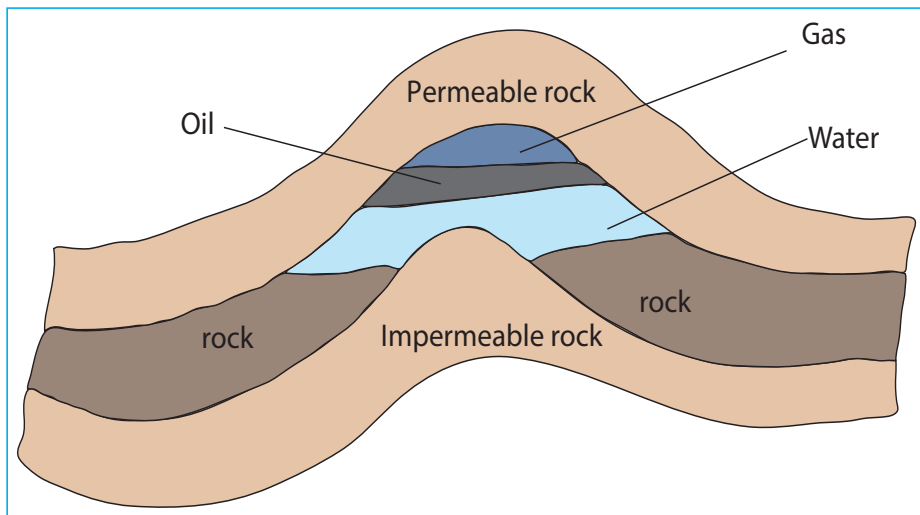


Fig. 13.16: Occurrence of oil

The equipment used to drill oil is known as **derrick**.



Fig. 13.17: An oil derrick in Nigeria

13.2.4 Minerals areas in Angola

Activity 13.3

Using the internet or other geographical books, discuss the factors that favour exploitation of minerals in Angola.

The major mining products in Angola are crude oil, diamonds and natural gas.

Angolan Exports, 2010	
Major exports	% of total
Crude oil	95.9
Diamonds	1.8
Refined petroleum	0.7
Liquefied natural gas	0.6

(Source: Mining Africa, 2010)

Table 13.1: Angola mineral exports in 2010

Oil is drilled along the coastal region of Angola. By 2010, oil was the leading mineral export from Angola. The sale of oil has created an impressive rate of economic growth in Angola.

Diamond is the second main mineral exported from Angola. The country produces alluvial diamonds which are found at the river valley, river beds of rivers Kwango, Kasai and Chicopa. The method used to mine diamond is known as placer or panning.

The other important mineral in Angola is **Iron**. Much of the iron ore in Angola contains 65% iron content. It is second to diamond as a foreign exchange earner.

Activity 13.4

Carry out a research to find out the importance of oil mining to the economy of Angola.

13.2.5 Major minerals in Libya

Oil was discovered in the desert which is over 200km from the Mediterranean region. Oil mined in Libya is sulphur free which causes less pollution. Oil from the desert is pumped through pipes to the Mediterranean coast where it is refined into different oil products such as petrol, diesel, paraffin and tar.

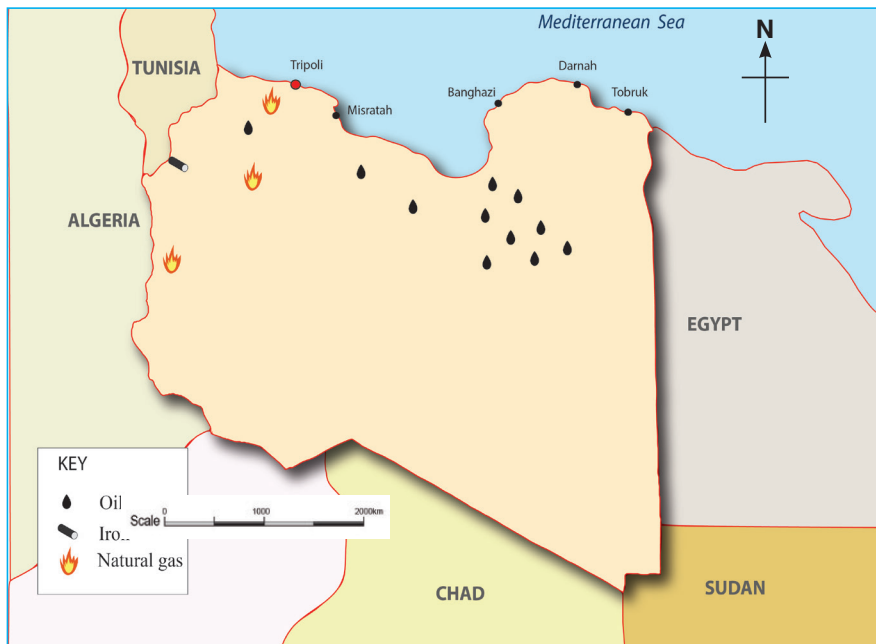


Fig. 13.18: Map of Libya showing its major minerals and where they occur

13.3 Methods of mining in Africa

Activity 13.5

Carry out a research to find out the country where each of the following mineral is found. Also find out the method of mining for each of the minerals. Support your answer with a short description of each method you have mentioned. Present your findings in class for further discussion.

- | | |
|------------|-------------|
| • Iron ore | • Mica |
| • Platinum | • Cobalt |
| • Asbestos | • Bauxite |
| • Silver | • Lead |
| • Copper | • Manganese |
| • Diamonds | • Tin |
| • Gold | • Oil |
| • Uranium | • Phosphate |

There are many different types of minerals found in Africa. Some of these minerals are copper, gold, coal, diamond, petroleum, uranium, natural gas, manganese, phosphate, silver and tin.

Activity 13.6

Use textbooks or Internet to research on methods of mining in Rwanda and other parts Africa.

Most of the minerals in Africa are either found near the earth's surface or deep into the earth's crust. The methods used to mine these minerals in Africa and the rest of the world will depend on the location of the mineral within the earth's crust.

There are two main methods used in mining. These are:

1. Surface mining
2. Underground mining

13.3.1 Surface mining

Surface mining is an appropriate method for extracting minerals that are found on the earth's surface or very close to the earth's surface. The main methods used to mine minerals found near or on the earth's surface are **open-cast** or **stripping methods**.

Open cast or stripping methods involve the removal of the top soil or layer that covers the required minerals by either digging out the top layer or blasting the rocks in the area. Bulldozers or tractors are then used to excavate the minerals.

Some of the minerals that are mined using this method include:

(a) Rock materials for building and construction from a quarry.



Fig. 13.19: Open cast method of mining in a quarry

(b) Extraction of clay from clay pits to make bricks.

(c) Digging out of limestone for the manufacturing of cement.



Fig. 13.20: A limestone quarry

- (d) Mining some beds of coal, iron, bauxite and phosphate that may appear as an outcrop on the earth's surface.



Fig. 13.21: A coal mine

- (e) **Alluvial or placer mining** is used to extract mineral deposits from the river beds. This method involves mixing the alluvial deposits with water in a container where it is rotated, thereby removing the bigger materials until the mineral is left in the container.

This method is also known as **panning method**.



Fig. 13.22: Miners using the panning method

13.3.2 Underground mining

This method is used where the mineral deposits lie deep below the earth's surface. Depending on the mode of occurrence and the type of mineral, various underground methods are used. Some of these underground methods used are:

- (a) Drift or adit mining

- (b) Slope mining
- (c) Shaft mining
- (d) Solution method
- (e) Drilling method

13.3.2.1 Drift or Adit mining

This method is used to mine minerals that appear in layers or seams on the side of the slope or valley. Coal that is found in distinct layers is mined using this method. A horizontal tunnel is dug to extract minerals such as coal which is scooped out and loaded onto rail wagons or lorries.

13.3.2.2 Slope mining

This method is used when mineral layers are too deep and steeply tilted. An inclined tunnel is constructed. A conveyor belt or cable cars may be used to bring out the ore to the surface.

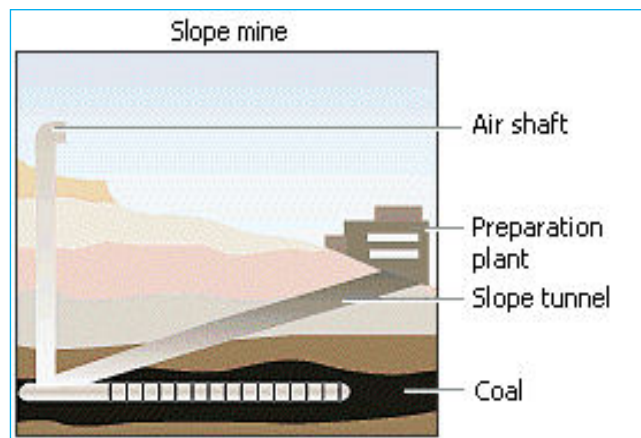


Fig. 13.23: Slope mining

13.3.2.3 Shaft mining

This method is used where the mineral is located far deep into the ground. Shafts are sunk vertically until they reach the mineral seams or layers. Horizontal tunnels (adits) are dug to reach the mineral. These tunnels must be supported so that they do not collapse and kill people or cover the mineral again. The ore is then blasted in order for it to break into manageable sizes that can be loaded to light railway tracks or put on conveyor belts for transportation to the foot of the main vertical shaft. The mineral is loaded onto box like cages or lifts to bring it to the surface.

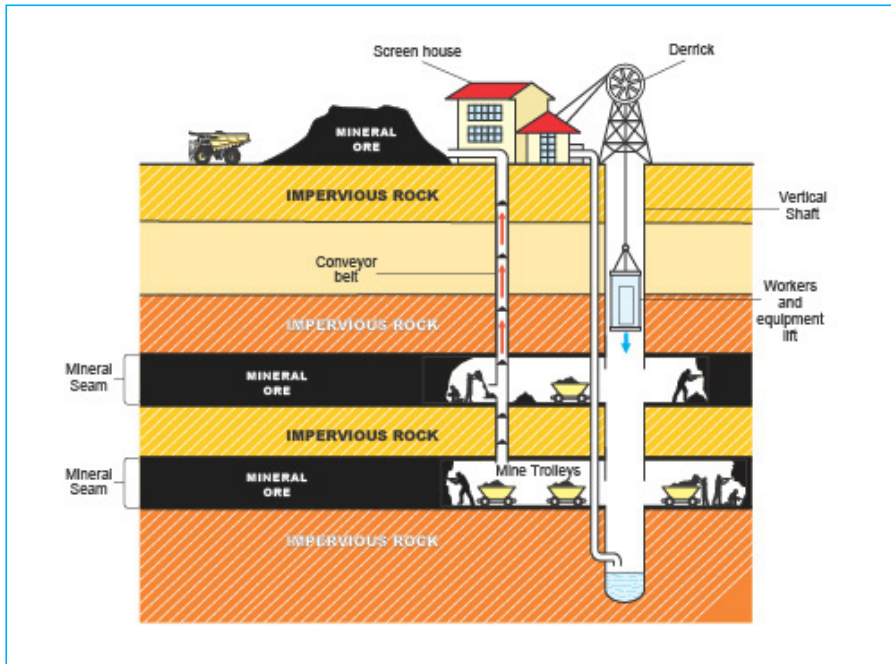


Fig. 13.24: Shaft tunnel

13.3.2.4 Solution method

This method is used where the mineral to be mined is soluble and found deep into the crust. Pipes are connected up to where the mineral is located. Very hot water or steam is injected into the pipe to dissolve the mineral ore. Hot air is pumped into the pipes to create pressure that forces the solution of the mineral to the surface. The water is evaporated from the mineral. This method is used mainly in the extraction of sulphur, potash and salts.

13.3.2.5 Drilling method

This method is used in the extraction of oil (petroleum) from the ground on to the surface. Oil underground is normally trapped under pressure. When the drill reaches the oil or gas bearing rock, the oil or the gas gushes upwards to the surface. Where pressure is low, a derrick is constructed to pump the oil or gas to the surface.

13.4 Factors favouring the exploitation of minerals in Africa

Activity 13.7

Use the local environment, geography textbooks or the Internet to explain factors favouring mining in Africa.

Before the activity of mining starts, it must be established by researchers whether the value of the mineral is greater than its exploitation cost.

Exploitation of mineral deposits is based on the following factors:

- (a) The worth of the mineral
- (b) The size or quantity of the deposits
- (c) The quality of the ore
- (d) The method of mining to be employed
- (e) Transportation costs
- (f) Labour required, both skilled and unskilled
- (g) Level of technology
- (h) Availability of capital
- (i) Marketability or demand of the mineral
- (j) Political influence

Worth of the mineral

Minerals that are highly valued such as gold, uranium, copper, oil and diamond can cover the cost of mining as compared to minerals of low value.

The size or quantity of the deposits

The size of the mineral reserves should be big and extensive to justify the installation of very expensive machines required for mining.

Quality of the Ore

It is important to consider the quality of the mineral because high quality minerals fetch a lot of money in the market. On the other hand, high quality metals are cheaper to process because they have fewer impurities.

Method of mining

The method used in mining depends on the occurrence of the mineral. If the mineral is near or at the earth's surface, open cast method would be used which is cheaper. Only expensive minerals found deep underground are considered for mining.

Transport cost

A well-developed means of transport facilitates mineral exploitation. Most of the minerals mined such as copper, iron ore and petroleum are very bulky and therefore need good roads to the processing plants as well as to the market. Minerals located in the interior of Africa where there is no infrastructure are likely not to be exploited.

Labour: Skilled and unskilled

Before any mineral is exploited, there must be an expert with skills to assess the quality and quantity of the mineral. There is also need for un-skilled labour that would be employed in doing manual work. In areas that are sparsely populated, there is need to provide social amenities.

Level of technology

The technical know-how and use of modern machines are required for the extraction of the mineral. It would be very expensive to use less efficient methods of mining such as placer method where there are large deposits.

Availability of capital

Capital is very important because it is needed to buy modern machines, do research and pay workers. In developing countries, inadequate capital to exploit their minerals has forced them to use foreign investors to exploit them. Most of the minerals in Africa have not been discovered or exploited because of inadequate capital.

Marketability or demand for the mineral

A mineral deposit may remain unexploited until such a time where there will be need for it. Only valuable minerals are exploited. Another factor affecting a mineral's demand is its international price which should not constantly fluctuate. Where the demand decreases, the production of the mineral is affected.

Political influence

Where a mineral is located at the border of two or more countries, different political ideology of the countries would not allow smooth exploitation of the mineral. An example is the conflict over the Copper Belt in Zambia and Democratic Republic of Congo.

13.5 Problems affecting mining in Africa

Activity 13.8

Discuss the problems that affect mining in Africa.

Problems that affect mining in Africa include:

- | | |
|--------------------------------------|---------------------------------|
| (a) Small size of mineral deposits | (b) Low quality of mineral ores |
| (c) Low value of minerals | (d) Poor methods of extraction |
| (e) Limited market | (f) Inadequate capital |
| (g) Unavailability of skilled labour | (h) Transport |
| (i) Political differences | |

Small size of mineral deposits

There are many mineral deposits that are found in Africa but in small quantities. These are not economical to mine.

Low quality of mineral ores

Minerals that are of low quality are uneconomical to mine, though some of them being very rare such as uranium are mined. Iron is found nearly everywhere but it is of low quality. The concentration of iron in the iron ore is less than 10%.

Low value of minerals

Minerals that are valuable are mined at a very high cost that most African countries



Fig. 13.26: Extracting and processing minerals like copper ore depends on its value

cannot afford. Some of these minerals include gold, diamond and copper. Most African countries have inadequate capital to facilitate mining of low quality minerals.



Fig. 13.27: Copper wires

Poor methods of extraction

Most minerals found in Africa are found deep underground. Some of them are of low quality. The method of extraction therefore becomes very expensive that they cannot make good returns. Some of African countries lack technology to exploit them.

Limited market

A mineral in Africa may remain unmined because it has low demand. Most minerals have demand in countries outside Africa. This would cost more to extract and export them.

Inadequate capital

Most African countries are poor. They do not have enough capital to buy required machinery and finance its exploitation.

Unavailability of skilled labour

Mining of minerals require both skilled and non-skilled labour. Africa does not have plenty of skilled labour. Even where mining is done through the open cast method, very little labour is needed since machines are used to scoop and load the trucks to the refinery.



Fig. 13.28: Loading and transporting mineral ore is costly

Poor transport systems

This is one of the major problems that affect exploitation of minerals in Africa. Most roads are impassable in remote areas where minerals are found especially during the rainy season. Most of the minerals mined are heavy and bulky and need good means of transport.

Political differences

Where minerals occur on the border of two countries, political influence may not favour exploitation of the mineral. An example is copper mining in the

Democratic Republic of Congo and Zambia.

Sometimes even within the same country, political or tribal differences affect the exploitation of the mineral.

Sustainability of mining in Africa

Sustainability of mining in Africa can be possible when adequate research has been done. African countries should pull their resources together and form a body that deals with research, mining and sale of minerals.

There is also need to train local technocrats to prospect minerals within their country and Africa at large. This would reduce the cost of importing skilled labour and management teams.

Some African countries that share mineral deposits should develop good political relationships to enable mining.

Minerals mined in Africa should be processed up to final products so that they can add value. Export of raw minerals reduce the profits by large margins. For example, Nigeria exports crude oil and imports refined oil which causes imbalance of trade.

13.6 Impact of mining on sustainable development in Africa

Mining has been a blessing to some African countries such as Libya and South Africa.

Activity 13.9

1. Suggest the effects of mining on the environment. Write a brief report to summarise your findings.
2. Discuss the impact of mining on sustainable development in our country.

A country like Nigeria is the leading producer of crude oil in Africa. However, it often has fuel shortages for its locomotives. This is because it normally has much of its oil refined overseas.

South Africa is the most developed country in Africa because of the mining of diamond and gold.

The countries to the North of Africa discovered a lot of oil in the Sahara Desert. After the discovery and exploitation, they have improved agriculture by getting water from the artesian wells in the deserts.

END UNIT ASSESSMENT

1. Explain the process involved in surface mining.
2. In your opinion, give a brief explanation why petroleum is more important in Africa compared to gold.
3. Discuss problems that affect the mining industry in Africa.
4. Briefly discuss the impact of mining on sustainable development in Africa.

UNIT 14

Power and energy in Africa

Key unit competence

By the end of this unit, you should be able to explain the impact of power and energy on sustainable development in Africa.

Introduction

Energy is important in the process of production. The supply of adequate amount of energy at the right time and place is essential for people to achieve a certain level of production. Development of any country is therefore dependent on the availability and proper use of energy resources. Energy may be obtained from wind, water, the sun, petroleum, natural gas and other different sources.

Quick facts

Energy is the power required to carry out an activity. For a person or machine to do work, energy must be used.

To understand more about power and energy in Africa, we will study the following key sections in detail:

- Types and sources of power and energy in Africa
- Factors favouring power and energy production in Africa
- Importance of power and energy in Africa
- Problems and solutions of power and energy production in Africa
- Case studies: Hydroelectric power stations/projects in Africa - Aswan (Nile) in Egypt and Akosombo (Volta) in Ghana.

14.1 Types and sources of power and energy in Africa

Energy sources are normally classified into two groups. These are **renewable** and **non-renewable sources**.

Activity 14.1

Use the knowledge gained from the previous class to:

1. Write down the meaning of renewable and non-renewable sources of energy.
2. Classify the following sources of energy as either renewable or non-renewable:

Water

Biomass

Coal

Wind

Sun

Natural gas

Tides

Steam

Petroleum

Uranium

Use a table similar to the one shown below to present your work.

Renewable sources	Non-renewable sources

The following are the major types and sources of energy in Africa:

(i) **Solar energy**

Solar energy is obtained from the sun. It is tapped from direct rays of the sun using solar panels to generate electricity.



Fig. 14.1: A solar panel on the roof of a house in Sonatube near Kigali City

African countries are blessed with sunlight almost all year round. The sun is free and inexhaustible. Solar energy is used in many ways, including cooking, drying grains, lighting and running electrical appliances.

(ii) **Biomass**

Biomass is a term used to describe living vegetative matter such as trees and scrubs from which energy can be obtained. Biomass is also generated from agricultural wastes, cereals and forage, crop residues, aquatic weeds, human and animal wastes. Biomass provides both fuel and other forms of energy.

The commonly used form of biomass in Africa is wood fuel. Wood is a forest resource and a source of energy especially in rural areas, where it provides energy in the form of firewood for both heating and lighting.

Wood, as a source of fuel, is used in form of firewood, charcoal, chips, sheets, pellets and sawdust.

Apart from cooking and heating, wood fuel can occasionally be used for fueling steam engines and steam turbines that generate electricity.

(iii) **Hydroelectric power**

Fast running water is used to generate hydroelectric power. This is the electricity that can be transmitted over long distances using cables.



Fig. 14.2: A hydro-electric power station on River Nyabarongo

(iv) **Geothermal power**

Geothermal power is generated from the earth's internal heat. Temperature in the interior of the earth is very high. When ground water comes into contact with the heated rocks underground, it becomes steam. By drilling into the hot rocks, the steam is tapped to generate geothermal power.



Fig. 14.3: Olkaria geothermal station in Kenya

Activity 14.2

Find out and write brief notes on each of the main geothermal power fields in Africa.

(v) **Drought animals**

Different animals have been used as sources of energy for many years in different parts of Africa. These include camels, oxen and donkeys.

Oxen are used for ploughing and pulling carts with luggage. Donkeys are used for transportation of goods. In countries such as Zambia and Mali, oxen are the principle source of transport and farm power available to small-scale farmers.



Fig. 14.4: Oxen pulling a cart in Mpika District, Zambia



Fig. 14.5: Donkey transport in Bamako, Mali

(vi) **Natural gas (Methane gas)**

Natural gas is internationally considered a very desirable fuel due to its technical, economic and environmental advantages.

Methane gas is formed from decomposing organic wastes. It can also be harnessed from submerged areas where it has accumulated over a long period of time. These include under water bodies or wetlands, including swamps, marshes and bogs.

(vii) **Petroleum**

Petroleum is also referred to as crude oil. Petroleum is refined to get several by-products such as diesel, kerosene, motor oil, jet fuel and lubricants.

Activity 14.3

Use the Internet or other Geography books to find out the countries in Africa that produce petroleum..

14.2 Factors favouring power and energy production in Africa

Activity 14.4

Use textbooks, Internet or geographical documents to research on other factors favouring power and energy production in Africa..

Some of the factors favouring power and energy production in Africa are shown in the table below:

<i>Demand</i>	As Africa continues to develop, energy demands and production also grows.
<i>Improved infrastructure</i>	This has made it possible to develop several power stations.
<i>Presence of huge renewable energy resources</i>	The renewable energy resources are evenly distributed and enormous. These include geothermal resources in Rift Valley as well as water resources.
<i>Presence of fossil energy resources</i>	Examples are oil and gas reserves in northern, western and southern Africa and also coal in western and southern Africa.
<i>Availability of sunshine</i>	Almost all countries of Africa receive plenty of sunshine throughout the year. This has helped in the production of solar energy.
<i>Population increase</i>	This has led to the need for more power and energy.

14.3 Importance of power and energy in Africa

Activity 14.5

Apply knowledge acquired in the previous class to discuss the importance of power and energy in Africa.

Power and energy play a very important role in the economic development of countries in Africa. The importance of power and energy in Africa include the following:

- (i) **Increased employment opportunities:** People are directly employed in the power and energy sectors or in other sectors that use power and energy such as industries. This has raised people's standards of living.

- (ii) **Development of industries:** Availability of power and energy lead to development and expansion of industries.
- (iii) **Growth of urban centres:** Many urban centres have come up and others have expanded due to availability of power and energy.
- (iv) **Improvement in agricultural production:** Availability of power and energy resources has led to modernisation and expansion of the agricultural sector. This has in turn increased agricultural production.
- (v) **Provision of energy for domestic use:** Energy is required for cooking, lighting, heating and providing power to some domestic appliances.
- (vi) **Expansion of the transport sector:** The transport sector is the largest consumer of petroleum. As the rate of production of petroleum increases, it causes an expansion in the transport sector.
- (vii) **Source of revenue for governments:** Taxes generated from those employed directly or indirectly in the power and energy sectors earn revenue for the countries with these sectors.
- (viii) **Generation of foreign exchange:** Some of the multi-purpose river projects are tourist attractions. This generates foreign exchange for countries with these projects.

Activity 14.6

Discuss the problems hindering effective production of power and energy in Africa.

14.4 Problems and solutions of power and energy in Africa

Africa has large amounts of power and energy resources. These have not been fully exploited due to the following problems:

(i) Inadequate capital

Production of power requires a lot of capital. Most African countries cannot afford to invest in power projects due to limited financial resources. Inadequate capital leads to insufficient maintenance of equipment and lack of modernisation.

(ii) Shortage of skilled manpower

There is shortage of skilled manpower which makes African countries hire experts from developed countries. This makes the production of power and energy expensive.

(iii) Political instability

There has been instability in some African countries. This has discouraged potential investors in the power and energy sectors.

(iv) High cost of power

Due to low income levels, majority of people cannot afford to pay for power. This tends to limit production of power in some areas due to low returns.

(v) Fluctuation of volume of water in rivers

Due to changes in climatic changes, water volume in rivers fluctuates. This at times may lead to interruptions in the production of hydroelectric power.

(vi) Low level of industrialisation

In many countries of Africa, industrialisation is not fully developed to necessitate high energy production.

14.4.1 Solutions to the problems of power and energy in Africa

Activity 14.7

Discuss the measures the governments of African countries have taken to solve the problems of power and energy production.

The following are some possible solutions to the problems of power and energy production in Africa:

- (a) Intensifying regional and interregional cooperation on renewable energy production and transmission.
- (b) Improving efficiency in the production, distribution and use of energy.
- (c) Ensuring there is peaceful political situation in order to attract investors in the energy sector.
- (d) Encouraging development of small power projects especially in the rural areas.

- (e) Lowering the pricing of power to make it affordable to people with low income.
- (f) Strengthening regional cooperation on research and training of skilled personnel required in the energy sector.
- (g) Fully utilising geothermal, wind and solar resources for renewable energy production.

14.5 Case studies: Hydro-electric power stations/ projects in Africa

Activity 14.8

Use textbooks, the Internet and atlases to find out some of the major hydroelectric power stations in Africa.

These projects are built along the courses of rivers. They are aimed at increasing economic growth and improving the living standards of people in Africa.

The following are physical factors that influence the establishment of hydro-electric power dams:

- Large water volume or constant supply of water to enable continuous production of electricity.
- Presence of hard basement rocks that provide a strong foundation for construction of dams.
- Presence of narrow gorges behind dams which minimise the cost of construction.
- Presence of impervious rocks which prevent seepage.
- Presence of deep gorges that act as reservoirs.
- Presence of steep river gradients, waterfalls or rapids which provide sufficient hydraulic force to the turbines.

In Africa, there are several hydro-electric power projects. In this section, let us focus on Aswan High Dam and Akosombo Dam.

Activity 14.9

1. With the help of an atlas, draw the map of Africa and show the location of Aswan High Dam and Akosombo Dam.
2. Explain why Aswan High Dam and Akosombo Dam were constructed on the sites where they are.
3. Use textbooks, Internet or geographical documents to research on the importance of major river dam projects in Africa.

14.5.1 Aswan High Dam

Aswan High Dam is in the southern part of Egypt. It was built across River Nile which is the longest river in the world. It was initiated by Gamal Abdel Nasser who was the president of Egypt at that time. Construction started in 1960 and was completed in 1970. During the construction, about 100,000 people were relocated. This was to provide space for the dam. The reservoir created by the dam forms Lake Nasser. It is about 500 kilometres long with part of it extending to Sudan.



Fig. 14.6: The Aswan High Dam on River Nile in Egypt

14.5.1.1 Reasons for the establishment of Aswan High Dam

(i) To control floods

The flooding of River Nile used to displace people and delay farming activities along the Nile Valley. It therefore became necessary to build a dam to control these floods.

(ii) To provide water for irrigation

About 96% of Egypt is in the Sahara Desert, so there was need for reliable water for irrigation. This was to ensure a constant supply of food throughout the year for the growing population.

(iii) To generate hydro-electric power

Before the dam was built, Egypt depended on petroleum to generate electricity. This was very expensive. The expansion of manufacturing industries was also needed so a cheaper source of energy was required.

(iv) To provide water for both industrial and domestic use

The expansion of manufacturing industries led to increase in the demand for water. The population that was also increasing required enough water for domestic use.

(v) To provide employment

Many people who own and work in various irrigation farms and those who work in electricity generating stations earn a living as a result of the establishment of Aswan High Dam.

(vi) To control siltation

Lower ends of River Nile are less affected by silt which is trapped by the dam. This has increased water volumes in these river sections.

14.5.1.2 Importance of the Aswan High Dam

- (i) The dam produces electricity for industrial and domestic use. Some manufactured goods are exported making the country earn foreign exchange.
- (ii) Water from Lake Nasser is used for irrigation. This has enabled Egypt to produce enough food for its population. Some agricultural products are also exported hence earning the country foreign exchange.
- (iii) Lake Nasser is a major inland fishing ground.
- (iv) The dam is a tourist attraction.
- (v) The dam has helped in controlling floods on the lower sections of River Nile.

- (vi) Lake Nasser has provided inland waterway hence easing movement of people and goods to southern Egypt and Sudan.
- (vii) The dam has created employment opportunities for many people hence raising their standards of living.
- (viii) There should be a high velocity for the water to be able to turn the turbines.
- (ix) Presence of enough large and constant volume of waters throughout the year that help to generate power.

14.5.1.3 Problems experienced in the production of power at the Aswan High Dam

Activity 14.10

Use the Internet or geographical documents to find out some other problems experienced in the production of power on the Aswan High Dam.

Some of the problems experienced in the production of power at the Aswan High Dam project include the following:

- (i) There has been deposition of silt in the reservoir. This has reduced the amount of water available for use. This makes the government spend a lot of money removing it.
- (ii) There are seaweeds that grow on the dam. These tend to obstruct navigation.
- (iii) There is loss of about 10% of annual water flow due to high evaporation rate.
- (iv) Drought in the Nile catchment area and development of more projects in the upper course has led to a reduction in the flow of water for the project.
- (v) Water that has accumulated behind the dam is clear and therefore sunlight penetrates deep down. With increased presence of nutrients from fertilisers in the water, more algae grow in the dam. This in turn pollutes the water, increasing the cost of drinking water treatment. Apparently, few experts had expected that water quality in the Nile would actually decrease because of the dam.
- (vi) This is a high maintenance cost for the equipment involved in the power production. This affects power production as it takes time before repairs are done and normalcy restored.

- (vii) Excessive utilisation of water resources in the upper course of the river affects volume of water required in the operations of the dam. This includes irrigation and diversion of water in the upper course of the water.

14.5.1.4 Possible solutions to the problems experienced in the production of power at Aswan High Dam

- (i) Regular removal of the silt from the reservoir.
- (ii) Mechanical harvesting and biological control of the seaweeds.
- (iii) Negotiate with countries in the upper course of Nile River on proper utilisation of the Nile water.
- (iv) Regular or routine maintenance of power plants for them to keep working.
- (v) Putting in place water reserves in the upper course of the river which regulate the volume of water to be constant despite natural calamities such as floods or drought.
- (vi) Removing algae alongside the weeds to increase the penetration of light within the dam. This reduces chances of growth of these impeding plants to energy production.

14.5.2 The Akosombo Dam

Akosombo Dam is on River Volta in the south eastern part of Ghana. It was initiated by the then Prime Minister of Ghana, Dr. Kwame Nkrumah. It is built at a place called Akosombo where River Volta flows between Togo Mountains and Akwapim Hills. Akosombo Dam is also known as Akosombo Hydro-electric Project. Construction started in 1961 and was completed in 1965. Behind the dam is Lake Volta (the largest human-made lake in the world by surface area). It covers 8,502 square kilometers. This is 3.6% of Ghana's land area.



Fig. 14.7: Akosombo Dam on River Volta

14.5.2.1 Reasons for the establishment of Akosombo Dam

(i) To generate hydroelectric power

Ghana needed hydro electric power in order to mine bauxite and refine it into aluminium. The country therefore required a cheap source of power instead of using imported crude oil which was very expensive.

(ii) To regulate the flow of River Volta

River Volta has three main tributaries which are the White Volta, the Black Volta and River Oti. The sources of these rivers receive rain once a year between May and October. During this season, River Volta would be flooded. Between November and April, the volume of water in River Volta would be very low. It was therefore necessary to regulate the flow of River Volta so that it would provide a constant supply of water throughout the year.

(iii) To develop manufacturing industries

There was need to generate power in order to encourage industrialisation in the country and to create employment opportunities.

(iv) To provide water for irrigation

The drier parts of the country needed to be irrigated in order to increase food production.

(v) To support people's livelihood

Economic activities, such as fishing and new farming activities along the shoreline and tourism, were engaged in. Lake transport also promoted these activities to a large extent. This relatively improved the standards of living of the recipient population, providing them financial stability for a long time.

(vi) To generate additional income for the national government

The dam has benefited the country to a large degree, supporting industrial growth among other economic activities. It is also important to note that the dam provides electricity to some of Ghana's neighbouring West African countries, serving as a good source of foreign exchange earnings. For instance, Togo and Benin, have signed contracts with the Volta River Authority.

14.5.2.2 Importance of Akosombo Dam

- (i) Akosombo Dam generates a large amount of electricity. This has led to the expansion of bauxite mining and aluminium smelting. New industries have been set up. These include food processing and fish canning industries. There are many people employed in these industries thus improving their living standards.
- (ii) Water from Lake Volta is used to irrigate large areas of land. This has led to increased food production.
- (iii) Lake Volta is a large inland fishing ground. Large quantities of fish are obtained from this lake and supplied to most parts of Ghana.
- (iv) Akosombo Dam is a major tourist attraction, which makes Ghana earn foreign exchange.
- (v) Lake Volta is used as a major inland waterway. It provides north to south shipping route.

14.5.2.3 Problems experienced in the production of power at the Akosombo Dam**Activity 14.11**

Use textbooks or internet to find out the problems experienced in the production of power at the Akosombo Dam.

- (i) Occasional droughts have led to a reduction in water levels of the lake. This has led to a reduction in power output.
- (ii) There is inadequate capital for expansion and maintenance of the project. The government has had to rely on foreign aid.
- (iii) The country's level of technology in hydro-electric power production is low. It has to rely on foreign experts.
- (iv) Siltation has occurred in the lake due to deposits by the rivers. This has reduced the amount of water available for production of power.
- (v) Increased demand for power and to support the various forms of livelihoods has put pressure on the lake, whose output remains constant.

14.5.2.4 Possible solutions to the problems experienced in the production of power at the Akosombo Dam

- (i) Strengthening technical education and training in order to gradually get skilled personnel required in the energy sector.
- (ii) Encouraging private investors to invest in the energy sector.
- (iii) Regular removal of silt from the lake.
- (iv) By 1981, a smaller dam was built in the town of Kpong, downstream from Akosombo. Further upgrades to Akosombo have become necessary for maintaining hydropower output.
- (v) The Aboadzi thermal plant was also constructed to complement the efforts to generate electricity. Additionally, plans are far advanced to commence construction of the Bui Dam.
- (vi) People who depend on the dam are being encouraged to venture into alternative sources of income, to avoid putting a lot of pressure on the dam, which has led to its overutilisation.

END UNIT ASSESSMENT

1. Briefly explain three examples of non-renewable energy sources.
2. Analyse the factors favouring power and energy production in Africa.
3. Explain the importance of power and energy to the economic development of Africa.
4. Discuss the problems hindering effective production of power and energy in Africa.
5. Suggest possible solutions to problems of power and energy production in Africa.
6. Discuss the impact of power and energy on sustainable development in Africa.

UNIT
15

Industrial Development in Africa

Key unit competence

By the end of this unit, you should be able to analyse the impact of Industrialisation on sustainable development in Africa.

Introduction

An industry is any form of economic activity through which people produce goods and services for their consumption or sale. The process and pace at which a country establishes industries is called industrialisation.

Industrial development in Africa has been on a steady rise because many countries are now experiencing stable political environments.

Lessons from the History class

*The phrase “**industrial revolution**” has long been used to identify the period roughly from 1800's, during which the accelerated application of mechanical principles, including steam power, to manufacturing in Great Britain changed the pace of change in economic structure and growth. Workers were grouped together in factories using concentrations of capital equipment greater in cost and more efficient in operation than the capital equipment known in Britain earlier. These factories utilised a few mechanical innovations, primarily in textiles and iron manufacturing, with the application of the steam engine, made factory-sized scale the most economic size for the production unit.*

A careful analysis of each of the following sections is given in this unit to explain the scope of industrial development in Africa.

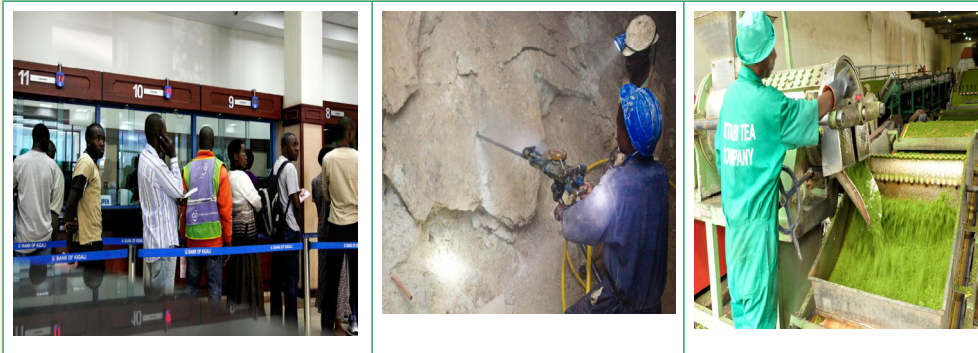
- Types of industries in Africa
- The major industrial areas of Africa: South Africa and the Nile valley

- Factors favouring industrialisation in Africa
- Importance of industrialisation to the economies of Africa
- Problems affecting industries in Africa
- Prospects for the sustainable development of industries in Africa

15.1 Types of industries in Africa

Activity 15.1

Study carefully the following photographs then answer the questions that follow:



1. In one statement, describe what the people in each photograph are doing.
2. Briefly explain how these three categories of people depend on each other.

Each photograph in **Activity 15.1** represent one type of an industry.

Industries are usually divided into three types. These are:

- Primary or extractive industries
- Secondary or manufacturing industries
- Tertiary or service industries

15.1.1 Primary or extractive industries

These are involved in the exploitation of natural resources. They provide raw materials for the secondary industries. Primary industries include mining, farming, fishing and forestry.

Example 1

- (a) A farmer who grows coffee is in the primary type of an industry. By growing coffee, the farmer will be preparing raw materials for coffee factories.
- (b) A miner will extract iron ore from the ground then send it for processing into a fine metal.

15.1.2 Secondary or manufacturing industries

These industries use raw materials from the primary industries. They add value to the raw materials, by processing them into finished products which are suitable for consumption. For example, coffee berries are raw materials. These berries are processed to make coffee which is ready for use. The processed coffee has higher value than the berries.

Some other examples of manufacturing industries are:

- Textile manufacturing
- Oil refining
- Cement making
- Flour milling
- Motor vehicle assembly
- Sugar processing

Secondary industries are sometimes sub-divided into two:

- (i) Heavy industries
- (ii) Light industries

(i) Light industries

These are involved in making goods that have little volume and weight. They also use relatively small amounts of raw materials. Examples of light industries include electrical equipment, plastics, cosmetics, textiles, printing and food processing.



Fig. 15.1: Harvested coffee berries



Fig. 15.2: Packed coffee - final product

(ii) Heavy industries

These involve manufacturing of heavy and bulky products using raw materials such as iron and steel. They involve heavy investments, high levels of technology, a lot of energy and large scale production. Examples of heavy industries include car manufacturing, ship building, iron and steel engineering.

Example 2

1. At the factory, coffee brought in by coffee farmers, is processed into a consumable product, which is packed nicely for sale. Such a category of processing falls under light industries.
2. The metal obtained from the initial activity of mining is used to manufacture cars, build a ship or even lay a railway line. Such a category of processing falls under heavy industries

15.1.3 Tertiary or service industry

This is an industry that deals with provision of services like transport and communication, banking, insurance, printing and publishing services.

These activities make it easy for the primary and secondary activities to be carried out.

Example 3

All the people involved in Examples 1 and 2 above need to be paid their money through a bank. Most people, after earning, also opt to save in a bank. In case any of these workers fall sick, they readily consult a doctor for medical attention.

From time to time, they will travel to see friends and relatives, or to work and back. Some even travel for leisure after working for many days.

Those who will be supporting their other activities through offering them services such as medical attention, transport or even banking are in the tertiary industry.



Fig. 15.3: Transport services are under the tertiary industry

Activity 15.2

Write down four examples for each of the following industries.

Type of industry	Examples
Primary	
Secondary	
Tertiary	

15.2 Factors favouring industrialisation in Africa

Activity 15.3

Apply the knowledge from the previous class, textbooks or the Internet to find out how the following factors have favoured industrialisation in Africa. Write the findings for class discussion. Cite examples from different countries across Africa to support your points.

- (i) Availability of labour
- (ii) Peace and stability (absence of conflict)
- (iii) Government policy

Industrialisation in Africa has been favoured by some or all of the following factors:

(i) **Availability of raw materials**

Industries in Africa have developed because of availability of raw materials. Raw materials such as minerals led to industrial development in South Africa. Availability of agricultural raw materials such as sugarcane, tea, coffee, maize and cocoa has made it possible to set up industries in many African countries.

(ii) **Availability of capital**

Capital is the money required to establish a business or an industry. African

countries, including South Africa, Morocco and Egypt have capital to set up industries. In some African countries, money for establishment of industries is borrowed from international donors and financial institutions such as World Bank. In some African countries, rich individuals are able to establish industries. There are also foreign investors.

(iii) **Availability of market**

The large urban centres with increasing population numbers provide market for industrial products. Some African countries have formed trading blocs that have enlarged the market for member states. There is also a large market outside the continent.

(iv) **Availability of power**

Many countries in Africa have hydroelectric power (HEP) projects.

For example, Akosombo in Ghana, Aswan High Dam in Egypt, Kainji in Nigeria, Kariba in Zambia, Ntaruka, Rusizi and Mukungwa HEP stations in Rwanda, Nalubaale HEP in Uganda and Seven Forks Dam in Kenya. All these provide power to industries. Some countries use other sources of power. For example, coal is used in South Africa.

(v) **Availability of transport and communication systems**

There are some major trans-continental highways like Great North Road, Trans Sahara Highway and Trans Africa Highway. These highways help in the transportation of raw materials and manufactured goods to different countries. There are also railway connections that help in the transportation of finished products. Water transport is also used.

There is also a well developed communication system. This keeps the market and industrial sector connected all the time.

(vi) **Availability of labour**

Many people are employed in industries. Majority of the people employed are unskilled. People with skills that are required in the industrial sector are sometimes from outside Africa. Many people are being trained in order to acquire the required skills.

Quick facts

Factors favouring industrialisation in Africa

- (i) Availability of raw materials
- (ii) Availability of capital
- (iii) Availability of market
- (iv) Availability of power
- (v) Availability of transport and communication systems
- (vi) Availability of labour
- (vii) Peace and stability (absence of conflict)
- (viii) Government policy

(vii) **Government policy**

The governments in Africa support growth and development of industries. This is usually done through enacting laws that protect industries from foreign competition. The governments sometimes reduce taxes on raw materials needed to set up industries. These industries would help in reducing unemployment.

(viii) **Peace and stability**

Peace is a guarantee to industrial development in any country. It ensures that labour is available for use in the industries. Peace also enables industries to be set up and even raw materials to be delivered to the industries. Industrial development requires that manufactured goods are delivered to the market for consumption, which is also possible when there is peace.

Activity 15.4

With the assistance of your teacher, carry out a study of an industry near your school. Make a report of your findings under the following sub-headings:

1. Type of industry
2. Factors that influenced its location
3. Benefits the industry has had to the local population and the country at large
4. Market for the finished products

15.3 Major industrial areas of Africa

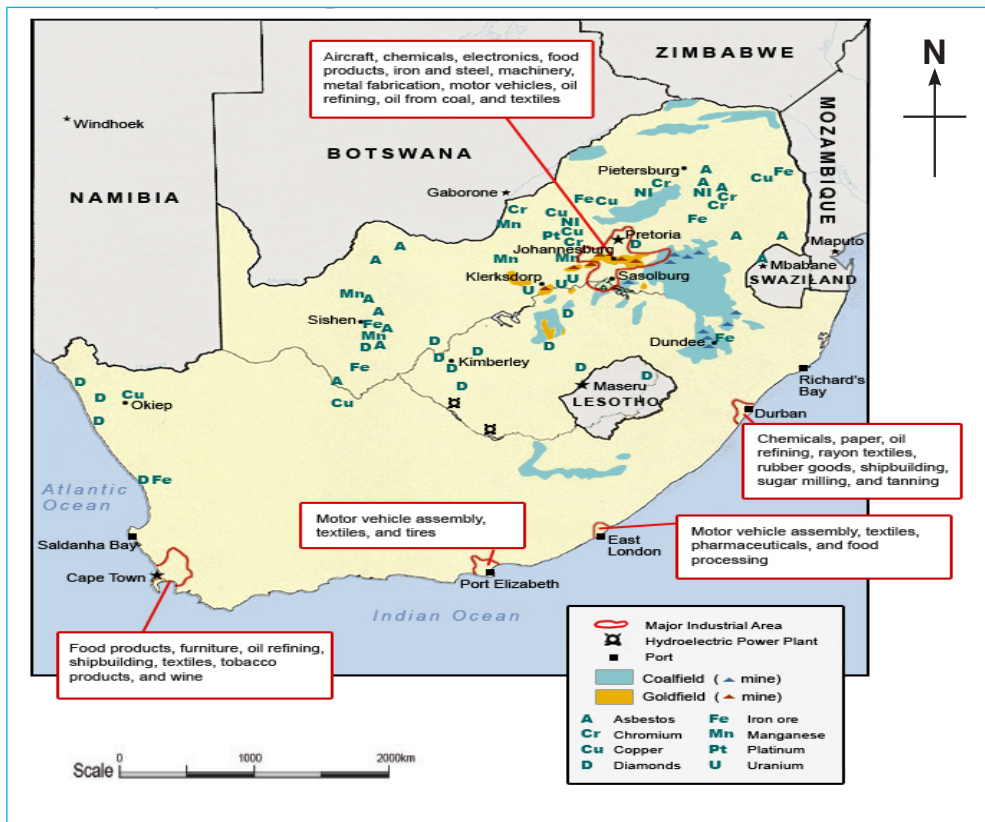
15.3.1 Industrial development in South Africa

South Africa is the most heavily industrialised country in Africa. This is because it was in contact with the developed countries for a long time before many other African countries.

The Dutch settled in South Africa and developed the country. As industries were developing in Europe, they were also developing in South Africa. Manufacturing industries are the biggest contributors to South Africa's national income.

There are four major industrial concentrations in South Africa. These are:

- (i) The Rand region
- (ii) The Western Cape centred on Cape Town
- (iii) The Eastern Cape centred on Port Elizabeth and East London
- (iv) The Durban-Pinestown region of Natal



Source: www.mining.com

Fig. 15.4: Map showing the major industrial concentrations in South Africa

South Africa has a wide range of industries. They include:

- Metal working and engineering
- Food processing industries
- Electrical machinery and equipment factories

- Chemical industries
- Oil refineries industries
- Pulp and paper manufacturing industries
- Car assembly industries

Factors which have favoured industrial development in South Africa

The main factor that has promoted industrial development in South Africa is the **availability of raw materials**. South Africa's industries are mainly found in the region called Witwatersrand (commonly known as the Rand). It is a region that is rich in gold. There are also a wide range of minerals such as coal, diamonds, iron ore, tin, lead, manganese, silver, salt, limestone, fluorspar and phosphates. Owing to the mineral deposits, mining industries have developed. Iron ore and coal have led to the development of heavy industries which manufacture steel.

Agricultural raw materials are also available. These include sugarcane, fruits, maize, hides and skins, fish and tobacco. These products have given rise to many secondary industries such as fruit canning, fish processing and cigarette factories, making of boots and shoes and flour milling.

Other factors which have favoured industrial development in South Africa are:

(i) **Well developed transport and communication networks**

The well developed transport network makes it possible to transport raw materials and finished products to the market. International airports and modern communication links have made it possible for gold and diamonds to be transported easily to the rest of the world. The seaports are able to handle large vessels which carry raw materials and finished products. This has led to development of industries at coastal towns such as Cape Town, Port Elizabeth, East London and Durban.

Quick facts

Factors that have favoured industrial development in South Africa

- Well developed transport and communication networks
- Availability of market
- Availability of power
- Availability of labour
- Availability of capital
- Availability of water
- Foreign investment
- Government policy

(ii) Availability of market

The high population in South Africa provides internal market for the goods produced in industries. Goods are also sold to external markets in African states and Western Europe.

(iii) Availability of power

South Africa has a large supply of coal which is an important source of energy. Coal does not give off much smoke or ash. This has made many industries in South Africa use it as a source of energy. In addition, it has enough electricity supply to run industries.

(iv) Availability of labour

There is a lot of cheap labour from rural areas of South Africa and from the neighbouring countries such as Botswana, Lesotho, Swaziland, Namibia and Mozambique. South Africa has many people trained in different skills required in the industrial sector.

(v) Availability of capital

The country is able to sell the precious minerals such as gold and diamonds which fetch a lot of money. This money is used to develop industries.

(vi) Availability of water

Many industries depend on water from River Vaal. This river has been dammed in order to store water for industries at the Rand.

(vii) Foreign investment

Foreign investors find South Africa attractive with its low-wage labour, large European market, unrestricted sites for industrial development, cheap coal and other raw materials. The Government actively encourages foreign investment to reduce exports of raw materials and process them within South Africa.

(iv) Government policy

The Government encourages home production by restricting certain imports and financing large basic industries such as electricity supply and phosphate production. Individual projects are also sponsored. The Government is also improving and extending transport and communication systems.

Activity 15.5

Use textbooks or the Internet to research about the importance of industrialisation to the economy of South Africa and the problems affecting industrial growth in South Africa.

15.3.2 Industrial development in Egypt

Egypt is the second most industrialised country in Africa after South Africa. Most of the industrial developments are in Lower Egypt. Egypt is not able to grow enough food for its growing population because much of its land is a desert. There is therefore need to develop and expand the industrial sector so that exports from the industries can pay for food imports. The main industrial centres are Cairo, Alexandria and Helwan. Other centres are the Suez and Nile Delta.



Fig. 15.5: Map of Egypt showing the major industrial areas

The main industries found in Egypt are:

- Electronics industries
- Chemical industries
- Petro-chemical industries
- Textile and spinning industries
- Engineering industries
- Sugar refining industries
- Food processing industries
- Home appliance industries
- Automobile industries
- Oil refineries

Activity 15.6

Use textbooks or Internet to find out the importance of industries to the economy of Egypt. Explain the problems affecting industrial growth in Egypt.

Factors which have favoured industrial development in Egypt

(i) Availability of power

Hydroelectric power generated from the Aswan High Dam and oil for thermal power has led to the development and growth of industries.

(ii) Availability of raw materials

Egypt has a variety of agricultural raw materials that are processed in industries. The raw materials include cotton, sugarcane, wheat and oranges. Egypt has various mineral resources such as petroleum, manganese, iron ore, gold, coal, fluorspar and limestone.

(iii) Availability of market

Industrial products are sold both in the internal market and external market. Egypt is near the rich countries of Europe so goods are sold to these countries.

(iv) Availability of transport and communication system

A well developed transport system by water, roads and railway has facilitated the development of industries. Modern communication links have helped in

linking the producers to the buyers.

(v) Availability of skilled labour

Egypt has skilled people to work in the industrial sector. There is also high level technology which has led to the development of modern industries.

(vi) Government policy

The Government of Egypt has put up strict control measures on imported commodities. High taxes imposed on imported products have encouraged the development of local industries. The Government has also encouraged foreign investors to invest in the industrial sector.

Activity 15.7

Read again and explain the factors that have favoured industrial development in South Africa and Egypt.

Using a table, summarise factors that are similar in one column and those that are unique to each country in the other column.

15.4 Importance of industrialisation to the economies of Africa

Activity 15.8

Apply the knowledge acquired in the previous class, geographical documents and the local environment to research on the importance of industries to the sustainable development of Africa. Present your findings for class discussion.

Industrialisation in a country plays an important role in the lives of its

people. This is why African countries are making efforts to encourage the establishment of industries.

The following are some of the benefits of industrialisation to the economies of various Africa countries.

(i) **Creation of employment opportunities**

Industries create employment opportunities to many people. This enables them to earn salaries, which raises their living standards. This helps many African countries to reduce the problem of unemployment.

(ii) **Earning foreign exchange**

When manufactured goods are exported, the countries earn foreign exchange. The money earned can be used in the development of other sectors of the economy.

(iii) **Generating revenue for governments**

The industrial sectors pay taxes that are levied by the governments of different African countries. The money earned from taxes is used to provide social services to the people. The money is also used in developing other sectors of the economy.

(iv) **Improved infrastructure**

When an industry is established in an area, transport and communication networks are improved. Power and water are also supplied. Other social amenities such as schools and health centres are also established. All these facilities stimulate development.

(v) **Self-sufficiency**

By developing industries, countries can provide consumer goods and other essential goods instead of relying on imports. This reduces the amount of money that would have been used to import the goods.

(vi) **Diversification**

Development of industries leads to diversification of the economies of Africa. Countries end up reducing reliance on one or two primary products,

Quick facts

Importance of industrialisation to the economies of Africa

- (i) Have created employment opportunities
- (ii) They are sources of foreign exchange
- (iii) They are sources of revenue for governments
- (iv) Have led to improved infrastructure
- (v) Have led to self-sufficiency
- (vi) Have created diversification of the economy
- (vii) Have led to improved international relations

for example reliance on agricultural products like coffee, cocoa, tea and sugarcane.

(vii) Improvement in international relations

Production of industrial products enables countries to engage in international trade. This enables people from different countries to interact.

Did you know?

The power and wealth of developed countries is based on industrial development.

15.5 Problems affecting industrial growth in Africa

Activity 15.9

Use the knowledge acquired from the previous class and textbooks to find out the problems of industrial development in Rwanda and the possible solutions to the problems.

The following are some of the problems affecting industrial growth in Africa.

(i) Shortage of capital

Many African countries have inadequate capital for development of the industrial sector. These countries therefore depend on foreign investors. Sometimes, money has to be borrowed from local banks or foreign financial institutions like the World Bank at a higher interest. This reduces the overall profitability of such industries to their citizens.

(ii) Shortage of skilled labour

Most countries in Africa have shortage of skilled labour especially those with managerial skills. This has led to the hiring of skilled workers from other countries. This increases the cost of running industries as such people are highly paid.

(iii) Limited market

In most African countries, the local market is limited. Although African countries have large populations, their levels of income are low. They do not provide sufficient market for the locally manufactured goods. Such a low demand may not sustain large scale manufacturing.

(iv) **Poor infrastructure**

Many African countries have few roads, railways and port facilities for handling goods on large scale. This may hinder the development of industries because it becomes expensive for raw materials to be transported to the industries. At the same time, finished products may not be easily distributed, because of the expenses involved.

(v) **Competition**

In some countries, there is stiff competition between imported and locally manufactured goods. This is because of the low quality of some products that are manufactured locally. This makes people prefer imported goods. Such goods are like textiles, electronics, shoes and cooking oil. This has made some countries to restrict importation of some goods. Competition has therefore made industrial growth in Africa to be slow.

Quick facts

Problems affecting industrial growth in Africa

- (i) Shortage of capital
- (ii) Limited market
- (iii) Shortage of skilled labour
- (iv) Poor infrastructure
- (v) Competition
- (vi) High operational costs
- (vii) Shortage of raw materials

(vi) **High operational costs**

The cost of acquiring industrial equipment may be very high. Worse still, when such equipment breaks down, it is expensive to repair them. The end result is a delay in the production process, sometimes leading to closure of the industry involved. In some instances, there is high cost of energy especially when it has to be imported, for example, petroleum.

(vii) **Shortage of raw materials**

Fluctuation of agricultural output affects agricultural industries as they may not get a constant supply of raw materials. Industries that depend on imported raw materials may experience shortages when their demand

increases.

15.6 Prospects of sustainable development of industries in Africa

Activity 15.10

Go through the prospects for sustainable development of industries in Africa. Relate them to the Rwandan context by citing examples from the local environment.

Compile your findings then seek your teacher's guidance afterwards.

Labour force in Africa has been steadily increasing due to the growing populations and high proportions of young people. The agricultural sector has become unable to absorb all of them. The industrial sector must therefore be improved and expanded in order to provide employment, goods and services to these people.

The following are some ways of improving and expanding the industrial sector in Africa:

- (i) Providing of adequate and efficient power supplies by investing in new power plants.
- (ii) Improving the quality of infrastructure in order to promote transportation of raw materials and final products.
- (iii) Developing information and communication technologies in order to reduce transaction costs in the industrial sector.
- (iv) Widening the market base by expanding regional markets and international markets.
- (v) Adding value to the quality of products manufactured to make them marketable and competitive.
- (vi) Providing training programmes in managerial, technical and entrepreneurial skills.
- (vii) Promoting a conducive business environment.
- (viii) Developing modern transport network to ease transportation of goods and services.

- (x) Encouraging industries that are more efficient in the use of resources, for example, those that generate less pollutants and waste.

Remember!

Sustainable development thrives where there is good governance, peace and security.

END UNIT ASSESSMENT

1. Briefly explain the three types of industries.
2. Explain five factors favouring industrialisation in Africa.
3. Prepare a summary on the importance of industrialisation to the economies of Africa.
4. Describe the problems affecting industrial growth in Africa.
5. Explain the prospects for industrial development in Africa.
6. Analyse the impact of industrialisation on sustainable development in Africa.

UNIT 16

Transport, Communication and Trade in Africa

Key unit competence

By the end of this unit, you should be able to analyse the impact of transport, communication and trade on sustainable development in Africa.

Introduction

Activity 16.1

Read the following story then answer the questions that follow:

Nduwayezu is a sales lady in Kicukiro. She owns a boutique, and specialises in businesslady clothes. She also offers money transfer service through the local telephone operator.

Last week, she received a phone call from her mother who stays upcountry in Nyamata. Her mother wanted to remind her of annual commemoration ceremony for their late father who passed on three years ago. She also wanted her to buy rice and wheat flour from the city, because these commodities are cheaper in the city than in the village.

On the day of travelling, she chose to go by bus. She loves travelling by road because the roads in Rwanda are in good condition. She couldn't wait to join her mother, because it was a while since they last met.

Using the story above:

1. Identify the various things that point towards transport, communication and trade.
2. Give a brief explanation why you think these three services are important to the people in Rwanda.

The story of Nduwayezu revolves around transport, communication and trade. The meaning of each of these services is given below:

- (i) *Transport* refers to the movement of goods, services and people from one place to another.
- (ii) *Communication* refers to means or ways of passing information from a sender to a receiver.
- (iii) *Trade* is the selling and buying of goods and services.

In this unit, you will cover the following key areas on transport, communication and trade in Africa:

Transport

- (i) Major means of transport in Africa
- (ii) Factors influencing development of transport in Africa
- (lii) Importance of various types of transport in Africa
- (iv) Problems of transport in Africa and possible solutions

Communication

- (i) Major means of communication in Africa
- (ii) Factors influencing the development of communication in Africa
- (iii) Importance of communication in Africa
- (iv) Problems affecting communication in Africa and possible solutions.

Trade in Africa

- (i) Types of trade
- (ii) Importance of trade in Africa
- (iii) Problems hindering trade in Africa
- (iv) Regional and international trade partners with Africa
- (v) Internal and international trade, imports, exports, partnerships and regional integration

16.1 Major means of transport in Africa

Activity 16.2

Explain different modes of transport found in your home areas and school neighbourhood.

16.1.1 Land transport in Africa

Major means of transport in Africa are:

- (a) Land transport in Africa
- (b) Water transport in Africa
- (c) Air transport in Africa

Land transport

Land transport is as old as mankind. Before the invention of the wheel, people used to transport their goods either on their heads and shoulders or carrying with hands or back. They also used animals such as donkeys or camels.

Activity 16.3

Study the photographs below then answer the questions that follow.



A



B

1. Describe the types of transport shown in photographs A and B.
2. Give the advantages of using the type of transport in photograph B compared to that in A.
3. Explain why the type of transport in photograph A is common in many parts of rural Africa.

Share your answers in class for further discussion.

Land transport in Africa occurs in many forms. These include:

- (a) Human portering and animal transport
- (b) Road transport
- (c) Railway transport
- (d) Pipeline transport

Each of these form of transport is discussed below:

(a) Human portering and animal transport in Africa

Activity 16.4

Discuss the advantages and disadvantages of human and animal transport.

Human and animal transport is the oldest known method of transport.

People transport goods by carrying light loads from one place to another. This is called human portering.

Animals like oxen, camels, donkeys and horses are used to carry heavier loads as compared to what people can carry. Animals are made to carry loads on their backs or on carts.

The main advantage of human and animal transport is flexibility. This is because it is possible for goods to reach collecting or loading points from the interior.

(b) Road transport in Africa

Road transport is the most common form of transport. Roads are used by people, animals, bicycles, or motorcycles and vehicles.

Roads are categorised as either all weather roads or loose surface roads. All weather roads (also called tarmac roads) can be used throughout the year irrespective of the season. On the other hand, loose surface roads (also called earth roads) are mostly passable during the dry season, getting muddy and sometimes impassable during the rainy season.

Activity 16.5

Study the following photographs then answer the questions that follow.



A



B

1. Describe the two types of roads shown in photographs A and B.
2. Discuss some of the advantages of having the type of road shown by photograph A.
3. Explain some of the disadvantages of having the road shown in photograph B.

Some major roads link different countries of Africa making movement of goods and services for trade easier. They are called Trans African Highways.



Fig. 16.1: Trans-African highways in Africa

Activity 16.6

Use the map showing the Trans-African Highways to answer the questions that follow.

1. Draw a table to show the following details:
 - (a) Names of the towns at the two ends of each road.
 - (b) Names of the countries that each road passes through.
2. Explain some of the challenges that might have faced the constructing of these roads.

Advantages of road transport

1. Roads are flexible. They can offer door to door transport.
2. They can be used at one's convenience as there is no time schedule for public service vehicles. This increases reliability of road transport.
3. Road transport is relatively faster as compared to human and animal transport.
4. Construction of roads is relatively cheaper compared to other means of transportation such as railway line and airports.
5. Roads act as feeders to other means of transportation such as ports and railway stations.
6. Different roads are classified in different grades but can be shared by different vehicles, bicycles, motorcycles as well as people on foot.
7. Roads open up rural areas leading to establishment of market centres.

Disadvantages of road transport

1. As the number of vehicles on roads increase, it causes traffic jams and congestions that cause delays.
2. Roads are prone to accidents and theft of goods on transit.
3. Fumes from the many vehicles on roads cause air and noise pollution.
4. Loose surface roads are usually affected by weather. For example, they become muddy and impassable during rainy season, leading to delays in the transportation of goods and services. During the dry season, they become dusty, causing poor visibility that may result into accidents.
5. There is also a likelihood of accidents due to poor visibility caused by bad weather such as excessive rains, foggy or misty conditions.

(c) Railway transport in Africa

Railway transport in Africa is not as old as road transport. It was established in Africa in the 19th century during the industrial revolution in Europe. This form of transport is not as developed as road transport.



Fig. 16.3: A train approaching Harare in Zimbabwe

Activity 16.7

Carry out a research to find out the various railway lines in Africa. Present your findings on a map with the following information:

- (a) Existing railway lines
- (b) Proposed railway upgrades and new railway lines

For you to find out!

Find out the history behind the establishment of TAZARA railway line.

- (a) Identify the countries in Africa it serves
- (b) Discuss the reasons for its establishment
- (c) Analyse some of the problems that the railway line faces in its operations

South Africa has the largest railway network in Africa. This is because it uses it to transport minerals such as gold, diamond and coal.

It is important to note that there has been minimal extensions of the railway line in most countries in Africa. This is because it is very expensive to construct railway lines due to the nature of the continent's terrain.

Activity 16.8

1. (a) Identify the countries in Africa that have no railway lines.
Suggest possible reasons why they lack railway lines.
(b) Discuss some of the benefits countries without railway may be missing
2. Suggest possible reasons why railway lines in Africa connect the coast to the interior of each country with only a few lines connecting two or more countries.
3. Imagine you are the minister in charge of transport in Rwanda and you are planning to develop a railway line connecting to the one that reaches the coast. Which railway line in East Africa would you advise the government to connect to and why?
4. Carry a research to find out the recent railway developments in Ethiopia and Kenya.

Advantages of railway transport

1. Trains carry both bulky and heavy goods easily and cheaply.
2. Trains are time bound, making them suitable to passengers and traders who work with tight time schedules.
3. There is no congestion on railways because they operate at specific times.
4. Trains are less prone to accidents compared to motor vehicles.
5. Once railways are constructed, they are very cheap to maintain.

Activity 16.9

1. Using geographical documents or the internet, explain the disadvantages of railways over roads.
2. Discuss the disadvantages faced by countries that have no railway lines.
3. Explain why constructing a railway line from east to west across Rwanda would be expensive.

Disadvantages of railway transport

1. Most of trains in Africa are relatively slow. However, new and fast trains are being developed. These rails are referred to as Standard Gauge Rails.
2. Railway transport cannot offer a door to door service. They are not flexible.
3. It is very expensive to construct a railway line.
4. Different countries have different rail gauges. This makes it difficult to transport goods by railway from one country to another. There is always trans-shipment that leads to destruction or theft of goods.
5. Rails cannot be used during the time of construction like the way they do when constructing roads.
6. Railway lines can only be constructed on relatively flat areas. Tunnels, railway cutting and winding slopes must be constructed in hilly areas, which makes railway construction very expensive.

(d) Pipeline transport in Africa

This is the transportation of liquids or fluids from one place to another. This method of transportation is newer compared to roads and railway. It is least developed in Africa. Substances that are often transported by pipes are oil, water and gas.

It is important to note that pipeline transport is heavily used in the Saharan countries. In these countries, oil is mined and transported all the way to the refineries which are located along the coast line.



Fig. 16.3: A pipeline

Activity 16.10

Draw a sketch map to show the Saharan countries in Africa. On the map, show the pipeline that runs across these countries.

Advantages of using a pipeline

1. Pipeline transport is never affected by weather.
2. There is no congestion or delay in transportation of fluids.
3. It does not pollute the environment.
4. Pipeline transport can be very flexible. It can be constructed to give door to door services to its users. An example is piped water.
5. It is cheap to maintain after construction.
6. It can transport a large quantity of a commodity to its destination without interruptions.

Disadvantages of using a pipeline

1. It can only transport one type of commodity, that is, fluid. Even the fluid must be of the same type.
2. When a leakage occurs, it can result to excess wastage and pollution depending on the type of fluid.
3. It requires a lot of capital to construct a pipeline.
4. Re-routing of pipeline is very expensive.

16.1.2 Water transport in Africa

Water had been used to transport people, animals and goods for a long period of time.

Water transport in Africa is practiced where there are big rivers, lakes (natural and artificial), seas and the ocean.

Rivers and lakes are referred to as **inland water ways** while oceans and seas are referred to as **sea ways**.

Both inland, water ways and sea offer a natural and existing free transport route. Little modification is required for vessels to dock easily. Some of the modification made would be dredging or building of canals.

Lessons from the History class

Explorers such as Vasco Da Gama used water to move long distances where they discovered new areas. Not only did Da Gama find a sea route to India, he discovered the most efficient sailing route there and back. He also visited the Cape of Good Hope in South Africa, Maputo in Mozambique and Malindi in Kenya, all being important harbours then and now.

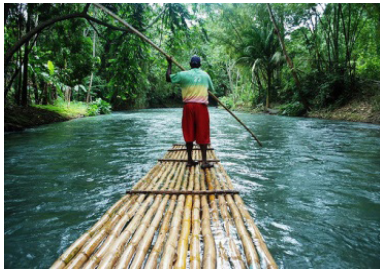
River transport in Africa

Rivers in Africa are navigable for short distances that allow dhows, boats and rafts to sail smoothly. In some sections of rivers, people use simple locally made vessels to cross or to carry out fishing in the shallow sections where the speed of flow of the river is low.

Activity 16.11

Study the photographs of a raft and canoes shown below then answer the questions that follow:

- (a) Compare the materials used to make a raft and a canoe.
- (b) Explain why a raft floats on water.
- (c) Briefly explain some of the possible challenges faced by people who use canoes.



A person using a raft



People using canoes

- (d) Suggest a river in Rwanda where each of the photograph could have been taken.

The following map shows some of the main rivers in Africa that have navigable sections.



Fig. 16.4: Map of Africa showing the main rivers that have navigable sections

The very large rivers in Africa have sections that are deep and wide enough to allow navigation of larger vessels such as steam boats.

Activity 16.12

1. Use the map showing major rivers in Africa and information from atlases to identify and mark the navigable sections of each river.
2. Identify the countries that have sections where rivers are navigable.
3. Discuss possible reasons why the other parts of those rivers are not navigable.
4. Discuss the factors that influence development of river transport in Africa.

Lake transport in Africa

Most of the lakes in Africa that are navigable are found in East Africa. Lake Victoria is the largest inland water way in Africa. It is such a huge lake that it allows large water vessels such as ships to sail across. The lake provides transportation routes between Uganda, Kenya and Tanzania. This has led to the growth of trade in the three countries. Some of the lake ports found on Lake Victoria include Kisumu and Homa Bay in Kenya, Jinja Port Bell, Entebbe in Uganda, Bukoba, Musoma and Mwanza in Tanzania.

These ports have loading and offloading facilities and termini for passengers.

Activity 16.13

1. Use the atlas to find out the two major lake ports on the shores of Lake Victoria in each country then copy and complete the table below.

Country	Lake ports
Kenya	
Uganda	
Tanzania	

2. Find out from geographical documents or the internet the trade goods that are transported across Lake Victoria from:
(a) Kenya to Uganda (b) Tanzania to Kenya
(c) Uganda to Tanzania

The following are other lakes that are used for navigation in Africa:

- (a) Lake Tanganyika acts as a waterway for Tanzania, Burundi, the Democratic Republic of Congo and Zambia. The main lake ports are Kasanga and Kigoma in Tanzania, Bujumbura in Burundi, Mpulungu in Zambia and Kalemie in the Democratic Republic of Congo.
- (b) Lake Malawi acts as a transport route for Malawi, Tanzania and Mozambique. The main lake ports are Nkhata Bay in Malawi, Mbamba Bay in Tanzania and Cobue in Mozambique.
- (c) Lake Albert provides waterways to the Democratic Republic of Congo and Uganda.
- (d) Lake Chad provides waterways to Chad, Nigeria, Cameroon and Niger.

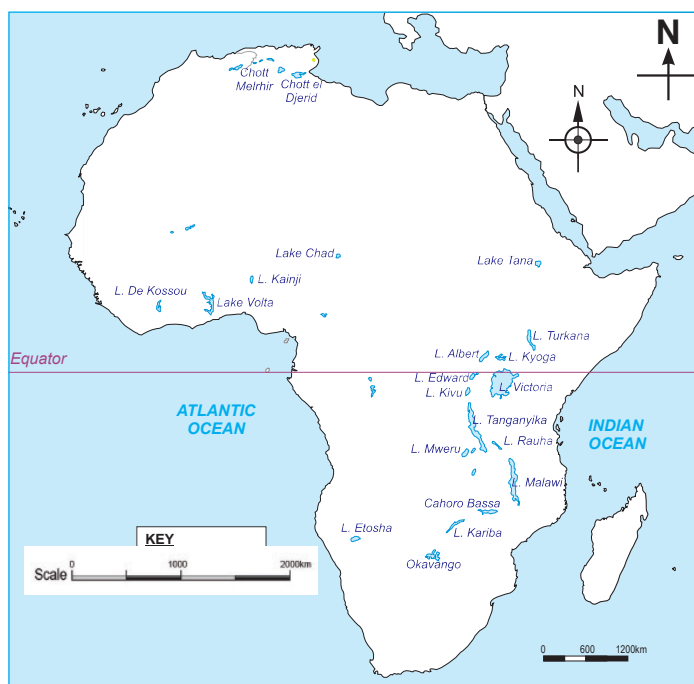


Fig. 16.5: Major lakes in Africa

Ocean transport in Africa (Seaways transport)

Seaways are also known as ocean transport. The oceans and seas that are used for transportation in Africa are Atlantic Ocean, Indian Ocean, Mediterranean Sea and Red Sea.

Seaways are natural transport routes that connect Africa to all parts of the world. Oceans and seas offer free routes in all directions with no maintenance cost.

Large ocean going vessels are used to carry heavy and bulky goods at low costs to different parts of the world. The bulk of the world trade uses seaways.

Activity 16.14

1. Using an atlas, draw a map of Africa and locate and label all the major sea ports.
2. For each port, name the country where it is found.

There are many sea ports around the continent of Africa where ships carrying passengers or goods anchor. The ports have loading and offloading facilities to quicken trade in the regions. At the port, the ocean going vessels refuel, take food, water and other services.



Fig. 16.6: Cargo ship approaching the port of Mombasa



Fig. 16.7: Passenger ship entering the deep sea from the Cape of Good Hope in South Africa

There are defined routes to different ports in Africa and the world.

To make the routes shorter and economical for trade, canals have been constructed in some areas. In Africa, Suez Canal was constructed to join the Red Sea and Mediterranean Sea. This promoted trade from Western Europe to the Far East.

Advantages of seaways

- (a) The routes are natural and free.
- (b) Ocean going vessels carry large and bulky goods easily.
- (c) There is very little traffic congestion if any, except at the loading and offloading bays.
- (d) It is cheaper to transport heavy goods and passengers.
- (e) Waterways are smooth and do not need repair.

Disadvantages of seaways

- (a) Away from the tropics, some seas freeze hindering navigation or entry to the port.
- (b) There are risks and losses especially during typhoons and tsunamis that cause accidents in the sea leading to loss of goods and human lives.
- (c) Water transport is very slow compared to roads, railway and air transport.
- (d) Sea vessels are expensive not only to acquire, but also to maintain and repair.
- (e) It requires experts to operate these vessels, who may not necessarily be available in countries.

Activity 16.15

Use the Internet and geographical documents to research on the following information:

1. Find out the sea ports that East African countries use for handling her exports and imports.
2. Identify some of the commodities transported by sea that Rwanda depends on.
3. Explain some of the challenges Rwanda face when her exports and imports pass through other countries.

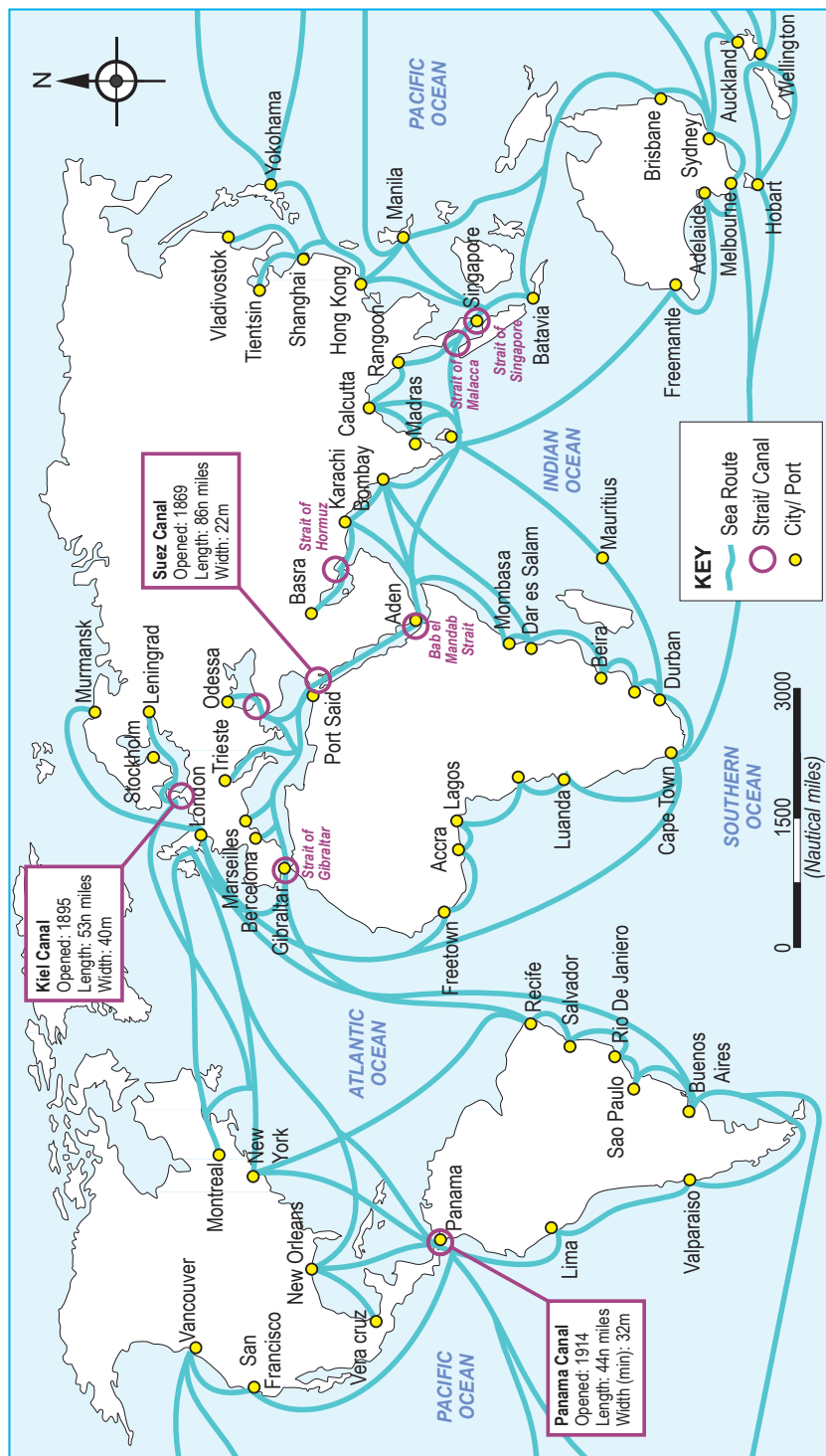


Fig. 16.8: Major sea routes in Africa and the world

16.1.3 Air transport in Africa

This is the movement of people, goods and services using aircrafts. There are different types of aircrafts. Each type is used for different purposes.



Fig. 16.9: A passenger plane taking off from Kigali International Airport

Air transport services can be grouped into two:

- (i) Local or domestic air transport that offers services within a country.
- (ii) International air transport that transports goods and people from their country to other countries or continents of the world.

For air transport to function, there must be airports that have big runways and airstrips where aircrafts can land and take off. Aircrafts load and off-load cargo and passengers at airports.

Activity 16.16

1. Use the Internet to find out the names of the major airports in the following cities in Africa:
 - (i) Johannesburg (ii) Nairobi
 - (iii) Lagos (iv) Cairo
2. Discuss the advantages of using air transport as compared to other forms of transport.
3. Discuss the disadvantages of using air transport over other forms of transport.
4. Discuss possible reasons why Rwanda has few airports.

Some aircrafts such as helicopters do not need runways since they can land at any place where there is space.

16.1.4 Factors influencing development of transport in Africa

Development of transport systems is influenced by a wide range of factors.

Activity 16.17

Discuss factors that may have been considered while constructing roads and airports in Africa.

Development of means of transport in Africa has been influenced by the following factors:

- Historical factors
- Physical factors
- Economic factors
- Capital availability
- Political factors

Each of these factors has been explained in details below:

Historical factors

Some of the routes used in Africa today were developed during the construction of railway line and roads.

Important to note is that these were improved from those that had been used by indigenous people for many years. They also follow into those later used by explorers, slave traders and Arab traders.

Physical features

Construction of roads and railway lines is very difficult and expensive in areas with rugged terrain. Africa has many hills, mountains, ranges and ridges that make the routes longer as they go winding around them. In most cases, they were avoided since it is very expensive to construct tunnels.

Other physical features that have hindered development of modes of transport are:

1. Drainage features such as rivers and swamps
2. Thick vegetation

Economic factors

Means of transportation are constructed in areas that have resources such as minerals and agricultural products. For example, the railway and road networks in South Africa is a result of mining of gold and diamond in the area.

Pipeline transport has been constructed in the Sahara Desert where oil has been discovered because returns outweigh expenses.

There are roads reaching most areas that are rich in agriculture. Where plantations such as tea, coffee, rubber, cereals, cotton, sisal and cocoa, both feeder roads and all weather roads are constructed.

Growth of industries in Africa has encouraged construction of roads, railway lines and airstrips. These means of transport are used to transport finished products to the market and raw materials to factories.

Landlocked countries such as Zambia, Uganda, Burundi and Rwanda have to rely on their neighbours. They have constructed either rail or roads to link to the neighbouring states so that they can export or import their goods effectively.

Availability of capital

For means of transportation to be constructed, there is need for capital. Countries that have adequate capital are able to construct means of transportation because they can buy machinery to do the physical work and hire modern technology as well as experts.

Countries such as those in East Africa do not have sufficient funds to construct railway lines. They rely heavily on what was constructed by the colonialists. It is only recently that Kenya started the construction of Standard Gauge Railway with the help of Chinese government that has provided the capital required.

Quick facts

Factors influencing development of transport in Africa

- (i) **Historical factors** which include routes used by explorers, slave traders and Arab traders and those constructed by colonialists and independence governments
- (ii) **Physical features** which include ruggedness of the land, **presence of** thick vegetation and influence of drainage features such as rivers and swamps
- (iii) **Economic factors**, which include availability of capital to construct roads, railway lines, establish pipelines, support setting up of industries and promote trade
- (iv) **Political factors**, which includes common development ideologies between neighbouring countries that favours development of common transport routes

Political factors

Countries with political differences experience difficulties in constructing means of transport through or joining them. Political instability has also made development of infrastructure difficult. Examples are Somalia and Southern Sudan which have had wars that have hindered the development of roads, railway lines and airports.

Different political ideologies of landlocked countries and their neighbours discourage development of transport systems in Africa. For example, in the case of Angola and Mozambique, which have affected transportation in both Zambia and Zimbabwe respectively. Zambia had to construct a railway to join her with Tanzania that had a different railway gauge.

16.1.5 Evaluation of the importance of various types of transport in Africa

All types of transport systems in Africa are important in facilitating economic development in Africa.

Activity 16.18

Use the Internet or geographical documents to find out how development of transport systems are important in enhancing various economic activities.

Your findings in **Activity 16.18** demonstrate how important to Africa various types of transport are. This is because they play the following key roles in economic development of different countries:

- (a) Promoting trade
- (b) Improving international relationships
- (c) Facilitating growth of industries
- (d) Contributing to development of urban centres
- (e) Improving agriculture

Promoting trade

Improved transport systems contributes to growth of trade in Africa. People are able to take their goods to both local and international markets. African countries import goods from other continents using both waterways and airways. Similarly, they export most of their agricultural commodities to other continents.

Trade within countries has also improved because of good means of transport.

Efficient modes of transport have made trade for perishable and valuable commodities reach the market while still fresh and safe.

Improving international relationships

Nearly each country in Africa is linked to its neighbour by roads. This makes it easy for the flow of people, goods and services. Through this movement, neighbouring countries have improved their relationships and as well as international understanding.

Different cultures are learned and adopted by people moving from one country to another. This also brings about the growth of trading centres along the means of transport or at the border.

Facilitating growth of industries

For any industry to grow, it needs raw materials and market for finished products. Therefore, most industries are located in areas that have good means of transportation. Both bulky and light commodities are transported to the factory by road, railway, air or water.

Industries need services of most of means of transportation. For example, an industry at the port of Mombasa in Kenya uses roads, air, railway, water and pipes to transport finished products to the hinterland and from the hinterland.

Contributing to development of urban centres

Most means of transportation especially roads have opened up the interior of countries in Africa. Many people have settled along means of transportation so that they can access transportation facilities of goods and services.

At the junction of some roads, settlements have emerged. The settlements lead to the growth of trade. For instance, Johannesburg in South Africa has

not only grown as a result of mining of gold but also because of different means of transport such as railway, roads and air.

Old steam engine train had specific areas where they would stop to add water and drop passengers. These areas, though remote, turned into the present urban centres.

Improving agriculture

People used to practice traditional farming such as bush fallowing and shifting cultivation whereby they only needed themselves and animals for transportation of their farm produce.

With the introduction of modern means of transportation into the interior, people started growing cash crops in plantations. Roads and railway lines have greatly increased agricultural production in rural Africa.

Horticultural farms mostly grow perishable crops that have also increased as a result of introducing air transport. Most flowers grown in green houses are transported by air to reach the market before they go bad.

Growing of plantation crops such as rubber, tea, coffee and wheat have increased as a result of the areas having good modes of transportation to the factory for processing to the market.

16.1.6 Problems facing transport in Africa

There are many challenges that affect different modes of transport in Africa. Most of these problems are common to many African countries.

Activity 16.19

Discuss how the following problems affect transport systems in Africa. For each problem, specify how it affects road, railway or air transport.

- (a) Inadequate capital
- (b) Nature of the landscape
- (c) Insecurity

(a) Problems of road transport in Africa

In addition to the problems highlighted in **Activity 16.19** above, road transport also experiences the following problems:

(i) High cost of maintenance

Roads, which are the mostly used means of transport, require regular maintenance. They wear out quite often, sometimes developing potholes. If not repaired, the tarmac gets worn out. Regular maintenance is expensive.



Fig. 16.10: A section of a road with potholes

(ii) Harsh climatic conditions

During the rainy season, some earth roads become impassable. Transportation of goods and services become impossible. This discourages trade within and outside Africa. Perishable goods such as milk, vegetables and meat go bad before reaching the market.

(iii) Rugged landscape

Most countries have varied terrain such as mountains, valleys, hills and plateaus. It is therefore very expensive to construct a road over the hills and down the valleys. It would be double expensive constructing a road on hilly areas compared to plateaus and plains. Rugged terrain discourages road construction.

(iv) Insecurity

The rate of crimes on the roads is high when compared to other means of transport. There are many car-jackings happening on some roads. This makes some people to prefer other means of transport to road transport.

(v) Prone to accidents

The rate at which accidents occur on the road is higher than in any other means of transport. This calls for careful use because when accidents occur, road users incur losses, in some cases lives being lost.

Activity 16.20

Study the photograph below the answer the following questions.

1. Describe the scene in the photograph.
2. Explain the factors that lead to such scenes.
3. Suggest ways in which such a problem can be avoided.



(v) Traffic congestion

Some roads in large urban centres are not wide enough to accommodate the large number of vehicles that use them. This results in traffic congestion causing delays in movement from one place to another. Such towns need space to construct multiple lane roads.

(b) Problems of railway transport in Africa

Railway transport experiences the following problems:

(i) Different railway gauge

Most railways in Africa were built by colonial governments. Different colonial governments build rail lines of different gauges. As a result, in some cases, trains cannot cross from one country to another. This leads to transshipment which is very expensive and causes delay and damage of goods.

(ii) Accessibility of railway transport

Most African countries have a single railway line connecting the coast to the interior and ending in a major town. This limits the number of people able to access and use it. Most people prefer to use other forms of transport.

(iii) Slowness

As compared to other means of transport, railway transport is slow. This makes it the last choice especially when goods to be transported or people to travel need to do so urgently.

(iv) Not flexible

Unlike road transport, trains are not flexible. They can not be used to offer door-to-door services, as they operate on fixed railway lines and routes.

(c) Problems of pipeline transport in Africa

Pipelines require a high cost of construction and maintenance. In addition, they are limited to transporting fluids such as petroleum products, gas and water.

The other problem is that pipes can easily be damaged by people with the intention of stealing the products being transported.



Fig. 16.11: A leaking pipe

In cases where the pipeline gets punctured, it is likely that much of the commodity being transported will be lost before repairs are done. This is because pipelines are sometimes laid in remote areas that cannot be accessed quickly.

(d) Problems of water transport in Africa

(i) Fluctuation of the volume of water

Most rivers in Africa have volume regime that fluctuate with seasons. During the dry period, the volume of water becomes too low to allow boats and ships to sail in them. They can only be used during the rainy season.

(ii) Natural barriers along the river

Some rivers are characterised by rapids, cataracts and waterfalls that hinder smooth flow of the water. For example, River Nile is only navigable in some sections and not all along its course.

(iii) Inadequate port facilities

Lack of modern equipment at the port to load and offload the goods increases transport cost because it might take longer to clear a ship. This has discouraged transportation of goods by ship to Africa where most ports are not well equipped.

(iv) Shallow harbours

Shallow harbours and ports along the coastline is a hindrance to development of ports since a lot of money is required to deepen the harbours. This means large ocean going vessels cannot anchor in such ports. They are normally offloaded in the deep sea and the cargo loaded into smaller vessels to take the goods to the shore. This increases the overall cost of transporting goods through such ports.

(e) Problems of air transport in Africa

(i) Cost

Air transport is very expensive for most people. Some countries in Africa have no airline of their own while some airlines have collapsed due to inadequate finances to fund their operations.

(ii) Coverage

Air transport does not cover many parts of the country. It has few landing or connecting places. This limits the number of people who can use them.

(iii) Terrorism

Air transport has been a target by terrorists in the recent past. This makes many people unwilling to use it.

(iv) Bad weather

Air transport is usually affected by bad weather. It is not best suited to operate in foggy, extremely rainy or a strong windy environment.

Activity 16.21

Discuss possible solutions to the following problems facing various forms of transport in Africa for presentation in class.

- (a) Inadequate capital
- (b) Insecurity
- (c) Pipeline vandalism
- (d) Shallow harbours
- (e) Accidents
- (f) Bad weather

16.2 Communication in Africa

Communication refers to methods used to pass messages from one person to another. There are three main types of communication. These are verbal, written and audio visual communication.

Activity 16.22

1. Discuss what you understand by each of the following form of communication. Give specific examples in each case:
 - (a) Written communication
 - (b) Audio communication
 - (c) Audio-visual communication
2. Explain why written communication was not used long ago in Africa.

16.2.1 Major means of communication in Africa

The three major means of communication in Africa are:

- (a) Written communication
- (b) Electronic sources
- (c) Audio communication

16.2.1.1 Written communication

This involves conveying information through writing. The reader and the writer must be able to understand how to read and write for it to be effective.

Written communication can further be divided into:

- *Printed and hand written documents:* Examples of these forms include newspapers, magazines, letters, telegrams, fax and billboards.
- *Electronic sources:* Examples of these forms include the internet and e-learning platforms.

A detailed explanation of each of these written forms is given below:

(i) Newspapers and magazines

Different countries in Africa including Rwanda pass information to the citizens through newspapers.

Activity 16.23

1. Name the different newspapers used in Rwanda.
2. Name any three magazines you are familiar with.
3. Explain why more people living in towns read newspapers compared to those in rural parts of Africa.
4. What measures should be taken to ensure that more people have access to newspapers?

(ii) Letters

This refers to writing and sending messages or information through the post office. However, this form of communication has been declining over time as people have resorted to using Short Message Services (SMS) and e-mails through electronic devices instead of handwritten documents. However, it is still necessary today.

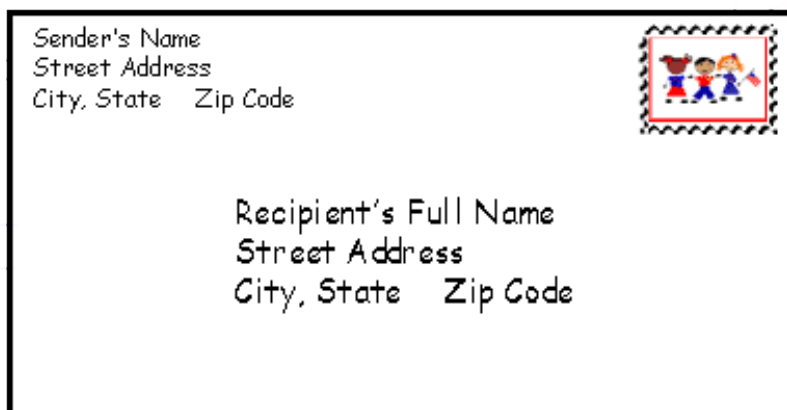


Fig. 16.12: A letter

(iii) Telegrams

These are short messages sent to an individual through a post office. The message is in written form. This method is not common today.

(iv) Fax

In this method, messages which are sent automatically get printed by the receiver's fax machine.



Fig. 16.13: A fax machine

(v) Billboards

Billboards are sometimes referred to as signboards. They give information especially to those who can read and write. Some have pictures that can be read or interpreted correctly by everybody. They are used to pass information such as 'AIDS KILLS'. They are mainly put at very strategic place especially in urban areas or by the road side where everybody using the road can see and read.



Fig. 16.14: A billboard in Rwanda

16.2.1.2 Electronic sources

The various electronic sources of communication are:

(i) Internet

This is a worldwide network of computers linked to each other electronically. This enables people to send and receive electronic messages known as e-mails instantly. This form of communication is also possible using the modern cell phones (smartphones) which are easily connected to the internet. For example, a person in Kigali in Rwanda can communicate with people anywhere in the world as long as they are connected to the internet. Through the internet, people can also share information through social media such as Facebook and Twitter.

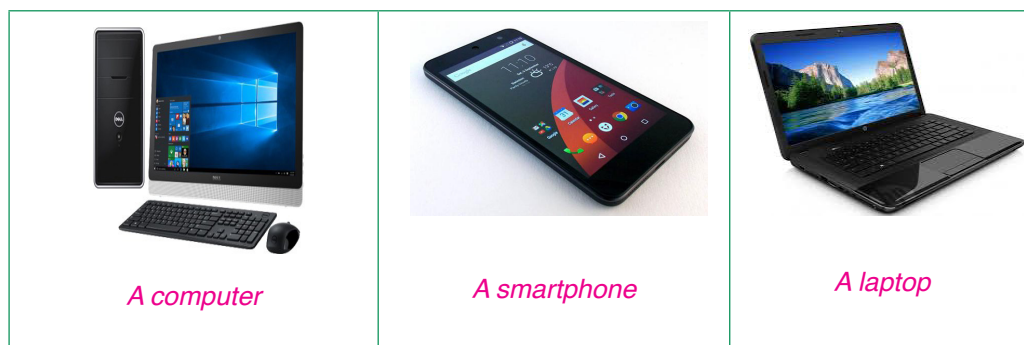


Fig. 16.15: Electronic devices that can access the internet

(ii) Electronic learning

Electronic learning (E-learning) is presentation of educational content through electronic devices such as smartphones, tablets, laptops and computers. It is a learner centred approach in which approved required content is presented to the learner through electronic devices available. The content may have notes and questions related to the topic of study.



Fig. 16.16: Students in schools using e-learning

(iii) Satellite stations

Most African countries have satellites of their own that they use to transmit information to and from other parts of the world.

It is important to note that today, countries are switching to the use of **fibre optic cable**, which is faster, cheap and reliable.



Fig. 16.17: A satellite station in Rwanda

16.2.1.3 Audio communication

This is a form of communication that is passed through a spoken word. The communication may be done face to face or through electronic devices.

Audio communication can take any of the following forms:

(a) Verbal communication

This is the transfer of information by word of mouth. It includes face to face conversations as well as over the telephone. The sender and the recipient of the information must be able to understand the language of use.

(b) Use of radio

Just like letters, radios are widely used to convey information to citizens of a country. They range from simple transistor radios to complex music systems. Today, digital radios are also available. Nearly everybody has a radio or can get access to it. Some countries have many radio stations which communicate in local languages.



Fig. 16.18: Different types of radios

c) Telephones

Fixed line telephones are found in designated places and are used to send and receive voice messages sent using either other telephones or cell phones. Some fixed line telephones use wires while others are wireless.



Fig. 16.19: Different types of radios

(d) Cell phones

This is a rapidly spreading method of communication in Africa. Cell phones are commonly known as mobile phones because they are portable. They therefore enable one to send or receive messages while anywhere where there is network connection. Cell phones are also used to send short messages as well as money transfer in some countries including Rwanda.



Fig. 16.20: Cell phones

16.2.2 Factors influencing the development of communication in Africa

Activity 16.24

Discuss how the following factors influence the development of communication in Africa.

- (a) Availability of capital
- (b) Literacy levels
- (c) Availability of electricity
- (d) Government policy

16.2.3 Importance of communication in Africa

Activity 16.25

Using geographical documents or the internet:

1. Carry out a research to find out how African countries have benefited through the development of the following forms of communication:
 - (a) The internet
 - (b) Newspapers
 - (c) E-learning
 - (d) Mobile phones

Development of communication facilitates economic growth in all sectors of the economy. This is because it makes passing and receiving of information and ideas efficient.

Communication promotes growth of agriculture, trade, tourism, industries and education among other sectors of the economy in any country. For

instance, telecommunication services enable traders to conduct business transactions faster and more efficiently. Some people such as those working in media houses are directly employed in the communication sector. It has also promoted international relationships which encourage movement of people from one country to another.

Other reasons why communication is important in Africa are:

- (a) Communication has led to the development of areas of trade in Africa. People can now trade from any part of Africa and the world without necessarily seeing each other face to face. This can be done through fax, Internet and cell phones.
- (b) With telecommunication services, business transactions are carried out faster and more efficiently. People can now buy and sell their goods and services without having to physically travel to meet with their clients.
- (c) The use of communication facilities has enabled people to transfer or send money from one part of the world to another with ease and very fast. Money transactions today are done using communication devices such as over the Internet and cell phones.
- (d) Modern communication systems allow instantaneous communication worldwide whereby mobility and labour is made available. This has shortened the distance between countries.
- (e) Through communication, people from different parts of Africa are in close contact enabling them learn about each other's way of life very fast. This has promoted friendship between nations.
- (f) Many people have been employed in the communication sector which has improved their living standards. Some are employed as journalists, officers, technicians to repair machines, broadcasters, airtime distributors and researchers.

16.2.4 Problems affecting communication in Africa and possible solutions

Activity 16.26

1. Discuss the possible solutions to the problems outlined in the table below and complete the table as indicated. One has been done for you.

Problems affecting communication in Africa	Possible solution to the problem
Illiteracy	Governments should encourage people to go to school irrespective of their age and social status.
Low income levels/ inadequate capital	
Language barrier	
Low electricity connectivity	
Underdeveloped transport network	
Government policy	
Insecurity	

There are many challenges that affect different forms of communication in Africa. For instance, most people in Africa are not able to buy communication gadgets such as televisions, computers and cell phones due to their low levels of income. As a result, economic growth is not as fast as would be expected.

Activity 16.27

Assume that you are a community leader in the area where you come from.

- (a) Outline the problems affecting effective communication in the community.
- (b) Write a proposal to the government suggesting the measures that should be taken to improve communication in the area.

Although different countries are at different levels in economic development, African countries have some common problems that affect development of communication. These include cost, illiteracy, use of foreign language, low electricity connectivity, poor transport network and insecurity in some countries.

16.3 Trade in Africa

Trade is the buying and selling of goods and services. It is also the exchange of commodities and services for money, with an aim of making a gain.

Goods used in trade refers to tangible items such as tea, cattle and minerals while **services** refers to intangible products such as education, insurance, banking, tourism, shipping and hotel services.

In the past, different communities exchanged goods for goods depending on what they had and what they wanted from the other communities. This method of trade was called **barter trade**.

Today, trade is carried out with money as a medium of exchange.

16.3.1 Types of trade

Trade can be classified into two types. These are **internal** and **external trade**.

16.3.1.1 Internal trade

This is trade that is carried out within a country. It is sometimes referred to as **home** or **domestic trade**. It involves buying or selling of goods within the country.

Internal trade can further be divided into **retail** and **wholesale trade**.

Activity 16.28

Using geographical documents or the Internet, write short notes on each of the following types of trade:

- (a) Retail trade
- (b) Wholesale trade
- (c) Barter trade

Your notes should include definitions and the factors that influence the development of each.

Retail trade is where a trader sells goods to an individual customer. You normally buy goods such as books, bread and milk from a retailer. The retailer buys goods to sell from a **wholesaler**. A wholesaler engages in **wholesale trade**. The wholesaler buys goods in bulk from the manufacturer or from distributors and sells them to retailers.



Fig. 16.21: A retailer



Fig. 16.22: A wholesaler

A wholesaler can also import goods to sell to the retailers. Both wholesalers and retailers operate in villages or urban centres.

16.3.1.2 External trade

This includes **regional** and **international trade**.

(i) Regional trade

This is trade between countries that are found within the same geographical region or regions. It occurs when countries sign an agreement to pursue a common trade policy. For example, trade carried out between Rwanda, Burundi, Uganda and Tanzania is called regional trade.

Most African countries are members of regional trading groupings. This benefits them by providing ready markets with low tariff charges because they operate under certain agreements. This enables each country to benefit.

Activity 16.29

With the help of map:

1. Identify countries that are members of the following regional trading blocs:
 - (a) Economic Community of West African States (ECOWAS)
 - (b) Southern African Development Company (SADC)
 - (c) Common Market for Eastern and Southern Africa (COMESA)
 - (d) Communauté Economique des Etats de l'Afrique Centrale (CEEAC)
2. Carry out a research to find out how Rwanda benefits as a member of COMESA

(ii) *International Trade*

This type of trade is also referred to as **foreign trade**. This involves exporting and importing goods on a global scale. Individual African countries, and sometimes as trading blocs, trade with European and Asian countries as well as with America and Australia. For example, African countries import machinery and vehicles from countries such as Germany and Japan. In turn, they export agricultural products like tea and coffee to such markets.

16.3.2 Importance of trade

Trade enables a country to acquire goods that it does not produce. For example, the industrialised nations such as Britain, France, Germany and Japan require raw materials for their industries some of which are from African countries. On the other hand, African countries require manufactured goods such as machinery, vehicles and chemicals which are not made locally. Other reasons why trade is important is that it enables countries to maintain good relationship with the trading partners, and also encourage business tourism to thrive.

Towns such as Kigali develop and expand as a result of trading activities.

Activity 16.30

Use geographical documents to research on the following ways through which African countries benefit from trade:

- (a) Creation of employment
- (b) Acquisition of foreign currency
- (c) Generating revenue for the government
- (d) Promoting development of transport and communication systems.
- (e) Promoting agricultural development
- (f) Promoting growth of industries

16.3.3 Problems hindering trade in Africa and possible solutions

Activity 16.31

Use the internet or geographical documents to find out how the following problems affecting trade in Africa can be solved.

1. Poor infrastructure
2. Fluctuation of prices in the world market
3. Trade restrictions
4. Smuggling
5. Corruption

Every country in Africa has challenges that limit growth of trade. Some of these challenges are unique to specific countries while others are common to many countries. Unique problems include:

(i) *Political instability*

When there is internal instability because of political reasons, a country may not engage in meaningful trade.

(ii) *Landlocked position*

International trade between landlocked countries and the overseas countries is expensive compared to countries that have sea ports of their own.

Other problems hindering trade in Africa include:

- (i) Climatic changes
- (ii) Effect of pests and diseases
- (iii) Poor infrastructure
- (iv) Fluctuation of prices in the international market
- (v) Competition from cheaper sources
- (vi) Trade restrictions
- (vii) Smuggling and corruption

16.3.4 Internal and international trade (Imports, exports, partnership and regional integration: EAC, ECOWAS, COMESA, CEEAC)

Each country in Africa has internal trade where the people within the country trade with one another. They engage in wholesale and retail trade. Countries also engage in international trade where they export commodities that they produce and import those that they do not produce.

16.3.4.1 Imports

Most countries in Africa with an exception of South Africa import manufactured goods which include heavy machinery, industrial materials, medicines, vehicles and agro-chemicals. These commodities are very expensive. They make some African countries to spend large sums of foreign currency as well as borrow loans to be able to afford the goods.

16.3.4.2 Exports

Africa mainly exports agricultural commodities such as coffee, tea, cocoa, meat and horticultural products. In the event of drought, crop yields go down, causing a reduction of the volume of exports. Sometimes, crops are affected by pests and diseases that lead to lowering of both quantity and quality of produce.

Many countries in Africa have been making efforts to process their agricultural commodities so that they can add value before they export to developed countries. There are also efforts to diversify their agricultural output and embracing green revolution which reduces the effect of climatic changes, pests and diseases.

Since the value of exports is so much lower than the value of imports, African countries experience **trade imbalance** or **unfavourable trade**.

Activity 16.32

The table below shows Rwanda's value of imports and exports in millions of US dollars from January to July 2016.

Study the table and answer the questions that follow.

Month	Value of Imports	Value of Exports	Value Difference
January	168.37	40.03	-128.34
February	205.57	36.90	-168.67
March	206.80	45.13	
April	191.73	42.94	-148.79
May	192.63	50.07	-142.56
June	206.13	53.49	
July	183.89	56.54	-127.35

Source: African Trade Fund (AfTra), 2016

- Calculate the difference in value for the months of March and June.
- Discuss and write a presentation on:
 - Why the imports are so expensive compared to the exports.
 - Things that can be done for the country to have favourable trade.
 - Indicate the months that had the highest export earnings and the ones that had the lowest export earnings.

16.3.4.3 Partnership and regional integration: EAC, ECOWAS, COMESA, CEEAC

Activity 16.33

1. Use geographical documents or internet to research on regional and international trade in Africa and write down the findings.
- 2 Highlight the aims and objectives of the following partnerships and regional integration in Africa:
 - (i) EAC
 - (ii) ECOWAS
 - (iii) COMESA
 - (iv) CEEAC/ECCAS

Regional integration is a process in which neighbouring states enter into an agreement in order to upgrade cooperation in trade through common institutions and rules.

Some of the regional trading blocs in Africa are:

- East African Community (EAC)
- Economic Community of West African States (ECOWAS)
- Common Market for Eastern and Southern Africa (COMESA)
- Communauté Economique des Etats de l'Afrique Centrale (CEEAC), also known in English as Economic Community for Central African States (ECCAS)

Activity 16.34

*Using the information obtained from **Activity 16.29**:*

- (a) Draw maps to show each of the regional trading blocs.
- (b) Carry out a research from various documents or the internet to find out reasons for formation of each trade bloc. Summarise your points under the map representing each trade bloc then make a class presentation.

END UNIT ASSESSMENT

1. Draw a sketch map of Africa. On it, locate and name the three major highways in Africa.
2. Citing examples from Rwanda, explain the importance of road
3. Explain the advantage of road transport over railway transport.
4. Briefly explain the major problems facing river transport in Africa.
5. Discuss the traditional means of communication in Africa.
6. Explain the importance of communication on the development of various countries of Africa.
7. Write a short paragraph about the meaning of trade.
8. Brainstorm on the problems hindering trade in Africa. Write a summary on each point discussed.
9. Explain the importance of:
 - (a) Internal trade
 - (b) International trade
10. Identify and state the importance of regional integration in Africa.
11. Assess the impact of transport, communication and trade on sustainable development of Africa.

UNIT 17

Tourism in Africa

Key unit competence

By the end of this unit, you should be able to analyse the impact of tourism on sustainable development in Africa.

Introduction

Activity 17.1

Using geographical documents or internet, research on the meaning of the following terms:

- (a) Tourism
- (b) Domestic tourism
- (c) International tourism
- (d) Ecotourism

Tourism is the activity involving a person travelling from home to other places for leisure, education, social activities or business. A person who travels to other places for the mentioned purposes is called a **tourist**. When people visit their country for similar purposes, they are called **domestic tourists** and the practice is referred to as **domestic tourism**. When people visit another country, this is called **international tourism** and the people are referred to as **international tourists**.

Ecotourism on the other hand is a recent phenomenon that combines tourism and conservation. Its aim is to care for and preserve nature. It involves using some of the earnings from tourism to conserve the same environment that tourists visit.

The main aim of this topic is to analyse the impact tourism has on economic development in Africa. To achieve this, we will be studying the following sections:

- The major tourist areas in Africa: natural environment, national parks, historical sites and socio-cultural activities
- Factors favouring the development of tourism in Africa
- Contribution of tourism to the development of Africa
- Problems affecting tourism in Africa
- Future prospects for sustainable development

17.1 Major tourist areas in Africa

Africa can be divided into five tourist regions. These are:

- (a) Northern Africa region
- (b) West Africa region
- (c) Central or middle Africa region
- (d) Eastern Africa region
- (e) Southern Africa region

Eastern and Southern Africa are renowned world over for their abundant wild game. Countries such as Kenya, Tanzania, Uganda, Botswana and South Africa have national parks and game reserves as well as sanctuaries for conservation of wildlife.

Activity 17.2

Prepare a slide show on a computer, a printout of images on a paper that is A4 in size or a chart with images cut out from various used magazines and pasted with glue.

17.2.1 Northern Africa

This comprises the Maghreb countries and Sudan. Many of these countries have historical sites and monuments which are the major attractions. Egypt is famous for its pyramids and the Sphinx. These are ranked Africa's

number one attractions. Libya, Tunisia and Algeria have historical sites while Morocco has ancient sites as well as famous waterfalls. Marrakech, Morocco's second largest city has a rich history.



Fig. 17.1: The Great Sphinx of Giza in Egypt



Fig. 17.2: Ancient ruins at Volubilis in Morocco, near the city of Meknes

17.2.2 West Africa

Tourist attractions are scattered in all countries, particularly historical monuments and sites. There are also landforms. In Mali, the city of Timbuktu is famous for its ancient African architecture. Djenné, also in Mali, is an old city established around 800BC. It is famous for its mud houses that are decorated with paint. An example is The Great Mosque of Djenné, which was made of mud, but has now been painted. The largest mud house in the world is located here. This city ranks 4th among the top ten attractions in Africa.



Fig. 17.3: The Great Mosque of Djenné in Mali

17.2.3 Central or Middle Africa

This region is famous for its historical sites, landforms, forests, rivers and associated features. Every country in this region has its own unique attractions. The Birunga Mountains in Rwanda are famous for tracking the mountain gorillas.

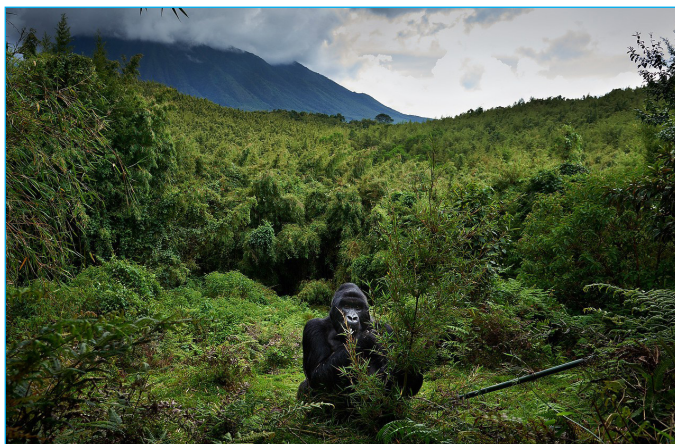


Fig. 17.4: A gorilla in a forest on Birunga Mountains

17.2.4 Eastern Africa

This region is the richest in varieties of attractions. These include:

- The Maasai Mara National Reserve in Kenya boasts of 570 recorded species of birds, 95 species of mammals including zebras, Thompson gazelles and over 2 million wildebeest (*gnu*), famous for their annual migration.
- Mount Kilimanjaro, ranking 8th among Africa's attractions is the largest and highest on the continent. It is a tourist attraction for adventure including mountain climbing.
- Zanzibar has fascinating history. It has amazing beautiful beaches and the Stone Town of Zanzibar which is a UNESCO world heritage. Zanzibar is ranked 9th among Africa's attractions.
- Omo River region is in the south western side of Ethiopia. It boasts of 50 different tribes with a rich cultural heritage. Most traditional customs are still intact.

Quick facts

Tourist attractions in East Africa

- (i) Gorillas and other wildlife in the Volcanoes National Park
- (ii) Mount Kilimanjaro in Tanzania
- (iii) Maasai Mara National Park in Kenya
- (iv) Zanzibar' rich history
- (v) The Omo River Valley, that has over 50 different tribes, fascinating culture and heritage

17.2.5 Southern Africa

This region includes Namibia, Botswana, Swaziland, Lesotho and South Africa. It has a rich history and a variety of attractions. South Africa, Namibia and Botswana have national parks with a wide variety of wildlife. Cape Town is a tourist destination because of the scenic beauty, beaches and sea creatures such as dolphins and seals.



Fig. 17.6: Gauteng-Mpumalanga museum in South Africa

Other important attraction in Southern Africa is Victoria Falls on River Zambezi, between Zambia and Zimbabwe. It is the largest waterfall in the world.



Fig. 17.5: Victoria Falls on River Zambezi

Activity 17.3

Make a list of the major tourist attractions in Africa. Avoid mentioning what has been presented above. Make a list of these attractions in your notebooks and present them to the class in a discussion.

17.2 Factors favouring development of tourism in Africa

Activity 17.4

Using available resources, discuss the factors that seem to favour development of tourism in Africa. Make a summary of these and present your findings to the rest of the class for further discussion and approval by the whole class, under the guidance of the teacher.

Africa is a very popular destination especially for foreign tourists from outside the continent. This is because the conditions for tourism are conducive. The conditions or factors which favour tourism are many and some are more evident in certain regions than in others. These are both physical and human factors.

17.2.1 Physical factors

(a) Climate

Most of Africa is within the tropics and the rest within the warm temperate zone. Africa is therefore endowed with warm to hot as well as sunny climate throughout the year. This is an attraction especially during winter for people living in Europe and North America who want to escape the cold weather. They come to Africa where it is much warmer.

(b) Scenery

Africa has varied scenery from landscape to other physical features. There are snow-capped mountains such as Mt. Kenya that is located along the

equator and Kilimanjaro and Ruwenzori which are in the neighbourhood. Tourists are fascinated to see snow in a hot region. Other sceneries include the Rift Valley and associated features, waterfalls, lakes, volcanoes and volcanic features, the beautiful sandy beaches and cool breezes.



Fig. 17.7: Mount Kilimanjaro – with its two peaks: Mawenzi on the left and Kibo on the right. Take note of climate and scenery in this photo

(c) Wildlife

Africa is endowed with a large variety of flora and fauna because of the tropical climate. Tourists visit countries that have conserved wildlife to view the herds of animals that are not seen in the wild in their home countries.

Animals such as elephants, buffaloes, giraffes, leopards, lions, rhinos, hippos, gorillas, impala, gazelles and crocodiles are a beauty to marvel. There is also a large variety of plant species including mangroves, indigenous trees and marine life especially along the East African coast that tourists view.



Fig. 17.8: Wildebeest during migration in Maasai Mara, Kenya

(d) Unique wildlife trends

The annual wildebeest migration from Maasai Mara to Serengeti in Tanzania is a unique naturally occurring animal trend world over. This phenomenon attracts tourists who come to witness it every year.

17.2.2 Human factors

(a) Traditional culture

Africa has many tribes. Each tribe has its unique culture and traditions. Tourists like seeing people in their traditional lifestyles such as dances, games, cultural festivals and dressing styles. In Rwanda, there are ceremonies such as Kwita Izina, which have been key tourist attractions each year they are held. Traditional dances such as *intore* are also tourist attractions.



Fig. 17.9: The Kwita Izina ceremony in Rwanda

(b) Preserved attractions

There are many monuments and historical sites in almost every country in Africa which tourists come to see. The pyramids and sphinx of Egypt, the architectural structures and the city of Timbuktu (Mali), the numerous forts such as Fort Jesus and the Gedi ruins along the coast of Kenya as well as the numerous museums in many countries all attract tourists.

Other human factors are summarised in the table below:

Human factor	Explanation
Hospitality	Many indigenous people in Africa are very friendly and welcoming to visitors. This encourages tourists to come to most African countries.
Political stability	The peace and political stability prevailing in many African countries created a conducive atmosphere that promote tourism. Tourists prefer visiting countries where they are secure.

Infrastructure	In developing infrastructure of a country, many governments target to improve tourism as well. Many roads to tourist sites are improved on continuously to make the sites accessible. Some areas are reachable by air or water. Wireless communication such as the internet is available in many areas as well.
Accommodation	High-class international hotels are found in many African countries. This promotes tourism. In addition, lodges and cottages are constructed in major towns that tourists visit as well as in national parks and game reserves. Tented camps are also available for enjoyment by the visitors.

Activity 17.5

With reference to available resources or the Internet, discuss how the following factors favour development of tourism in Africa:

1. Publicity
2. Training in tourism
3. Research programmes
4. Government support

17.3 Contribution of tourism to the development of Africa

Activity 17.6

Using available sources or the Internet, discuss other benefits of tourism to the economy of African countries.

The tourism industry contributes immensely to the economy of each country where it is conducted. The following are some of the benefits of tourism:

- (a) Tourism earns a country foreign exchange.
- (b) It is a source of employment.
- (c) It leads to improvement of infrastructure.
- (d) Through embracing ecotourism, it has further led to conservation of wildlife.

- (e) It has created a need for preservation of artefacts which are important in learning about the past.
- (f) Various activities associated with tourism are a source of local revenue.
- (g) Agriculture has also greatly improved due to tourism. This is because of the demand it has created for food, vegetables and fruits in tourist hotels, lodges and resorts.
- (h) There has been a marked growth of training institutions which equip learners with skills necessary to become tourist managers, accountants, tour guides, beverages managers in hotels and housekeepers.

17.4 Problems affecting tourism in Africa and future prospects for sustainable development

17.4.1 Problems affecting tourism in Africa

The tourism industry is facing a number of problems on the continent. They include the following:

(a) Inadequate capital

Inadequate capital in many African countries is an obstacle to expansion of the tourism industry. There is a shortage of capital to improve and expand infrastructure in tourist areas as well as expanding accommodation facilities.

(b) Poaching of wild game

Animals such as the elephants, rhinos and leopards are in danger of extinction because of poachers. These animals are attractions for tourists and if they are exterminated, then tourism will be affected negatively.



Fig. 17.10: A rhino's horns cut off by poachers

(c) Political conflicts and civil wars

Many African countries have experienced political instability meaning that they lack peace. Tourists avoid visiting such countries because of insecurity.

(d) Terrorism

Terrorism is becoming a global issue but it seems a great threat in Africa because of lack of capacity to counter terrorism. African countries are more vulnerable also because of complacency among the citizenry as well as government departments.

(e) Destruction of the environment

Human activities are causing conflicts between people and wildlife.

Agricultural activities, mining and road construction all lead to destruction of the habitat for animals as well as corridors for animal migration. Indiscriminate felling of trees destroys some rare indigenous plants.

*Quick facts***Problems affecting tourism in Africa**

- (a) Shortage of capital to market, promote and maintain infrastructure for the industry.
- (b) Poaching.
- (c) Political conflicts and civil wars.
- (d) Insecurity and terrorism.
- (e) Destruction of the environment.
- (f) Rugged terrain.
- (g) Human encroachment.

Remember!

It is important that we take care of our environment because it is one of the resources we have in generating income. We always need to advocate for a pollution free environment by embracing the 3 R's of conservation, which are:

- Reduce
- Re-use
- Recycle

Activity 17.7

1. Listed below are additional problems facing the tourism industry in Africa.

- (a) Poor infrastructure
- (b) Rugged terrain
- (c) Insecurity within a country
- (d) Demand for land

Discuss how each of the problems listed affects tourism in Africa. Summarise your explanations.

2. Differentiate between problems affecting and problems associated with tourism.

Using available resources or the Internet, explain how each of the problems stated above are associated with tourism.

Apart from problems affecting tourism, there are also problems associated with tourism. It is necessary to know the difference. Some of these are outlined below:

- (i) Increase in drug abuse
- (ii) Shortage of accommodation
- (iii) Change in social values
- (iv) Encouragement of poaching
- (v) Increase in crime
- (vi) Disturbance of wild animals and environment
- (vii) Over-focusing on tourism

17.4.2 Prospects for sustainable development

Africa is loved as a tourist destination. For that reason, there is need for African governments to plan to develop and expand the industry. For the industry to grow and be sustainable, some measures need to be taken to curb the challenges that drag it behind. These include the following:

- (a) Governments need to budget for and allocate funds for the purpose of taking care of tourist sites. Foreign companies need to be encouraged to invest in the countries by building hotels and other tourist resorts.
- (b) Security has to be given priority through co-operation with neighbouring countries to combat terrorism.
- (c) Training and equipping game rangers with modern equipments including weapons as a measure of curbing poaching.
- (d) Efforts have to be made and funds allocated for improvement and establishment of infrastructure in areas that support tourism.
- (e) Land that is reserved for wildlife has to be protected against encroachment.

- (f) Establishment of environmental bodies that would be in charge of supervising the state of the environment and advising on measures of controlling pollution would be vital in maintaining a healthy environment.

Did you know?

Ecotourism aims at conserving the environment while traditional tourism is taking place. Governments need to embrace this new concept and implement the measures to achieve the desired goals. Measures include:

- Respecting the local culture and traditions and safeguarding them.
- Encouraging active participation by local people in the tourist destination areas while at the same time respecting their rights.
- Educating visitors on available resources and the need to conserve and preserve them.
- Conserving and utilising tourism resources sustainably.
- Sharing out the benefits accruing from tourism with the local people by using part of the income to develop their areas.

END UNIT ASSESSMENT

1. (a) Distinguish between internal and international tourism.
(b) Explain the concept of ecotourism.
2. Discuss ways in which tourism contributes to the economy of African countries.
3. Explain problems affecting tourism in Africa.
4. Summarise the prospects for sustainable development of tourism in Africa.

UNIT 18

Development Case Studies

18.1 Agriculture

18.1.1 Agriculture on Polder Lands in Netherlands

Key unit competence

By the end of this unit, you should be able to compare the agricultural development levels on the Polder Lands in Netherlands to Rwanda.

Introduction

Netherlands means low lands, it was covered by flood water from the sea, this is because in one part were marshes, swamp land or land covered with poor soil. This land has been reclaimed from the sea and is protected from possible flooding by sea water using high walls called **dykes**. An area of reclaimed land is called **polder**.

To understand more about agriculture on Polder Lands in Netherlands, we shall discuss the following sections:

- Introduction to the Netherlands
- Agriculture on the Polder Lands in the Netherlands: Dairy farming and Horticulture
- Factors influencing Agriculture on the Polder Lands in the Netherlands
- Importance of agriculture in the Netherlands
- Unique problems hindering agricultural expansion on the Polder Lands and possible solutions
- Livestock farming in the Netherlands

Quick facts

In Netherlands, land reclamation started in the 17th Century. Reclaimed lands, also **Polders** in Netherlands, are mainly used for:

- (a) **Livestock farming**, including dairy farming, ranching and domestication of animals such as pigs, camels, mules and buffaloes.
- (b) **Horticulture**, which includes the growing of fruits, vegetables and flowers. This is mainly done in **greenhouses**.

18.1.1.1 Introduction to the Netherlands

Netherlands is one of the countries in Western Europe. It lies between the North Sea to the north and Belgium to the south.

Activity 18.1.1

The map provided below shows some of the countries that make up Europe.



1. Use the map to develop a table with the following columns:
 - (a) Countries that boarder Netherlands.
 - (b) The sea that boardsers Netherlands.
 - (c) The location of Netherlands in relation to:
 - (i) France
 - (ii) United Kingdom
 - (iii) Denmark
2. Use the atlas or a research from the Internet to find out:
 - (a) The source of Rhine River
 - (b) Countries through which Rhine River flows

Netherlands is one of the countries through which Rhine River flows. It is at the coast of the Netherlands that River Rhine enters the sea.

The total land area of the Netherlands is approximately 33,717 square kilometres. By 2016, the country's population was estimated at 16,973,795.

18.1.1.2 Agriculture on the Polder Lands in the Netherlands: Dairy farming and horticulture

The polders are highly utilised for agriculture, mainly for dairy farming and horticulture.

Activity 18.1.2

1. Identify areas in Rwanda where land reclamation has been carried out.
2. State the economic activities practised on such reclaimed land.
3. Explain how land reclamation has helped in agricultural development in Africa.
4. Use the Internet and Geographical documents to:
 - (a) Find out the location of the polders in the Netherlands.
 - (b) Find out the economic activities carried out in the polders.

In Netherlands, land reclamation started in the 17th Century and the reclaimed land has been used for various activities such as dairy farming and horticulture.

Important point that should be added is

Steps of land reclamation taken in Netherlands

- Dykes /embankments were built to enclose part of the sea water. The sand was imported from Germany and Sweden
- Water was pumped out of these areas using wind mill and electrical pumps
- The dry land was planted with reeds to control weeds and preserve moisture in the soil and to absorb more salt from the soil.

- When they were dry then reeds were cut and used as mattresses lied on surfaces of the dykes to protect the wall from sea wave erosion.
- More dry soils were added to the dried areas
- Soil was grouped according to the type for different uses
- Ditches were cut at the floor of the enclosed land in order to put water into the main pump and back into the sea.

(a) Dairy farming in the Netherlands

Dairy farming focuses on milk production. Dairy farmers mainly keep high milk yielding Friesian breed of cattle. A single farmer can keep as many as five hundred cows. The cattle are allowed to graze in free roaming stables in summer. In winter, they are kept indoors where they are fed on protein rich hay, fodder, grass and silage.

The main dairy products exported from the Netherland include cheese, butter and condensed milk.

Activity 18.1.3

Study photographs A and B below then answer the questions that follow.



A



B

1. In a paragraph, suggest the method of feeding in each of the two photographs.
2. With reasons, briefly explain the season that may influence the type of feeding in the two photographs.

(b) Horticulture in Netherlands

Horticulture is the growing of fruits, vegetables and flowers. Netherlands has one of the most highly developed horticultural sectors in the world. Most of the horticultural crops are grown in green houses.

Activity 18.1.4

Study the photographs below then answer the questions that follow.



1. Identify the crops shown in photographs A and B.
2. Discuss the advantages of growing crops in greenhouses.
3. Identify places in Rwanda where horticulture is practised in greenhouses.

18.1.1.3 Factors influencing agriculture on the Polder Lands in the Netherlands

Just like in Rwanda, agriculture in the Netherlands is influenced by several factors.

Activity 18.1.5

Carry out a research using the Internet or geographical documents to find out how the following factors have influenced agriculture in Netherlands.

- (a) Relief of the land
- (b) Availability of capital
- (c) Advanced research
- (d) Availability of water
- (e) A hardworking population

Present your findings for class discussion.

Other factors that influence agriculture in the Netherlands include the following:

(i) Climate

Netherlands experiences temperate climate with mild winters, cool summers and well distributed rainfall. This has made it possible for different agricultural activities to be carried out.

(ii) Efficient transport system

The highly developed transport system in the Netherlands enables farm produce to reach the market while still fresh.

(iii) Government policy

The government facilitates development of agriculture by encouraging farmers to form cooperatives which assist them especially in marketing their produce.

(iv) Advanced technology

Farmers in the Netherlands apply highly advanced technology in agriculture. For instance, they use computerised controls in greenhouses where they control moisture and temperature to what is ideal for the crops. Thus the crops are not affected by variation in climate whether winter or summer.

(v) Market

The large population within Netherlands and in the rest of Western Europe provides a ready market for farm produce.

18.1.1.4 Importance of agriculture in the Netherlands

Agriculture in the Netherlands is one of the very important economic activities. Some of the reasons are outlined below:

- (a) Agriculture is a major foreign exchange earner.
- (b) Agricultural activities provide employment opportunities to many people.
- (c) It is a major source of food for the country's population.
- (d) It has led to the development of agro-based industries.
- (e) To the government, it is a source of revenue.

Activity 18.1.6

Discuss the following questions and prepare points for class presentation.

1. Explain what you understand by agro-based industries.
2. Give examples of agro-based industries in Rwanda and in the Netherlands.
3. Explain various ways through which the government of Rwanda gets foreign exchange.
4. Imagine you are the minister in charge of agriculture in Rwanda. Using Netherlands as your model, suggest the various ways you would help increase agricultural production in the country.

18.1.1.5 Unique problems hindering the agricultural expansion on the Polder Lands and possible solutions

Although the Dutch use highly advanced technology in agriculture, they do experience some problems that affect the sector. Some of the problems are unique because most of the farms are found on land that has been reclaimed from the sea. This is not so in many other countries in the world.

Activity 18.1.7

The table below outlines some of the problems that affect agriculture on the polders in the Netherlands. Using the Internet or geographical resources, find out the possible solution to each problem and complete the table appropriately.

	Problem	Possible solution
1.	Areas with soils made of peat and sands are infertile.	
2.	Seepage of sea water causes salinity in the soil	
3.	Collapse of the dykes could lead to flooding of the farms.	
4.	Some areas experience waterlogging because the land is low-lying.	
5.	Prolonged dry spells lead to shortage of water needed for irrigation.	
6.	Increased use of chemicals is an environmental hazard.	

18.1.1.6 Livestock farming in the Netherlands

Activity 18.1.8

Discuss the following questions then write your answers in your notebooks.

1. Apart from pork, give other products obtained from pigs.
2. Discuss how farmers benefit from keeping sheep and horses.

Livestock farming refers to the raising of domestic animals such as cattle, pigs, sheep, and horses.

Apart from dairy farming which is mainly practised in the reclaimed areas in the Netherlands, there are other types of livestock reared in the country. Some farmers keep pigs for production of pork and other related products. Others keep sheep while there are those who keep horses. Camels, mules and even buffaloes are other types of livestock reared.



Fig. 18.1.1.1: Some of the livestock kept in the Netherlands

END UNIT ASSESSMENT

1. Explain why the polders are ideal for agriculture in the Netherlands.
2. Explain the mechanism of protecting polders from flooding by sea water.
3. Explain why farmers in the Netherlands prefer keeping the Friesian breed of cattle.
4. Describe the advantages of growing horticultural crops in greenhouses.
5. Compare the level of agricultural development on Polder Lands in the Netherlands with that of Rwanda.

18.1.2 Plantation Agriculture in Brazil

Key unit competence

By the end of this unit, you should be able to analyse plantation agriculture development in Brazil.

Introduction

Brazil is a very large country with a population density of about 25 people per square kilometre. This makes it possible to set up large farms without affecting too many settlements.

To understand more about plantation agriculture in Brazil, we will focus on the following sections:

- Introduction to Brazil
- Plantation agriculture zones in Brazil
- Characteristics and types of crops grown (coffee, tea and sugarcane)
- Factors favouring plantation agriculture in Brazil
- Importance of plantation agriculture in Brazil
- Problems and solutions associated with plantation agriculture

Quick facts

- A **plantation** is a large scale farm in which one type of crop is grown. Usually, the crop is grown for sale. Some plantations have factories where the crop is processed before it is marketed.
- Brazil has low population density, which allows large farms (plantations) to be established.
- Main cash crops grown in Brazil include tea, sugarcane, sisal, coffee, cocoa, corn and soya beans.

18.1.2.1 Introduction to Brazil

Brazil is the largest country in South America and the fifth largest in the world after Russia, China, Canada and USA. It covers approximately 8,349,320 square kilometres.



Fig. 18.1.2.1: Location of Brazil on the continent of South America

Brazil's main drainage is the Amazon River. It extends to the Atlantic Ocean with a coastline that stretches for about 7,491 kilometres. Brazil has a population estimated at 209,398,410, making it the fifth most populated country in the world after China, India, USA and Indonesia.

Activity 18.2.1

Use an atlas, geographical documents, or Internet for this activity.

- Draw a sketch map of Brazil showing the states where plantation agricultural zones are found.
- Write down the characteristics of the crops grown in Brazil.
- Explain some of the factors favouring plantation agriculture in Brazil.
- Discuss the importance of plantation agriculture in Brazil.
- For each of the problems facing plantation farming in Brazil, suggest possible solutions.

Did you know?

Christ the Redeemer in Brazil is a symbol of Christianity across the world. The statue has also become a cultural icon for both Rio de Janeiro and Brazil. It is listed as one of the Seven Wonders of the World.

Plantation agriculture in Brazil, characteristics and type of crops grown

Brazil has many areas where plantations have been set up. These are mainly on the eastern parts of the country. Since the country has a low population, it allows room for large farms to be established. Apart from the north eastern and Amazon regions, most of other parts of the country have fertile soils and experience moderate to high rainfall. Crops grown in the plantations include sugarcane, coffee, cocoa, corn and soya beans.



Fig. 18.1.2.2: The map of Brazil showing plantation zones

Activity 18.2.2

Carry out a research to find out the similarities and differences between plantation agriculture in Brazil and in Rwanda.

Characteristics of plantation agriculture in Brazil

The following are some characteristics of plantation agriculture in Brazil:

- (a) Most of the plantations are owned by foreigners.
- (b) It is in the plantations, also known as 'Fazendas,' that most of the production of cash crops is done.
- (c) Farming is highly mechanised.
- (d) Owners of plantations use hired labour.
- (e) Compared to plantations in other countries, Brazil has some of the most extensive plantation farms.
- (f) Crops grown on these plantations include coffee, tea, sugarcane and sisal.



Fig. 18.1.2.3: Aerial coffee plantation in Sao Paulo State, Brazil

Activity 18.2.3

Study carefully the photograph below to answer the questions that follow



1. Explain four uses of the products obtained from the crop shown in the photograph above.
2. Use the Internet or other Geographical documents to identify four places in Brazil where this type of crop is grown.
3. Suggest reasons why this farm appear successful.
4. Describe the climate best suited for the growing of the crop shown in the photograph.
5. Compare and contrast commercial farming in Brazil and that of Rwanda.

18.1.2.2 Factors favouring plantation agriculture in Brazil

Activity 18.2.4

Use the Internet or geographical resources to research on how the following factors favour plantation agriculture in Brazil.

- (a) Good transport system
- (b) Availability of market
- (c) Government policy
- (d) Availability of capital
- (e) Availability of labour
- (f) Role of the Brazilian Agricultural Research Corporation

Plantation agriculture in Brazil is favoured by a number of factors. They include:

- (a) Availability of vast land for farming.
- (b) Farms are managed by people who have been trained.
- (c) There is availability of capital as owners of large farms are able to get finances from banks to run the farms.
- (d) Water is also readily available for irrigation in areas which lack sufficient rainfall.
- (e) The land is flat which is ideal for mechanisation.
- (f) Brazil has well-developed transport facilities for transporting farm inputs and produce.

18.1.2.3 Importance of plantation agriculture in Brazil

Activity 18.2.5

Discuss the importance of agriculture to both farmers and the government of Rwanda. Compare and contrast the importance of plantation agriculture in Brazil and Rwanda.

Plantation farming is a major activity contributing to the economic development in Brazil. Some of the contributions include:

1. Provision of revenue to the government.
2. Creation of employment opportunities.



Fig. 18.1.2.4: Plantation agriculture provides employment to many people

3. Generation of foreign exchange for the country from exports.
4. Provision of market to the small scale farmers.
5. Skill development for those involved in different farm activities.

18.1.2.4 Problems and solutions associated with plantation agriculture in Brazil

Plantation agriculture in Brazil is not without problems. One of the problems is occasional outbreaks of fires in sugarcane farms. This causes massive losses.



Fig. 18.1.2.5: A fire outbreak in a sugarcane plantation in southern Brazil

Activity 18.2.6

The table below outlines some of the problems that affect plantation agriculture in Brazil. Using the Internet and geographical resources, find out the possible solution to each problem and complete the table below appropriately.

Problem		Possible solution
1.	Prolonged drought especially in northeast region and Amazon basin. In these areas, rainfall is not well distributed.	
2.	Some areas have infertile soils which limit the desired harvest. This is common in Brazilian grassland.	
3.	Inadequate infrastructure such as roads and railways.	

4.	Inadequate capital among some farmers.	
5.	Use of hired labour which is expensive.	
6.	Migration of rural population to urban areas causing labour shortage.	
7.	Frequent fire outbreaks and diseases in plantations.	
8.	Price fluctuation of produce in the international market.	

Discuss your answers with the rest of the class.

Solutions to the problems associated with plantation agriculture in Brazil

1. There was the construction of the Cadro Dam in 1903 which sorted out the problem of prolonged drought by providing water for irrigation.
2. Financial institutions give out loans to farmers with minimum interest rate. This is to solve the problem of inadequate capital.
3. Infertile areas have been utilised for animal grazing other than leaving them to lie idle.
4. In areas experiencing semi-temperate climate, grains are grown. This makes such areas economically viable.
5. In order to keep up with increasing production, crops are immediately taken to the market. This solves inadequate storage facilities.
6. The government reduced tax burden and controlled exchange rate, which allowed price stability.
7. Transport has been solved by the use of trucks which carry goods to the market places on highways.
8. Fire engines and other measures have been availed on plantation farms in Brazil to counter attack fire out breaks.

END UNIT ASSESSMENT

1. Explain five factors that favour plantation farming in Brazil.
2. Outline four characteristics of plantations in Brazil.
3. Explain four problems experienced in plantation farming in Brazil.

18.1.3 Agriculture in the USA

Key unit competence

By the end of this unit, you should be able to analyse the levels of agricultural development in the USA.

Introduction

United States of America (USA) is a vast country that has varied agricultural activities in different regions. The activities range from small scale mixed farming with intensive cultivation of horticultural crops to very large scale, highly mechanised farms that produce single crops such as wheat and corn. Animal rearing is widespread with ranches in the grassland areas while in other areas, there is intensive mixed farming where animal keeping is on small scale.

In this unit, agriculture in the USA has been discussed more under the following sections:

- Introduction to the USA
- Regionalisation of agriculture in the USA
- Agricultural systems in the USA
- Factors favouring agricultural development in the USA
- Agribusiness in the USA: Agrichemicals, farm machinery, crop production, processing and seed supply
- Unique problems hindering agricultural expansion and possible solutions in the USA

Did you know?

1. Today's American farmer feeds about 155 people worldwide. In 1960, that number was 26.
2. Raising beef cattle is the single largest segment of American agriculture.

18.1.3.1 Introduction to USA

USA is one of the countries on the continent of North America. It is a Federal Republic divided into fifty states including Alaska, a non-contiguous state and Hawaii, an **archipelago** state. USA is a large country with an area of nearly 9,826,630 square kilometres, making it the third largest in the world after Russia and Canada.

According to Worldometers (www.worldometers.info), USA is the third in the world by population with China as first and India as second. By 2016, USA's population was estimated at 322,762,018.

Activity 18.1.3.1

- Using your dictionary, explain the meaning of the following words:
 - Non-contiguous
 - Archipelago
- Describe the location of Alaska in relation to the rest of the USA.
- Using the Internet or an atlas, describe the location of the Hawaii archipelago in relation to the rest of the USA.



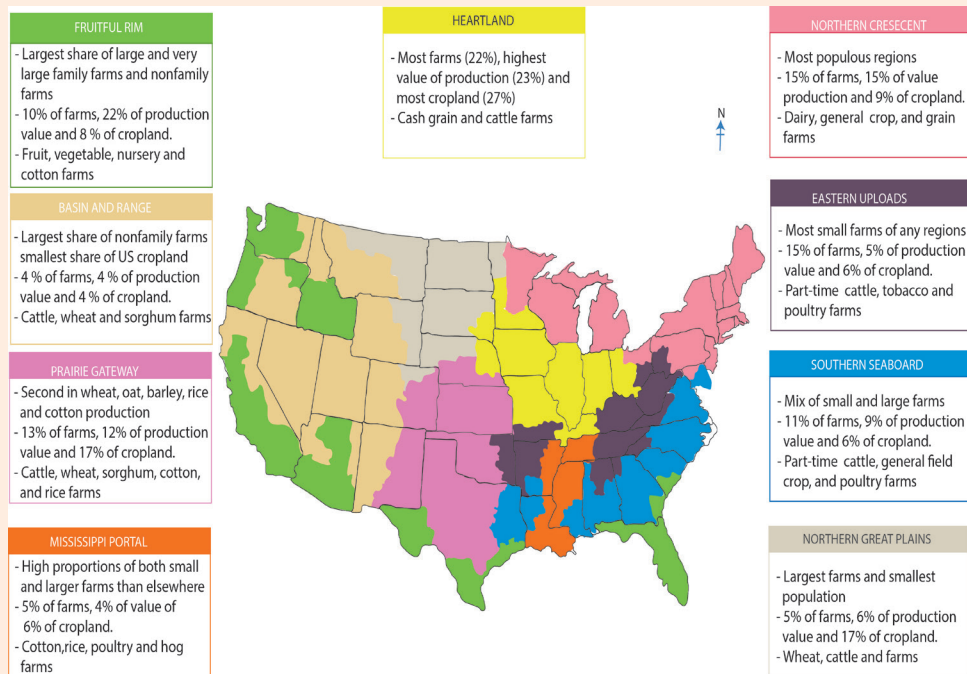
Fig. 18.1.3.1: Map of the United States of America

18.1.3.2 Regionalisation of agriculture in the USA

USA is a very large country with diverse landscapes and varied climatic conditions. As a result, agricultural activities vary from one region to another. Regionalisation of agriculture refers to the zoning of agricultural types and systems which are carried out mainly due to varied climate and nature of landscape in different areas in the country. Each zone is unique in the characteristics of agriculture.

Activity 18.1.3.2

The map provided below shows the agricultural zones in USA. Use it to answer the questions that follow.



1. Identify characteristics of agriculture in each of the nine zones indicated.
2. Explain why each region is utilised as indicated in the map.

USA is a major exporter of food because of her highly developed agriculture. Each region produces for domestic and export market. The major crops grown in the northern plains where the population is fairly low include wheat, oats, barley and corn. Here, the farms are very large and highly mechanised.



Fig. 18.1.3.2: Mechanised wheat farming in the Palouse of Eastern Washington State

Activity 18.1.3.3

Use the Internet or text books to research on the major crops grown in each of the states and complete the table below. One has been done for you.

	State	Major crop(s)
1.	California	Fruits (such as oranges, grapes, lemons, plums, berries) vegetables, rice and cotton
2.	Wyoming	
3.	Texas	
4.	Florida	
5.	Iowa	
6.	Pennsylvania	
7.	Kentucky	
8.	North Dakota	

Note that each state represents a zone. In the very dry areas such as parts of California and the neighbouring states, crop production is through irrigation. The main crops are fruits and vegetables.



Fig. 18.1.3.3: Fields of carrots are watered in late March 2015 in Kern County, California

18.1.3.3 Agricultural systems in the USA

The agricultural systems practised in USA vary from place to place depending on the nature of the landscape, climate and population density. However, some areas are under systems that were introduced by the early settlers and have continuously improved with the introduction of modern technology in agriculture.

Activity 18.1.3.4

Use geographical documents or the Internet to research on the following agricultural systems in USA. For each system, give examples of the types of products and states where it is carried out.

- (a) Mixed farming
- (b) Irrigation farming

Make a presentation in class for discussion.

Apart from **mixed** and **irrigation farming** you have discussed above, there are other agricultural systems in USA, some of which are outlined below:

(a) Ranching

Ranching is rearing of livestock in large numbers on a rangeland. Ranching in USA is mainly practised in the open grasslands in states such as Montana and North Dakota among many others. Some ranches extend hundreds of kilometres where the animals are looked after by cowboys riding on horses. Some farmers keep cattle while others keep sheep in ranches.



Fig. 18.1.3.4: A cowboy in a ranch in McGinnis Meadows, Montana, USA

(b) Small scale intensive farming

This farming aims at maximising the yields through means such as application of manure and fertiliser. Farming is capital intensive with high inputs per unit area. The land is always under cultivation and is characterised by high yields. Some farms have both livestock and crops.

(c) Large scale arable farming

This is a system of farming characterised by very large farms that are highly mechanised. Each farm produces a single crop for export. Single farmers have hundreds of acres of land under one crop. This is common in areas where the land is generally flat or gently sloping to allow use of machines in activities such as land preparation, planting, application of pesticides and harvesting.

Activity 18.1.3.5

Use geographical documents or the Internet to research on the dominant agricultural systems in each of the following regions in USA.

- (a) North eastern region
- (b) North western region
- (c) South western region
- (d) Mid-west region (for example in Texas)
- (e) Southern coastal areas

Present your findings for class discussion.

18.1.3.4 Factors favouring agricultural development in the USA

Generally, factors that favour agriculture in the USA can be categorised into **natural factors** and **human factors**.

(a) Natural factors

From the perspective of natural factors, agriculture in the USA has been favoured by factors such as climate, soils and topography.

(i) Climate

USA has varied climate which favours a wide range of agricultural systems. In some places, agricultural activities are determined by prevailing climatic conditions. For instance, in areas that have ranches and the areas with large scale arable farms, farmers depend on natural rainfall for growth of pastures or crops.

(ii) Soils

Originally, most of USA's agricultural areas depended on natural soil fertility. However, with continued use of the land, soil fertility is maintained by adding chemical fertilisers so that high yields can be sustained.

(iii) Topography

The topography of USA's is ideal for agriculture because land is gently sloping or generally flat. Apart from the Rocky and Appalachian mountain ranges, the rest of the country has a favourable landscape.

(b) Human factors**Activity 18.1.3.6**

Using geographical documents or the internet, research on the human factors that favour agriculture in the USA. Make a class presentation from your findings.

18.1.3.5 Agribusiness in the USA

Agribusiness is a business operation that may include farming that is done as a business and any other businesses that are directly or indirectly dependant on agriculture. Agribusinesses may produce agricultural commodities, process agricultural products, distribute agricultural produce or supply goods and services to farmers. Note that an agribusiness can be a very large enterprise or a small scale business benefiting directly or indirectly from agriculture.

Activity 18.1.3.7

Use geographical documents to find out and make a list of six agribusiness activities in Rwanda. For each business, indicate how it is related to agriculture. Copy and complete the table below with the information that you have found. Two examples have been done for you.

Business	How it relates to agriculture	Example of a place where the business is found
Selling of tractors	Tractors are used in ploughing the land	Kigali
Tea processing	Tea is an agricultural product	Near tea farming areas

In USA, there is a wide variety of agribusinesses. Some of them are outlined below:

(i) Making of agrichemicals

The demand for agrichemicals is very high leading to the presence of different types of factories where such products are made.

(ii) Manufacturing of farm machinery

There are numerous industries engaged in the manufacture of farm machinery such as tractors, combine harvesters, milking machines, feed mixers and other agro-related equipment. Such machines make farm activities efficient.

Quick facts

Agribusinesses may produce agricultural commodities, process agricultural products, distribute agricultural produce or supply goods and services to farmers. Agribusinesses in USA include:

- Making of agrichemicals
- Manufacturing of farm machinery
- Commercial crop production
- Production of animal feeds
- Food processing
- Seed supply



A milking machine



An automatic egg collector



A tractor

Fig. 18.1.3.5: Examples of farm machinery

(iii) Commercial crop production

Most farmers in USA carry out farming as an income generating activity. For instance, the large wheat and corn farms produce for local and international market. Thus the farmers are like business people.

(iv) Production of animal feeds

Small scale livestock farmers require feeds for their livestock since the animals do not always go out to graze especially during winter.

(v) Food processing

This is a widespread industry that provides the local population with processed foods. Examples include fruit, vegetable, meat canning, flour

milling, milk processing and baking. Food processing can be done at home for immediate consumption or on a large scale for sale. Processed foods last longer than fresh produce.



Fig. 18.1.3.6: Examples of simple food processors at home

(vi) Seed supply

Seed supply is important in the USA because it provides seeds for the season. Before supply, seed processing companies get the best varieties of seeds that easily fetch market in different regions of USA. Their businesses are anchored on several factors including seed yields and seed quality (germination and vigor), which is usually unpredictable due to growing conditions. Another factor is market demand for certain crops, which may vary significantly from one year to the next.

Various seeds are made available for the farmers, including every kind of grasses, flowers, vegetables and grain. Others are onions, garlic, spices, coffee, beans and nuts. There are also lavender, meadowfoam and mint or peas, beans and pumpkin seeds.

Importance of agribusiness in USA

Agribusiness is an important economic sector without which agricultural activities would not succeed. Agribusiness facilitates the supply of agricultural input to the farms. It also enables inputs to the farms. It also enables farmers to market their produce. Other than benefiting those directly involved in farming, there are many other people who earn their living through businesses that relate indirectly to agriculture.

Activity 18.1.3.8

Discuss and make notes on the importance of agribusiness under the following subheadings:

- (a) Provision of farm inputs
- (b) Transportation
- (c) Creation of employment opportunities
- (d) Encouraging the development of infrastructure

Share your notes with the rest of the class.

18.1.3.6 Unique problems hindering agricultural expansion and possible solutions in USA

Farmers in various parts of the world face common problems such as weather changes and fluctuation of prices of commodities in the world market. However, in USA, there are some unique problems that hinder expansion of agriculture.

Activity 18.1.3.9

Use geographical documents or the Internet to explain how the following problems hinder expansion of agriculture in USA. For each problem explained, suggest possible solutions. An example has been done for you.

Problem	Explanation	Possible solution
High usage of water which depletes the water resources.	In areas where agriculture depends on irrigation, expansion of farming is limited by the amount of water available.	Building of dams for storage of water and supplying of water to different farms at different times to avoid excessive use at a particular time.
Soil deterioration due to monoculture.		
Excessive use of fossil fuels.		
Restrictive migration policy.		
Expansion of urban centres.		
Competition in the global market.		
Unfavourable weather conditions.		

Compare the problems hindering agricultural development in the USA with those experienced by farmers in Rwanda. Explain how farmers in collaboration with the government of Rwanda have overcome these problems to ensure a food secure nation.

END UNIT ASSESSMENT

1. Describe the location of USA on the North American Continent.
2. Explain why agricultural activities vary widely in USA.
3. Explain the natural factors that favour agriculture in USA.
4. Discuss some of the solutions to the unique problems that affect agricultural expansion in USA.

18.2 Industrialisation

18.2.1 Industrial Development in Germany

Key unit competence

By the end of this unit, you should be able to compare the level of industrial development in Germany in Relation to Rwanda.

Introduction

Germany is one of the world's most industrialised nations. The range of industries in the country include heavy engineering industries, chemical industries, car manufacturing and machinery industries among others.

Industrial development in Germany has been discussed in this unit in detail under the following key sections:

- Industrial development in Germany
 - Introduction to Germany
- Ruhr industrial complex in Germany
 - The major industries in the Ruhr region
 - Factors for the Ruhr industrial development
 - Importance and problems of industrialisation in Germany

Quick facts

Industrial development is a process in which a country establishes manufacturing enterprises which gradually expand to cover many areas of the economy. This leads to an increase in production activities. For this to happen, a country must have the necessary inputs such as raw materials, capital, power, labour and market.

18.2.1.1 Industrial development in Germany

Britain was the first country in Europe to industrialise. Despite being endowed with natural resources required to industrialise, Germany had to wait until the **unification** of its states to surpass Britain in industrialisation. Since then, it has maintained the pace, because factors such as a good education policy that supplies the country with talented and skilled labour and good governance.

Did you know?

Just like unification in Germany, it was not until after the 1994 Genocide against the Tutsi that Rwanda started achieving economic prosperity, including industrialisation. This is because before then, the country was run by a divisive government, whose priority was to continue holding onto power and not developing the country. The peace brought by President Kagame's government set the stage for development, spelling out flagship points that in 2000, were spelled out in vision 2020 programme.

Introduction to Germany

Germany is one of the countries in Western Europe. It is the fifth largest country in Europe, covering an area of approximately 357,022 square kilometres. By 2016, the country's population was estimated at 81,248,691, making it the second largest population in Europe after Russia. It shares borders with nine other countries.



Fig. 18.2.1.1: Location of Germany

For a long time, Germany had large **coal reserves** located in the areas of Saar, Ruhr, Upper Silesia and Saxony. Today, the reserves are almost exhausted. It also boasts of **Iron deposits** sited in the areas of Erzgebirge, Harz Mountains and also in Upper Silesia. It's these natural resources, coupled with favourable political climate and supportive economic policies, which has helped it to industrialise.

18.2.1.2 The Ruhr Industrial Complex in Germany

Ruhr is a short form German Ruhrgebiet also known as Ruhr area, Ruhr region, or Ruhr valley, it is a polycentric urban area in North Rhine- Westphalia, German.

The Ruhr Industrial Complex is among the oldest and most industrialised regions in Germany. The Ruhr region lies near the Ruhr River which rises in the hills of central Germany and flows generally to the west to join the Rhine River at Duisburg.

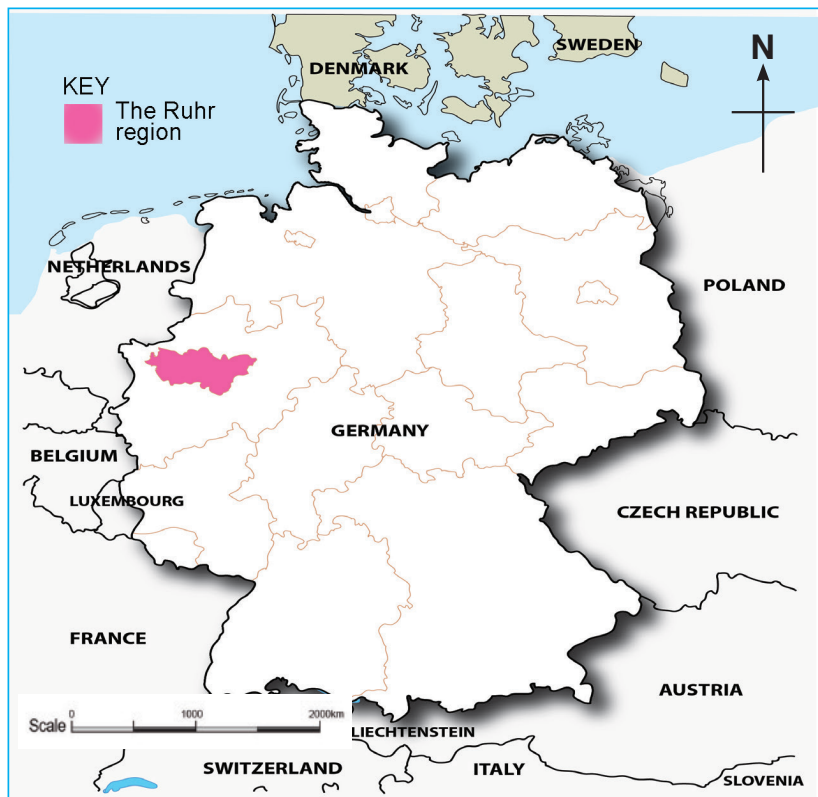


Fig. 18.2.1.2: Location of the Ruhr region in Germany

18.2.1.3 The major industries in the Ruhr Region

The Ruhr region is the oldest and largest manufacturing area of Germany. It is Europe's largest producer of iron and steel. The initial reason for industrial development in the region was the presence of large deposits of coal that occurred very close to the surface. The coal seams were exposed in the Ruhr valley while the deepest seams were at about 800 metres below the

surface. The thickness of the coal seams was one to three metres. These favourable conditions led to large scale coal mining in the region.

The region has large industrial cities that are close to each other.

Activity 18.2.1.1

1. Use the Internet or other geographical documents to identify the main cities of the Ruhr Region.
2. Use geography text books to find out the raw materials used in the following industries in the Ruhr region.
 - (a) Iron and steel industries
 - (b) Engineering industries
 - (c) Chemical industries
 - (d) Textile industries

The major industries in the Ruhr region include:

1. Iron and steel industry

This is highly concentrated in Duisburg, Essen, Bochum and Dortmund. This industry is the main consumer of coal while iron ore is imported from Sweden and France.

2. Engineering industry

This industry is found mainly in Essen, Dusseldorf, Dortmund, Duisburg and Solingen. This industry produces agricultural equipment and machinery such as tractors and combine harvesters used in large scale farming, ship building, heavy vehicle manufacturing and armament.

3. Chemical industry

Chemical industry is concentrated in Cologne, Dusseldorf, Essen, Stuttgart, Marl and Leverkusen.

4. Textile industry

This industry is concentrated in Krefeld, Dusseldorf (the main production centre for women clothing), Wuppertal and Gladbeck. It produces silk, cotton textiles, rayon products and carpets.

Activity 18.2.1.2

The chemical industry in the Ruhr region uses by-products of coal and crude oil. Use geographical resources and the Internet to find out the various products from this industry.

Share your findings with the rest of the class.

Other industries in the Ruhr region

In the Ruhr region, there are other industries which include oil refineries, electronic industries and food processing industries. Food processing industries are concentrated in Mannheim, Cologne, Mainz and Bremen.

18.2.1.4 Factors for the Ruhr industrial development

Activity 18.2.1.3

Compare the factors that influence growth of industries in Rwanda with the factors that apply to the Ruhr region. Write a short report on similarities and differences. Ensure you include specific examples of industries in Germany and Rwanda.

Present your findings in class for further discussion.

The development of industries in the Ruhr region started in around 1850. The region grew to become the leading region in manufacturing in Germany and Europe's largest producer of steel, iron and coal. However, there has been a steady decline in industrial activities in the recent years.



Fig. 18.2.1.3: The Rhine-Ruhr city in Germany

The following factors contributed to the initial growth of industries in the region:

(i) **Presence of cheap coal deposits**

The Ruhr was well endowed with high quantities and quality coal deposits lying exposed on the earth's surface while some of it was close to the surface. This was useful in iron and steel industries since it could generate heat of up to 5000°C needed to melt iron.



Fig. 18.2.1.4: Mining of coal from a pit in the state of North Rhine-Westphalia, in western Germany in 2010

(ii) **Availability of water transport**

The region had cheap water transport as raw materials and finished products would be transported along Rivers Ruhr, Lippe, Essen and the Rhine.

(iii) **Availability of iron ore**

Germany had large deposits of iron ore along the valley of River Wupper. This was a major raw material in the production of steel.

(iv) **Presence of ready market**

The large population of Germany and the other countries in Europe provided a ready market for industrial products from the Ruhr region.

(v) **Availability of capital**

The government and private firms provided the required capital for the establishment of industries in the Ruhr region.

(vi) **Availability of skilled labour**

The German people had skills of craftsmen dating as far back as 1800. When modern technology was mixed in this skill, industries emerged very quickly and steadily.

(vii) **Government policy**

The government policy was also favourable. After the Second World War, German government was determined to boost her industrial sector. It invested large amounts of capital and passed policies that favoured industrial growth.

18.2.1.5 Importance and problems of industrialisation in Germany

The manufacturing sector of any country plays a major role in the economy of the country.

Activity 18.2.1.4

- (a) Use the Internet or any other available source to find out the economic importance of the industrial sector in Germany.
- (b) Explain problems affecting the industrial sector in Germany.
- (c) Compare the importance of the industrial sector in Rwanda with that of Germany, giving the similarities and differences.

Prepare from your findings.

In Germany, industrialisation has been important in the following ways:

1. Industries provide employment opportunities to a very large population. Over 70% of Germany's total population works in industries.
2. The government earns revenue from the industries. This is through taxes that manufacturers are expected to pay.
3. Exporting manufactured goods earns the country foreign exchange.
4. Industries have facilitated the development of infrastructure in Germany. These include roads, railways, pipelines and waterways.
5. Many employees in the industries are able to acquire specialised skills which they could use even after leaving employment.
6. Industries provide consumer goods that the citizens require.
7. Some of the largest urban centres in Germany have developed as a result of industrial development. Examples of such towns include Essen, Mainz, Duisburg, Hamburg and Bremen.



Fig. 18.2.1.5: Essen city in the Ruhr Region, Germany

Activity 18.2.1.5

1. Using the Internet or geographical documents, research on the industrial products that Germany exports to Rwanda.
2. Find out some of Rwanda's exports to Germany.

Problems associated with industrialisation in Germany

Despite the many advantages of industrial development, there are some problems that emerge as industries develop. Some are directly related to industries while others are indirect.

Activity 18.2.1.6

Study the photograph below then answer the questions that follow.

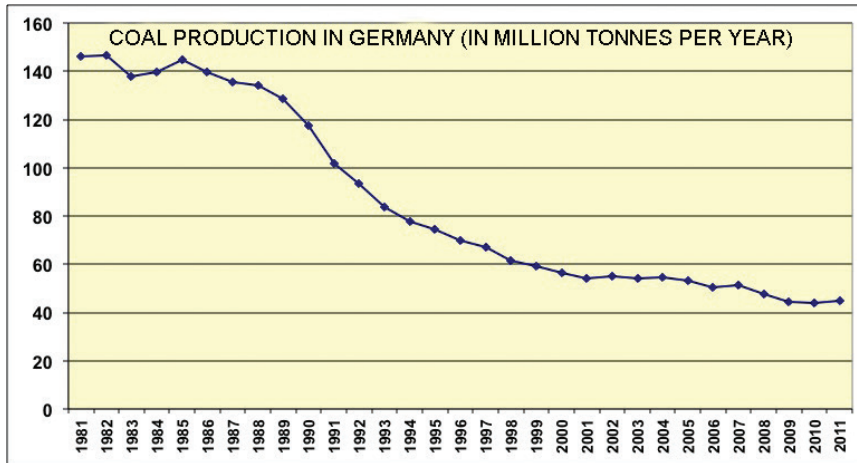


1. Describe the scene in the photograph.
2. Suggest the types of industries that could have such results.
3. Suggest some of the measures that could be taken to avoid such cases.

Present your answer.

Some of the problems associated with industrialisation in Germany include:

1. High level of mechanisation and automation in industries leads to loss of jobs.
2. There has been a decline and closure of some industries due to inadequate raw materials such as iron and coal. This has contributed to loss of jobs and regional imbalances.



Source: AzoMining.com

Fig. 18.2.1.6: Graph showing decline in coal deposits in the Ruhr Region, Germany

3. There is congestion in urban centres due to high population which is attracted by industries.
4. There is a problem of environmental pollution due to toxic wastes that pollute land and water. In addition, gases from thermal power plants and petro-chemical industries have greatly affected European atmosphere.
5. Mining has resulted to land degradation. This is common in areas with coal deposits existing in deeper layers. Extraction has left the land being degraded.
6. There is stiff competition from countries producing similar products. They include USA and Japan. Because of high technology in these countries, they use low costs of production, which poses a threat to the

END UNIT ASSESSMENT

1. Draw a sketch map of Germany showing the location of the Ruhr industrial region.
2. Explain the factors that led to the development of industries in the Ruhr region.
3. Discuss four ways in which industries are important in Germany.
4. Explain three problems associated with industrialisation in Germany.
5. Suggest possible solutions to the problems identified in question 4 above.

18.2.2 Industrial Development in Japan

Key unit competence

By the end of this unit, you should be able to compare the levels of industrial development in Japan in relation to Rwanda.

Introduction

Industrial development plays a key role in the economic development of any country. This is because manufactured goods are of very high value compared to raw goods such as unprocessed agricultural products or unprocessed minerals.

Processing of any raw material adds value to the product. All countries would want to generate income by promoting value addition of whatever raw material they produce. It is through industrialisation that countries such as Japan have developed. On the other hand, some developing countries in Africa are far behind in industrial development, making them to have weak economies.

To understand more about industrial development in Japan, we will discuss the following sections in this unit:

- (a) Introduction to Japan
- (b) Industrial areas of Japan
- (c) The major industries of Japan
- (d) Factors for industrial development in Japan
- (e) Importance and problems of industrialisation in Japan

18.2.2.1 Introduction to Japan

Japan is an island nation in East Asia. It is located in the North West Pacific Ocean off the coast of the Asian continent. It lies to the east of the East sea/ Sea of Japan and to the north of East China Sea.

Japan is made up of over six thousand Islands in the Pacific Ocean. Only four hundred and thirty of these islands are inhabited.

By 2012, the population of Japan was estimated at 127.4 million people. However, Japan has been experiencing population decline and by 2015, the population had gone down to about 126.6 million. The country is the

world's tenth in population size. The largest concentration of population is in Tokyo which is the capital city. The many islands of Japan have a total land area of 377,835 square kilometres.

Activity 18.2.2.1

Japan is an Island nation comprised of four major islands. Use the Internet, atlases and the map showing the location of Japan to answer the following questions:

- Name the four main islands of Japan starting with the largest.
- Cite the largest town in each of the four islands.
- Discuss the importance of the location of Japan in relation to its industrial development.
- Name the four countries that neighbour Japan.
- Name the sea that separates Japan from the mainland of the Asian continent.



Fig. 18.2.2.1: Map showing the location of Japan

Activity 18.2.2.2

Compare Japan and Rwanda under the following subheadings:

- (a) Location of each country
- (b) Size of each country
- (c) Population size of each country
- (d) Population size of the capital cities in each country



Fig. 18.2.2.2: Tokyo, the capital city of Japan

18.2.2.2 Industrial areas of Japan

Even though Japan does not produce most raw materials needed for development of heavy industries, it is the most industrialised country in Asia. There are four major industrial regions in Japan. These are:

1. The Keihin Region
2. The Hashin Region
3. The Isle Bay Region
4. The Kitakyushu Region

Activity 18.2.2.3

Use an atlas, the Internet or geographical documents to identify and name the major cities in each of the following industrial regions of Japan.

1. The Keihin Region
2. The Hanshin Region
3. The Isle bay region
4. The Kitakyushu Region

18.2.2.3 The major industries of Japan**Activity 18.2.2.4**

Use geographical documents or Internet to find out the raw materials used in the following industries in Japan.

- (a) Iron and steel industries
- (b) Ship building
- (c) Aerospace industry
- (d) Petrochemical industries

Present your findings for class discussion.

In the past, Japan used to import all the manufactured goods needed in the country. Nowadays, the country is among the leading exporters of manufactured goods in the world. This is because the country has varied industries making it one of the most industrialised nations in the world. The major industries include the following:

(a) Iron and steel industry

Japan ranks second to China in the production of iron and steel worldwide.

This industry is mainly located in Yawata, Kamaishi, Kimitsu, Honshu and Muroran in Hokkaido.

*Quick facts***Major industries in Japan**

- Iron and steel industry
- Ship building
- Aerospace
- Petrochemicals
- Motor vehicles and machinery industry
- Electronics
- Food processing
- Fish industry



Fig. 18.2.2.3: The steel industry in Kimitsu, near Tokyo

Over half of Japan's steel capacity is concentrated near the major port cities of Himeji, Kobe-Osaka and Tokyo-Yokohama areas of South Central Honshu. Most of Japan's steel plants are situated either on the Bay-Coast or on some canal or river. This is because they depend on imported raw materials and also need ready market for finished steel.

(b) Ship building

Although Japan faces stiff competition from South Korea and China, it has a successful and advanced shipbuilding industry.

(c) Aerospace

Japan is a major producer of space crafts and air crafts. In 1969, Japan established the National Space Development Agency which was tasked with the development of satellites and machines called **launch vehicles** used for launching the space crafts to the space. Other products include commercial aircrafts, helicopters aircraft engines and other parts of aircrafts.



Fig. 18.2.2.4: Mechanics work on MRJ regional jet at Mitsubishi Aircraft Corporation's plant in Toyoyama, Japan

(d) Petrochemicals

The petrochemical industry in Japan is highly developed. The main market for its products are the developing countries of Asia. The main locations for these industries include Kashima, Kawasaki, Oita, Shunan, Iwakuni, Mizushima, Osaka and Yokkaichi.

Products from this industry include Ethylene, Benzene, Toluene, Xylene, Polyethylene, Polyvinyl Chloride and many others.

(e) Motor vehicles and machinery industry

This is a major industry in Japan and supplies vehicles and vehicle parts to almost all the countries in the world. Japan's vehicles have a reputation of good quality, being durable and efficient in fuel consumption. There are many companies that deal with motor vehicle manufacturing. Among them are Toyota, Nissan and Subaru.



Fig. 18.2.2.5: Motor vehicle assembling at the Toyota Kaikan plant at the company's Headquarters in Japan

Activity 18.2.2.5

1. Use the Internet or any geographical material to find out the most successful industry in Japan.
2. Explain the major characteristics of the motor vehicle industry in Japan.
3. What would Rwanda require to develop a motor vehicle manufacturing industry?

Share your findings with the rest of the class.

(f) Electronics

Many of the world's major electronics companies are based in Japan. As a result, Japan has a highly developed electronics industry. The companies include Canon, Casio, Panasonic and Sony.

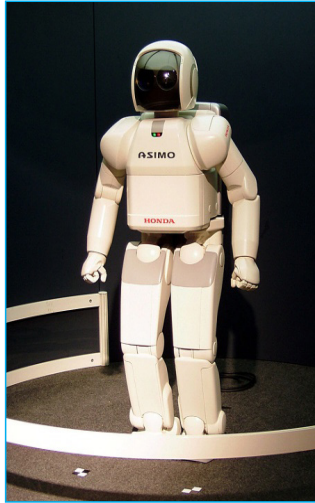


Fig. 18.2.2.6: ASIMO, a robot built by Honda

Japan also specialises in production of robots most of which are used in different operations in industries such as car, aerospace and ship building. In some operations, use of robots is more efficient and precise than use of human labour.

Activity 18.2.2.6

1. With the assistance of your teacher, carry out a research in a nearby town to find out different electronic products produced in Japan that are used in Rwanda. Ensure your report on the findings include the following:
 - (a) Name of the item
 - (b) Manufacturing company
 - (c) Place of origin of the item
 - (d) How popular the item is in Rwanda
2. Explain why Rwanda has no electronics manufacturing industries.

(g) Food

The food industry in Japan is the third largest industry after electrical and transport industry. In this industry, a variety of products, ranging from traditional Japanese items, such as soybean paste (miso) and soy sauce, to beer and meat are produced.

(h) Fish industry

The fishing industry in Japan is one of the largest in the world. Japanese use both large vessels and medium sized boats to catch large quantities of fish. Some of the species caught include bonito, crab, sardines, salmon, shrimp, Pollock, mackerel clams, tuna and yellowtail. Fishing is not only done from Hokkaido to Kyushu but also in the Korean and Chinese waters. From this industry, raw materials for products such as cosmetics, medicines and lubricants are obtained.



Fig. 18.2.2.7: Fishing vessels in Choshi Chiba, Japan

Activity 18.2.2.7

Use geographical documents or the internet to:

- (a) Identify areas in which fishing is carried out in Japan.
- (b) Compare the fish species caught in Rwanda with those of Japan.
- (c) Compare fishing in Rwanda and Japan under the following subheadings:
 - (i) Type of fisheries
 - (ii) Methods of fishing
 - (iii) Fish related industries

18.2.2.4 Factors for industrial development in Japan

There are several factors that have influenced the development of industries in Japan. There are some factors that are common to all the regions in Japan. However, there are others that are unique to each region.

Activity 18.2.2.8

1. Using the Internet or geographical documents, research on how the following factors have favoured industrial development in Japan.
 - (a) Intensive utilisation of raw materials
 - (b) Internal competition
2. Suggest ways through which intensive utilisation of raw materials and internal competition can boost industrial development in Japan.

The following factors are common to all regions:

- (a) Availability of power
- (b) Efficient transport and communication services
- (c) Abundant labour supply
- (d) Availability of local and international market
- (e) Favourable government policy
- (f) Availability of water
- (g) Indented coastline
- (h) Advanced technology

Activity 18.2.2.9

Using the Internet or other geographical materials, carry out a research to find out the main industries and suggest the main raw materials for the industries mentioned in each of the regions listed below. Indicate whether the raw material is locally obtained or imported.

- (a) The Keihin Region
- (b) The Hanshin Region

- (c) The Isle Bay Region
 - (d) The Kitakyushu Region
2. Compare factors that favour industrial development in Rwanda with those of Japan.

Present the conclusions you come up .

18.2.2.5 Importance and problems of industrialisation in Japan

It should be noted that the manufacturing industry in Japan accounts for about 27.5 percent of the economy income and employs about 30 percent of the population. However, its significance is even greater than these numbers would suggest.

Activity 18.2.2.10

Use geographical documents or the Internet to find out: the importance of industries to the economy of Japan.

Industrialisation in Japan has been important in many ways. Some of these are:

- (i) It generates revenue for the government through the taxes it levies on exports. This revenue is used to develop infrastructure such as roads, schools and hospitals.
- (ii) Tourism has developed as a result of many people being attracted to the various industrial manufacturing sites.
- (iii) Industrialisation has ensured good relations with other countries where goods are sold or where raw materials are obtained from.
- (iv) It provides jobs to many people. Jobs provided of include those of managers, engineers, accountants, technicians, among others.
- (v) It promotes local and international trade.
- (vi) Industrialisation has enhanced the development of cities and ports in areas where industries are located. Some of these cities are Sapporo, Yokohama, Kyoto and Hiroshima.



Fig. 18.2.2.8: The City of Sapporo



Fig. 18.2.2.9: Yokohama City



Fig. 18.2.2.10: The City of Kyoto

Activity 18.2.2.11

Discuss how industrialisation contributes to the following in Japan:

- (i) Creation of employment
- (ii) Development of skilled labour
- (iii) Improved standards of living
- (iv) Consumption of quality goods

Problems of industrialisation in Japan

Despite the many advantages of industrial development in Japan, there are some problems that emerge as industries develop. Some are directly related to industries while others are indirect. These problems include:

- (a) **Deforestation:** Industries in Japan have resulted into deforestation because more land for industries is required. This has been compounded by Japan's high population, which requires settlement on the limited land available.



Fig. 18.2.2.11: Deforestation in Aokigahara forest, also known as the Sea of Trees, in northwestern flank of Japan's Mount Fuji

- (b) **Global warming:** It has resulted into high levels of pollution of the environment from the waste materials such as gases emitted from industries. This has contributed to global warming.
- (c) **Competition:** There has been competition from other countries such as China, USA and Germany. This has forced Japan to invest in research to keep up with the competition.

Activity 18.2.2.12

Compare and contrast the problems of industrialisation in both Japan and Rwanda.

Present your work for class discussion.

END UNIT ASSESSMENT

1. Briefly discuss the major industries in Japan.
2. Summarise the factors that favour industrial development in Japan.
3. Describe the importance of industrialisation to the economy of Japan.
4. Compare the similarities between the problems of industrialisation in Rwanda and Japan.

18.2.3 Industrial Development in USA

Key unit competence

By the end of this unit, you should be able to analyse the levels of industrial development in the USA.

Introduction

United States of America (USA) is one of the leading nations in industrialisation. The manufacturing sector employs over twelve million workers and generates 12.5% of the Gross Domestic Product (GDP). Industrial development is concentrated in certain areas where there are favourable factors that attract growth and development of industries.

To understand more about industrialisation in the USA, we will focus on the following sections:

- Industrial regions in USA: Great Lakes Region, Megalopolis, coastal areas around the Gulf of Mexico and the western coast of the USA
- Factors influencing industrial development in the USA
- Importance, problems associated with industrialisation in the USA and possible solutions

18.2.3.1 Industrial regions in the USA

Although there are manufacturing industries in every state in the USA, the country has six areas that can be classified as industrial zones. These are areas with heavy concentration of industries which range from very light, small scale industries to heavy industrial enterprises.

Activity 18.2.3.1

Using the Internet or other geographical materials, write brief notes about each of the industrial regions, indicating the main industrial cities in each of the region.

The main industrial areas in the USA are:

- Great lakes region
- Megalopolis region

- Coastal areas around the gulf of Mexico
- The western coast of the USA

The following map shows industrial areas in the USA.

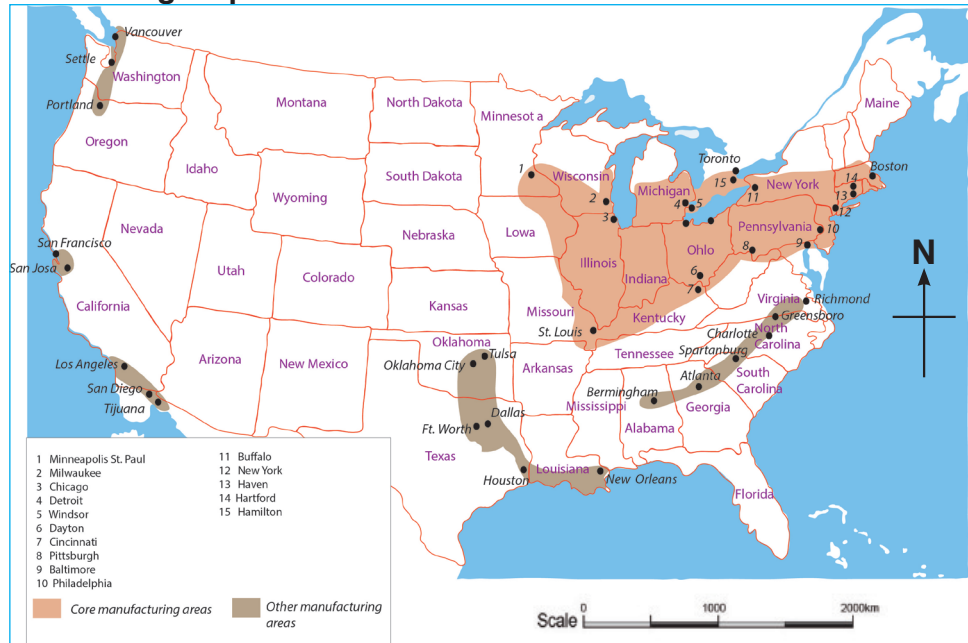


Fig. 18.2.3.1: Map of USA showing the industrial areas

Each of the regions has some dominant industries related to the main raw materials readily available in the region. However, common to all regions are food processing industries.

The table below shows some of the industries in major industrial regions in USA.

Region	Main industries	Some raw materials
The western coast of the USA	Ship building, electrical equipment, textile machinery, clothing industry, transport equipment, pharmaceutical industries, food processing	Iron, steel, coal, timber, oil, cotton, agricultural food products, chemicals
Megalopolis region	Oil refining, mining equipment, steel milling, chemical industries, synthetic rubber, clothing industry, food industries	Minerals: Crude oil, petroleum products, Sulphur, phosphates, iron and steel. Agricultural products: Cotton, wool, agricultural food products

Coastal areas around the gulf of Mexico	Oil refining, chemical industries, textile industry, food processing, pharmaceuticals, fishing equipment	Crude oil, agricultural food products, cotton
The Great Lakes Region	Automotives, consumer products, medical, process industries, energy, heavy equipment, aerospace, transportation	Iron ore, coal, salt, cement, limestone, petroleum products, gypsum, potash, wheat, corn, soybeans

18.2.3.2 Factors influencing industrial development in the USA

There are several factors that influenced the development of industries in USA. There are those factors that were common to all the regions, while others were unique to each region.

Availability of raw materials is one of the common factors to all regions, although the type of the dominant raw materials varies from one region to another. This determines the main type of industry in each region.

Another common factor is a **developed infrastructural system**, including modern transport and communication systems. For instance, USA has a well developed network of roads and railways. This has made it easy for raw materials to be transported to factories and finished goods to be moved to market centres. It also makes it possible for people to travel to and from work with ease.



Fig. 18.2.3.2: A passenger train at Edison, New Jersey

Other factors that are common to all regions include:

- (a) Availability of power from dams such as Hoover Dam
- (b) Reliable ICT systems
- (c) Abundant labour supply
- (d) Availability of local and international market
- (e) Favourable government policy
- (f) Availability of water



Fig. 18.2.3.3: Hoover Dam, USA



Fig. 18.2.3.4: Superhighways in the Megalopolis

Activity 18.2.3.2

Use the Internet or any geographical documents to explain how the following factors influenced industrial development in USA:

- (a) Availability of mineral resources
- (b) Strategic location of USA
- (c) An educated labour force

18.2.3.3 Importance, problems associated with industrialisation in the USA and possible solutions

Activity 18.2.3.3

1. Use the Internet or any other available source to find out the economic importance of the industrial sector in USA and that of Rwanda.
2. Explain the problems affecting the industrial sector in New York and suggest possible solutions to the problems.

Importance of industrialisation in USA

It should be noted that the manufacturing industry in USA accounts for 12 percent of the economy and about 11 percent of the private sector workforce. However, its significance is even greater. Like in many other countries, manufacturing industry is important for many reasons, some of which are listed below.

1. It provides jobs to many people. Jobs include those of managers, engineers, accountants, technicians, among others.
2. It promotes local and international trade.



Fig. 18.2.3.5: A worker welds a cab frame in Dublin, Virginia

3. It is a source of revenue for the government.
4. It is a foreign exchange earner for the country.
5. People obtain exceptional skills from industries.
6. Industrialisation has diversified the country's economy.

Problems associated with industrialisation in the USA

Despite the many advantages of industrial development, there are some problems that emerge as industries develop. Some are directly related to industries while others are indirect.

Read the following article then attempt the questions that follows

ENVIRONMENT

US States Most Affected By Industrial Air Pollution

When it comes to the states that are the most polluted in the United States, Ohio and Kentucky come out on top of the list followed by Texas.



Columbus Ohio is the most polluted state

Curbing carbon emission has been an issue for many countries around the globe. Climate change fueled by global warming has brought about a sense of urgency among world leaders to reduce carbon footprints and focus on green energy. On the other hand, most countries like the U.S has an economy that thrives on manufacturing. Several industries around the country manufacture products that greatly contribute to the foreign exchange earnings and also provide employment to many citizens of the U.S. These industries

are however a great source of pollution because of the waste products such as chemical wastes and toxic fumes that are let out into the environment. Power plants also play a big role in industrial pollution and together with the heavy industries they account for nearly 80% of all greenhouse gas emissions. Some states are known to be industrial states and have a number of big and robust industries. Apart from employment that these industries provide to the locals, they also greatly pollute the environment leading to low quality of air and other health complications.

States which have fewer industries and manufacturing plants are less polluted and have a lower amount of carbon emission.

Worst Polluters in The United States

The state of Ohio has several manufacturing plants and is one of the states that has a big electricity generation sector. The harmful fumes emitted from the plants and other industries makes the state one of the highest polluted states in the U.S. Ohio is also home to a coal plant which contributes a very large amount of greenhouse emissions into the environment. Cutting down on these emissions will mean that Ohio shifts to green energy but that will be a tall order given the significance of these industries to the state and also to the country as a whole. Kentucky has seen its level of pollution rise because the authorities have not been able to find ways of reducing emissions from its coal fired power plants that release a lot of toxic fumes into the environment. Pollution from its electricity sector has continued to rise placing it just behind Ohio in toxic air pollution. States like

Florida have continued to fall down the list of highly polluted states because there has been a deliberate shift from coal to natural gas which is much of a less polluter. There are also states like Michigan which are experiencing a decline in manufacturing and in retrospect experiencing less pollution. By default, they have continued to experience a decline in air pollution and not through a well laid out plan to reduce the same.

Trends in Industrial Air Pollution

Some states in the U.S have continued to experience a gradual decline in industrial air pollution, either through deliberate government policies or by default when manufacturing plants begin to close shop. Shifting to more renewable energy sources has greatly helped some states in cutting carbon emissions while in others where different stakeholders have continued to do nothing, air pollution has continued to rise. It is apparent that through deliberate actions to shift to green energy, air pollution can be reduced as has been the case with Florida.

Article adapted from <http://www.worldatlas.com/articles/top-20-most-polluted-states-in-the-us.htm>

Apart from the problems of industrialisation mentioned in the article, other problems associated with industrialisation include the following:

- (i) Declining mineral resources have led to closure of some industries leading to loss of jobs.
- (ii) Competition from imports which limits markets for manufactured goods. For instance, Japan exports automobiles to USA and this greatly threatens motor vehicle industry in USA.

- (iii) There is a problem of rising cost of production which leads to increased prices of industrial goods.
- (iv) Unfair taxation system imposed on USA industrial products in other countries has affected the demand for US products in the external markets. For example, Japan levies high taxes on cars from USA, which has seriously further discouraged manufacturing in USA.
- (v) Industrial expansion leads to large areas that would be used for agriculture being used up by industries.
- (vi) Growth of industries led to growth of large urban centres which came along with urban problems such as limited office space, rise in crime rate and emergence of shanties due to housing problems.

Activity 18.2.3.4

From the article on environment:

1. Explain the main pollutants in the USA.
2. Describe activities that lead to pollution as highlighted in the article.
3. Summarise the effects of pollution.
4. Point out the measures the government of USA has taken to manage pollution.

Present your answer for class discussion.

Solutions to the above problems

Activity 18.2.3.5

1. Study the problems listed above and using the Internet or geographical documents, discuss ways in which the following problems are being addressed.
 - (a) Declining mineral resources
 - (b) Pollution
 - (c) Competition from imports
2. Explain how the government of USA ensures that pollution of air, land and water is prevented.

Some of the solutions to industrial problems are:

- (a) Locating industries in regions where there is enough space and also setting them outside cities.
- (b) For high crime rate, the government has used its police to crack down law breakers.
- (c) The high cost of production has been checked by the use of automated robots.
- (d) The problem of space has been addressed by building storey buildings (skyscrapers) which accommodate more people.



Fig. 18.2.3.6: Skyscrapers in Chicago, USA

END UNIT ASSESSMENT

1. Draw a sketch map of USA showing the location of the main industrial regions. Observe the good qualities of a map, that is, it must have a title, compass, key and a frame.
2. Mention the factors that led to the development of industries in the regions identified in question 1 above.
3. Briefly explain four ways in which industries are important in USA.
4. Explain three problems associated with industrialisation in USA.
5. Suggest the possible solutions to the problems identified in question 4 above.

18.3 Tourism in Switzerland

Key unit competence

By the end of this unit, you should be able to compare levels of tourism development in Switzerland in relation to Rwanda.

Introduction

Tourism is not a new concept to you because you learnt about it in Unit 13 of Senior 1 and Unit 22 of Senior Two. In Unit 17 of this book, we expanded the knowledge you had about tourism as an economic activity, tourism in Rwanda, to include tourism in Africa.

Activity 18.3.1

1. Explain the meaning of the term tourism.
2. Citing examples from Switzerland, discuss the various economic activities carried out in Switzerland.
3. With reasons, explain why Africa is a favourite destination to many Europeans.

Outside Africa, Switzerland is also a destination of choice for many tourists. It has one of the most well developed tourism industries in the world. The country has a wide range of tourist attractions that make many people visit the country in both winter and summer.

To learn more about tourism in Switzerland, we shall study the following sections in this unit:

- Introduction to Switzerland
- Tourist attractions in Switzerland
- Factors for the development of the tourism industry in Switzerland in comparison to those of Rwanda
- The importance of tourism and problems affecting tourism in Switzerland and possible solution.

18.3.1 Introduction to Switzerland

Switzerland is a fairly small country found in Central Europe. The country has a total land area of approximately 41,283 square kilometres. In 2016, the population of Switzerland was estimated at 8,371,339.

(Source: *Switzerlandtourism.com*)

Quick facts

Switzerland is among the top twenty five tourist destinations of the world and one of the leading countries in Western Europe. It is a landlocked country at the heart of Europe. The landscape of the country is rugged, with the Alps Mountains covering a significant part of the surface area..

Activity 18.3.2

The map below shows the location of Switzerland. With the help of an atlas, use the map to answer the following questions:

- Describe the location of Switzerland.
- Describe the similarities between Switzerland and Rwanda in terms of location.



18.3.2 Tourist attractions in Switzerland

In Switzerland, tourism is a very important industry which dates back to the 18th century. A few Europeans from Britain and Germany visited and liked the country mainly for its Alpine scenery.

Tourist attractions in Switzerland are varied. They include physical and human related attractions. There are those features that attract tourists in winter while others are summer attractions.

Activity 18.3.3

Use the Internet or other geographical references to identify physical and human attractions in Switzerland.

Share your findings with the rest of the class.

Currently, tourism is highly developed and Switzerland has the advantages of nature to the fullest. Major destinations in Switzerland include Bern, Zurich, Geneva, Lucerne and Interlaken.

The tourism industry in Switzerland is highly developed because of the presence of various tourist attractions which include the following:

(i) Mountains

Most of the country's landscape consists of the Alpine mountain ranges which covers over 60% of the total land area. This provides Switzerland with a variety of sceneries such as snowcapped peaks and u-shaped valleys. In winter, many tourists go for skiing on the snow covered mountain slopes. In summer, many are attracted by the beautiful scenery of the mountain peaks and steep sided valleys.

Activity 18.3.4

Study the photographs below then answer the questions that follow:



Photograph A



Photograph B

- (a) Describe the activities taking place in each of the photographs.
- (b) Identify the photograph that was taken in winter and explain how it differs with the one taken in summer.

(ii) Climate

The cold winters in Switzerland enable the formation of snow on the mountain sides which attract tourists interested in skiing. The warm summers are ideal for sight-seeing, swimming in the beautiful lakes and sun bathing.

(iii) Rivers and lakes

Switzerland has numerous lakes and rivers that form beautiful sceneries especially in summer. Many tourists engage in water sports such as boat riding and swimming in the lakes. Examples of such lakes are Geneva (which is the largest), Lucerne, Constance and Zurich.



Fig. 18.3.1: Boat riding on Lake Geneva

River Rhine has beautiful waterfalls near the town of Schaffhausen which attract many tourists.



Fig. 18.3.2: Rhine Waterfalls on River Rhine in Switzerland

Activity 18.3.5

1. Identify mountains in Switzerland that have played a great role in the development of the tourism industry in the country.
2. Use the Internet or other geographical sources to identify waterfalls and rapids that attract tourists in Rwanda.
3. Apart from tourist attraction, explain how else waterfalls can be useful to the economy of Switzerland.

(iv) Fauna and Flora

Switzerland is well endowed with a variety of animals and indigenous plants. For instance, on the slopes of the Alps, a mix of deciduous and coniferous trees are common. In this place, forests have remained more natural or have been re-naturalised. Those re-naturalised include coniferous trees like spruce, pine and fir.

There are a variety of animals such as the deer and stag, fox and marten, wolves and bears, wild ibex and Marot. Some of the animals are in zoos while others are found in their natural habitat.

A variety of almost 200 species of birds attract tourists interested in bird watching. Examples of birds found are the black redstarts, blackbirds, blackcaps, great and blue tits, robins, sparrows, crows, pigeons, seagulls, swans, mallards, coots, woodpeckers, starlings, swallows, nutcrackers,

choughs, buzzards and kites.



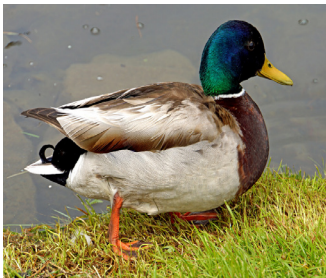
A blackcap



A coot



A chough



A mallard



A black redstart



A buzzard

Fig. 18.3.3: Unique bird species in Switzerland



Wild ibex



A marten



A Marot

Fig. 18.3.4: Unique animal species in Switzerland

Activity 18.3.6

Use the Internet or other geographical documents to identify the plants and animals that are tourist attractions in Switzerland.

Share your findings in class.

18.3.3 Factors for the development of the tourism industry in Switzerland in comparison to that of Rwanda

Development of tourism in Rwanda is lower than that of Switzerland. In Switzerland, tourism is one of the leading foreign exchange earner for the country.

Activity 18.3.7

1. Use the Internet or geographical documents to compare the factors for the development of tourism in Switzerland and in Rwanda under the following sub-headings:
 - (a) Scenery
 - (b) Climate
 - (c) Development of transport infrastructure
 - (d) Availability of accommodation facilities
2. Suggest ways in which the tourism industry in Rwanda can be improved.

Apart from the factors listed in the activity above, tourism in Switzerland is favoured by:

(a) Diversity of languages

People of Switzerland are able to communicate using the main languages spoken in Europe where most of the tourists come from. Among the languages spoken are French, German, English, Italian and Spanish.

(b) Hospitality

The Swiss are very friendly people who are always willing to serve and help tourists. This has also promoted the development of tourism industry.

(c) Political stability

Switzerland is a neutral country as far as international politics are concerned. This has saved the nation from political instability. Tourists feel secure to visit the country at any time of their choice.

(d) Transport and communication system

There are well developed networks of transport and communication systems in Switzerland. Railways, roads and water ways reach even the most far off

corners of the country, which makes movement of tourists to different areas possible.

(e) Its policy of neutrality has made peace dwell in the country and hence tourists have been encouraged to visit the country

(f) Its central location in Europe has also led to high accessibility of the country from different directions in Europe and other countries like America etc.



Fig. 18.3.5: Railway transport in Switzerland

Activity 18.3.8

Compare and contrast the following factors in relation to tourism in both Switzerland and Rwanda:

- (a) Availability of modern hotels and accommodation facilities
- (b) Presence of trained and skilled personnel
- (c) Presence of a well-developed media network
- (d) Modern financial and banking sector

18.3.4 The importance of tourism and problems affecting tourism in Switzerland and possible solutions

i) The importance of tourism in Switzerland

As indicated earlier, tourism is the main foreign exchange earner in Switzerland.

Activity 18.3.9

Read the statement below and answer the question that follows.

*“Tourism is the **business** of **providing services** such as **transport**, **places to stay**, or **entertainment** to people who are on holidays. These people may be nationals or foreigners.”*

1. Identify the key roles played by tourism in the lives of the Swiss people from the statement above.
2. In addition to the information in the statement above, explain other reasons why tourism is important to any country.

A large number of people are employed in tourism. They include hoteliers, tour guides, ski instructors, drivers and travel coordinators.

Tourism has promoted development of towns such as Zurich, Geneva, Lausanne and Basel.



Fig. 18.3.6: The City of Zurich



Fig. 18.3.7: The City of Basel

It has promoted the growth of craftsmanship as people develop antiques and crafts pieces that are on a high demand among the tourists.

ii) Problems affecting the tourism industry in Switzerland

Although tourism is highly developed in Switzerland, it has some challenges that affect it. For instance, due to global warming, the snow has been reducing such that in some areas, tourists cannot engage in skiing any more.

Activity 18.3.10

1. Compare the problems faced by the tourism industry in Rwanda with those of Switzerland.
2. Explain each of the following challenges facing tourism in Switzerland and suggest possible ways of addressing each.

Problem (explain the problem)	Possible solution
Competition from other countries	
Occurrence of accidents in the mountains	
The strong Swiss Franc	

END UNIT ASSESSMENT

1. Draw a sketch map of Switzerland showing the country's location in relation to Germany, France, Italy and Austria.
2. Explain four ways in which tourism is important to Switzerland.
3. Explain three problems associated with tourism in Switzerland.
4. Suggest possible solutions to the problems identified in question 3 above.
5. Compare the level of tourism development in Switzerland in relation to Rwanda.

18.4 Population in China

Key unit competence

By the end of this unit, you should be able to compare population problems of China and control measures taken in relation to Rwanda.

Introduction

Over the years, China has been experiencing population increase which reached a billion in 1982. Between 1960 and 1980, the increase was very rapid but from the 1990s, some drastic laws were enacted in an effort to control the growth. Since then, the trend has been reducing. According to the United States Census Bureau, the population of China was estimated to be 1.36 billion up from 665 million in 1960.

To understand more about population in China, we will discuss the following sections in this unit:

- Introduction to China
- Size of population compared to the world population
- Factors influencing population distribution in China
- Problems of population in China
- Policies for population control in China

18.4.1 Introduction to China

China is located on the eastern part of Asia. It borders the Pacific Ocean on the eastern side. On other directions, it shares boundaries with fourteen other countries, including Russia, Mongolia, Nepal, Kazakhstan and India.

Activity 18.4.1

Carry out a research then attempt the following questions:

- (a) Find out the continent in which China is found.
- (b) List the countries that share boundaries with China.
- (c) Mention the water bodies found on the eastern part of China.
- (d) Compare the size of China to that of her neighbouring countries.
- (e) The area of China is approximately 9,640,821 square kilometres. Calculate the number of times it is bigger than Rwanda.



Fig. 18.4.1: A map showing the location of China

18.4.2 Size of China compared to the world population

China's total land area is approximately 9,640,821 square kilometres. Its population was estimated to be 1,382,323,332 according to 2016 UN data.

Activity 18.4.2

Use the Internet or any other relevant documents to compare the population density of China to that of India and Japan.

Prepare a class presentation from your findings.

China is the most populous country in the whole world. The population of China in comparison to other nine selected countries of the world has been summarised in the table on the next page.

Country	Population	Area km ²
China	1,382,323,332	9,390,784
India	1,326,801,576	2,972,892
USA	322,762,018	9,155,898
Indonesia	260,581,100	1,812,108
Brazil	209,567,920	8,349,320
Pakistan	192,826,502	770,998
Nigeria	186,987,563	910,802
Bangladesh	162,910,864	130,172
Russia	143,439,832	16,299,981
Japan	127,368,088	364,485

Source: World factbook, 2016

Table. 18.4.1: Population of China in comparison to other selected countries

Activity 18.4.3

- For each country given, name the continent where it is found.
- To calculate the **population density**, you will divide the size of the **population** by the size of the land area. Thus:

$$\text{Population Density} = \frac{\text{Number of People}}{\text{Land Area}}$$

Using this formula, calculate the population density of the countries shown in the table above.
 Copy the table above in your notebook then introduce a column on the right to show the population density of each country.
- Find out the country that has the highest population density.

18.4.3 Factors influencing population distribution in China

Like any other country, China's population distribution is influenced by both human and physical factors.

Activity 18.4.4

Apply the knowledge gained in Senior Two to explain the physical factors that influence population distribution in Rwanda and China.

China is divided into two halves based on the density and distribution of population. One half is the eastern section while the other one is the western part of the country. Of these two, the east region is more densely populated than the west.

18.4.3.1 Physical factors influencing population distribution in China

(i) Relief

In China, the area to the east is densely populated because the land is gently sloping. In the south east and the coastal areas, the land is generally flat making it suitable for settlement as well. The western section of the country is mountainous, which makes it unsuitable for settlement and agriculture.

(ii) Climate

The western part of the country receives little rainfall. In addition, the area experiences extreme temperatures with very cold winters reaching -40°C and very hot summers with up to 50°C . The Gobi Desert is found in this region. The eastern part of the country is favourable for settlement because it has sufficient rainfall and mild temperatures.



Fig. 18.4.2: Gobi Desert in China

(iii) Soil fertility

The eastern part of China has fertile soils such as loess and silts, deposited by rivers in the lowlands. These soils are ideal for farming unlike the ones on the west which are poor and infertile.

(iv) Availability of natural resources

The eastern part of China has plenty of

Quick facts

Physical factors influencing population distribution in China

- i) Relief
- ii) Climate
- iii) Soil fertility
- iv) Availability of natural resources

rivers which provide water. Other resources in this part include timber and minerals such as coal, oil and copper.

Activity 18.4.5

Carry out a research to establish how the following human factors influence population distribution in China.

- (a) Urbanisation
- (b) Industrial development
- (c) Availability of infrastructure
- (d) Government policy
- (e) Development of agriculture
- (f) Availability of transport facilities

18.4.4 Problems of population in China

There are various problems that are experienced if the population of a country is too high.

Activity 18.4.6

Use your knowledge of population of Rwanda and China as examples to explain the problems caused by overpopulation.

Prepare a report for class presentation.

China has faced several problems due to its high population. These include the following:

1. **Unemployment:** Joblessness is a major problem because job creation is not as rapid as the rate of population growth. However, unemployment is slowly decreasing.
2. **Pressure on available resources:** The high population leads to high demand for the few resources available leading to overcrowding in places such as health facilities, schools and cities. This has forced the government to apply a one-child policy in order to control population.



Fig. 18.4.3: Overcrowded streets of Beijing

3. **Increase in crime rates:** Overpopulation leads to increased crime rates and antisocial behaviour especially among the unemployed in major towns and cities.
4. **Increased government expenditure:** The government is forced to spend large amounts of money to provide social services such as health facilities and schools at the expense of other infrastructural developments that can lead to the growth of the economy.

18.4.5 Policies for population control in China

In order to control population, the government of the Republic of China came up with the following measures:

- (i) It came up with the “family-based old-age care system”. This is intended to supplement and support old people. The government also proposed to gradually increase the retirement age so as to limit financial expenditure on old people.
- (ii) The government has revised the policy to control birth rate. With “one-child policy” per couple, the birth rate has been reduced from 5.9 to 2.1. This is the rate needed to maintain a stable population. Nowadays two children per couple are allowed.
- (iii) It has implemented a new urbanisation policy where small and medium-sized cities have been helped to expand and rural areas also developed into urban centres. This has reduced congestion in cities.

- (iv) Education regarding family planning and the various methods of contraception has been emphasised. This adds more knowledge to the population on how they can handle the population issues.
- (v) The government provides free sterilisation to parents who feel their families are already too large. In addition, there are financial incentives to people who volunteer to be sterilised. This has increased the number of people being sterilised.
- (vi) China has legalised abortion. This has helped in reducing the number of children who would have been born out of wedlock.

Did you know?

According to UN estimates of 2016, the current population of **Rwanda** is **12,159,586**, which is **equivalent to 0.16%** of the total world population. Rwanda ranks number 76th in the list of highly populated countries. The total land area is 26,338 Km² with population density of 461 people per Km². This justifies that Rwanda is densely populated.

Source: www.worldometers.info

Activity 18.4.7

Explain the measures implemented by the government of China to control its population.

END UNIT ASSESSMENT

1. Describe the location of China on the Asian continent.
2. Explain three factors that have influenced population distribution in China.
3. Briefly explain the problems caused by a large population in China.
4. Describe the policies that have been put in place in China to control population growth.

18.5 Urbanisation in USA

Key unit competence

By the end of the unit, you should be able to explain the levels of Urbanisation in USA.

Introduction

An urban area is a settlement characterised by high population density and many built up areas compared to the areas surrounding it. Urban areas can be large **conurbations**, cities or small towns. In USA, any settlement with a population of 50,000 people or more is classified as an urban centre.

In this unit, we shall discuss urbanisation in the USA under the following sections:

- Major urban areas in the USA
- Characteristics of urban centres in the USA
- Functions of urban centres in the USA
- Factors influencing urban growth and development in the USA
- Importance and consequences of urbanisation in the USA
- Case study: New York

Quick facts

Urbanisation means an increase in the proportion of people living in towns. As the number of people living in an urban centre increases, the town expands, leading to an increase in economic and social activities.

18.5.1 Major urban areas in the USA

Activity 18.5.1

Use the Internet or textbooks to identify the major urban centres found in USA.

USA is one of the most developed nations of the World. It has many urban centres throughout the country. The rapid industrial revolution in the eighteenth and nineteenth centuries brought about rapid urban growth. Currently, out of every five people in the USA, four live in urban centres.

The table below shows the ten largest urban centres of USA, their population, land area and population densities.

Rank	Urban centre	Population	Land area (km ²)	Population density per km ²
1	New York	19,378,102	8,936.0	2053.6
2	Los Angeles	12,150,996	4,496.3	2,702.5
3	Chicago	8,608,208	6,326.7	1,360.6
4	Miami	5,502,379	3,208.0	1,715.2
5	Philadelphia	5,441,567	5,131.7	1,060.4
6	Dallas	5,121,892	4,607.9	1,111.5
7	Houston	4,944,332	4,299.4	1,150.0
8	Washington	4,586,770	3,423.3	1,339.9
9	Atlanta	4,515,419	6,851.4	659.0
10	Boston	4,181,019	4,852.2	861.7

Source: www.worldometers.info

Activity 18.5.2

1. Draw a sketch map of USA showing the location of the ten urban centres listed in the table above.
2. For each town, name the state where it is located.
3. Make a list of those that are sea ports and those that are in the interior.

18.5.2 Characteristics of urban centres in the USA

Activity 18.5.3

Use photographs, textbooks or the Internet to research on the characteristics of the major urban centres in USA. Compare these characteristics with urban centres in Rwanda. Your report should include their similarities and differences.

The following are some characteristics of urban centres in USA:

- (i) They are well planned with zones such as industrial, residential, recreation and central business districts clearly set out.
- (ii) Some of the largest conurbations in the world are found in USA.
- (iii) Most of the towns have straight streets and avenues intersecting at right angles.

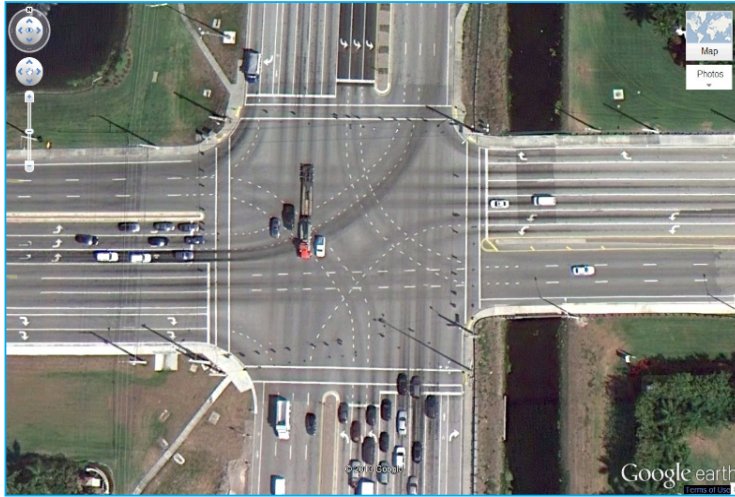


Fig. 18.5.1: Gainesville's Archer Road and 34th Street intersecting at right angles

- (iv) The large cities have efficient public transport in form of trains, trams and buses.
- (v) There are no earth roads in the urban centres.
- (vi) Some of the tallest skyscrapers in the world are found in cities of USA.

18.5.3 Functions of urban Centres in the USA

Urban centres in USA have a wide range of functions. While some functions are common to all the centres, there are functions that are only in some centres. For instance, the towns found along the coast are sea ports and have fishing related activities. Some in the interior functions as agricultural collecting centres.

Activity 18.5.4

- (a) Use the Internet or geography textbooks to find out the functions of Kigali.
- (b) Compare the functions of Kigali city to those of New York.
- (c) Find out the attractions that exist in towns that are tourist centres in Rwanda. Give examples of these towns.

The following are some of the functions:

1. The towns serve as **residential areas**. Many people live in different urban centre such as New York, Dallas, Washington and Miami.
2. They are **transport and communication centres**. Some have large international airports while the smaller towns have airports that serve domestic flights only.
3. They serve as **health centres**. Many health facilities are located in different parts of urban centres.
4. They are **cultural and educational centres**. There are many educational institutions such as universities, well established libraries and museums in different cities such as New York, Los Angeles and Chicago.
5. They are **tourist centres**. People come from all over the world to see such attractions as historical sites, art galleries, skyscrapers, games and sports. Examples of such attractions are Lake Placid, Salt Lake City and New York.
6. Many of the cities are **industrial centres**.
7. They all have **trading activities**.
8. In each of the states, there is a **capital city** with offices of the state government. The federal government offices are in Washington DC.
9. They act as entertainment centres. Large entertainment joints are in cities such as Miami, Las Vegas, Bloomington and New York.

Activity 18.5.5

Use photographs, text books on internet to research on the following information concerning cities in USA.

- Find out the main functions of the following cities:
(a) Los Angeles (b) Detroit (c) Hollywood
- Go through the functions listed above and relate them to the photographs shown below.

Explain the function associated with each photograph.



Photo A



Photo B



Photo C



Photo D

- Give examples of cities where the following functions are dominant:
(a) Oil refining (b) Federal Administration
(c) Lake port

18.5.4 Factors influencing urban growth and development in the USA

Activity 18.5.6

Explain the factors that influence urban growth in USA.

Various urban centres in USA grew because of factors such as:

(i) Population growth

The main reason that continuously contribute to urban growth is increase in urban population. Population increase occurred from migration of people into urban areas. This increased construction and hence urban growth.

(ii) Economic growth

There was an expansion of the economic base. This led to a higher per capita income. This increased the number of working persons which created a demand for new housing hence the growth of urban centres.

(iii) Industrialisation

The establishment of new industries in the countryside increased urban growth. This is because industries required more workforce, creating a demand for housing facilities. As housing increased, so did the urban centres.

(iv) Physical features

In some cases, urban centres developed because of unsuitable physical terrain (such as rugged terrain, wetlands, mineral lands or water bodies). When physical features such as water bodies stood on the way of expansion, people could skip construct beyond it.

(v) High cost of living

Some urban centres experienced an increase in the cost of living, forcing people to shift to cheaper centres. The ones they shifted to kept on growing with time.

(vi) Development of transportation

Improved transportation led to an increase in the rate at which people

accessed some cities. Places along these routes also developed due to various economic activities that were established to serve passengers.

(vii) Government development policies

Some areas developed into urban areas because the government restricted movement of people from one area while encouraging movement to others.

(viii) Housing investment

As people in urban centres accumulated wealth, they began to invest in rural areas by constructing additional housing. This gave chance to some places to grow, especially those that were villages, expanding to become urban centres.

18.5.5 Importance and consequences of urbanisation in the USA

Urban centres contribute a great deal to the economy of the countries where they are located. This can be explained by the fact that some start as small towns but eventually grow to large cities as they become a foci of economic activities.

Activity 18.5.7

Discuss the importance of New York City to the economy of USA.

The following are some of the contributions that urban centres in USA make to the country:

- (a) The large urban population provides a market for manufactured goods and agricultural products.
- (b) They provide employment opportunities as various economic activities grow.
- (c) They promote trading activities.



Fig. 18.5.2: A business street in New York: Businesses are an example of economic activities

- (d) Urban population is provided with residential facilities in the towns.
- (e) They attract the development of industries.
- (f) They encourage cultural integration. This is because they attract people from different regions and nationalities who come along with varied cultures.
- (g) Urban centres make it easy for governments to provide social services to the people.
- (h) Some urban centres have facilities that are tourist attractions.

18.5.5.1 Consequences of urban centres in USA

While development of urban centres in USA has had many positive effects in the country, there have been some negative effects mainly to the residents and to the environment in general.

Activity 18.5.8

Discuss

1. The negative effects that the growth and development of New York has caused to:
 - (a) The residents of the city
 - (b) The surrounding environment
2. The demands that the government of USA must meet for the residents in the city.

Some of the consequences of development of urban centres in USA are:

- (i) Development of urban centres in USA leads to encroachment on land that would otherwise be used for farming especially the large cities that are located in rich agricultural areas.
- (ii) Waste from these towns pollute the environment. This is caused by exhaust fumes from vehicles and by gases emitted by industries.
- (iii) Large cities such as New York experience traffic congestion causing delays as commuters move from one part of the city to another. There is also overcrowding in social areas such as entertainment places like clubs.



Fig. 18.5.3: Traffic congestion in New York

- (iv) Urban development causes rural-urban migration. A high percentage of people in USA live in urban areas.
- (v) Urban development leads to increased incidents of criminal activities especially in the very large cities.
- (vi) In places where old residential buildings of the cities are neglected, they become slums.
- (vii) Unemployment is witnessed in towns such as Detroit where old industries have closed down.

18.5.6 Case study: New York

Location

New York is a coastal city located on the east coast of USA at the southern tip of the state of New York. It is situated on the Atlantic coast on one of the largest natural harbours in the world.

The map below shows the location of New York City in the state of New York.



Fig. 18.5.4: A map showing the location of New York

Activity 18.5.9

Using geographical documents or the Internet, write a brief historical background about the state of New York City.

To ease administration, the city is divided into five boroughs, namely Brooklyn, Queens, Manhattan, the Bronx and Staten Island.



Fig. 18.5.5: A map showing the five boroughs of New York City

Factors for the growth of New York City

Activity 18.5.10

Using geographical documents or the Internet, carry out a research to find out how the following factors led to the growth of New York City:

- (a) Presence of a large natural harbour
- (b) Presence of Hudson River
- (c) Frost coast
- (d) Flat relief
- (e) Rich hinterland

The following are some of the factors that supported the growth of New York City.

1. Its location on the western side of the Atlantic Ocean made it easy for her to trade with other regions. It is not surprising that the Port of New York is one of the largest ports in the world.
2. The presence of Hudson River enabled New York to navigate into inland and access the interior.



Fig. 18.5.6: Docks on the Hudson River, New York City

3. Its harbours are ice free since they never freeze, which makes loading and off-loading of goods possible throughout the year.
4. Its relief is flat, which ensures easy construction of warehouses, roads and docks.
5. The hinterland is very fertile which has enabled successful agriculture.

Functions of New York City

- (a) The headquarters of the United Nations (UN) is located in New York.



Fig. 18.5.7: UN headquarters in New York

- (b) It is a financial capital with vibrant financial trading activities, banking and other related activities.
- (c) It is a sea port with one of the busiest ports in the world.
- (d) It is a transport and communication centre. It is connected to the interior by air transport, highways, railways and water transport. John F Kennedy Airport, one of the world's busiest airport, is located in New York City.
- (e) It is an industrial centre with many different types of industries such as ship building.
- (f) It is a tourist centre with many different types of tourist attractions such as museums and tall skyscrapers.
- (g) It is an educational centre with many universities and other institutions of higher learning.

Problems of New York City

The huge size of New York City causes the town to experience many problems. Some of these problems are:

- (i) It has large slum areas such as Harlem which is one of the oldest residential areas in the city.
- (ii) It has high unemployment rates.
- (iii) It experiences high rates of crime.
- (iv) It experiences traffic congestion due to its high population.

Activity 18.5.11

Using geographical documents or the Internet, find out other problems experienced in New York and how the problems are being solved.

END UNIT ASSESSMENT

1. Explain three characteristics of urban centres in USA.
2. Explain four functions of urban centres in USA.
3. Summarise some of the consequences of urbanisation in USA.
4. Briefly explain how the location of New York has supported its growth.

Glossary

Aspect: The direction of a slope in relation to rain bearing winds and sunlight.

Barter trade: This is the exchange of goods for goods, goods for services or services for services.

Bush fallowing: A system of farming whereby the farmer cultivates one piece of land for some years and later leaves it for some years with the aim of restoring the fertility of the soil naturally. During this period, the farmer cultivates another piece of land.

Communication: It is the passing of information from a sender to a receiver.

Crustal warping: Earth movement that causes downward shifting of rocks of the earth's crust creating a depression on the surface of the earth.

Circumvent: To find a way around (an obstacle).

Desertification: This is a process in which fertile land becomes a desert.

Drainage: Layout of water features on the earth's surface. Can also be defined as the flow of surface and sub-surface water from an area either naturally or by using artificial means.

Draught animals: Also called draft animals or beasts of burden, these are working animals, either as service animals or draft animals. They may also be used for milking or herding, jobs that require human training to encourage the animal to cooperate.

Ecotourism: Tourism directed towards exotic, often threatened, natural environments, especially to support conservation efforts and conserve wildlife.

Environment: All that is around us. It includes such things as air, vegetation, land and people.

Environmental conservation: Protection and proper utilisation of the natural things found around us such as forests, water, land and air.

Extractive industries: These are economic activities, also referred to as primary industries. They involve exploitation of natural resources, for example, the extraction of minerals.

Habitat: The natural home or environment of an animal or plant.

Lagoon lake: A shallow body of water at the coast, separated from the larger sea by islands, sand bars or coral reef.

Meteorites: Solid materials in form of large stones or rocks that have fallen on the earth's surface from other heavenly bodies.

Population density: Number of people living within a unit area. For instance, number of people per square kilometre.

Population distribution: How people are spread out in an area such as a country.

Porterage: This is the carrying of goods by people on their heads, back or by hand.

Ribbon lake: Long and narrow finger-shaped lakes usually found in glacial troughs.

River braids: A network of river channels that split then after some distance, they converge downstream to become one stream.

Scenery: The natural features of a landscape considered in terms of their appearance.

Secondary industries: These are also known as manufacturing industries. They are industries that use raw materials obtained from primary industries and converts them into products of a higher value.

Shifting cultivation: A form of agriculture, used especially in tropical Africa, in which an area of ground is cleared of vegetation and cultivated for a few years and then abandoned for a new area until its fertility has been naturally restored.

Sustainable development: Economic development that takes place without depleting the natural resources.

Terrorism: The unlawful use of violence and intimidation, especially against civilians, in the pursuit of political aims.

Trade: This is the selling and buying of goods and services.

Transport: This refers to the movement of goods, services and people from one place to another.

Wildlife: Wild animals collectively; the native animals and sometimes plant vegetation.

