MINISTRY OF EDUCATION

GHANA GEOGRAPHERS ASSOCIATION

GEOGRAPHY

for Senior High Schools

Year 3

Writers

Prof. Ishmael Yaw Dadson
Glago Frank Jerome
Susuana Adwoa Appiah

Reviewer

Prof Kofi Adu Boahen

MINISTRY OF EDUCATION
GHANA ASSOCIATION OF BUSINESS EDUCATION TEACHERS

Geography

for Senior High Schools

Year 3

Writers

Prof. Ishmael Yaw Dadson
Glago Frank Jerome
Susuana Adwoa Appiah

Reviewer

Prof Kofi Adu Boahen

Ghana Education Service (GES)

© Ministry of Education 2026

This publication is not for sale. All rights reserved. No part of this publication may be reproduced without prior written permission from the Ministry of Education, Ghana.

ISBN:

Contents

FOREWORD VI

SECTION 1 FLUVIAL GEOMORPHOLOGY AND MASS WASTING 1

RIVER CHANNELS, ASSOCIATED LANDFORMS AND MASS WASTING 2

RIVER CHANNELS AND ASSOCIATED LANDFORMS 2
SIGNIFICANCE OF FLUVIAL LANDFORMS 27
MASS WASTING 29
TYPES OF MASS WASTING 32
SOCIO-ECONOMIC AND ENVIRONMENTAL EFFECTS OF MASS WASTING . . 36
REVIEW QUESTIONS 1 40

SECTION 2 MAP READING AND INTERPRETATION 42

MAPS, THEIR ELEMENTS AND ANALYSIS 43

NATURAL FEATURES ON TOPOGRAPHICAL MAPS (E.G. RELIEF, DRAINAGE) . 43
CULTURAL FEATURES ON TOPOGRAPHICAL MAPS (SETTLEMENTS, FARMS AND ROADS) 50
THE INTERRELATIONSHIP BETWEEN NATURAL AND CULTURAL FEATURES ON TOPOGRAPHICAL MAPS 55
REVIEW QUESTIONS 2 64

SECTION 3 POPULATION STUDIES IN GHANA 65

POPULATION GROWTH, DISTRIBUTION AND MIGRATION TRENDS IN GHANA AND AFRICA 66

POPULATION GROWTH AND DISTRIBUTION IN GHANA. 66
FACTORS INFLUENCING POPULATION GROWTH AND POPULATION DISTRIBUTION IN GHANA. 72
POPULATION MIGRATION IN GHANA 79
CONTRASTING POPULATION GROWTH: GHANA IN THE CONTEXT OF AFRICA AND THE WORLD. 91
SOCIO-ECONOMIC IMPLICATIONS OF MIGRATION FROM AFRICA TO THE REST OF THE WORLD. 96
REVIEW QUESTIONS 3 106

SECTION 4 ECONOMIC ACTIVITIES IN GHANA 107

ECONOMIC ACTIVITIES. 108

TOURISM IN GHANA 108
TRADE IN GHANA. 117
TRANSPORT AND COMMUNICATION IN GHANA 130
REVIEW QUESTIONS 4 139

SECTION 5 CLIMATE CHANGE 140

THE EARTH AND ITS NEIGHBOURHOOD: THE EARTH'S ATMOSPHERE 141

THE CONCEPT OF CLIMATE CHANGE 142
REMEDIES TO IMPACTS OF CLIMATE CHANGE 146
REVIEW QUESTIONS 149

SECTION 6 REPRESENTATION OF GEOSPATIAL DATA THROUGH DOT MAPS AND FLOW CHARTS 150

GEOSPATIAL DATA COLLECTION, REPRESENTATION AND INTERPRETATION . 151

ANALYSING GEOSPATIAL DATA USING DOT MAPS 151
ANALYSING GEOSPATIAL DATA USING FLOW CHART (FLOW LINE MAPS) . 161
REVIEW QUESTIONS 6 171

SECTION 7 WASTE MANAGEMENT IN GHANA. 172

ENVIRONMENTAL DEGRADATION 173

SOURCES OF WASTE IN YOUR COMMUNITY AND GHANA 173
EFFECTS OF IMPROPER WASTE MANAGEMENT IN YOUR COMMUNITY AND GHANA. 177
METHODS OF WASTE MANAGEMENT IN GHANA: REDUCE, REUSE AND RECYCLE (3RS) 181
REVIEW QUESTIONS 7 186

SECTION 8 DESERT ENCROACHMENT AND LANDSLIDES 187

ENVIRONMENTAL HAZARDS AND THEIR MANAGEMENT. 188

DESERT ENCROACHMENT IN GHANA 188
LANDSLIDES IN GHANA AND THEIR PREVENTION. 191
REVIEW QUESTIONS 8 197
ANSWERS TO REVIEW QUESTIONS 11. 198
ANWERS TO REVIEW QUESTIONS 2 206
ANSWERS TO REVIEW QUESTION 3 214
ANSWERS TO REVIEW QUESTION 4 221
ANSWERS TO REVIEW QUESTION 5 232
ANSWERS TO REVIEW QUESTION 6 240
ANSWERS TO REVIEW QUESTION 7 249
ANSWERS TO REVIEW QUESTION 8 254
REFERENCES 262
GLOSSARY. 265
ACKNOWLEDGEMENTS 267

FOREWORD

Ghana's new Senior High School Curriculum aims to ensure that all learners achieve their potential by equipping them with 21st Century skills, knowledge, character qualities and shared Ghanaian values. This will prepare learners to live a responsible adult life, progress to further studies and enter the world of work. This is the first time that Ghana has developed a Senior High School Curriculum which focuses on national values, attempting to educate a generation of Ghanaian youth who are proud of our country and can contribute effectively to its development.

The Ministry of Education is proud to have overseen the production of these Learner Materials which can be used in class and for self-study and revision. These materials have been developed through a partnership between the Ghana Education Service, teacher unions (Ghana National Association of Teachers- GNAT, National Association of Graduate Teacher -NAGRAT and the Pre-Tertiary Teachers Association of Ghana-PRETAG) and National Subject Associations. These materials are informative and of high quality because they have been written by teachers for teachers with the expert backing of each subject association.

I believe that, if used appropriately, these materials will go a long way to transforming our Senior High Schools and developing Ghana so that we become a proud, prosperous and values-driven nation where our people are our greatest national asset.

Haruna Iddrisu MP
Minister for Education

SECTION

1

FLUVIAL GEOMORPHOLOGY AND MASS WASTING

RIVER CHANNELS, ASSOCIATED LANDFORMS AND MASS WASTING

INTRODUCTION

This section covers how rivers and slopes shape the land, forming valleys, floodplains, and deltas, and explains their formation and change over time. It highlights the value of river landforms in Ghana for farming, transportation, jobs, and tourism. The section also discusses mass wasting, the movement of soil and rocks down slopes due to gravity, including types like landslides and soil creep. It outlines the impact of these processes on people, the environment, and the economy, connecting them to related topics from Year One Section 7. Studying these subjects helps you understand how rivers and slopes affect Earth's surface and daily life.

KEY IDEAS

- Rivers erode through the following processes: hydraulic action, abrasion, attrition and solution
- Transportation involves the movement of weathered material from one location to another
- Deposition creates landforms like **deltas**, **floodplains** and **levees**.
- The stages in the development of a river include the upper course, middle course and lower course
- Mass wasting can be explained as the movement of a large amount of earth materials down a slope, which changes the shape of the land.
- There are two main types of slides: Translational slide and Rotational slide (also called a slump).

RIVER CHANNELS AND ASSOCIATED LANDFORMS

Meaning of Rivers

A river is a natural stream of water that flows in a channel from its beginning to its end. It is usually big and keeps moving all the time. Relatively smaller rivers are sometimes called streams. The place where a river begins is called its **source**. A river's source can come from different locations. It can start from a spring (like the River Thames in England and river Volta in Ghana), from rainwater that flows off the land (like the River Zaire in Africa), from melting ice or glaciers (like the River Rhone in France), or from a lake (like the River Nile in Africa).

The **mouth** of a river is where it ends. At the mouth, the river flows into a bigger body of water, such as another river, a lake, the sea, or the ocean. For example, the Volta River enters the sea at Ada in Ghana. The mouth is the last part of the river's journey.

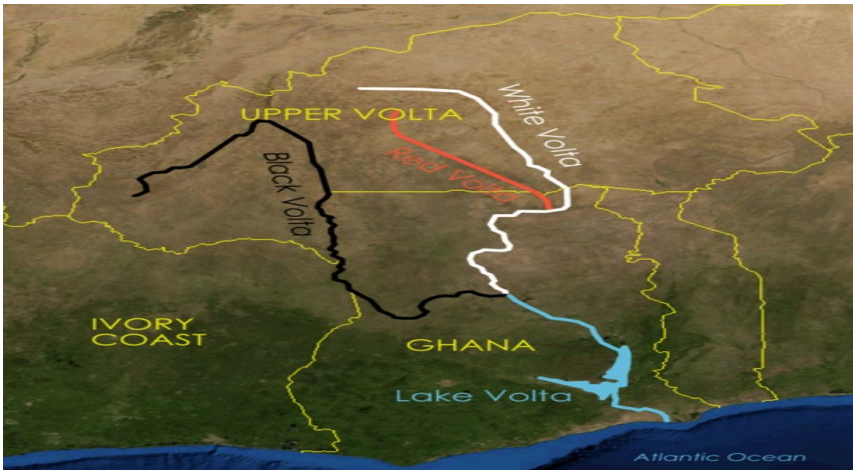


Figure 1.1: Picture of a river channel showing source and mouth

Visit this link to watch a video of a river from source to mouth https://youtu.be/Sv16XOnNKeU

Concepts Associated with Rivers

1. Riverbed: This is the bottom of the river - the ground under the water where the river flows.
2. Banks of a river: These are the sides of the river, like natural walls that keep the water in. They are made of soil, rocks, or other materials.
3. Depth of a river: This is how deep the river is. It is the distance from the surface of the water to the riverbed.
4. Width of a river: This is how wide the river is - the distance from one side of the river to the other.
5. As the river flows, smaller rivers or streams often join it. These smaller rivers are called tributaries, and the place where they meet the main river is called a confluence. For example, Khartoum is a confluence town because it is where the White Nile and the Blue Nile meet.
6. The whole area where the main river and all its tributaries flow is called a river basin or catchment area.
7. A highland or ridge that separates one river basin from another is called a watershed, water divide, or water parting.

8. The load of a river is the sand, silt, pebbles, and clay that the river carries as it flows. These materials can settle at the bottom or move downstream.
9. The velocity of a river is how fast the water flows, usually measured in metres per second.
10. The discharge of a river is the amount of water that flows through the river in a certain time. It is calculated by multiplying the area of the river's cross-section by its velocity.
11. Laminar flow happens when river water moves smoothly in straight, parallel layers, without much mixing. In contrast, turbulent flow happens when the water moves in a rough and disorderly way, with swirling and spinning patterns.

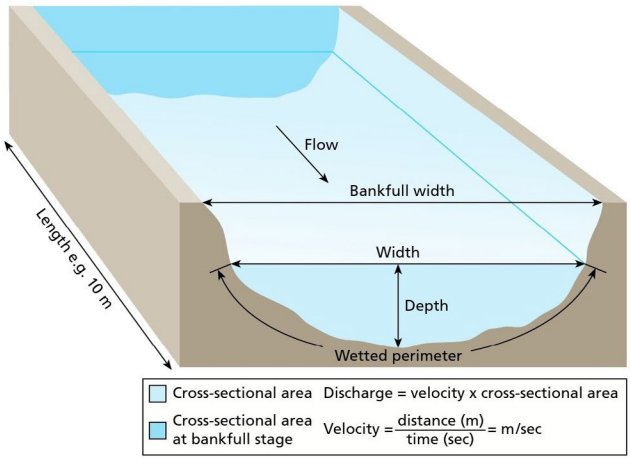


Figure 1.2: River discharge

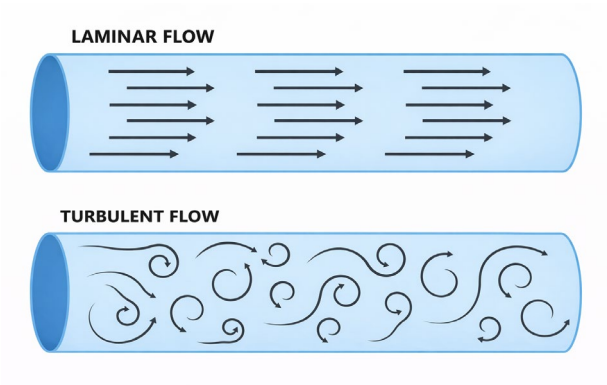


Figure 1.3: Laminar and Turbulent Flow

Fluvial/River Processes

Rivers shape the landscape through three main processes: erosion, transportation, and deposition.

1. **Processes of River Erosion**

   Rivers erode through the following four main processes

   a. Hydraulic action: This happens when the strong force of the moving water pushes and removes loose materials like sand, soil, and small rocks from the bottom and sides of the river.

b. Abrasion (Corrasion): This happens when the river uses the sand, gravel, and stones it carries to scrape and wear away the riverbed and banks, like sandpaper.

c. Attrition: This happens when the rocks and stones carried by the river bump into each other, breaking into smaller, smoother pieces over time.

d. Solution (Corrosion): This happens when the water dissolves certain minerals, like salt and limestone, from the rocks in the riverbed and banks.

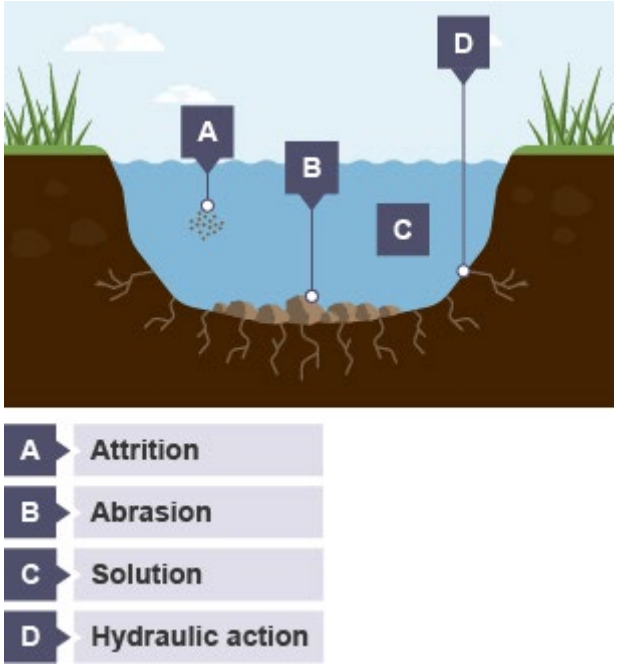


Figure 1.4: Processes of river erosion (cross-sectional view)

2. **River Transportation (Movement of Eroded Material)**

All the materials that the river carries along, or transports, are called the load.

Rivers transport materials in four main ways

a. Traction: This happens when big, heavy rocks or boulders roll or slide along the bottom of the river because of the water's force.

b. Saltation: This happens when small stones or pebbles bounce or hop along the riverbed as the water pushes them.

c. Suspension: This happens when very light and tiny particles like clay and silt are carried along in the water without sinking to the bottom.

d. Solution: This happens when minerals that have dissolved in the water are carried along. You cannot see them because they are mixed into the water.

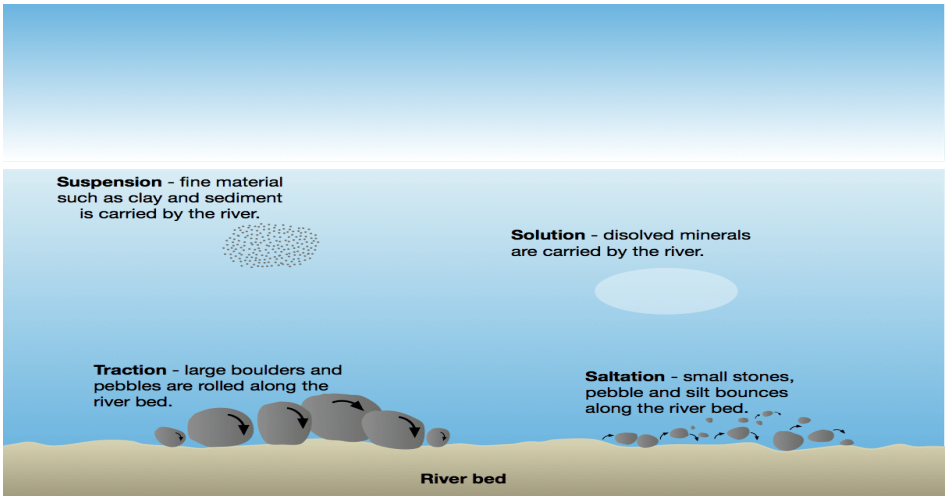


Figure 1.5: River transportation processes

Visit this link to watch a video on river transportation https://youtu.be/8h5ZdCX2Of4

3. **River Deposition (Dropping of Materials)**

   Deposition happens when a river loses strength and can no longer carry all the sand, stones, and other materials in it. The river then drops these materials on the ground. This can happen when the following happens.

   a. The river flows into a lake or the sea.

   b. The land becomes flatter, and the river slows down.

   c. The river valley becomes wider.

   d. There is less water in the river, like during the dry season.

   e. The river bends a lot (meanders), which makes it lose speed.

   Deposition creates landforms like deltas, floodplains, and levees.

The Nature of Sorting of Load in River Deposition

The sorting of river load during deposition means how the river arranges different materials (like stones, sand, and mud) based on their size and weight when it slows down. This happens because the faster the river flows, the more it can carry. When the river loses energy and slows down, it drops its load in a certain order:

1. The biggest and heaviest materials (like big rocks and boulders) are dropped first. This usually happens in the upper part of the river or at the bottom of a steep slope.

2. Medium-sized materials (like sand and gravel) are dropped next, often in the middle part of the river. These can form sandbanks and bars.
3. The smallest and lightest materials (like silt and clay) are dropped last. This usually happens in the lower part of the river or where it meets the sea or a lake, forming deltas.

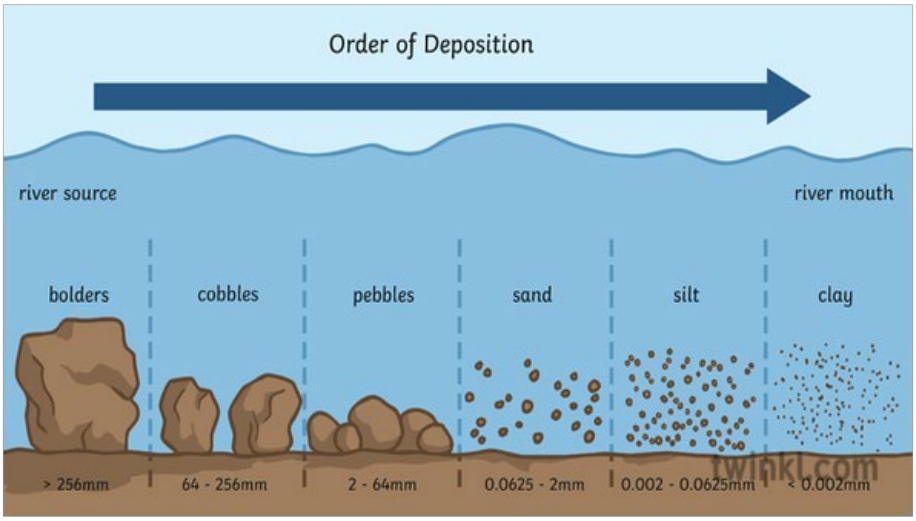


Figure 1.6: Order of river deposition (The heavier materials are dropped first before the river reaches the mouth)

Long Profile of a River

1. **The long profile of a river** is a drawing or graph that shows how steep or gentle the river is from where it starts (the source) to where it ends (the mouth).
2. The long profile is usually **concave in shape**, meaning it is steep at the beginning (upper part) and becomes flatter as it moves toward the end.
3. When the river wears away the bottom (erodes it), it is called **degrading**. When the river drops sand, stones, and other materials on the bottom, it is called **aggrading**.
4. The long profile can be shown in the form of a cross-section, hence the **cross profile of a river**. The **cross profile** shows the shape of the river and its valley if you cut across it and look from the side. The cross-profile changes as the river moves from the start to the end, and it has three main parts: the **upper course**, the **middle course** and the **lower course.**

   The long profile also shows how the river changes as it moves along. It is divided into three main parts

   a. The u**pper course**, where the river is steep and fast.

   b. The **middle course**, where it becomes wider and slower.

   c. The **lower course,** where it is flat and flows into a lake, sea, or ocean.

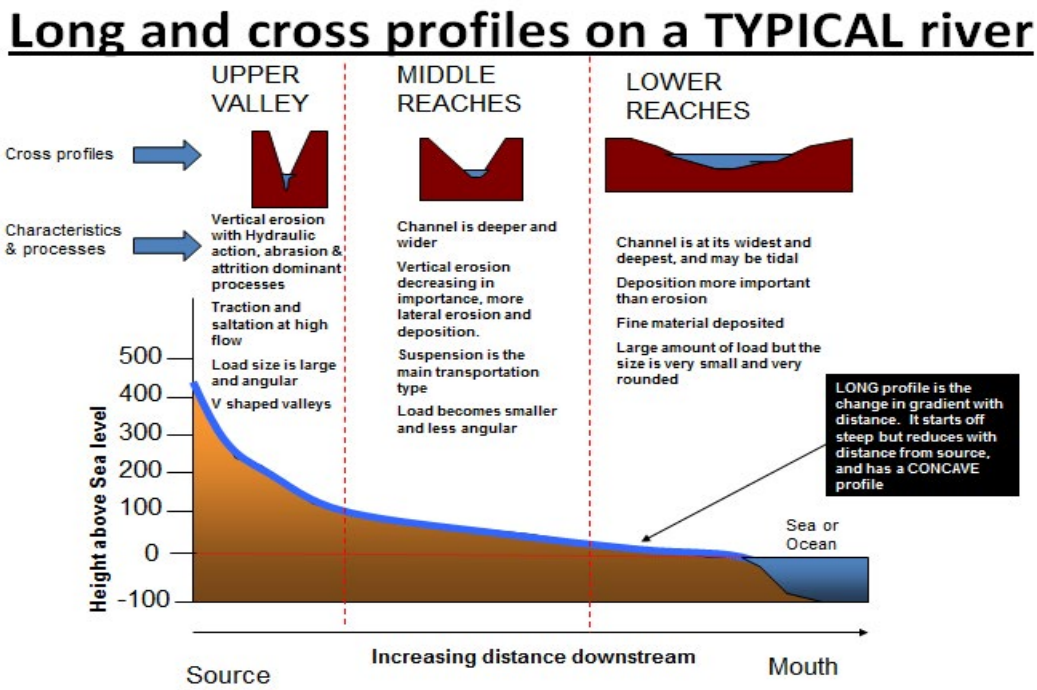


Figure 1.7: Long and cross profile of a river channel (the river 'behaves' differently at each of the stages along the profile)

Visit the link to watch the profile of a river https://youtu.be/u_ReEAsFVY0.

Stages In the Development of a River Channel

1. **Upper Course (Youthful/Torrent Stage)**
   a. This part of the river is found near its **source,** usually in the mountains or hills.
   b. The slope here is very **steep**, and the river flows very fast.
   c. The river cuts **downwards** into the ground more than sideways.
   d. The river may also erode **backwards,** making its source move back into the land.
   e. The river carries big, rough rocks and boulders, which mostly roll along the riverbed (traction).
   f. Landforms found here include **V-shaped valleys, interlocking spurs, waterfalls**, **rapids** and **gorges.**
2. **Middle Course (Maturity/Valley Stage)**
   a. The **slope of the land becomes gentle** and the river gets **wider and deeper**.
   b. The river mainly erodes **sideways,** which makes the valley wider.

c. The valley here is usually **U-shaped.**

d. The river carries **smaller and smoother materials,** which it moves by **bouncing (saltation)** and **floating (suspension)** in the water.

e. Common features in this part of the river are **meanders** (big bends in the river) and **oxbow lakes** (curved lakes formed when a meander is cut off).

3. **Lower Course (Old Age/Plain Stage)**

a. This part of the river is near the **mouth**, where it flows into a lake, sea, or ocean.

b. The slope of the land here is very **gentle.**

c. The river becomes very **wide**, **deep** and **slow-moving**.

d. The river drops (deposits) most of its materials here because it has **less energy**.

e. The river mostly carries **fine particles like silt and clay**, which stay mixed in the water (suspension) or dissolve in it (solution).

f. Landforms found here include **floodplains** (flat land near the river), **levees** (raised riverbanks), and **deltas (**land formed at the river mouth).

River Erosional Landforms

V-Shaped valley

Characteristics/Appearance

1. The valley is **steep and narrow** and it looks like a **V shape** when seen from the side.
2. The sides of the valley are very high and close together, leaving little space for the river to spread out.
3. The valley sides often have **loose rocks and plants** growing on them.
4. This type of valley is found in the **upper part of the river**, where the river cuts deeply **downwards** into the land.

Mode of Formation

1. In the **upper part** of a river, it wears away the ground **downwards** using the force of water (hydraulic action) and by scraping with stones and sand (abrasion).
2. The fast-moving water cuts deep into the riverbed and makes a **steep valley**.
3. Weather and gravity make the valley sides fall in, which creates the typical **V-shape**.
4. Over time, this process continues, making the valley even **deeper and more shaped**.

Figure 1.8: V-shaped valley

Interlocking Spurs

Characteristics/Appearance

1. These are a series of **zigzag or overlapping hills** that stick out into the river valley.
2. The river flows around these hills in a **snake-like or winding path**.
3. When you look at them from above or from the side, the hills seem to **fit together or interlock**.
4. This usually happens in the **upper part of a river**, where the river is not strong enough to cut through the hard rocks.

Mode of Formation

1. In the **upper part** of the river, the water is not strong enough to cut through the hard rocks in its way.
2. So, the river flows **around the hard rocks**, making a zigzag path.
3. The river wears away the **softer rocks** by the force of water (hydraulic action) and by rubbing stones and sand against it (abrasion), making the valley deeper.
4. After a long time, the ridges (spurs) seem to **interlock**, as the river weaves its way around them.

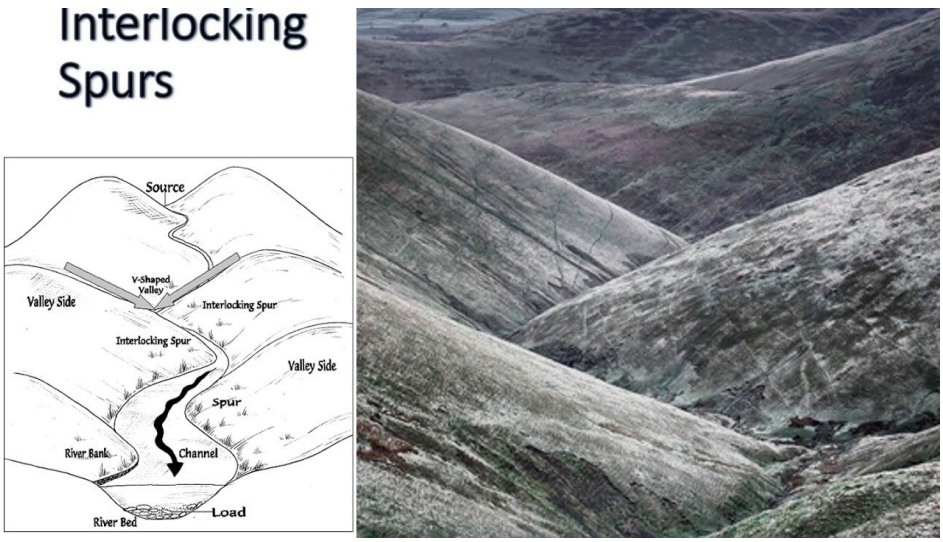


Figure 1.9: Interlocking spurs

Visit the link to watch a video on interlocking spurs and V-shape https://youtu.be/uWswm9mGVTU and https://youtu.be/gDnGumb5NrY, on various erosional landforms

Potholes

Characteristics/Appearance

1. Circular or bowl-shaped depressions in the riverbed.
2. Often filled with pebbles that swirl and deepen the holes.
3. Can vary in size from a few centimetres to several metres wide.
4. Found in fast-flowing rivers, especially in the upper course.

Mode of Formation

1. **Potholes** are small, round holes that form on the riverbed when pebbles and stones spin around in circles in the water.
2. The strong water (hydraulic action) pushes into cracks in the rocks and loosens pieces of rock.
3. The spinning pebbles scrape and grind the riverbed (abrasion), making the holes deeper and rounder.
4. Over time, many potholes can join together to form **larger pools** on the riverbed.

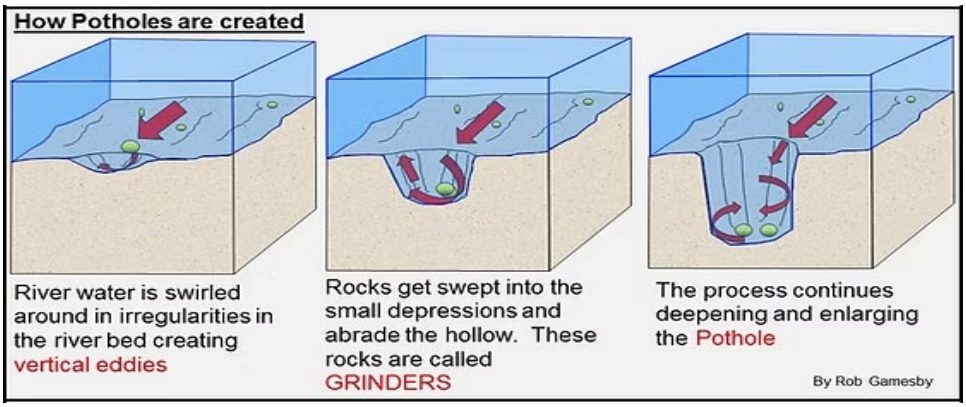


Figure 1.10: Formation of potholes

Figure 1.11: Exposed potholes in the riverbed

Waterfall

Characteristics/Appearance

1. A **waterfall** happens where the river water suddenly falls from a high place to a lower place.
2. At the bottom of the waterfall, a **deep pool** (plunge pool) is formed because the water hits and wears away the rocks.
3. A layer of **hard rock** stays on top as a ledge, while the **softer rock** below gets worn away faster.
4. When the water falls, it creates **spray and mist** because of its strong force.

Mode of Formation

1. The river flows over a layer of **hard rock**, with **softer rock** underneath it.
2. The force of the water (hydraulic action) and rubbing of stones (abrasion) wear away the softer rock more quickly, creating a hollow space called an **undercut**.
3. The hard rock above loses support and **falls down**, making the waterfall move backwards (upstream).
4. This keeps happening over time, and a **plunge pool** (deep hole) forms at the bottom of the waterfall.

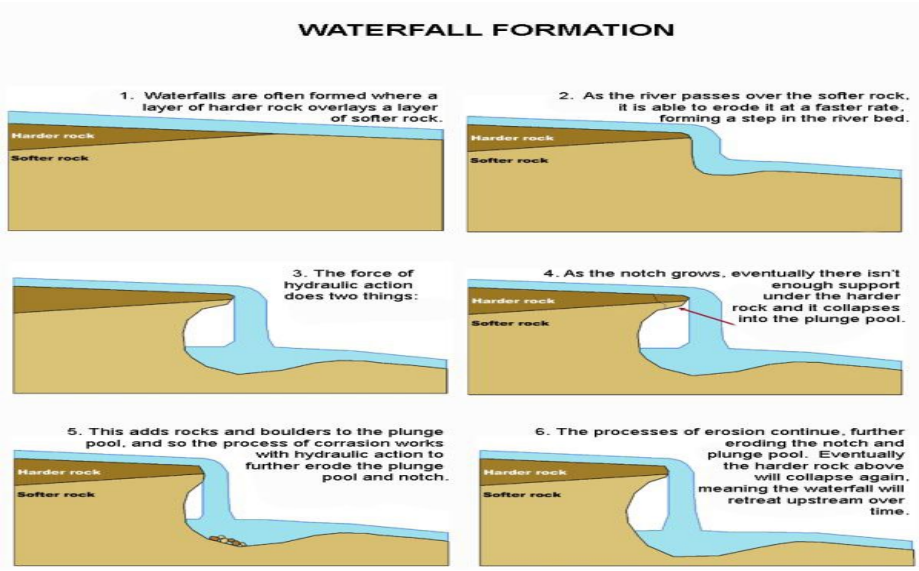


Figure 1.12: Formational process of waterfall

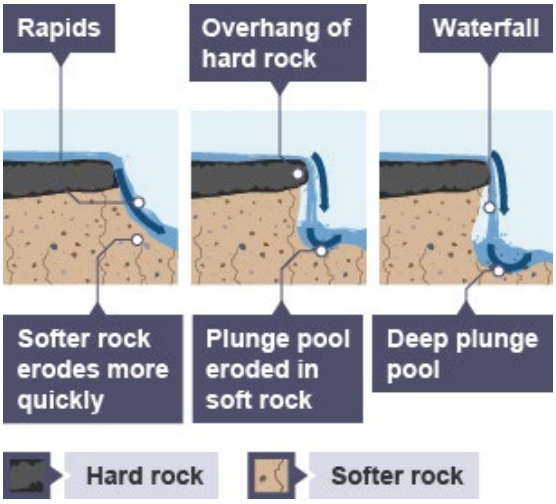


Figure 1.13: Waterfall with plunge pool

Visit the link to watch a video on waterfalls and a plunge pool

https://youtu.be/TAPqH_JUQZg

Gorge

Characteristics/Appearance

1. A **gorge** is a deep, narrow valley with very steep sides, formed by the river cutting into the land over time.
2. It is often created when a **waterfall moves backwards (upstream)**.
3. The river flows very fast at the bottom of the gorge.
4. The sides of the gorge are usually made of bare rocks or rough cliffs, with very few plants growing there.

Conditions Necessary for the Formation of a Waterfall

1. There should be a layer of **hard rock on top of softer rock**.
2. The **softer rock must be open and exposed** further down the river.
3. The softer rock wears away faster than the hard rock, creating a **sudden drop**.
4. The riverbed needs to have a **steep slope** for the water to fall.
5. The river must have enough **water and energy** to wear away the soft rock under the hard rock.

Mode of Formation

1. As a **waterfall moves backwards** because of erosion and falling rocks, it creates a **steep and narrow valley** called a **gorge**.
2. The river keeps cutting **downward** into the ground through the force of water (hydraulic action) and the rubbing of rocks (abrasion), making the valley deeper.
3. The gorge stays **steep and narrow** as the river continues to cut down.
4. Over time, the gorge can become very **long** as the waterfall keeps moving backwards.

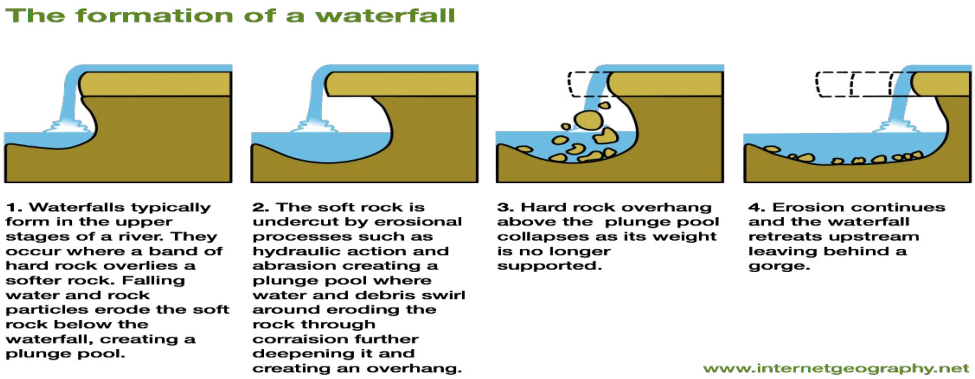


Figure 1.14: Formational process of gorge

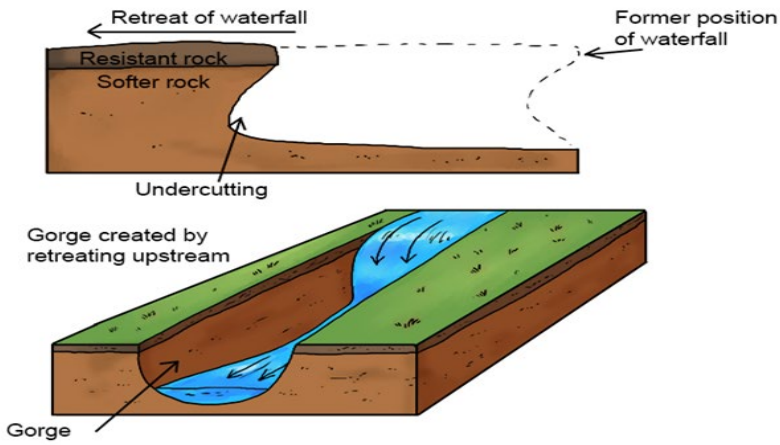


Figure 1.15: Cross-sectional and 3-D aerial view of a gorge

Rapids

Characteristics/appearance

1. This is a part of the river where the water is **rough and fast-moving**.
2. The bottom of the river is **uneven** because it has both hard and soft rocks.
3. The water looks **foamy and white** because it moves in a very rough and swirling way.
4. Rapids are usually found in the **upper and middle parts** of a river.

Mode of Formation

1. **Rapids** happen when the riverbed has layers of **hard and soft rock**.
2. The **soft rock wears away faster** because of the force of the water and the rubbing of stones, making the riverbed uneven.
3. As the water flows over this **bumpy surface**, it becomes rougher and shakier.
4. This creates a **fast and rough part of the river** called rapids.

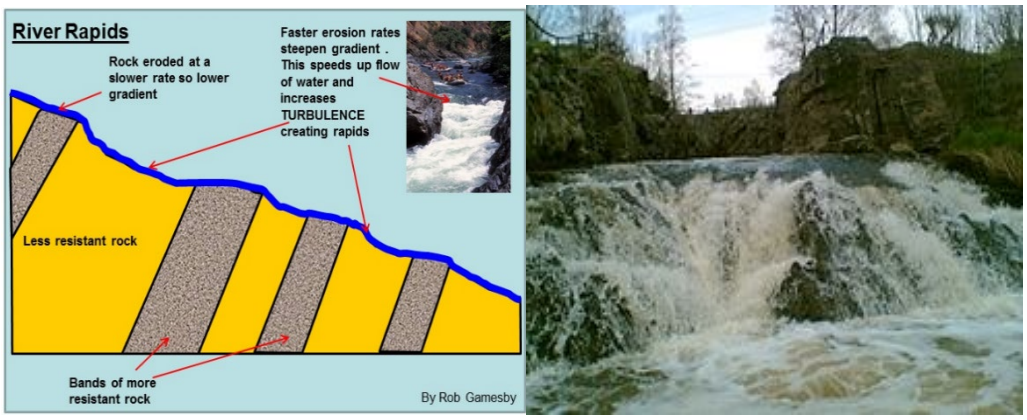


Figure 1.16: Formation of rapids (cross-sectional diagram on left and real image on right)

Meander

Characteristics/Appearance

1. **Meanders** are **curved or S-shaped bends** in the river's path.
2. The river **erodes (wears away)** the **outer bank**, where the water flows faster.
3. The river **drops sand and mud** on the **inner bank**, where the water is slower.
4. Meanders are common in the **middle part** of the river but become bigger and clearer in the **lower part**, where the river has more energy to bend.
5. Sometimes, a meander can be **cut off** from the main river, forming an **oxbow lake**.

Mode of Formation

1. A river in the middle or lower course begins to flow across a relatively flat landscape.
2. Variations in the riverbed cause the water to flow more quickly on one side, leading to initial curves or bends.
3. On the outside of the curve, the water flows faster and exerts more force.
4. This causes erosion through hydraulic action and abrasion, cutting into the bank and deepening the channel.
5. On the inside of the curve, the water flows more slowly, leading to the deposition of sediments (sand, silt, .).
6. As the process of erosion on the outer bank and deposition on the inner bank continues, the bend becomes more pronounced as meanders.

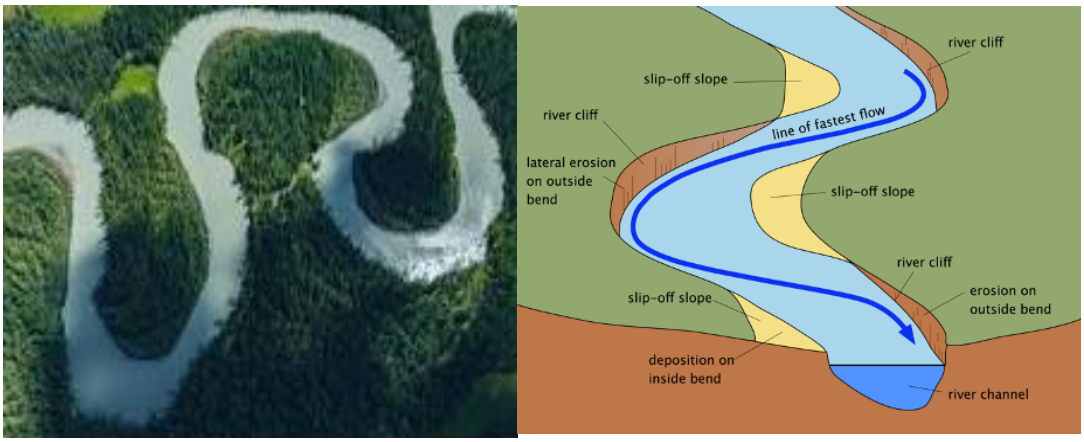


Figure 1.17: Meader formation

River Cliff (Bluff)

Characteristics/Appearance

1. A steep, vertical bank found on the outer bend of a meander.
2. River erosion due to strong water flow.
3. It exposes layers of soil and rock on the riverbank.
4. Collapses over time due to undercutting and weathering.

Mode of Formation

1. River cliffs form on the outer bends of meanders where erosion is strongest.
2. Hydraulic action weakens the riverbank by forcing water into cracks.
3. Abrasion further wears away the bank as fast-moving water carries sediment.
4. This creates a steep, vertical slope known as a river cliff or bluff.

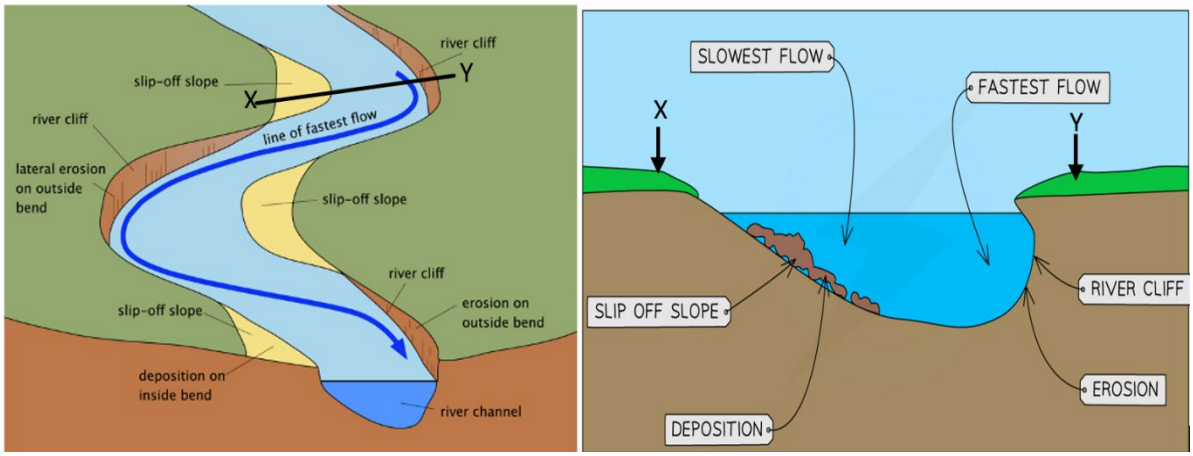


Figure 1.18: cross-sectional view showing slip-off slope and river cliff at meander bend

River Capture

River capture (also called stream piracy) happens when one river takes over the water from another river and makes it flow into its own channel.

Conditions Needed for River Capture

For river capture to happen, certain things must be in place

1. There must be heavy rainfall, which gives the stronger river more water and energy to erode.
2. Two rivers must flow side by side in parallel valleys.
3. A ridge or watershed (highland) must separate the two rivers.
4. One river must be stronger and faster than the other.
5. The stronger river's valley must be deeper than the weaker river's valley.
6. The stronger river must cut backwards (headward erosion) faster than the weaker tone.
7. The rocks at the start of the stronger river must be softer and easier to erode.
8. The stronger river must cut through the ridge more quickly than the weaker river.

Mode of Formation

1. River capture starts when two rivers flow in neighbouring valleys, separated by a ridge. One river (A) is stronger because it flows faster and from a higher place.
2. The stronger river (A) cuts back into the land until it breaks through the ridge and captures the water from the weaker river (B), pulling it into its own valley.
3. After the capture, river (A) becomes even bigger and stronger because it now carries water from both rivers. The place where the capture happens is called the elbow of capture.
4. Below this point, the remaining part of river (B) becomes small and weak. This leftover river is called a misfit river because it looks too small for its valley.
5. The old dry valley between the elbow of capture and the misfit river is called a wind gap.

Examples of River Capture

River Tano captured by River Volta (Ghana), Yemetu captured by Ogunpa (Nigeria), Mansi captured by Offin (Ghana), Tano captured by Volta (Ghana), etc.

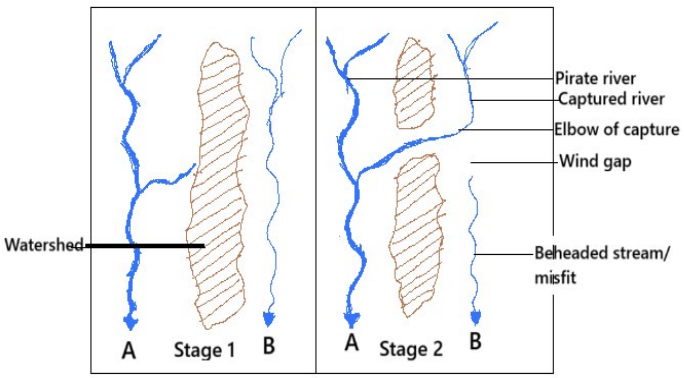


Figure 1.19: Stages of river capture

River Depositional Landforms

River deposition occurs in the lower course and produces some features and landforms. Examples are discussed below.

Point Bars (also called Slip-Off Slopes)

Characteristics/Appearance

1. Point bars are gentle, sloping areas found on the inner side of a river bend (meander).
2. They are made of sand, silt, and gravel left behind by the slower-moving water.
3. They have a curved shape, matching the bend of the river.
4. They often look like a crescent or hook along the riverbank.

Mode of Formation

1. Point bars form on the inner side of a meander, where the water flows more slowly.
2. Because the water is slower here, it loses energy and drops sand, stones, and mud.
3. Over time, more and more sediments pile up, making the point bar bigger.
4. Heavier materials like gravel and coarse sand settle close to the riverbank.
5. Lighter materials like silt and clay settle farther away from the river.

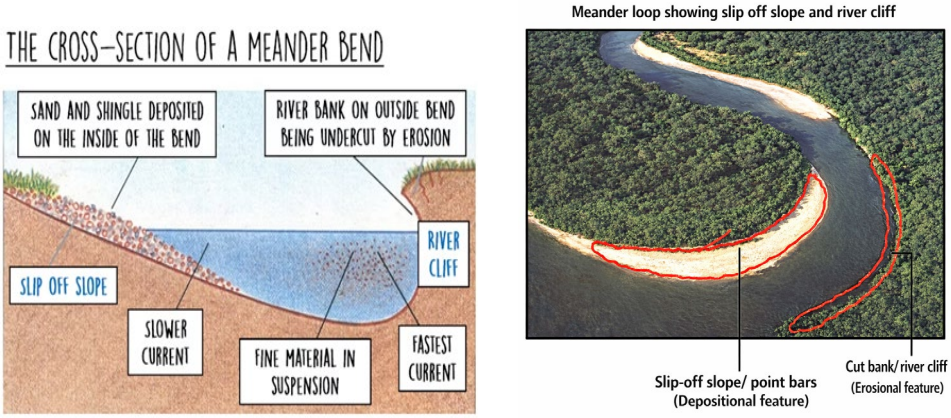


Figure 1.20: Real image showing aerial view of slip-off slope/point bars

Oxbow Lakes

Characteristics/Appearance

1. U-shaped or crescent-shaped lake formed by an abandoned meander.
2. Often isolated from the main river.
3. Can vary in size, from small to large bodies of water.
4. Found in areas where meanders have been cut off.

Mode of formation

1. A meander becomes increasingly curved due to erosion.
2. The river eventually cuts across the narrow neck of the meander.
3. Deposition seals off the meander, forming an oxbow lake.

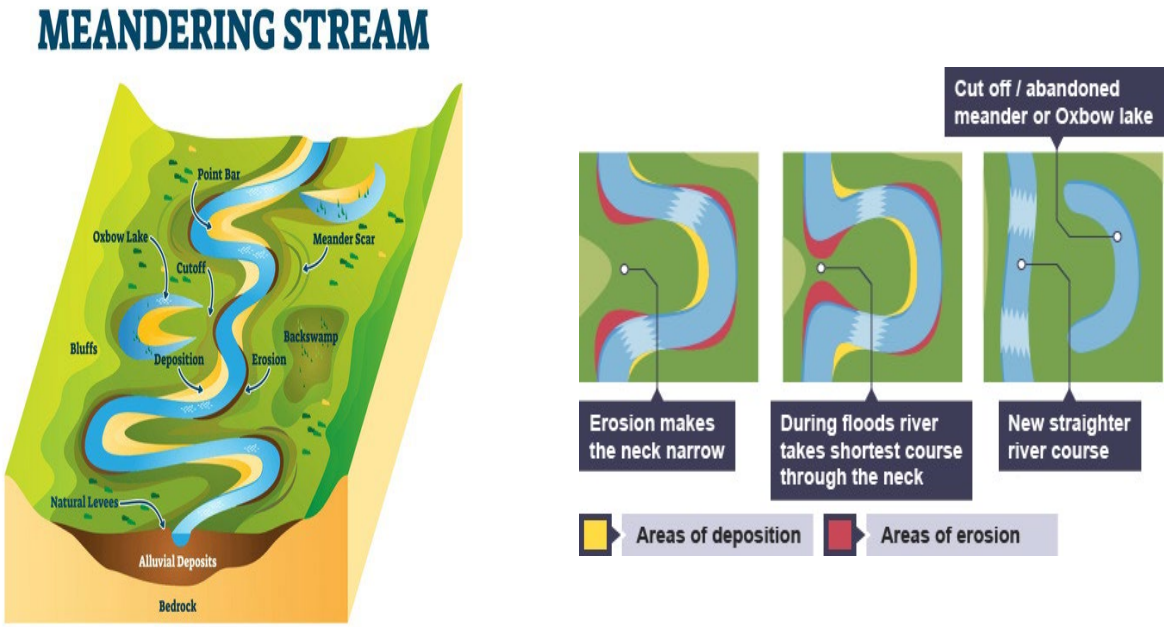


Figure 1.21: Formation of an oxbow lake

Floodplains

Characteristics/Appearance

1. Flat, low-lying land adjacent to a river.
2. Typically covered with fertile soil, often with silt and clay.
3. Can be wide or narrow depending on the river.
4. May contain small lakes, ponds, or wetlands.

Mode of Formation

1. Formed by repeated flooding, where rivers overflow their banks.
2. During floods, sediment is deposited on the valley floor.
3. Over time, this creates a broad, flat area of fertile land.

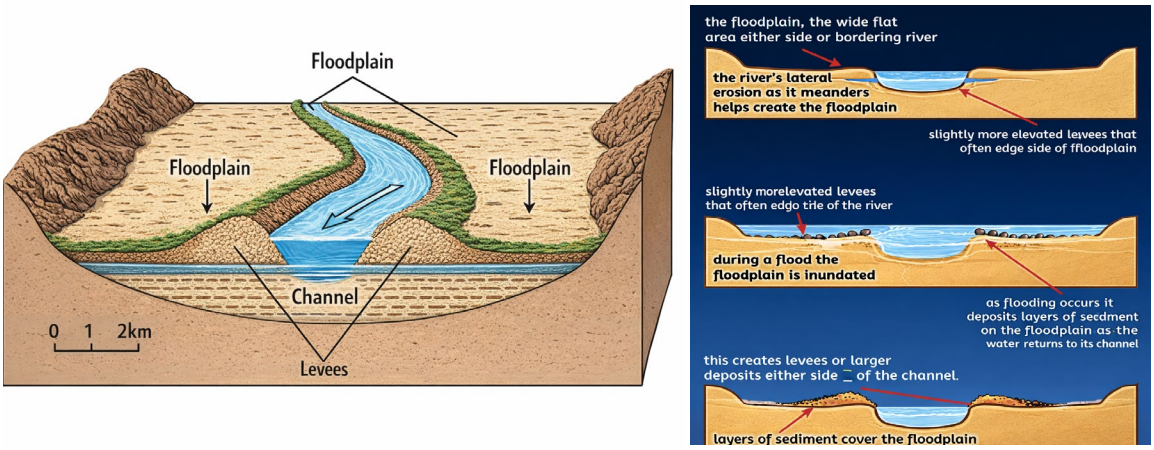


Figure 1.22: Formation of floodplains and levees

Levees

Characteristics/Appearance

1. Raised banks or ridges formed along river channels.
2. Typically found on both sides of a river.
3. Can be steep or gentle, depending on the level of sediment deposition.
4. May vary in height, with some reaching several metres.

Mode of Formation

1. Formed during flood events when rivers overflow.
2. As water slows down on the riverbank, heavier sediments are deposited closest to the river.
3. Over time, repeated flooding builds up raised ridges along the river.

Braided Rivers/Channels

Characteristics/Appearance

1. A network of interwoven channels separated by bars of sand, gravel, or rocks.
2. The channels are often shallow and wide.
3. The river looks like a “braid” of multiple smaller channels.
4. Found in areas with high sediment load and fluctuating water flow.

Mode of Formation

1. Occur when a river carries a large amount of sediment.
2. The river splits into multiple channels that frequently shift.

3. The sediment load and fluctuating flow create bars that separate the channels.

Figure 1.23: Formation of braided channels

Deltas

Characteristics/Appearance

1. A delta is land that forms at the mouth of a river, where it flows into a lake, sea, or ocean.
2. It has many small river channels (called distributaries) and areas where mud, sand, and silt are deposited.
3. Deltas can have different shapes, and they may look triangular, fan-shaped, or finger-like.

Mode of Formation

1. A delta forms when the river slows down as it enters still water.
2. The river drops the sand, silt, and clay it was carrying, building new land.
3. Over time, the river splits into many smaller channels, creating the delta.

1. **Arcuate Delta**
   a. **Characteristics/Appearance**

      An arcuate delta is fan-shaped, with many small river channels. It often looks like a rounded arch.

      Example: The Nile Delta in Egypt.

   b. **Mode of Formation**

      This type of delta forms when the river mouth splits into several distributaries and deposits sediment in a fan-like pattern.

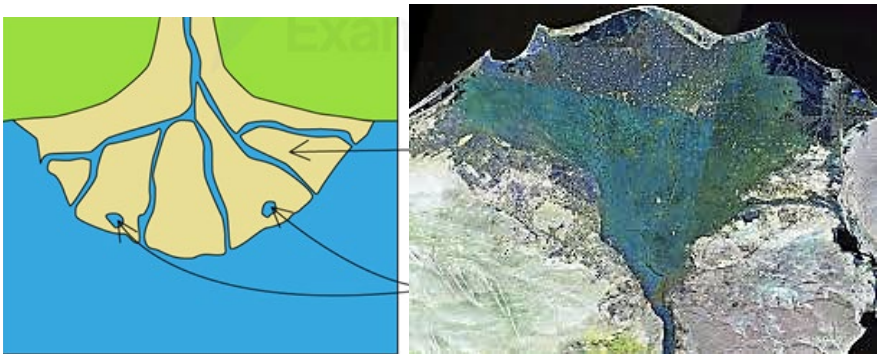


Figure 1.24: The Nile Delta

2. **Bird's Foot Delta**
   a. **Characteristics/Appearance**

      Shaped like a bird's foot, with many long, thin channels extending into the water.

      Example: Mississippi Delta.

   b. **Mode of Formation**

      Formed when a river deposits sediment in a way that creates a branching, finger-like shape.

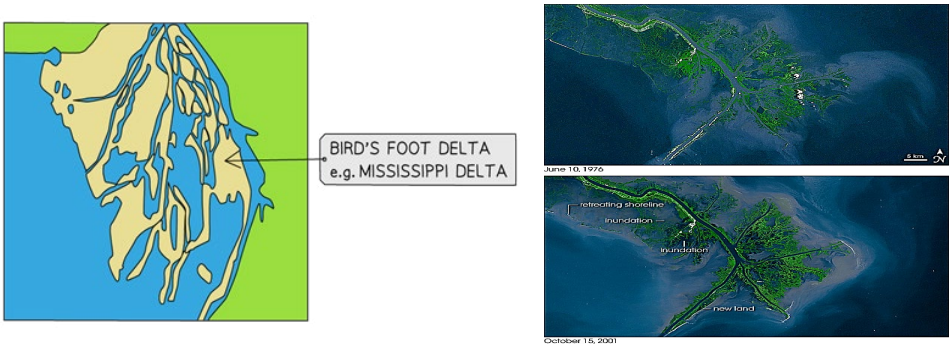


Figure 1.25: Mississippi Delta

3. **Cuspate Delta**
   a. **Characteristics/Appearance**

      Triangular or pointed in shape, with a clear separation of channels.

      Example: Tiber Delta.

   b. **Mode of Formation**

      Formed when the river splits into fewer channels, creating a pointed delta.

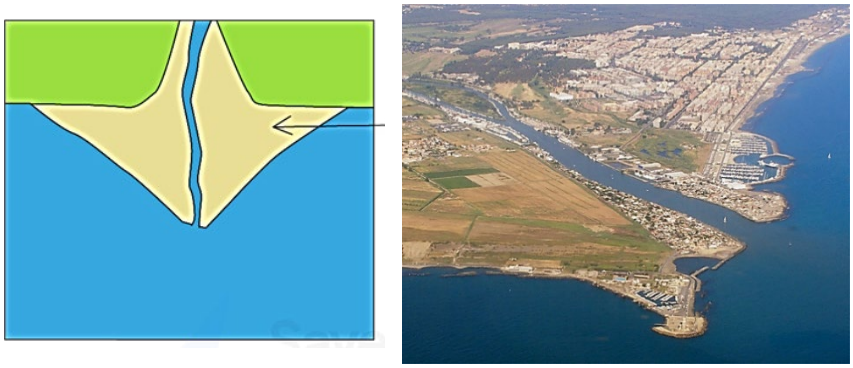


Figure 1.26: Tíber Delta

4. **Estuarine Deposits/Delta**
   a. **Characteristics/Appearance**

      Muddy or sandy deposits are found in the mixing zone of fresh and saltwater.

      Example: Volta Estuary

   b. **Mode of Formation**

      Formed when sediment is deposited in the estuary where river water meets the sea, with sediment carried in by the river and the tides.

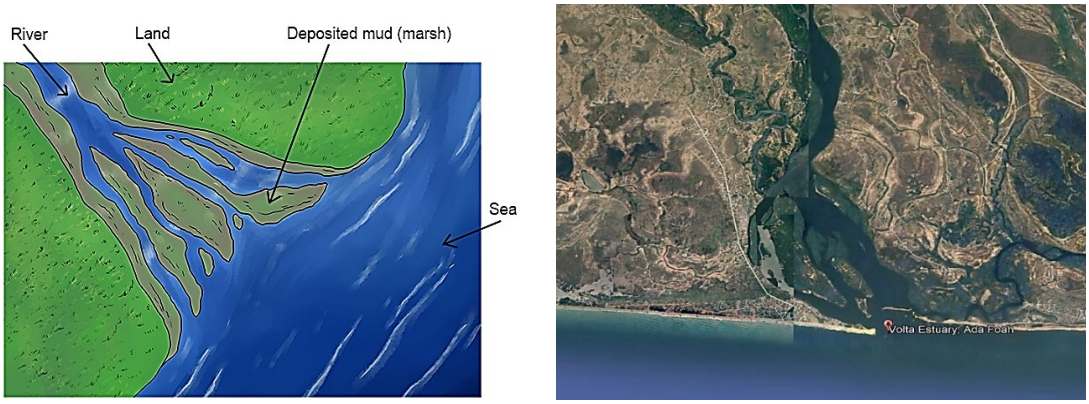


Figure 1.27: The Volta estuary

Visit the link to watch a video on Delta https://youtu.be/lWgP6vN5s2c

Similarities Between Arcuate Delta and Bird's Foot Delta

1. They are found at the lower course of a river
2. They are depositional landforms at the lower course of a river

3. They are formed at the entry of a river into the sea
4. They are found in areas with high tidal ranges
5. The river's mouth, forming the delta, is perpendicular to the coastline
6. They are made up of coarse (larger) and fine materials
7. They have multiple distributary channels that branch out from the main river
8. They form a network of waterways
9. They have sediment lopes that extend into the sea
10. Both constantly change in shape due to sediment deposition

River Rejuvenation

River rejuvenation refers to the renewed ability of a river to erode its channel due to an increase in its potential energy.

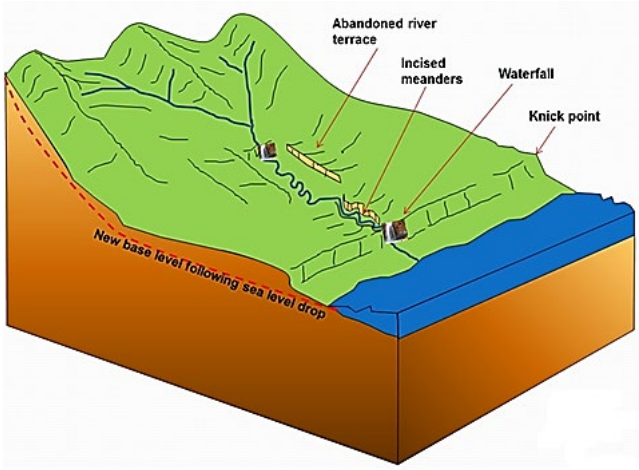


Figure 1.28: River rejuvenation

Causes of River Rejuvenation

1. Tectonic Uplift: Uplift of land raises the river's gradient, increasing velocity and erosive power.
2. Drop in Sea Level: Lowering of the base level forces the river to cut deeper into its valley.
3. Increased Discharge: Higher water volume, often due to climate change or glacial melting, enhances erosion.
4. Change in Load: A decrease in sediment supply allows the river to focus on vertical erosion rather than deposition.

Effects and Features of Rejuvenation

1. Incised Meanders: Previously formed meanders become entrenched due to vertical erosion.
2. Knickpoints: Sudden changes in gradient, often forming waterfalls or rapids.

3. Terraces: Step-like landforms on valley sides, indicating former floodplain levels.
4. Gorges and Valleys: Deepening of river valleys due to increased erosion.

Activity 1.1 Researching Erosional & Depositional Landforms of Rivers

1. Choose two river landforms from this section.

   One river erosional landform (e.g., waterfall, gorge, V-shaped valley).
   One river depositional landform (e.g., delta, floodplain, levee).

   a. Research using an atlas, textbook, or approved website to investigate the following;
      i. The processes involved in creating the river landform.
      ii. the precise geographical coordinates of one example.
      iii. In which stage of river development does it belong (youth, middle or old age)
   b. Write a summary (3–5 sentences per landform) that names and describes the river feature, the processes involved in formation, where it belongs in the river cycle and location using your own words.
   c. Create a Visual Representation:
      i. On a single A4 paper or digital slide, sketch a plan and/or side-view diagrams of the two landforms you selected. Clearly label each sketch with any significant features (e.g., plunge pool, river cliff for example)
      ii. Use colour-coding to highlight erosion (warm/red) or deposition (cool/blue)
   d. Add arrows to show water movements, erosional forces or areas of deposition: Label the arrows clearly or use a different colour for erosion and deposition processes
   e. Compile your sketches and written explanations into one document. Ensure clarity, creativity, and accuracy in both content and design.
2. For this activity, work in pairs. Ensure that everyone has an equal opportunity to contribute.
   a. Take turns asking and answering the following guiding questions:
      i. What is river erosion? What are the processes of river erosion?
      ii. Can you name two landforms created by river erosion?
      iii. What is river transportation? What are the processes of river transportation?
      iv. What is river deposition?
      v. What are two landforms formed by river deposition?

b. Based on your discussion, write a short script (about 5 lines) where one person explains how one erosional and one depositional landform is formed, and the other reads the script to check accuracy and asks questions if there are any parts of the script that are not clear.
c. Both pair members should sketch the erosional and depositional landforms discussed. Label them clearly and briefly describe how each is formed under the sketch. Analyse the sketches for clarity and accuracy.

3. Research to investigate the impact of erosional processes rivers in different climatic zones (Dry Desert and Tropical Rainforest for example). Carefully choose two rivers. For example, the Congo River (Democratic Republic of Congo) and the Nile River (Egypt).
   a. Search the internet or books for information. Focus on the following:
      i. climatic influences.
      ii. Impact of climate on river processes – erosion/transportation/deposition
   b. How do these rivers influence surrounding landforms and communities?
   c. Prepare a presentation highlighting the key differences you have found and the reasons for them.
   d. Present your findings to a friend or the class.
4. River Systems Audit

   Choose a Ghanaian river system (e.g. Pra River, White Volta, Ankobra).

   a. Use maps, videos, and field reports to track the river's progression from its Youthful Stage (e.g. rapids and waterfalls near source) to Old Age Stage (e.g. deltas or ox-bow lakes near mouth).
   b. Create a timeline plan with specific landforms clearly labelled and places where erosion/deposition processes occur. Add photos or sketches.
   c. Research how landforms at each stage impact human settlement, agriculture, and transport. Include data on flooding, erosion, and water use from local news, interviews, or government websites.
5. Community Campaign for Riverbank Protection: Design a public awareness campaign to prevent riverbank erosion. Reflect on how inclusive communication can help spread awareness.
6. Take a field trip to a nearby river or stream and undertake the following:
   a. Document your observations of the rivers or streams with sketches, notes, and photos.
   b. Focus on river channels, rock formations, and signs of river erosion or deposition and how humans have influenced natural processes.
   c. Back in class, write up and interpret your findings.
   d. Create a report including how human activity affects river processes and share with a friend in class

7. Mapping River Channels and Risk Zones

   For a river in your local area, investigate the relationship between its channel and the surrounding topography. Source topographical maps or use digital tools like Google Earth:

   a. From the map, identify and map all river channels in a well-defined area.
   b. from the map identify areas prone to erosional processes (consider steepness of land or flat areas prone to flooding)
   c. Annotate your maps with shaded zones which could present a risk to nearby human activities.
   d. Present your map and discuss or propose land-use strategies to reduce erosion or flooding risks in your community

8. **Case Study**: Analysis of River Processes for a Ghanaian River

   Choose a river system in Ghana – for example, the Volta, Pra or Nasia. With your knowledge of river systems and processes, complete a report based on the following five areas:

   a. Erosion Dynamics: Examine how rainfall intensity and land use affect bank erosion and sediment removal.
   b. Transportation of Sediments: Assess how seasonal flow variations influence the movement of suspended and bedload materials.
   c. Deposition Zones: Identify areas where reduced velocity leads to sediment accumulation, such as floodplains or deltas.
   d. Human Impact: Evaluate how dams, agriculture, and urban development alter natural flow regimes and sediment budgets.
   e. Channel Morphology Changes: Track shifts in river meanders, braiding, or incision due to hydrological and geomorphological forces.

SIGNIFICANCE OF FLUVIAL LANDFORMS

Rivers and the landforms they create are very important for every country's growth and development. For example, in Ghana, the Southwestern River System (rivers like Bia, Tano, Ankobra, and Pra) covers about 22% of Ghana, and it provides water for the wet, forest areas. The Coastal River System (like Ochi-Nakwa and Densu) is smaller, covering about 8%, but it supplies water to big towns and cities such as Accra.

Lake Volta, one of the largest human-caused lakes in the world, produces electricity (912 megawatts), supports transport, irrigation, and fishing. Lake Bosomtwe, a natural lake in the Ashanti Region, is used for fishing and attracts tourists. The Volta River Delta, where the river meets the sea, often floods and suffers erosion.

The fertile soils of the White and Black Volta floodplains help farming but can also flood. The Afram and Oti valleys support local life, while the Birim River valley produces diamonds, and the Offin River valley is known for gold. Famous waterfalls like Wli, Boti, and Kintampo Falls are beautiful tourist sites and have cultural importance.

Positive Effects of Fluvial Landforms on the Socio-Economic Development of Ghana

1. **Transportation and Trade**

   The Akosombo Gorge allows ferries to transport people, crops, and goods between the north and south of Ghana. This makes it easier for farmers and traders to sell things like food and timber.

2. **Farming and Food Security**

   Floodplains, such as those by the White Volta River, have rich soil from floods, making them great for growing crops like cowpeas, onions, and tomatoes. River valleys, like the Accra Plains, also have good soil for farming, helping farmers earn a living. Plus, lakes and rivers support fishing, which provides food and income for families.

3. **Electricity Generation**

   The Akosombo Gorge is home to the Akosombo Dam on the Volta River, which generates hydroelectric power. This power is used in homes, schools, and businesses, helping Ghana grow and develop.

4. **Tourism and Jobs**

   Beautiful waterfalls like Wli Falls, Boti Falls, and Kintampo Falls attract tourists. Visitors pay for tours, food, and hotel stays. Lake Volta offers boat rides and stunning views, bringing in more tourists. This creates jobs for local guides, drivers, and businesses.

5. **Mineral Resources**

   River valleys, such as the Birim River valley (known for diamonds) and the Offin River valley (known for gold), contain valuable minerals. Mining these resources creates jobs and brings money to Ghana through exports.

Negative Socio-Economic Effects and Challenges of Ghana's River Landforms

1. **Flooding**

   Flooding is a big problem, especially during the rainy season. It can destroy homes, roads, and farms, making it hard for people to travel and do business.

2. **Water-Borne Diseases**

   Rivers and lakes can become unsafe when they get polluted. Floods and poor sanitation can spread diseases like cholera, typhoid, and diarrhoea. Illegal mining adds harmful chemicals like mercury to the water, making it dangerous to drink or use. We need clean water and good sanitation to stay healthy.

3. **Environmental Damage**

   'Illegal mining (called galamsey) and farming near rivers harm the environment. These activities can pollute the water, destroy forests, and cause soil erosion.

This makes rivers muddy and harms fish and other aquatic life. Soil erosion also makes farmland less fertile.

4. **Coastal Erosion and Saltwater Intrusion**

   In the Volta Delta, the coastline is shrinking because less sediment is coming from the river, especially after dams were built. Saltwater is moving into freshwater areas, which harms farms and fishing. This threatens people's livelihoods.

5. **Displacement from Dam Construction**

   Building dams like Akosombo and Bui has forced many people to move. About 78,000 people had to leave their homes for Lake Volta, and over 2,500 for the Bui Dam. While some were given new homes, many lost their land and way of life, which affected their social and economic well-being.

Activity 1.2 River Resources and Threats

1. River Resources
   a. Name a river valley where diamonds are found.
   b. Identify one other Ghanaian river valley and the resource it provides.
   c. Explain how these resources contribute to Ghana's export economy.
2. How do fluvial landforms simultaneously contribute to both agriculture and public health challenges in Ghana?
   a. Describe two ways rivers help improve agricultural productivity.
   b. Identify one health risk caused by river systems or flooding.
   c. Suggest a community-level solution to balance farming and health concerns.
3. To what extent can river-based socio-economic development in Ghana be sustained without worsening environmental degradation?
   a. Choose two benefits rivers bring to Ghana's economy.
   b. Discuss two environmental issues linked to river use or exploitation.
   c. Propose a local or national policy or innovation that could protect river systems while supporting development.

MASS WASTING

Mass wasting happens when rocks, soil, and other materials move down a slope because of the force of gravity. This movement does not mainly depend on water, ice, or wind to carry the materials. It can also be explained as the movement of a large amount of earth materials down a slope, which changes the shape of the land. Mass wasting can also cause problems for people and the environment, like damaging homes, roads, and farms, or harming plants and animals in the area.

Figure 1.29: Incidence of mass wasting at Peduase road to Oyarifa

Visit this link to watch a video on mass wasting https://youtu.be/k3IJKJQ2pAY

Factors Influencing Mass Wasting

1. **Slope Angle (Steepness)**

   Steeper slopes are more likely to experience sliding or falling because gravity pulls harder on the materials. The steepest angle at which loose material can stay in place is called the angle of repose. If the slope becomes steeper than this (e.g., after cutting a road), mass wasting can happen. For example, rocks fall more easily from steep mountains than from gentle hills.

2. **Type of Material**

   The kind of soil or rock on the slope also matters. Clay-rich soils stick together better, but if they get very wet, they can suddenly slide. Loose materials like sand and gravel do not hold well and can slide easily. Rocks that are cracked or layered (like shale) are also weak and can fail more easily. For example, dry sand can collapse quickly compared to compact clay.

3. **Water Content**

   Water can both help and harm a slope. A little water can hold particles together, but too much water makes the soil heavy and slippery, causing landslides or mudflows. Water also freezes in cracks, making rocks weaker. For example, heavy rains or melting snow can soak a slope and cause it to slide.

4. **Vegetation (Plants)**

   Plants help hold the soil together with their roots and reduce erosion. Cutting down trees or burning the land removes this protection, making slopes unstable. On the other hand, very heavy plants can add weight and sometimes cause sliding. For example, a forested hill is more stable than one that has been cleared of trees.

5. **External Triggers**

   Sudden events like earthquakes, volcanic eruptions, or blasting by humans can shake or weaken a slope, making it fail. For example, an earthquake in a mountain area can cause many landslides.

6. **Climate and Weather**

   The weather and climate of an area affect slopes. Heavy rains, snowmelt, and storms add water to the soil and can trigger mass wasting. In cold areas, freezing and thawing weaken rocks. In wet regions, like tropical areas, monsoon rains often cause landslides.

7. **Weathering**

   Over time, rocks and soils break down because of weathering. Physical weathering breaks rocks into smaller, weaker pieces. Chemical weathering changes the minerals and makes them less strong. This makes slopes more likely to fail. For example, rocks weakened by years of freezing and thawing can suddenly fall.

Activity 1.3 Mass Wasting

1. **Field Study**
   a. Take a field trip around the school compound or a nearby area where evidence of mass wasting (e.g., landslides, rockfalls, or soil creep) can be observed.
   b. Identify examples of mass wasting and categorise them based on type (e.g., landslides, mudflows, or rockfalls).
   c. Document your findings through sketches, photographs, and short notes.
   d. Apply your knowledge by observing real-life examples of mass wasting and classify them under types.

   OR

   a. Take a field trip further away from school where evidence of mass wasting is visible (e.g., a landslide-prone hill or eroded slope).
   b. Identify the factors contributing to mass wasting at the site (e.g., steep slopes, deforestation, or heavy rainfall).
   c. Document your observations with sketches, photographs, and notes
   d. Analyse how these factors interact to cause mass wasting in the area.

2. **Slope Modification and Risk Assessment**

   Case Study: Road Construction at Peduase to Oyarifa
   Use a map or the internet to learn more about the topography of this area, then answer the following questions:

a. Explain how altering slope angles during road construction can increase the risk of mass wasting in this area.
b. Identify two types of materials present in Ghana that may respond differently to slope steepening.
c. Suggest engineering or planning strategies that could reduce the likelihood of slope failure in this area.

3. **Water Content and Vegetation Interactions**

Case Study: Landslide Risk in Forested Hills near the Volta Region
Use a map or the internet to learn more about this area, then answer the following questions:

a. Discuss how water content and vegetation interact to either stabilise or destabilise slopes.
b. Evaluate the impact of deforestation on slope stability in tropical climates.
c. Propose a community-based land management plan to reduce mass wasting risks while supporting local livelihoods.

4. **Climate, Weathering, and Long-Term Slope Stability**

Case Study: Seasonal Mass Wasting in the Eastern Highlands of Ghana
Use a map or the internet to learn more about the topography and soils of this area, then answer the following questions:

a. Describe how climate and weathering contribute to long-term slope weakening.
b. Assess how freeze-thaw cycles and monsoon rains might affect different slope materials.
c. Recommend monitoring techniques or early warning systems that could help communities prepare for mass wasting events.

TYPES OF MASS WASTING

Creep

Creep is the slowest type of mass wasting, where soil and small rocks move very slowly downhill. It happens so slowly that you usually don't notice it, but over time it can cause trees, poles, and fences to lean or bend. The most common type is called soil creep, which happens on gentle slopes as the soil slowly moves down because of gravity.

Soil creep is mostly caused by the freezing and thawing or wetting and drying of the soil.

1. When the soil freezes, it pushes up at a right angle to the slope.
2. When it thaws, the soil falls slightly, making it move downhill little by little.
3. This pushing up of soil at right angles is called heaving.

Soil creep can also form small, step-like ridges on the slope called *terracettes*. Another example is *solifluction*, which happens in cold places where freeze-thaw action slowly moves the soil downhill.

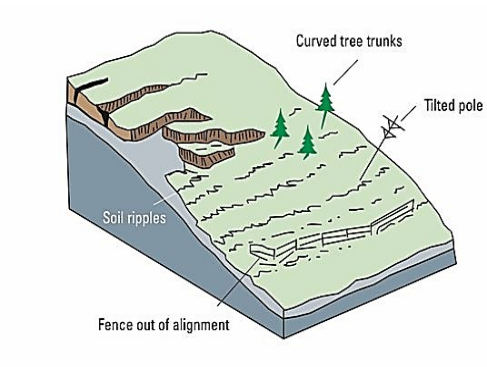


Figure 1.30: Tilted fence Soil creep shows evidence of soil creep

nnnn

Figure 1.31: Terracettes on slopes **Figure 1.32**: Solifluction lobes

Slide

A slide happens when a large block of soil or rock quickly moves down a slope along a clear, flat surface. It is faster than creep and more noticeable. There are two main types of slides:

Translational slide and *Rotational slide (also called slump)*.

Translational slide

In a translational slide, a big block of soil or rock moves downhill along a flat surface. The bottom part of the slide, where the materials pile up, is called the toe.

Examples of translational slides include: Rock slide — when large rocks quickly move down a flat slope. Landslide — when a big mass of soil and rock moves quickly down a flat slope.

These slides are usually sudden and can cause damage to the land, roads, and buildings at the bottom of the slope.

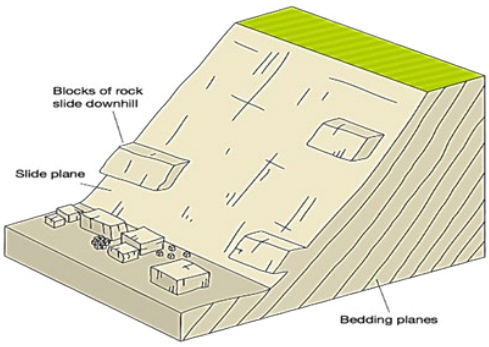


Figure 1.33: Rock slide

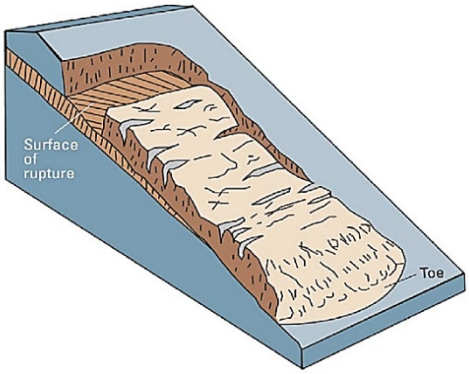


Figure 1.34: Landslide

Rotational slides (Slump)

Rotational slides are the downslope movement of a large mass of soil or rock debris along a curved slip surface or concave slope.

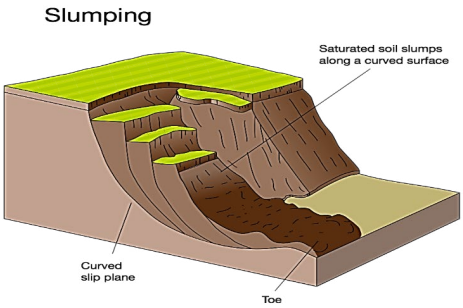


Figure 1.35: Slumping

Flow

A **flow** happens when wet soil or rocks move quickly down a slope, looking like a thick liquid. In a flow, water helps the soil or debris to slide by making it slippery, but it is not the main force that moves the material — gravity is. Some examples of flows are:

1. Mudflow — when wet mud rushes down a slope.
2. Debris flow — when a mix of soil, rocks, and water moves fast downhill.
3. Lahar — a special type of mudflow that happens when volcanic ash and water mix and flow down the side of a volcano.

Flows can be very dangerous and destructive because they move quickly and can travel a long way. A *lobe* is a rounded or stretched-out part of the flow that sticks out from the main body of the moving material.

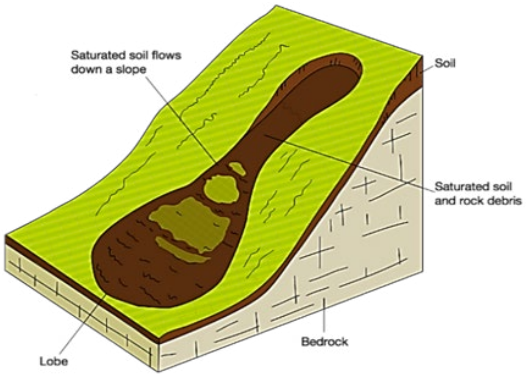


Figure 1.36: Mudflow

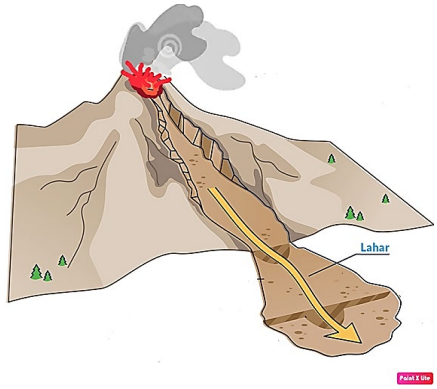


Figure 1.37: Lahar during volcanic activity

Fall

A fall happens when rocks or debris suddenly break loose and drop straight down from a cliff or steep slope. Falling rocks and boulders can be very dangerous and can damage houses, roads, and even hurt people, especially in mountain areas. A common example is a rockfall, where rocks break off and fall to the bottom of a slope. At the bottom of a cliff, you often see a pile of broken rocks. This is called **talus** (or scree). The angle of repose is the steepest angle at which the pile of rocks can stay in place without sliding down.

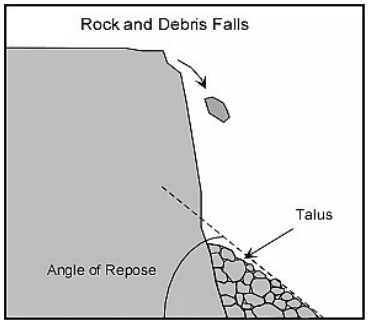


Figure 1.38: Rock fall

Topple: The rotation and tilting forward of a rock mass around a pivot point at its base. This movement often occurs along pre-existing joints or weaknesses in the rock. An example is rock topple.

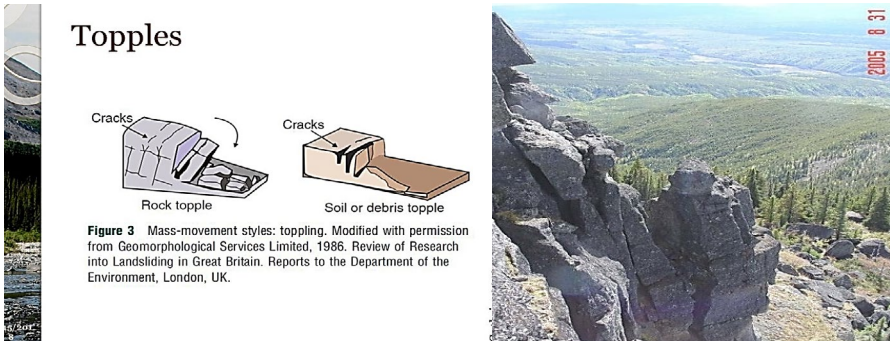


Figure 1.39: Rock topple

Activity 1.3 Types of Mass Wasting

1. Watch short videos or view images of different types of mass wasting (e.g., landslides, rockfalls, mudflows).
2. Discuss the processes behind each type and share your findings with the class or a friend, focusing on how material composition and slope influence mass wasting.
3. Research one specific type of mass wasting (e.g., landslides, rockfalls, or soil creep).
4. Create a PowerPoint presentation or a poster that explains the type of mass wasting, its causes, and its real-world examples (e.g., in Ghana or globally).
5. Using a tray filled with sand, gravel, and water, simulate different types of mass wasting.
6. Tilt the tray at different angles to observe how slope gradient, material type, and water content influence the movement of materials.
7. Record your observations and relate them to real-world processes.

SOCIO-ECONOMIC AND ENVIRONMENTAL EFFECTS OF MASS WASTING

The following are some of the social, economic and environmental effects of mass wasting.

Social and Economic Effects

The social and economic effects are mentioned below.

1. **Loss of Lives and Injuries**

   Sometimes, sudden events like landslides, mudslides, or falling rocks can kill or injure people, especially if they happen near where many people live. For example, in 2019, heavy rains caused a landslide in the Eastern Region of Ghana, killing several people. In 2006, a huge landslide in the Philippines buried a whole village and killed over 1,100 people, many of them children.

2. **Destruction of Roads and Buildings**

   Mass wasting can destroy important things like roads, bridges, train tracks, and houses. This makes it hard for people to move around, talk to others, or get help. In areas like Akwapim and parts of the Volta Region, landslides during the rainy season often damage roads that farmers use. In 2014, a big landslide in India destroyed homes and roads, cutting off villages from help.

3. **People Losing Their Homes**

   When the ground becomes unsafe, people are sometimes forced to leave their homes, either for a short time or forever. This can cause families to lose their jobs, their friends, and their way of life. In mining towns like Obuasi and Tarkwa, people have been moved because of landslides caused by both nature and mining. In Nepal, many people in the mountains have to move every year because of landslides during the rainy season.

4. **Loss of Farmland and Crops**

   Landslides and mudflows can cover or wash away farms, making it hard for farmers to grow food. In the Ahafo Region, landslides during heavy rains have damaged cocoa and plantain farms, making it hard for families to earn money and eat well. In Colombia, landslides have destroyed coffee farms, which hurt both farmers and the country's economy.

5. **High Economic Costs**

   Mass wasting can cost a lot of money. The government has to spend on fixing roads, helping displaced people, and rebuilding homes. Businesses also lose money when roads are blocked, or buildings are destroyed. For example, after floods and mudslides in Accra, the government spent millions repairing roads and helping victims. In 2017, a landslide in Sierra Leone killed over 1,000 people and cost millions of dollars to fix the damage.

Environmental Effects of Mass Wasting

1. **Poor Soil and Less Fertile Land**

   When slopes collapse, the top layer of soil, which is good for farming, can get buried or washed away. This makes it hard to grow crops. For example, in 2017, landslides around Aburi covered farmlands and made them useless for some time. In Venezuela, in 1999, landslides destroyed coffee farms and made the soil poor.

2. **Rivers Getting Blocked or Filled with Mud**

   The loose soil and rocks from mass wasting often end up in rivers and streams. This can block water, fill reservoirs with mud, and even create small dams that might break and cause floods. In 2010, landslides on the Kwahu escarpment sent mud into the Volta River's branches, causing floods. In Japan, a 2014 landslide from a volcano filled rivers with mud, forcing workers to keep clearing it.

3. **Floods and Changes in Water Flow**

   Sometimes, landslides block valleys and create temporary lakes. When these natural dams break, they cause big floods. Landslides can also change where rainwater flows. In Ghana's Atewa Range, heavy rains have caused small landslide ponds that later flooded nearby farms. In 2008, an earthquake in China caused a landslide that blocked a river and later flooded areas downstream when it broke.

4. **Loss of Plants and Animal Habitats**

   Mass wasting destroys trees, plants, and the places where animals live. It can take many years for plants to grow back. In the Western Region, cutting down trees on steep cocoa farms, along with heavy rains, has caused landslides that stripped the land and affected birds and insects. In Sierra Leone in 2017, mudslides buried forests and killed many unique plants and animals.

5. **Dirty and Polluted Water**

   When soil, mud, and even chemicals from farms are washed into rivers, the water becomes dirty and unsafe for fish and people. For example, after landslides near Mamfe, the Densu River became muddy, which made it harder and more expensive to treat for drinking water. In New Zealand, landslides increased the amount of harmful chemicals in rivers, hurting fish and requiring stricter land controls

Activity 1.4 Effects of Mass Wasting

1. Describe any specific mass wasting event (e.g., landslides in a hilly region of Ghana or globally recognised events such as the 1987 Alajo landslide).
   a. Research the socio-economic and environmental effects of the event, including impacts on communities, infrastructure, ecosystems, and local economies.
   b. Prepare a detailed presentation (e.g., PowerPoint, poster, or infographic) and share your findings with the class.
2. Analyse the causes of any other mass wasting event in another African Country.
   a. Find out the socio-economic and environmental consequences (e.g., loss of life, destruction of property, soil erosion, habitat destruction).
   b. Outline how the local community responded and what lessons can be learned to prevent mass wasting events in the future.
   c. Write a report to summarise your findings including the short- and long-term effects of the event and strategies put in place to prevent or reduce the impact of mass wasting.
3. Using online mapping tools (e.g., Google Earth) or traditional mapping methods, identify areas in Ghana prone to mass wasting.
   a. Annotate the map with examples of past events, the types of mass wasting that occurred, and the socio-economic and environmental effects.
   b. Include an analysis of how these areas could be better managed to reduce future risks.
4. Debate on Land Use and Mass Wasting

   Debate with your friends in class on the topic; *"Human activities such as deforestation and mining significantly worsen the effects of mass wasting."*

   a. Take opposing sides, providing arguments and evidence to support your positions, including real-world examples from Ghana.
   b. Take a reflective view on the role of human activity in exacerbating the effects of mass wasting.
5. Visual Storytelling

   Create a photo essay, video documentary, or storyboard illustrating the effects of mass wasting in a specific area (e.g., habitat destruction, displacement of people, and farmland loss).

   a. Include interviews (if possible), data, and visual evidence to communicate how mass wasting affects the environment and local communities.
6. Perform the role as a researcher, designer, writer, and presenter: Use textbooks, reliable websites, or videos to research the socio-economic (e.g., loss of lives, destruction of homes) and environmental effects (e.g., deforestation, soil erosion) of mass wasting.

a. Create a PowerPoint to include, but not limited to
   i. *Slide 1: Brief explanation of mass wasting*
   ii. *Slide 2: Socio-economic effects (with examples or images)*
   iii. *Slide 3: Environmental effects (with examples or images)*
   iv. *Slide 4: Conclusion and suggested solutions*

b. Present your findings in a short session with a friend.

Activity 1.5 Revision on All Areas of Section 1 From Years 1 to 3

Take a field trip to a local site with visible landforms (e.g., hills, valleys, riverbanks, or degraded areas).

1. Identify the types of rocks and discuss how they influence weathering processes in the area.
2. Observe evidence of weathering (e.g., chemical or physical weathering) and its impact on soil formation.
3. Examine the role of mass wasting (e.g., landslides or soil creep) in shaping the landscape.
4. How have fluvial processes (e.g., erosion, transportation, and deposition) affected nearby lands and contributed to the landform development (e.g., floodplains or eroded land).
5. Document observations using sketches, photographs, and written notes, and prepare a field report explaining the interconnections between these processes for a Class presentation.
6. How do the types of rocks influence weathering processes and soil development?
7. Discuss with a friend the role of weathering and soil erosion in mass wasting.
8. Identify the impacts of mass wasting on landform changes in hilly areas.
9. Write and present to the class a case study on land degradation in Ghana (e.g., soil erosion in farming areas or deforestation in the Volta Basin).

EXTENDED READING

- General Geography in Diagrams by R. B. Bunnett (2014)
- Essentials of Physical Geography by I.Y. Dadson, K. Adu-Boahen, & B.A. Owusu (2022)
- Geomorphology in the Anthropocene by A. S. Goudie (2020)
- Fundamentals of geomorphology (4th ed.) by R. J. Huggett
- Natural hazards: Earth's processes as hazards, disasters, and catastrophes (5th ed.) by E. A. Keller & D. E. DeVecchio (2021)

REVIEW QUESTIONS 1

1. Explain how each of the following factors helps to shape the channel of a river. Provide examples from specific rivers in Ghana.

a. Climate
b. Topography
c. Geology
d. Dam construction

2. Using examples from Ghana, evaluate the long-term environmental and socio-economic implications of river flooding. In your response, consider both negative and positive outcomes, and assess the effectiveness of community and policy-level adaptation strategies. Support your analysis with relevant case studies or data.

3. Explain the different processes of river erosion. How do these processes work together to shape river channels?

4. a. Explain the concept of the longitudinal profile of a river.

b. How does the gradient change from the river's source to its mouth?

c. Why does the gradient change in the course of a river?

5. How does each of the following affect the profile of a river?

a. Geology
b. Gradient
c. Volume of water
d. Human activities

6. Floodplains play a complex role in agricultural productivity and flood risk. Using examples from Ghana.

a. Analyse three (3) ways in which floodplains contribute to crop farming and evaluate their long-term sustainability. (8 marks)
b. Assess the challenges floodplains present for effective flood management, considering both environmental and socio-economic factors.
c. Propose and justify two (2) integrated strategies that could improve floodplain management in Ghana, balancing agricultural use with flood risk reduction.

7.

a. Compare V-shaped valleys and U-shaped valleys, based on
   i. Characteristics
   ii. Formation
b. In what four (4) ways do rivers influence human settlements?
c. What four (4) strategies can be used to conserve rivers and their associated landforms?

8. Identify any four (4) factors that influence mass wasting and explain how these factors interact to cause mass wasting events in different environments.

9.

a. Discuss the different types of mass wasting processes, such as landslides, rockfalls, and mudflows.

b. Evaluate how the nature of the material involved influences the severity, predictability, and management of different mass wasting events. Use examples from Ghana or other regions to support your analysis.

10.

a. In what three (3) ways does mass wasting affect local communities in relation to

   i. Socio-economic life

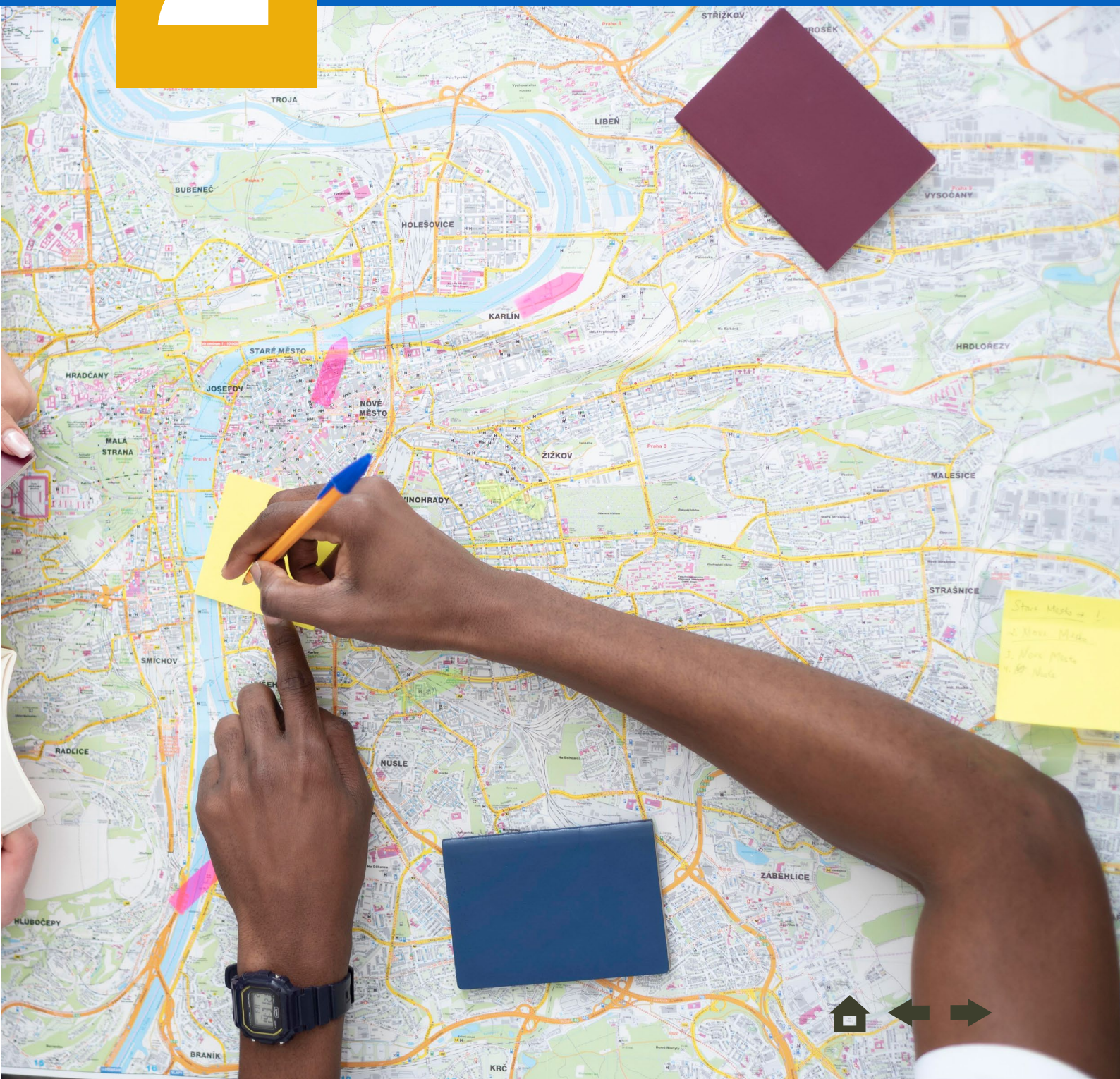
   ii. environmental conditions

b. What strategies can be implemented to mitigate these impacts?

SECTION

2

MAP READING AND INTERPRETATION



MAPS, THEIR ELEMENTS AND ANALYSIS

INTRODUCTION

This section centres on analysing maps by identifying and interpreting natural and cultural features. It starts by examining natural features such as relief and drainage patterns, emphasising their importance in understanding the physical landscape. It then delves into cultural features like settlements, farms, and roads, emphasising the spatial representation of human activities. Lastly, the section investigates the connections between natural and cultural features, demonstrating how physical landscapes shape human settlement patterns and land use. This section can be related to the concepts you learnt in Year One, Section Four, that is, map scales, methods of representing relief, and the use of contours. It can also be linked with the relief and drainage of Ghana, which was taught in Year One Section Five.

KEY IDEAS

- Topographical maps are used to represent detailed information on both natural and cultural features of the Earth's surface.
- Natural features shown on topographical maps are related to relief and drainage.
- Human or cultural features shown on topographical maps are related to settlements and transport.
- On topographical maps, natural features are mainly shown with symbols, including contour lines, points, shaded areas and colours.
- The human or cultural features are shown and identified on topographical maps with the aid of conventional symbols, colours, letters, lines and dots; usually shown in the key or legend of the map.
- It is important to identify and understand the connection between natural and cultural features on topographic maps

NATURAL FEATURES ON TOPOGRAPHICAL MAPS (E.G. RELIEF, DRAINAGE)

This lesson is devoted to a discussion on how one can identify and interpret or explain natural features such as water bodies, highlands, lowlands and other natural features on topographical maps. Topographical maps are used to represent detailed information on both natural and cultural features of the Earth's surface. Examples of natural features usually shown on topographical maps are hills, valleys, slopes, and plains, rivers, streams, marshy and flooded areas, among others. In addition to physical features, topographical maps also show human-created things like settlements, roads, and farms, offering a comprehensive view of an area. Topographical maps are therefore essential for analysing landscapes, understanding the relationship between natural and cultural features, and supporting activities such as navigation, planning, and

environmental management. The features that are related to highlands and lowlands are collectively called relief, while those related to water bodies are called drainage. Hope you remember these from your previous lessons on relief and drainage in Ghana? For now, this lesson will take you through the representation of natural features on topographical maps.

Methods of Showing Natural Features on Topographical Maps

On topographical maps, natural features are mainly shown with symbols, including lines, points, areas and colours. These symbols simplify complex information, making it easier to interpret and understand the map. The symbols are usually contained in the map's **key or legend**, ensuring that users can understand the map. Various methods are used by cartographers to show relief and drainage features on maps. Do you remember your lesson in Year One about methods of representing relief on maps? That is Year One, Section 4. Since you have learnt all these in Year One, the methods are just mentioned here by way of revision to help refresh your memory to understand the main issues that are discussed here.

The Methods of Representing Relief

1. Spot Heights
2. Trigonometrical Points/Stations
3. Contour Lines
4. Layer Tinting (Colouring)
5. Hachures
6. Hill Shading
7. Form Lines

The Methods of Representing Drainage on Topographical Maps

1. **The use of Blue Lines for Rivers and Streams**
   Blue lines and or colour and Blue shaded areas of various thickness are used to show drainage features or water bodies, including drainage patterns.
2. **Drainage Patterns**
   a. Dendritic Pattern: Resembles the branches of a tree, typical of areas with uniform rock types.
   b. Radial Pattern: Rivers flow outward from a central high point, such as a hill or volcano.
   c. Trellis Pattern: Parallel streams are connected by shorter tributaries at right angles, occurring in regions with alternating hard and soft rocks.
   d. Rectangular Pattern: Streams follow a grid-like pattern due to faulted or jointed terrain.

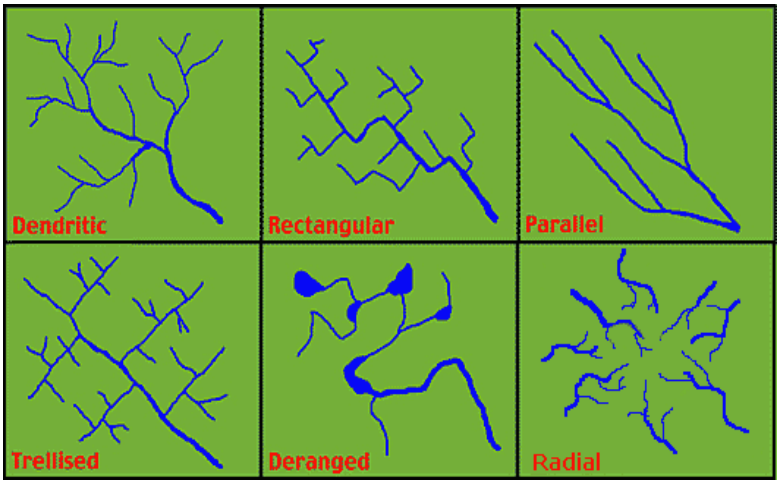


Figure 2.1: Types of drainage patterns usually identified on topographical maps

e. Representation of Water Features, such as lakes, reservoirs, and ponds, are shown as blue shaded areas.

f. Contours and Drainage: Contour lines are used to show the elevation and shape of the land, providing clues about water flow. Examples are listed below.

   i. V-shaped Contours: Indicate valleys or streams, with the "V" pointing upstream.

   ii. Widely Spaced Contours: Indicate flat areas, often along river floodplains.

   iii. Closely Spaced Contours: Show steep slopes, where water flows more rapidly.

g. Symbols for Water Bodies and Features

   i. Wells and Springs: Represented with symbols such as circles or dots.

   ii. Marshes and Swamps: Indicated with blue shading and additional symbols like grass tufts.

h. Flow Direction of rivers and streams: Arrows may be used to indicate the flow direction of rivers or streams, helping map users understand the drainage flow.

Feature Name	Symbol
Falls	
Rapids	
Direction of flow arrow	
Dry river bed	
Stream - intermittent	
Sand in Water or Foreshore Flats	

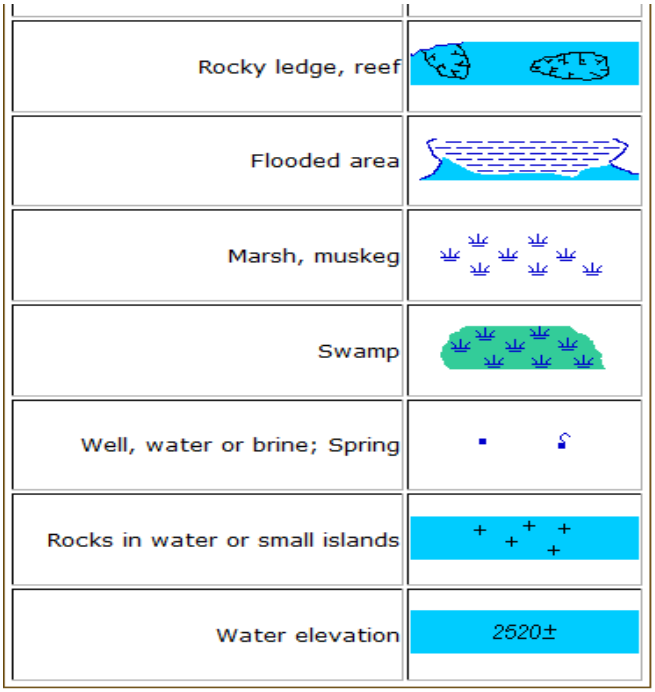


Figure 2.2: Examples of symbols used to represent water features on Topographical maps

Identification and Analysis of Relief Features on Topographical Maps

Contour lines are the mostly used. The following are the guidelines for identifying and analysing relief features on topographical maps:

Use of Contour Lines to identify relief and specific landforms

Contours are the primary tools for analysing relief on a topographical map. They connect points of equal elevation. For example:

1. Closely spaced contours indicate steep slopes or cliffs.
2. Widely spaced contours indicate gentle slopes or flat terrain.
3. Concentric circles represent hills or mountains, with the highest point at the centre.
4. V-shaped contours indicate valleys, with the “V” pointing upstream or uphill.
5. Hills/Mountains you will find concentric contours with decreasing elevation outward.
6. Valleys, V-shaped contours pointing toward higher elevation.
7. Plains, areas with few contour lines and minimal elevation changes.
8. Ridges, long, narrow elevations with closely spaced contours on both sides.
9. Cliffs, very closely packed contours indicating steep vertical slopes.
10. Depressions, contours with hachure marks pointing inward.

With the above guidelines, a typical relief topographical map of Ghana will generally show highlands in the eastern portions like the Akwapim Togo ranges, spanning from the Akwapim area, through parts of the Volta and Oti Regions. Some other highland areas are found within the Kwahu-Mampong scarp, the Gambaga escarpment and lowlands in the coastal areas, central portions and parts of the Northen regions.

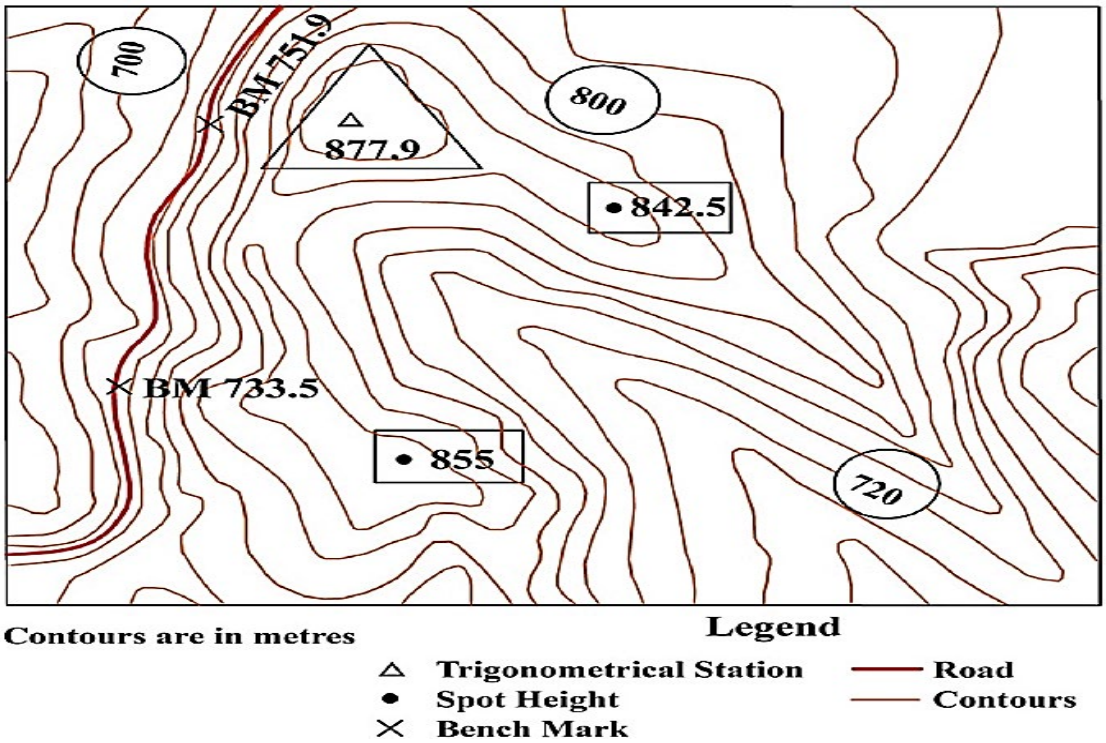


Figure 2.3: Topographical map, showing relief features

Description of Relief Features on Topographical Maps

In describing relief features on topographical maps. One needs to identify the feature and use its locational and other characteristics as they are found on the map.

Begin by familiarising yourself with key terms such as contours, contour interval, index contours, spot heights, and trigonometrical stations.

Identify relief features, using Contours. Some of the features you are likely to identify are hills, mountains, steep slopes, cliffs, gentle slopes, valleys, plains, ridges and plateaus, among others. Segment or divide the map into highland areas and lowland areas.

Describing Highland Features of Topographical Maps

There is no universal peak level that defines highlands, but mostly, areas above 90 to 300 metres (100ft) are considered hilly, while areas above 300 metres are considered mountainous. This classification differs across different geographical regions. In order to effectively describe highland features on topographical maps, the following guidelines should be followed;

1. Identify the types of highlands present on the map. These may include ridges, plateaus, mountains, hills, and spurs, as they are found on the specific map being referred.
2. Use the cardinal points to describe the general direction of the highlands. State the location of some of the specific relief features on the map. They may be found on the east, west, southwestern, or northeastern part of the map, as the case may be.
3. With reference to the contour values, spot heights, or trigonometrical points state the highest point above sea level. Use the cardinal points or landmarks to state where it is located in the map area. You may also make reference to landmarks to describe the location of specific features.
4. You may describe or state the summit of mountains, plateaux and peaks as the case may be.
5. Comment on the type or nature of the slopes. You may identify and describe the slopes as
   a. *Steep slopes: Indicated by closely spaced contour lines.*
   b. *Gentle slopes: Indicated by widely spaced contour lines.*
   c. *Uniform slopes: Consistently spaced contour lines.*
   d. *Variable slopes: Unevenly spaced contour lines.*
6. Describe the tops/summits of the highlands. For instance, the ridge has ridged summits whiles whereas several peaks depict flat and rounded summits.
7. Mention areas with special highland features such as isolated hills, saddles/cols, passes, escarpments, knolls and others.
8. Identify and describe all other related highlands in the map area.

Describing Lowland Features on Topographical Maps

1. Identify the general direction of the low-lying areas on the map.
2. State the types or nature of the lowlands. You may identify valleys, plains, and undulating land. Use the cardinal points or landmarks to state their location on the map. For example, the northeastern, southwestern or northern part of the map is made of low-lying plains, as the case may be.
3. Describe the specific lowland features that have been identified on the map. Use appropriate adjectives and geographical terms to describe them. You may describe the lowlands as flat, gently sloping, rolling lowland, or lowlands with isolated hills.
4. State the lowest point on the map.

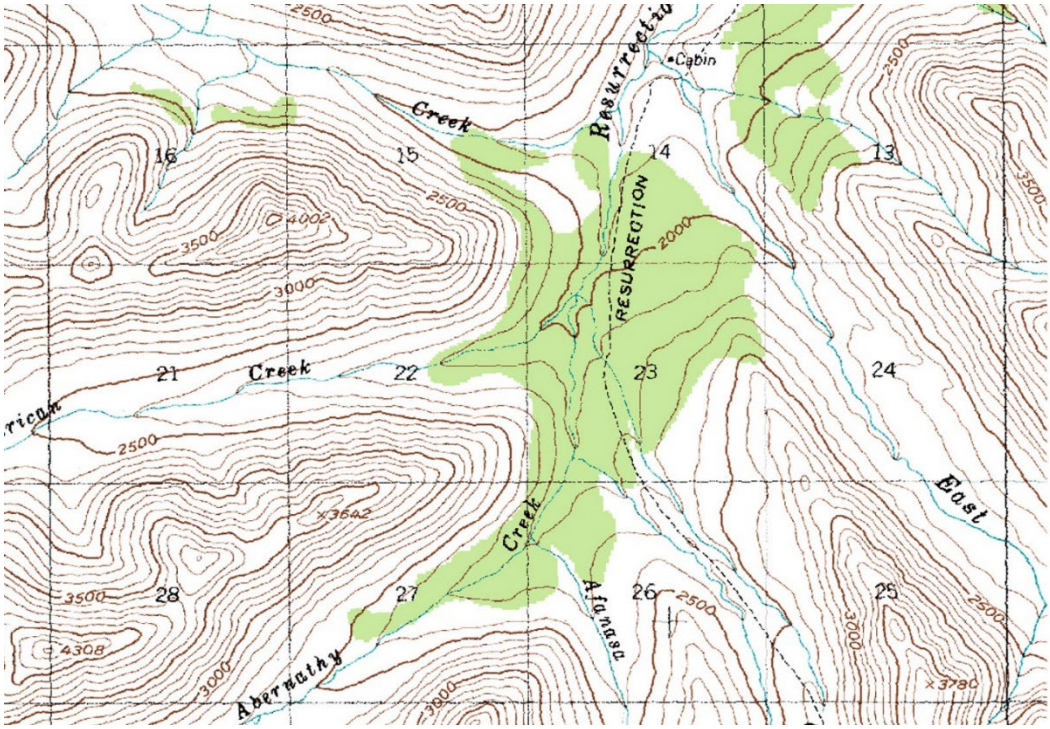


Figure 2.4: Example of a topographic map showing relief and drainage. Hope you will try and use this map to identify and describe relief and drainage features?

Activity 2.1 Relief Features

1. Visit your school library for samples of topographical maps showing relief features (observe the contour lines) such as plains, mountains, hills, valleys, cliffs, and spurs.
2. Identify and sketch specific relief features using the contour lines (e.g., concentric circles for hills, V-shaped contours for valleys, close contour lines for steep hills).
3. Analyse and explain the characteristics of the identified relief features, such as slope steepness, elevation, and location.
4. Create a summary chart comparing the features (highland or lowland) and their significance to human activities like settlement, farming, and transportation.

Activity 2.2 Topographical maps

Use the topographical maps distributed in class, markers, and large paper

1. Sketch and label common contour patterns and create a poster with a friend.

   Clue: *Concentric circles (hills/mountains), V-shaped contours (valleys/streams), Closely spaced contours (steep slopes), Widely spaced contours (gentle slopes), identify other various relief features on a topographical map.*

2. Describe the characteristics and how they are represented using contours and analyse how each feature affects human activities (e.g., farming, settlement, tourism).
3. Display your poster in class or present your findings to the class.

CULTURAL FEATURES ON TOPOGRAPHICAL MAPS (SETTLEMENTS, FARMS AND ROADS)

This part of the text discusses the identification and description of cultural or human features on topographical maps. The features are mostly created by humans, and they include settlements, roads, rail lines, farms, mines, and other forms of land use. Understanding and identifying these features helps to describe and interpret or analyse them on topographical maps. The human or cultural features are shown and identified on topographical maps with the aid of conventional symbols, colours, letters, lines and dots; usually shown in the key or legend of the map. Being able to identify and describe human features on maps helps one to understand the land use and the changes that occur on the land from time to time. It also helps to plan and manage the land to keep pace with the changing trends in human activities in the particular area covered by the map.

IDENTIFYING SETTLEMENT TYPES, PATTERNS & CHARACTERISTICS

Places where humans live are called settlements. They differ in types, sizes, function and distribution.

Identifying and Describing Settlement Types and Patterns

Settlement type depicts the kind of settlement, while pattern shows the layout. The patterns of settlements that are usually identified and described on topographical maps are:

Nucleated Settlements

These settlements are compact and clustered around a central point, such as a market, water source, or crossroads. They often indicate areas of economic activity or resource availability. On the map, they are shown with closely packed dots, depicting how the buildings in those settlements are close to each other in reality. In Ghana, examples of nucleated settlements are the urban centres

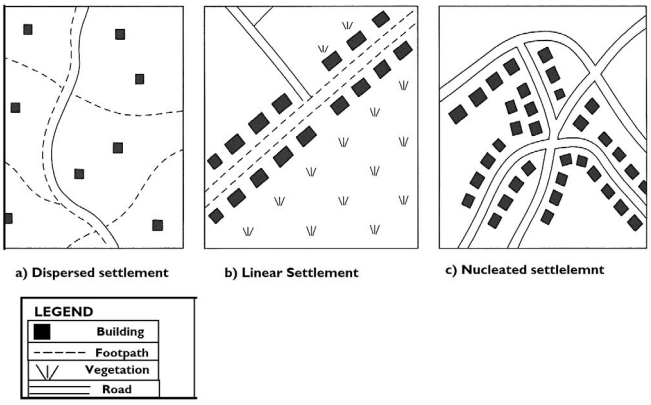


Figure 2.5: Nucleated settlement

Dispersed Settlements

These settlements consist of scattered houses or farms spread over a large area. They are commonly found in rural or agricultural regions.

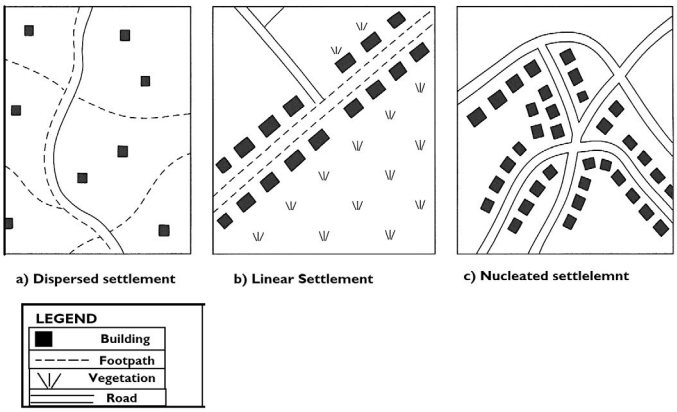


Figure 2.6: Dispersed or scattered settlement

Linear Settlements

These are settlements arranged in a straight or curved line, often along a road, waterway, railway, or valley.

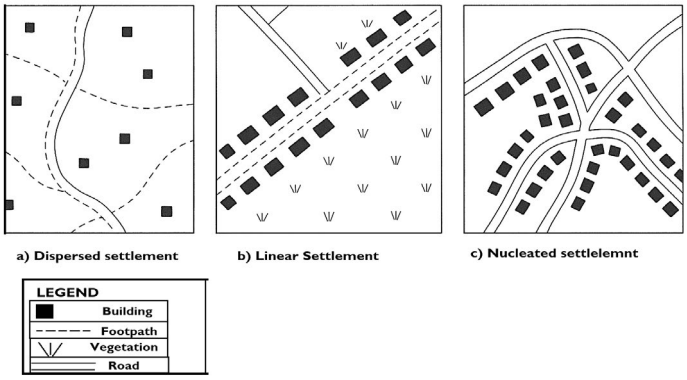


Figure 2.7: Linear settlement

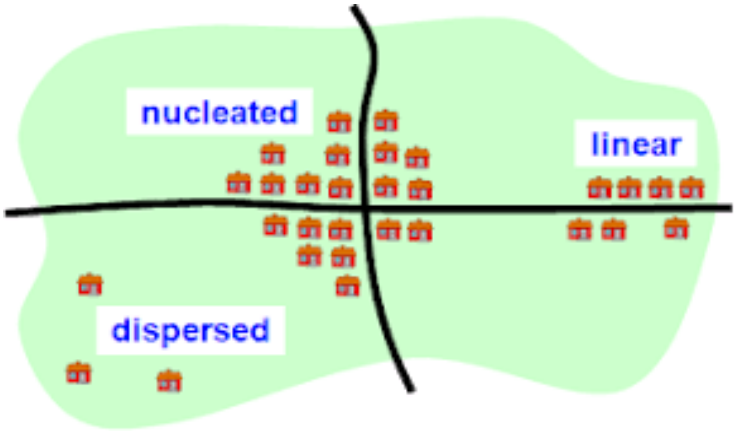


Figure 2.8: Types and patterns of settlements

Describing the Characteristics of Settlements on Topographical Maps

In describing the characteristics of settlements on topographical maps, focus on understanding the location, size, shape, pattern, and associated features of the settlement. The following guidelines should be followed:

1. **Identify the Settlement**

   Locate the settlement on the topographical map, using the symbols provided in the map legend or key. For example, small settlements such as villages may be represented by small dots, while larger settlements like towns and cities may be represented by larger symbols or clustered areas. Note the physical features on which the settlement is located (e.g. valley, hilltop, riverbank).

2. **Analyse the Location**

   Describe where the settlements are situated in the map area in relation to the cardinal points, landmarks, physical features.

3. **Examine the shape and pattern of the Settlement**

   Identify and describe the shape of the settlement, whether linear, that is arranged along a road, river, or valley, nucleated, that is clustered around a central point, such as a market, or dispersed, that is scattered houses or farms over a wide area.

4. **Assess Accessibility and Connectivity**

   Look for transportation networks (roads, railways, or waterways) and describe how they connect the settlement to other areas. Consider whether the settlement serves as a hub for trade or transportation.

5. **Relate settlements to land Use**

   Examine the surrounding land use and its relationship with the settlement, such as agricultural land, industrial areas, mining, lumbering, .

6. **Identify and describe key economic activities**

   Describe some notable economic activities that are likely to be undertaken at the settlements. This can be done with the help of symbols. Examples may be tourism or logging, due to the presence of forest or reserves. as a key activity. Mining due to the presence of a mine or minerals.

7. **Describe services and facilities**

   Identify symbols for social amenities and services such as schools, hospitals, markets, or churches.

8. **Analyse population density**

   Based on the size and clustering of the settlement, estimate whether it is densely or sparsely populated. Link population density to the physical and economic features of the area. Comment whether it is an isolated compound, scattered village, built-up area, district capital or administrative capital.

9. **Identify the functions**

   Identify and state the functions of settlements in the map area. This is based on the facilities, economic activities and services offered by the settlements. Examples may include residential, commercial, industrial, mining, agricultural, and administrative.

Describing the Functions of Settlements

When describing the functions of settlements on topographical maps, focus on identifying the roles the settlement plays and the services it offers based on its location, surrounding features, and human activities. You may identify the following:

Identify settlements near a river, coastline, fertile plains, or mountains. This is likely that the people are involved in fishing, trade, or transportation. Others include;

1. Fertile plains: Likely an agricultural hub.
2. Mountainous areas: Could support tourism or mining.
3. Trade hubs: Facilitating the movement of goods and services.
4. Transport nodes: Connecting regions and enabling economic activities.
5. Agricultural areas: Suggest the settlement is involved in farming or food production.
6. Industrial zones: Indicate industrial or manufacturing functions.
7. Natural reserves or forests: Suggest tourism or logging activities.
8. Markets: Indicate trading activities.
9. Ports: Suggest fishing, trade, or transportation.
10. Factories: Indicate industrial or manufacturing functions.

    In all, settlement functions can be summarised under

    a. Economic Functions: Trade, agriculture, fishing, and manufacturing.

    b. Social Functions: Education, healthcare, religious services.

    c. Transport Functions: Trade hubs, transport nodes, ports.

    d. Tourism Functions: Accommodations, attractions, recreational services.

Describing Characteristics of Roads (or Other Routes) on Topographical Maps

Roads, rails, waterways and footpaths are collectively referred to as communication lines in map work. These are identified with the help of symbols depicting the various types and classes of communication lines.

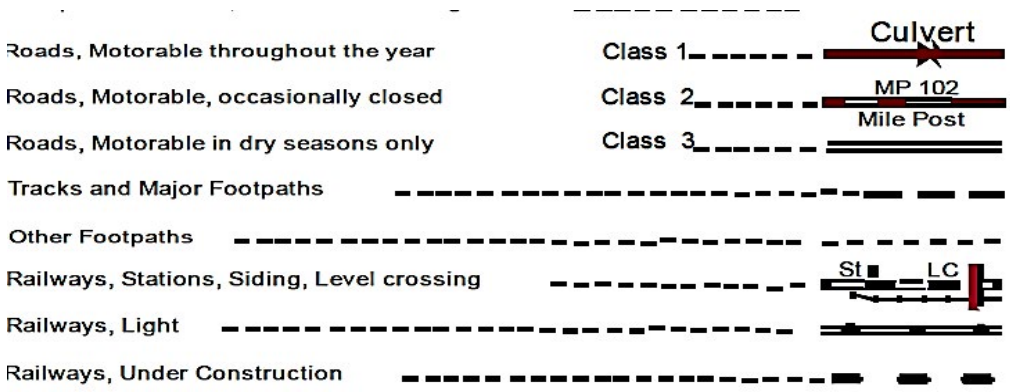


Figure 2.9: Forms of routes

In describing these communication lines, the following guidelines may be followed

1. Identify all forms or types of routes such as roads, rail, waterways, air routes and footpaths, as the case may be.
2. For roads, identify the classes such as Class 1, Class 2, and Class 3 roads. These are often distinguished by varying line symbols and thickness.
3. Observe the nature and connectivity of the roads, which will indicate an urban or rural setting
4. Describe the concentration of roads in the map area and assign reasons. They may be linking major towns or important economic activities.
5. Areas with scattered roads may depict steep slopes or flooded or marshy areas, indicating inaccessibility
6. Closely spaced contour lines indicate steep gradients.
7. Identify any symbols denoting bridges or tunnels, which indicate road continuity across physical barriers like rivers or mountains.
8. Identify all other routes, such as rails, waterways, air routes and footpaths and assign reasons to their connectivity and distribution in the map area.
9. Always refer to the map's legend to accurately interpret road symbols and colours used.

Activity 2.3 Identifying Cultural Features

Using the topographical Maps provided, identify the cultural features on maps (e.g., settlements, farms and roads).

1. Analyse how each feature affects human activities (e.g., farming, settlement, tourism).
2. Display your poster in class or present your findings to the class.
3. Analyse how these features influence the use of land and human settlement in the area represented on the map.
4. Predict the challenges and opportunities posed by these features (e.g., steep slopes causing erosion or fertile valleys and supporting agriculture)

Activity 2.4 Using Topographical Maps

Visit your school library or search the internet for topographical maps showing both cultural and natural features.

1. Identify and make a sketch of the map to show the cultural features and note their characteristics (e.g., road types, settlement types and patterns).
2. Analyse with a friend how the cultural features are influenced by natural features (e.g., settlements near rivers or roads avoiding steep slopes).
3. Share your findings with your friends and discuss how these cultural features impact land use and the environment.
4. Choose two different settlement patterns you have identified on a topographical map. Analyse how the differences in relief influence settlement, farming, and transportation in the two areas.

THE INTERRELATIONSHIP BETWEEN NATURAL AND CULTURAL FEATURES ON TOPOGRAPHICAL MAPS

Topographical maps are special maps that show a clear and detailed picture of the Earth's surface. They show **natural features** like rivers, mountains, and valleys, as well as **human-made features** like roads, towns, and farms. These maps help us understand how people live and work with the land, and how the land affects what people do.

Natural Features

Natural features are parts of the Earth's surface that were made by nature and not by humans. Examples include

1. Relief (hills, valleys, plateaus and plains)
2. Water bodies (rivers and streams, lakes, wetlands)
3. Vegetation (forests, grasslands/savannah)

Cultural Features are human-caused or human-influenced features.

Examples include

1. Settlements (villages, towns, cities)
2. Roads, railways, footpaths, bridges
3. Farmlands and plantations
4. Dams and irrigation schemes

How to Analyse Interrelationships on Topographic Maps

1. **How Relief (land shape) and Settlement Affect Human Activities**
   a. People usually build their towns and villages on low, flat, and well-drained land because it is easy to build on, good for farming, and easy to make roads and other facilities.
   b. Steep hills and mountains have very few people because they are hard to build on, have poor soils, and can be dangerous (e.g., landslides).
   c. Plateaus (high flat areas) often have more people because they are easy to reach, flat enough to build on, and good for city growth.
   d. Valleys (low areas between hills, often with rivers) usually have settlements along the rivers. This is because the soil is fertile, water is available, and the land is flat enough to live and farm on. Valleys also make good routes for transport.
   e. Ridges (long narrow hills) and steep slopes often stop people from building or spreading settlements there. People usually live at the bottom of these features where it is less harsh.
   f. As you go higher up mountains, you find fewer people because the soil is thin, the weather is colder, and it is windier.
   g. In hilly areas, people sometimes make natural terraces (flat steps on the slope) for farming or building houses to make use of the land.
   h. Steep and rocky coastlines have few people, but flat coastal plains usually have many people because they are good for trade and easy to build on.
   i. In the past, some towns were built on hilltops for protection against enemies. Some of these old settlements are still there today because of their history and culture.
2. **How Water Bodies (Drainage) Affect Human Activities**
   a. Rivers and streams attract people because they provide water for drinking, farming (irrigation), and animals. People also build roads near rivers.
   b. In dry areas, people often grow crops along rivers using irrigation because they depend on the river for water.
   c. Bridges are built where roads cross rivers, usually at narrow places or where the land makes it easier to build.
   d. People usually build their homes on higher ground near rivers instead of on the flat river banks. This helps them avoid floods while still having access to water.

e. Where two rivers meet (confluence), there are often bigger towns because of fertile land, plenty of water, and good trade opportunities.

f. Humans also build canals, dams, and reservoirs to store water, produce electricity, or help with farming.

g. Wetlands and swamps usually have few people living on them because of floods, but they can still be used for fishing, growing rice, or protecting nature.

h. Rivers and lakes are also used for fun, fishing, and tourism. You can often see roads or buildings near them for these activities.

i. The shape of rivers can affect how roads are built. Roads may run alongside rivers in valleys or go around wide rivers to cross at narrower spots.

j. Rivers and streams are sometimes used as natural boundaries between towns, farms, or districts.

3. **How Vegetation Affects Human Activities**

a. When people cut down forests, it usually means they need land for farming, building houses, or creating space for development.

b. Forest reserves are special areas where farming or building is not allowed because the land is being protected for animals, plants, and the environment.

c. Some roads go around thick forests because it is hard to clear them or because the forest is protected.

d. Large farms called plantations (for crops like cocoa, rubber, or oil palm) can often be seen on maps. These show how people use the land for business.

e. Open grasslands with scattered trees (savanna) are good for keeping animals like cattle, sheep, and goats, especially in drier areas.

f. Forests close to rivers are sometimes left untouched to protect the river and prevent soil erosion and dirty water.

g. When trees are cut for wood or charcoal, this shows deforestation, which is how people use forests for business or home needs.

h. Areas where the forest is growing back usually show places where people used to farm or live but later left.

i. Places with thick forests often have fewer people living there compared to open grasslands or areas with short bushes.

j. Trees and bushes can also act as windbreaks to protect farms and homes from strong winds, especially in dry or open areas.

k. Some forests or small groves are kept because of tradition or religion. These are called sacred groves and are important to the community's culture.

4. **How and Land Features (Relief) Affects Transportation**
   a. Roads and railway lines are usually built on flat land because steep slopes are hard and expensive to build on.
   b. Sometimes, roads are built in valleys or between hills where the land is not too steep, making it easier for cars and trains to move.
   c. When the land is very hilly or mountainous, engineers may build tunnels or winding (curved) roads to make travel possible.
   d. If a road crosses contour lines at a right angle, it shows the road is going uphill. If the road follows the contour lines, it means the road is on flat or gently sloping land.
   e. Roads that zigzag or move in a switchback pattern show the road is climbing a steep hill, often seen in highland areas.
   f. If roads or railways suddenly stop or are missing in some places, it may be because of natural barriers like cliffs, steep slopes, or deep valleys.
   g. Bridges and cuttings (where part of a hill is dug out) are used to help roads and railways cross difficult land.
   h. In mountainous areas where the land is very rough, there are usually fewer or no roads because it is hard to build there.
   i. More roads are found in lowland areas with gentle slopes because building is easier and transport works better.
   j. When many roads meet at one place in a valley, it often becomes a transport centre or hub because the land allows easier access from different directions.
   k. In flat areas, roads are usually straight. In hilly areas, roads bend and curve more to follow the shape of the land.

How to Study the Relationship Between Natural and Human Features on Topographical Maps

To understand how natural features (like rivers, hills, and valleys) and human-made features (like roads, buildings, and farms) are connected on a topographical map, we need to follow some clear steps. Students must learn how to carefully look at the map, think about what they see, and explain how the different features affect each other. The steps below will help you do this properly.

1. **Find the Natural Features on the Map**

   Start by looking at the natural parts of the land shown on the topographic map. These include:

   a. Landforms (Relief features): Use the contour lines to find hills, valleys, ridges, slopes, flat areas (plateaus), and low areas (depressions).

b. Water bodies (Drainage features): Look for rivers, streams, lakes, and swamps. Try to see how they are shaped (like tree branches or circle patterns) and which way the water flows.

c. Vegetation: Find areas with forests, grasslands (savanna), farms (plantations), or bushy lands. These are shown with different colours or map symbols.

d. Other natural features: You may also see rock areas, swampy places, or wetlands.

Why the relationship between Natural and Human features is important

This helps you understand what the natural environment looks like and how it might affect where people live, farm, or build roads.

2. **How to identify Human-made Features on the Map**

Now look for the things that people have built or created on the land. These include:

a. Settlements: Look for names of towns, villages, or scattered houses. Check how they are arranged either close together (nucleated), along a road or river (linear), or spread out (dispersed).

b. Transport routes: Look for roads, railway lines, bridges, and footpaths which have distinct linear (straight line) pattern.

c. Farming and land use: You can spot farms by recognising regular sections of cleared land, marked fields, or special symbols showing plantations.

d. Public services: These include buildings like schools, churches, hospitals or clinics, markets, water tanks, and even airstrips. Look for functional labels like 'Holy Trinity Cathedral' or 'Kotoka International Airport'.

Why identifying Human Features is important

By finding these human-made features, you can understand how people use the land and how they live with the natural environment.

3. **Look at How Close or Far Things Are from Each Other**

In this step, you check how human-made features (like towns, roads, or farms) are placed in relation to natural features (like rivers, hills, or forests). Ask yourself questions like:

a. Are the towns and villages close to rivers, or far away from them?

b. Do the roads pass through valleys, or do they go around steep hills?

c. Are the farms found on flat land or on steps (terraces) along slopes?

d. Are towns near forest areas or far away from swampy places?

Why assessing the spacing between features is important

This helps you understand how people choose where to live, farm, or build roads it is usually based on how safe, useful, or easy the land is to use.

4. **Look for Patterns in How Things Are Arranged**

   Now, check how the human-made features (like buildings or roads) are spread out on the map. These patterns often show how the land affects where people live or build.

   Look for these common patterns:

   a. Linear pattern: Houses or roads arranged in a straight line along rivers, coastlines, or valleys.

   b. Dispersed pattern: Buildings are spread far apart, often found in farming areas or in hilly places.

   c. Nucleated pattern: Buildings grouped closely together, often found where roads meet or in flat, fertile land.

   d. Transport pattern: Roads may go around hills, spread out from a central point (like a town), or be thick in flat, lowland areas.

   Why identifying settlement patterns is important

   Seeing these patterns helps you understand how natural features like hills, rivers, and forests affect where people live, farm, or build roads.

5. **Make Meaning from What You See**

   After studying the map and looking at how natural and human features are related, you can now explain what you've found. Here are some examples of conclusions you can make:

   a. Land shape (relief) affects where people live: Most people build homes on flat or gently sloping land because it is easier to build and travel on.

   b. Water bodies (drainage) support farming and living: Rivers and streams provide water for farming and for daily use in homes.

   c. Vegetation affects how land is used: Thick forests can make areas hard to reach, so people may cut down trees to create farms, or roads may go around them.

   d. People change the natural environment: For example, forests are cleared to make farms, rivers may be redirected to water crops, and hills may be shaped (terraced) to build houses or grow food.

Note

Remember that you should always justify any conclusions you make with map evidence, such as contour values, symbols, distance measurements, and grid references.

Table 2.1: Nature of the relationship between natural and cultural features

Natural Feature	Cultural Feature	Nature of Relationship
River	Settlement, farmland	The river provides water for domestic use and irrigation
Hill	Sparse settlement	Steep terrain limits building and accessibility

Flat land	Dense farmland	Suitable for mechanised and subsistence farming
Forest	Logging road, cleared fields	Human use of vegetation for economic activity
Wetland	No development	Conservation or unsuitability for building

Activity 2.5 Design a New Settlement

For this activity you will need a topographical map extract. You should get help from your teacher or a local library to get a suitable map.

1. Imagine that you have been asked to choose a site for a new village using this topographical map.
   a. Study the map and choose a good place to build your village. Think about things like water sources (rivers), flat land (for building), and nearby roads.
   b. On a blank sheet or tracing paper, sketch the area you have chosen from the map and draw the layout of your village. Add:
      i. Houses
      ii. Roads
      iii. A school
      iv. A farm or market
      v. Any natural features like rivers or hills nearby
   c. Explain your choices. Why did you put the school there? Why are the houses near or far from the river? Write a few sentences to support your point.
   d. Present your village to the class. Show your drawing and talk about how natural and cultural features work together.
2. Write a summary about what you learned from this activity using a PowerPoint presentation.

Activity 2.6 Tracing Connections Between Land and Life

1. Form a Research Team with your friends in class. Divide into small groups of 4–5 learners. Ensure each team has different abilities (e.g., map readers, speakers, writers).
   a. Study a Topographical Map from your school library. Each group receives a different topographical map of a region in Ghana (or the same map for comparison).
   b. Identify and label at least 4 natural features (e.g., hills, rivers, forests, valleys).

c. Identify and label at least 4 cultural/human features (e.g., settlements, roads, farms, schools).
d. In your group, discuss and answer the following
    i. How do the natural features influence where people live or what they do?
    ii. How do human activities affect the natural environment on the map?
    iii. Can you find any evidence of adaptation to natural features (e.g., farming on slopes, bridges across rivers)? Record your answers in point form.

2. On a large sheet/chart paper, sketch parts of your map and add notes or drawings to show
    a. Key features
    b. Arrows and labels explaining how the natural and cultural features are connected
    c. One or two photos (printed or drawn) showing similar examples from your community
3. Each group should respond to the questions below.
    a. What was the most interesting connection you discovered?
    b. How do people in your community also depend on or change the natural environment?
4. On a sheet of paper or in a learning journal, each learner writes:
    a. One way nature affects how people live
    b. One way people change the land
    c. One thing they enjoyed or learned during the activity

Activity 2.7 Tracing Connections Between Land and Life II

1. Get a topographical map (from the school library, the internet, or your Geography Teacher).
2. Identify key cultural and natural features on the topographical map.
3. Explain the importance of cultural features on socio-economic activities (e.g., roads for transportation, settlements for housing, farms for agriculture).
4. Discuss challenges associated with these features with a friend (e.g., overcrowding in settlements, road congestion).
5. Propose solutions to improve the management of these features by making a poster or doing a class presentation.
6. Critically analyse the interactions you have discovered between the physical and human features on your map.

Activity 2.8 Tracing Connections Between Land and Life III

Draw a map of Ghana on a piece of paper. On the map, do the following;

1. Identify and draw the major rivers in Ghana, including:
   a. River Volta
   b. River Pra
   c. River Ankobra
   d. River Tano
   e. River Black Volta
   f. River White Volta and label each river clearly.
2. On the same map, use contour lines or shading to indicate the highland and lowland areas
3. Use symbols and appropriate conventional signs to indicate five regional capitals and add the roads linking them.
4. Combine the information in points 1, 2 and 3 to describe the relationship between natural and human/cultural features in Ghana, as depicted on your map.

Presentation Requirements

1. Accuracy is important, so make sure your knowledge of Ghana's geography is used to locate the rivers, highlands and lowlands in the right place on the map.
2. Make sure your map is neat and easy to read.
3. Use a pen or pencil to draw the map and label the rivers.
4. make use of colours and shading
5. Add a title and a key, if necessary, do not forget to put an arrow to show where north is.

EXTENDED READING

- Anderson, K., & Ryan, B. (2020). Topographic map interpretation and analysis. Routledge.
- Peter K. Acheampong (2014). Statistical mapping and map interpretation for Africa. University of Cape Coast Press
- Monkhouse, F. J., & Wilkinson, H. R. (2016). Maps and diagrams: Their compilation and construction. Routledge. (Reprinted edition)
- Robinson, A. H., Morrison, J. L., Muehrcke, P. C., Kimerling, A. J., & Guptill, S. C. (2017). Elements of cartography (7th ed.). Wiley.
- Wilson, J. P., & Fotheringham, A. S. (Eds.). (2018). The SAGE handbook of GIS and society. SAGE Publications.

REVIEW QUESTIONS 2

You must identify evidence from the map by quoting grid references and compass points in your answers to the following questions.

1. Using your topographical map, describe how the physical features influence human activities such as farming, settlement, or transportation.
2. You are provided with a topographical map of an area prone to flooding. Identify the physical features that contribute to this issue and propose solutions to mitigate it.
3. Using your topographical map, explain how the location of a settlement on a map can indicate its function (e.g., a trading centre, administrative hub).
4. How do rivers and drainage systems on your topographical map affect the location of settlements?
5. Examine your topographical map and describe how relief features (e.g., hills, valleys) influence the development of transportation networks such as roads or railways.
6. Your topographical map shows a settlement near a river prone to flooding. Analyse how the natural feature (the river) impacts human activities and suggest solutions to mitigate the challenges of flooding.
7. Analyse an area on the topographical map provided where farming is practised near a forest reserve. Explain how the expansion of farming activities would conflict with the conservation of the forest.

SECTION

3

POPULATION STUDIES IN GHANA

POPULATION GROWTH, DISTRIBUTION AND MIGRATION TRENDS IN GHANA AND AFRICA

INTRODUCTION

This section explains how the number of people, where they live, and how they move from one place to another affect community development. It begins by examining how the population is growing in both rural (villages) and urban (towns and cities) areas, and how this growth varies across regions. It also examines the factors that cause population changes, including birth rates, job opportunities, and government policies. The section explains why people move, such as moving from villages to cities (rural-urban migration), being forced to move within the country, or even moving to other countries, and how these movements change communities. Lastly, it compares how fast Ghana's population is growing to other African countries and the world, showing how these changes affect development, how we use resources, and how governments plan for the future. This section relates to Year One Sections 8 and 10, as well as Year Two Section 3

KEY IDEAS

- Migration has both positive and negative impacts on source regions and destinations
- Population density tells us how many people live in a certain area, usually measured as people per square kilometre
- Population distribution refers to how people are spread across a specific area.
- Population distribution is shaped by a combination of physical, economic and social factors.
- The rapid growth is driven by a combination of demographic, social, economic, and environmental factors.
- Settlement refers to any community, whether permanent or temporary, in which people reside, without regard to its size, population, or level of importance.

POPULATION GROWTH AND DISTRIBUTION IN GHANA

The population of a country is the total number of people living in that country at a particular time. Population growth means the way the number of people increases over time, and population distribution refers to how people are spread out across different parts of the country. These ideas are very important because they affect many things about how a country develops. In Ghana, learning about population helps us to understand how people settle in different areas, how we use our natural resources, and how the government plans for schools, hospitals, roads, and other needs.

Population Growth in Ghana

Population growth means the increase in the number of people living in an area over time. It is usually shown as a percentage. In Ghana, the first official count of people (called a census) was done in 1960. At that time, there were about 6.7 million people. Since then, the number of people has been growing very fast. By 2021, the population had grown to about 30.8 million which is about four times more than in 1960. The biggest increase happened after 1984, when the population grew from 12.3 million to 30.8 million in 2021. This rapid growth shows how both the way people live, and the economy have been changing over time.

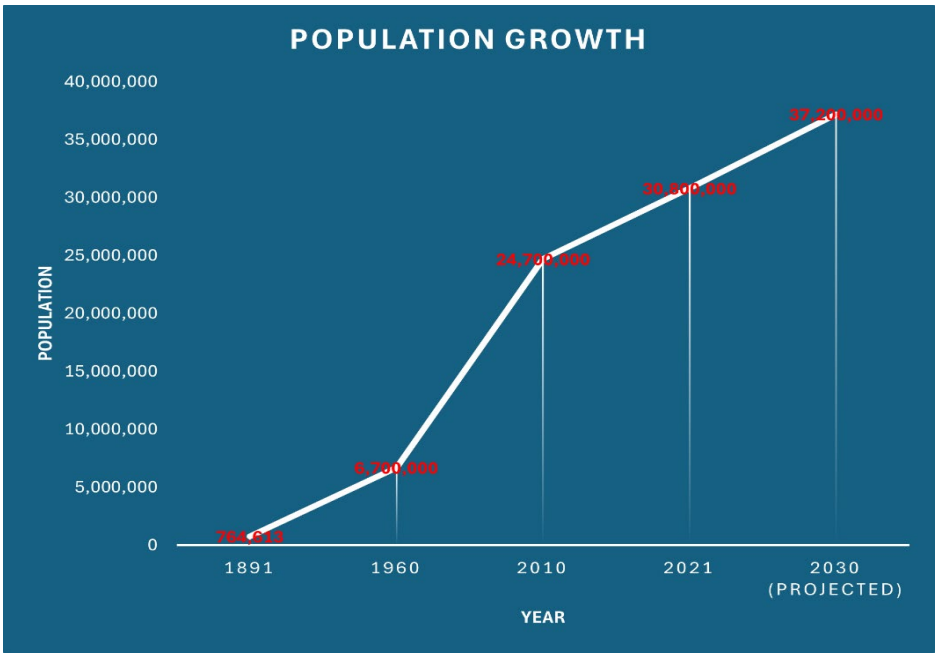


Figure 3.1: Line graph showing Ghana's population growth for the past, present and future

Figure 3.1 shows how Ghana's population has grown from 1891 and also gives an estimate for 2030. The figure shows that the number of people in Ghana has been increasing very fast over the years. In 1891, the population was about 764,613. By 1960, it had grown to 6.7 million. After that, the number of people kept rising quickly, reaching 24.7 million in 2010 and 30.8 million in 2021. The graph also predicts that by 2030, Ghana's population could reach about 37.2 million. The line on the graph becomes steeper as time goes on, which means the population is growing faster and faster. This shows how quickly the number of people in Ghana has changed and is expected to keep growing.

Population Distribution in Ghana

Population distribution means how people are spread out in a country or area. Some places have many people, while others have very few. This happens because of things like the weather (climate), type of soil, availability of water, job opportunities, roads, and how people settled in the past. In Ghana, not all parts have the same natural resources or jobs, so people do not live everywhere equally.

Population density tells us how many people live in a certain area, usually measured as people per square kilometre. It helps us know how crowded or empty a place is. For example, cities like Accra have high population density because many people live in a small space. Rural areas like parts of the Northern Region have low population density because people are more spread out. Knowing population density helps the government plan for schools, hospitals, roads, and other important services.

General Spatial Pattern

1. **Areas with Many People (Densely Populated)**

   a. **Coastal Areas**

   The areas along the coast, especially in the Greater Accra Region and parts of the Central and Western Regions, have a lot of people. This is because of trade, government offices, and jobs in the big cities.

   b. **Ashanti Region**

   This region, with Kumasi as the main city, also has many people because of its rich history, busy markets, industries, and good farming lands.

   c. **Big Cities**

   Apart from Accra and Kumasi, other cities like Sekondi-Takoradi, Cape Coast, and Tamale also have a lot of people. The Greater Accra area, including Accra and Tema, has the highest number of people in a small space.

1. **Areas with Few People (Sparsely Populated)**

   a. **Northern Regions**

   The Savannah, North East, and Upper West Regions have fewer people. This is because of less rainfall, different ways of farming, and where people chose to settle in the past.

   b. **Ahafo Region**

   This is the region with the smallest number of people in Ghana, so it has a low population density.

   c. **Bono East Region**

   This region also has fewer people compared to the southern parts of Ghana.

   d. **Oti and Volta Regions**

   Some parts of these regions, especially areas far from towns and cities, have very few people living there.

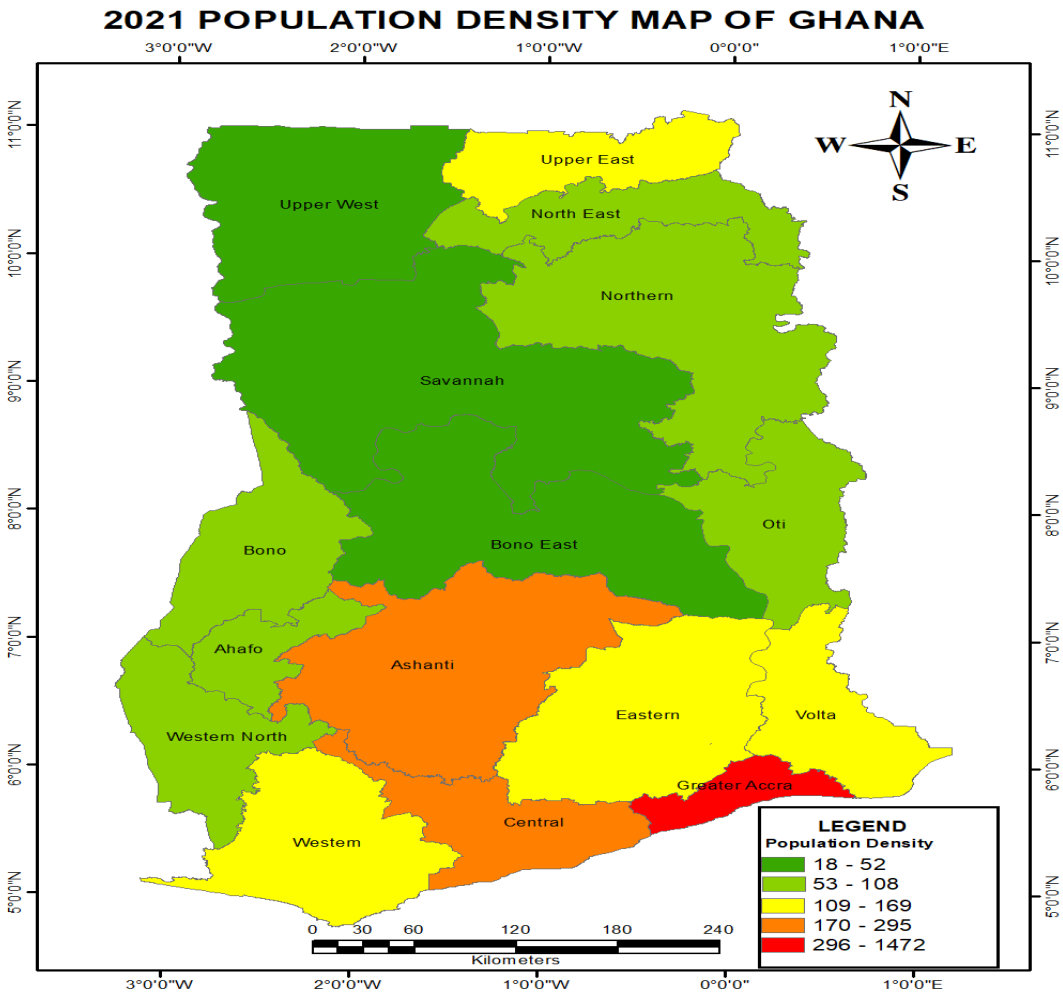


Figure 3.2: 2021 population density map of Ghana

Distinguishing Between Population Growth, Distribution and Density

Population Growth

Definition: The change in the size of a population over time, expressed either as an absolute number or as a rate (e.g. 2.3 % per annum).

Focus: Temporal, how the total number of people increases (natural increase and net migration).

Example: Ghana's population grew from about 6 million in 1960 to over 33 million in 2024, at roughly 2.2 % per year.

Population Distribution

Definition: The pattern or arrangement of where people live across a given area (e.g. regions of a country).

Focus: Spatial, where people are located and how they are clustered or dispersed.

Example: In Ghana, most people live in southern and forest-coastal regions (Greater Accra, Ashanti), while northern savannah zones are sparsely settled.

Population Density

Definition: The number of people per unit area, usually expressed as persons per square kilometre (people/km^2).

Formula:

Focus: Quantitative measure of how crowded or spacious an area is.

Example: Greater Accra has a density of over 1,200 people/km^2, whereas the Savannah Region has fewer than 20 people/km^2.

Table 3.1: Key distinctions among population growth, distribution and density

Aspect	Population Growth	Population Distribution	Population Density
What it measures	Change in total numbers over time	Location and pattern of settlement	Number of people in a given area
Dimension	Temporal	Spatial	Spatial quantitative
Units	People or % per year	Descriptive (regions, urban/rural)	People per km^2
Use in planning	Projection of future needs	Identifying service gaps & migration flows	Assessing overcrowding or underuse

Visit the link to watch a video on population growth, distribution and density

https://youtu.be/h2r-PBUO1LU

Activity 3.1 Population Patterns in Focus

1. Form a small group with friends in the class, taking note of different abilities and choose roles for each member
   a. Researcher (finds information)
   b. Note-taker (writes down ideas)
   c. Presenter (speaks for the group)
   d. Encourager (supports and motivates the group).

2. Watch a short video on population growth and distribution in Ghana. Identify areas with high population growth.
   a. Describe the settlements – are they large, small, spread out, overcrowded, busy or empty?
3. In your group, suggest
   a. One area or region where the population of Ghana is growing very fast.
   b. An area or region with a high and low number of people (density).
   c. One example of how people are spread (like more people in cities or villages).
4. On the printed photos or screenshots, write short notes or labels to explain what is happening in each picture.
   a. For each picture or trend, write one sentence to explain:
   b. What you see (e.g., *"This city is very crowded."*)
   c. Why it happens (e.g., *"Many people come here to work."*).
5. Each group member says one thing they learned and one good feeling they had about working as a team.
6. As a group, present your labelled picture and share one teamwork lesson in a short 2-minute presentation.

Activity 3.2 Population Puzzle

1. Write a simple definition of each of these terms in your own words
   a. Population growth
   b. Population distribution
   c. Population density
2. Study the population data below, which is for two regions in Ghana. The numbers are in millions of people.

Year	Northern Region	Eastern Region
2000	1.80	2.10
2005	2.15	2.21
2010	2.48	2.32
2015	2.80	2.44
2021	3.35	2.58

   a. Draw a graph from the data in the table. Using the same axes, year along the bottom (x-axis) and population up the side (y-axis), draw line graphs to represent the changes in the two regions.

b. Compare and contrast the two line graphs (slope, steepness, rapid or slow change)
c. Give some reasons for population changes in the Northern Region
d. Give some reasons for population changes in the Eastern Region.
e. Which one of the definitions in (a) is not used in (b)? Explain why.

3. At the end, write one thing you learned while doing the task and one positive feeling you had during the activity.
4. Present your definitions, charts and your analysis in a short 2-minute talk or submission with a friend in class.

FACTORS INFLUENCING POPULATION GROWTH AND POPULATION DISTRIBUTION IN GHANA

Factors Influencing Population Growth in Ghana

Ghana's population has increased a lot over the years. In 1960, there were about 6.7 million people in the country. By 2024, the number had grown to about 33 million, with the population growing by about 2.23% every year (GSS, 2024). This rapid growth is driven by many factors, including how people live, the economy, the environment, and other social factors. Below are some of the main reasons why Ghana's population keeps growing:

High Fertility Rates

In Ghana, women have an average of about 3 to 4 children each (3.66 according to GSS, 2024). This is called the Total Fertility Rate (TFR). There are also about 29 babies born for every 1,000 people each year, which shows that the population is growing fast.

Some reasons why many children are still being born in Ghana

1. **Cultural Beliefs**

   In many communities, having many children is seen as a blessing and a sign of wealth and respect. People also believe that children will take care of their parents when they grow old, especially in villages.

2. **Poor Access to Family Planning**

   Not everyone has good access to information or tools to plan their families, like contraceptives. In rural areas, even fewer women use these methods and in 2014, only about 27% of women used modern contraceptives.

3. **Early Marriage and Childbirth**

   Many girls, especially in the north, get married at a young age and start having children early. Most women have their first baby at around 20 years old, which means they have more years to have more children.

4. **Education Levels**

   In places where women have less education, they often have more children. Women who go to secondary school or higher usually have fewer children, but in some areas, it is still hard for girls to get a good education.

Declining Death Rates

Better healthcare and living conditions have helped reduce the number of deaths in Ghana, which makes the population grow because more people live longer and reach the age to have children. The Crude Death Rate (CDR) dropped from 19 deaths for every 1,000 people in 1960 to about 6 deaths for every 1,000 people in 2022. Also, people now live longer, life expectancy increased from about 45 years in 1960 to about 66 years in 2024.

The following are some reasons why fewer people are dying in Ghana today

1. **Better Healthcare**

   More people can now visit hospitals, get vaccines, and use programs to help mothers and babies. Because of this, the number of babies who die before age one has dropped a lot — from 120 deaths per 1,000 births in 1960 to about 34 deaths in 2022.

2. **Clean Water, Food, and Sanitation**

   More people have access to clean water, good toilets, and better food. This has reduced deaths from diseases like malaria and diarrhoea. Government programs like the National Health Insurance Scheme (NHIS) also make it easier for people to see doctors.

3. **Urbanisation (More People Living in Cities)**

   Today, about 59% of people in Ghana live in towns and cities (2024). Cities usually have better hospitals and health services, which help reduce deaths compared to villages.

Migration Patterns

Moving from one place to another, called migration, does not increase Ghana's population as much as births and deaths do. In 2022, the number of people leaving Ghana was just a little more than the number coming in, about 0.16 people per 1,000 population left the country, meaning more people moved out than came in.

Some of the reasons why people move

1. **Moving Within Ghana (Internal Migration)**

   Many people move from villages to cities like Accra and Kumasi to find jobs and enjoy better services. This does not change the total number of people in the country, but it changes where people live and makes cities more crowded.

2. **Moving Out of Ghana (International Migration)**

   Some Ghanaians travel to other countries, such as in Europe or North America, to look for work. At the same time, some people from nearby countries move into Ghana. The number of people leaving is slightly higher than those coming in, so the population grows a little slower.

3. **Refugees**

   Ghana gives shelter to some refugees from other countries, but the number is small and does not really affect the total population.

Social, Economic, and Government Factors

The way people live, the economy, and government rules and programs also affect how many people are born and how many die. These things influence how fast Ghana's population grows.

Contributing factors

1. **Economic Growth**

   Ghana's economy is improving. In 2023, it grew by about 3.8% (World Bank). This has helped people live better and reduced deaths. But because more people move to cities for jobs, some areas still have many births.

2. **Education Policies**

   Since 2017, the Free SHS policy has made it easier for children to go to senior high school. When girls stay in school longer, they usually have fewer children. But this change happens slowly over time.

3. **Family Planning Programs**

   The government and other groups have taught people about using contraception to plan their families. This has helped lower the average number of children per woman from about 7 in 1960 to about 4 in 2022. But in some places, few people use these services, so birth rates are still high.

4. **Culture and Religion**

   In many communities, religious and cultural beliefs encourage people to have many children. This is common among Christians, Muslims, and followers of traditional religions.

Impact

These factors work together in different ways. For example, better education and family planning are starting to help reduce the number of children people have. But because of strong cultural beliefs and because not everyone can easily get family planning services, the population is still growing. Also, since most of Ghana's population is young, with an average age of about 21 years in 2024 (Worldometer) there are still many people who are old enough to have children. This means the population will keep growing for some time.

Environmental and Geographic Factors

The environment and where people live affect how fast the population grows because they influence how people live and the kinds of jobs they can find.

Some of the environmental factors

1. **Climate and Natural Resources**

   The southern part of Ghana has good weather and resources like cocoa and minerals. This makes it easier for people to live and work there, so more people move to the south, and the population grows faster there. The northern part has hotter, drier weather with problems like droughts, so fewer people live there, and the population grows more slowly.

2. **Urbanisation (More People Living in Cities)**

   Many people move to towns and cities and about 59% of Ghanaians lived in cities in 2024. Cities have better hospitals, schools, and other services, which help people live longer and keep the population growing.

Impact

The good conditions in the south help more people live healthy lives and have families, so the population grows more there. The harder conditions in the north make it more difficult for people, so population growth is slower there. This creates differences between the North and South.

Quantitative Insights

To illustrate the impact of these factors, consider the natural increase rate (CBR - CDR):

In 1960: 49.8 (CBR) - 19.0 (CDR) = 30.8 per 1,000.

In 2022: 28.55 (CBR) - 6.14 (CDR) = 22.41 per 1,000.

This decline in the natural increase rate reflects lower fertility and mortality, but the absolute population increase remains high due to a larger base (e.g., 0.717 million annually from 2021 to 2024). ***Table 3.2*** summarises population trends in Ghana between 1960 and 2022

Table 3.2: Key demographic indicators over time (Sources: GSS, 2021; GSS, 2024)

Year	Population	TFR	CBR (per 1,000)	CDR (per 1,000)	Natural Increase (per 1,000)
1960	6,726,815	6.85	49.8	19	30.8
1984	12,296,081	6.24	44.9	14.2	30.7
2000	18,912,079	4.85	35.9	9.9	26
2010	24,658,823	4.21	33	8.6	24.4
2021	30,832,019	3.49	27	7.5	19.5
2022	33,107,275	3.66	28.55	6.14	22.41

Table 3.2 compiled from GSS and The World Factbook, highlights how high fertility and declining mortality have driven growth, with migration playing a minor role.

Implications for Ghana

The interplay of these factors has significant implications

1. **Economic Pressure**

   A rapidly growing population (doubling time ~31 years at 2.23%) strains resources, requiring more jobs and infrastructure.

2. **Demographic Dividend**

   The youthful population (37% under 14 in 2021) offers potential economic benefits if educated and employed.

3. **Policy Needs**

   Enhanced family planning, healthcare, and education policies are critical to managing growth sustainably.

Ghana's population is growing mainly because many people still have many children. This is caused by cultural beliefs that value big families and because not everyone has access to family planning. At the same time, fewer people are dying now because healthcare and living conditions have improved. Moving in and out of the country (migration) does not really change the population much. Other things like education, jobs, and the weather also affect how people are spread out in different parts of the country. It is important to understand all these reasons so that Ghana can plan well for the future and make good use of its young and growing population.

Activity 3.3 Population Trends in Ghana

In this activity, you will analyse the implications of Ghana's population growth and propose targeted policy interventions to address demographic challenges.

1. Use the population data in the table (1960–2022).
   a. Write down what is happening to TFR, CBR, and CDR over time.
   b. Estimate the doubling time for Ghana's population from 2024.
2. Cause and Effect Mapping: Create a cause-and-effect diagram linking high fertility and declining mortality to economic and social pressures in Ghana.
3. **Policy Simulation**: For this part of ***Activity 3.3***, you should work in small groups of no more than three.
   a. Each group represents ONE government ministry (for example, Health, Education, Urban Development).
   b. Your group should propose two realistic strategies to manage population growth sustainably. (for example, the Health Ministry might expand NHIS coverage and mobile clinics, or the Education Ministry could strengthen Free SHS and incentivise girls' retention in classes)
   c. Write down your strategies in your notebook.

4. **Impact Matrix**
   a. Based on the strategies suggested for part 3, your group should now rank each one using a matrix.
   b. Make the matrix axes Impact on Population Growth vs Feasibility.
   c. Discuss within your group which interventions offer high impact and are realistically implementable.
5. **Reflection: Demographic Dividend Potential**

   Based on the fact that Ghana has a youthful population, write down some ways in which youth can become an economic asset. (consider links to employment, entrepreneurship, and vocational training)
6. **Summary Statement**

   In your notebook, write one paragraph summarising your top recommendation: *"To reduce population pressure, Ghana should…"*. Present your recommendation to the class.

Activity 3.4 Regional Disparities and Population Distribution Debate

1. **Map Analysis**
   a. View a population density map of Ghana (digital or printed).
   b. Identify which regions have the highest and lowest population densities.
   c. Discuss in pairs: Why do more people live in the south than in the north?
   d. Share ideas with the class, focusing on:
      i. Climate differences
      ii. Natural resources
      iii. Access to infrastructure (e.g., roads, hospitals, schools)
2. **Comparative Analysis – North vs South**
   a. Use a Venn diagram to compare the northern and southern regions of Ghana.
   b. Include the following categories:
      i. Fertility rates
      ii. Access to healthcare and education
      iii. Migration patterns
      iv. Environmental challenges (e.g., drought vs rainfall)
   c. Identify at least two similarities and two differences.
   d. Highlight how these disparities affect population growth and development.
3. **Role Play – Regional Planning Teams**
   a. Divide into two teams

   i. Team A: Northern Development Authority
   ii. Team B: Southern Urban Planning Unit
b. Each team discusses the unique challenges in their region.
c. Propose two strategies to manage population growth in your region. Examples:
   i. North: drought-resistant farming, mobile education units
   ii. South: urban decongestion, satellite towns, family planning outreach
d. Prepare a short explanation of how each strategy addresses population issues.
e. Present your strategies to the class.

4. **Debate – Equity vs Efficiency**
   a. Pose the question: *Should Ghana invest more in the north to balance growth, or focus on the south where returns are higher?*
   b. Each team prepares one argument using evidence from the population data.
   c. Conduct a short debate, allowing each team to respond once.
   d. Encourage respectful disagreement and evidence-based reasoning.
5. **Reflection – Migration and Urbanisation**
   a. Discuss: How does internal migration affect service delivery and planning in cities like Accra and Kumasi?
   b. Consider impacts on:
      i. Housing
      ii. Healthcare
      iii. Education
      iv. Employment
   c. Share one insight with the class or write it down individually.
6. Summary: Regional Strategy Tagline
   a. Each learner writes a slogan for their team's strategy. Examples:
      i. "Balanced growth through inclusive planning"
      ii. "Empowering the north via mobile education and resilient farming"
   b. Post slogans on a classroom board or share aloud.

POPULATION MIGRATION IN GHANA

Population migration means people moving from one place to another, either to live there for a short time or for the rest of their lives. Migration is an important part of Ghana's population story. People move because of reasons like jobs, family, the environment, or history. In Ghana, migration happens both inside the country (from one region to another) and outside the country (to or from other countries). According to the 2021 Population and Housing Census, about 28.9% of Ghanaians (8.2 million out of 30.8 million) were living in a place different from where they were born. Many people move from the northern parts of Ghana to the south to find better jobs and improve their living conditions.

Various Forms of Migration in Ghana

Migration in Ghana can be categorised into several forms, reflecting the diversity of movement patterns.

Internal Migration

This means people moving from one place to another *within the same country*.

Inter-Regional Migration

This is when people move from *one region of the country to another region*. According to the 2021 Migration Report from the Ghana Statistical Service, about 55.1% of internal migrants (about 4.5 million people) moved between regions. Most of these people moved from the rural northern regions like Upper East, Upper West, and Northern Region to the southern regions like Greater Accra, Ashanti, Eastern, and Western Regions, where life is often better.

People move for many reasons, such as to find better jobs, go to school, or have a better life.

Some examples are:

1. Young workers moving from Kumasi (Ashanti Region) to Accra (Greater Accra) for banking and ICT jobs.
2. Traders leaving Bawku (Upper East) to work in Sekondi-Takoradi (Western Region) in the oil and gas business.
3. Students from Tamale (Northern Region) moving to Tema (Greater Accra) for university and internships.

These movements show that many people are attracted to big cities in the south because they offer more jobs, schools, and business opportunities compared to the countryside in the north.

Intra-Regional Migration

This happens when people move to a new place *within the same region*. Intra-regional migration usually involves short distances and happens for reasons like joining family, getting married, finding a job, or getting better access to schools and hospitals. According to the Ghana Statistical Service's 2021 report, about 44.9% of internal migrants (around 3.7 million people) moved within their own region. Unlike inter-regional migration (which is often long-distance and between regions), intra-regional migration usually happens between villages and towns or small towns and big cities in the same region.

Some examples are:

1. In the Ashanti Region, people move from towns like Offinso or Bekwai to Kumasi to find jobs, better housing, or to join family members.
2. In the Volta Region, people leave rural areas to move to Ho for school or health care.
3. In the Central Region, people making a living by fishing move between coastal towns like Winneba and Cape Coast depending on where fish are available.

Intra-regional migration is very important because it helps develop local areas by moving workers where they are needed and helping small towns grow. It is also influenced by family traditions — for example, people may move to take care of older relatives or to live closer to extended family. Even though it is not always about making money, this kind of movement keeps family connections strong and helps communities work together.

Rural to Urban Migration in Ghana

Rural to urban migration happens when people move from villages or small towns to bigger towns and cities. Many people move to cities because they hope to find better jobs, go to school, and enjoy a better way of life. This type of migration has been one of the main reasons why cities in Ghana have grown so much over the years. According to the *Migration in Ghana Report*, by 2010 about 2.7 million people (44.5% of city residents aged 5 and above) were migrants and most of them came from rural areas. Because of this, the number of people living in cities in Ghana increased from 23% in 1960 to 59% in 2024.

Some examples are:

1. Young farmers from northern villages moving to Tamale to work in shops and other services.
2. Graduates from the Brong-Ahafo Region moving to Kumasi to work in the clothing and furniture industries.
3. People making a living fishing and traders from towns like Winneba and Elmina moving to the Accra-Tema area to sell goods, trade, or work in markets.

This movement helps people and their families to earn more money and live better lives. But it also creates problems in cities, such as too many people needing housing, transportation, hospitals, and clean water. Even with these challenges, rural to urban migration is still an important part of Ghana's development because it gives many people the chance to improve their lives.

Urban to Rural Migration in Ghana

Urban to rural migration happens when people move from big towns and cities back to villages or smaller towns. This is not as common as moving from villages to cities, but it has become more popular in recent years. Many people choose to move because life in the village is cheaper, calmer, and there are new business opportunities outside the busy cities.

According to studies on migration in Ghana, between 2000 and 2010, the number of people moving from cities to villages grew by about 9.7%. Most of these were older people who retired, and young families leaving cities like Accra, Kumasi, and Takoradi to return to their hometowns or start new lives in rural areas.

Some examples are:

1. A retired nurse from Korle Bu Hospital moving back to live with family in Wenchi, Bono Region.
2. A young couple leaving Tema to start a mango business in a village near Hohoe, Volta Region.
3. Graduates who cannot afford to rent houses in the city are moving to Bantama, Kumasi to open tutorial centres.

This kind of migration helps reduce overcrowding in cities and lessens the pressure on housing, transport, and sanitation. However, it can also bring problems to the rural areas, like higher demand for land, water, schools, and clinics. Even so, urban to rural migration is important because it helps spread jobs, skills, and development more evenly across the country.

Voluntary and Forced Migration

Most people in Ghana move because they *choose to*. This is called **voluntary migration**, and it happens when people want better jobs, education, or a better life.

Sometimes, however, people are *forced* to move because of problems they cannot control. This is called **forced migration**. Examples include people leaving their homes because of droughts in the north or because of political problems. Voluntary migration is more common in Ghana, while forced migration happens less often.

Temporary Migration

Temporary migration happens when people move to another place for a **short time**, usually less than one year, and then go back to their home. In Ghana, this often happens because of seasonal work or short-term contracts.

Examples are:

1. **Seasonal Farm Work**

   Young men and women from the north travel to the cocoa-growing areas in the Ashanti and Western Regions to help with planting and harvesting. After the work is done, they return home.

2. **Fishing and Fish Processing**

   Fishermen and fish processors from towns along the Central and Western coasts move to fishing camps on Lake Volta or the Gulf of Guinea for a few months and then go back to their villages.

3. **Short-Term Jobs**

   Workers like builders, carpenters, or nurses sometimes take jobs in cities like Accra, Tema, or Takoradi for a fixed time. When their contracts end, they return to their hometowns. This type of migration is important because it helps people earn money while still staying connected to their home communities.

Permanent Migration

Permanent migration happens when people move to a new place and plan to stay there for a long time, usually more than one year, with no fixed plan to return home. In Ghana, people often move permanently because of jobs, education, or to join their family.

Some examples are

1. **Moving to Cities**

   Families from villages in the Northern or Upper East Regions move to live permanently in cities like Accra, Kumasi, or Sekondi-Takoradi to find steady jobs and enjoy better schools, hospitals, and services.

2. **Education and Jobs**

   Students who finish school in rural areas and stay in southern cities to work as bankers, ICT workers, teachers, or health workers.

3. **Joining Family**

   Wives, husbands, and children move to join family members (like the main breadwinner) who already live in the city.

These moves create permanent homes in the new place, and people start a new life there.

The North-South Migration Trend

Many people in Ghana move from the northern regions to the southern regions. This is one of the most common ways people move within the country. In the year 2000, about 1 out of every 5 people (18.4%) who were born in the north were living in the south.

According to the 2021 census, many people are leaving the north. For example, the Upper East Region has a very low number of people moving there (only about 2%). On the other hand, many people move to the south, especially the Greater Accra Region, which has a high number of newcomers (about 35.1%). This shows that more and more people prefer to live in the southern parts of Ghana, often because of better jobs, schools, and living conditions.

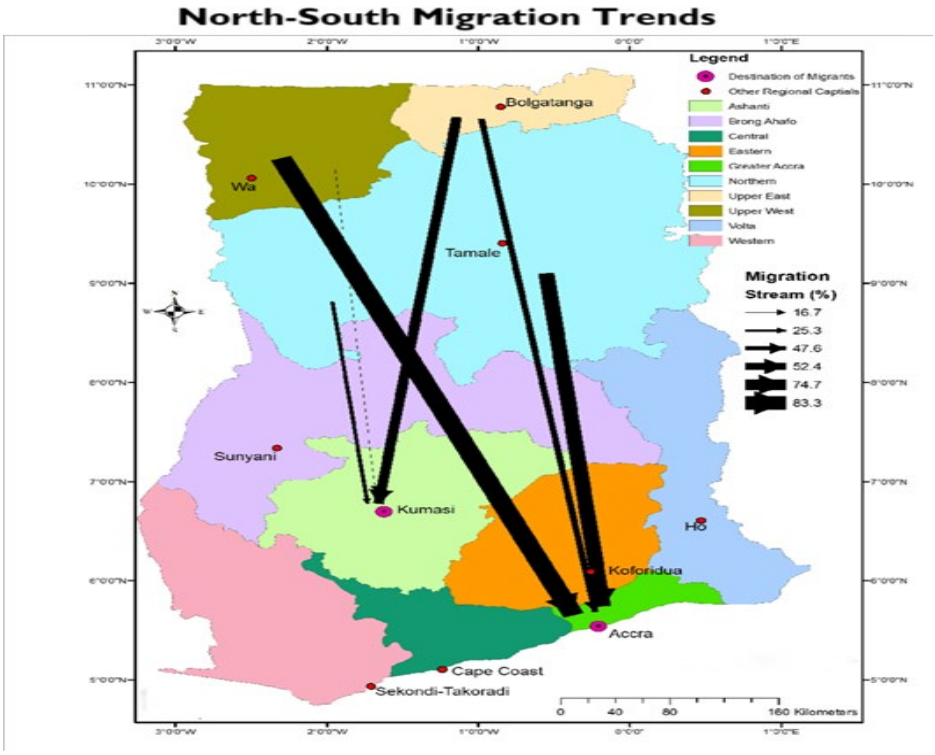


Figure 3.3: Flow Map of Ghana showing North-South Migration of the Youth (2013)

Reasons for North-to-South Migration in Ghana

1. **Environmental Reasons (Push and Pull)**

   Northern Ghana is in the Sudano-Sahelian zone, which has very little and unpredictable rainfall. Sometimes, there are long droughts that destroy crops and make farming difficult. This makes many people want to leave. On the other hand, southern Ghana has fertile land, good weather for farming, more stable jobs, and better living conditions. These things attract people from the north.

2. **Economic Opportunities**

   People move to the south because there are more chances to work, earn money, and have a better life. The south is more developed, with more businesses, jobs, and higher living standards compared to the north.

3. **Social Amenities**

   The south has better services like good hospitals, schools, electricity, clean water, good roads, and fun places to relax. These things make people, especially from villages and poor areas, move to cities and towns in the south.

4. **History and Culture**

   Migration has been part of Ghana's history for many years. In the past, people moved south to work in mines and on farms during colonial times. Many families from the north already have relatives in the south, and cultural ties encourage others to join them. These old routes and family connections still make it easy for people to move today.

Factors Influencing Population Distribution in Ghana

Population distribution shaped by a combination of physical, economic and social factors. Below is an overview of each category, with Ghana-specific examples.

Physical Factors That Affect Where People Live in Ghana

1. **Climate and Rainfall**

   The weather and amount of rain in an area affect how many people live there. The Forest–Coastal Belt (e.g., Greater Accra, Central, Western) gets a lot of rain (about 1,500–2,000 mm each year), which makes farming easier and supports more people. The Savannah Zones (e.g., Upper East, Upper West, Savannah) get less rain (about 800–1,100 mm), and sometimes droughts happen, making it harder to grow food. Fewer people live here.

2. **Soil Fertility and Vegetation**

   Good soil and plants also determine where people settle. In places like Ashanti, Eastern, and Western Regions, the soil is rich and good for growing cocoa, oil palm, and food crops. These areas have more farmers and larger populations. In the north, the soil is less fertile (sandier and harder), so it only supports basic farming and livestock. Fewer people live there.

3. **Land Shape (Relief and Topography)**

   The shape of the land also affects settlements. Flat lowlands and river valleys, like around the Volta Basin and the coastal plains, are good for farming, building roads, and towns, so many people live there. Hilly and high areas, like the Akwapim-Togo ranges and Kwahu Plateau, are harder to live in. People only settle there when there are jobs from mining or tourism, like in Aburi and Kwahu.

4. **Water Availability**

   Having water all year makes an area more attractive to live in. Places near rivers like the Volta River, Black Volta, and streams have water for farming, fishing, and daily life, so more people live there. In dry northern areas, where water only comes during the rainy season, people are more spread out and sometimes move around to find water and good land.

Economic Factors That Affect Where People Live in Ghana

1. **Jobs (Employment Opportunities)**

   Where people can find work greatly affects where they live. Big cities like Accra-Tema, Kumasi, and Takoradi have many jobs in factories, offices, and the oil industry, so lots of people move there. In the countryside, farming areas like the cocoa farms in Ashanti and Western Regions, and tree crop farms in Bono East and Ahafo, also give people jobs and keep communities alive.

2. **Roads, Schools, and Hospitals (Infrastructure and Services)**

   Good roads, transport, and social services make places more attractive to live. For example, areas along the Accra–Kumasi highway and the western railway line have grown because it's easy to travel and do business there. Towns like Sunyani, Koforidua, and Hohoe, which have hospitals, schools, markets, and other services, attract more people.

3. **Markets**

   People like to live where they can easily sell and buy things. Coastal ports like Tema and Takoradi have many trade jobs, so more people live nearby. Towns like Ejura and Tamale are big trading centres where farm products are collected and sold, so they also attract settlers.

4. **Industry and Natural Resources**

   Areas with industries and natural resources also attract many people. Gold-mining towns like Obuasi and Tarkwa are full of workers and their families. The oil and gas industry in Sekondi-Takoradi has brought more people to live and work in that area too.

These economic factors help explain why some places in Ghana are more crowded and developed than others.

Social Factors That Affect Where People Live in Ghana

1. **History**

   Where people settled long ago still affects where they live today. Big towns like Kumasi and Cape Coast are still important because they were capitals of old kingdoms like the Asante and Fante. Southern towns with some of the first schools and hospitals built by missionaries and colonial leaders also continue to attract people because these services are still there.

2. **Culture and Ethnic Groups**

   People often like to live near their family's or tribe's hometown. This is why many Ewe people live close to each other in the Volta Region. Towns with chiefs, palaces, and famous festivals, like Navrongo and Kpalimé, also bring in visitors and even new residents.

3. **Schools and Hospitals**

   People move to places where they can get good education and healthcare. Cities like Accra, Kumasi, Tamale, Ho, and Cape Coast have universities and polytechnics, which attract students, teachers, and workers. Big hospitals like Korle Bu and Komfo Anokye also bring many patients and health workers to nearby areas, helping those cities grow.

4. **Government Plans**

   The government sometimes helps people move or develop new areas. New regional and district capitals, like Dambai in the Oti Region, attract workers and development. Programs like building villages, giving electricity, and resettlement projects also help people settle in places that were not crowded before.

These social factors show how history, culture, services, and government plans affect where people choose to live.

SETTLEMENT TYPES AND PATTERNS IN GHANA

Learning about how and where people live is an important part of geography. A **settlement** means any place where people live, whether it is big or small, temporary or permanent.

In simple words, a settlement is just a place where people stay. This could be:

1. a single house in a faraway area,
2. a small village,
3. or even a big city with millions of people.

Settlements can be very small, like one family living alone, or very large, like a **megacity** (a city with more than ten million people). Your work using maps in the last section introduced you to the idea that settlements could be classified using pattern-related terms like 'linear', 'nucleated' and 'dispersed'. You also learned that settlements could have different functions based on the activities carried out there – residential (for living), industrial and agricultural. It is important when analysing settlements and patterns in Ghana to remember that there are different **sizes** and **types**. As you continue to learn about settlements in Ghana in this section you will begin to understand some of the reasons for their size and type.

Types of Settlements in Ghana

Ghana exhibits a diverse range of settlement types, which can broadly be categorised into rural and urban settlements, each with distinct characteristics and examples.

1. **Rural Settlements**: **Characteristics and Examples**
   a. Low Population Density: Rural settlements have a smaller, more spread-out population compared to urban areas.
   b. Location: Typically found outside urban centres, often in remote or peripheral areas.
   c. Economy Based on Natural Resources: The livelihoods of residents are mainly tied to agriculture, fishing, mining, or other land-based activities.
   d. Economic Diversity: Rural settlements vary depending on their dominant economic activity such as farming, fishing, crafts, or mining.
   e. Traditional Skills and Practices: Many rural communities maintain traditional livelihoods like carving, weaving, or herbal medicine.
   f. Social Structure: Settlements may be organised around tribal or ethnic groupings, with distinct sub-communities.
   g. Proximity to Urban Areas: Some rural settlements exist near urban centres but retain rural characteristics due to small population sizes and traditional ways of life.

Example: Okurase, a village in the Eastern Region with about 3,500 people; main occupations include subsistence farming and carving; comprises seven sub-communities representing different tribes.

Figure 3.4: Satellite image of Okurase

2. **Urban Settlements**: **Features and Examples**
   Urban settlements are towns and cities where many people live and work. Below are their main features

   a. Many People in a Small Space: Cities have a lot of people living close together.
   b. Better Roads and Services: Urban areas have good roads, electricity, water, and communication systems.
   c. More Social Services: There are more schools, hospitals, markets, banks, parks, and other important services.
   d. Jobs Outside Farming: Most people work in offices, shops, factories, or provide services rather than farming.
   e. Tall Buildings and Planned Areas: Cities have modern houses, tall buildings, and organised neighbourhoods (although some areas are still unplanned).
   f. People Moving In: Many people from villages move to cities for jobs, schooling, and a better life.
   g. Expensive to Live: It costs more to live in the city because rent, food, and transport are more expensive.
   h. Heavy Traffic: Big cities like Accra and Kumasi have traffic jams because of too many cars and not enough roads.
   i. Environmental Problems: Cities sometimes have problems like too much rubbish, dirty air, loud noise, and flooding because of poor planning.

j. Different Cultures: People from many different ethnic groups and regions live together in cities.

Some examples of urban settlements in Ghana are Accra, Kumasi, and Tamale.

Figure 3.5: Satellite image of Accra

Factors Influencing Settlement Development in Ghana

The way settlements grow and develop in Ghana depends on many things, such as the land and weather, the kinds of work people do, how families and communities are organised, important events from the past, and government decisions.

Physical Factors

1. Land (Relief and Topography): People like to build on flat or gently sloping land because it is easier for building houses and farming. Steep mountains or hills are less preferred.
2. Water Supply: Places with rivers, streams, or underground water attract people because they need water for drinking, cooking, washing, and farming.
3. Soil Fertility: Areas with rich, fertile soil are good for farming and growing food, so people settle there.
4. Climate: Areas with good weather, enough rain, and not too hot or dry are better for living and farming.

Economic Factors

1. Jobs (Employment Opportunities): People move to places where they can find work, such as in factories, shops, mines, or farms.

2. Markets and Trade: People like to live near markets and busy roads where they can buy and sell goods easily.
3. Transport and Roads: Areas with good roads, railways, ports, or airports attract people because it is easier to travel and do business.

Social and Cultural Factors

1. Family and History: Some people live where their ancestors lived or where their family and traditions are important.
2. Safety and Protection: People may choose to live in safe places that protect them from danger, attacks, or natural disasters.
3. Schools and Churches: Places with schools, hospitals, churches, and mosques attract people because they need these services.

Political Factors

1. Government Plans: The government can decide where people should live by building roads, schools, and providing services.
2. Administrative Centres: People move to big towns or capitals where government offices and services are located.

Technology

1. Modern Services: Places with electricity, clean water, toilets, and internet attract more people.
2. Building Technology: New building methods allow people to live even in places that were once hard to build on, like swampy areas or steep hills.

Table 3.3: Classification of Rural Settlements in Ghana by Economic Activity

Type of Settlement	Key Characteristics/Examples
Agricultural Settlements	Focused on crop cultivation and livestock rearing; examples include many villages in the Volta and Northern Regions.
Mining Settlements	Developed around mineral extraction sites (gold, diamonds, .); examples include Obuasi (though now urbanising, it originated as a mining settlement) and smaller mining communities in the Western Region.
Fishing Settlements	Located along the coast or major rivers, with economies centred on fishing; examples include communities along the coast of the Central and Western Regions, and near Lake Volta.
Traditional/ Cultural Settlements	Retain strong ties to traditional crafts, ceremonies, or historical significance; examples include craft villages near Kumasi (Bonwire, Ntonso, .) and historically significant towns with traditional chieftaincy roles.

Activity 3.5 Mapping Migration in Ghana

Work in groups or with a friend from both crowded (high-density) and less crowded (low-density) areas. Assign roles: **sketcher**, **data collector**, **presenter**, and **encourager**.

1. Together, quietly list the main migration patterns in Ghana (like people moving from **villages to towns** or from the **north to the south**).
2. On a blank map of Ghana, draw the regions and mark the major cities.
3. Use arrows of different sizes to show the **direction** and **amount** of migration. Big arrows mean more people are moving; small arrows mean fewer.
4. Next to each arrow, write **one reason** why people move that way (like jobs, school, farming, or better living conditions).
5. As a group, discuss how these movements affect both the places people **leave** and the places they **move to**.
6. Each person should say **one thing they learned** and also say **something nice** about a teammate's contribution.
7. Finally, present your map with the arrows and share one idea about how migration affects people and communities in a **2-minute group presentation**.

Activity 3.6 Migration Stories

Think of or imagine a story about someone who moved from one place to another in Ghana (for example: from a village to a city, or from north to south).

1. On a sheet of paper, write down:
   a. Where the person moved **from** and **to**.
   b. Why they moved (e.g., to find work, go to school, join family).
   c. What challenges they faced after moving.
   d. How their life improved (or didn't) because of the move.
2. Pair up with a classmate: Take turns telling your stories to each other.
   a. Together, write down two things that were **similar** in both stories and one different thing.
   b. Discuss how migration can help or hurt both the place people leave and the place they move to.
   c. Share one thing they learned from this activity with a PowerPoint presentation.

Activity 3.7 Exploring Settlements in Ghana - Patterns & Places

Write down one **type of settlement** (like hamlet, village, town, or city) and one **settlement pattern** (like nucleated, linear, or dispersed) you know.

1. Compare your answers with a friend and together agree on **three types of settlements** and **two settlement patterns** that are found in Ghana.
2. Use tools: Look at atlases, maps, or pictures to find real-life examples of each type of settlement and pattern. Write down the names of the places and where they are in Ghana.
3. Create a mini-poster or slide:
   a. Draw simple symbols to show each settlement type and pattern.
   b. Label your examples clearly.
   c. Add a small map of Ghana and mark the locations of the examples.
4. Discuss with your friend: Talk about why each settlement type and pattern exists in those places (for example: because of farming, trade, flat land, or rivers).
5. In a short (3-minute) presentation, show your map/poster, explain your findings, and share your thoughts on teamwork.

CONTRASTING POPULATION GROWTH: GHANA IN THE CONTEXT OF AFRICA AND THE WORLD

Understanding how the population of a country grows is very important for planning and development. This helps leaders make good decisions for the future. For a country like Ghana, learning about its population is even more important because it has a special place in Africa and the world. We have already talked about how Ghana's population is growing and changing. In this lesson, we will compare Ghana's population growth with that of Africa and the whole world. By looking at the similarities and differences, we can better understand the challenges Ghana faces and the opportunities it has for development. This comparison also helps us see what is causing the changes in population and what they mean for the lives of people in Ghana.

Ghana's Population Growth: Trends and Characteristics

1. Ghana's growth rate peaked at 3.32% in 1957 but has declined to ~1.89% in 2024.
2. Key features: young median age (21 years), fertility rate (3.3–3.4), and rapid urbanisation (58–60% urban).
3. Urbanisation is driven by economic opportunities but strains infrastructure.
4. Population momentum will likely sustain growth despite declining fertility.

Africa's Population Growth: A Continental Perspective

1. Africa is the fastest-growing continent (2.3% in 2024), with regional disparities (e.g., >3% in Middle/Eastern Africa vs. <2% in Southern/Northern Africa).
2. Younger median age (19 years) and higher fertility (4.0–4.1) than in Ghana.
3. Urbanisation lags in Ghana (44–45% urban) but is accelerating, creating infrastructure challenges.
4. Potential for a demographic dividend but requires investments in education and jobs.

Global Population Growth: Contrasting Patterns

1. Global growth rate (0.8–0.9%) is much lower than Africa's, driven by declining fertility (2.25 children/woman).
2. Regional divergence: Sub-Saharan Africa grows at 2.5%, while Europe/N. America stagnate.
3. Higher median age (30 years) and life expectancy (73.3 years) reflect an advanced demographic transition.
4. Global urbanisation (~55%) parallels Ghana's, posing similar challenges for sustainable development.

Comparative Analysis of Population Growth Rates

A direct comparison of population growth rates for Ghana, Africa, and the world over in recent years clearly illustrates Ghana's position within these broader trends.

Table 3.4: Comparing Population Growth Rates (Sources: GSS 2021,2024)

Year	Ghana Growth Rate	Africa Growth Rate	World Growth Rate
2020	2.01%	2.43%	0.97%
2021	1.98%	2.38%	0.86%
2022	1.94%	2.34%	0.84%
2023	1.93%	2.34%	0.88%
2024	1.89%	2.32%	0.87%

Table 3.4 shows that Ghana's population growth rate is always between the highest growth rate of Africa and the lowest growth rate in the world. This means Ghana is in a special position and it needs to develop its economy and improve people's lives while also managing the pressure of a growing population. Even though Ghana's population is growing more slowly than many African countries, it is still growing faster than the world average.

If Ghana's current growth rate continues, the population is expected to double in about 36 years (by 2024 estimates). This means the country has to plan carefully for things like schools, hospitals, jobs, and roads to meet the needs of more people in the future.

In the past, Ghana's growth rate was very high, like many other African countries. But over time, Ghana's growth has slowed down compared to Africa's average, though it is still

much higher than the world's average. This shows how Ghana's population growth has changed over the years.

Key Demographic Indicators: A Comparative Lens

Table 3.5: Population Characteristics: Ghana, Africa, and the World (circa 2022)

Sources (GSS, 2021; World Bank, 2023; World Factbook, 2024; Worldometer, 2024).

Characteristic	Ghana (2022)	Africa (2022)	World (2022)
Total Population	33,149,152	~1.4 billion (est. 1.373 billion in 2021)	~8.0 billion (reached in Nov 2022)
Fertility Rate	3.43 children per woman	~4.3 children per woman (2021)	~2.27 children per woman (2021)
Mortality Rate	6.14 deaths/1,000 population (Crude Death Rate)	~8 deaths/1,000 population (Crude Death Rate, 2021)	~8 deaths/1,000 population (Crude Death Rate, 2021)
Life Expectancy	69.37 years (WHO, 2022 est.)	~63 years (2021)	~72 years (2021)
Literacy Rate (Adult)	61% women, 74% men (15-49 years, 2022)	~70% (overall average, varies widely by country)	~86.3% (overall, recent estimate)
Median Age	20.7 years	Not readily available for entire continent, but generally very young (e.g., Sub-Saharan Africa: ~18-20 years)	~30 years
Urban Population %	56.60%	~44% (2021)	~57%

Population Structure and Urbanisation

1. **Youthful Population Structure**
   a. 36% of Ghanaians are aged 0-14, and 60% are working age (15-64) (2024).
   b. Reflects a youth bulge common in Africa, contrasting with ageing populations globally.
2. **Demographic Dividend Potential**
   a. Large working-age population offers economic growth opportunities if paired with:
   b. Investments in education/skills training.
   c. Job creation to absorb the workforce.
3. **Rapid Urbanisation**
   a. 58-60% urban (vs. Africa's 44-45%), nearing global averages (~55%).
   b. Pros: Drives economic activity and innovation.
   c. Cons: Strains infrastructure (housing, transport) and risks inequality.

4. **Policy Imperatives**
   a. Urban planning to manage growth sustainably.
   b. Essential services (water, sanitation) to support urban populations

Socio-Economic Factors and Policy Implications

1. **What Affects Population Growth**?
   a. How fast a country's population grows depends on things like access to healthcare (people live longer), education (especially for women, which often leads to having fewer children), and government plans (like family planning and creating jobs).
   b. When there is a lot of poverty and women have fewer rights, people tend to have more children. But when there are more jobs and women have more say in decisions, families usually have fewer children.
2. **Ghana's Falling Birth Rate and Some Challenges**
   a. The number of children per woman in Ghana is going down because more people use family planning and more women are working.
   b. Many young people cannot find jobs, so they move to other countries to study or work, which affects the number of workers in Ghana.
3. **What Can Be Done**?
   a. The government should invest more in schools, hospitals (including family planning), and jobs so that Ghana's young population can help develop the country.
   b. Good planning of cities, roads, and houses is also needed so that as more people move to towns and cities, everyone can live well.
4. **What About Other Countries**?
   a. In many parts of the world, the same thing happens, better education and more jobs mean fewer children, but poverty and inequality mean families have more children.
   b. So, it is important for every country to make good plans to help people live better lives while keeping the population at a level the country can support.

Future Projections and Potential Impacts

Ghana's Moderating Growth

Population growth rate expected to decline to 1.4% by 2043, yet total population may reach 48.8 million. At current rates, the population could double in 33 years, demanding long-term planning.

Africa's Rapid Expansion

Continent projected to reach 2.5 billion by 2050, maintaining high growth trends. Contrasts with global slowdown, highlighting regional disparities.

Global Trends

World population growth to peak mid-2080s, with Ghana and Africa outpacing global averages.

Key Implications for Ghana

1. Infrastructure needs: Schools, healthcare, and transport must expand to match growth. Environmental/resource pressures: Sustainable management critical for water, land, and energy.
2. Economic potential: Declining growth rates may ease youth dependency and boost per capita income if paired with:
   a. Job creation and education investments.
   b. Proactive policies in urban planning and agriculture.

Outlook

Ghana faces both challenges (resource strain) and opportunities (demographic dividend) – strategic planning will determine whether growth translates into sustainable development.

Activity 3.8 Comparing Population Trends

Research the population growth rates for Ghana, Africa, and the World. (Use UN charts, World Bank data, or your textbook.)

1. Draw a Graph: Use graph paper or a computer to draw three lines (one for Ghana, one for Africa, and one for the World) over the same time period.
2. Highlight Key Points: On your graph, circle the year when Ghana's growth was the highest and another year when Africa's or the world's trend changed clearly.
3. Write your Observations: Write two short sentences:
   a. How Ghana's growth compares to Africa's growth.
   b. How do both compare to the world's growth?
   c. Share with your partner one surprising thing you noticed and how you felt about working with real-life data.
4. Present a PowerPoint explaining what their graphs show and share their feelings about the activity with the class.

Activity 3.9 Population Growth Timeline Challenge

1. On a long sheet of paper or in your notebook, draw a timeline from 1960 to 2024. Divide it into sections, each section representing one year.

2. Use a textbook or a reliable online source (like UN or World Bank data) to find out the population numbers for **Ghana**, **Africa**, and the **World** during each of these years.
   a. One year at a time, starting with 1960, use three different colours to draw bars for each population (e.g., Red for Ghana, Blue for Africa, Green for the World) on the timeline.
   b. Besides your timeline, write down one major event per decade or year (e.g., a new health policy, a free education programme, or a migration change) that may have affected population growth.
3. On the back of your timeline or in a short paragraph, answer:
   a. What surprised you about Ghana's population growth?
   b. How is Ghana's trend different or similar to Africa and the world?
4. Post your timelines around the classroom. Walk around to view others' work and write one thing you learned from a classmate's timeline on a sticky note.
5. In small groups or as a class, discuss:
   a. Why is it important for Ghana to plan for future population growth?
   b. How can young people help?

SOCIO-ECONOMIC IMPLICATIONS OF MIGRATION FROM AFRICA TO THE REST OF THE WORLD

In the past few years, many Africans have moved to live in other parts of the world, such as Europe, North America, the Middle East, and Asia. This movement of people has brought many changes. It affects both the countries they leave (home countries) and the countries they move to (new countries) in important social and economic ways.

Reasons Why People Migrate from Africa to the Rest of the World

People migrate for various reasons, commonly classified as push and pull factors.

Push Factors (Reasons why people leave their home country)

These are the bad or difficult conditions in African countries that make people want to move to other places to find better opportunities.

1. **No Jobs and Poverty**

   Many young people in Africa cannot find good jobs because there are not enough opportunities. For example, in Ghana in 2023, about 13 out of every 100 young people were unemployed. This makes many people travel to other countries to work and earn money.

2. **Fighting and Political Problems**

   In some parts of Africa, there are wars, violence, and political troubles. People leave to escape danger, attacks, or the fear of being hurt. For example, wars in Sudan and Congo have forced many people to run away and live elsewhere.

3. **Poor Health and Education**

   Some people cannot get good medical care or proper schools in their home countries. So, they move to places where they or their children can get better health services and education.

4. **Bad Weather and Climate Change**

   Problems like drought (no rain), floods, and land turning into desert make it hard for people to grow food or find water. This forces them to move to areas where they can live and farm better. For example, the shrinking of Lake Chad has made many people move away.

5. **Unfair Treatment and Abuse**

   Some people are treated badly because of their religion, tribe, beliefs, or who they are. They may be put in jail unfairly or hurt, so they move to safer places where they feel protected.

6. **Poor Living Conditions**

   In many places, there is no clean water, electricity, good roads, or proper houses. People leave to find places with better living conditions.

7. **Corruption and Poor Leadership**

   When leaders misuse money and don't care for the people, it becomes hard for citizens to have hope for the future. Many decide to leave and look for better chances elsewhere.

Pull Factors (Reasons Why People Are Attracted to Other Countries)

These are the good things or opportunities in other countries that make people from Africa want to go there.

1. **Better Jobs and Higher Pay**
   Many people move because they can find good jobs and earn more money than in their home countries. Some countries also need workers in areas like farming, healthcare, and caring for the elderly.

2. **Good Healthcare and Schools**

   Countries in Europe, America, and parts of Asia have better hospitals and schools. People go there so their families can get good medical care, and children can have a better education.

3. **Peace and Safety**

   Some people move because the country they go to is peaceful and safe, with no war or political problems. This gives them a sense of security.

4. **Better Living Conditions**

   In some countries, life is more comfortable. There are good roads, clean water, electricity, public transport, and help for people who don't have jobs.

5. **Chance to Improve Skills and Career**

   People, especially those with special skills, go to countries where they can grow in their jobs, learn more, do research, and improve themselves.

6. **Family and Friends Already There**

   Some people move because others from their home country already live there. These friends or family help them settle, find a place to stay, and get work.

7. **Need for Skilled Workers**

   Some countries look for skilled workers, like doctors, nurses, engineers, and IT experts, and invite them to work there because they do not have enough of such workers.

Impacts of Migration on the Source Country (Country of Origin)

Migration has a complex and often dual impact on the countries from which people emigrate.

Positive Impacts of Migration

1. **Money Sent Home (Remittances)**

   One of the biggest benefits of migration is that people working in other countries send money back to their families. In 2023, Africans living abroad sent about 54 billion dollars home. This money helps families pay for food, school, healthcare, and even start small businesses or build houses. In some countries, the money from migrants is more than what the government gets from foreign aid.

2. **New Skills and Ideas**

   When migrants come back home after living abroad, they often bring new skills, knowledge, and ideas they learned in other countries. This helps improve businesses, schools, hospitals, and even farming in their home country. For example, a nurse or teacher returning from abroad may introduce better ways of working.

3. **Fewer Job Problems at Home**

   When young people who cannot find jobs at home move to other countries, it reduces the number of unemployed people in their home country. This helps reduce problems caused by too many people looking for work.

4. **More Trade and Investment**

   People living abroad help create business and trade links between their home and host countries. They also invest in houses, shops, and other projects back home, helping the economy grow.

5. **Stronger Family and Cultural Links**

   Migration keeps families and cultures connected. People who live abroad still talk to and support their relatives at home, bringing back stories, traditions, and new ways of thinking.

Negative Impacts of Migration

1. **Brain Drain**

   When skilled people like doctors, nurses, teachers, engineers, and IT experts leave their home country to work elsewhere, it causes a big problem. This is called *brain drain*. It means the country loses important workers, making it harder to run hospitals, schools, and other services. For example, some African countries don't have enough doctors because many have moved to other countries.

2. **Family Separation**

   When parents or family members move away for a long time, it can hurt the family. Children left behind may feel lonely, sad, or have trouble growing up properly. Families can become divided, and traditions may break down.

3. **Too Much Dependence on Money Sent Home**

   Even though the money migrants send home is helpful, if families or the government depend too much on it, they may stop working hard to improve their own economy or create jobs.

4. **Loss of Young Workers**

   When many young people leave to work abroad, there may not be enough people left at home to work on farms, in factories, or in offices. This can slow down the country's progress.

5. **More Old People than Young People**

   If many young adults leave, the country may end up with mostly old people and very few working-aged people to support them.

6. **Dangers of Irregular Migration**

   When people travel without proper documents or use dangerous routes (like crossing deserts or seas), they risk being hurt, cheated, or even losing their lives. This causes pain for their families and communities.

How Migration Affects the Country That Receives Migrants

When people move to another country, it also affects the country they move to. There are both benefits and challenges for the receiving country.

Positive Effects

1. **More Workers and Filling Job Gaps**

   Migrants often take jobs that the local people do not want or where there are not enough workers. For example, they work in farming, building, caring for sick or elderly people, hotels, and even in areas like healthcare and computers. In the UK, many doctors and nurses in the hospitals come from other countries, including Africa.

2. **Cultural Diversity**

   Migrants bring new languages, food, music, clothes, and traditions. This makes life more colourful and helps people learn about other cultures and respect differences.

3. **Helping the Economy**

   Migrants pay taxes, buy goods and services, and some even start businesses that employ other people. This helps the country's economy to grow.

4. **Keeping the Population Young**

   Some countries have many old people and very few young workers. Migrants help by bringing in younger workers to keep the economy and social systems going.

5. **New Ideas and Businesses**

   Many migrants are creative and start businesses or come up with new ideas that help the country develop.

6. **More Demand for Goods**

   When migrants move in, they buy food, clothes, houses, and use services, which helps businesses and keeps the economy active.

Negative Effects of Migration on the Receiving Country

1. **Pressure on Services**

   When too many migrants arrive at once, it can put pressure on things like housing, schools, hospitals, and buses. If the country is not well-prepared, these services may not be enough for everyone.

2. **Cultural Differences**

   Even though having many cultures is good, it can sometimes cause problems. People may not understand each other's language, traditions, or way of life, which can lead to misunderstandings or disagreements.

3. **Discrimination and Unfair Treatment**

   Some migrants may face racism or unfair treatment because they look different, speak another language, or come from another place. This can make life hard for them in the new country.

4. **Lower Wages in Some Jobs**

   In some types of work, like farming or construction, having many migrants competing for the same jobs can cause wages to go down.

5. **Community Challenges**

   If many migrants move to the same area, some people may feel there is too much competition for resources or that their way of life is changing too fast. This can cause tension in the community.

Challenges Faced by African Migrants

Moving to another country and settling there can be very hard for African migrants. Here are some of the problems they face

1. **Dangerous Journeys**

   Because there are not enough legal ways to travel, many migrants use unsafe routes. They cross hot deserts like the Sahara, facing thirst and attacks by bad people. Some also cross the sea in weak boats, and many lose their lives on the way.

2. **Exploitation and Abuse**

   Migrants without proper documents are often treated badly. They may be forced to work like slaves, cheated by smugglers, or even abused.

3. **Problems With Documents**

   Getting visas, work permits, or permission to stay is often very hard, expensive, and slow. Many cannot get these papers, making them live illegally and vulnerable.

4. **Language and Culture**

   When they arrive, many migrants cannot speak the local language or understand the way of life, which makes it hard to find jobs, make friends, or feel at home.

5. **Racism and Discrimination**

   Some migrants face racism, unfair treatment, or are excluded just because of their skin colour or where they come from. This can make life very difficult and hurt their feelings.

6. **No Access to Services**

   Migrants without documents often cannot go to school, visit a hospital, or get help from the government when they need it.

7. **Emotional Stress**

   Many migrants have already suffered from war, violence, or hunger at home and during their journey. These bad experiences can make them feel sad, worried, or depressed.

8. **Money Problems**

   Sometimes migrants are tricked into paying high fees to agents, employers, or even friends who promise to help them but only take advantage of them.

Role of Return Migration

Return migration happens when people who travelled to live and work in another country come back home after some time. Some return because they choose to. For example, after finishing school, saving enough money, or just wanting to come back. Others are forced to return, maybe because their visa expired, they were deported, or life became hard in the foreign country. When they come back, they can help improve their home country in many ways. This is sometimes called a "brain gain."

1. **Bringing Back Skills and Knowledge**

   People who return bring with them new skills, ideas, and ways of doing things they learned while abroad. They can help improve schools, hospitals, technology, farming, and businesses in Ghana.

2. **Starting Businesses and Investing**

   Many returnees come back with money they saved or access to loans. They often start businesses, build houses, or create jobs for others. Some even bring new kinds of products and services.

3. **Sharing New Cultures and Attitudes**

   They bring back good work habits, new ways of thinking, and cultural practices they saw abroad. This can help their communities become more open-minded and modern.

4. **Helping Their Communities**

   Some returnees use their money and experience to improve their hometowns. They may build schools, fix roads, support hospitals, or help poor families.

5. **Keeping Connections Abroad**

   Even after coming back, they often keep in touch with friends or family abroad. They can still send or receive money and bring more opportunities to their country.

6. **Improving Institutions**

   Some returnees use what they learned abroad to make government offices, schools, or organisations work better and more honestly.

Activity 3.10 Why People Move - An Inquiry

Work in small groups of no more than three people. Give each member a role, such as *researcher*, *writer*, *presenter*, or *encourager*, so everyone has something to do.

1. Use your textbooks, trusted websites, newspapers, or even talk to people in your community to find out the *reasons why people move* (push and pull factors) and how it affects their lives.
2. For each reason you find, write one short sentence about it and also note where you got the information.
3. Put the reasons you found into two groups that is, *positive effects* and *negative effects* of migration.
4. Draw or create a colourful poster or slide. Show at least three of the reasons with arrows, drawings, or symbols. Make sure to label everything clearly.
5. Talk about one thing that surprised you during the research and how you felt while learning about it.
6. Each group will take 3 minutes to show their poster or slide, explain two important points they learned, and share their feelings about the activity.

Activity 3.11 My Migration Story Map

On your own, use your textbook, class notes, or a short internet search to find at least *three reasons why people move* (push and pull factors).

1. For each reason, write one or two short sentences to explain it clearly.
2. On a blank sheet of paper, draw the outline of Ghana (or the world). Use arrows to show at least two examples of migration. For example, north to south in Ghana, or Africa to Europe. Label the arrows with the reason why people move.
3. Use colours or symbols to make your map clear and attractive. You can also draw small icons to represent jobs, schools, drought, or other factors.
4. At the bottom of the page, write one or two sentences about what you learned and how you feel about migration. For example: *"I learned that people move for many reasons, and I feel proud of how they work hard to improve their lives."*
5. Share your map with a friend, your teacher, or the class and explain one key idea you learned using PowerPoint presentations

Activity 3.12 Talking About Migration: From Ghana to the World

Join a group with classmates from different parts of Ghana. Choose one person to guide the discussion (facilitator) and another to write down key points (notetaker).

1. Take turns to share one story, example, or fact about migration from your own home region. Everyone else listens carefully and respectfully.
2. As a group, talk about these two questions:
   a. How is migration in Ghana similar to migration in other African countries?
   b. How is migration in Ghana different from migration in other parts of the world?
3. Together, write down at least two ways migration affects people and communities (for example: sending money home, losing skilled workers, learning new cultures).
4. Each person in the group says one good thing they noticed about another person's sharing and one feeling they had while hearing everyone's stories.
5. The facilitator shares with the whole class:
   a. One similarity between Ghana and Africa in migration
   b. One difference between Ghana and the world
   c. One socio-economic effect of migration

Activity 3.13 My Migration Story Poster

Take a few minutes to think about someone you know (family, neighbour, or friend) who has migrated either within Ghana, to another African country, or outside Africa.

1. On a sheet of paper, jot down
   a. where the person moved from and where they moved to.
   b. why they moved (push and/or pull factors).
   c. one positive effect their migration had (e.g., sending money, learning skills).
   d. one challenge they faced (e.g., homesickness, discrimination).
2. On a blank paper or card
   a. Draw a simple map or symbols showing the journey.
   b. Add short sentences or keywords explaining their reason for migrating, positive effects, and challenges.
   c. Use colours, arrows, or small drawings to make it clear and attractive.
3. Stand up and briefly explain your poster to a partner or the whole class, highlighting what you learned about migration from the story you shared.
4. Write one sentence about how learning about migration makes you feel, and what you think can be done to make migration better for everyone.

Activity 3.14 Revision on all the focal areas from Years One to Three

1. Visit your school library or search the internet for an administrative map of Ghana and a physical map showing relief, drainage, and vegetation.
   a. Identify areas of high and low population density.
   b. Discuss with a friend how physical features such as relief, drainage, and vegetation influence population distribution in your community.
   c. Relate your findings to specific regions (e.g., dense population in Greater Accra due to flat terrain and economic opportunities, sparse population in the Northern Region due to arid conditions).
   d. Present your discussions to the class on your findings using annotated maps with explanations.
2. Sketch a map of Africa and show the regions with the highest and lowest population growth.
   a. Use physical maps from your school library to analyse how relief, drainage, and vegetation influence population growth patterns.
   b. Discuss how these physical factors affect settlement patterns and economic activities in the identified regions. Create a visual presentation combining maps and written analysis.
   c. Try to connect population growth and distribution with the physical environment of Ghana.
   d. Using the physical and administrative maps of Africa, Present in Class how migration has influenced settlement patterns, socio-economic development and the physical characteristics (e.g., Rainfall, Soils, Vegetation) of Africa.
   e. Critically analyse the impacts of migration on Ghana's settlements.

EXTENDED READING

- Dadson I. Y. (2021). Integrated Human and Regional Geography, *Revised Edition*. Cape Coast: University of Cape Coast Press
- Population Reference Bureau (2024, 2023, 2022). World Population Data Sheet. See (www.prb.org)
- Ghana Statistical Service. (2021). *2021 Population and Housing Census*. (2024). *Mid-year Population Estimates.* Ghana Statistical Service.
- "Ghana Development Indicators" by the World Bank (2023)
- "Ghana Demographics" from The World Factbook (2024) by the Central Intelligence Agency

REVIEW QUESTIONS 3

1. Examine four (4) ways in which rapid population growth can create challenges for urban areas in Ghana.
2. Using your understanding of Ghana's demographic trends, propose and explain four (4) strategies that can help manage population growth and improve the distribution of people across the country. Include specific examples, case studies, or data from Ghana to support your points. And make sure examples are relevant and clearly linked to the strategies discussed.
3. Sketch a map of Ghana showing areas of high and low population densities. Annotate the map with reasons for these variations.
4. Explain how the following affect Ghana's population distribution.
   a. Climatic conditions
   b. Economic opportunities
   c. Access to social amenities
5. How does uneven population distribution affect socio-economic development in Ghana? Explain your answer under four (4) main points with examples.
6. Define rural-urban migration and explain why it is a challenge for Ghana's socio-economic development. Propose and explain four (4) strategies that could be used to manage rural-urban migration in Ghana, using relevant examples to support each strategy.
7. Compare the population distribution of Ghana to that of other African countries.
   a. Explain why African migrants move to other parts of the world?
   b. How does the migration of Africans affect both the source region and destination, using specific examples?
8. Propose and explain four (4) strategies that African governments can implement to reduce the negative impacts of migration and enhance its socio-economic benefits, using relevant examples to support each strategy.

SECTION

4

ECONOMIC ACTIVITIES IN GHANA

ECONOMIC ACTIVITIES

INTRODUCTION

This section of the lesson looks at how tourism, trade, transport, and communication help Ghana grow and develop. These sectors are very important because they create jobs, bring money into the country, and help the economy grow. For example, tourism attracts visitors, trade allows us to sell and buy goods, transport helps people and goods move around, and communication connects people and businesses. However, these sectors also face problems like poor roads, a lack of good policies, and difficulty reaching bigger markets. In this lesson, you will talk about these problems and how they can be solved. You will also look at real-life examples to understand how these sectors work. By the end, you will be able to explain how tourism, trade, transport, and communication help the country and suggest ideas to make them better and more sustainable for everyone. This section is related to Year One sections six, ten, eleven and Year Two sections one, three and four of the learning materials.

KEY IDEAS

- A tourist is a person who travels to a place other than where they usually live, for pleasure, relaxation, study, business, or adventure.
- Ghana's transport system is diverse, with each mode playing a unique role in national development.
- Ghana's economy is supported by tourism, trade and transport/communication systems
- International trade involves the exchange of goods and services between Ghana and other sovereign nations.
- Trade is not merely about buying and selling; it is a powerful engine for socio-economic transformation.
- Trade is categorised into Domestic Trade and International Trade.

TOURISM IN GHANA

Tourism is when people travel and spend time in places outside where they normally live. The United Nations World Tourism Organisation (UNWTO) explains tourism as the activities of people who visit other places, staying there for less than one year, mainly for fun, rest, business, or other reasons, but not to work in that place. A person who travels away from their home area for enjoyment, study, business, or adventure is called a **tourist**. The services that provide tourists with food, places to sleep, and entertainment are called the **hospitality industry**. In simple terms, tourism is about people exploring new places and the businesses that make their stay comfortable and enjoyable.

Primary Forms of Tourism (Based on Geographical Scope)

1. Domestic Tourism: Involves residents of a given country travelling only within that country.

   Example: A family living in Accra, Ghana, takes a vacation to Mole National Park in the Northern Region of Ghana. They are Ghanaian residents travelling only within Ghana.

2. Inbound Tourism: Involves non-residents (foreigners) travelling in a given country.

   Example: A tourist from Germany visits Ghana to explore Cape Coast Castle and attend the Panafest festival. They are non-residents entering Ghana.

3. Outbound Tourism: Involves residents of a given country travelling to another country.

   Example: A Ghanaian family travels to Kenya and stays in Nairobi to visit cultural and historical attractions, including the Karen Blixen Museum and the Giraffe Centre.

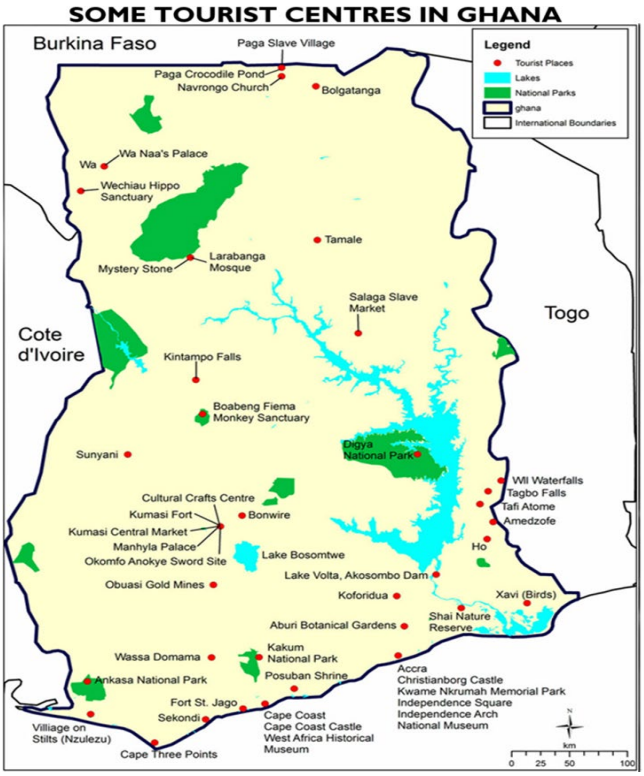


Figure 4.1: A map of Ghana showing some tourist centres

To provide a clearer overview, ***Table 4.1*** summarises these diverse types of tourism in Ghana.

Table 4.1: Types of Tourism in Ghana

Type of Tourism	Description	Examples
Cultural Tourism	Travel to experience different cultures, traditions, heritage, festivals	Aboakyir Festival-Winneba, Akasidae Festival -Kumasi, Damba-Tamale
Heritage Tourism	Focuses on historical sites and the legacy of the past	Cape Coast and Elmina Castles
Ecotourism	Responsible travel to natural areas, conserving the environment	Kakum National Park, Mole National Park
Adventure Tourism	Travel involving thrilling or adrenaline-inducing activities	Hiking Mount Afadjato, Paragliding at Kwahu
Recreational Tourism	Travel for leisure and relaxation, including beaches and theme parks	Labadi Beach, Busua Beach
Business Tourism	Travel for professional or corporate purposes	Attending conferences in Accra
Food Tourism	Travel centred around culinary experiences	Visiting local markets, trying traditional dishes
Rural Tourism	Travel to rural areas to experience rural life and natural landscapes	Farm stays, countryside excursions
Medical Tourism	Travel for medical treatment	Seeking specialised medical care
Religious Tourism	Travel for religious purposes	Visiting religious sites, participating in religious events
Event Tourism	Tourism focused on specific events and festivals	Kwahu Easter Paragliding Festival

Ghana's Unique Tourist Attractions: A Journey Through History and Nature

Ghana's appeal as a tourist destination lies in its rich tapestry of historical, cultural, and natural attractions.

Historical and Heritage Sites

Ghana's coast has many old forts and castles that remind us of the transatlantic slave trade. These buildings, like **Cape Coast Castle** and **Elmina Castle**, are UNESCO World Heritage Sites and help visitors learn about this sad but important part of history. Other historical places include the **Kwame Nkrumah Memorial Park** in Accra, which honours Ghana's first president, and **Independence Square**, which shows Ghana's struggle for freedom. In the north, the ancient **Larabanga Mosque**, one of the oldest mosques in West Africa, is also very special. Near Kumasi, the **Asante**

Traditional Buildings, another UNESCO World Heritage Site, display the beautiful designs and rich culture of the powerful Asante Kingdom. These places help us understand Ghana's history and culture better.

Figure 4.2: The Larabanga Mosque Figure 4.3: Cape Coast Castle

Natural Attractions

Ghana has many beautiful natural places to visit. The country has several national parks and wildlife reserves. **Kakum National Park** is famous for its exciting canopy walkway high above the rainforest, while **Mole National Park**, the biggest in Ghana, is home to elephants and other animals. There are also lovely waterfalls, such as **Kintampo Falls** and **Wli Falls**, which are known for their beauty and peaceful surroundings. Along the Atlantic Ocean, you can find golden beaches like the lively **Labadi Beach** and the calm **Busua Beach**, perfect for relaxing and having fun. Other amazing places include **Lake Bosomtwi**, a lake formed by a meteorite, and the green **Aburi Botanical Gardens**, where you can enjoy fresh air and nature. These natural attractions show the beauty of Ghana's land and wildlife.

Figure 4.4: Mole National Park Figure 4.5: Kakum National Park

Cultural Events and Festivals

Ghana is full of life and culture, and many traditional festivals are celebrated every year. These festivals show the rich traditions and customs of different ethnic groups in the country. For example, the **Homowo Festival** is celebrated by the Ga people in the Greater Accra Region to mark a good harvest. The **Odwira Festival** is held by the Akwapim people to purify the land and celebrate the harvest. In Elmina, the **Bakatue Festival** starts the fishing season, while in Winneba, the **Aboakyer Festival** involves a traditional deer hunt. Other festivals include **Fetu Afahye** in Cape Coast, the **Damba Festival** in the northern regions, and the exciting **Kwahu Easter Paragliding Festival**, where people fly through the air in paragliders. These festivals are colourful, fun, and an important part of Ghana's culture.

Figure 4.6: The Damba festival

Figure 4.7: The Homowo festival

The Role of Tourism in Ghana's Development

1. **Brings Foreign Money**

   Tourism helps Ghana earn money from visitors. For example, the *Year of Return* in 2019 brought over 750,000 tourists, who spent about $1.5 billion on hotels, food, and souvenirs.

2. **Provides Jobs**

   Many Ghanaians work in tourism for example, in hotels, restaurants, transport, and as tour guides. For example, people work at Elmina Beach Resort in housekeeping, catering, and guiding tourists.

3. **Supports Local Businesses**

   Tourists buy local goods like *kente* cloth from Bonwire, helping small businesses earn more.

4. **Protects Culture**

   Festivals like *Panafest* and *Emancipation Day* in Cape Coast teach visitors about Ghana's history and keep traditions alive.

5. **Helps Communities**

   Places like Tafi Atome Monkey Sanctuary use money from tourism to build schools and clinics for the local people.

6. **Improves Skills**

   Schools like GIMPA train people to work in tourism and hospitality.

7. **Better Roads and Airports**

   Tourism improves transport. For example, Kotoka Airport's new Terminal 3 helps welcome more visitors.

8. **Protects Nature**

   Fees from places like Kakum Park help care for the forest and animals.

9. **Encourages Clean Practices**

   Tourism also promotes protecting the environment, like keeping beaches clean and conserving marine life.

Challenges Facing Tourism in Ghana

1. **Poor Roads and Transport**

   Many tourist sites are hard to reach because of bad roads and limited transport, especially during the rainy season. For example, roads to Mole National Park are often muddy and broken.

2. **Few Good Hotels**

   In smaller towns and villages, there are not enough good-quality hotels. Visitors to Wli Waterfalls or Mount Afadja often stay in simple guesthouses.

3. **Frequent Light-Off and Water Problems**

   Power cuts and water shortages make it hard for hotels to give visitors a good experience, like air-conditioning or internet.

4. **Low International Awareness**

   Many people around the world don't know about Ghana's beautiful tourist attractions because of weak advertising compared to countries like Kenya.

5. **Poor Online Presence**

   Many sites have no websites or social media, so tourists can't find enough information.

6. **Too Much Dependence on Diaspora**

   Most visitors are from the Ghanaian diaspora; we don't attract enough people from other parts of the world.

7. **Lack of Skilled Workers**

   Some tour guides and hotel workers are not well-trained, making visitors unhappy.

8. **Few Training Schools**

   Institutions like GIMPA don't have enough practical training or high enrolment to meet the industry's needs.

9. **Brain Drain**

   Skilled workers like chefs and hotel managers leave Ghana for better jobs abroad.

10. **Dirty Environment**

    Littering, cutting trees, and pollution damage beautiful sites, like at Ada Foah, where plastic spoils the beach.

11. **Climate Change**

    Rising sea levels and bad weather damage coastal attractions, like those at Keta.

12. **Overcrowding**

    Too many visitors at popular places like Kakum's canopy walkway can harm the environment and reduce safety.

13. **Safety Issues**

    Small crimes in tourist areas, such as pickpocketing in Accra, scare some visitors.

Solutions to the Challenges Facing Tourism in Ghana

1. **Bad Roads**

   Fix and maintain roads to tourist sites by working with private investors. Improve roads to Mole National Park so visitors can reach it all year.

2. **Few Good Hotels**

   Help local people build better hotels by giving them loans and tax breaks. Support eco-lodges near Wli Waterfalls and Mount Afadja.

3. **Light-Off and Water Shortages**

   Use solar energy and rainwater systems in hotels and tourist sites. Cape Coast hotels can try solar panels to keep power steady.

4. **Low Global Awareness**

   Advertise Ghana's tourism at international fairs and work with big airlines to promote package tours.

5. **Poor Online Information**

   Build a simple tourism website and app with all the needed details and even virtual tours of places like Kakum.

6. **Too Much Focus on Diaspora**

   Market to tourists from Europe and Asia by showing eco-tourism and adventure activities.

7. **Lack of Skilled Workers**

   Provide more training in customer care and guiding and organise exchange programs to learn from experienced professionals.

8. **Few Training Schools**

   Improve existing schools with better courses and offer scholarships for tourism studies.

9. **Brain Drain**

   Pay good salaries and give benefits to keep skilled workers in Ghana.

10. **Dirty Environments**

    Enforce strict cleaning rules at tourist sites. Start campaigns to stop plastic use and provide bins at beaches.

11. **Climate Change**

    Build seawalls and eco-friendly buildings to protect coastal areas like Keta.

12. **Overcrowding**

    Use ticketing systems and promote other attractions nearby to reduce crowds at places like Kakum's walkway.

13. **Safety Issues**

    Post more police in tourist areas, run safety campaigns, and set up a tourist helpline for emergencies.

Activity 4.1 Exploring the Tourism Sector Together

1. Work in a group of no more than three people and use books, websites, or interviews to find out about
   a. **Economic Benefits:** Jobs created, how tourism helps Ghana's money (GDP), and improvements like better roads and airports.
   b. **Social Benefits:** How tourism helps keep our culture alive, improves communities, and supports less privileged people.
   c. **Challenges:** Problems like bad roads, too many taxes, poor planning, and harm to the environment.
2. Write a short report or prepare a presentation showing:
   a. What you found out about tourism's importance in Ghana.
   b. The challenges you discovered and how we can solve them.
   c. **Choose one way to share your work:**
   d. Talk to the class with posters or charts.
   e. Make a colourful poster with pictures and words.
   f. Act out a short drama to show your points.
   g. Use slides or a short video if you have access.
   h. Visit a nearby tourist site to see how it really works.

Activity 4.2 My Dream Tourist Destination

1. Imagine you are designing a new tourist site in Ghana that will attract visitors from around the world.
   a. On a sheet of paper or in your notebook, describe:
      - The name of your tourist site.
      - Where in Ghana it is located.
      - What makes it special (e.g., nature, history, culture, adventure).
      - What activities tourists can do there (e.g., hiking, swimming, learning about history).
      - How will it help the local people and the environment?
   b. Draw and colour a simple map or picture of your site showing its main features.
   c. Share your idea with a partner or with the class, explaining why tourists would love to visit your destination.
   d. Write one sentence about what you learned about tourism through this activity.

Activity 4.3 Video analysis of tourist sites in Ghana.

1. Write a report on a popular tourist site in Ghana you know (examples are Kakum National Park, Cape Coast Castle, Mole National Park, and Lake Volta.
   a. Describe to a friend some beautiful attraction sites located in your community
   b. Identify the socio-economic benefits of these sites to the local communities and Ghana's economy.
2. Analyse the challenges faced by these tourist sites (e.g., poor road access, inadequate facilities).
   a. Propose solutions to address these challenges (e.g., improving infrastructure, marketing campaigns).
   b. Create a presentation or infographic summarising your report or findings on the tourist sites.
3. Conduct research using textbooks, videos, and statistical data.
4. Prepare a detailed report explaining any of the following:
   a. The social and cultural benefits of tourism in Ghana (e.g., preservation of heritage, cultural exchange).
   b. Challenges facing the tourism sector in Ghana (e.g., infrastructure deficits, environmental degradation).

   c. Strategies to overcome tourism challenges and promote sustainable tourism.
   d. Present your findings to the class.
5. Research tourist sites, identify and name any site in your region that the government can develop for tourism.
   a. Discuss with a friend the economic and socio-cultural benefits of the government and the community.
   b. Take a field trip to a nearby tourist site (e.g., Cape Coast Castle or a local eco-tourism destination).
   c. Observe the facilities and services available at the site.
   d. Interview staff or community members about the socio-economic benefits of the site.
   e. Identify challenges faced by the site and suggest solutions.
   f. After the trip, write a reflection report explaining the role of the site in Ghana's socio-economic development and the strategies needed to improve the tourism experience.
6. The government is planning to develop a new eco-tourism site in a rural area.
   a. Assume the role of any of the following: a policymaker, an environmentalist, a tourism operator, or a local community leader.
   b. Develop a tourism development plan that balances economic growth with sustainability and community involvement.
   c. Discuss with a friend the potential socio-economic benefits (e.g., job creation, infrastructure improvement) and environmental impacts of the project.
7. Using maps and images on Tourism in Ghana and Other African Countries: Compare the contributions of tourism to GDP, employment, and infrastructure in Ghana and the selected country.
   a. Identify the challenges faced by the tourism sectors in both countries.
   b. Discuss with a friend the lessons Ghana can learn from the selected country to improve its tourism sector.
   c. Create a comparative chart and share your analysis with the class.

TRADE IN GHANA

Introduction to Trade

Trade simply means buying and selling goods and services in an organised way. Long ago, people traded by exchanging one item for another and this is called **barter**. Today, most trade is done using money to pay for what we want. Trade is very important because it connects the people who make goods or offer services with those who need or want them. Trade can happen on a small scale, like in a village market, or on a large scale, between many countries around the world. The main purpose of trade is to make sure that goods and services are available to people when and where they need them.

Key Terms in Trade

1. **Barter**
   This is an old way of trading where people exchange goods or services directly without using money. For example, someone may give yams in exchange for fish. This still happens in some villages today.
2. **Commerce**
   This means all the activities that help trade to happen. It includes buying and selling, but also things like transport (moving goods), banking (keeping and lending money), insurance (protecting businesses from losses), and advertising (telling people about products).
3. **Market**
   Any place or system where buyers and sellers meet to trade. This can be a local market square or even an online shop. Prices in a market are decided by how much people want the goods (demand) and how much is available (supply).
4. **Commodity**
   A raw material or farm product that is bought and sold and usually looks the same no matter who produces it. Examples in Ghana are cocoa, gold, maize, and oil.
5. **Exports**
   Goods and services made in Ghana and sold to other countries. Exports bring money into Ghana.
6. **Imports**
   Goods and services made in other countries and brought into Ghana. Ghana spends money to buy imports.
7. **Balance of Trade**
   This is the difference between the value of what Ghana sells to other countries (exports) and what it buys from them (imports) in a year.

Types of Trade

Trade can be categorised based on its geographical scope: Domestic Trade and International Trade.

Domestic or Internal Trade

Domestic trade, also called internal or home trade, is the buying and selling of goods and services **within Ghana**. It happens when products are moved from the places where they are made to the places where people need them. This trade connects different parts of the country such as towns, villages, and cities and also helps everyone get the goods and services they need.

Parts of Domestic Trade

Domestic trade has two main parts

1. Wholesale Trade: This is when goods are sold in large quantities by producers or big suppliers to shop owners, businesses, or organisations. Wholesalers help move goods from factories or farms to many different shops.

2. Retail Trade: This is when goods are sold in small amounts directly to the people who use them. Retailers are the shopkeepers, market sellers, and supermarkets that we see every day. They sell goods to customers for their personal use.

Examples of Goods Traded Within Ghana

1. Farming Products: Farm produce is very important in trade across Ghana. Common food items include maize, yam, cassava, plantain, rice, tomatoes, onions, garden eggs, pineapples, and mangoes. Even cocoa, which is usually exported, is also sold locally from farms to buying centres.
2. Fish and Meat: Because Ghana has a long coast and many rivers, fish like smoked fish, tilapia, and herrings are sold in many areas. Meat such as beef, chicken, goat, and mutton, especially from the north, is also traded in the country.
3. Made-in-Ghana Products: Factories in Ghana produce items like soap, detergents, plastic bowls, cooking pots, drinks, clothes, and small radios. These are sold in markets and shops nationwide.
4. Handmade Crafts: Ghana's culture is seen in goods like baskets, beads, Kente cloth from Ashanti and Volta, wooden carvings, and pottery. These are sold to both locals and visitors.
5. Other Goods: Building materials like cement, iron rods, sand, and gravel, as well as household items, are also common in trade.

Popular Trading Centres in Ghana

Markets in Ghana are not just places where people buy and sell goods. They are also lively places where people meet, share ideas, and help the economy grow in their areas.

1. **Makola Market (Accra)**

   This is one of the most famous markets in Ghana, found right in the centre of Accra, the capital city. It is always busy with many traders selling all kinds of things such as clothes, cosmetics, food, and household items.

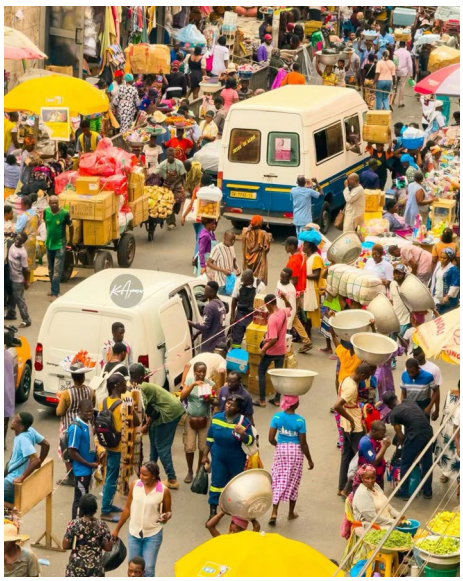


Figure 4.8: Bird-eye view of Makola market

2. **Kumasi Central Market (Kejetia)**
   This is one of the biggest open-air markets in West Africa, located in Kumasi. It is a very large and busy place where traders sell many different items like gold, cloth, food, and handmade crafts. The market is also an important place where goods are sent to and brought from other parts of Ghana and even nearby countries.

Figure 4.9: Kumasi Central Market

3. **Tamale Market**
   This is the main market in Northern Ghana. It is very important for selling farm products from the northern areas, such as shea butter, groundnuts (peanuts), grains, and animals. The market also helps traders do business with people from Burkina Faso, a country close to Ghana.

Figure 4.10: Tamale Market

4. **Takoradi Market Circle**
   A distinctive circular market structure, it is a major trading centre in the Western Region, known for its fresh seafood, agricultural produce, and manufactured goods. Its proximity to Takoradi Port also influences its trade activities.

Figure 4.11: Takoradi Market Circle

5. **Techiman Market**

   This market is found in the Bono East Region. It is well known as an important place where farmers and traders come to buy and sell farm produce. People from all over Ghana and even from nearby countries visit the market, especially on big market days. They mostly trade in food items like yam, maize, plantains, and vegetables.

Figure 4.12: Techiman Market

6. **Agbogbloshie Market (Accra)**

   While infamous for electronic waste, Agbogbloshie is also a massive market for foodstuffs, particularly onions, tomatoes, and other vegetables, serving as a major food distribution point for Accra.

Figure 4.13: Agbogbloshie Market

Factors Influencing Domestic Trade

1. **Transportation Networks**

   The roads, railways, and boats (like those on the Volta Lake) help traders move goods faster and at lower costs. When there are good roads and different ways to transport goods, it becomes easier to reach more customers. New highways and interchanges make this even better.

2. **Availability of Goods and Demand**

   Trade happens between places that have more goods than they need and places where those goods are needed. For example, yams from the Bono and Northern regions are sent to cities, while factory-made goods from cities go to villages.

3. **Population Density and Distribution**

   Places with many people, like Accra, Kumasi, and Takoradi, have more buyers, so trade does well there. As more people move to cities, trade in those places grows.

4. **Security and Safety**

   Traders like to work in safe places. When there is stealing, fighting, or fires at markets, it can scare traders and reduce business.

5. **Cultural and Religious Practices**

   Festivals, weddings, and religious events like Christmas and Eid make people buy more things, which increases trade. Weekly market days are also important in many communities.

6. **Government Policy and Regulation**

   The government controls things like taxes, market fees, and business licenses. When these rules are fair and help businesses, trade becomes easier and more profitable.

7. **Information Flow**

   When traders know the prices, what is in demand, and where to get goods, they can make better choices. This stops them from being cheated and helps them trade more successfully.

Advantages of Domestic Trade

1. Creates Many Jobs: Domestic trade gives work to millions of Ghanaians. People work as farmers, traders, porters (kaya), drivers, shopkeepers, artisans, and helpers in the trade business.
2. Supports Local Industries: Trade helps people sell the goods they make or grow in Ghana. This encourages more production, brings in more money, and helps factories and farms to grow.
3. Helps Share Resources Across the Country: Trade moves goods from places where they are produced (like farming areas) to where they are needed (like cities). This makes sure everyone can get what they need.
4. Brings Money to Local Governments: When traders pay market fees, tolls, and shop rates, the money helps Metropolitan, Municipal, and District Assemblies (MMDAs) to develop their areas and provide services.

5. Encourages Business and Self-Employment: Many people, especially women and young people, are able to start their own businesses through trade and earn money to take care of themselves and their families.
6. Promotes Ghana's Culture: Selling local crafts, traditional clothes like Kente, and Ghanaian food helps keep our culture alive and shows its beauty to others.

Problems of Domestic Trade

1. Bad Roads and Transport: In many villages, the roads are very bad. This makes it hard, slow, and expensive to take goods to the market. Sometimes food spoils on the way, and prices become high for buyers.
2. Poor Storage and Market Facilities: There are not enough good warehouses, cold rooms, or well-planned markets. Because of this, perishable goods like tomatoes, garden eggs, and fish often spoil, especially when there is a good harvest. Crowded markets also make trading harder.
3. High Business Costs: Traders have to pay many taxes and fees. Sometimes they are even asked for bribes. Paying for electricity and water also adds to their costs and reduces their profits.
4. Difficulty Getting Loans: Many small farmers and traders don't have the documents or property the banks need to give them loans. This makes it hard for them to grow their businesses.
5. Overcrowded and Dirty Markets: Some markets, especially in cities, are too full of people and goods. They also have poor waste management and dirty surroundings, which can cause sickness and make trading difficult.
6. Theft and Fires: Traders sometimes lose their goods to thieves, robbers, or market fires. Many markets also lack good security to protect traders and their goods.
7. Middlemen Cheating Farmers: In some cases, people who buy from farmers pay them very low prices and then sell the goods at much higher prices in the city. This leaves the farmers with little profit.
8. Selling Only Raw Goods: Most farm products are sold just as they are harvested, without processing or packaging. This means Ghana misses out on the extra money that comes from adding value to the goods.

Solutions to Problems of Domestic Trade

1. Build Better Roads and Markets: The government should build and repair good roads, especially the small roads that link farms to markets. They should also build proper markets with enough stalls, good drainage, good waste disposal, and storage facilities like cold rooms and silos.
2. Give Small Loans to Traders and Farmers: Banks and microfinance companies should give affordable loans with easy payment terms to farmers and small traders so they can grow their businesses.
3. Reduce Too Many Taxes and Fees: The government should make taxes and fees clear and fair, so traders don't pay too much. This will help them make more profit.

4. Make Markets Clean and Safe: There should be good waste collection, regular cleaning, proper lighting, security guards, and fire safety equipment in all markets.
5. Support Trader Groups: Trade associations should be strengthened to help their members, solve problems, teach good business practices, and make sure everyone trades fairly.
6. Process and Package Local Products: Farmers and businesses should process what they produce (like making tomatoes into paste, cassava into gari, or fruits into juice). This makes the goods last longer and sell for higher prices.
7. Share Market Information: Farmers and traders should get timely information about prices, what goods are needed, and where they are needed. This can be done through phones, radios, or apps.
8. Stop Middlemen from Cheating Farmers: Farmers can form cooperatives (groups) to sell their goods together so they can get better prices without being cheated by intermediaries.
9. Train Traders and Farmers: Traders and farmers should be trained in good business skills, how to save and manage money, keep clean, and use modern ways to sell their goods.

International Trade

International trade means buying and selling goods and services between Ghana and other countries. It is an important part of globalisation because it helps Ghana focus on producing the things it can make well (exports) and also get the goods and services it cannot produce easily at home (imports).

Major Trading Partners of Ghana

Ghana does business with many countries around the world. Some of the main trading partners are:

1. China: China is one of Ghana's biggest trading partners. Ghana buys (imports) things like electronics, machines, clothes, building materials, and other goods from China. China also buys raw materials from Ghana.
2. European Union (EU) Countries: The EU as a group is very important for Ghana's trade. Some key EU countries are;
   a. Netherlands: Buys a lot of Ghana's cocoa, fruits, and vegetables.
   b. Germany: Sells (exports) machines, cars, and special equipment to Ghana.
   c. United Kingdom (UK): Buys Ghana's gold, cocoa, and timber.
3. United States (US): The US buys Ghana's gold and cocoa, and sells oil, machines, and other products to Ghana.
4. India: India trades medicines, rice, machines, and clothes with Ghana.
5. Nigeria: Nigeria, a close neighbour, is an important partner. Ghana buys oil and some food from Nigeria and also sells goods there.

6. South Africa: Trades with Ghana in mining equipment, packaged foods, and drinks.
7. United Arab Emirates (UAE): Becoming more important for Ghana, especially in oil products and as a centre for re-exporting goods.

Major Export Items of Ghana (What Ghana sells to other countries)

These are the main things Ghana sells to other countries to earn money from foreign trade

1. Gold: This is Ghana's biggest export. It is sent in raw or partly processed form to countries like Switzerland, UAE, India, and China.
2. Cocoa Beans and Products: Ghana is the second largest cocoa producer in the world. It exports cocoa beans, cocoa paste, cocoa butter, and cocoa liquor to countries like the Netherlands, Belgium, Germany, and the USA.
3. Crude oil: Since 2010, oil has become one of Ghana's top exports. It is mostly sold to countries in Asia (like China and India) and Europe.
4. Timber and Wood Products: Ghana exports wood in different forms, such as plywood, veneer, and sawn timber, mainly to Europe and Asia.
5. Manganese and Bauxite: These are raw materials used in making steel and aluminium, sold to countries that need them for industries.
6. Cashew nuts: Cashew has become an important export, especially to India and Vietnam for processing.
7. Fruits and Vegetables: Ghana sells fresh pineapples, mangoes, yams, and garden eggs, mainly to European countries that like exotic fruits.
8. Seafood: Ghana exports tuna (often canned), other fish, and shrimp to other countries.
9. Non-Traditional Exports (NTEs): These include many other items like shea butter, crafts, processed foods, drinks, and textiles (like Kente cloth), which help Ghana have more variety in its exports.

Major Import Items into Ghana (What Ghana buys from other countries)

These are goods and services that Ghana does not produce at all or does not produce enough of for everyone.

1. Machinery and Equipment: Ghana buys machines and tools from countries like China, Germany, and the USA. These include farm machines, building equipment, factory machines, and spare parts to help develop the country.
2. Refined Petroleum Products: Even though Ghana produces crude oil, it still buys petrol, diesel, and fuel for planes because the country cannot process enough oil by itself.
3. Vehicles and Spare Parts: Ghana imports cars, buses, trucks, motorbikes, and their parts, mainly from Japan, China, South Korea, and Europe.

4. Food Items: To support local food and meet people's needs, Ghana buys rice, wheat, sugar, chicken, and some packaged foods from other countries.
5. Pharmaceuticals and Medical Supplies: Ghana imports medicines, vaccines, and medical equipment for hospitals, mostly from India, China, and Europe.
6. Textiles and Clothing: Ghana buys both new and second-hand clothes (called *obroni wawu*), mainly from China, Europe, and the USA.
7. Electronics: Ghana imports things like TVs, phones, fridges, computers, and other gadgets, mostly from China and Asia.
8. Iron and Steel Products: These are materials used to build houses, factories, and make other products.
9. Plastics and Chemicals: These are used in factories, businesses, and even at home for different purposes.

The Role of Trade in the Socio-Economic Development of Ghana

Trade is not just about buying and selling. It helps Ghana grow and develop in many ways.

Why Trade is Important

1. Creates Jobs: Trade gives work to many people such as farmers, factory workers, drivers, traders, bankers, customs officers, shopkeepers, and many more. This helps reduce poverty and improves people's lives.
2. Brings Money to the Government: The government collects taxes and import/export fees from trade. This money is used to build roads, schools, hospitals, and provide other important services.
3. Provides a Market and Encourages Production: Because of trade, farmers, manufacturers, and service providers have people to buy what they produce. This motivates them to produce more and improves the economy.
4. Brings New Technology and Ideas: When Ghana trades with other countries, it gets modern machines, tools, and better ways of doing things. This helps make work faster and better.
5. Earns Foreign Money: When Ghana sells goods to other countries, it earns money in foreign currencies (like dollars or euros). This money helps the country buy things it needs from abroad and keep the Cedi stable.
6. Encourages Business and Creativity: Trade gives people the chance to start and grow their own businesses. It also inspires new ideas and independence.
7. Improves Living Standards: Trade brings more goods and services to the market. Competition from imports helps to keep prices lower and improve quality, giving people more choices.
8. Improves Infrastructure: Because of trade, Ghana has to build and improve ports (like Tema and Takoradi), airports (like Kotoka), roads, railways, and communication networks. These also help the whole country develop.

9. Brings Countries Together: Trade with other African countries through groups like ECOWAS and AfCFTA promotes friendship, peace, and shared development.

Challenges Facing the Trade Sector in Ghana

Even though trade is very important for Ghana, there are still many problems that make it difficult to grow.

1. Too Much Dependence on Imports: Ghana buys too many goods from other countries, like rice, chicken, and manufactured products. This takes away foreign money, hurts local businesses, and makes the economy weak when world prices change.
2. Unfavourable Balance of Trade: Ghana often buys more than it sells. This trade deficit uses up foreign money, weakens the Cedi, and increases debt.
3. Poor Infrastructure: Bad roads, weak railway lines, and not enough modern ports make it hard and expensive to move goods quickly and safely.
4. Changing Prices of Exports: The prices of Ghana's main exports such as gold, cocoa and oil go up and down in the world market. When prices drop, Ghana earns less money, which can hurt the economy.
5. Corruption and Smuggling: These illegal activities reduce government income, create unfair competition for honest businesses, and make prices unstable.
6. Complicated Rules and Delays: Too many customs checks, paperwork, and unnecessary delays at ports and borders make trade expensive and discourage traders.
7. Little Processing of Raw Materials: Ghana mostly sells raw materials like cocoa beans, gold, and oil without adding value. If these were processed into finished products, they would earn more money and create more jobs.
8. Limited Variety of Exports: Ghana depends too much on a few products. If demand or prices for such products fall, the economy suffers.
9. Competition from Cheap, Low-Quality Imports: Local businesses find it hard to compete with cheap and poor-quality goods from other countries, which can cause local companies to fail and people to lose their jobs.
10. Lack of Access to Loans: Many small and medium businesses cannot get enough money to grow, buy better machines, or improve their products to meet international standards.

Solutions to the Challenges in Ghana's Trade Sector

To solve the problems in trade, Ghana needs to take several actions and work together as a country.

1. Add Value to Our Products and Build More Factories: Instead of selling raw materials like cocoa beans, gold, and bauxite, Ghana should process them into finished goods like chocolate, jewellery, aluminium, and cassava flour. This will bring more money and create jobs. The government can help by giving tax breaks, loans, and training people with skills in packaging, quality control, and export management.

2. Improve Roads, Ports, Railways, and Electricity: Ghana should build better roads to connect farms, factories, and ports. Modernising ports like Tema and Takoradi will make trade faster and cheaper. The railways should also be fixed and expanded to carry goods easily. A stable and affordable electricity supply is also very important for businesses.
3. Support Local Businesses: Ghana should encourage people to buy goods made in Ghana. The government can help local industries by giving loans, tax cuts, and making sure imported goods follow fair quality standards so local businesses can compete.
4. Sell More Products to More Countries: Ghana should not depend on just a few exports. We can sell more things like cashew, shea butter, fruits, crafts, and even services like tourism and ICT. The government should help businesses find new buyers by attending trade fairs and advertising Ghanaian products in other countries.
5. Make Trade Easier and Reduce Corruption: The government should make trade rules simple and fast and reduce the paperwork at the ports. Using computers and online systems can help avoid bribery and smuggling. There should also be stricter punishments for illegal trade and corruption.
6. Trade More with Africa: Ghana should take advantage of agreements like the African Continental Free Trade Area (AfCFTA) and ECOWAS to sell more goods to other African countries. This will reduce dependence on faraway markets and open more opportunities for Ghanaian businesses.
7. Provide Loans and Fair-Trade Policies: Ghana should set up banks and credit schemes to give affordable loans to traders and exporters. Training in international trade and payment systems will also help businesses do better in global markets. The government should keep trade policies stable to give traders confidence to invest.
8. Use Technology in Trade: Ghana should promote online businesses (e-commerce) so that local traders can sell their goods in Ghana and beyond. Digital payment systems should also be encouraged to make buying and selling easier, faster, and safer for everyone.

Activity 4.4 Understanding Trade in Ghana

Investigating Trade in Ghana

1. **Research in Your Group or with a friend:** Work together in a group and use books, the internet, and other reliable sources to find information about:
   a. The types of trade in Ghana — internal (within Ghana) and external (with other countries).
   b. The benefits of trade for people and the country.
   c. The problems or challenges Ghana faces in trade.

2. Choose **one** of these ways to present what you have learned:
   a. Make a Poster or Infographic — for students who like drawing and visuals.
   b. Act out a Role-play or Short Skit — for students who like acting and moving around.
   c. Create a Digital Slideshow — for students who enjoy using computers.
   d. Do a Radio Talk Show Simulation — for students who like talking and listening.
3. Write a simple report of what you found. You can:
   a. Use bullet points and pictures to explain.
   b. Summarise the main points and what your group thinks about trade in Ghana.
   c. Add at least **one suggestion** on how trade in Ghana can be improved.

Interviewing a Trader or Business Owner

As a group or individually, prepare **5-7 simple questions** to ask a trader or business owner in your community.

1. Questions can focus on:
   a. the type of goods or services they sell.
   b. where they get their goods from (local or imported).
   c. how trade helps them and their family.
   d. the challenges they face in their business.
   e. their ideas for improving trade in Ghana.
2. Visit the trader or business owner at their shop, market stall, or office.
3. Politely ask your questions and take notes of their answers.
4. If possible, take a photo of their goods or shop (with their permission).
5. Write a summary of what you learned from the interview.
6. You can:
   a. share it with the class in a short oral presentation.
   b. create a poster with the trader's story and what you learned.
   c. add it to your group's report or display.

TRANSPORT AND COMMUNICATION IN GHANA

Transport and communication are very important for Ghana's economy. They help people and goods move from one place to another and make it easy to share information. Ghana has **roads, railways, airports, and waterways** that connect different parts of the country and support trade, business, and tourism. **Mobile phones and the internet** also help people stay in touch and do business faster and easier. However, there are still problems such as bad roads, high transport costs, and poor access in villages and rural areas. Fixing these problems is important to grow the economy, improve people's lives, and bring the whole country together.

Transport means the organised movement of people, goods, and services from one place to another using different ways, like cars, trains, boats, or planes, to meet our needs. **Communication** is about sending and receiving information through different means, helping people stay connected and work together.

Transport Systems

Ghana's transport system is diverse, with each mode playing a unique role in national development. ***Table 4.2*** shows the major transport systems in Ghana.

Table 4.2: Major Transport Systems in Ghana.

Mode	Current Status	Key Example/Initiative
Road	Dominant, handling ~95% of passenger and freight traffic. Over 70,000 km of roads, with urban highways in good condition but rural feeder roads often impassable during rainy seasons.	The "Year of Roads" campaign (2020-2022) rehabilitated feeder roads in the Volta and Ashanti Regions, improving access to markets. The Accra-Kumasi motorway remains a critical trade route.
Rail	Limited network (~947 km, with 160 km operational by 2020), mostly in southern Ghana. Phased expansion underway to support bulk cargo transport.	The Tema-Mpakadan standard-gauge railway (completed 2021) enhances cargo movement, with plans for a Burkina Faso link to boost regional trade.
Air	Kotoka International Airport in Accra is the main hub, with regional airports in Kumasi, Sunyani, Ho, Wa, Tamale, and Takoradi. Air travel supports trade and tourism but is costly for most Ghanaians.	The 2023 expansion of Tamale International Airport has increased northern Ghana's connectivity, supporting commerce and tourism.
Water	Tema and Takoradi ports handle international trade, while Lake Volta ferries and river barges support inland transport.	The MV Dente ferry service connects Kete Krachi and Yeji, with proposals for expanded inland waterway trade on Lake Volta to reduce road congestion.

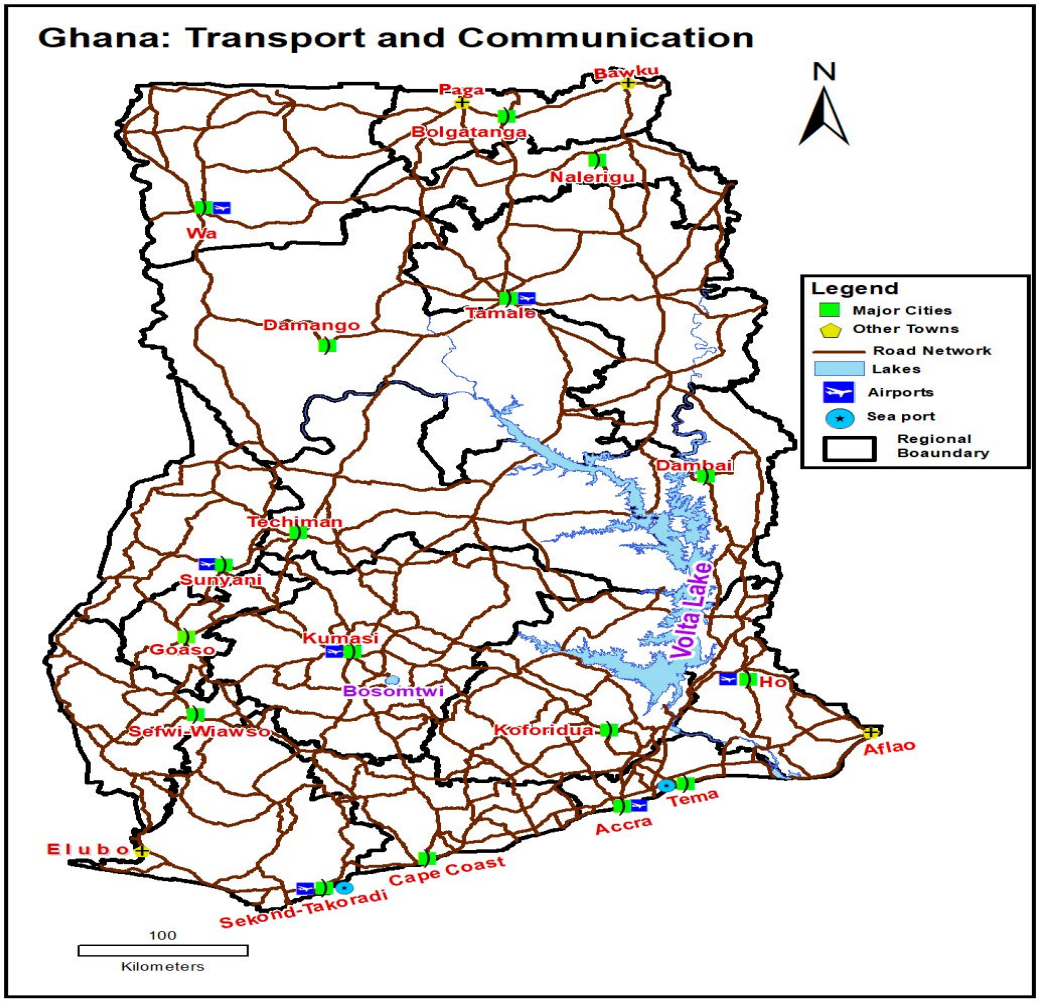


Figure 4.14: Map of Ghana showing Transport and Communication Systems

Communication Systems in Ghana

1. **Telecommunication**

   In Ghana, many people use mobile phones and there are more SIM cards than people because some have more than one SIM. By 2023, about 40 million SIM cards were active. The mobile phone business is very big and keeps growing. Most cities have fast 4G internet, and by 2024, trials of even faster 5G internet began in Accra and Kumasi.

2. **Internet**

   Ghana has built a strong network called the *National Fibre Backbone* that connects all 16 regions and helps more people use the internet. By 2023, about half (53%) of Ghanaians were using the internet. There is also community Wi-Fi in some schools to help students learn online. But in rural areas, only about 30% of people have good internet service.

3. **Postal Services**

   GhanaPost runs about 360 post offices around the country. It now also uses modern technology, like *GhanaPostGPS*, which gives every location a unique digital address. Together with courier companies, GhanaPost delivers letters and parcels in a faster and more reliable way.

Role of Transport and Communication in Ghana's Development

Transport and communication help Ghana to grow and improve people's lives in many ways.

1. **Helps Trade and Business**

   Good roads, ports, and mobile money make buying and selling easier. For example, the Tema Port has been improved so ships wait less time, helping Ghana export cocoa, gold, and oil faster. Trotros and taxis help traders travel to markets in towns like Nsawam and Kpongu. Mobile money, which handled about GHS 1.2 trillion in 2023, allows people to pay and receive money easily without using cash.

2. **Provides Jobs and Grows the Economy**

   Transport and communication make up about 12% of Ghana's economy (GDP). Many people work as drivers, port workers, and telecom staff. Apps like Bolt and Uber have also given jobs to over 10,000 young people in cities. Telecom companies also hire workers for customer care and network repairs.

3. **Brings Foreign Investment**

   Better roads, airports, and internet attract businesses from other countries. The new Terminal 3 at Kotoka Airport brought more airlines to Ghana. Fast internet in Accra attracted European companies like Teleperformance to open call centres here. The Tema Free Zone now hosts factories thanks to good roads and port facilities.

4. **Improves Education and Healthcare**

   Good transport helps students in rural areas get to school. During COVID-19, online learning reached over 2 million students. In the Ashanti Region, the Mobile Telemedicine service allows patients in towns like Obuasi to talk to doctors on their phones instead of travelling far. The Wireless Ghana project also improved the internet in rural areas.

5. **Supports Culture and Unity**

   Roads make it easier for people to attend festivals like Homowo in Accra and Panafest in Cape Coast. Social media connects Ghanaians abroad to local events through hashtags like #GhanaFest, which strengthens cultural pride and brings people together.

6. **Builds Better Infrastructure**

   Big projects like the Eastern Corridor Road (Koforidua-Ho-Aflao) help connect towns and support tourism. The Takoradi Port has been upgraded for bigger ships, helping the oil and gas industry. The Pokuase Interchange in Accra, finished in 2021, has reduced traffic jams and made travel faster.

7. **Expands Telecommunication Services**

   The Ghana Rural Telephony Project brought mobile networks to over 200 rural communities. MTN is also spending more money to expand 4G to more areas, and trials for 5G have started in Accra and Kumasi, which will make internet even faster and help with new technologies.

Challenges Facing the Sector

The transport and communication sectors face significant challenges that hinder their efficiency and inclusivity.

Table 4.3: Challenges of the transport and communication sector

Challenge	Impact	Illustrative Scenario
Poor road conditions	Increased vehicle maintenance costs and delayed goods delivery, leading to economic losses.	Cassava farmers in the Eastern Region lose 20% of their yield due to delays on unpaved feeder roads during the rainy season.
Inadequate rail network	Over-reliance on roads causes congestion and pollution, raising transport costs.	Transportation of Cocoa from the regions to Tema relies on lorries, increasing costs compared to potential rail transport.
Limited Rural Access	Isolates communities, limiting access to schools, clinics, and markets, contributing to brain-drain.	Remote and inaccessible villages struggle to retain teachers and healthcare workers.
Slow Internet and High Data Costs	Widens the digital divide, hindering online entrepreneurship and education.	Start-ups in some urban centres like Tamale face unreliable video conferencing, deterring investors due to slow internet.
Obsolete Communication Technology	Inefficient emergency and government services, reducing responsiveness.	Police in some districts rely on outdated analogue radio dispatch, delaying emergency responses.
Policy Inconsistency	Deters investors, delaying infrastructure projects.	Fluctuating telecom license fees in 2023 delayed tower rollouts by Airtel Tigo, affecting service quality.
Limited Funding	Causes project delays or cancellations, stalling development.	The proposed Tema-Accra light-rail project was shelved in 2024 due to budgetary constraints.

Success Stories of Transport and Communication in Ghana

1. **Zipline Medical Drone Service**

   Since 2021, Zipline has been using drones to send blood, vaccines, and other medical supplies to faraway clinics in the Western and Central Regions. What used to take hours now takes just minutes. By 2024, they had made over 1 million deliveries and saved many lives in places like Sefwi-Wiawso.

2. **GhanaPostGPS in Action**

   During the 2022 national census, GhanaPostGPS helped workers collect information from homes more accurately, especially in rural areas like the Northern Region. It made mapping households 40% better. This digital address system also helps online shopping by giving clear delivery addresses.

3. **Huni Valley–Takoradi Railway Upgrade**

   In 2025, with help from Switzerland, Ghana completed a 100-kilometre railway between Huni Valley and Takoradi in the Western Region. This railway makes it easier to move goods and passengers, reduces traffic on the roads, and supports the oil and gas business.

Activity 4.5 Exploring transport and communication in Ghana

1. **Connecting Ghana - How Transport and Communication Help Our Country**

   Use textbooks, videos, newspapers, interviews (with teachers, parents, or community members), and the internet (if available) to find out:

   a. How *roads, railways, air, and water transport* help trade, education, healthcare, and tourism in Ghana.
   b. How *ICT, mobile phones, radio, and the internet* help people communicate.
   c. The problems: bad roads, high costs, poor service in rural areas, lack of internet for everyone.
   d. Pick **one** of these project types and work on it based on what you are good at

Format	What to Do
📸 Poster or Infographic	Draw or design a big poster with pictures and short notes showing how transport and communication help Ghana, and the main problems.
🗣️ Role-play or Skit	Act out a short drama about how bad roads or poor internet affects people's daily lives.
🛠️ Model Building	Use clay, cardboard, or other materials to build a model of a transport system (like a bus station, port, or railway) or a communication tower.
📰 Mini-News Report	Record or act out a short "news report" talking about the issues and suggesting ways to solve them.
🗺️ Community Map	Draw a map of your area showing where the transport and communication systems are located.

   e. On **1–2 pages** (or a poster), summarise what you found out
      i. How transport and communication help Ghana.

ii. The problems in the system
iii. Your ideas for how to make it better.

f. Use your chosen project (poster, drama, news report, .) to share your findings with your classmates.

2. **Interview and Photo Story - Transport and Communication in My Community**

Create **5–7 simple questions** to ask people in your community.

a. The questions can be about:
   i. How they use transport (trotro, taxi, bicycle, .) and communication (mobile phones, radio, internet).
   ii. How transport and communication help them in their daily lives.
   iii. The challenges they face with roads, networks, or services.
   iv. Their suggestions for improvement.
b. Go around your community and politely interview at least **two people** (a trader, driver, teacher, nurse.)
c. Write down their answers and, if they agree, take photos of them, their workplace, or transport/communication tools they use.
d. On a sheet of paper, create a *photo story or poster* with:
   i. The photos you took (or drawings if you can't print photos).
   ii. Short captions or speech bubbles showing what the people said about transport and communication.
   iii. A section on what you learned and your own suggestions.
e. Present your photo story or poster to your classmates and explain what you discovered about how transport and communication work in your area.

3. **Diary of a Traveller - A Day in the Life**

Think of a character (real or imaginary) who lives in Ghana and travels or communicates a lot during the day.
For example: a market trader, a delivery driver, a nurse in a rural clinic, a student in a city, or someone making a living by fishing in a coastal town.

a. Write a **one-page diary entry** about this person's day, showing:
   i. How they use roads, buses, trains, boats, or planes.
   ii. How they use mobile phones, radio, internet, or letters to communicate.
   iii. The problems they face such as bad roads, poor network, high costs, or delays.
   iv. How better transport and communication would make their day easier.
b. Draw simple pictures or symbols to go with your diary.
c. You can show the transport systems, phones, or places visited.
d. Read your diary aloud or display it on the wall for others to read.

e. Discuss what everyone learned about how transport and communication affect everyday life in Ghana.
f. Present your findings in a portfolio

4. **The influence of transport and communication on socio-economic development in Ghana**

Prepare a comprehensive report on the role of transport and communication in Ghana's socio-economic development.

a. Your report should include an analysis of current transportation modes, challenges, and the popularity of road transport, along with recommendations for improvement.
b. Present your findings through a mix of written content, visual aids, and a group presentation.

Activity 4.6 Revision on Section 4 from Years 1 to 3: Comparative Analysis of Economic Activities

1. Research and compare subsistence and commercial agriculture, lumbering, and mining in Ghana. Create a table or graphic organiser highlighting the benefits and challenges of each economic activity.
   a. Write a short report (approx. 250-300 words) discussing the importance of these activities to Ghana's economy.
   b. Include specific examples and case studies to support your arguments.
   c. Suggest strategies to improve the benefits of each activity and resolve the challenges they present.
   d. Share your information with a friend in class
2. Write a report on a popular tourist site in Ghana you know (examples are Kakum National Park, Cape Coast Castle, Mole National Park, and Lake Volta.
   a. Describe to a friend some beautiful attraction sites located in your community
   b. Identify the socio-economic benefits of these sites to the local communities and Ghana's economy.
   c. Analyse the challenges faced by these tourist sites (e.g., poor road access, inadequate facilities).
   d. Propose solutions to address these challenges (e.g., improving infrastructure, marketing campaigns).
   e. Create a presentation or infographic that summarises your report or findings on the tourist sites.
3. Research tourism in Ghana using textbooks, videos, and statistical data.

   Prepare a detailed report explaining any ONE of the following;

   a. The social and cultural benefits of tourism in Ghana (e.g., preservation of heritage, cultural exchange).
   b. Challenges facing the tourism sector in Ghana (e.g., infrastructure deficits, environmental degradation).
   c. Strategies to overcome tourism challenges and promote sustainable tourism. Present their findings to the class.
4. Research potential tourist sites, identify and name any site in your region that the government can develop for tourism. Give your reasons why it might be a potential tourist site. Outline the pros and cons of developing the site. Justify why you think it is worth developing as a tourist attraction.
5. Discuss with a friend the economic and socio-cultural benefits of tourism to the government and the community.
6. Take a field trip to a nearby tourist site (e.g., Cape Coast Castle or a local eco-tourism destination).
   a. Observe the facilities and services available at the site.
   b. Interview staff or community members about the socio-economic benefits of the site.
   c. Identify challenges faced by the site and suggest solutions.
   d. After the trip, write a reflection report explaining the role of the site in Ghana's socio-economic development and the strategies needed to improve the tourism experience.
7. The government is planning to develop a new eco-tourism site in a rural area.
   a. Assume the role of any of the following: a policymaker, an environmentalist, a tourism operator, or a local community leader.
   b. Develop a tourism development plan that balances economic growth with sustainability and community involvement.
8. Discuss with a friend the potential socio-economic benefits (e.g., job creation, infrastructure improvement) and environmental impacts of the project.
   a. Take a field trip to a tourist site (e.g., Kakum National Park, Cape Coast Castle, or Mole National Park) or a key transport hub (e.g., Tema Port or Kotoka International Airport).
   b. Observe the physical setting (e.g., relief, natural vegetation, or proximity to rivers).
   c. Describe how the physical environment supports tourism or transportation (e.g., beautiful landscapes attract tourists and rivers facilitate trade).
   d. Discuss with a friend the challenges related to infrastructure or environmental degradation.
9. Write a report on how the site contributes to Ghana's socio-economic development through tourism or trade. Try to connect physical settings to tourism and transportation while analysing their economic significance.

a. Use a map of Ghana showing relief, drainage, and major economic activities.
b. With your friend in class, identify key tourist sites, trade routes, and transportation networks.
c. Analyse how physical features (e.g., mountains, rivers, and coastal areas) influence the location of these activities in Ghana and Africa.
d. Create an annotated map showing the connections between physical settings, tourism, trade, and transportation.
e. Present your maps and findings to the class.

10. Research on the internet for statistical data on tourism revenue, trade exports, and transportation infrastructure in Ghana.
    a. Discuss with your friend by comparing the contributions of tourism, trade, and transportation to Ghana's GDP.
    b. Analyse how physical settings enhance or limit the performance of these sectors (e.g., rivers for inland trade or scenic landscapes for tourism).
    c. Discuss challenges faced by each sector, such as poor road networks or environmental degradation.
    d. Create a chart or infographic summarising their findings.
11. Design a project to promote tourism, trade, or transportation in Ghana. The project should focus on how physical settings can be leveraged to enhance socio-economic benefits.
    a. Prepare a detailed plan outlining the role of physical settings (e.g., rivers, mountains) in the proposed activity.
    b. Provide Strategies to address challenges such as inadequate infrastructure or environmental degradation and expected socio-economic benefits, such as job creation or revenue generation.
    c. Present your project using multimedia tools.

EXTENDED READING

- "Integrated human and regional geography" by I. Y. Dadson (2021)
- "Current Issues in Tourism," 20(3), specifically "Divided we stand: Institutional collaboration in tourism planning and development in the Central Region of Ghana" by E. A. Adu-Ampong (https://www.google.com/search?q=2017)
- "African Journal of Hospitality, Tourism and Leisure," 9(2), specifically "Sustainable tourism development in Ghana: A stakeholder analysis" by G. K. Amoako & K. Dartey-Baah (2020)
- "Journal of Sustainable Tourism," 27(6), specifically "Cultural tourism and poverty alleviation in rural Ghana: A case study of the Nzulezo stilt village" by A. B. Asiedu & T. K. Gbedema (2019)
- "National Tourism Development Plan (2020–2024)" by the Ghana Ministry of Tourism, Arts and Culture (2020)

REVIEW QUESTIONS 4

1. Explain in four (4) ways how tourism contributes to job creation in Ghana. Provide examples of regions or sectors where this is evident.
2. In what four (4) ways does tourism support the trade sector in Ghana? Support your answer with relevant examples.
3. Evaluate the relationship between transportation infrastructure and the accessibility of tourist sites in Ghana.
4. In what four (4) ways does trade contribute to regional development in Ghana? Support your answers with relevant examples.
5. Discuss how poor transportation networks hinder trade in Ghana. Provide examples of regions affected by poor accessibility to markets.
6. Analyse how competition from imported goods affects local industries. How does this challenge impact Ghana's economy and trade sector?
7. Discuss in four (4) ways how trade contributes to the growth of manufacturing industries in Ghana.
8. Analyse the role of communication networks (e.g., mobile phones, internet) in enhancing business operations and education in Ghana. Provide relevant examples.
9. Explain how traffic congestion in urban areas like Accra and Kumasi impacts economic productivity. Propose solutions to address this challenge.
10. Propose any four (4) strategies to revitalise the railway sector and enhance its contribution to the economic development of Ghana.

SECTION

5

CLIMATE CHANGE

THE EARTH AND ITS NEIGHBOURHOOD: THE EARTH'S ATMOSPHERE

INTRODUCTION

Climate change is a global issue driven mainly by human activities. These include burning fossil fuels like petrol and diesel, clearing forests, and releasing greenhouse gases from factories, vehicles, and agriculture. These actions increase the concentration of carbon dioxide and other greenhouse gases in the atmosphere, trapping more heat and disrupting Earth's climate systems.

Although Ghana contributes relatively little to global emissions, it is already experiencing serious effects. Rising global temperatures are making Ghana's climate hotter and less predictable. Rainfall patterns are changing, leading to longer dry spells, sudden floods, and more frequent droughts. These shifts make farming more difficult, reduce access to clean water, damage infrastructure like roads and buildings, and increase the spread of diseases.

Environmental impacts are also severe. Forests are shrinking, coastlines are eroding, and habitats for plants and animals are being lost. Rivers may dry up or overflow, and fertile land can become barren. These changes threaten both biodiversity and the livelihoods of people who depend on natural resources.

Ghana is responding with a range of solutions. These include:

- Planting trees to restore forests and absorb carbon dioxide
- Expanding the use of renewable energy sources like solar power
- Promoting sustainable farming methods that protect soil and water
- Working to reduce pollution and improve waste management

Understanding climate change in Ghana means recognising how global human actions—especially those in high-emission countries—affect local environments and communities. In this topic, you will explore the causes of climate change, its impacts on people and nature in Ghana, and the steps being taken to reduce its effects.

This section builds on what you studied in Years 1 and 2 on weather patterns and human impact on the environment, natural resources, sustainability, and global interdependence.

KEY IDEAS

- Climate change refers to long-term changes in global and local temperatures and weather patterns.
- Climate change has both socio-economic and environmental effects.
- Climate change can be linked to both natural and man-made causes
- Remedies to its impacts focus on mitigation strategies like reducing carbon emissions.
- Some of the effects of climate change are rising sea levels, extreme weather events, declining agricultural productivity, and threats to biodiversity and human health.
- Adaptation measures include improving climate-resilient infrastructure and sustainable land use.

THE CONCEPT OF CLIMATE CHANGE

Climate change is an important environmental issue that affects the whole world, including Ghana. It has gained a lot of attention because it is already causing problems for both people and the environment. Climate change means a slow but long-lasting change in global and local weather patterns involving mainly an increase or decrease in temperatures and rainfall. These changes can happen naturally, the result of ash thrown into the atmosphere from volcanic eruptions, but in reality, they are mostly caused by human activities like cutting down trees and burning fossil fuels that release harmful gases into the air. These changes to the global climate are causing serious problems such as rising sea levels, strong and unusual weather like floods and droughts, which cause poor harvests from farms, the loss of animal and plant life, and more health problems for people.

Causes of Climate Change

Climate change in Ghana and other parts of the world is caused by both human actions and natural events. Below are some of the main human causes.

1. **Human Causes of Climate Change**
   a. **Greenhouse gas emissions**: When people burn fuel for cars, cooking, or electricity, it produces gases like carbon dioxide. These gases trap heat in the atmosphere, making the Earth hotter and causing climate change.
   b. **Deforestation**: Cutting down trees for farming, buildings, or firewood means fewer trees are left to clean the air by taking in carbon dioxide. This adds more harmful gases to the air, which leads to climate change.
   c. **Industrial activities**: Factories and mining activities burn fuels and use chemicals that release harmful gases into the air. These gases warm the Earth and make the air dirty.
   d. **Bush burning**: Burning grasslands and farms puts a lot of smoke and carbon dioxide into the air. It also kills plants that would normally help clean the air.
   e. **Urban pollution**: In towns and cities, smoke from cars, waste burning, and cooking with fuel adds dirty gases to the air. This increases heat and adds to climate change.

2. **Natural Causes of Climate Change**
   Apart from human activities, there are also natural events that can cause changes in the Earth's climate. These include:
   a. **Solar activity**: The amount of energy the Sun gives off does change slightly, but over a long period of Geological time. When the Sun gives off more energy, it can make the Earth warmer. When it gives off less energy, the Earth can become cooler. The changes are too slow to cause the rapid climate change the Earth is experiencing today, but it has affected Earth's climate in the past, causing ice ages or warm periods where sea levels were very high.

b. **Volcanic eruptions**: When a volcano erupts, it throws out ash, smoke, and gases into the air. These can block sunlight and make the Earth cooler for a short time. But if volcanoes release a lot of carbon dioxide over time, they can also add to global warming.

c. **Changes in Earth's movement**: Over thousands of years, the way the Earth moves around the Sun changes slightly. This includes changes in its path, how much it tilts, and how it spins. These slow changes can affect the Earth's climate over long periods.

Evidence of Climate Change in Ghana

In Ghana, there are clear signs that the climate is changing. Some of the evidence is mentioned below.

1. **Hotter temperatures**: The weather in Ghana has become hotter over the years, with longer and drier seasons. This heat affects people's health, makes animals uncomfortable, and reduces the amount of food farmers can produce.
2. **Unpredictable rainfall**: Rainfall is becoming less and less frequent, and it doesn't follow the usual pattern anymore. Sometimes it rains too much or too little, making it hard for farmers to know when to plant. This causes low crop harvests, especially in areas that depend on rain for farming.
3. **Rising sea levels and flooding**: Coastal towns like Keta, Ada, and Teshie are seeing the sea rise and flood the land. This destroys houses, farms, and roads. It also washes away the coastline, forcing people to leave their homes.
4. **More droughts**: In northern Ghana, dry periods (droughts) are lasting longer and becoming worse. Water bodies dry up, crops die, and there's not enough food or water for people and animals.

Activity 5.1 Tracking Climate Change in Ghana

Research and present evidence of climate change in Ghana, focusing on local impacts and potential solutions. Follow the guidelines below.

1. Information sources that confirm climate change is happening in Ghana: Gather information on climate change in Ghana from various sources (websites, newspapers, community members, videos). Pictures/photos and the opinions of local people are both important sources of information.
2. Data Collection: Collect and analyse data on changes in rainfall and temperature patterns, droughts, floods, and effects on farming, water, health, and jobs in your locality or a different region in Ghana.
3. Presentation: Choose a presentation method (poster, video, drama, map, interview, or Gallery walk) to showcase findings and display in class. As you present, try to answer these questions.
   a. What surprised you most?
   b. What real signs of climate change did you discover in Ghana?

c. What can you do to reduce the effects of climate change?

4. Observe and record local weather changes over one week, noting down any unusual events which might be signs of climate change (floods, drought, heat, bushfires). Interview two community members (farmer, fisherman, trader, elder) about their experiences with weather changes and impacts on their work or daily life.

Activity 5.2 Identifying Examples of Climate Change in Ghana

Research, analyse, and present the sources of evidence for climate change in an area of Ghana near to you, and outline their impact. Follow the work plan below.

1. Gather together credible sources of evidence which show climate change is happening in Ghana in or near your local area.
2. Evaluate the validity of your evidence using well-supported, factually based arguments.
3. Engage in a debate on the assigned topic with a friend, using evidence to support arguments.
4. You can also create a Climate Change Chart by illustrating climate change concepts using pictures, symbols, and keywords.
5. Share charts with classmates and also create community awareness in your school community using your posters.

Impacts of Climate Change

Climate change has social, economic and environmental effects. These are discussed below;

Socio-Economic Impacts of Climate Change

Climate change affects people's lives, jobs, and the country's development in many ways.

1. **Worsens inequality:** Poor people, women, and those in rural areas suffer the most because they don't have enough money or resources to deal with the effects of climate change. This makes the gap between the rich and the poor even wider.
2. **Slows down economic growth:** Disasters like floods and droughts damage farms, roads, and buildings. This costs a lot of money to fix and slows down the country's development.
3. **Affects important areas like farming, health, and transport:** Changes in rainfall and heat reduce food production from farms, cause more sickness, like malaria, and spoil roads and hospitals. This puts pressure on government services.
4. **Reduces productivity:** When it is too hot, or the weather is bad, workers—especially farmers and builders cannot work well. This leads to less work done and less money earned.

5. **Destroys lives and jobs:** Floods, dry spells, and sea erosion damage homes, farms, and small businesses. People may be forced to move and lose their sources of income, leading to hunger and hardship in many areas.

Environmental Impacts of Climate Change

Climate change affects the natural environment in many harmful ways.

1. **Drought:** When it rains less and the sun is too hot, the land becomes very dry. This leads to water shortages, dry soil, and fewer plants and trees growing.
2. **Storms:** Hotter temperatures cause stronger and more frequent storms with heavy rain and strong winds. These storms can wash away soil, flood land, and harm forests, rivers, and animals.
3. **Heat waves:** long periods of extreme heat are happening more often. These heat waves make it hard for plants, animals, and even people to survive. They also dry up rivers and can cause bushfires.
4. **Rising sea levels:** Ice from cold regions is melting, and warmer oceans are expanding. This causes the sea to rise, leading to the washing away of beaches, saltwater entering freshwater, and flooding in low-lying areas.
5. **Melting glaciers:** Glaciers (huge bodies of ice) are melting quickly due to rising temperatures. This reduces the supply of freshwater and adds more water to the sea, making sea levels rise.
6. **Warming oceans:** The oceans are getting hotter as they absorb heat from the Earth. This harms sea life like fish and coral, and changes how ocean currents and weather behave.

Adaptation Strategies

To deal with the effects of climate change, people in Ghana and other places are using smart ways to adapt. Here are some examples:

1. **Planting drought-resistant crops:** These are crops that can survive with little water. Farmers use them so they can still get good harvests even when there is little rain. This helps prevent hunger.
2. **Growing early maturing crops:** These crops grow and are ready for harvest in a short time. They are useful when the rainy season is shorter or unpredictable.
3. **Practising regenerative farming:** Farmers use methods like composting, mulching (covering the soil), and changing the types of crops they plant. These improve the soil and help farms stay strong during hard weather.
4. **Storing water:** People build small dams, collect rainwater, and dig reservoirs to save water for use during dry times. This helps in farming and daily life.
5. **Preventing wildfires:** Clearing dry grass, using controlled burning, and following fire safety rules help reduce the chances of bushfires that destroy farms and forests.
6. **Protecting against floods and heat:** Building strong drainage systems, flood walls, and heat-resistant buildings helps protect people, homes, and farms from too much rain or extreme heat.

Activity 5.3 Exploring Climate Change Impacts in Ghana

Work with friends to research and present the impacts of climate change on communities in Ghana, highlighting adaptation strategies and solutions.

1. Act out a story depicting the social, economic, and environmental effects of climate change on a Ghanaian community and their collaborative efforts to find solutions.
2. Draw and label impacts to illustrate the effects of climate change on food crops, jobs, and the environment in Ghana, including potential solutions.
3. Create a front-page article with pictures and captions, highlighting climate change impacts and solutions in Ghanaian communities.

REMEDIES TO IMPACTS OF CLIMATE CHANGE

In your earlier lessons, you learned that climate change is a big problem for people, animals, plants, and the economy all over the world. It is mainly caused by human activities like burning fuels and using the land in harmful ways. To reduce the damage caused by climate change, people are taking two main actions.

Mitigation, finding ways to reduce the harmful gases we put into the air.

Adaptation: making changes to help people and the environment cope with the effects of climate change.

Climate Change Solutions

Here are some ways people and governments can help reduce the effects of climate change.

1. **Using Clean Energy:** Switching to energy from the sun (solar), wind, and water (hydro) instead of using petrol, diesel, or coal helps reduce the harmful gases that cause climate change.
2. **Better Farming Methods:** Using modern tools, good-quality seeds, and smart ways of watering crops (like drip irrigation) helps farmers grow more food and deal with weather changes.
3. **Building Strong Infrastructure:** Governments can help by building better roads, water systems, and food storage facilities. These make it easier for farmers and rural areas to deal with droughts, floods, and other climate problems.
4. **Using Green Technologies:** Factories and businesses can use cleaner machines and reduce smoke and waste. Using more public transport and electric cars can also help reduce air pollution.
5. **Supporting Science and Research:** Scientists can find new ways to fight climate change, like developing crops that grow faster or do not get sick easily, and better ways to control pests and plant diseases.

6. **Teaching People About Climate Change:** Making posters, videos, and radio talks helps people learn how climate change affects them and what they can do to help protect the environment.

Activity 5.4 Climate Change Remedies

1. Embark on a Field Visit to a Climate-Affected Community,
   a. Explore by observing and suggesting solutions for climate challenges.
   b. Observe the challenges faced by the community.
   c. Interview residents about their coping strategies.
   d. Document possible solutions, such as promoting alternative livelihoods or infrastructure development.
   e. Present your findings and recommendations to a friend.
2. Design a poster titled "Climate Change Remedies" with at least 3 remedies for climate change.
   a. Include the following
      i. A catchy title.
      ii. Visuals.
      iii. Message of action and hope.
   b. Present your findings to the class
3.
   a. Evaluate real-world climate change remedies through case studies in Ghana on adaptation strategies, such as
      i. The Keta Sea Defence project.
      ii. Agroforestry projects in Northern Ghana.
      iii. Solar energy initiatives in rural areas.
   b. Analyse the effectiveness of the projects by addressing
      i. The challenges the project aims to solve.
      ii. How the project was implemented.
      iii. The outcomes and lessons learned.
   c. Facilitate a discussion with your friends on how these projects can be improved.
4. Take a Field Visit to a Ghanaian Community which has been affected by Climate Change.
   a. Explore by observing and suggesting solutions for climate challenges. e.g., a coastal area threatened by flooding or a drought-prone farming village.
   b. Observe the challenges faced by the community.

c. Interview residents about their coping strategies.
d. Document possible solutions, such as promoting alternative livelihoods or infrastructure development.
e. Present your findings to the class

Activity 5.5 Revision Activity

1. Utilise visual representations of Ghana, such as hand-drawn, digital, or printed maps, to illustrate the following aspects:
   a. Climate and vegetation zones
   b. Relief and drainage characteristics
   c. Areas susceptible to flooding, including Keta, Accra, and Kumasi
2. Discuss with a friend how interactions between relief, climate, and vegetation impact socio-economic activities like farming, forestry, settlements, and health.
3. Based on any case study (e.g., rising temperatures in Northern Ghana, flooding in Keta), identify causes, evidence, and impacts of climate change.
4. Propose adaptation and mitigation strategies for climate change and flood risks.
5. Present your findings in class using visual aids (maps, charts, PowerPoint). Show the connections, impacts, and proposed solutions in a debate with your classmates.

EXTENDED READING

- "Climate change adaptation in Ghana: The role of indigenous knowledge in agriculture" from the African Journal of Environmental Science and Technology, 13(5) by P. O. Adjei & J. Amoako-Tuffour (2019)
- "Assessing coherence between sector policies and climate compatible development: Opportunities for triple wins in Ghana" from Sustainability, 9(11) by P. Antwi-Agyei, A. J. Dougill, & L. C. Stringer.
- "Understanding Climatology" (3rd Ed) by I. Y. Dadson (2019)
- "Urban resilience to climate change in Ghana: Challenges and opportunities for adaptation" from Cities, 108 by D. B. Dovie & S. Lwasa (2021)

REVIEW QUESTIONS

1. Discuss any four (4) causes of climate change in Ghana.
2. Evaluate the reliability and significance of observable evidence that climate change is occurring in Ghana. Use four examples and explain how each reflects broader climate trends.
   a. Compare the evidence of climate change in the northern and southern regions of Ghana.
   b. How do the impacts differ based on geography and socio-economic activities?
3. How has climate change impacted socio-economic activities such as agriculture, fishing, and settlement patterns in Ghana? Propose strategies to mitigate these impacts.
4. Propose any five (5) strategies to help Ghanaian farmers adapt to the impacts of climate change.
5. Compare the adaptation strategies used in Northern Ghana (e.g., addressing desertification) with those used in coastal areas (e.g., managing sea-level rise and flooding). Which region faces more severe challenges, and why?
6. Evaluate how education and public awareness campaigns can enhance Ghana's ability to adapt to climate change.
7. What role does community involvement play in the success of these initiatives?
   a. Evaluate the role of international partnerships and agreements in addressing climate change impacts in Ghana.
   b. How can Ghana take advantage of global frameworks to enhance its climate resilience?

Note: Questions 2 to 8 are extension questions.

SECTION

6

REPRESENTATION OF GEOSPATIAL DATA THROUGH DOT MAPS AND FLOW CHARTS

GEOSPATIAL DATA COLLECTION, REPRESENTATION AND INTERPRETATION

INTRODUCTION

This section teaches you how to understand and explain geospatial data by using dot maps and flow charts. Dot maps show where things are located, while flow charts show how people, goods, or services move from one place to another. These tools help you to see patterns and how things are spread out across different areas. You will also learn how to read these maps and charts carefully to get useful information. This will help you answer geography questions and make good decisions based on what you see. By studying these maps and charts, you will develop important skills for understanding and explaining information. These skills are useful not only in geography but also in everyday life, especially when working with data or planning something. In summary, this section helps you become better at reading, understanding, and using maps and charts to learn about the world around you. This section can be linked to Year One Section 4 and 9 and Year Two Section 2 and 7 learning materials.

KEY IDEAS

- A **flow line map** uses lines to show movement between different places.
- Dot maps are a type of thematic map that uses dots to indicate the presence, quantity, or distribution of a particular phenomenon across a geographical area.
- One advantage of dot and flow line maps to represent geospatial data is that patterns are easily recognisable at a glance.
- One disadvantage of a dot map is that when many dots cluster in a small area, it can obscure patterns or exaggerate density, especially at smaller scales.
- One disadvantage of a flow line map is that data with a large range is difficult to show, as some lines will be so wide they hide others.
- Interpreting flow line maps involves analysing the direction, thickness, and spatial distribution of lines to understand movement patterns and their implications.
- The size of the dot or thickness of the flow line represents a category or quantity

ANALYSING GEOSPATIAL DATA USING DOT MAPS

In Years 1 and 2, you learned about geospatial data. This is information that shows where things are found on Earth. It includes details like the location of towns, how people are spread out in an area, or where diseases are affecting people. This kind of information helps you understand what is happening in different places.

Geospatial data can be shown in many ways, and one common method is through **dot maps**. Dot maps are special maps that use dots to show the presence or number of something in a place. Each dot stands for a certain number of things, like people, farms, or factories. For example, one dot might show 100 people or 5 farms. By looking at where the dots are and how many there are, you can understand how something is spread out in an area. This helps you to study and make decisions about the world around you.

Why Use Dot Maps?

1. Dot maps help us see how something is spread out in a particular area.
2. They make it easy to spot where there are many or few of something.
3. Dot maps are simple to read and understand.
4. They can show a lot of information in a clear and easy way.
5. By looking at the dot patterns, we can compare different places.
6. Each dot can stand for any amount we choose, like 1 school or 100 people.
7. Dot maps help us see patterns, such as where things are grouped or missing.
8. They show where something is found and where it is not.
9. Dot maps are great for topics like population, farming, or disease spread.
10. If made well, dot maps give a clear and true picture of how things are spread out across a place.

Representing Geospatial Data Using Dot Maps

To make a good dot map, there are a few important steps to follow.

1. **Understand the Data You Are Using**

   Before drawing the map, you need to know what kind of information (data) you are working with.

   a. What are you showing on the map? For example, is it people, animals, crime cases, or diseases?

   b. What is the total number of things you are mapping? For example, how many cattle are there?

   c. Is the data grouped by places like districts or regions?

2. **Choose the Right Dot Value**

   This means deciding what each dot will stand for.

   a. If the total number is large, let one dot represent more so the map doesn't look too crowded.

   b. If the total is small, each dot can stand for less, so the map doesn't look too empty.

   c. Try different dot values until the map looks clear and easy to understand.

Example

a. A population of 1,000,000 people

i. Dot value of 1,000 people per dot = 1,000 dots.

ii. Dot value of 10,000 people per dot = 100 dots.

3. **Determining Dot Placement**

a. **Random placement**: For general distribution (e.g., population), dots are randomly placed within administrative units using GIS software.

b. **Precise placement**: When exact coordinates are available (e.g., crime incidents), dots are located precisely, offering a more accurate representation.

c. **Proportional distribution**: With supplementary data (e.g., land use), dots may be more densely placed in specific zones where the phenomenon is known to be concentrated.

4. **Adding Essential Map Elements**

All maps should include the following components

a. **Title**: Clearly states what the map represents (e.g., *Population Distribution in Ghana, 2024*).

b. **Legend**: Indicates the dot value (e.g., *One dot represents 5,000 people*).

c. **Scale**: Provides context for distance.

d. **North Arrow**: Indicates direction.

e. **Source**: States where the data came from.

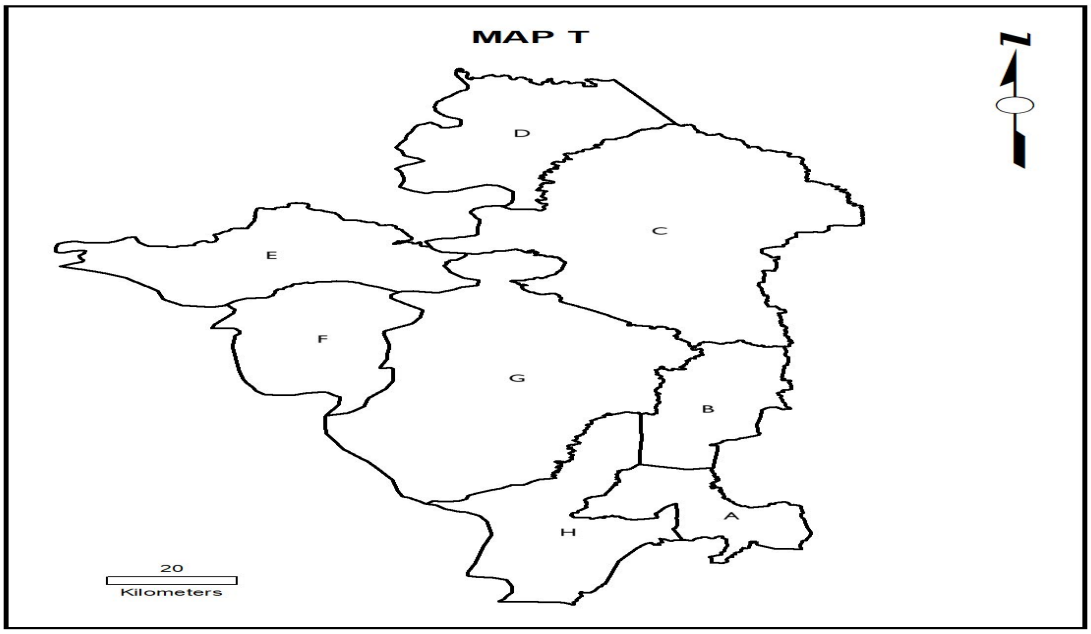
f. **Border/Neat line**: Frames the map area.

Worked Example using ***Table 6.1*** and ***Map T***

Table 6.1: Annual sheep production of Region P for the year 2020.

Town	Annual Sheep Production x1000
A	50
B	40
C	60
D	35
E	55
F	45
G	30
H	65

a. Using the base map provided (**Map T)** and a dot value of **1 dot to represent 5 sheep,** plot a dot map to represent the data in Table 6.1.



b. Based on the dot map, analyse the distribution of sheep production in Map T. Research and discuss how factors like climate, access to water, or transportation infrastructure might have influenced this distribution in 2020, and propose a plan to support towns with lower production.

Solution

a. **Allotting dot maps**

Determining dot value

If 1 dot = 5 sheep

Therefore, , Town A = $\frac{50}{5} \times 1\ dot$ = 10 dots

Town B = $\frac{40}{5} \times 1\ dot$ = 8 dots

Town C = $\frac{60}{5} \times 1\ dot$ = 12 dots

Town D = $\frac{35}{5} \times 1\ dot$ = 7 dots

Town E = $\frac{55}{5} \times 1\ dot$ = 11 dots

Town F = $\frac{45}{5} \times 1\ dot$ = 9 dots

Town G = $\frac{30}{5} \times 1\ dot$ = 6 dots

Town H = $\frac{65}{5} \times 1\ dot$ = 13 dots

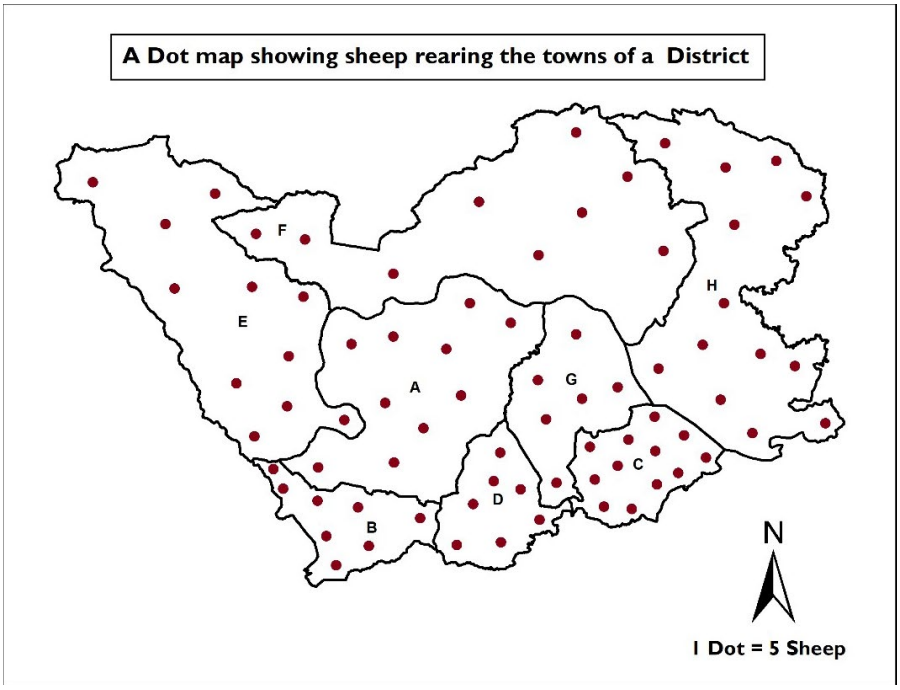


Figure 6.1: Dot map for annual sheep production (Map T)

b. **Sample Solution: Analysing the distribution and discussing the factors**

Analysis of Distribution

The dot map of Map T displays a concentration of sheep production in the northern and southern parts of the region, with fewer dots indicating lower production in one central area. This suggests that the northern and southern areas are more favourable for cattle production. It further indicates that the Northern and southern areas may have better access to resources like grazing land and water. The towns may be urban with easy accessibility and demand for sheep. It can be concluded that the area covered by Map T has favourable conditions for the production of sheep.

Factors Influencing Distribution

1. **Climate:** The northern and southern areas might have a climate that is more suitable for sheep rearing, such as less humidity and more open grazing lands, which are ideal for sheep health and productivity.
2. **Access to Water:** Proximity to water bodies or irrigation systems in the northern and southern parts can support sheep rearing by providing necessary water for both sheep and pasture maintenance.
3. **Transportation Infrastructure:** The presence of better roads and transport facilities in the northern and southern areas can facilitate easier movement of sheep to markets and access to veterinary services, enhancing production levels.
4. **Additional Factors:** Regions with better access to veterinary services and market facilities can further support higher production levels.

Plan to Support Towns with Lower Production

1. **Identify Specific Towns:** The central town with fewer dots on the map indicates lower sheep production and require targeted interventions.
2. **Improving Infrastructure:** Develop better road networks and transportation services to connect these towns to major markets and service centres, encouraging more efficient sheep trade.
3. **Water Access and Irrigation:** Implement small-scale irrigation systems, such as dams or ponds, to ensure a consistent water supply for sheep and pasture, which can be critical in drier areas.
4. **Training and Support:** Provide education and training programs for local farmers about modern sheep rearing practices and sustainable farming techniques. This can include workshops and extension services to help farmers adopt more efficient practices.
5. **Sustainability and Innovation:** Encourage sustainable practices by introducing technologies for better pasture management and environmental conservation efforts.

Activity 6.1 Digital Integration: Steps to Create a Dot Map in ArcMap a GIS software (if Available to the school)

1. **Start ArcMap and Load Your Data**
   a. Open ArcMap.
   b. Load your polygon shapefile (e.g., districts, regions) that contains the attribute data you want to map (e.g., population, number of farms).
2. **Open the Layer Properties**
   a. In the Table of Contents, right-click on the shapefile layer.
   b. Select Properties.
3. **Go to the Symbology Tab:** In the Layer Properties window, click on the Symbology tab.
4. **Choose 'Dot Density':** Under the "Show" options on the left panel, select Quantities > Dot Density.
5. **Select the Field(s) to Map**
   a. In the middle panel, under "Field Selection", choose the field(s) containing the data you want to visualise (e.g., Population, Cattle, Farms).
   b. Click the > arrow to add them to the "Mapped Fields" list.
6. **Set Dot Value and Dot Size**
   a. Choose an appropriate dot value (e.g., 1 dot = 500 people) depending on the total quantity.
   b. Adjust the dot size (in points) to ensure visibility without overcrowding.
7. **Choose Dot and Background Colours**
   a. Select a suitable dot colour that stands out against the background.

b. Optionally, choose a background colour for your polygons (often a light or neutral colour works best).

8. **Preview and Adjust**
   a. Click Apply and then OK to preview the map.
   b. If the dots are too crowded or too sparse, go back to adjust the dot value or size.
9. **Add Map Elements**
   a. Add essential map components such as:
      i. Title
      ii. Legend (shows dot value)
      iii. North arrow
      iv. Scale bar
      v. Data source
      vi. Neat line
10. **Save or Export Your Map**
   a. Save your ArcMap project.
   b. To share the map, go to File > Export Map and choose a format (e.g., PDF, PNG, JPEG).

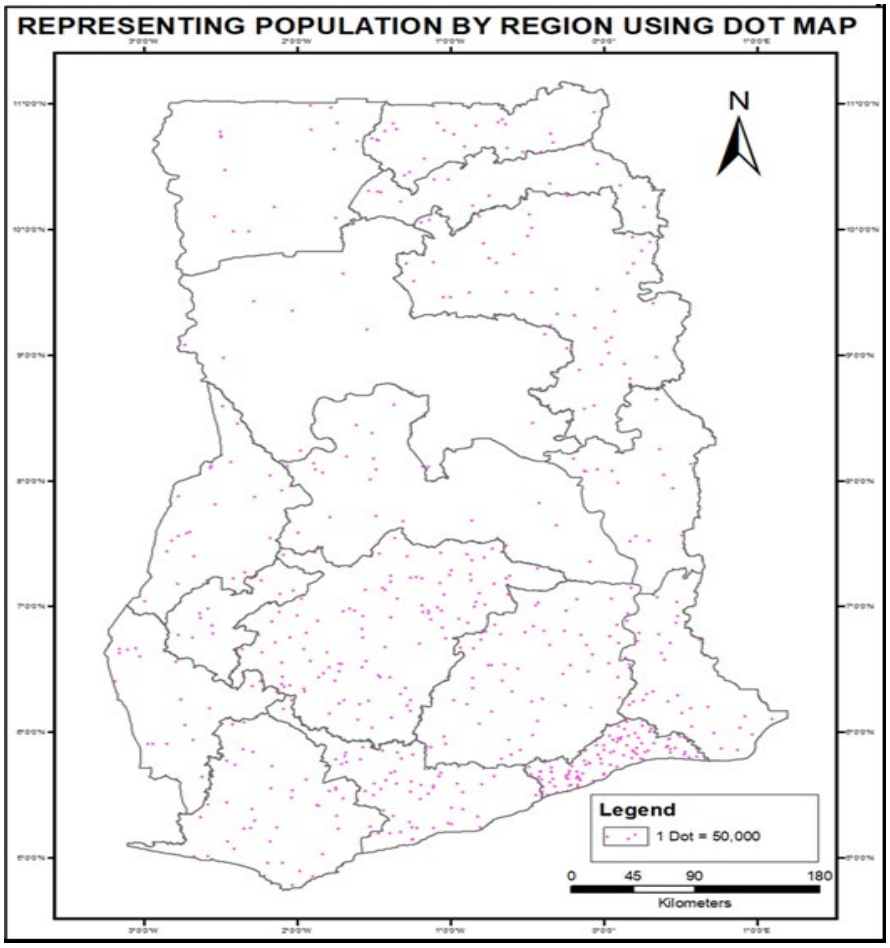


Figure 6.2: *A Dot map showing population distribution (one dot represents a settlement of equal or greater than 50,000 people)*

Analysing Geospatial Data Using Dot Maps

Once the dot map is created, you can analyse the spatial patterns. Key features to look for

1. **Concentration**: Areas where dots are clustered, indicating high density.
2. **Dispersion**: Dots spread widely indicating low density.
3. **Clusters**: Groups of dots forming distinct patterns.
4. **Gaps or absence**: Areas without dots, indicating the phenomenon is not present.
5. **Linear patterns**: Dots follow lines such as roads or rivers.
6. **Peripheral patterns**: Dots are concentrated around the edges of a region.
7. **Temporal change**: Comparing dot maps from different periods can reveal changes in distribution.

Guiding Questions for Analysis

1. Where is the highest concentration?
2. Where is the lowest concentration or absence?
3. Are there recognisable patterns (linear, clustered)?
4. Do the patterns relate to physical or human features on the base map?
5. Are there anomalies or unexpected patterns?

Interpreting Geospatial Data Using Dot Maps

When you interpret a dot map, you are not just describing what you see. You should try to explain **why** things are the way they are. This means using what you see on the map and thinking about what you know about geography.

Here are some questions to help with interpretation.

1. Why do some places have more dots?
   – Is it because of big towns, good land for farming, or natural resources?
2. Why do some places have few or no dots?
   – Could it be because the land is dry, mountainous, or far from other places?
3. What are the reasons behind the pattern?
   – Think about natural features (like rivers), human activities (like jobs), or social reasons (like population).
4. What does this pattern mean for people?
   – Could it affect roads, schools, hospitals, or the environment?
5. What might happen if the pattern changes in the future?

Example: Interpreting a Population Dot Map

If the map shows high population concentration along the coast and near major cities, but sparse dots in desert or mountainous areas

1. **Analysis**: High density in coastal and urban areas; low density in rugged or arid regions.

2. **Interpretation**
   a. Coastal zones may be attractive due to trade, fishing, favourable climate.
   b. Cities attract people due to jobs, education, and services.
   c. Deserts/mountains may be less hospitable due to limited water, poor soils, and difficult terrain.
3. **Implications**: High-density areas may face pressure on housing and services, while low-density areas might remain underdeveloped.

Analysing and Interpreting a Dot Map

A simplified dot map shows the **distribution of gold mines** in a hypothetical country. Clusters of dots appear in one region; other regions have few or none.

1. **Analyse**: Describe the pattern. Where are the clusters? Where are the gaps?
2. **Interpret**
   a. What physical factors (e.g., geology, mineral deposits) explain the clusters?
   b. What economic benefits could result from such concentration?
   c. What environmental issues (e.g., land degradation, pollution) could arise in mining areas?

Limitations of Dot Maps

Dot maps are helpful, but they also have some challenges.

1. **Hard to count dots in crowded areas:** When there are too many dots close together, it can be difficult to count them and know the exact number.
2. **Dot size issues:** If the dots are too big, they can cover important parts of the map. If they are too small, they may be hard to see.
3. **Choosing dot values can be tricky:** The person making the map decides how much each dot stands for. This can change how the map looks and how people understand it.
4. **Problem with how areas are divided (MAUP):** Sometimes, the map shows data by large areas like regions or districts. If the dots are placed randomly inside these areas, it might give a false idea of where things actually are in real life.

Activity 6.2 Analysing Geospatial Data Using Dot Maps

1. With your knowledge of the regional geography of Ghana, identify each of the regions in the map below.
2. Using the population data below, with the scale of population density (1 dot = 5,000 people), illustrate or plot your Data using Dot maps on the Map of Ghana Above

REGIONS	POPULATION DENSITY
Western Region	80,000 people per sqkm
Northern Region	50,000 people per sqkm
Eastern Region	95,000 people per sqkm
Central Region	75,000 people per sqkm
Upper East Region	45,000 people per sqkm
Ashanti Region	210,000 people per sqkm

Dot map of Ghana showing population density (1 dot = 5000 people)

3. Examine the dot map and write a summary of the population density of Ghana by region.
4. Analyse patterns and explain to a friend how certain areas are more densely populated.
5. Compare coastal and inland population distributions
6. What factors might explain the population clustering patterns you observe.
7. How might this data inform government resource allocation decisions?
8. Research and write a 500-words essay on "Urban Sprawl in Ashanti region on Patterns, Causes, and Future Planning Implications"

ANALYSING GEOSPATIAL DATA USING FLOW CHART (FLOW LINE MAPS)

To show how people or goods move from one place to another, we use **flow line maps**, which are a special type of chart. A **flow line map** uses lines to show movement between different places. The **thickness of the line** tells us how much is moving:

1. A **thick line** means a large number of people or goods are moving between two places.
2. A **thin line** means a smaller number is moving.

These maps help us easily see patterns, such as where most people travel or where goods are being traded. They are useful for understanding how places are connected through movement.

Representing Geospatial Data with Flow Line Maps

To create a flow line map, you need data about movement, including

1. The starting point (where the flow begins),
2. The ending point (where the flow goes),
3. The quantity of the flow (e.g., number of people, tons of goods).

Steps to Create a Flow Line Map

1. **Choose a Base Map:** Pick a map that shows all the locations in your data.
2. **Plot the Flows:** Draw lines between the starting and ending points. Add arrows to show the direction of movement.
3. **Scale the Lines:** Make the line thickness match the quantity of the flow. Choose a scale (e.g., 1 mm of thickness = 1,000 units) and use it for all lines.

Example

Imagine you have data about students traveling between two schools

1. School A to School B: 3,000 students
2. School B to School A: 1,000 students

On your map;

1. Draw a line from A to B, 3 mm thick (if 1 mm = 1,000 students).
2. Draw a line from B to A, 1 mm thick.
   The thicker line shows more students move from A to B.

Analysing Flow Line Maps

After creating a flow line map, analyse it to understand the patterns. Look for

1. **Major Flows:** Find the thickest lines—these show the largest movements.
2. **Directions:** Check the arrows. Is the flow mostly one-way or balanced?
3. **Connectivity:** See which places are linked by many or thick lines.

Example
In a flow line map of trade between cities, a thick line from City X to City Y (and a thinner one back) might show that X exports more to Y than Y sends back. Many lines to City X could mean it is a trade centre.

Interpreting Flow Line Maps

Interpreting means making sense of the patterns you've analysed. Ask

a. **Why do these flows exist?** Look for reasons like jobs, trade deals, or closeness between places.

b. **What do they mean?** Large flows might affect population, economy, or culture.

c. **Are there surprises?** Unexpected flows could show new trends.

Example
If a flow line map shows a thick line of tourists from Country A to Country B, you might interpret that B has popular attractions or better weather, drawing visitors from A.

Example: Migration Flow Line Map

Here's an example using migration between three countries: Country A, Country B, and Country C.

Migration Data

- A to B: 50,000 people
- B to A: 20,000 people
- A to C: 30,000 people
- C to A: 10,000 people
- B to C: 15,000 people
- C to B: 25,000 people

Representation

- Draw a map with Countries A, B, and C.
- Add arrows between them showing migration direction.
- Scale the lines: Let 1 mm = 10,000 people.
    - A to B: 5 mm (50,000 people)
    - B to A: 2 mm (20,000 people)
    - A to C: 3 mm (30,000 people)
    - And so on.

Analysis

- The thickest line (A to B, 5 mm) shows the biggest flow: 50,000 people.
- More people move from C to B (25,000) than B to C (15,000).

Interpretation

- Country B might offer better opportunities (jobs, safety), attracting people from A and C.
- Fewer people leave B, suggesting it is a desirable place to stay.

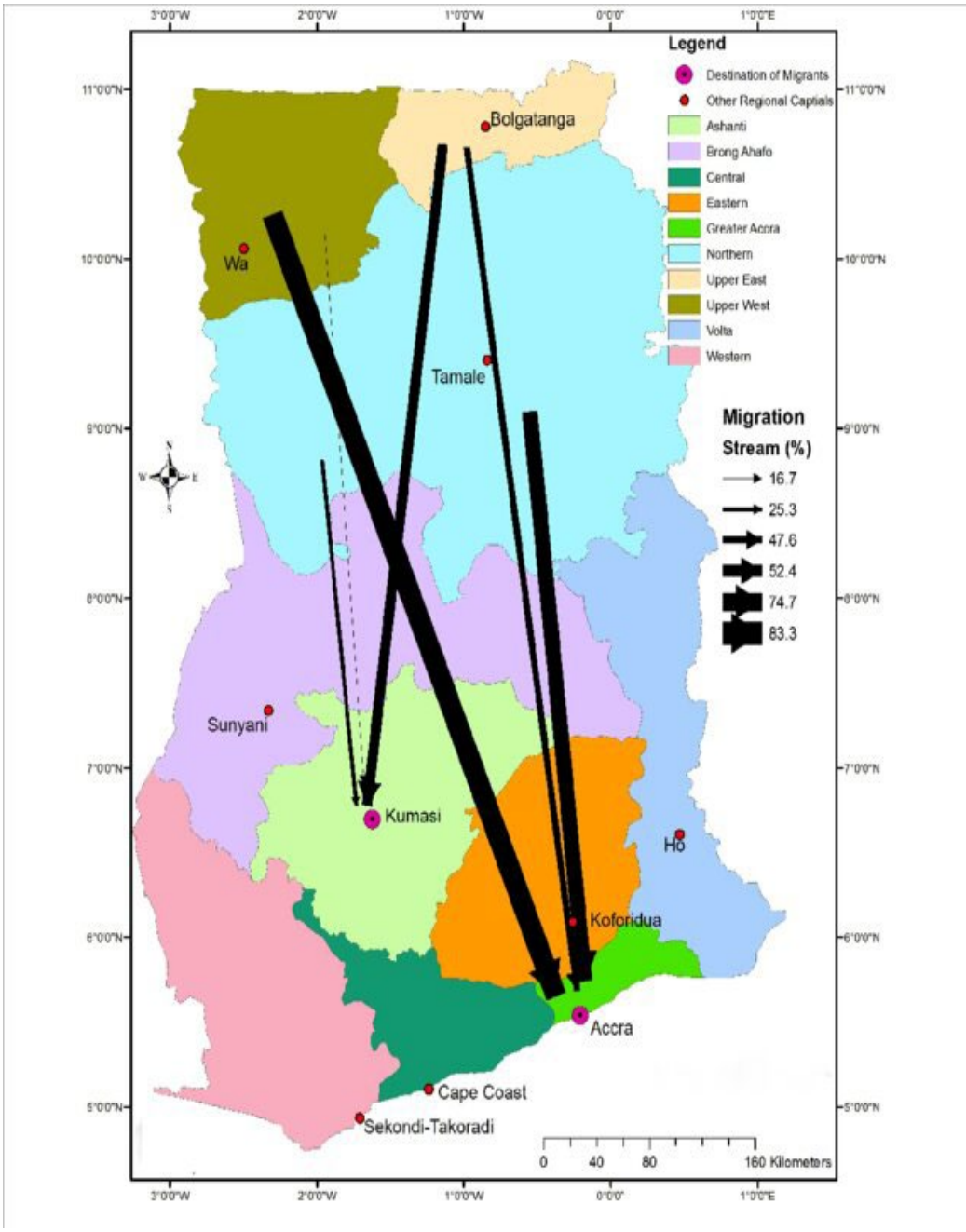


Figure 6.3: *An example of a flow chart map. The thicker the line the larger the movement of people and vice versa.*

Worked Example

Table 6.2 below presents data on the quantity of farm produce transported from selected farming communities to the Accra Makola Market in the Greater Accra Region during October 2022.

a. Use it to calculate and construct a flow line chart for the transported farm produce to the Accra Makola Market using the outline map provided. (1mm to represent 1000 farm produce)

Table 6.2: Quantity of farm produce transported from selected farming communities.

Farming Community/Town	Quantity of Farm Produce (in metric tonnes)
Adansi Akrofuom	1000
Adansi South	2000
Ahafo-Ano South	2000
Amansie South	1000
Atwima Mponua	3000
Asante-Akim South	4000
Ejura-Sekyedumasi	5000
Offinso North	2500
Sekyere Afram Plains North	5000

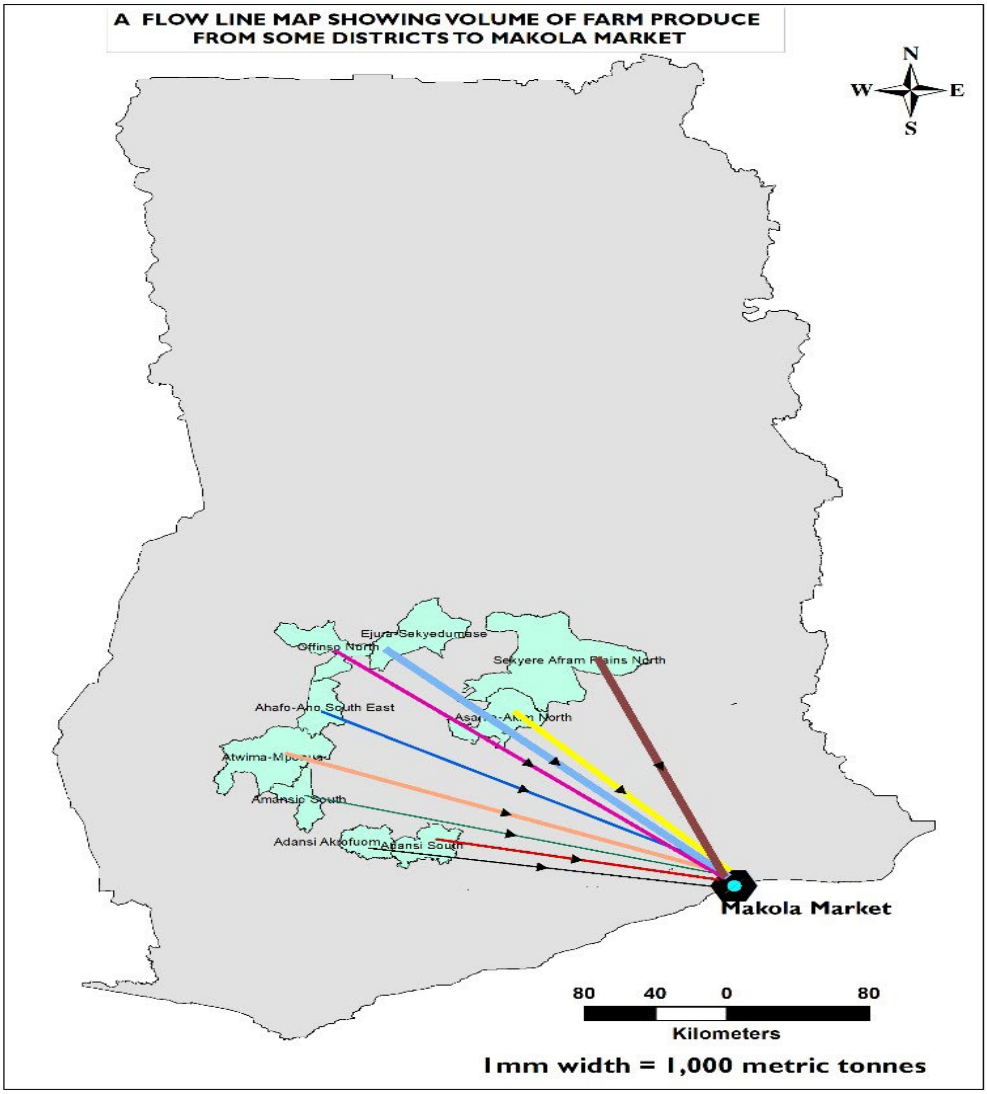


Figure 6.4: *Map showing volume of farm produce from some selected Districts to Makola*

Solution

Since 1mm = 1000 farm produce (in metric tonnes)

a. Adansi Akrofuom =

b. Adansi South =

c. Ahafo-Ano South =

d. Amansie South =

e. Atwima Mponua =

f. Asante-Akim South =

g. Ejura-Sekyedumasi =

h. Offinso North =

i. Sekyere Afram Plains North =

Activity 6.3 Analysing Geospatial Data Using Flow Chart (Flow Line Maps)

Agricultural Production Mapping

1. The table below presents the movement of tonnes of cocoa production across Ghana's cocoa-growing regions to Takoradi Harbour in the year 2023.

   a. Use it to calculate and construct a flow line chart for the transported farm produce to the Kumasi Central Market. Refer to an atlas and draw a map of Ghana to represent these cocoa farming communities. [Use 1mm to represent 1000 farm produce]

Farming Community/Town	Quantity of Cocoa (in metric tons)
1. Bechem	1000
2. Bibiani	2000
3. Dunkwa-on-Offin	2000
4. Enchi	1000
5. Juaboso	3000
6. Mim	4000
7. Nsuaem	5000
8. Sefwi Wiawso	2500
9. Tarkwa	5000

1mm = 1000 farm produce (in metric tonnes)

Create Flow Line Maps

   b. Use flow lines (arrows) of varying thickness to represent the volume or intensity of movement of Cocoa from the growing areas to Takoradi Harbour

c. Include the direction of flow, legend, title, and labels.
d. Use large paper, markers, and optional digital tools (e.g. Google Drawings).
e. Discuss the questions with a friend
   i. Where the movement is most intense?
   ii. What are the Socio-economic impacts of the movement of cocoa production?
f. Create an accurate flow map using the provided data.
g. Analyse spatial patterns of production
h. Show your completed Flow Map to your teacher for comments

Extension Activity

Refer to an atlas to undertake this activity

Theme	Example Flow
Regional Migration	From Savanna to Greater Accra (A)
Trade	Tomatoes from Burkina Faso to Accra (B)
Transport	Morning traffic into Accra from Madina (C)

1. The Table above represents the movement of Socio-Economic activities in Ghana. Using large paper, markers, and optional digital tools (e.g. Google Drawings). Use flow lines (arrows) of varying thickness to represent the volume or intensity of movement.
   a. Include the direction of flow, legend, title, and labels.
   b. Where is the movement most intense?
   c. What are the push and pull factors?
   d. What impacts does this movement have (social, economic, environmental)

Activity 6.4 Revision on Section 6 from Years One to Three

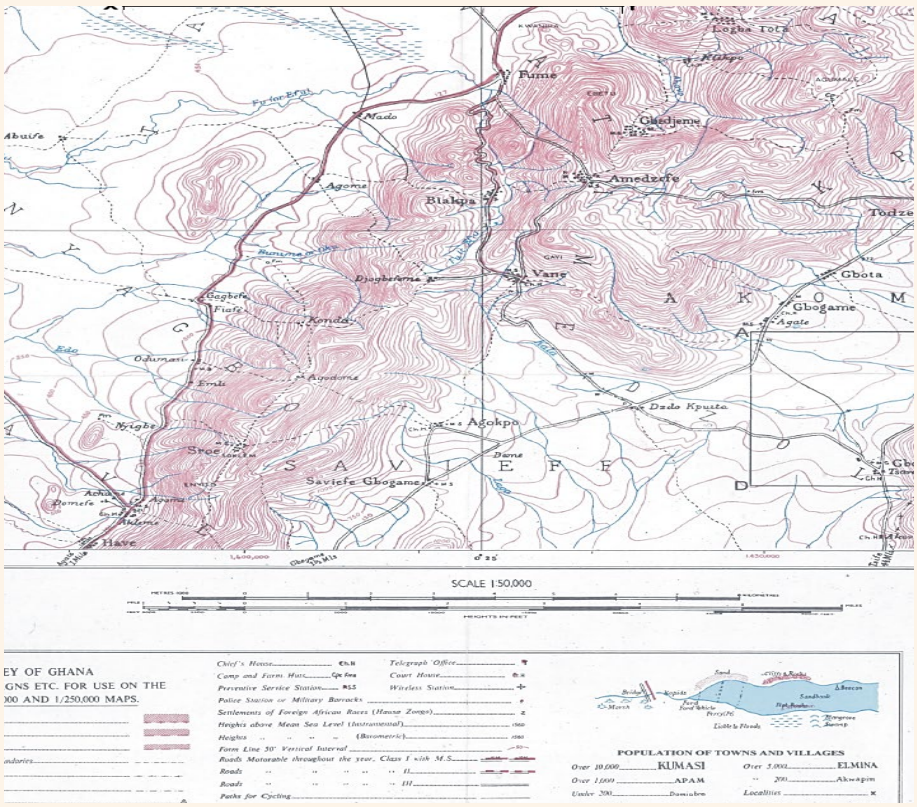
1. **Mapwork and Geospatial Theory**
   a. Visit your school library for any topographic maps showing different scales.
      i. Identify the scale type (e.g., representative fraction or linear scale).
      ii. Convert between different map scales (e.g., 1:50,000 to 1 cm = 0.5 km).
      iii. Explain how contour patterns represent different landforms (e.g., steep slopes, valleys, ridges).
   b. Explain how the following geospatial data collection methods can be used

i. Traditional tools (e.g., chain and compass).
ii. Modern technologies (e.g., GPS, drones, remote sensing).

c. Discuss how technologies like drones, GIS, and satellite imagery are used for mapping and data collection.
d. How can these technologies help improve environmental management in your community (e.g., flood monitoring, urban planning)?
e. Use posters to present on the importance of maps and geospatial data in solving real-world problems.
f. How can these emerging technologies be applied in your local communities?
g. Prepare a PowerPoint presentation on the strengths and limitations of traditional versus modern geospatial data collection methods?
h. Share your findings with the class

2. **Map reading**

Work independently or in small groups, depending on the task. Ensure you read and follow all instructions carefully. Record your answers clearly in your notebook or on a sheet of paper to present your findings at the end of the activity.



Use the Map extract above to perform the following tasks

Task 1: Maps and Their Importance

a. Study the topographic map and identify three natural and three cultural features using a grid reference.
b. For each feature, explain its importance to humans

Task 2: Map Scales and Their Conversions

a. Identify the three types of scale of the map.
b. Show by working, how to convert the scale of the map from the ratio at the bottom to line and written statement of scale .

Task 3: Methods of Representing Relief on Maps

a. Observe the contour lines on the map and identify one hill, one valley, a watershed and one ridge. Mark these features on the map with the following letters:
   i. Hill (H)
   ii. Valley (V)
   iii. Watershed (W)
   iv. Ridge (R)
b. Hand the grid references to pinpoint the areal extent of each of the features.
c. Aside from the contours, discuss two methods that can be used to represent the elevation of the location on the given map.

Task 4: Using Contours to Represent Relief

a. On a graph sheet, draw an annotated cross-section along the line X-Y on the map, using a vertical scale of 1 cm to represent 50 feet
b. Calculate the vertical exaggeration of the cross-section drawn.
c. Describe three relief characteristics of the map.
d. Describe three drainage features of the map

Task 5: Techniques of Map Enlargement and Reduction

a. Draw a new outline of the section labelled ABCD to a scale of 1:25,000.

On your new outline, locate and name;

   i. The entire Class 3 road
   ii. River Kala and indicate its direction of flow with an arrow.
   iii. A 750-foot contour line
   iv. *Gbogame* settlement

b. Discuss three reasons why it is necessary to enlarge a map.

Task 6: Measurement of Distances and Areas on Topographical Maps

a. Using the map scale provided, calculate the real-world distance (in kilometres)
   i. by road from *Amedzofe* to *Kpedze*;
   ii. as the crow flies from Fume to *Tafi Atome*.
b. Calculate the area of the map in kilometres.

Task 7: Directions and Bearings

a. Determine the compass direction of *Tafe Atome* from *Amedzofe*.
b. Calculate the bearing of *Amedzofe* from *Tafe Atome*.

Task 8: Methods of Collecting Geospatial Data

a. Explain two methods that could have been used to collect the data for this topographic map
b. Discuss one advantage and one disadvantage for each method you identified.

Task 9: Emerging Technologies for Geospatial Data Collection

a. Research one emerging technology that could be used to create maps.
b. Write a brief explanation of how this technology works and how it differs from traditional methods of data collection.

Task 19: Reflection and Presentation

a. Reflect on the tasks you completed. Which task did you find most interesting or challenging? Why?
b. Prepare a brief presentation as a group, summarising your findings. Be creative in explaining your answers, using diagrams or sketches where possible.

Extension Activity: Digital Online Maps vs Traditional Hardcopy Topographic Maps

1. Using a digital device (e.g., smartphone, tablet, or computer), open Google Maps and explore a specific area of interest (e.g., your hometown, a famous city, or a natural landmark).
2. Spend some time experimenting with the following features:
   a. Zooming in and out to explore scale.
   b. Switching between map views (e.g., terrain, satellite, and traffic).
   c. Using the search feature to find specific locations (e.g., schools, hospitals, or restaurants).
   d. Exploring landmarks and their additional information (e.g., reviews, contact details, or photos).
3. In your group, discuss the advantages of using Google Maps or other digital maps compared to hardcopy topographic maps. Use the following guiding questions:
   a. How does the ability to zoom in and out improve map usability?
   b. What additional information (e.g., real-time traffic, nearby services) does Google Maps provide that a hardcopy topographic map cannot?

c. How does the ability to search for specific locations make digital maps more convenient?

d. What are the benefits of switching between different map views (e.g., satellite or terrain)?

4. Create a simple comparison table in your notebook to summarise the advantages of digital maps over hardcopy topographic maps. Use the table format below:

Feature	Digital Maps (Google Maps)	Hardcopy Topographic Maps
Accessibility		
Real-time updates		
Scale		
Additional Information		
Navigation Features		

EXTENDED READING

- Geospatial technologies and spatial data infrastructure development in Ghana" from GeoJournal, 85(3) by P. O.-W. Adjei & C. A. Mensah (2020)
- "Cartography: Thematic map design" (8th ed.) by J. Anderson & B. Ryan (2020)
- "GIS-based spatial modelling for urban planning in Ghana: Application and challenges" from the Journal of Urban Management, 10(3) by E. K. Antwi, J. Boakye-Danquah, & E. K. Forkuo (2021)
- "Urbanisation and health in Africa: Exploring the interconnections through GIS" from the African Geographical Review, 34(1) by G. Owusu, P. W. K. Yankson, & S. Agyei-Mensah (2015)
- "The SAGE handbook of GIS and society" edited by J. P. Wilson & A. S. Fotheringham (2018)

REVIEW QUESTIONS 6

1. Examine the spatial patterns of population distribution represented on any dot map of Ghana. What factors could explain these patterns, and how do they relate to socio-economic activities in different regions?
2. Evaluate the advantages and limitations of using dot maps to represent geo-spatial data such as population distribution or agricultural production in Ghana.
   a. Analyse a dot map showing the distribution of cocoa production in Ghana.
   b. What geographic and climatic factors influence the concentration of cocoa farming in certain areas?
3. What geographical, climatic, and economic factors explain the population distribution patterns observed on the dot map of Ghana?
4. Assess the advantages and limitations of using flow charts to represent population migration in Ghana.
5. Using a flow chart, analyse the movement and distribution of population in Ghana between and among Navrongo, Techiman, Kumasi and Accra. What factors drive this migration trend?
6. Based on a flow chart illustrating urbanisation trends in Ghana, predict future challenges and propose strategies to address them.

SECTION

7

WASTE MANAGEMENT IN GHANA

ENVIRONMENTAL DEGRADATION

INTRODUCTION

Waste management represents one of the most pressing environmental challenges facing Ghana today. This is particularly evident in rapidly growing urban centres like Accra, Kumasi, and Takoradi. This section delves into issues relating to waste generation, collection, treatment, and disposal within the Ghanaian context. The main issues covered in this section are the sources of waste in your community, the effects of improper waste management or disposal and appropriate methods of waste management in Ghana. Studying these issues would assist you in gaining broad knowledge on challenges facing the Ghanaian society in terms of waste and devising appropriate strategies to manage them. This section can be linked to your lessons on air and water pollution in Year One, as well as land degradation, soil pollution and management of floods in Ghana in Year Two.

KEY IDEAS

- One of the major environmental challenges facing Ghana today is the management of waste generated by people.
- The main sources of waste in Ghana are households, commercial centres, public institutions and industry.
- The types of waste in our communities and Ghana can be divided into plastics, metals, waste water, electronic waste, food residue and construction debris like rocks and concrete.
- Littering, dumping of waste into gutters and drains, burning, open space and pit dumping are considered inappropriate waste disposal methods in Ghana
- Some of the effects of improper waste management or disposal in Ghana are diseases, water pollution, air pollution and soil contamination.
- Some of the appropriate methods of waste management in Ghana are to Reduce, Reuse and Recycle (3Rs).

SOURCES OF WASTE IN YOUR COMMUNITY AND GHANA

Waste generation is part of every human society. As the population increases with rapid urbanisation, so will the amount of waste generated also increase. As a result, waste generation and improper disposal have posed a major challenge to Ghanaian households, institutions, communities and the nation as a whole. This topic covers the meaning of waste, types and sources of waste in Ghana.

Meaning of waste

Waste is any discarded or unwanted material, substance or object. The material has become or is referred to as waste because it has been discarded, abandoned, or is no longer wanted or needed by its original user. It includes items that have served their intended purpose or have become unusable and unwanted, such as empty water sachets, cans, and plastics. These wastes are produced in large volumes in our Ghanaian communities every day by households, institutions, businesses, industries and individuals.

Types of waste

In our households, communities and Ghana in general, we can identify these and other types or forms of waste as shown in ***Figure 7.1***.

Figure 7.1: Some examples or types of waste.

Hope you have identified some of these in your communities. Read the detailed description below.

1. **Organic waste:** Includes food residue, dead leaves and vegetation or plants, etc.
2. **Recyclable waste:** Those that can be reused, such as paper, plastics, glass, metal, etc.
3. **Solid waste: includes** debris from building and construction, wood, and metal.
4. **Liquid waste:** Examples are wastewater, excreta, chemicals, etc
5. **Hazardous waste:** Dangerous substances like chemicals, acid in batteries, pharmaceuticals, etc
6. **Electronic waste (E-Waste):** Examples are abandoned and discarded electronic materials such as computers, typewriters, mobile phones, radios, and televisions, either in whole or in parts of them.

Sources of Waste in Your Community and Ghana

There are various sources of waste in Ghanaian communities. The types of waste and their sources may differ due to location and activities. Although communities and individuals are an important source of waste in Ghana, commercial and industrial waste needs to be considered. There is some overlap in the types of waste that communities and commercial and industrial enterprises produce.

Sources of waste at the community level in Ghana

The following are the sources of waste in a typical Ghanaian community.

1. **Household or domestic wastes:** This is waste generated within the household. Examples are food waste scraps and packaging from groceries, discarded household furniture, clothes, appliances, and household liquid waste.
2. **Institutional waste:** Mainly from schools, health facilities, and hotels. Examples are waste **p**aper from schools, medical waste, food, and broken furniture.
3. **Commercial waste:** From businesses and commercial centres such as markets. Examples are plastics, foods, papers, packages, and cans.
4. **Building and construction:** Soil, rock and concrete debris, and boulders from construction sites, excavation, blocks and bricks factories, wood processing, welding, and metals.
5. **Farming activities:** From crop farming, animals and poultry. Examples are crop residue, poultry and farm animal dung, and abandoned farm equipment.

Sources of waste at the commercial level in Ghana

In Ghana, the following sources of waste can be identified.

1. **Mining Activities:** Through mining of minerals like gold, diamonds, salt, and oil, among others, waste is generated. Examples of such waste come from mining areas such as Obuasi, Kenyasi, Tarkwa, Akwatia, and areas where oil and salt mining take place. Examples of waste generated through these sources are wastewater (tailings), rock debris, dust, soils, and metallic objects.
2. **Agriculture:** The sources are crop farming, animal rearing, fishing and forestry. Examples of waste are food residue, tree branches, dead plants, poultry and animal dung, fish waste, discarded agricultural tools and equipment.
3. **Commercial:** From markets, streets, restaurants, stores and entertainment grounds. Examples are rotten foods, fruits and vegetables, empty cans, plastics and paper packages. These wastes are common at marketplaces like Makola, Techiman, Mankessim, Kejetia and other municipal and district commercial centres.
4. **Manufacturing:** Mainly from factories and processing industries. Examples of waste are metals, wood, contaminated wastewater, etc. These are very common in industrial areas in Tema, Accra, Kumasi, Takoradi and Tamale.
5. **Building and construction:** Building of houses, construction of roads and related projects generate a lot of waste. Examples of these wastes are metals, rock and soil particles, wood, and

6. **Electronic Waste (E-Waste):** In Ghana, Agbogbloshie in Accra is noted for its E-waste dump. It is made of old and discarded electronics, such as computers, refrigerators, mobile phones and other household electrical appliances. These are also referred to as hazardous waste.

Figure 7.2: Dumpsite for E-waste at Agbogbloshie (hazardous wastes)

Activity 7.1 Sources of Waste in your Community

This activity involves you taking part in a field study to collect evidence of the types of waste that can be seen in your community. This could be in your local town or village, or in the school compound.

1. Pre-visit preparation: Before embarking on a field visit, identify the waste sources and any types of waste you expect to find in your community or on the school compound. A tally chart would be a good idea, so you can record what you see easily and quickly.
2. Before you go, categorise sources and waste as major or minor and discuss observation strategies and safety.
3. Now, embark on a Community Visit to a nearby area to observe waste sources.
4. Record the sources and types of waste and talk to the locals if possible.
5. Sketch or photograph waste sources.
6. On your return to school, organise and categorise your findings.
7. You could refine your data by classifying the waste types and sources in a meaningful way.
8. Discuss the type of waste generated in your community to a friend or in a class presentation.

9. Note any differences between community, commercial and industrial waste patterns with waste generated in your school community.
10. Create a poster to describe the different types of waste using pictures and captions.
    a. On your posters, suggest ways to reduce common waste in your community.
    b. In a class presentation, discuss the concept of waste management

EFFECTS OF IMPROPER WASTE MANAGEMENT IN YOUR COMMUNITY AND GHANA

Most of the challenges which arise with waste in Ghana are due to how it is managed. If you manage waste using the correct methods, most of these challenges would be reduced.

Meaning of waste management

How do you get rid of waste in your home, school and community? Waste management involves the efficient collection, transportation, processing and disposal of wastes. Many communities and commercial enterprises dispose of waste using methods which cause harm to the environment and humans. It is therefore important to dispose of waste in a way which reduces this harm.

Improper waste management practices in our communities and in Ghana

Much of the waste in Ghana is not officially collected, transported, processed or properly discarded. In our Ghanaian communities, waste is sometimes burnt, thrown on waste ground, dumped in gutters, littered on the street, put in overflowing waste bins, and disposed of in other improper methods. The following are some of the improper ways of disposing of waste in Ghana.

1. **Littering:** It is common practice to throw rubbish and waste on the street, in the market, and anywhere in the open instead of dumping them in designated bins. Some of these rubbishes are thrown from moving vehicles, from homes and along the street.
2. **Illegal Dumping:** This occurs when waste is dumped or left in unauthorised areas, such as on the street, open spaces, along the roadside, and other prohibited areas.
3. **Dumping of waste in drains and gutters:** It is common practice to throw rubbish into gutters and open drains. When it rains, this can cause floods because these gutters get clogged.
4. **Throwing rubbish into water bodies:** It is improper to throw rubbish into water bodies, such as rivers, lakes and ponds. This bad practice is common in urban centres of Ghana. For example, the Odaw River in Accra and the Subin in Kumasi are turned into refuse dumps.

5. **Burning of refuse:** In some instances, refuse and waste are burnt in the open. This causes air pollution in the area.
6. **Disposal in open pit:** Sometimes, waste is disposed of in an open pit. It is common practice to dig trenches around the house and dump waste in them.
7. **Dumping in overflowing waste bin:** When designated waste bins are not regularly emptied, waste piles up and overflows. It is improper to continue to pile up waste on and overflowing waste bin. This creates a mess in the areas, thus producing a bad odour.

Effects of Improper Waste Management in Our Community

In our various communities, improper waste can pose a lot of challenges to the people. The following are the effects of improper waste management in our communities

Environmental Effects

1. **Destruction of land and soil:** In our various communities, the open dumping of waste destroys the soil. The land and the soil become unproductive and cannot support plant growth.
2. **Destruction of water bodies.** Dumping of waste in rivers, streams, ponds and lakes pollutes these water bodies. It makes them unsafe for drinking and other uses.
3. **Air Pollution: Open dumping and b**urning of refuse contribute to air pollution. Poisonous materials are introduced into the atmosphere. This reduces the quality of the air, which can cause airborne diseases.
4. **Contributes to floods:** Choked gutters and rubbish-filled drains prevent free flow or rain water, thus causing floods in our communities. This is very common in urban centres.
5. **Reduces the natural beauty of the environment:** the aesthetic or natural beauty of the environment may be destroyed by improper waste disposal.

Social and economic effects

1. **Spread of Diseases:** Piled-up refuse or waste can cause diseases. This is because it attracts fungi, rodents, flies, and other disease-causing organisms. Some of the diseases that are caused through uncollected or piled -up waste are malaria fever, cholera, typhoid fever, and diarrhoea.
2. **Pose challenges to respiration:** Burning of waste such as plastics, papers, tyres, wood and other materials can cause respiratory diseases such as cough, asthma, common cold and irritation to the eyes.
3. **Can cause injuries:** Some of the waste, such as metals, glass, wood, broken concrete and sharp-edged objects, can hurt and injure people.
4. **Reduces the pride and beauty of the community:** The social status of the community may be affected since the areas may be noted for their dirty surroundings. This will affect the growth of the community in several ways, including a low quality of life.

5. **Puts financial burden on the community:** The local authorities may have to spend a lot of money to deal with the pile-up of waste and related challenges. In most of our communities, the challenge with improper waste disposal is so overwhelming that the district or municipal assembly spends a huge amount of money to clear them, often running out of money as the problem is so great.

Effects of Improper Waste Management in Ghana

The effects of improper waste management in our communities are the same as in the nation. The only difference is that in the community, only a few people may be affected. In Ghana, the problem is more challenging in the urban areas and cities than in the rural communities. The following are some of the effects of improper waste disposal in Ghana:

1. **Health challenges:** It can affect the health of the population living near the polluted area due to improper waste disposal. Exposure to these wastes can cause skin irritations, blood infections and respiratory-related health issues. This may be common in areas like Accra, Kumasi, Tamale, Sekondi-Takoradi and some other urban areas with vast refuse dump sites.
2. **Air pollution**: Papers, plastics and other toxic chemicals burnt at waste disposal sites emit gases and chemicals into the atmosphere. These also release a bad odour in the area. This is very common in landfill sites in our urban centres, such as Accra, Kumasi, and Tamale.
3. **Soil contamination:** Soil contamination is one of the major challenges caused by improper waste disposal in Ghana. Some wastes that end up in waste dumps release toxic chemicals into the soil. Examples are glass, bottles, plastics, household refuse, and industrial and commercial waste. Soil contamination not only affects plant growth; it is also unhealthy to humans and animals feeding on those plants.
4. **Water pollution:** Poisonous wastes in the environment leak into the ground, and ultimately, into both surface and ground water. Untreated sewage can enter the sea, rivers, lakes and streams and threaten the organisms in these water bodies. Contaminated water is also dangerous and harmful to humans who consume fish and other marine life. Examples are found in the Odaw River, Korle Lagoon in Accra, Subin River in Kumasi and other water bodies in Ghana.
5. **Flooding:** Disposal of waste into gutters and other drainage systems can cause floods, especially in urban centres. In the wet season, some of the floods that occur in parts of Accra, Kumasi, Sekondi Takoradi and Tamale can partly be blamed on clogged gutters due to the dumping of wastes in them. These floods cause damage to property, death and displacements of residents and contribute to the spread of waterborne diseases.
6. **Economic Costs:** The cost of managing and disposing of waste and associated challenges is such a burden to the state. The government has to buy more equipment, hire large labour, and pay for proper sites where the waste can be properly disposed. One of such issues is the management of single-use plastics in Ghana where in many major urban areas, collection and disposal cannot be done fast enough to remove the massive volumes produced.

7. **Negatively affects tourism and businesses:** The problem of improper waste disposal affects Ghana's image in areas of tourism and related businesses. Some of the waste dumps are an eyesore, and that makes the environment unattractive to potential investors and visitors. For example, some of our beaches are filled with waste and may not be pleasant to visit there for tourism and recreational activities.

Appreciating the Problem of Dealing with Ghana's Waste

In this section, you have found out about one of the most serious problems facing Ghana now and in the near future. Waste management in Ghana is facing a critical breakdown, driven by rapid urbanisation, inadequate infrastructure, and systemic underfunding. The country generates approximately 12,710 tonnes of solid waste daily, with Accra alone contributing nearly 15% of that total. Yet only a fraction is properly treated—especially plastic waste, of which 840,000 tonnes are produced annually, but less than 10% is recycled. Landfills like the Kpong Engineered site, designed to last 25 years, reached capacity in just three years due to overwhelming inflows of up to 3,000 tonnes per day, far exceeding its intended 500-tonne limit. The absence of at-source separation limited private sector accountability, and the collapse of key contracts like YEA–Zoomlion have left Metropolitan, Municipal, and District Assemblies (MMDAs) scrambling to maintain basic services. Without urgent reforms—such as extended producer responsibility, sustainable financing, and investment in circular economy infrastructure—Ghana risks deepening its public health and environmental crisis.

Activity 7.2 Effects of Improper Waste Management

1. Research and analyse the effects of poor waste disposal by following any of the options below:

   Option A: Take a Field Visit to a location in your community with poor waste disposal (e.g., open dump, choked drain).
   Observe the following.

   a. Types of waste present.
   b. Who is affected and how.
   c. Community reactions towards waste disposal.

   Option B: Search on the internet for videos and pictures of waste mismanagement in Ghana. Take notes, sketches, or photos (if allowed) to record information. Present your findings in class through creative formats to promote community awareness.

2. Use the table below to write on: Cause–Effect–Consequence–Solution (CECS).

Cause	Identify reasons for improper waste disposal.
Effect	Note visible problems caused.
Consequence	Consider long-term impacts.
Solution	Suggest realistic actions for the school/community.

a. Use Sentence Starters for Support:
   i. "We noticed that…"
   ii. "This can cause…"
   iii. "This will likely lead to…"
   iv. "A possible solution is…"
b. Present your findings and solutions by using drawings, photos, captions, or acting in class discussion.

METHODS OF WASTE MANAGEMENT IN GHANA: REDUCE, REUSE AND RECYCLE (3RS)

You have now discovered that improper waste disposal causes many problems for you, the community, and the nation as a whole. There are a number of methods for properly disposing of waste. These include recycling, composting, incineration, reuse, and landfilling. Among these, recycling, reuse and composting are preferred due to their environmental benefits. In this part of section 7, the emphasis will be on waste reduction, recycling and reuse, that is the 3Rs. The 3Rs (Reduce, Reuse, and Recycle) are fundamental principles of waste management that help minimise waste and manage it properly to reduce the challenges associated with improper waste management.

R1 - Reduce

Meaning: Reduce or reducing wastes means minimising the amount of waste we create in our daily activities. This relates to the habit of cutting down the amount of waste we generate over a period. This is very important in Ghana because the world is now tilted towards this method of managing waste, and we need to embrace it as a nation.

Methods of reducing waste

There are ways we can reduce the amount of waste we generate in Ghana in a day or within a period. These include;

1. Buying products with less packaging (e.g. loose tomatoes instead of packaged ones)
2. Using digital documents instead of printed ones in schools and offices
3. Carrying reusable shopping bags instead of collecting plastic bags
4. Avoiding single-use plastics such as straws, cutlery, and water sachets.
5. Cultivate the habit of reusing certain materials not less than once.

Things you could do immediately to reduce waste might be using both sides of paper for writing or printing, carrying reusable water bottles and lunch boxes to school, and encouraging families to buy in bulk to reduce packaging waste. These actions can be tracked over a week to measure impact, fostering a habit of waste reduction.

Why should we reduce waste? The Benefits

1. Saves natural resources and energy
2. Reduces the pressure on landfill sites
3. Helps lower household and municipal waste collection costs

R2 - Reuse

Meaning: It involves finding new applications for materials or products after their original use instead of discarding them. Examples of products that can be reused are shown in ***Figure 7.3.***

Figure 7.3: Examples of products that can be reused

You can

a. Use empty bottles to store water or homemade drinks
b. Reuse plastic containers for food storage
c. Donate old clothes, shoes, and school supplies to others in need
d. Repair broken items (like shoes or bags) instead of discarding them

Benefits

a. Reduces the volume of waste sent to landfill

b. Saves money and reduces the need for new products

c. Encourages creativity and innovation (e.g. using old tyres as flowerpots)

Challenges and Opportunities

While reuse is practised, awareness and formal integration into waste management systems are low, with reusable materials often found littering streets and drains. Incentives, such as free bins or increased collection frequency, could encourage more reuse.

R3 - Recycle

Meaning: Recycling is the process of converting waste materials into new materials and objects. It involves separating, processing, and reusing materials from solid wastes such as paper, plastics, glass, metals, and some types of organic wastes. Recycling is one of the best disposal methods simply because it goes a long way to preserving the environment. There are several materials that you can recycle. Some are shown in Figure 7.4.

Figure 7.4: Examples of products that can be recycled

You can recycle by

a. Collecting plastic waste for recycling into chairs, buckets, and pavement blocks

b. Melting down scrap metals to produce tools or machine parts

c. Turning food waste into compost for the garden or farm

d. Using old paper to produce recycled paper products

Recycling Initiatives in Ghana

a. Companies such as *Trashy Bags Africa* collect and recycle water sachets into bags and wallets

b. Some communities now have separate bins for plastics, metals, and organic waste to encourage sorting and recycling. This is called waste segregation.

c. Educational campaigns and NGOs (Non-Government Organisations) promote recycling in schools and markets

Benefits

a. Reduces landfill waste. Instead of acquiring large tracts of land as waste dumps, recycling helps to conserve that land for something else. It also reduces the cost of acquiring such land.

b. Helps reduce the amount of waste in the environment

c. Creates jobs and business opportunities in the recycling industry

d. Conserves natural resources and reduces the need for new ones

e. Provides environmentally friendly means of disposing of wastes

f. Helps minimise pollution.

Activity 7.3 Methods of Waste Management in Ghana: Reduce, Reuse and Recycle (3Rs)

1. Research on Waste management strategies.
   a. Create a folder on waste management strategies you have researched.
   b. Classify each strategy under Reduce, Reuse, or Recycle.
   c. Justify your classification using examples from Ghana (e.g., reusing plastic containers).
   d. Create a 3Rs Poster or Chart.
      i. Design the poster with three sections for Reduce, Reuse, and Recycle.
      ii. Include key examples and illustrations.
      iii. Add 1-2 practical actions for your school/community to implement for each category.
   e. Present your poster, explaining in class or during a PTA session.
2. Discuss common waste materials in your school/community.
   a. Think of useful items to make from them (e.g., pencil holders, flower pots).
   b. Use picture cards or watch videos from the internet for ideas.

c. Sketch a design using recycled materials.
d. Label materials and describe the item's function.
e. Justify how it solves a waste problem.
f. Use clean and safe waste materials.
g. Share your school-based waste management initiatives in class.

Activity 7.4 Revision on all focal areas from Years One to Three

1. Research and discuss environmental issues such as air Pollution, Water Pollution, Land Degradation, Soil pollution and ways of managing Floods.
   a. Present in class the causes, effects, and management strategies of environmental issues with your peers in class.
2. Create a Poster for the class gallery, highlighting key environmental issues, impacts and management or mitigation strategies in Ghana.
3. Present your poster for the class presentation, highlighting the connections between challenges (e.g., how air pollution affects water bodies).
4. With your friends in class, brainstorm on one actionable step for an environmental challenge that you and your peers can implement in the school community.
5. Research the growing problem of waste management in Ghana and outline some suggestions for reducing the impact of waste in the future.

EXTENDED READING

- General Geography in Diagrams, R. B. Bunnett (2014)
- Essentials of Physical Geography, I.Y. Dadson, K. Adu-Boahen, & B.A. Owusu (2022)
- Geomorphology in the Anthropocene A. S. Goudie (2020)
- Fundamentals of geomorphology, (4th ed.) by R. J. Huggett (https://www.google.com/search?q=2017)
- Natural hazards: Earth's processes as hazards, disasters, and catastrophes, (5th ed.) by E. A. Keller & D. E. DeVecchio (2021)

REVIEW QUESTIONS 7

1.

a. Describe two sources of waste commonly found in urban areas of Ghana and two sources of waste commonly found in rural areas. How do these sources differ?

b. Analyse the long-term implications of current waste production trends for Ghana's development.

2. In what four (4) ways does improper waste disposal contribute to environmental degradation in Ghana?

3. Discuss the effects of improper waste disposal in Ghana on:

a. Health

b. Tourism

c. Water bodies

d. Community development

4.

a. With relevant examples, propose strategies to improve waste management in your community and Ghana.

b. How can the "3Rs" (Reduce, Reuse, Recycle) be applied effectively?

SECTION

8

DESERT ENCROACHMENT AND LANDSLIDES

ENVIRONMENTAL HAZARDS AND THEIR MANAGEMENT

INTRODUCTION

In this section, you will study two important environmental problems: desert encroachment and landslides. You will learn what causes these problems and how they affect people and the environment. For desert encroachment, especially in northern Ghana, you will discover that cutting down trees and poor farming practices can make the land dry and turn it into desert. You will also explore ways to solve this problem, such as planting more trees, using the land wisely, and educating communities. For landslides, you will learn that they can happen because of natural events like heavy rain or earthquakes, or because people build on steep slopes or remove trees. To prevent landslides, you will study methods like planting vegetation on steeper slopes, planning settlements properly, and protecting hillsides. This topic will help you understand how human activities can cause environmental problems. It also teaches you how to find and support good ways to protect the environment in your communities. This lesson can be linked to Year One sections 5,7,10,13 and Year Two sections 1,3,8 and 9 learning materials

KEY IDEAS

- **Desertification is when the** land turns to desert – often soil loses its water and nutrients and cannot support plants and animals like before.
- The two main causes of desert encroachments in Ghana are droughts (long dry periods) and human activities like removing vegetation.
- Preventing desert encroachment involves both environmental conservation and community action.
- Landslides are mass movements of rock and soil down a slope that has become unstable as a result of natural processes or human activities.
- Landslides have environmental, economic, and social effects.
- Preventing and mitigating landslides in Ghana requires a multifaceted approach, addressing both natural and human-induced causes.

DESERT ENCROACHMENT IN GHANA

Desert encroachment happens when land that was once good for farming or growing plants slowly turns dry and becomes like a desert. This means the land loses its water and nutrients and cannot support plants and animals like before. It is also called **desertification**. This problem mostly happens in dry areas and is caused by both natural changes, like little rainfall and human activities such as cutting down trees, overgrazing by animals, and poor farming practices.

Areas in Ghana Affected by Desert Encroachment

In Ghana, some parts of the country, especially in the north, are slowly turning dry and losing their ability to support plants and farming. These areas are in the **savanna zone**, which already has little rainfall and dry weather. If people do not take good care of the land, it can quickly turn into a desert. Some of the areas most affected include:

1. **Upper East Region**: Places like Bawku, Bolgatanga, and Garu get very little rain, have hot weather, and have too many animals feeding on the grass. This makes the land dry and weak.
2. **Upper West Region**: Towns like Wa and Lawra have few trees and plants. Cutting down trees and poor farming practices make the problem worse.
3. **Northern Region**: Places such as Tamale and Yendi are losing trees because of too much farming and cutting down trees (deforestation).
4. **Savannah Region**: Areas with sandy soil and not much plant cover are also at risk of becoming dry and desert-like.

Summary of the Causes of Desert Encroachment

Natural Causes

1. **Prolonged drought:** Lack of rainfall over several years leads to dry soil and dying vegetation.
2. **Climate change:** Rising temperatures and reduced rainfall patterns affect soil and water availability.

Human Activities

1. **Deforestation**: Cutting down trees for firewood, charcoal, and farming exposes the soil to erosion.
2. **Overgrazing**: Too many animals feed on the same land, leading to the destruction of vegetation cover.
3. **Bush burning:** Frequent burning of grasslands and farms destroys the soil structure and organic matter.
4. **Poor farming practices:** Continuous farming without soil conservation depletes nutrients and causes land degradation – the soil will not grow crops which produce a yield that farmers can live on.

Summary of the Effects of Desert Encroachment

Environmental Effects

1. Loss of biodiversity due to the destruction of habitats for plants and animals.
2. Increased soil erosion and reduced soil fertility.
3. Disruption of water cycles, leading to reduced water availability.

Social Effects

1. Displacement of communities as fertile land becomes unproductive, forcing people to migrate.
2. Food insecurity due to reduced agricultural yields.

Economic Effects

1. Decline in agricultural productivity, affecting livelihoods and food supply.
2. Increased costs for rehabilitation of degraded land and provision of relief to affected communities.

How to Prevent and Manage Desert Encroachment

Desert encroachment can be stopped if people take good care of the environment and work together as a community. Here are some ways Ghana and other countries are fighting desert encroachment.

1. **Planting More Trees (Afforestation and Reforestation):** Planting trees is one of the best ways to stop the land from turning into a desert. Planting trees where there were none before is called **afforestation**, while planting trees again in places where they were cut down is called **reforestation**. Trees protect the soil from being washed or blown away, help keep water in the ground, and make the land cooler. Ghana's **Green Ghana Project** encourages everyone to plant trees to save the environment.
2. **Using Better Farming Methods:** Poor farming can damage the land. Farmers can protect the soil by using smart methods like **crop rotation** (changing crops from season to season), **mixed cropping** (growing different crops at the same time), and **mulching** (covering the soil with dry leaves or grass). Also, farming along the shape of the land (**contour ploughing**) and building steps on hills (**terracing**) help keep the soil strong and full of nutrients.
3. **Managing Animal Grazing:** Too many animals feeding on one piece of land can destroy the grass and leave the soil bare. **Controlled grazing** means moving animals from one place to another to let the grass grow back. Fences and special grazing areas also help to stop animals from spoiling the land.
4. **Using Other Sources of Energy:** Cutting down trees for firewood and charcoal destroys the environment. People are encouraged to use other energy sources like **solar power**, **LPG gas**, or **improved cookstoves**. These do not harm the environment as much and help keep forests safe.
5. **Teaching People and Getting Communities Involved:** Educating people, especially farmers, herders, and young people, about the dangers of desertification helps them understand why they must protect the land. When communities help plant trees and take care of the land, the solutions are stronger and last longer because everyone feels responsible.

Activity 8.1 Talking About Desert Encroachment

1. Work with a friend for this activity. Search books and Online resources for pictures showing evidence of desertification in Ghana (before-and-after images, cracked soil, dry land, dead crops). Use the Internet if you can.
   a. With the help of your friend or colleague, answer the following;
      i. What do you think "desert encroachment" means?
      ii. Have you or someone you know seen anything like this?
      iii. Where in Ghana do you think this is happening most?

      Note: If you are from a dry area, share any personal or family experiences. If you are from a forest zone, compare what you see in the pictures to your area

   b. Write, draw, or record your answers or thoughts on the following points and questions.
      i. What desert encroachment means to you?
      ii. Two causes you know or think of.
      iii. One effect you have heard of or seen.
      iv. Are the causes more from human activity or natural processes?
2. Create a colourful mind map or infographic titled: "Desert Encroachment in Ghana"

   Include These Branches

   a. What it means – clear definition
   b. Main causes (use pictures, icons, or drawings)
   c. Three effects with real examples (e.g., crop loss, water shortage)
3. Display your mind map on a wall or table in the class.

LANDSLIDES IN GHANA AND THEIR PREVENTION

A **landslide** happens when **soil, rocks, and other loose materials** quickly move down a slope. This usually happens because **gravity pulls them down** when the ground becomes weak or unstable. Landslides can be caused by **heavy rainfall** that soaks the soil, **Earthquakes** that shake the ground or **Human activities** like cutting down too many trees (deforestation) or building without proper planning. Sometimes, a landslide only affects the top layer of the ground, but in some cases, it can go much deeper into the rocks beneath.

Places in Ghana Where Landslides May Happen

Even though landslides are not very common in Ghana, some places are more at risk because of **steep land, heavy rains, and human activities** like farming or building. These include

1. **Akwapim-Togo Ranges**
   a. These are **very high and hilly areas**, with some parts rising over **1,000 metres**.
   b. During the rainy seasons (**April to July** and **September to October**), the soil becomes **soaked with water**, which can lead to landslides.
2. **Kwahu Plateau and Escarpments**
   a. This area is also **high and has steep slopes**; some parts drop **up to 500 metres** to the lowlands.
   b. **Farming on the slopes** removes the plants that hold the soil, making the land **easier to wash away** during rain.
3. **Hilly Areas Around Kumasi**
   a. Around Kumasi, there are **small steep hills**, especially near the city and new building areas.
   b. **Construction and roadbuilding** often cut into the hills, making the ground **less stable**.
4. **Western North Region (Forest and Savannah Border)**
   a. In this region, **cutting down trees and mining** can remove the top layer of soil.
   b. **Rainfall in the wet seasons** (April–July and September–October) can then cause **slopes to collapse**.

Summary of the Causes of Landslides

Landslides are triggered by several natural and human-induced factors.

Natural Causes

1. **Heavy Rainfall**

   When it rains a lot, the soil becomes too wet and loose. This makes it easy for the ground to slide, especially on hills. An example is the recent landslide in Accra after heavy rains.

2. **Earthquakes**

   Earthquakes shake the ground, causing loose soil and rocks to fall. Although earthquakes are rare in Ghana, they can still cause landslides in some areas.

3. **Erosion**

   Erosion happens when water or wind wears away soil from hills and slopes. This weakens the land and can lead to landslides, especially in places like Aburi.

Human Causes

1. **Deforestation**
   Cutting down trees removes roots that hold the soil together. Without trees, soil washes away easily, which can cause landslides.

2. **Building on Steep Slopes**
   Putting up buildings on hills changes how water flows and can weaken the land. This happens in fast-growing places like Weija-Kasoa.

3. **Poor Land Use**
   Bad farming methods, mining, and poor drainage systems make the land weaker. These activities increase the risk of landslides.

Summary of the Effects of Landslides

The effects of landslides are discussed below.

Environmental Effects

1. **Damage to Plants and Animals**
   Landslides destroy forests and animal habitats, reducing biodiversity.

2. **Dirty Rivers and Streams**
   Landslides carry soil into water bodies, making the water dirty and harmful to living things in the water.

Social Effects

1. **Loss of Life and Injury**
   Landslides can kill or hurt people. In May 2025, four people died in Accra because of a landslide.

2. **Homelessness**
   Landslides force people to leave their homes. Over 3,000 people had to move in Accra after one such event.

3. **Broken Roads and Buildings**
   Landslides damage roads, bridges, and houses, making it hard for people to travel or get help.

Economic Effects

1. **Loss of Farmland**
   When farmlands are covered or damaged, farmers lose their crops and money. This has happened in places like Twifo-Mampong.

2. **High Costs**
   It is expensive for the government and communities to fix the damage and help affected people.

3. **Disrupted Business**
   When roads are destroyed, goods can't move easily, and businesses suffer.

How to Prevent or Reduce Landslides

1. **Planting Trees (Afforestation)**
   Growing trees helps to hold the soil together, reduce water speed, and prevent erosion.

2. **Good Drainage**
   Building proper drains helps direct rainwater away from slopes and keeps the soil from getting too wet.

3. **Terracing Hills**
   Making steps on steep land helps to slow down water and make farming safer, especially in hilly areas.

4. **Avoid Building on Slopes**
   Don't build houses or roads on steep or weak land. This reduces the chances of damage during landslides.

5. **Early Warning Systems**
   Using tools to check rainfall and soil movement can help give warnings so people can move before a landslide happens.

6. **Educating Communities**
   Teaching people about the dangers of landslides and what to do can save lives and reduce damage.

7. **Government Laws and Support**
   The government should make and enforce laws to protect land, support research, and ensure people use land wisely.

Activity 8.2 Talking About Landslides

1. Visit the internet to watch short **videos or pictures** of landslides
   a. In Ghana (e.g., Akwatia, Ahafo, hilly mining areas)
   b. In other countries (e.g., Brazil, Sierra Leone, Nepal)

c. Before and after pictures, how it affected people, and what was done to help
d. While watching, think about:
   i. What is happening?
   ii. Why is it happening?
   iii. How are people and places affected?

2. Use prompt cards or a worksheet to describe what you saw
   a. **What is a Landslide?**
      i. What do you think a landslide is?
      ii. What did the pictures and videos show?
   b. **What Causes Landslides?**
      i. What natural things cause them? (e.g., heavy rains, earthquakes)
      ii. What human actions make it worse? (e.g., cutting down trees, mining)
   c. **What Are the Effects?**
   d. How are people, homes, roads, and schools affected?
3. Create flashcards to show the chain from cause → landslide → effects. Show how one leads to another.
4. Share your findings with a friend or the class.

Activity 8.3 Revision on all focal areas from Years One to Three

Search the internet for a large map of Ghana and West Africa and do the following activities individually or with a group of your classmates.

1. Identify major physical features such as mountains, rivers, vegetation zones, and flood-prone areas.
2. Analyse how these features influence human activities (e.g., farming, mining, settlement). Consider the following questions in your analysis.
   a. How does the climate influence vegetation and soil types?
   b. What is the relationship between relief and drainage systems in Ghana?
   c. How do environmental hazards affect socio-economic activities?
   d. How can sustainable practices mitigate challenges like land degradation, floods, and droughts?
   e. How human actions contribute to environmental hazards (e.g. desertification, landslides).
   f. What actions can you take to protect the local environment?
3. Use visual aids (e.g., photos or videos) to showcase your findings.
4. Plan a community awareness campaign on one of the following:
   a. Sustainable land use practices.

b. Waste management to prevent floods.
c. Planting trees to combat drought and fires.

EXTENDED READING

- Environmental Protection Agency. (2020). *Land use policies and regulations in Ghana. Accra*: Government of Ghana.
- Ghana Geological Survey Authority. (2018*). Landslide risk assessment in Ghana*. Accra: Government of Ghana.
- Intergovernmental Panel on Climate Change. (2021). *Climate change and land*: An IPCC special report. Retrieved from https://www.ipcc.ch/report/srccl/
- Mensah, K., & Owusu, E. (2019). *Deforestation and desertification in Ghana: A case study of the Upper East Region.* Journal of Environmental Management, 25(3), 123-135.

REVIEW QUESTIONS 8

1. Examine any four (4) ways in which reforestation and afforestation programmes can help manage desert encroachment in Ghana.
2. Analyse the role of education and community awareness in Combating:
   a. Desert encroachment
   b. Landslides
3. Based on current trends, what long-term impacts could desert encroachment have on Ghana's economy? How can these effects be mitigated?
4. Examine the effects of Desert Encroachment on the following:
   a. Vegetation
   b. Animals
   c. Crop farming
   d. Cattle rearing
5. In what four (4) ways does vegetation help to control landslides in a steep sloping area?
6. Analyse community-based strategies that can be implemented to reduce landslide risks?

ANSWERS TO REVIEW QUESTIONS 1

1.

a. Climate affects river channels through variations in rainfall and temperature. In Ghana, the seasonal nature of rainfall leads to changes in river volume and flow rate. For instance, during the wet season, rivers like the Ayensu and Densu swell, which can lead to increased erosion and deposition, altering the river channel. Conversely, during the dry season, reduced flow can lead to sediment deposition, causing the channel to become shallower.

b. Topography: The topography of an area influences the gradient and speed of river flow. In Ghana, rivers flowing from highlands to lowlands, such as the Volta River, experience changes in velocity and erosion potential. Steeper gradients in the highlands lead to faster flow and increased erosion, while lowland areas favour deposition, shaping the river channel and forming features like floodplains and meanders.

c. Geology: The type of rock and soil through which a river flows affects its channel formation. For example, rivers flowing over resistant rocks, like granite, in Ghana may form narrow, deep channels with features such as rapids or waterfalls, as seen in parts of the Black Volta. In contrast, rivers in softer sediments may have wider, shallower channels, which are more prone to changes in shape due to erosion and deposition.

d. Dam Construction: The construction of dams, such as the Akosombo Dam on the Volta River, significantly changes river channels by regulating flow and reducing materials that can be transported downstream. This can lead to changes in channel shape and depth. The controlled flow can also influence the development of new landforms, like deltas, and impact local ecosystems and human activities.

2. *Environmental Implications*

Flooding has complex and enduring effects on the environment. In Ghana's White Volta Basin, seasonal floods cause severe soil erosion, stripping away fertile topsoil and reducing agricultural productivity. Simultaneously, sedimentation downstream alters river morphology and aquatic habitats, sometimes creating new wetlands that support biodiversity. For instance, post-flood sediment deposits in the Oti River have led to the expansion of riparian vegetation, attracting migratory birds and enhancing ecosystem services.

However, floods also contaminate water sources, introducing pollutants from agricultural runoff, latrines, and industrial waste. This degrades water quality and disrupts aquatic food chains. Long-term monitoring by the Water Resources Commission shows elevated nitrate and coliform levels in flood-prone areas, posing risks to both wildlife and human health.

Socio-Economic Implications

Floods devastate livelihoods, particularly in agrarian communities. The 2023 Akosombo Dam spillage displaced over 30,000 people and destroyed thousands of hectares of farmland. Beyond immediate crop loss, such events trigger food insecurity, rising prices, and reduced income for farmers. Infrastructure damage such as roads, bridges and schools further compounds economic strain, especially in underserved regions like North Tongu.

Health risks escalate post-flood due to stagnant water and overcrowded shelters, leading to outbreaks of cholera and malaria. Moreover, displacement disrupts education and social cohesion, with long-term psychological effects on vulnerable populations.

Resilience and Adaptation Strategies

Communities have adopted various resilience measures, from elevated housing and improved drainage to early warning systems. In the Upper East Region, local NGOs have promoted community-based flood mapping and rainwater harvesting, reducing vulnerability. However, these efforts are often underfunded and fragmented.

At the policy level, Ghana's National Flood Control Programme has introduced zoning regulations and floodplain management plans. Yet enforcement remains inconsistent, especially in informal settlements. A 2022 audit by the NDPC revealed that only 40% of flood-prone districts had implemented their contingency plans effectively.

Evaluation and Conclusion

While floods pose significant threats, they also offer opportunities for ecological renewal and policy reform. The key lies in integrating scientific data, community knowledge, and sustained investment. Ghana's experience shows that adaptive governance, not just reactive relief, is essential for long-term resilience.

3. Explanation of the processes of river erosion and how each links up with the rest to shape river channels.

- Hydraulic action
- Attrition
- Abrasion/Corrasion
- Solution/Corrosion

Explain how each of these contributes and links up with the rest to shape river channel

4.

a. Longitudinal profile of a river
   - Provides a detailed explanation of the longitudinal profile, emphasising the gradual change in gradient from a river's source to its mouth.
   - Includes relevant concepts such as base level, equilibrium, and the significance of the profile in understanding river dynamics.
   - Uses appropriate terminology and provides examples from specific rivers if possible.

b. How the gradient change from the river's source to its mouth
   - Clearly describes how the gradient decreases from the steep, fast-flowing sections near the source to the gentler slopes near the mouth.

- Discusses factors influencing these changes, such as erosion and deposition processes.
- Provides examples from specific rivers to illustrate points.

c. Why the gradient change in the course of a river
   - Explains that the gradient changes due to natural processes like erosion, transportation, and deposition, which shape the river profile over time.
   - Discusses the role of geological factors and human activities in influencing gradient change.
   - Offers examples from specific contexts or rivers.

5. How Different Factors Affect the Profile of a River

a. Geology: The type of rocks and geological structures through which a river flows significantly affects its profile. Hard, resistant rocks, such as granite, tend to form steep and narrow channels, while softer, less resistant rocks, like limestone or shale, lead to wider and more meandering channels. Over time, geological structures like faults and folds can direct the river's path, influencing its gradient and flow patterns.

b. Gradient: The gradient, or slope, of the riverbed directly influences the river's velocity and erosive power. A steeper gradient results in faster-flowing water with greater potential for erosion, leading to the formation of V-shaped valleys or canyons. Conversely, a gentle gradient reduces the river's speed, promoting deposition and the development of features like floodplains and meanders.

c. Volume of Water: The volume of water in a river affects the carrying capacity and ability to erode or deposit material. High volumes, especially during floods, increase the river's erosive power, reshaping the channel and potentially altering its course. Conversely, reduced water volumes, often due to seasonal variations or human extraction, can lead to sediment deposition and changes in channel morphology.

d. Human Activities: Human activities such as dam construction, deforestation, and urbanisation can significantly alter a river's profile. Dams disrupt the natural flow, leading to sediment accumulation upstream and reduced sediment transport downstream. Deforestation increases erosion rates, while urbanisation can alter natural drainage patterns, affecting the river's gradient and flow.

6.

a. Ways in Which Floodplains Contribute to Crop Farming in Ghana

Fertile Soils: Floodplains are often covered with nutrient-rich alluvial soils deposited by rivers. These fertile soils are ideal for crop cultivation, supporting high agricultural productivity. For example, the floodplains of the Volta River provide fertile grounds for growing crops like maize and rice, contributing to food security and local economies.

Natural Irrigation: During seasonal flooding, floodplains benefit from natural irrigation, which helps maintain soil moisture levels essential for crop growth. This reduces the need for artificial irrigation systems and lowers water costs for farmers, enhancing agricultural efficiency.

Biodiversity and Crop Diversity: The diverse ecosystems within floodplains support

a variety of plant species, allowing farmers to practice crop rotation and polyculture. This diversity enhances soil fertility and reduces pest and disease outbreaks, promoting sustainable farming practices.

b. Challenges Posed by Floodplains for Flood Management

Frequent Flooding: Floodplains are naturally prone to flooding, which can lead to crop damage, soil erosion, and loss of agricultural land. Managing these recurrent floods requires significant investment in infrastructure like levees and flood control systems to protect crops and settlements

Infrastructure Vulnerability: Infrastructure such as roads and bridges on floodplains is highly susceptible to damage during floods, disrupting transportation and access to markets. This can hinder economic activities and emergency response efforts during flood events.

Health Risks: Flooding in floodplains can lead to stagnant water, creating breeding grounds for disease-carrying insects such as mosquitoes. This poses public health challenges and requires integrated flood management and health strategies to mitigate risks.

c. Two from the following strategies to balance agricultural use with flood risk reduction, Ghana could

- enforce zoning regulations and promote community-led flood awareness.
- apply ecosystem-based strategies such as wetland restoration and riparian buffers which offer natural flood mitigation while supporting biodiversity and soil health.
- Use integrated planning and early warning systems which are key to transforming floodplains into resilient landscapes.

7.

a. Comparison of V-shaped Valleys and U-shaped Valleys

i. Characteristics

V-shaped Valleys: These valleys are characterised by their narrow, steep-sided profiles that resemble the letter "V". They are typically found in the upper courses of rivers where the river cuts down into the bedrock, creating sharp and angular valley sides.

U-shaped Valleys: These valleys have a broader, more rounded profile, resembling the letter "U". They are formed by glacial activity, where glaciers carve out a wide trough with gently sloping sides and a flat valley floor.

ii. Formation

V-shaped Valleys: Formed by river erosion in the upper course, where the river's energy is focused on downward erosion. This creates a deep, narrow channel as the river cuts through resistant bedrock over time.

U-shaped Valleys: Formed by glacial erosion. As glaciers move down a slope, they pluck and abrade the valley sides and floor, widening and deepening the valley to create the characteristic U-shape.

b. Ways Rivers Influence Human Settlements

- Water Supply: Rivers provide a crucial source of water for domestic, agricultural, and industrial use, making them attractive locations for human settlements.
- Transportation: have historically served as important transportation routes, facilitating trade and communication between communities. Many towns and cities have developed along navigable rivers.
- Fertile Land: The deposition of nutrient-rich sediments during floods enhances soil fertility on riverbanks and floodplains, supporting agriculture and food production.

Recreational and Cultural Significance: Rivers offer recreational opportunities such as fishing, boating, and tourism, contributing to the local economy. They often hold cultural and historical significance for communities.

c. Strategies to Conserve Rivers and Their Associated Landforms

- Riparian Buffer Zones: Establishing vegetated areas along riverbanks to reduce erosion, filter pollutants, and provide habitat for wildlife.
- Sustainable Water Management: Implementing practices such as rainwater harvesting, efficient irrigation, and wastewater recycling to conserve water resources and maintain river health.
- Pollution Control Measures: Enforcing strict regulations on industrial and agricultural discharges into rivers to prevent contamination and protect aquatic ecosystems.
- Restoration Projects: Initiating projects to restore natural river channels, wetlands, and floodplains, enhancing biodiversity and improving the resilience of riverine environments.

8. Factors that influence mass wasting

- Slope Gradient: Steeper slopes are more prone to mass wasting as gravity exerts a stronger pull on the materials. In environments with significant elevation differences, this can lead to rapid and extensive movement of earth materials down the slope.
- Water Content: The presence of water can both add weight to soil and rocks and reduce friction between particles. During heavy rainfall or snowmelt, the increased water content can trigger landslides or mudflows, particularly in areas with loose soils.
- Vegetation: Vegetation can stabilise slopes by anchoring soil with roots. However, when vegetation is removed due to deforestation or land use changes, the stability decreases, making slopes more susceptible to mass wasting events.
- Geology and Soil Composition: The type and structure of underlying rocks and soils can influence their susceptibility to mass wasting. For instance, clay-rich soils are prone to sliding when wet, and certain rock layers can act as slip planes.

Interaction of Factors: These factors interact in complex ways to influence mass wasting events. For example, a steep slope with clay-rich soil that has been deforested is likely to experience more frequent and severe mass wasting during periods of heavy rainfall. Conversely, a well-vegetated gentle slope with stable rock composition is less likely to undergo mass wasting.

9.

a. Discussion on Types of Mass Wasting Processes

Landslides: Landslides involve the rapid movement of a large mass of earth materials down a slope. They are often triggered by factors such as heavy rainfall, earthquakes, or human activities like deforestation. The material involved in landslides can range from loose soil to large boulders. The characteristics of the landslide depend on the nature of the material; for example, landslides involving cohesive clay soils may move as a single mass, while those involving loose, granular material may flow more freely.

Rockfalls: Rockfalls occur when individual rocks or rock fragments break free from a steep slope or cliff. This process is often caused by weathering and erosion, which weaken the rock structure. The nature of the material typically hard, fractured rock affects the characteristics of rockfalls, resulting in rapid, sudden movements. The impacts of rockfalls are generally localised but can be severe, especially if they occur near roads or settlements.

Mudflows: Mudflows, also known as debris flows, involve the fast-moving flow of water-saturated earth material. They usually occur in areas with steep slopes and can be triggered by intense rainfall or volcanic activity. The nature of the material fine-grained and heavily saturated allows mudflows to travel quickly and cover large areas, causing significant damage to infrastructure and agriculture.

b. How the nature of the material involved influences the severity, predictability, and management of different mass wasting events

The nature of the material involved in mass wasting events plays a critical role in determining their characteristics, severity, and the strategies required for effective management. Unconsolidated materials such as clay, silt, and loose alluvium tend to produce rapid, high-volume flows like mudflows and earthflows. These events are often triggered by intense rainfall or saturation, as seen in parts of Ghana's Eastern Region where deforested slopes composed of lateritic soils have experienced destructive mudslides during the rainy season. The fine-grained texture and low cohesion of these materials allow them to mobilise quickly, making prediction difficult and requiring early warning systems based on rainfall thresholds and soil moisture monitoring.

In contrast, consolidated materials like jointed rock or fractured bedrock are more prone to rockfalls and landslides. These events are typically more localised but can be sudden and catastrophic, especially in steep terrain. For example, in the Akwapim-Togo Range, rockfalls have occurred due to weathering and seismic activity, posing risks to nearby settlements and transport routes. The predictability of such events depends on geological mapping and structural analysis, which can identify zones of weakness and guide land-use planning.

The interaction between material type and environmental conditions also influences impact severity. Saturated clay-rich soils may flow for long distances, affecting large areas, while dry granular materials may collapse abruptly but remain confined. Human activities such as mining, road construction, and deforestation exacerbate these risks by destabilising slopes and altering drainage patterns. In Ghana's gold mining zones, spoil heaps composed of loose overburden have triggered

slope failures, highlighting the need for engineered containment and vegetation restoration.

Effective management must be tailored to material characteristics. For unconsolidated soils, slope stabilisation through terracing, reforestation, and controlled drainage is essential. For rocky terrains, rock bolting, netting, and exclusion zones can reduce hazard exposure. Ultimately, integrating geotechnical data with community-based risk mapping offers the most resilient approach to mitigating mass wasting impacts across diverse environments.

10.

a. *Impacts of mass wasting on communities*

i. *Socio-Economic Life*

- Infrastructure Damage: Mass wasting can lead to the destruction of roads, bridges, and buildings, leading to costly repairs and disruptions in transportation and communication networks. This can hinder local businesses and economic activities, affecting livelihoods and income generation.
- Displacement and Housing: Landslides and other mass wasting events can displace communities, leading to temporary or permanent relocation. The loss of homes and land can result in social and economic instability for affected families, increasing poverty levels.
- Agricultural Losses: The removal of topsoil and fertile land due to mass wasting can severely impact agricultural productivity. This leads to reduced crop yields, food shortages, and loss of income for farmers, affecting the local economy and food security.

ii. *Environmental Conditions*

- Habitat Destruction: Mass wasting can destroy natural habitats, leading to a loss of biodiversity. The sudden movement of earth materials can bury ecosystems, disrupting plant and animal life.
- Water Quality Degradation: Sediments and debris from mass wasting events can pollute water bodies, affect aquatic life and make water unsafe for human consumption. This can lead to long-term environmental degradation and health issues for local communities.
- Landscape Alteration: Mass wasting reshapes the landscape, creating new landforms and altering natural drainage patterns. This can affect local ecosystems and the availability of natural resources, impacting both wildlife and human activities.

b. *Strategies to Mitigate Impacts of Mass Wasting*

- Vegetation Management: Planting trees and maintaining vegetation cover can stabilise slopes and reduce the risk of mass wasting. This strategy involves reforestation and controlled land use to prevent soil erosion and landslides.
- Infrastructure Planning: Designing and constructing infrastructure with mass wasting risks in mind can mitigate damage. This includes building retaining walls, proper drainage systems, and using geotechnical engineering techniques to reinforce vulnerable areas.

- Community Education and Preparedness: Educating communities about the risks of mass wasting and implementing early warning systems can enhance preparedness. Training on emergency response and evacuation procedures can reduce the impacts of mass wasting events on human life and property.
- Land Use Regulations: Implementing strict land use regulations can prevent construction and development in high-risk areas. This involves zoning laws and policies that restrict activities on unstable slopes and promote sustainable land management practices.

ANWERS TO REVIEW QUESTIONS 2

1. Introduction

- Clearly define the role of physical features in shaping human activities.
- Briefly mention examples of human activities that are influenced by physical features (e.g., farming, settlements, and transportation).

Description of Physical Features and Their Influence on Human Activities

- *Rivers and Drainage Systems*

  Description: Identify rivers or drainage systems on the map. Mention their direction, flow, or location.

  Influence on Human Activities: Explain how rivers support farming through irrigation, settlements due to water supply, and transportation by enabling trade or fishing.

- *Relief Features (e.g., Mountains, Hills, Valleys)*

  Description: Identify relief features such as mountains, hills, or valleys on the map. Indicate their elevation or slope characteristics.

  Influence on Human Activities: Explain how steep slopes limit farming but encourage tourism or mining, while valleys with fertile soils support agriculture and settlements.

- *Plains and Flat Lands*

  Description: Identify flat or gently sloping areas on the map.

  Influence on Human Activities: Explain how these areas are suitable for large-scale farming, dense settlements, and the construction of roads or railways.

Use of Map Evidence

Provide specific examples from the map to support their descriptions and analyses.

- Accurate identification of physical features such as rivers, mountains, or plains.
- Logical connection between the features and human activities (e.g., "The river in the southeastern corner supports farming through irrigation").

Conclusion: Summarise the role of physical features in influencing human activities.

2.

- Definition of Flooding: Define flooding as the overflow of water onto normally dry land, often caused by natural or human factors.
- Relevance of Physical Features: Briefly explain how physical features such as rivers, low-lying areas, and poor drainage systems contribute to flooding.

Identifying Physical Features Contributing to Flooding

- *Low-Lying Areas*

Description: Identify low-lying areas (e.g., floodplains or regions with closely spaced contour lines at low elevations).

Impact: Explain how these areas are prone to water accumulation during heavy rainfall or river overflow.

- *Rivers and Drainage Systems*

  Description: Identify rivers, streams, or drainage channels on the map.

  Impact: Explain how rivers may overflow during heavy rainfall, leading to flooding.
- *Poor Drainage or Wetlands*

  Description: Identify areas with wetlands, marshes, or swampy land.

  Impact: Explain how such areas retain water and contribute to flooding.
- *Steep Slopes and Runoff*

  Description: Identify steep slopes that lead to rapid water flow.

  Impact: Explain how these slopes increase surface runoff, overwhelming low-lying areas.

Proposing solutions to mitigate flooding based on the identified physical features:

- Improve Drainage Systems: Suggest constructing or maintaining drainage systems to channel excess water.

  Example: For instance, building culverts or storm drains in low-lying areas.
- Reforestation and Afforestation: Propose planting trees in steep slope areas to reduce surface runoff.

  Example: Mention reforestation efforts along riverbanks to stabilise soil and slow down water flow.
- Floodplain Zoning and Settlement Planning: Suggest restricting settlements and farming in flood-prone areas.

  Example: Propose relocating settlements from low-lying floodplains to higher ground.

Conclusion

- Summarise the impact of physical features on flooding and the importance of mitigating strategies.
- Recommend proactive measures such as early warning systems and community education.

3. Introduction

- Definition of Settlement Location and Function: Define settlement location as the geographical position of a settlement on a map, and settlement function as the role or purpose the settlement serves in the area.
- Relevance: Briefly explain that the location of a settlement often determines its function, such as trade, administration, farming, or transportation.

Analysing Features on the Map to Determine Settlement Function

Identify physical and human features surrounding the settlement on the map and explain how these features influence its function.

Physical Features

- Proximity to Rivers or Water Bodies

  Description: Identify if the settlement is near a river, lake, or coast.

  Function: Explain how this proximity supports fishing, water transportation, or trade.

Example: A settlement near the Volta River may function as a fishing or trading hub.

- Relief and Landforms

Description: Identify if the settlement is on a plain, plateau, or valley.

Function: Explain how flat lands support farming and dense settlements, while higher areas may serve as administrative hubs or tourist centres.

- Fertile Land/Agricultural Areas

  Description: Identify surrounding farmland or agricultural activities.

  Function: Explain how the settlement supports farming by acting as a service centre for agriculture.

Human Features

- Roads and Transport Networks

Description: Identify if the settlement is located at a road junction, along a highway, or near a railway.

  Function: Explain how this location makes the settlement a transportation or trading hub.

- Markets or Trade Centres

Description: Identify symbols for markets or trading areas near the settlement.

Function: Explain how the settlement facilitates local or regional trade.

- Administrative and Social Facilities

Description: Identify schools, hospitals, or government offices.

Function: Explain how these facilities indicate the settlement's administrative or service function.

Use of Specific Examples from the Map

- Accurate identification of features near the settlement (e.g., rivers, roads, markets).
- Logical explanation of how these features influence the settlement's function (e.g., "The settlement is located at a crossroads, making it a trading centre").

Conclusion: Summarise how the location of a settlement can indicates its function(s) based on the evidence of physical and human features from a map.

4. Introduction

- Definition of Rivers and Drainage Systems: Define rivers and drainage systems as natural watercourses and networks that collect and channel surface water.
- Relevance to Settlements: Briefly explain how rivers and drainage systems influence settlement location by providing water, supporting agriculture, and enabling trade and transportation.

Analysis of How Rivers and Drainage Systems Affect Settlements

Identify features on the map and explain their impact on settlement location.

- *Access to Water Supply*

- Identify rivers or drainage systems near settlements on the map. Example: A settlement located near a river may rely on it for drinking water and domestic use.
- Impact on Settlements: Explain how the availability of water encourages settlement growth and supports activities such as farming and urban development.

- *Support for Agriculture*
  - Identify areas where rivers and drainage systems provide irrigation for farmlands. Example: A settlement near fertile floodplains benefits from the nutrient-rich soil deposited by rivers during flooding.
  - Impact on Settlements: Explain how proximity to rivers supports crop cultivation and food security, thus attracting settlers.
- *Transportation and Trade*
  - Highlight rivers used for transportation or trade on the map. Example: Settlements along navigable rivers like the Volta might function as trade hubs.
  - Impact on Settlements: Explain how rivers enable the movement of goods and people, fostering economic activities and settlement growth.

Challenges of Rivers and Drainage Systems for Settlements

Discuss potential challenges posed by rivers and drainage systems near settlements.

- Flooding
  - Identify low-lying areas or floodplains prone to flooding on the map.
  - Impact: Explain how frequent flooding disrupts settlements and damages infrastructure.
- Waterborne Diseases
  - Mention stagnant water or poorly drained areas near settlements on the map.
  - Impact: Explain how stagnant water can lead to diseases like malaria or cholera, affecting settlement health and growth.

Conclusion: Summarise the influence of rivers and drainage systems on settlement location, highlighting their role in providing water, supporting agriculture, and enabling trade.

5. Introduction

- Definition of Relief Features: Define relief features as variations in elevation of the Earth's surface, such as hills, valleys, and plains, as represented on topographical maps.
- Relevance to Transport Networks: Briefly explain that relief features significantly influence the location, alignment, and construction of transportation networks like roads and railways.

Identifying Relief Features and Their Impact on Transportation

- Hills and Mountains
  - Description: Identify hills or mountains on the map using contour lines. Mention characteristics such as steep slopes (closely spaced contours) or rounded peaks.

- Impact on Transportation: Explain how steep slopes make construction challenging, leading to the use of tunnels, zigzag roads, or routes bypassing the area.
- Example: Railways avoid steep hills by using tunnels or gentle slopes.

- Valleys
  - Description: Identify valleys on the map using V-shaped contour patterns.
  - Mention whether the valley is wide or narrow.
  - Impact on Transportation: Explain how valleys with gentle slopes encourage the construction of roads or railways, as they often provide natural pathways.
  - Example: Roads and railways often follow river valleys to minimise construction costs and avoid steep gradients.
- Plains and Flat Lands
  - Description: Identify flat or gently sloping areas on the map with widely spaced contours.
  - Impact on Transportation: Explain how flat lands are ideal for constructing straight and cost-effective transportation networks.
  - Example: Highways are often built in flat regions as they require less effort in levelling or excavation.

Challenges Associated with Relief Features

- Steep Slopes and Construction Costs

  Description: Mention how building roads or railways on steep slopes increases costs and requires advanced engineering techniques.

  Explanation: Example: Roads may need retaining walls or zigzag alignments to navigate steep terrain.
- Flood-Prone Valleys

  Description: Discuss how valleys with rivers can flood, disrupting transportation.

  Explanation: Example: Bridges or elevated roads may be required to maintain connectivity in flood-prone areas.

Conclusion: Summarise how relief features such as hills, valleys, and plains significantly influence the layout and construction of transportation networks.

6. Introduction

- Define flooding as the overflow of water onto land and explain the role of rivers as natural drainage systems that support human activities such as farming, trade, and settlement.
- Mention that settlements near rivers often benefit from resources but face challenges such as flooding.

Analysis of How the River Impacts Human Activities

Focus on the specific impacts of the river on human activities as shown on the topographical map

Positive Impacts

- Water Supply

Description: The river provides water for drinking, domestic use, and irrigation.

Example/Impact: For instance, the settlement may use the river for agriculture or fishing.

- Economic Activities

  Description: The river supports trade and transportation, as settlements near rivers often act as trading hubs.

  Example/Impact: Goods may be transported along the river to other areas.

Negative Impacts

- Flooding

  Description: The settlement is located in a low-lying area or floodplain, making it prone to seasonal flooding.

  Example/Impact: Flooding damages property, farmlands, and disrupts economic activities.

- Health Risks

  Description: Stagnant water caused by flooding can lead to waterborne diseases such as malaria or cholera.

  Example/Impact: This negatively affects the health and productivity of the population.

- Infrastructure Damage

  Description: Roads, bridges, and houses near the river may be washed away or weakened by floods.

  Example/Impact: This interrupts transportation and increases rebuilding costs.

Proposing Solutions to Mitigate Flooding Challenges

- *Flood Control Measures*

  Description: Suggest building levees, embankments, or floodwalls to contain the river's overflow.

  Example: These structures can prevent water from reaching settlements during heavy rains.

- *Improved Drainage Systems*

  Description: Propose constructing drainage channels or improving existing ones to divert excess water.

  Example: This ensures that floodwater is quickly removed from settled areas.

- *Relocation and Zoning*

  Description: Suggest relocating settlements to higher ground or enforcing zoning laws to prevent construction in flood-prone areas.

  Example: This minimises the risk of property damage and loss of life.

Conclusion

- Summarise how the river benefits the settlement but also poses challenges due to flooding.
- Recommend sustainable practices like early warning systems, reforestation along riverbanks, and community education on flood preparedness.

7. Introduction

- Definition of Farming and Forest Reserves: Define farming as the cultivation of crops and livestock to support livelihoods, and forest reserves as protected areas of forest conserved for ecological balance and biodiversity.
- Relevance to the Question: Briefly explain how farming near forest reserves can create opportunities for human activities but also lead to conflicts, such as deforestation and habitat destruction.

Description of the Area on the Map

Learners should identify and describe the features of the area based on the topographical map.

- Farming Area

  Description: Identify the farming area using features such as farmlands, irrigation symbols, or flat terrain near the forest reserve.

  Impact: Explain how the farming area supports agricultural activities like crop cultivation or livestock rearing due to fertile soil or proximity to water sources.
- Forest Reserve

  Description: Identify the forest reserve on the map, using vegetation shading or labelled boundaries.

  Importance: Highlight the ecological role of the forest, such as habitat for wildlife, carbon storage, and prevention of soil erosion.

Explanation of Conflicts Between Farming and Forest Conservation

Analyse how the expansion of farming activities conflicts with forest conservation. Allocate marks based on the following points:

- Deforestation

  Description: Explain how farmers expand their farmlands by cutting down trees in the forest reserve.

  Impact: Discuss how deforestation leads to the loss of biodiversity and disruption of the forest ecosystem.
- Soil Erosion and Degradation

  Description: Explain how the removal of forest cover for farming exposes soil to erosion.

  Impact: Discuss how this reduces soil fertility and affects both farming and the forest ecosystem.
- Habitat Destruction and Wildlife Displacement

  Description: Explain how farming activities encroach on forest habitats, displacing wildlife.

  Impact: Discuss how this leads to reduced biodiversity and potential human-wildlife conflicts.
- Pollution and Overuse of Resources

  Description: Farming near forests often leads to pollution from fertilisers and pesticides.

Impact: This affects forest water systems and reduces the quality of resources available to the ecosystem.

Proposing Solutions to Address the Conflict

Provide practical solutions to mitigate conflicts between farming and forest conservation.

- Sustainable Farming Practices

  Description: Encourage agroforestry, crop rotation, and organic farming to balance farming needs with forest conservation.

  Example: Farmers can plant crops alongside trees to reduce deforestation and improve soil fertility.
- Implementation of Buffer Zones

  Description: Establish buffer zones between farmlands and forests to prevent encroachment.

  Example: Local authorities can create protected buffer areas around forest reserves.
- Community Education and Awareness

  Description: Educate farmers about the importance of conserving forests and introduce them to sustainable farming techniques.

  Example: Hold workshops or campaigns in farming communities near forest reserves.

Conclusion

- Summarise how farming near forest reserves creates opportunities for livelihoods but also poses significant risks to forest conservation.
- Recommend collaborative efforts between farmers, local authorities, and environmental organisations to balance farming and conservation needs.

ANSWERS TO REVIEW QUESTION 3

1. Introduction

- Define rapid population growth and briefly discuss its relevance to urban areas in Ghana.
- Mention examples of urban areas in Ghana experiencing rapid population growth, such as Accra, Kumasi, or Tamale.

Identify and explain any Challenges of Rapid Population Growth

- *Pressure on Infrastructure*

  Explain how rapid population growth overwhelms urban infrastructure like roads, electricity, and water supply.

  Provide examples such as traffic congestion in Accra or inadequate water supply in Kumasi.
- *Housing Shortages and Urban Slums*

  Discuss the shortage of affordable housing, leading to the growth of slums and informal settlements.

  Use examples such as Nima or Agbogbloshie in Accra to illustrate slum proliferation.
- *Strain on Social Services*

  Explain how rapid population growth overburdens healthcare, education, and sanitation services.

  Provide examples such as overcrowded schools or hospitals in urban areas.
- *Environmental Degradation*

  Analyse how rapid urbanisation leads to deforestation, pollution, and poor waste management.

  Highlight examples such as flooding in Accra due to poor drainage and waste disposal.

Conclusion

- Summarise the key challenges of rapid population growth in urban areas.
- Suggest practical solutions, such as improved urban planning, investment in infrastructure, and decentralisation of development.

2. *Define population growth and distribution and briefly explain why managing these challenges is critical for Ghana.*

Proposed Strategies

- Promoting Rural Development: Improve infrastructure, healthcare, education, and job opportunities in rural areas to reduce rural-urban migration. Example: Building modern schools and hospitals in underserved regions like the Northern Region.
- Implementing Family Planning Programs: Educate citizens on family planning and provide access to contraceptives to control high birth rates. Example: National campaigns by the Ghana Health Service to promote family planning in densely populated areas like Greater Accra.

- Availability of Economic Opportunities: Create job opportunities and industrial hubs in less developed regions to balance population distribution. Example: Establishing industrial parks in regions like the Savannah or Upper East Regions to reduce congestion in cities like Accra and Kumasi.
- Improving Urban Planning and Infrastructure: Expand and upgrade urban infrastructure to accommodate growing populations in cities. Focus on housing, transportation, and waste management. Example: Developing affordable housing projects in Accra and Kumasi to reduce overcrowding in slums like Nima.

Conclusion: Summarise the importance of implementing these strategies to address population growth and distribution challenges in Ghana. Highlight the need for collaboration between the government, private sector, and citizens.

3. Sketching the Map of Ghana

- Outline: A clear and accurate outline of Ghana with the correct shape and proportions.
- Regions Indicated: All 16 administrative regions labelled correctly.
- Map Essentials: Inclusion of a title, scale, compass direction, and key/legend to differentiate high and low population density areas.

Identification of High and Low Population Density Areas

- High Population Density Areas: Correctly identify and shade regions with high population density, such as:
  - Greater Accra Region (e.g., Accra and Tema)
  - Ashanti Region (e.g., Kumasi)
  - Western Region (e.g., Takoradi).
- Low Population Density Areas: Correctly identify and shade regions with low population density, such as:
  - Northern Region
  - Savannah Region
  - Oti Region.
- Key/Legend: Use appropriate symbols or colours to distinguish high and low-density areas.

Annotation of Reasons for Population Variations

- High Population Density: Provide two well-explained reasons for high population density areas. Example:
  - Economic activities: Urban centres like Accra and Kumasi attract people for jobs and trade opportunities.
  - Infrastructure: Regions with better transport, healthcare, and education facilities attract higher populations.
- Low Population Density: Provide two well-explained reasons for low population density areas. Example:
  - Harsh physical conditions: The Northern and Savannah regions experience arid conditions, discouraging settlement.
  - Limited economic opportunities: These regions lack industries and attract fewer job seekers.

4. *Explain population distribution*

a. Climatic Conditions

Influence Population Distribution

- Areas with favourable climatic conditions, such as high rainfall and moderate temperatures, tend to attract higher populations. For instance, southern Ghana, particularly the rainy coastal and forest zones, supports agriculture and human settlement due to fertile soils and a reliable water supply.
- On the other hand, regions with harsh climatic conditions, such as the arid savannah regions in northern Ghana, often have lower population densities due to limited agricultural productivity and water scarcity.

b. Economic Opportunities

Influence on Population Distribution

- Urban areas with abundant economic opportunities, such as jobs in industries, trade, and services, attract large populations. Regions with active economic hubs experience rapid population growth due to rural-urban migration. Examples are Greater Accra, Kumasi and Sekondi-Takoradi
- In contrast, rural and other areas with limited economic activities, such as subsistence farming, often experience low population densities. Examples are low population density areas like the Oti and Savannah regions, where economic opportunities are limited, and there is out-migration.

c. Access to Social Amenities

Influence on Population Distribution

- Areas with better access to social amenities, such as quality healthcare, education, electricity, and clean water, attract more people. Urban centres generally provide these amenities, resulting in higher population densities. Examples are the Greater Accra and Ashanti regions
- Conversely, rural areas with inadequate social services often experience low population densities, as people migrate to urban centres for better living conditions. Examples are the Northern and Savannah regions

5. Effects of Uneven Population Distribution on Socio-Economic Development

- *Strain on Resources in Densely Populated Areas*

  Explanation: Overpopulation in areas like Greater Accra places pressure on housing, healthcare, education, and infrastructure (e.g., roads and water supply). This leads to overcrowding, poor living conditions, and slum development.

  Example: Slums like Nima and Agbogbloshie in Accra face challenges such as inadequate sanitation and poor waste management.

- *Under-utilisation of Resources in Sparsely Populated Areas*

  Explanation: Sparsely populated areas, such as the Savannah and Oti regions, experience under-utilisation of natural resources, limited economic activities, and slower development due to a lack of human capital.

  Example: Limited industrial activities and poor access to markets in northern Ghana result in stagnant economic growth.

- *Imbalance in Economic Development*

  Explanation: Uneven population distribution leads to regional inequalities, where densely populated regions enjoy better infrastructure and economic opportunities, while sparsely populated regions lag.

  Example: Greater Accra and Ashanti regions dominate economic activities, while regions like the Upper East struggle with poverty and limited access to services.
- *Migration and Urbanisation Challenges*

  Explanation: Migration from rural to urban areas exacerbates urbanisation challenges, including unemployment, traffic congestion, and increased cost of living in cities.

  Example: Rural-urban migration has caused rapid population growth in Kumasi and Accra, leading to overcrowded schools and hospitals.

Conclusion

- Clear summary of the key effects of uneven population distribution on socio-economic development (e.g., resource strain, underdevelopment, inequality, urban challenges).
- Practical suggestions or forward-looking statements, such as the need for balanced regional development, improved infrastructure, decentralisation, or policy reforms.

6. Definition of Rural-Urban Migration: Define rural-urban migration as the movement of people from rural to urban areas in search of better living conditions and opportunities.

Strategies to Manage Rural-Urban Migration

- Promoting Rural Development: Develop rural areas by improving infrastructure (e.g., roads, electricity, water supply), healthcare, and education to make them more liveable and attractive. Example: Government programs like "Planting for Food and Jobs" to boost agricultural productivity and create employment in rural areas.
- Decentralising Economic Opportunities: Establish industries, factories, and businesses in rural areas to create jobs and reduce the need for migration to urban areas. Example: Setting up agro-processing factories through the "One District, One Factory" initiative to create employment opportunities in rural districts.
- Improving Access to Social Amenities in Rural Areas: Provide quality healthcare, education, and recreational facilities in rural areas to improve living standards and reduce migration to cities. Example: Building Community-based Health Planning and Services (CHPS) compounds in rural areas for better healthcare delivery.
- Urban Planning and Infrastructure Development: Improve urban infrastructure and services to manage the effects of migration, such as overcrowding, slums, and traffic congestion. Example: Expanding affordable housing schemes in cities like Accra and Kumasi to accommodate growing populations.

Conclusion

- Clear summary of the key strategies proposed to manage rural-urban migration (e.g., rural development, decentralisation, improved amenities, urban planning).
- Insightful closing statement that highlights the importance of coordinated efforts by

government, communities, and the private sector to ensure balanced development and reduce migration pressures.

7. Definition of Population Distribution: Define population distribution as the way people are spread across a given area.

Comparison of Population Distribution in Ghana and Other African Countries

- *Physical Factors Influencing Population Distribution*

  Explanation

  - In Ghana, areas with favourable climatic and physical conditions, such as the southern regions (Greater Accra and Ashanti), are densely populated. Similarly, other African countries, such as Egypt, have dense populations along the Nile River due to fertile land.
  - Sparsely populated areas in Ghana, such as the Northern and Savannah regions, are comparable to arid regions like the Sahara Desert in countries like Algeria and Mali.

  Example

  - Ghana: Southern regions with fertile soils and good rainfall.
  - Africa: Populations concentrated along rivers (e.g., the Nile in Egypt) and fertile highlands (e.g., Ethiopia).

- *Economic Opportunities and Urbanisation*

  Explanation

  - Ghana's urban centres, such as Accra and Kumasi, attract high population densities due to job opportunities and industrial activities. Similarly, cities like Lagos (Nigeria) and Nairobi (Kenya) experience high population densities due to economic opportunities.
  - In contrast, rural areas across Ghana and many African countries experience lower populations due to limited economic activities.

  Example

  - Ghana: Accra and Kumasi are economic hubs.
  - Africa: Lagos (Nigeria) and Johannesburg (South Africa) are highly urbanised and densely populated.

- *Access to Social Amenities*

  Explanation

  - In Ghana, regions with better access to healthcare, education, and infrastructure (e.g., Greater Accra) attract higher populations. Similarly, in African countries like South Africa, areas with developed infrastructure attract higher populations.
  - Areas with limited access to amenities, such as the Savannah Region in Ghana or rural parts of Chad, have lower population densities.

  Example

  - Ghana: Greater Accra has high-quality social services.
  - Africa: Urban centres like Cape Town (South Africa) attract dense populations.

- *Migration Trends and Population Distribution*

Explanation

- o Rural-urban migration in Ghana increases population densities in cities like Accra while depleting rural areas. Similarly, in countries like Nigeria and Kenya, rural-urban migration leads to overcrowding in cities such as Lagos and Nairobi.
- o Migration due to conflict or environmental challenges (e.g., droughts) also affects distribution in both Ghana and Africa.

Example

- o Ghana: Migration from the Northern Region to urban centres.
- o Africa: Refugee movements in countries like Sudan and Somalia cause uneven population distribution.

Conclusion

- Clear summary of the key factors influencing population distribution across Ghana and other African countries (e.g., physical geography, economic opportunities, access to amenities, migration).
- Insightful closing statement that highlights the importance of balanced development and strategic planning to address uneven population distribution across the continent.

8.

a. *Explanation of why African migrants move to other parts of the world*

Push Factors

Explanation of factors pushing Africans to leave their home countries, such as:

- Poverty and lack of economic opportunities.
- Political instability, conflicts, and insecurity.
- Environmental challenges such as droughts and desertification.

Pull Factors

Explanation of factors attracting Africans to other parts of the world, such as:

- Better job opportunities and higher wages.
- Access to quality education and healthcare.
- Political stability and improved living conditions.

Examples are movement to Europe and America for industrial jobs and movement to the Gulf states for domestic and other jobs

b. How migration of Africans affects both the source region and the destination

- Source Region

  Positive Impacts

  Remittances sent back home improve household incomes and support local economies. Migrants gain skills abroad and may return to contribute to development.

  Negative Impacts

  Loss of skilled labour (brain drain), reducing capacity for economic growth. Rural areas experience depopulation and reduce agricultural productivity.

- Destination Region

  Positive Impacts

  Migrants provide labour for industries and services that may face shortages. Cultural diversity and exchange enrich the host society.

  Negative Impacts

  Overpopulation in urban areas may strain resources like housing and healthcare. Social tensions or xenophobia may arise due to competition for jobs.

9.

- Promote Job Creation and Economic Development: Governments should invest in industries, agriculture, and entrepreneurship to create jobs and reduce the need for migration. Example: Ghana's "One District, One Factory" initiative aims to create jobs in rural areas.
- Improve Access to Quality Education and Skills Development: Provide accessible and high-quality education to equip citizens with skills for local job markets. Example: Technical and vocational education programs in Kenya to reduce youth unemployment.
- Enhance Regional Cooperation and Integration: Encourage regional trade and free movement of labour within Africa to reduce external migration. Example: The African Continental Free Trade Area (AfCFTA) facilitates economic growth and trade among African nations.
- Support Diaspora Engagement Policies: Encourage African migrants to send remittances, invest in their home countries, and share knowledge gained abroad. Example: Ethiopia's diaspora policy encourages investment in local businesses.

ANSWERS TO REVIEW QUESTION 4

1. Introduction

Definition of Tourism and Its Relevance: Define tourism as the movement of people for leisure, cultural, or recreational purposes and explain its socio-economic significance in Ghana.

Overview: Briefly state that tourism creates jobs directly and indirectly across various sectors such as hospitality, transportation, and cultural heritage sites.

- *Employment in Hospitality and Accommodation*

  Explanation: Tourism boosts the demand for hotels, guesthouses, and resorts, creating jobs for hotel staff, housekeeping, and catering services.

  Sector Link: The hospitality sector benefits directly from the influx of tourists.

  Example: Cape Coast and Elmina (Central Region) attract tourists visiting the Cape Coast Castle and Elmina Castle, leading to job creation in nearby hotels and restaurants.

- *Employment in Transportation*

  Explanation: Tourists require transport services to travel between attractions, creating jobs for drivers, tour operators, and car rental services.

  Sector Link: The transportation sector benefits from increased demand for mobility.

  Example: Mole National Park (Northern Region) attracts safari tourists, boosting jobs for local drivers and tour guides.

- *Employment in Cultural and Heritage Sites*

  Explanation: Tourism supports jobs related to managing and maintaining cultural and historical sites, as well as offering cultural performances and souvenirs.

  Sector Link: Cultural tourism directly involves locals in showcasing their traditions.

  Example: The Kwahu Easter Festival (Eastern Region) employs locals performing traditional dances or selling crafts.

- *Employment in Local Markets and Craft Industries*

  Explanation: Tourists purchase locally made goods such as handicrafts, textiles, and artwork, creating jobs for artisans and traders.

  Sector Link: The craft and retail sectors benefit from the influx of tourists.

  Example: Kente weaving in Bonwire (Ashanti Region) generates jobs for weavers who sell their products to visiting tourists.

Conclusion: Summarise the role of tourism in creating jobs across multiple sectors, emphasising how it contributes to the Ghanaian economy.

2.

- Definition of Tourism and Trade: Define tourism as the movement of people for leisure, cultural, or recreational purposes, and trade as the exchange of goods and services to support economic activities.

- Relevance: Briefly explain that tourism promotes trade by creating demand for local goods and services, thereby increasing economic activities in Ghana.

Ways Tourism Supports the Trade Sector

- Promotion of Local Handicrafts and Artworks

  Explanation: Tourism creates a market for locally made goods such as beads, kente cloth, carvings, and paintings, which are sold to visitors.

  Sector Link: This boosts the craft and retail sectors, offering opportunities for artisans and traders.

  Example: Bonwire (Ashanti Region) is known for kente weaving, which attracts tourists and promotes trade in textiles.

- Increased Demand for Food and Agricultural Products

  Explanation: Tourism increases the demand for food and beverages in hotels, restaurants, and local markets, supporting agricultural and agro-processing sectors.

  Sector Link: Farmers and food traders benefit from the increased consumption by tourists.

  Example: Lake Bosomtwe (Ashanti Region) attracts tourists, which creates demand for fresh fish, vegetables, and locally processed foods.

- Growth in the Retail Sector

  Explanation: Tourists purchase goods such as souvenirs, clothing, and jewellery from local shops and markets, boosting retail trade.

  Sector Link: The retail sector directly benefits as tourists spend money in markets and shopping centres.

  Example: Accra's Art Centre is a hub for selling souvenirs and crafts to international and domestic tourists.

- Trade in Tourism Services

  Explanation: Tourism supports the trade of services such as transportation, tour guiding, and event planning, which are essential for travel experiences.

  Sector Link: Service providers like car rentals, tour operators, and cultural performers benefit from tourism.

  Example: Mole National Park (Northern Region) attracts tourists who use local transportation and hire guides, boosting the service economy.

  Conclusion: Summarise how tourism supports trade through the promotion of local goods, services, and economic activities.

3.

- Definition of Transportation Infrastructure and Accessibility: Define transportation infrastructure as the network of roads, railways, airways, and waterways that facilitate the movement of people and goods. Define accessibility as the ease with which people can reach tourist sites.
- Relevance: Briefly explain the importance of transportation infrastructure in promoting tourism by enabling easier access to tourist sites.

Analysis of the Relationship Between Transportation Infrastructure and Accessibility

- Roads and Highways: Well-maintained roads and highways improve accessibility to tourist sites by enabling convenient travel for both domestic and international tourists.

  Impact: Roads reduce travel time and connect urban centres to rural tourist destinations.

  Example: The Accra-Cape Coast Road improves accessibility to Cape Coast Castle and Kakum National Park.

- Railways can connect major urban centres to tourist sites, making travel more cost-effective and efficient.

  Impact: The availability of railways encourages group travel and reduces congestion on roads.

  Example: The potential redevelopment of Ghana's railway system could improve access to sites like Mole National Park.

- Air Transport: Air transport connects international and domestic tourists to remote or distant sites.

  Impact: Airports close to tourist destinations reduce travel time and increase convenience.

  Example: Tamale Airport enhances access to Mole National Park in Northern Ghana.

- Waterways: Waterways provide alternative access to areas near rivers, lakes, or coastal tourist destinations.

  Impact: They support tourism activities such as boat tours and water-based recreation.

  Example: The Volta River supports tourism in areas like Akosombo and Ada.

  Challenges Affecting Transportation Infrastructure and Accessibility

- Poor Road Conditions: Many rural roads leading to tourist sites are poorly maintained, making travel difficult and unsafe. Example: The poor road network to Wli Waterfalls in the Volta Region reduces visitor numbers.

- Inadequate Investment in Infrastructure: Limited funding for transportation infrastructure development restricts access to remote tourist sites. Example: The lack of rail transport to areas like Mole National Park hinders accessibility.

  Conclusion

- Summarise the importance of transportation infrastructure in improving accessibility to tourist sites and its role in promoting tourism in Ghana.
- Suggest strategies such as increased investment in transportation networks and maintenance to improve accessibility.

4.

- Definition of Trade and Regional Development: Define trade as the exchange of goods and services, and regional development as the economic and infrastructural growth of specific areas within a country.

- Relevance to Ghana: Briefly explain that trade plays an essential role in improving infrastructure, creating jobs, and enhancing economic activities in Ghana's regions.
- Infrastructure Development: Trade stimulates the development of infrastructure such as roads, bridges, and storage facilities to facilitate the movement of goods and services.

  Development Outcome: Improved infrastructure enhances connectivity between regions and supports economic activities.

  Example: The construction of the Tema Harbour has boosted trade in the Greater Accra Region, improving transportation networks across the country.
- Job Creation

  Explanation: Trade creates employment opportunities in areas such as transportation, retail, and warehousing.

  Development Outcome: These jobs support income generation, reducing poverty and improving living standards in the regions.

  Example: The cocoa trade in the Ashanti and Western Regions has created jobs for farmers, transporters, and traders in local markets.
- Revenue Generation for Regional Governments

  Explanation: Regional governments benefit from taxes and levies imposed on traded goods, which are reinvested in local development projects.

  Development Outcome: This revenue supports the provision of social services such as healthcare, education, and sanitation.

  Example: Revenue from trade in shea butter in the Northern Region has been used to fund local education and healthcare initiatives.
- Promotion of Inter-Regional Trade and Economic Integration

  Explanation: Trade promotes economic integration by encouraging the exchange of goods and services between different regions in Ghana.

  Development Outcome: This fosters regional interdependence, enhancing cooperation and reducing economic disparities.

  Example: The Volta Region supplies fish to other regions, while the Ashanti Region provides kente cloth, demonstrating mutual benefit through inter-regional trade.

Conclusion

- Summarise how trade contributes to regional development in Ghana by improving infrastructure, creating jobs, generating revenue, and fostering economic integration.
- Suggest strategies such as expanding trade networks, improving road infrastructure, and investing in local industries to maximise the benefits of trade.

5.

Introduction

- Definition of Transportation Networks and Trade: Define transportation networks as systems of interconnected roads, railways, waterways, and airways that facilitate the movement of goods and people. Define trade as the exchange of goods and services.

- Relevance: Briefly explain that poor transportation networks create barriers to trade by limiting market access, increasing transportation costs, and reducing trade efficiency.

Ways Poor Transportation Networks Hinder Trade

- *Limited Access to Markets*

  Explanation: Poor road networks in rural areas make it difficult for farmers and traders to access urban markets, leading to reduced income and trade opportunities.

  Impact: Limited access results in wasted agricultural produce and discourages investment in commercial farming.

  Example: Farmers in remote parts of the Northern and Upper East Regions face challenges transporting crops like millet and sorghum to major markets.

- *Increased Transportation Costs*

  Explanation: Poorly maintained roads and long travel times increase fuel consumption and vehicle maintenance costs, making goods more expensive.

  Impact: Higher transportation costs reduce the competitiveness of locally produced goods in both domestic and international markets.

  Example: Traders moving goods from farming areas in the Volta Region to Accra face high transportation costs due to deteriorated road conditions.

- *Reduced Trade Efficiency*

  Explanation: Poor infrastructure, such as inadequate railways or waterways, leads to delays in the movement of goods, reducing trade efficiency.

  Impact: Delays can cause perishable goods like vegetables or fish to spoil, reducing profits for farmers and traders.

  Example: The lack of railway connections between Kumasi and other regions limits the efficient transport of cocoa and timber for export.

  - *Unequal Regional Development*

  Explanation: Poor transportation leads to economic isolation in remote regions, as these areas are unable to participate fully in trade activities.

  Impact: This creates disparities in regional development, with urban centres advancing while rural areas remain underdeveloped.

  Example: The Western Region, rich in timber resources, faces challenges getting timber to processing centres due to poor road networks.

Conclusion: Summarise how poor transportation networks hinder trade by limiting market access, increasing costs, and creating regional disparities.

6. Introduction

- Definition of Competition from Imported Goods: Explain that competition from imported goods occurs when foreign products dominate local markets, often due to lower prices, perceived higher quality, or greater availability.
- Relevance to Ghana's Economy and Trade Sector: Briefly explain that this competition can negatively impact local industries by reducing their market share, profitability, and ability to grow.

Ways Competition from Imported Goods Affects Local Industries

- Reduction in Market Share for Local Industries

  Explanation: Imported goods, often cheaper or perceived as higher quality, reduce demand for locally produced goods.

  Impact: Local industries struggle to sell their products, leading to reduced revenue and stunted growth.

  Example: The influx of imported rice from Asia has reduced the market share of locally produced rice in regions like Volta and Northern Ghana.

- Closure of Local Industries

  Explanation: Intense competition forces some local industries to shut down due to their inability to compete with cheaper imports.

  Impact: This leads to job losses and reduces economic activity in affected regions.

  Example: Several textile factories in Ghana, such as those in Tema and Accra, have closed due to competition from imported fabrics from China.

- Loss of Jobs in Local Industries

  Explanation: When local industries lose market share or shut down, workers in these industries lose their jobs.

  Impact: Unemployment increases, leading to reduced household incomes and increased poverty.

  Example: The decline of the Ghanaian poultry industry due to cheap imported chicken has led to job losses for farmers and factory workers.

- Reduced Investment in Local Manufacturing

  Explanation: Investors may be discouraged from funding local industries due to the dominance of imported goods in the market.

  Impact: This limits the growth and modernisation of local industries, reducing their ability to compete.

  Example: Limited investment in Ghana's footwear industry has been linked to the influx of imported shoes.

Impact on Ghana's Economy and Trade Sector

- Negative Trade Balance: The reliance on imported goods increases imports while reducing exports, leading to a trade deficit. Example: Ghana imports large quantities of consumer goods such as electronics and processed foods, while exporting fewer locally manufactured products.
- Low Economic Growth: The decline of local industries reduces their contribution to GDP and limits job creation. Example: The collapse of the textile and poultry industries has slowed industrial growth in Ghana.

Conclusion

- Summarise how competition from imported goods affects local industries, leading to reduced market share, job losses, and a negative trade balance.
- Suggest strategies such as promoting local production, reducing import dependence, and enforcing trade policies to protect local industries.

7. Introduction

- Definition of Trade and Manufacturing Industries: Define trade as the exchange of goods and services, and manufacturing as the processing of raw materials into finished or semi-finished products.
- Relevance: Briefly explain that trade provides the necessary linkages between raw material suppliers, manufacturers, and consumers, thereby driving the development of manufacturing industries in Ghana.

Ways Trade Contributes to the Growth of Manufacturing Industries

- Provision of Raw Materials: Trade facilitates the supply of raw materials needed for manufacturing, either from domestic sources or imports.

  Link to Manufacturing Sector: This ensures that industries have a steady supply of inputs to process into finished goods.

  Example: The importation of crude oil supports the operations of Tema Oil Refinery, which processes it into petroleum products.

- Expansion of Markets for Finished Goods: Trade provides access to both domestic and international markets, creating demand for locally manufactured goods.

  Link to Manufacturing Sector: Increased demand encourages manufacturers to expand production and improve product quality.

  Example: Ghanaian chocolate and processed cocoa products are exported to Europe and North America, boosting the cocoa processing industry.

- Technology and Equipment Importation: Trade enables the importation of advanced machinery and technology, which improves production efficiency in manufacturing industries.

  Link to Manufacturing Sector: Access to modern equipment enhances the competitiveness of local industries.

  Example: The importation of textile machinery has improved production in Ghana's textile industry.

- Generation of Revenue to Support Manufacturing: Revenue from trade, such as taxes and export earnings, is reinvested in developing manufacturing industries.

  Link to Manufacturing Sector: Governments and private investors use trade revenue to build factories, improve infrastructure, and provide incentives to manufacturers.

  Example: Revenue from the export of gold and timber has been used to support industrial parks in Ghana, such as the Tema Industrial Area.

Conclusion: Summarise how trade contributes to the growth of manufacturing industries by providing raw materials, expanding markets, enabling technology transfer, and generating revenue.

8. Introduction

- Definition of Communication Networks: Define communication networks as systems that facilitate the exchange of information through technologies such as mobile phones, the internet, and other digital platforms.

- Relevance to Business and Education in Ghana: Briefly explain that communication networks play a significant role in improving efficiency, accessibility, and productivity in Ghana's business and education sectors.

Role of Communication Networks in Enhancing Business Operations

- Facilitating E-Commerce and Online Marketing: Communication networks enable businesses to advertise and sell products online, reaching a wider customer base.

  Link to Business Activities: Mobile phones and internet platforms like social media and e-commerce websites allow businesses to showcase their products and interact with customers.

  Example: Small businesses in Accra use platforms like Jumia and Tonaton to sell goods and services.

  Impact: Increases business visibility, customer engagement, and sales revenue.

- Enhancing Communication and Coordination: Mobile phones and internet services allow businesses to communicate efficiently with suppliers, employees, and customers.

  Link to Business Activities: Businesses use mobile technology for real-time updates on deliveries and transactions.

  Example: Cocoa farmers in the Ashanti Region use mobile platforms to track market prices and coordinate with buyers.

  Impact: Improves productivity, reduces delays, and builds stronger business relationships.

Role of Communication Networks in Enhancing Education

- Access to Online Learning Platforms: The internet provides access to online learning resources and platforms, enabling students and teachers to access educational materials.

  Link to Education Activities: Platforms like Zoom, Google Classroom, and YouTube are widely used for virtual classes, tutorials, and research.

  Example: During the COVID-19 pandemic, students across Ghana used virtual platforms to continue their education.

  Impact: Promotes continuous learning, even in times of disruption.

- Improving Communication Between Teachers, Students, and Parents: Mobile phones and internet services improve communication between educators, students, and parents, ensuring effective coordination.

  Link to Education Activities: Teachers use communication apps to send assignments and updates to students and parents.

  Example: Schools in Accra use WhatsApp groups to share homework and important announcements with parents.

  Impact: Enhances collaboration, ensures accountability, and improves student performance.

Conclusion

- Summarise how communication networks improve business operations and education by enhancing efficiency, accessibility, and productivity.
- Suggest strategies such as expanding internet access to rural areas and investing in digital infrastructure to maximise the benefits of communication networks.

9.

- Definition of Traffic Congestion and Economic Productivity: Define traffic congestion as the overcrowding of vehicles on roads leading to delays, and economic productivity as the efficiency with which resources are used to produce goods and services.
- Relevance to Urban Areas in Ghana: Briefly explain that traffic congestion in cities like Accra and Kumasi hinders economic productivity by increasing transportation costs, delaying goods and services, and reducing work efficiency.

Impact of Traffic Congestion on Economic Productivity

- Increased Transportation Costs: Traffic congestion leads to higher fuel consumption and vehicle maintenance costs, increasing the cost of transporting goods and services.

  Link to Economic Activities: This reduces profit margins for businesses and raises the cost of goods for consumers. Example: Businesses in Accra spend more on transportation due to prolonged traffic on major roads like the Accra-Tema motorway.

- Delays in the Movement of Goods and Services: Congestion causes delays in delivering goods to markets and services to customers, reducing efficiency in trade and commerce.

  Link to Economic Activities: This disrupts supply chains and results in financial losses for businesses. Example: Traders in Kumasi's Kejetia Market face delays in receiving supplies due to traffic congestion on feeder roads.

- Reduced Worker Productivity: Workers spend hours in traffic, leading to late arrivals at work and reduced working hours.

  Link to Economic Activities: This decreases overall productivity and negatively impacts business performance. Example: Employees commuting from Madina to central Accra face long delays, affecting their output.

- Environmental and Health Costs: Congestion increases air pollution from vehicle emissions, leading to higher healthcare costs and reduced quality of life.

  Link to Economic Productivity: Poor health reduces worker efficiency and increases absenteeism. Example: The high level of emissions along Ring Road in Accra contributes to respiratory illnesses, reducing productivity.

Proposing Solutions to Address Traffic Congestion

- Development of Public Transportation Systems

  Explanation: Invest in efficient public transport systems such as buses or light rail to reduce the number of private vehicles on the road.

Link: This reduces road congestion and makes travel faster and more affordable.

Example: The Bus Rapid Transit (BRT) system in Accra has been introduced to reduce congestion.

- Construction of Bypass Roads and Flyovers

  Explanation: Build bypass roads and flyovers to divert traffic from congested urban centres.

  Link: This reduces bottlenecks at major intersections and improves traffic flow.

  Example: The Pokuase Interchange has eased traffic on the Accra-Nsawam road.

- Implementation of Traffic Management Systems

  Explanation: Use technology such as traffic lights, GPS navigation, and real-time traffic monitoring to manage traffic flow.

  Link: This minimises delays and optimises road usage.

  Example: Accra's smart traffic lights at key intersections help improve traffic coordination.

Conclusion

- Summarise how traffic congestion in urban areas like Accra and Kumasi affects economic productivity through increased costs, delays, and reduced efficiency.
- Recommend and justify sustained investments in public transport, road infrastructure, and traffic management to address congestion challenges.

10.

- Definition of the Railway Sector and Its Importance: Define the railway sector as a transportation system that facilitates the movement of goods and passengers over long distances. Highlight its importance in reducing road traffic, supporting trade, and promoting industrial development.
- Relevance to Economic Development: Briefly explain that revitalising the railway sector can improve connectivity, reduce transportation costs, and drive regional development in Ghana.

  Proposed Strategies to Revitalise the Railway Sector

- Investment in Modern Railway Infrastructure

  Explanation: Build new railway lines and upgrade existing ones with modern technology to improve efficiency and reliability.

  Link: Modern infrastructure reduces delays, improves safety, and attracts more users.

  Example: Upgrade the Accra-Tema railway line to enhance the transportation of goods from the Tema Port to inland markets.

- Public-Private Partnerships (PPP)

  Explanation: Collaborate with private companies to provide funding, expertise, and management for railway development projects.

  Link: PPPs reduce the financial burden on the government and bring in technical expertise to improve operations.

Example: Partnerships with international companies to develop the Western Railway Line for transporting bauxite and manganese.

- Expanding Railway Networks to Key Economic Zones

  Explanation: Extend railways to connect major economic hubs, industrial zones, and agricultural areas to ports and urban centres.

  Link: This improves the movement of goods, reduces transportation costs, and boosts trade activities.

  Example: Extend railways to the Northern Region to facilitate the transportation of agricultural produce like yams and shea butter.

- Promotion of Passenger Rail Services

  Explanation: Develop affordable and reliable passenger railway services to reduce road congestion and improve accessibility.

  Link: Affordable rail services encourage more people to use trains, reducing pressure on road networks and boosting productivity.

  Example: Introduce efficient commuter trains between Kumasi and Accra to ease road traffic and support urban commuters.

Conclusion: Summarise how the proposed strategies investment, partnerships, network expansion, and passenger services can revitalise Ghana's railway sector.

ANSWERS TO REVIEW QUESTION 5

1.

- **Definition of Climate Change:** Climate change is defined as long-term changes in temperature, precipitation, and atmospheric conditions, primarily caused by both natural and human factors.
- **Relevance to Ghana:** Briefly explain that climate change in Ghana is due to a combination of human activities, such as deforestation and industrial emissions and natural processes, such as changes in weather patterns.
  - Cause 1: Deforestation
  - Cause 2: Industrial Emissions
  - Cause 3: Agricultural Practices
  - Cause 4: Fossil Fuel Combustion

  For each cause mentioned, consider these points;
    - Explanation of the cause.
    - Connection to climate change in Ghana.
    - Real-world example from Ghana.
    - Demonstration of understanding through analysis.
- **Summary: Summarise the four causes of climate change in Ghana and emphasise** their contribution to rising temperatures, erratic rainfall, and environmental degradation.
- **Recommendations:** Suggest measures such as reforestation, promoting renewable energy, and reducing emissions to mitigate climate change impacts in Ghana.

2.

- **Rising Temperatures (4 Marks)**
  - Evidence: Average temperatures across Ghana have increased over the past decades.
  - Link to Climate Change: This warming trend aligns with global patterns of greenhouse gas accumulation.
  - Ghana Example: Northern Ghana has recorded temperature increases exceeding 1°C since the 1960s.
  - Impact: Higher temperatures exacerbate drought conditions, reduce crop yields, and increase heat-related illnesses.
- **Erratic Rainfall Patterns (4 Marks)**
  - Evidence: Rainfall has become increasingly unpredictable, with shifts in onset and cessation dates.
  - Link to Climate Change: Climate change disrupts atmospheric circulation, affecting precipitation cycles.

- Ghana Example: The Upper East Region now experiences shorter rainy seasons and prolonged dry spells.
- Impact: This affects agricultural planning, water availability, and food security.

- **Rising Sea Levels and Coastal Flooding (4 Marks)**
  - Evidence: Coastal areas are experiencing more frequent tidal surges and erosion.
  - Link to Climate Change: Melting polar ice and thermal expansion of oceans contribute to sea-level rise.
  - Ghana Example: Communities like Keta and Ada have lost land and homes to coastal erosion.
  - Impact: Displacement of populations, loss of livelihoods, and damage to infrastructure.
- **Increased Frequency of Extreme Weather Events (4 Marks)**
  - Evidence: Ghana faces more frequent floods, droughts, and storms.
  - Link to Climate Change: A warming climate intensifies the hydrological cycle, increasing the severity of weather events.
  - Ghana Example: The 2022 floods in Accra caused widespread damage and displaced thousands.
  - Impact: Strains emergency response systems, disrupts economic activities, and threatens lives.

3. *For each point mentioned, consider the following in your comparison.*

a. **Evidence in the Northern Region.**
- Description of the evidence (e.g., desertification, prolonged droughts).
- Link to climate change (e.g., rising temperatures, reduced rainfall).
- Example (e.g., desertification in the Savannah zones).
- Impact on livelihoods (e.g., reduced agricultural productivity, livestock losses).
- Comparison to the South (e.g., drier conditions compared to wetter conditions in the South).

Evidence in the Southern Region
- Description of the evidence (e.g., increased flooding, rising sea levels).
- Link to climate change (e.g., melting ice caps contributing to sea-level rise).
- Example (e.g., coastal flooding in Keta and Ada).
- Impact on livelihoods (e.g., displacement of communities, loss of farmland).
- Comparison to the North (e.g., wetter conditions compared to the dry north).

b.
- **Geographical Context:** Ghana has diverse geographical features, including the arid north and the wet, coastal south, influencing how climate change impacts these areas.
- **Relevance of Socio-Economic Activities:** Activities such as agriculture, fishing, and urbanisation determine the severity of climate impacts.
- **Differences Based on Geography**

- Description of geographical differences (e.g., arid Savannah in the north vs. coastal areas in the south).
- Link to climate impacts (e.g., desertification in the north vs. flooding in the south).
- Example (e.g., drought in Northern Ghana reduces crop yields, while coastal flooding in Keta displaces communities).

- **Differences Based on Socio-Economic Activities**
  - Description of socio-economic activities (e.g., agriculture in the north vs. fishing and urban development in the south).
  - Link to climate impacts (e.g., reduced rainfall affects farming in the north, while rising sea levels threaten fishing in the south).
  - Example (e.g., farmers in the north face food insecurity due to erratic rainfall, while urban flooding disrupts businesses in Accra).

4. *Impacts of Climate Change on Specific Socio-Economic Activities*

- **Impact on Agriculture**
  - **Description:** Erratic rainfall patterns, prolonged droughts, and rising temperatures reduce crop yields.
  - **Explanation:** Climate change disrupts traditional farming seasons and reduces soil fertility.
  - **Example**: Northern Ghana faces persistent droughts, leading to failed harvests of staple crops such as maize and millet.
  - **Impact Analysis:** Reduced yields lead to food insecurity, loss of income for farmers, and rural-urban migration.
- **Impact on Fishing**
  - **Description:** Rising sea temperatures and coastal erosion deplete fish stocks and disrupt fishing activities.
  - **Explanation:** Warmer waters affect fish breeding cycles, while rising sea levels threaten coastal fishing villages.
  - **Example:** Declining fish stocks in communities such as Ada and Keta have reduced incomes for fisherfolk.
  - **Impact Analysis:** This leads to increased unemployment, reduced protein intake, and reliance on imported fish.
- **Impact on Settlement Patterns**
  - **Description:** Rising sea levels and extreme weather events, such as floods, displace coastal communities.
  - **Explanation:** Coastal erosion and frequent flooding force communities to relocate inland.
  - **Example:** Coastal flooding in Keta and Ada has displaced thousands of residents, leading to loss of homes and farmlands.
  - **Impact Analysis:** This causes overcrowding in urban centres, increased poverty, and pressure on urban infrastructure.

Strategies to Mitigate Impacts

- **Promote Climate-Resilient Agriculture**
  - **Explanation:** Introduce drought-resistant crop varieties, efficient irrigation systems, and agroforestry practices.
  - **Example:** Farmers in Northern Ghana can adopt drought-resistant maize varieties to ensure stable harvests.
- **Sustainable Fisheries Management**
  - **Explanation:** Implement policies to regulate overfishing, establish marine protected areas, and train fisherfolk in alternative livelihoods.
  - **Example:** Communities in Ada can be trained in aquaculture to reduce reliance on depleting wild fish stocks.
- **Coastal Zone Management**
  - **Explanation:** Construct sea defence, restore mangroves, and relocate vulnerable settlements.
  - **Example:** The Keta Sea Defence project has helped protect farmlands and homes from coastal erosion.

5. *Five Adaptation Strategies*

- **Promote Climate-Resilient Crop Varieties**
  - **Explanation:** Introduce drought-tolerant and heat-resistant crops to withstand extreme climatic conditions.
  - **Link to Climate Adaptation:** Ensures stable crop yields despite erratic rainfall and rising temperatures.
  - **Example:** Farmers in Northern Ghana can adopt drought-resistant maize varieties like "Drought Tego" to improve food security.
- **Efficient Irrigation and Water Management**
  - **Explanation:** Develop irrigation systems such as drip irrigation and water harvesting techniques to ensure a consistent water supply.
  - **Link to Climate Adaptation:** Reduces dependence on unpredictable rainfall and prevents water scarcity during dry seasons.
  - **Example:** The Ghana Irrigation Development Authority (GIDA) promotes small-scale irrigation systems for farmers in drought-prone areas.
- **Agroforestry Practices**
  - **Explanation:** Integrate trees into farmlands to reduce soil erosion, improve soil fertility, and provide shading for crops.
  - **Link to Climate Adaptation:** Enhances ecosystem resilience, reduces the impact of extreme heat, and supports sustainable farming.
  - **Example:** Agroforestry projects in the Brong-Ahafo Region combine yam farming with trees to improve yields and protect the soil.

- **Climate-Smart Agricultural Practices**
  - **Explanation:** Employ techniques such as crop rotation, conservation tillage, and organic fertilisers to improve soil health and reduce greenhouse gas emissions.
  - **Link to Climate Adaptation:** Increases productivity while minimising environmental degradation caused by farming.
  - **Example:** Farmers in the Volta Region practice crop rotation to maintain soil fertility and reduce pest infestations.
- **Access to Climate Information and Extension Services**
  - **Explanation:** Provide farmers with real-time weather forecasts, climate data, and advice on appropriate farming techniques.
  - **Link to Climate Adaptation:** Enables farmers to make informed decisions on planting, harvesting, and resource management.
  - **Example:** The Ghana Meteorological Agency collaborates with local radio stations to provide weather updates to farmers in rural areas.

Conclusion

- *Summarise the five strategies: climate-resilient crops, irrigation, agroforestry, climate-smart agriculture, and access to climate information.*
- *Recommend increased government support, investment in agricultural technology, and international collaboration to ensure successful implementation of these strategies.*

6. *Define climate change as long-term changes in weather patterns caused by natural processes and human activities, and its impact on specific regions. Briefly state how Northern Ghana and coastal areas face unique climate-related challenges (e.g., desertification in the north and flooding in coastal areas), requiring tailored adaptation strategies.*

Adaptation Strategies in Northern Ghana

- **Description of Strategies:** Explain key strategies to combat desertification and drought, such as:
  - **Reforestation and Afforestation**: Planting trees to reduce soil erosion and improve moisture retention.
  - **Rainwater Harvesting**: Collecting and storing rainwater for irrigation and domestic use.
  - **Agroforestry**: Integrating trees and crops to improve soil fertility and prevent land degradation.
- **Examples:** Provide specific examples, such as reforestation initiatives in the Savannah zones or the use of drought-resistant crops like millet and sorghum.
- **Analysis:** Discuss how these strategies build resilience in farming communities and mitigate desertification.

Adaptation Strategies in Coastal Areas

- **Description of Strategies:** Explain key strategies to manage sea-level rise and flooding, such as:

- **Construction of Sea Defence**: Building Sea walls and groynes to protect coastal communities.
- **Mangrove Restoration**: Restoring mangroves to act as natural barriers against coastal erosion and flooding.
- **Relocation of Vulnerable Communities**: Moving communities at high risk of flooding to safer areas.

- **Examples:** Provide specific examples, such as the Keta Sea Defence Project or mangrove restoration programs in Ada.
- **Analysis:** Discuss how these strategies protect livelihoods and infrastructure but may require significant financial investment.

Comparison of Challenges and Severity

- **Comparison of Challenges**

  Highlight how the challenges differ between the regions.
  - Northern Ghana faces prolonged droughts, desertification, and reduced agricultural productivity.
  - Coastal areas face rising sea levels, frequent flooding, and displacement of communities.
- **Evaluation of Severity:** Argue which region faces more severe challenges and justify the argument.
  - For example, Northern Ghana may face more severe long-term challenges due to widespread desertification and food insecurity affecting large populations.
  - Alternatively, coastal areas could be considered more severely impacted due to immediate threats like displacement and loss of land.

  Conclusion
  - *Summarise the adaptation strategies for both regions and the key challenges they address.*
  - *Propose a balanced approach, such as increased government funding, international collaboration, and community-based efforts to address climate impacts in both regions.*

7.

Define education and public awareness campaigns as tools for equipping individuals and communities with knowledge, skills, and attitudes to address climate-related challenges. Highlight that education and awareness are essential for empowering citizens to adopt sustainable practices and support climate adaptation strategies.

Evaluation of Education and Public Awareness Campaigns

- **Raising Awareness of Climate Risks**
  - **Explanation:** Education campaigns help communities understand the risks associated with climate change, such as droughts, floods, and rising sea levels, enabling informed decision-making.
  - **Example:** Campaigns by the Ghana Climate Innovation Centre (GCIC) educate rural communities on the impacts of extreme weather events.

- **Promoting Sustainable Farming Practices**
  - **Explanation:** Educating farmers on climate-smart agricultural practices such as crop diversification and soil preservation improves resilience to erratic rainfall and droughts.
  - **Example:** Agricultural extension services in Northern Ghana train farmers to adopt drought-resistant crops and irrigation techniques.
- **Encouraging Community-Based Solutions**
  - **Explanation:** Public awareness campaigns encourage collective action, such as reforestation programs and flood mitigation projects, to address climate challenges.
  - **Example:** Local radio campaigns in coastal areas like Keta promote mangrove restoration to combat coastal erosion.
- **Enhancing Youth Engagement**
  - **Explanation:** Climate change education in schools equips young people with the knowledge and skills needed to develop innovative solutions for the future.
  - **Example:** Environmental clubs in Ghanaian schools promote tree planting and recycling initiatives.

8.

a. *Evaluation of International Partnerships and Agreements*

- **Paris Agreement**
  - *Explanation:* Ghana is a signatory to the Paris Agreement, which provides a framework for reducing greenhouse gas emissions and adapting to climate impacts.
  - *Example:* Ghana has committed to reducing emissions by 15-45% by 2030 with support from international funding and technology.
- **Green Climate Fund (GCF)**
  - *Explanation:* The GCF provides financial resources to developing countries to implement climate adaptation and mitigation projects.
  - *Example:* Ghana has accessed GCF funding for renewable energy projects and coastal zone management.
- **United Nations Environment Programme (UNEP)**
  - *Explanation:* UNEP supports Ghana with capacity-building programs, environmental education, and policy advice on climate resilience.
  - *Example:* UNEP assisted Ghana in developing its National Adaptation Plan (NAP) to address climate vulnerabilities.
- **Bilateral Partnerships**
  - *Explanation:* Ghana collaborates with countries like Germany and Norway to enhance renewable energy and forest conservation programs.
  - *Example:* The REDD+ program, supported by Norway, helps reduce deforestation and promote carbon storage in Ghana.

b. *Utilising Global Frameworks*

Context: *Highlight that global framework like the Paris Agreement, GCF, and UNEP present opportunities for Ghana to address climate challenges through funding, technology, and knowledge sharing.*

- **Strengthening Policy Implementation**
  - **Explanation:** Ghana can align its climate policies with global frameworks to ensure access to financial resources and technical support.
  - **Example:** By aligning its Nationally Determined Contributions (NDCs) with the Paris Agreement, Ghana secured funding for renewable energy projects.
- **Expanding Access to Climate Finance**
  - **Explanation:** Ghana can increase funding for climate adaptation projects by engaging with the Green Climate Fund (GCF) and other global mechanisms.
  - **Example:** Coastal protection projects in Keta have been funded through international grants.
- **Leveraging Technology Transfer**
  - **Explanation:** Ghana can partner with developed countries to adopt advanced technologies for renewable energy and sustainable agriculture.
  - **Example:** Collaboration with Germany has supported the promotion of solar energy systems in rural areas.

Conclusion: *Summarise the importance of aligning policies, accessing finances, and leveraging technologies to enhance Ghana's climate resilience through global frameworks.*

ANSWERS TO REVIEW QUESTION 6

1. **Definition of Dot Maps and Population Distribution:** Define dot maps as a geo-spatial tool used to represent population distribution by placing dots to indicate the density of people in various locations.

   Relevance to Ghana: State that dot maps help visualise population patterns in Ghana, highlighting areas of high and low population densities and their implications for development.

   Analysis of Spatial Patterns

   - **High Population Densities:** Regions like **Greater Accra** and **Ashanti** have high population densities due to urbanisation, industrialisation, and better infrastructure. These areas are represented by clusters of dots.
   - **Moderate Population Densities:** Areas such as **Western Region** and **Volta Region** have moderate population densities because of agricultural activities and some level of industrial development.
   - **Low Population Densities:** Northern regions like **Upper East** and **Northern Region** have sparse populations due to harsh climatic conditions and limited economic opportunities.

   Explanation of Factors Influencing Population Distribution

   - **Economic Opportunities**
     - Urban areas like Accra and Kumasi attract populations due to job opportunities in industries, commerce, and services.
     - Example: Greater Accra's role as Ghana's economic hub explains its dense population.
   - **Climatic and Environmental Conditions**
     - Harsh conditions such as droughts in the north discourage settlement, while fertile lands in the south promote agriculture and higher population densities.
     - Example: Sparse populations in Northern Ghana versus dense populations in cocoa-growing areas like Ashanti.
   - **Infrastructure and Accessibility**
     - Regions with better transportation networks, schools, and healthcare facilities attract more people.
     - Example: Coastal regions have higher populations due to better access to ports and markets.

   Link to Socio-Economic Activities in Different Regions

   - **Agriculture**
     - Areas like Ashanti and Western Region with fertile soils support farming activities, leading to moderate-to-high population densities.
     - Example: Cocoa farming in Ashanti attracts labour and sustains livelihoods.

- **Industry and Trade**
  - Urban centres like Accra and Kumasi facilitate trade, industrialisation, and commerce, resulting in high population densities.
  - Example: Accra's dense population supports its role as a trade and financial hub.

Conclusion

- ***Summary of Patterns and Factors:*** *Summarise the observed spatial patterns (high, moderate, and low densities) and their influencing factors.*
- ***Implications for Development:*** *Highlight that understanding population distribution helps policymakers address challenges such as urban overcrowding and rural underdevelopment.*

2. *Define dot maps as a type of thematic map where dots are used to represent quantities or densities of a specific variable, such as population or agricultural production. Highlight their importance in visualising spatial patterns, making data interpretation easier for decision-making in areas like population studies or agricultural planning in Ghana.*

Advantages of Dot Maps

- **Clarity in Representing Density Patterns:** Dot maps effectively display density patterns by showing concentrations of dots in areas with high values, making it easy to identify spatial variations.

  Example: For example, a dot map of Ghana's population shows high densities in Greater Accra and Ashanti Regions, reflecting urbanisation.
- **Easy to Interpret:** Dot maps are visually simple and intuitive, allowing users to quickly grasp patterns without requiring advanced technical knowledge.

  Example: Farmers in Ghana can use dot maps to identify regions with high agricultural productivity, such as cocoa farming areas in the Western Region.
- **Highlighting Spatial Trends:** Dot maps reveal spatial trends and relationships, such as how population distribution aligns with economic activities or natural resources.

  Example: A dot map of fishing activity in Ghana shows high concentrations along the coastal regions, such as Tema and Sekondi-Takoradi.
- **Flexibility in Scale:** The scale of dot maps can be adjusted to represent data at different levels, such as local, regional, or national.

  Example: A dot map of maize production in Ghana can focus on district-level data for targeted agricultural policies.

Limitations of Dot Maps

- **Overlapping Dots in Dense Areas:** In areas with high values, dots may overlap, making it difficult to accurately interpret data.

  Example: For instance, a dot map of population density in Accra may become cluttered, obscuring specific locations.

- **Misleading Representation in Sparse Areas:** In areas with low values, the absence of dots may give the impression that no activity occurs, even when some data exists.

  Example: A dot map of agricultural production in the northern regions of Ghana may underestimate small-scale farming activities.

- **Requires Accurate Data:** Dot maps rely on accurate and detailed data. Inaccurate or outdated data can lead to misrepresentation.

  Example: If population data for rural areas is incomplete, the dot map will not accurately reflect rural settlement patterns.

- **Cannot Show Qualitative Data:** Dot maps are limited to representing quantitative data and cannot depict qualitative aspects such as reasons behind population movement.

  Example: A dot map of migration patterns in Ghana cannot explain the socio-economic causes of rural-to-urban migration.

  Conclusion

  - *Summarise that dot maps are effective tools for visualising spatial patterns but may face challenges such as overlapping dots or reliance on accurate data.*
  - *Suggest integrating dot maps with other tools such as proportional symbol maps or GIS to enhance data interpretation and usability.*

3. *Define dot maps as thematic maps that use dots to represent quantities or densities of specific variables (e.g., cocoa production). Highlight the usefulness of dot maps in visualising spatial patterns of cocoa farming in Ghana. Briefly state that Ghana is one of the largest cocoa producers globally, with key production areas concentrated in specific regions.*

a. **Analysis of the Dot Map**

- **Key Patterns Observed:** Cocoa production is concentrated in the middle and southern parts of Ghana, particularly in regions like Ashanti, Western, Eastern, and parts of the Brong-Ahafo Region. Sparse or no production is observed in the northern Savannah areas.

  Examples: Mention specific towns or areas (e.g., Sefwi Wiawso in the Western Region, Kumasi in Ashanti) with high cocoa farming activity.

- **Interpretation of Patterns:** The high concentration of cocoa farming in the middle belt is due to favourable climatic and geographic conditions (e.g., fertile soils, adequate rainfall). Sparse production in the north is due to unsuitable climate and soil conditions.

  Examples: Relate the patterns to the distribution of vegetation zones, such as forests in the middle belt and Savannah in the north.

- **Socio-Economic Implications:** High cocoa production areas contribute significantly to Ghana's economy through exports and provide employment for many farmers.

  Examples: Discuss the role of cocoa in export earnings and how it supports rural communities in cocoa-growing regions.

b. **Factors Influencing Cocoa Farming**

- **Geographic Factors:** Fertile soils such as forest ochrosols and oxysols in the middle and southern belts support cocoa farming.

  Example: Regions like Ashanti and Western have soils rich in nutrients, ideal for cocoa cultivation.

- **Climatic Factors:** Cocoa thrives in areas with high and evenly distributed rainfall (1,200–2,000 mm annually) and temperatures between 21°C and 32°C, which are common in the forest zone of Ghana. Prolonged dry seasons and insufficient rainfall in the northern Savannah regions make cocoa farming difficult.

  Examples: Mention high rainfall in the Western and Ashanti Regions, which makes them optimal for cocoa production.

Conclusion

- *Summarise the observed patterns on the dot map and the key factors influencing cocoa farming, such as fertile soils, high rainfall, and moderate temperatures.*
- *Suggest measures such as climate adaptation strategies, soil conservation, and sustainable farming practices to maintain Ghana's cocoa production.*

4. Analysis of Population Distribution Patterns

- **High Population Densities:** Densely populated areas include Greater Accra, Ashanti, and parts of the Western Region due to urbanisation, industrialisation, and better infrastructure.

  Example: Greater Accra, as the capital and economic hub, has the highest population density.

- **Moderate Population Densities:** Regions like Volta and Bono, Ahafo and Bono-East have moderate densities due to agricultural activities and smaller urban centres.

  Example: Moderate densities are observed in areas with subsistence farming and small-scale industries.

- **Low Population Densities:** Sparse populations are found in Northern, Upper East, and Upper West Regions due to harsh climatic conditions and limited economic opportunities.

  Example: Regions with Savannah vegetation and poor rainfall patterns have lower population densities.

Factors Influencing Population Distribution

Geographical Factors

- **Relief:** Flat and low-lying areas are more populated as they are easier to develop, and farm compared to hilly or mountainous areas.

  Example: Coastal plains in Greater Accra and Western Regions have high population densities, while the Akwapim-Togo Ranges in the east have sparse populations.

- **Soil Fertility:** Fertile soils in the middle belt (e.g., Ashanti and Brong-Ahafo) support farming, attracting higher populations.

Example: Cocoa farming in Ashanti Region supports dense rural populations.

Climatic Factors

- **Rainfall :** Areas with moderate to high rainfall support agriculture and settlements.

  Example: Southern Ghana, with its bimodal rainfall pattern, supports dense populations engaged in farming.

- **Temperature and Drought:** High temperatures and prolonged droughts in Northern Ghana discourage settlement and farming.

  Example: Savannah zones in Upper East and Upper West have sparse populations due to unreliable rainfall.

Economic Factors

- **Employment Opportunities:** Urban centres like Accra and Kumasi attract people due to job opportunities in industries, trade, and services.

  Example: Accra's dense population is linked to its status as Ghana's economic hub.

- **Infrastructure Development:** Areas with better infrastructure (e.g., roads, schools, hospitals) attract higher populations.

  Example: Coastal regions like Greater Accra have better infrastructure compared to the northern Savannah.

Conclusion

Highlight that geographical, climatic, and economic factor collectively influence population distribution patterns in Ghana. Suggest policies such as improving infrastructure in underpopulated areas and promoting sustainable agriculture to balance population distribution.

5.

- *Define flow charts as a visual representation of processes or systems that use symbols and arrows to show the flow of information or activities. Highlight their application in representing migration processes, such as rural-to-urban or international migration.*
- *Mention how flow charts provide a clear, step-by-step understanding of migration trends, causes, and impacts in Ghana.*

Advantages of Using Flow Charts

- **Clear Representation of Processes:** Flow charts simplify the visualisation of migration processes, such as the steps involved in rural-urban migration.

  Example: A flow chart can show how drought in Northern Ghana leads to migration to Accra for employment opportunities.

- **Easy to Interpret:** Flow charts are user-friendly and help learners or policymakers quickly understand migration patterns and their causes.

  Example: A flow chart illustrating economic migration can show the push factors (e.g., poverty) and pull factors (e.g., better job prospects in urban areas).

- **Highlighting Relationships:** Flow charts effectively show relationships between causes and effects, such as how natural disasters influence migration trends.

Example: A flow chart can demonstrate how flooding in the Volta Region leads to displacement and migration to higher ground.

- **Useful in Decision-Making:** Flow charts provide structured data that can guide decision-making, such as planning for infrastructure development in urban areas experiencing high in-migration.

  Example: Urban planners in Accra can use a flow chart to identify migration hotspots and allocate resources accordingly.

Limitations of Using Flow Charts

- **Oversimplification of Complex Data:** Flow charts may oversimplify complex migration processes, failing to capture the full range of factors influencing migration.

  Example: A flow chart showing rural-urban migration might overlook cultural or social factors, such as family ties.

- **Lack of Quantitative Detail:** Flow charts are primarily qualitative and do not convey numerical data, such as the exact number of migrants.

  Example: A flow chart cannot show the exact number of people migrating from the Northern Region to Greater Accra.

- **Limited Usefulness for Large Data Sets:** Flow charts are less effective for representing large or complex datasets, as they can become cluttered and difficult to follow.

  Example: A flow chart attempting to represent migration trends across all 16 regions of Ghana may become too complex to interpret effectively.

- **Static Representation:** Flow charts are static and do not capture dynamic changes in migration trends over time.

  Example: A flow chart showing migration caused by economic factors may not account for sudden changes, such as the impact of a new policy or natural disaster.

Conclusion

- *Summarise that flow charts are useful for visualising migration processes in Ghana but have limitations such as oversimplification and lack of quantitative detail.*
- *Suggest combining flow charts with other tools, such as GIS maps or statistical charts, for a more comprehensive analysis of migration trends.*

6.

- *Define population movement and distribution as the relocation of people from one area to another and how they are spread across different regions. Mention that migration in Ghana is influenced by factors such as economic opportunities, environmental conditions, and social networks.*
- *Explain that flow charts are effective tools for visualising the direction, scale, and patterns* of migration between Navrongo, Techiman, Kumasi, and Accra.

Analysis of Population Movement and Distribution Using a Flow Chart

Key Migration Patterns

- **Navrongo to Techiman:** Migration from Navrongo (Northern Region) to

Techiman (Bono East Region) is driven by seasonal agricultural work and access to fertile lands. **Example :** Farmers from Navrongo migrate to Techiman during the farming season to engage in yam and maize production.

- **Techiman to Kumasi and Accra:** Migration occurs as people move from Techiman to urban centres like Kumasi and Accra for better job opportunities and access to services. **Example:** Young people from Techiman migrate to Kumasi to work in transport or trade industries.

Explanation of Flow Chart

- **Representation of Movement**: In the flow chart, arrows should indicate migration paths.
  - **Navrongo → Techiman → Kumasi → Accra:** Use appropriate symbols or labels to show the reasons for migration (e.g., economic opportunities, urbanisation).
- **Logical Flow**: The chart should clearly represent sequential movement, such as: Rural areas (Navrongo) → Semi-urban areas (Techiman) → Urban areas (Kumasi, Accra).

Factors Driving Migration Trends

- **Economic Factors:** People migrate to urban centres like Kumasi and Accra for job opportunities in industries, trade, and services.

  Example: Accra's role as Ghana's economic hub attracts migrants from rural areas seeking employment.
- **Geographic Factors:** Fertile lands in Techiman attract migrants from Navrongo for agricultural work.

  Example: Migrants from drought-prone areas in the north move to Techiman due to its favourable farming conditions.
- **Social Factors:** Social networks and family connections play a significant role in migration patterns, as people often move to areas where they have relatives or friends.

  Example: Migrants from Navrongo may move to Kumasi or Accra where family members already reside, providing support during relocation.
- **Environmental Factors:** Harsh environmental conditions, such as droughts in northern Ghana, push people to migrate to more favourable regions.

  Example: Prolonged dry seasons in Navrongo lead to migration to wetter areas like Techiman for farming.

Conclusion

- *Summarise that population movement between Navrongo, Techiman, Kumasi, and Accra is driven by economic opportunities, geographic advantages, and environmental conditions.*
- *Suggest policies such as improving rural infrastructure, creating job opportunities in regional towns, and addressing environmental challenges to reduce rural-urban migration.*

7.

- *Define urbanisation as the increase in population in urban areas due to migration, natural population growth, or expansion of cities.*
- *Mention that flow charts are useful tools to visually represent the processes and trends of urbanisation.*
- *Highlight how urbanisation in Ghana is concentrated in cities like Accra, Kumasi, and Takoradi, driven by economic opportunities, infrastructure development, and migration from rural areas.*

Analysis of Urbanisation Trends Using a Flow Chart

- **Rural-to-Urban Migration:** Urbanisation in Ghana is largely fuelled by migration from rural areas to urban centres like Accra and Kumasi, driven by the search for better job opportunities and access to services.
- **Flow Chart Representation**: Arrows in the flow chart should show movement from rural areas (e.g., Northern Ghana) to urban centres (e.g., Accra).
- **Urban Expansion:** Cities are expanding into surrounding peri-urban areas due to increasing population densities.
- **Flow Chart Representation:** The flow chart should show cities like Accra and Kumasi expanding into their peri-urban regions.
- **Economic Centralisation:** Urban centres attract industries, businesses, and services, reinforcing their role as economic hubs.
- **Flow Chart Representation:** Include nodes in the flow chart representing industries and services clustering in urban regions.

Prediction of Future Challenges

- **Overcrowding and Housing Shortages:** Rapid urbanisation leads to overcrowding in cities, causing housing shortages and the growth of informal settlements or slums.

  Example: Accra has experienced the growth of slums in areas like Nima due to rural-urban migration.
- **Strain on Infrastructure and Services:** Urban areas face pressure on roads, water supply, electricity, and waste management systems due to increasing populations.

  Example: Traffic congestion in Accra and Kumasi is a result of inadequate road infrastructure.
- **Environmental Degradation:** Urban sprawl leads to the loss of green spaces, deforestation, and increased pollution in cities.

  Example: The expansion of Accra towards peri-urban areas has resulted in deforestation and encroachment on wetlands.

Proposed Strategies to Address Challenges

- **Decentralisation of Development:** Promote development in smaller towns and regional capitals to reduce migration pressure on major cities.

  Example: Investing in infrastructure and industries in towns like Tamale or Techiman to create employment opportunities.

- **Public Infrastructure Investment:** Increase investment in urban infrastructure such as roads, public transportation, and waste management systems.

  Example: Expansion of public transport systems like the Bus Rapid Transit (BRT) in Accra to reduce congestion.

  Conclusion

  - *Summarise the urbanisation trends, predicted challenges, and proposed strategies in Ghana.*
  - *Highlight the importance of sustainable urban planning and balanced regional development to address future challenges.*

ANSWERS TO REVIEW QUESTION 7

1.

a. In urban areas of Ghana, common sources of waste include **plastic packaging** from consumer goods and **electronic waste** from discarded devices. These result from high consumption and technological use in cities. In rural areas, waste often comes from **agricultural residues** like crop stalks and **organic household waste** such as food scraps. These are linked to farming activities and subsistence living. The key difference is that urban waste tends to be **non-biodegradable and industrial**, while rural waste is mostly **biodegradable and natural**, reflecting the contrast in lifestyles and economic activities.

b. *Define waste production trends as patterns of waste generation over time, influenced by factors such as population growth, urbanisation, and industrialisation. Highlight the increasing waste generation in Ghana due to urbanisation and economic activities.*

State that analysing waste production trends is essential for understanding their impacts on Ghana's environmental, social, and economic development.

Analysis of Current Waste Production Trends

- **Increasing Plastic Waste:** Discuss the rising use of single-use plastics in Ghana, especially in urban areas for packaging and shopping.
- Example: Mention the prevalence of plastic waste in cities like Accra, where plastics often clog drainage systems.
- **Growth in E-Waste:** Address the increasing disposal of electronic waste due to the growing use of electronic devices.
- Example: Highlight the Agbogbloshie e-waste dump in Accra as a major site for electronic waste disposal.
- **Insufficient Waste Management Infrastructure:** Note that waste collection and recycling systems are inadequate to handle the growing volumes of waste.
- Example: Discuss the lack of recycling centres in rural areas and the reliance on informal waste collectors in urban regions.

Long-Term Implications of Waste Production Trends

- **Environmental Degradation:** Waste accumulation leads to pollution of water bodies, soil, and air, affecting ecosystems and biodiversity.
- Example: The pollution of the Korle Lagoon in Accra due to improper waste disposal.
- **Public Health Risks:** Accumulated waste creates breeding grounds for disease vectors, leading to outbreaks of diseases like cholera and malaria.
- Example: The 2014 cholera outbreak in Accra was partly caused by improper waste disposal.
- **Economic Costs:** High costs of waste clean-up and loss of tourism revenue due to polluted environments.

- Example: Plastic pollution on Ghana's beaches reduces their appeal to tourists, affecting the tourism sector.
- **Loss of Agricultural Productivity:** Soil pollution from waste reduces agricultural productivity, threatening food security.
- Example: Landfills in peri-urban areas encroach on arable farmland.

Recommendations and Solutions for Sustainable Development

- **Strengthening Waste Recycling Programs:** Introduce and expand recycling programs to reduce the volume of waste sent to landfills.
- Example: Establish recycling hubs in major cities like Accra and Kumasi to process plastic and e-waste.
- **Public Awareness Campaigns:** Educate the public on proper waste disposal and the adoption of the 3Rs (Reduce, Reuse, Recycle).
- Example: Launch school-based waste education programs to inculcate sustainable habits among young people.

2. *Define improper waste disposal as the act of discarding waste in ways that harm the environment, such as open dumping, burning, or neglecting waste segregation. Highlight that improper waste disposal in Ghana poses significant environmental challenges, such as pollution, habitat destruction, and climate change.*

Four Ways Improper Waste Disposal Contributes to Environmental Degradation

a. **Pollution of Water Bodies**

- Waste dumped into rivers, streams, and lagoons contaminates water sources, introducing harmful pollutants like plastics, heavy metals, and chemicals.
- Wastewater and leachate from dumpsites also seep into groundwater, causing long-term contamination.
- Example: The pollution of the Korle Lagoon and Odaw River in Accra is caused by indiscriminate dumping of waste.
- Impact: Leads to the destruction of aquatic ecosystems, loss of biodiversity, and unsafe drinking water for humans and animals.

b. **Soil Degradation**

- Hazardous waste, such as electronic waste and industrial chemicals, dumped on land can lead to soil contamination.
- This reduces soil fertility, making it unsuitable for agriculture and plant growth.
- Example: The Agbogbloshie e-waste site in Accra, where toxic substances like lead and mercury have polluted the soil.
- Impact: Affects food production, threatens food security, and contributes to land degradation.

c. **Air Pollution**

- Open burning of waste, including plastics, releases harmful gases like carbon monoxide, dioxins, and particulates into the air.
- This contributes to poor air quality and greenhouse gas emissions, exacerbating climate change.

- Example: Burning refuse at illegal dumpsites in urban areas like Kumasi and Tema leads to smog and respiratory problems.
- Impact: Causes health issues such as asthma and lung diseases, while contributing to global warming.

d. **Flooding and Habitat Destruction**

- Improper disposal of plastics and other solid waste blocks drainage systems, leading to urban flooding during rains.
- Flooding destroys habitats for plants and animals and causes soil erosion.
- Example: The frequent flooding in Accra is partly caused by plastic waste clogging drainage systems.
- Impact: Leads to displacement of communities, destruction of infrastructure, and loss of biodiversity.

Conclusion

- *Summarise the four ways improper waste disposal contributes to environmental degradation, emphasising the need for immediate action.*
- *Recommend adopting sustainable waste management strategies, such as recycling, public education, and enforcement of waste disposal laws, to reduce environmental degradation in Ghana.*

3. *Define improper waste disposal as the process of discarding waste in ways that harm the environment, such as open dumping, burning, or neglecting proper waste management practices. State that improper waste disposal has far-reaching consequences on health, tourism, water bodies, and community development in Ghana.*

Discussion of Effects

a. **Health**

- Improper waste disposal creates breeding grounds for disease vectors like mosquitoes and rodents, leading to outbreaks of diseases such as malaria, cholera, and typhoid.
- Burning waste releases toxic gases that cause respiratory conditions like asthma and lung cancer.
- **Example:** The 2014 cholera outbreak in Accra was linked to poor waste management and the contamination of water sources.
- **Impact:** Leads to increased healthcare costs, reduced productivity, and a decline in overall public health.

b. **Tourism**

- Accumulation of waste in public spaces, beaches, and tourist attractions reduces the aesthetic appeal of these areas, discouraging both local and international tourists.
- Pollution of natural attractions like rivers and lagoons diminishes their value as tourist destinations.
- **Example:** Plastic waste pollution on Ghana's beaches, such as the beaches in Accra and Cape Coast, has led to a decline in tourism activities.

- **Impact:** Results in lost revenue for local businesses and the national economy and undermines efforts to promote Ghana as a clean and green tourist destination.

c. **Water Bodies**

- Dumping waste into rivers, streams, and lagoons contaminates water sources, introducing harmful pollutants like plastics, heavy metals, and chemicals.
- Polluted water bodies affect aquatic ecosystems, leading to reduced biodiversity and the death of fish and other marine life.
- **Example:** The Korle Lagoon in Accra is heavily polluted due to improper waste disposal, making it uninhabitable for aquatic life.
- **Impact:** Polluted water bodies increase the cost of water treatment and limit the availability of clean water for domestic, agricultural, and industrial use.

- **Community Development**
  - Poor waste management reduces the quality of life in communities by causing foul odours, unsightly surroundings, and increased health risks.
  - It discourages investment and economic development, as businesses are less likely to operate in areas with poor sanitation.
  - **Example:** Communities in Accra with poor waste management practices, such as slum areas, experience slower development due to the lack of infrastructure and investment.
  - **Impact:** Impedes community growth, worsens poverty levels, and perpetuates a cycle of underdevelopment.

Conclusion

- *Summarise the effects of improper waste disposal on health, tourism, water bodies, and community development, emphasising the interconnectedness of these issues.*
- *Suggest solutions such as adopting the 3Rs (Reduce, Reuse, Recycle), enforcing waste management laws, and raising public awareness about the importance of proper waste disposal.*

4.

a. **Strategies to Improve Waste Management.**

- **Establishing Recycling Centres:** Build recycling centres in urban and rural areas to process waste materials such as plastics, paper, and metals into reusable products.

  Example: Recycling initiatives in Accra, such as the Dokuplast program, which converts plastic waste into pavement blocks.
- **Public Awareness Campaigns:** Educate the public on proper waste disposal and the benefits of adopting sustainable waste management practices through media, schools, and community workshops.

  Example: Community education programs in Kumasi have encouraged households to separate organic and non-organic waste.

- **Enforcing Waste Management Laws:** Strengthen the enforcement of laws against littering and illegal dumping to ensure compliance with proper waste disposal practices.

  Example: The implementation of fines for indiscriminate dumping in Tema has reduced waste accumulation in public spaces.
- **Promoting Public-Private Partnerships:** Collaborate with private companies to improve waste collection, recycling, and disposal systems.

  Example: Zoomlion Ghana Limited has partnered with local governments to provide waste collection services in urban areas.
- **Introducing Waste Segregation Systems:** Encourage households and businesses to separate waste into biodegradable, recyclable, and non-recyclable categories for easier management.

  Example: Pilot programs in Accra have provided colour-coded bins to households for waste separation.

b. **Application of the "3Rs" (Reduce, Reuse, Recycle)**

- **Reduce:** Encourage the reduction of waste generation by using fewer disposable items and avoiding unnecessary packaging.

  Example**:** Campaigns in Ghana promoting the reduction of single-use plastics, such as banning plastic straws and encouraging reusable bags.
- **Reuse:** Encourage the reuse of items like bottles, containers, and shopping bags to minimise waste.

  Example: Reusable water bottles and cloth bags are being promoted in schools and markets in Kumasi.
- **Recycle:** Transform waste materials into new products through recycling initiatives, such as processing plastic into building materials.

  Example: Recycling programs in Accra convert plastic waste into pavement blocks and furniture.

Conclusion

- *Summarise the proposed strategies and the importance of applying the "3Rs" to improve waste management in Ghana.*
- *Recommend sustained public education, investment in recycling infrastructure, and strong government policies to promote sustainable waste management practices.*

ANSWERS TO REVIEW QUESTION 8

1.

- *Define reforestation as the process of planting trees in areas where forests have been depleted and afforestation as planting trees in areas that were not previously forested.*
- *Highlight how reforestation and afforestation can combat desert encroachment in Ghana, particularly in the Savannah and Northern regions, by restoring vegetation cover and improving soil health.*

Four Ways Reforestation and Afforestation Programmes Manage Desert Encroachment

- **Reducing Soil Erosion:** Tree roots bind the soil, preventing soil erosion caused by wind and water. Trees also act as windbreakers, reducing the impact of strong winds that contribute to desertification.
  - Example: Tree planting initiatives in Northern Ghana under the Savannah Accelerated Development Authority (SADA) have helped stabilise soils in degraded areas.
  - Impact: Restores soil fertility, supports agriculture, and reduces the expansion of barren lands.
- **Improving Water Retention and Restoring Water Cycles:** Trees increase soil moisture retention by reducing water runoff and allowing more water to seep into the ground. They also play a role in restoring local water cycles by enhancing rainfall patterns.
  - Example: Reforestation projects in arid parts of the Northern Region have helped improve water availability for farming and domestic use.
  - Impact: Encourages sustainable farming practices and reduces the risk of desert-like conditions spreading to other areas.
- **Enhancing Biodiversity:** Planting trees creates habitats for various plant and animal species, increasing biodiversity in degraded areas. This promotes ecosystem stability and resilience.
  - Example: The "Green Ghana" initiative has planted millions of trees, restoring vegetation and habitats for wildlife in semi-arid regions.
  - Impact: Improved biodiversity contributes to long-term ecological balance and supports wildlife conservation.
- **Providing Socio-Economic Benefits:** Reforestation and afforestation create jobs in tree planting and forest management while providing resources like firewood, fruits, and medicinal plants.
  - Example: Community-based tree planting programs in the Upper East Region have provided alternative livelihoods for farmers affected by land degradation.
  - Impact: Reduces poverty, supports local economies, and enhances community resilience against desertification.

Conclusion

- *Summarise the four ways reforestation and afforestation manage desert encroachment: reducing soil erosion, improving water retention, enhancing biodiversity, and providing socio-economic benefits.*
- *Recommend scaling up reforestation and afforestation programs in Ghana through government support, community involvement, and international partnerships.*

2.

- *Define education as the process of imparting knowledge and skills to individuals to enhance their ability to address challenges.*
- *Define community awareness as the act of informing and engaging communities to take collective action toward solving environmental issues.*
- *Highlight the importance of education and community awareness in equipping individuals and communities with the knowledge and skills to combat environmental hazards like desert encroachment and landslides.*

a. **Role of Education and Community Awareness in Combating Desert Encroachment**

- **Promoting Sustainable Land Use Practices:** Education helps farmers adopt sustainable practices such as agroforestry, crop rotation, and soil conservation to prevent desertification.
  - Example: Community training programs in the Northern Region of Ghana educate farmers on planting drought-resistant crops and integrating trees with farming.
- **Public Awareness Campaigns:** Community awareness campaigns encourage individuals to stop activities that contribute to desert encroachment, such as overgrazing and deforestation.
  - Example: The "Green Ghana" initiative raises awareness about the importance of tree planting to combat desert encroachment in arid areas.
- **Involving Local Leaders and NGOs:** Education programs involving local leaders and NGOs ensure that knowledge about desertification prevention is spread effectively within communities.
  - Example: NGOs like the Savannah Accelerated Development Authority (SADA) have engaged communities in Northern Ghana to participate in reforestation projects.
- **Incorporating Desertification Topics into School Curricula:** Introducing desertification topics in schools equips learners with the knowledge and skills to protect the environment from a young age.

- Example: Schools in the Savannah Region have integrated lessons on the causes and prevention of desertification into their Geography curriculum.

b. **Role of Education and Community Awareness in Combating Landslides**

- **Educating Communities on Early Warning Systems:** Education provides communities with knowledge about landslide early warning systems, enabling them to respond effectively to risks.
  - Example: Training programs in hilly areas of Ghana teach residents how to interpret weather forecasts and identify signs of potential landslides.
- **Teaching Soil Conservation Techniques:** Education encourages the adoption of soil conservation techniques such as terracing, contour ploughing, and vegetation cover to stabilise slopes.
  - Example: Farmer education programs in the Eastern Region have promoted terracing to reduce soil erosion on steep slopes.
- **Public Awareness Campaigns on Construction Practices:** Community awareness campaigns discourage unsafe construction practices on steep slopes, which increase the risk of landslides.
  - Example: Awareness programs in landslide-prone areas around the Akwapim-Togo Ranges emphasise safe building practices and proper drainage systems.
- **Promoting Afforestation to Stabilise Slopes:** Educating communities about the benefits of planting trees on slopes helps prevent soil erosion and reduces landslide risks.
  - Example: Tree planting campaigns in the hilly areas of Ghana have helped stabilise slopes and prevent landslides during heavy rains.

Conclusion

- *Summarise the role of education and community awareness in combating desert encroachment and landslides, emphasising their importance in promoting sustainable practices and reducing risks.*
- *Recommend integrating education and awareness programs into national environmental policies and encouraging collaboration between communities, schools, and NGOs to combat these environmental hazards.*

3.

- *Define desert encroachment as the gradual expansion of desert-like conditions into previously fertile areas, often caused by deforestation, overgrazing, and climate change.*
- *Highlight that desert encroachment is a major concern in the northern regions of Ghana, where it threatens agriculture, water resources, and livelihoods, with significant implications for the economy.*

Analysis of Long-Term Impacts of Desert Encroachment on Ghana's Economy

- **Reduced Agricultural Productivity:** Desert encroachment leads to the degradation of fertile lands, reducing crop yields and threatening food security.

  Example: Farmers in the Upper East Region have reported declining yields of millet and sorghum due to soil degradation and loss of arable land.

- **Loss of Livelihoods:** Communities that depend on agriculture and livestock face unemployment and poverty as desert encroachment destroys grazing lands and farmlands.

  Example: Pastoralists in Northern Ghana experience conflicts over shrinking grazing lands, leading to economic and social instability.

- **Increased Cost of Water Resources:** Desert encroachment reduces water availability as rivers and water bodies dry up, increasing the cost of accessing clean water for irrigation and domestic use.

  Example: The drying up of the White Volta River affects irrigation schemes in Northern Ghana, leading to higher costs for water access.

- **Decline in Tourism Revenue:** Desertification damages natural and cultural heritage sites, reducing their appeal to tourists and impacting the tourism sector.

  Example: The degradation of eco-tourism sites in the Savannah Region, such as Mole National Park, has led to a decline in tourist visits.

- **Increased Government Expenditure:** The government must allocate more resources to combat desertification and provide relief to affected communities, diverting funds from other developmental projects.

  Example: Programs like the Savannah Accelerated Development Authority (SADA) require significant funding to address desert encroachment in Northern Ghana.

Proposed Mitigation Strategies

- **Reforestation and Afforestation Programs:** Planting trees in degraded areas helps to restore vegetation, reduce soil erosion, and combat desert encroachment.

  Example: The Green Ghana initiative has planted millions of trees in the Savannah Region to restore degraded lands.

- **Promoting Sustainable Agricultural Practices:** Techniques such as agroforestry, crop rotation, and soil conservation maintain soil fertility and prevent desertification.

  Example: Farmers in Northern Ghana have been trained to adopt agroforestry practices, integrating trees with crops to protect arable lands.

- **Public Education and Community Awareness:** Educating communities about the causes and effects of desert encroachment encourages sustainable land use practices.

  Example: Awareness campaigns in the Upper East Region focus on reducing deforestation by promoting the use of alternative energy sources like LPG instead of firewood.

Conclusion

- *Summarise the long-term economic impacts of desert encroachment, such as reduced agricultural productivity, loss of livelihoods, and increased government expenditure.*
- *Recommend scaling up reforestation programs, promoting sustainable practices, and strengthening policies to mitigate the effects of desert encroachment in Ghana.*

4.

- *Define desert encroachment as the expansion of desert-like conditions into previously fertile areas, resulting from factors such as deforestation, overgrazing, and climate change.*
- *State that desert encroachment is a major challenge in the northern regions of Ghana, where it threatens ecosystems, agricultural productivity, and livelihoods.*

Analysis of Effects

a. **Effects on Vegetation:** Desert encroachment destroys vegetation by degrading soil fertility and reducing water availability for plants. This leads to the loss of trees, shrubs, and grasses, which are essential for stabilising the environment.

- Example: Many parts of Northern Ghana, such as the Upper East Region, have experienced the loss of vegetation cover due to desertification.
- Impact: Reduced vegetation leads to soil erosion, loss of biodiversity, and a decline in ecosystem services.

b. **Effects on Animals:** Desert encroachment destroys habitats for wildlife, forcing animals to migrate or face extinction. It also reduces the availability of food and water for grazing animals.

- Example: In the Savannah Region, desertification has reduced the habitats for antelopes and other wildlife species.
- Impact: Loss of animal populations disrupts ecosystems and reduces biodiversity, which affects ecological balance.

c. **Effects on Crop Farming:** Desert encroachment degrades arable land, making it unsuitable for crop farming. This leads to reduced crop yields and threatens food security in affected areas.

- Example: Farmers in the Upper East Region have experienced declining yields of staple crops like millet and sorghum due to soil degradation.
- Impact: Reduced crop production leads to economic losses for farmers, increased poverty, and reliance on food imports.

d. **Effects on Cattle Rearing:** Desert encroachment reduces the availability of grazing lands and water sources for cattle, making it difficult for herders to sustain their livestock.

- Example: In Northern Ghana, cattle herders face conflicts over shrinking grazing lands caused by desertification.
- Impact: Reduced livestock numbers lead to economic losses for herders and threaten the supply of meat and dairy products.

Conclusion

- *Summarise the effects of desert encroachment on vegetation, animals, crop farming, and cattle rearing, emphasising the interconnectedness of these impacts.*
- *Recommend sustainable practices such as reforestation, water management, and community awareness campaigns to mitigate the effects of desert encroachment.*

5.

- *Define vegetation as the cover of plants, trees, shrubs, and grasses that help stabilise the soil and environment.*
- *Explain that vegetation plays a crucial role in preventing landslides by providing natural barriers against soil erosion and slope instability.*
- *Highlight the importance of vegetation in steep sloping areas, where landslides are common due to unstable soil and excessive water runoff.*

Analysis of Four Ways Vegetation Helps Control Landslides

- **Vegetation Stabilises Soil Through Root Systems:** Tree roots bind the soil particles together, reducing soil movement. Deep-rooted vegetation anchors the soil to the bedrock, providing stability in steep-sloping areas.
  - Example: Pine and acacia trees planted on slopes in the Eastern Region of Ghana have helped stabilise steep terrains.
  - Impact: Prevents soil erosion and reduces the likelihood of slope failure, ensuring long-term slope stability.
- **Vegetation Reduces Surface Runoff and Water Infiltration:** Vegetation acts as a natural barrier, slowing down water runoff during heavy rains. This allows water to infiltrate the soil gradually, reducing waterlogging and maintaining slope stability.
  - Example: Grass cover in hilly areas of the Akwapim-Togo Ranges has reduced surface runoff, preventing landslides during the rainy season.
  - Impact: Prevents excessive water saturation of the soil, which is a key trigger of landslides and slope failures.
- **Vegetation Acts as a Windbreaker and Reduces Soil Erosion:** Vegetation absorbs the impact of wind and rain, reducing the erosion of topsoil. Trees and shrubs protect the soil from being washed away or blown off steep slopes.
  - Example: Bamboo plantations in the Volta Region have been used to minimise soil erosion on steep hillsides.
  - Impact: Helps maintain soil structure and fertility, reducing the risk of landslides caused by weakened soil.
- **Vegetation Enhances Slope Stability Through Organic Matter:** Vegetation adds organic matter to the soil, improving its structure and water-holding capacity. This reduces soil compaction and promotes better drainage, lowering the risk of landslides.
  - Example: Reforestation projects in landslide-prone areas of the Eastern Region have shown improved soil stability due to increased organic matter from decaying plant material.
  - Impact: Improves soil quality and reduces the chances of waterlogged, unstable soil on slopes.

Conclusion

- *Summarise the four ways vegetation helps control landslides, including stabilising soil, reducing runoff, acting as a windbreaker, and enhancing slope stability.*
- *Recommend the implementation of reforestation programs and the protection of existing vegetation to prevent landslides in steep sloping areas.*

6.

- *Define community-based strategies as locally driven initiatives where communities actively participate in identifying, planning, and implementing measures to reduce risks from environmental hazards, including landslides.*
- *Highlight the importance of empowering communities in landslide-prone areas to take preventive and mitigation actions through education, collaboration, and sustainable practices.*

Analysis of Community-Based Strategies

- **Organising Community Education and Awareness Campaigns**
  - Educating communities about the causes, signs, and risks of landslides helps them identify early warning signs and adopt preventive measures.
  - Awareness campaigns can promote safe land-use practices, such as avoiding construction on steep slopes.
  - **Example:** Community-based education programs in the Eastern Region of Ghana have raised awareness about the dangers of deforestation on slopes.
  - **Impact:** Long-term reduction in landslides due to informed decision-making and proactive measures taken by the community.
- **Promoting Reforestation and Afforestation Programs**
  - Planting trees on slopes stabilises the soil and prevents erosion, reducing the risk of landslides.
  - Communities can organise tree-planting days and monitor the growth of vegetation on steep terrains.
  - **Example:** Local groups in the Akwapim-Togo Ranges have implemented tree-planting initiatives to stabilise slopes and prevent landslides during heavy rains.
  - **Impact:** Improved slope stability and restoration of degraded lands, leading to a safer environment for communities.
- **Developing Community-Based Early Warning Systems**
  - Establishing simple early warning systems, such as rainfall monitoring or soil movement alerts, helps communities evacuate or take action before a landslide occurs.
  - Community members can be trained to observe warning signs like cracking soil or unusual water flow.
  - **Example:** Communities in landslide-prone areas of Ghana have used local rain gauges to monitor rainfall levels, reducing the risks of slope failure.

- **Impact:** Enhanced preparedness and timely responses, minimising casualties and property damage during landslides.

- **Implementing Sustainable Land-Use Practices**
  - Communities can adopt practices like terracing, contour ploughing, and controlled grazing to reduce soil erosion and maintain slope stability.
  - Zoning regulations within communities can restrict construction on unstable slopes.
  - **Example:** Farmers in the Volta Region have adopted terracing techniques to stabilise agricultural lands on hilly terrains.
  - **Impact:** Sustained productivity of agricultural lands and reduced risk of landslides caused by poor land management practices.

  Conclusion

  - *Summarise the community-based strategies, such as education campaigns, reforestation, early warning systems, and sustainable land-use practices, emphasising their role in reducing landslide risks.*
  - *Recommend active community participation, government support, and partnerships with NGOs to implement and sustain these strategies effectively.*

REFERENCES

- Adjei, P. O., & Amoako-Tuffour, J. (2019). Climate change adaptation in Ghana: The role of indigenous knowledge in agriculture. *African Journal of Environmental Science and Technology, 13*(5), 187–196.
- Adjei, P. O.-W., & Mensah, C. A. (2020). Geospatial technologies and spatial data infrastructure development in Ghana. *GeoJournal, 85*(3), 705–718.
- Adu-Ampong, E. A. (2017). Divided we stand: Institutional collaboration in tourism planning and development in the Central Region of Ghana. *Current Issues in Tourism, 20*(3), 295–314.
- Agyeman, Y., & Boateng, I. (2021). Sustainable farming practices in the Upper East Region of Ghana. *Agricultural Systems, 180*, 102765.
- Amoako, G. K., & Dartey-Baah, K. (2020). Sustainable tourism development in Ghana: A stakeholder analysis. *African Journal of Hospitality, Tourism and Leisure, 9*(2), 1–15.
- Anderson, J., & Ryan, B. (2020). *Cartography: Thematic map design* (8th ed.). Routledge.
- Anderson, K., & Ryan, B. (2020). *Topographic map interpretation and analysis*. Routledge.
- Anderson, R. S., & Anderson, S. P. (2016). *Geomorphology: The mechanics and chemistry of landscapes*. Cambridge University Press.
- Antwi, E. K., Boakye-Danquah, J., & Forkuo, E. K. (2021). GIS-based spatial modelling for urban planning in Ghana: Application and challenges. *Journal of Urban Management, 10*(3), 292–301.
- Antwi-Agyei, P., Dougill, A. J., & Stringer, L. C. (2017). Assessing coherence between sector policies and climate compatible development: Opportunities for triple wins in Ghana. *Sustainability, 9*(11), 2130.
- Asare-Nuamah, P., & Amungwa, F. A. (2018). Climate change and its impact on agriculture in Ghana: A review. *Journal of Agricultural Science, 10*(7), 123–134.
- Asiamah, Y., & Owusu, G. (2016). The use of GIS in Ghanaian senior high schools: Challenges and opportunities. *Ghana Journal of Geography, 8*(1), 43–61.
- Asiedu, A. B., & Gbedema, T. K. (2019). Cultural tourism and poverty alleviation in rural Ghana: A case study of the Nzulezo stilt village. *Journal of Sustainable Tourism, 27*(6), 781–798.
- Bierman, P. R., & Montgomery, D. R. (2020). *Key concepts in geomorphology* (2nd ed.). W. H. Freeman.
- Boamah, S. A. (2019). Mapping health facilities in Ghana using GIS: A case study of the Northern Region. *International Journal of Health Geographics, 18*(1), 15.
- Bunnett, R. B. (2014). *General geography in diagrams*. Pearson Education.
- Dadson, I. Y. (2019). *Understanding climatology* (3rd ed.). UCC Press.
- Dadson, I. Y. (2021). *Integrated human and regional geography* (Rev. ed.). University of Cape Coast Press.
- Dadson, I. Y., Adu-Boahen, K., & Owusu, B. A. (2022). *Essentials of physical geography*. University of Cape Coast Press.
- Dovie, D. B., & Lwasa, S. (2021). Urban resilience to climate change in Ghana: Challenges and opportunities for adaptation. *Cities, 108*, 102987.
- Environmental Protection Agency, Ghana. (2020). *Ghana's fourth national communication to the United Nations Framework Convention on Climate Change*. EPA Ghana.

- Ghana Ministry of Tourism, Arts and Culture. (2020). *National tourism development plan (2020–2024)*. Government of Ghana.
- Ghana Statistical Service. (2021). *2021 population and housing census*. Ghana Statistical Service.
- Ghana Statistical Service. (2024). *Mid-year population estimates*. Ghana Statistical Service.
- Ghana Tourism Authority. (2021). *Annual tourism report 2020*. Ghana Tourism Authority.
- Goudie, A. S. (2020). *Geomorphology in the Anthropocene*. Cambridge University Press.
- Gregory, I. N., & Ell, P. S. (2017). *Historical GIS: Technologies, methodologies and scholarship*. Cambridge University Press.
- Gregory, K. J. (2019). *The basics of geomorphology: Key concepts*. Routledge.
- Huggett, R. J. (2017). *Fundamentals of geomorphology* (4th ed.). Routledge.
- International Monetary Fund. (2023). *Ghana: Economic overview*. International Monetary Fund.
- Keller, E. A., & DeVecchio, D. E. (2021). *Natural hazards: Earth's processes as hazards, disasters, and catastrophes* (5th ed.). Routledge.
- Kimbu, A. N., & Tichaawa, T. M. (2018). Sustainable development and tourism in African regions: Insights from Cameroon and Ghana. *Tourism Planning & Development, 15*(5), 519–539. https://doi.org/10.1080/21568316.2017.1405371
- Knight, J., & Rogerson, C. M. (2022). *Geography education for sustainable development*. Springer.
- Knighton, D. (2019). *Fluvial forms and processes: A new perspective* (2nd ed.). Routledge.
- Mensah, I., & Amissah, E. F. (2019). The impact of cultural festivals on tourism development in Ghana: A case study of the Aboakyer festival. *International Journal of Tourism Sciences, 19*(1), 1–14.
- Mensah, J., & Amoako, K. (2022). Coastal vulnerability to climate change in Ghana: Evidence from Keta and Ada. *Journal of Coastal Research, 38*(2), 345–356.
- Migoń, P. (Ed.). (2019). *Geomorphological landscapes of the world*. Springer.
- Ministry of Environment, Science, Technology and Innovation. (2015). *Ghana's national climate change policy*. Government of Ghana.
- Ministry of Environment, Science, Technology and Innovation. (2022). *The Green Ghana Project: A national afforestation initiative*. Government of Ghana.
- Monkhouse, F. J., & Wilkinson, H. R. (2016). *Maps and diagrams: Their compilation and construction* (Reprinted ed.). Routledge.
- Murphy, B., & Hall, T. (2021). *Geographical skills and fieldwork for GCSE and A-level*. Hodder Education.
- National Disaster Management Organization. (2019). *Early warning systems for natural disasters in Ghana*. Government of Ghana.
- Ofori, S. A., Cobbina, S. J., & Doke, D. A. (2018). Climate change and water resources in Ghana: Impacts and adaptation measures. *Water International, 43*(6), 843–859.
- Osei, A., & Asante, F. (2020). Terracing as a landslide prevention strategy in hilly regions of Ghana. *Geotechnical Engineering Journal, 45*(2), 89–102.
- Otoo, F. E., & Amuquandoh, F. E. (2021). Community-based ecotourism in Ghana: A case study of the Boabeng-Fiema Monkey Sanctuary. *Journal of Ecotourism, 20*(2), 145–162.

- Owusu, G., Yankson, P. W. K., & Agyei-Mensah, S. (2015). Urbanisation and health in Africa: Exploring the interconnections through GIS. *African Geographical Review, 34*(1), 5–25.
- Petersen, J., Sack, D., & Gabler, R. E. (2014). *Fundamentals of physical geography*. Cengage Learning.
- Population Reference Bureau. (2024). *World population data sheet*. https://www.prb.org
- Ritter, D. F., Kochel, R. C., & Miller, J. R. (2016). *Process geomorphology* (5th ed.). Waveland Press.
- Robinson, A. H., Morrison, J. L., Muehrcke, P. C., Kimerling, A. J., & Guptill, S. C. (2017). *Elements of cartography* (7th ed.). Wiley.
- Schumm, S. A. (2015). *River variability and complexity*. Cambridge University Press.
- Teye, J. K., & Yaro, J. A. (2023). Climate change and rural livelihoods in northern Ghana: Evidence from drought and adaptation strategies. *Climate and Development, 15*(4), 321–334.
- Teye, V. B., & Timothy, D. J. (2020). Tourism and the slave trade in West Africa: A comparative study of Ghana and Senegal. *Tourism Geographies, 22*(3), 526–546.
- Tsibu, B. (2022). *Human and regional geography for senior high schools*. Abundance of Grace Enterprise.
- United Nations Convention to Combat Desertification. (2020). *Desertification in West Africa: A regional assessment*.
- Wilson, J. P., & Fotheringham, A. S. (Eds.). (2018). *The SAGE handbook of GIS and society*. SAGE Publications.
- World Bank. (2021). *Climate risk profile: Ghana*. World Bank Group.
- World Bank. (2023). *Ghana development indicators*. World Bank.
- World Factbook. (2024). *Ghana demographics*. Central Intelligence Agency.
- World Health Organisation. (2022). *Ghana health profile*. World Health Organisation.
- Worldometer. (2024). *Ghana population data*. https://www.worldometers.info

GLOSSARY

Adaptation	Adjustments made in systems, processes, or behaviours to minimise the negative effects of climate change.
Climate	The long-term average of weather conditions in a particular area, typically assessed over a period of 30 years or more.
Composting	The natural process of recycling organic matter, such as leaves and food scraps, into a valuable fertiliser that can enrich soil and plants.
Conservation	The protection, preservation, and sustainable use of natural and cultural resources such as wildlife, forests, water bodies, historical monuments, and traditions.
Contamination	The action or state of making air, water or soil impure by introducing unwanted substances in it.
Digital interpretation	The use of computers and software to study and understand images or data collected from sources like satellites, drones, or GPS.
Drainage	How water flows across the land, including rivers, streams, and rainwater movement from higher to lower areas.
Drought	An extended period of deficient rainfall relative to the statistical multi-year average for a region.
Ecotourism	Tourism that focuses on visiting natural areas in an environmentally friendly manner, supporting conservation, respecting local cultures, and benefiting local communities.
Environment	Includes the air we breathe, the water we drink, the land, animals, plants, and even the weather.
Floodplains	Flat or nearly flat areas adjacent to rivers and streams that are prone to flooding.
Geospatial data	Information related to places or locations on the Earth's surface.
Gravity	Causes water to flow downhill and helps landslides occur on steep slopes by pulling loose soil and rocks downward.
Growth Rate	How fast or slow the number of people in a place is increasing over time.
Heritage	Valued traditions, culture, history, and natural resources passed down from previous generations.
Hill	A raised area of land higher than the surrounding land but not as high as a mountain.
Hospitality	The friendly, generous, and welcoming treatment of guests, visitors, or strangers.
Incineration	The burning of solid waste at high temperatures in a controlled environment.
Landfill	A site for the disposal of waste as part of waste management.
Mitigation	Efforts and strategies aimed at reducing greenhouse gas emissions and enhancing carbon sinks.
Oxbow lake	A U-shaped body of water formed when a river meander is cut off.
Point bars	Depositional landforms found along the inside bends of meandering rivers.

Population Momentum	When a population keeps growing even after birth rates decline due to a large number of young people.
Rapid Urbanisation	A fast increase in people moving from villages to cities, often leading to overcrowding and poor infrastructure.
Rapids	Sections of a river where water flows swiftly over rocks or steep gradients, creating turbulent currents.
Recreation	Activities people engage in during free time for enjoyment, relaxation, and fun.
Return Migration	When people who moved to another place decide to return to their home area.
Settlement	A place where people live, such as a village, town, or city.
Steep Land	Land with a very sharp or high slope.
Steep valley	A valley with very steep sides, creating a sharp drop from surrounding land.
Terrain	The shape and features of the land in an area.
Thematic map	A map that focuses on a specific topic or theme.
Topographical map	A map showing the shape and height of land using lines and symbols.
Traditions	Practices, customs, beliefs, or ways of life passed down through generations.
Urbanisation	The general process of more people living in towns and cities instead of rural areas.
Waste segregation	Separating different types of waste at the source for proper handling and processing.
Wetland	Land covered with water for part or all of the year, rich in plant and animal life.

ACKNOWLEDGEMENTS

Ghana Education Service (GES)

List of Contributors

Name (Writers)	Institution
Prof. Ishmael Yaw Dadson	University of Education, Winneba
Glago Frank Jerome	Akatsi College of Education
Susuana Adwoa Appiah	TAMALE SHS
Name (Reviewer)	**Institution**
Prof Kofi Adu Boahen	University of Winneba

This book is intended to be used for the Year Three Business Management Senior High School (SHS) Curriculum. It contains information and activities to support teachers to deliver the curriculum in the classroom as well as additional exercises to support learners' self-study and revision. Learners can use the review questions to assess their understanding and explore concepts and additional content in their own time using the extended reading list provided.

All materials can be accessed electronically from the Ministry of Education's Curriculum Microsite.

[Scan the QR Code to visit the website]

Ghana Education Service (GES)

ISBN 978-9-98-895837-4