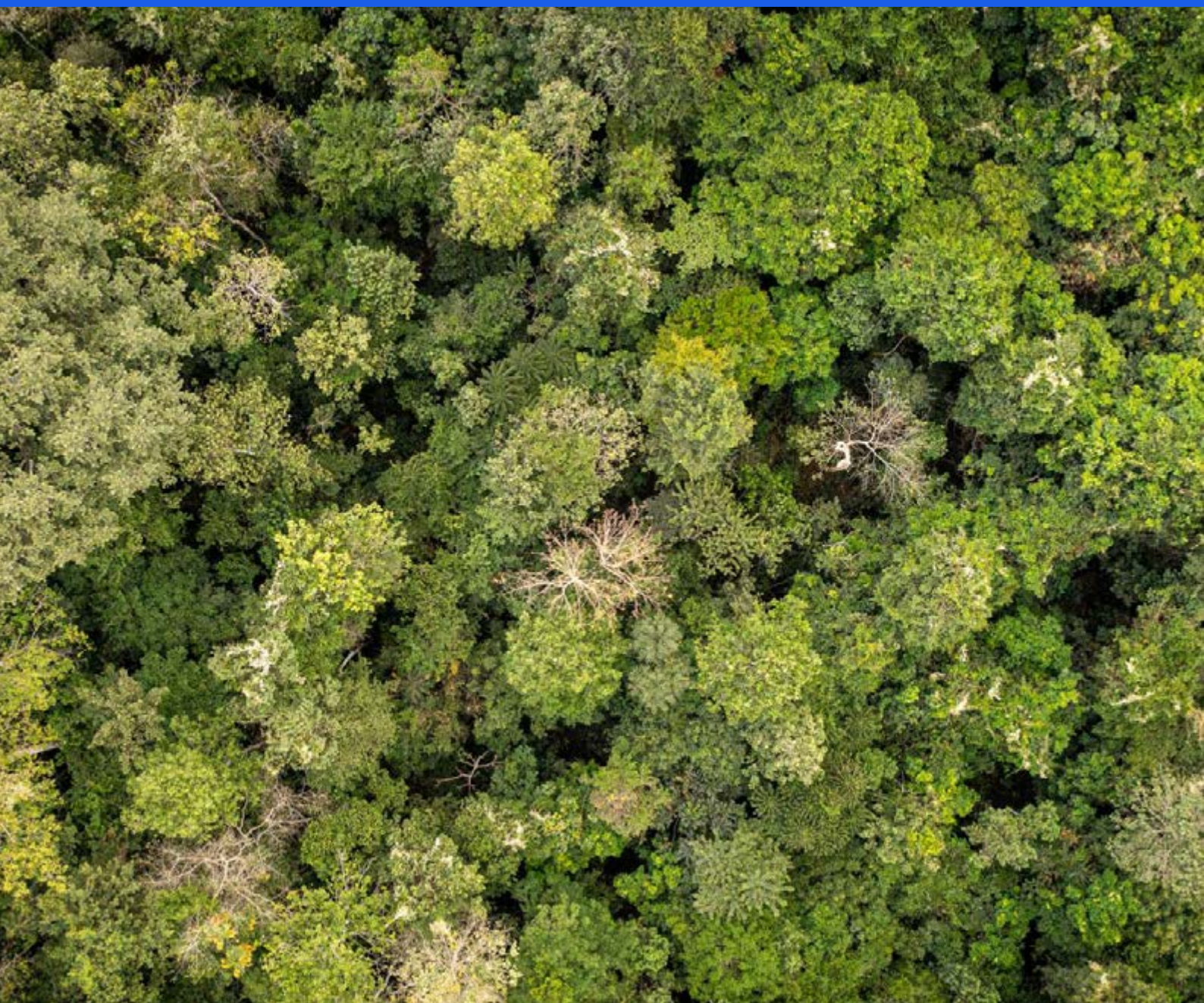
Geography Year 1

SECTION

10

CLIMATE, VEGETATION AND SOILS IN GHANA



HUMAN AND ENVIRONMENT

Physical Setting and People

Introduction

This section covers the climate, vegetation and soils of Ghana and outlines the relationship between them and explains their socio-economic importance. Ghana's climate can be described as tropical with warm, humid conditions. It has distinct wet and dry seasons. Ghana's natural vegetation is varied, ranging from forests, mangroves to grassland. There are many different soil types in Ghana, several of which are rich in nutrients supporting the growth of crops like cocoa and maize. This section will help you understand that climate, vegetation and soils work together to provide Ghana's people with socio-economic benefits and help in building a sustainable economy. This section can be linked to topics from Social Studies in Junior High School.

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

- Discuss the climate, vegetation and soil types in Ghana and their importance and challenges to socio-economic development

Key Ideas

- Ghana's climate is tropical, with warm and humid conditions all year round.
- The climate is influenced by temperature, latitude, altitude, oceans and air masses.
- It has distinct wet and dry seasons.
- The climate of Ghana can be divided into four main types or zones.
- The natural vegetation of Ghana is influenced by climate, topography, soil, presence of water bodies, human activities and time.
- Ghana is divided into six natural vegetation zones.
- Soil is the loose material on the surface of the Earth that consists of tiny bits of rock, minerals, water, air, and organic matter (both living and dead). It is essential for plant growth as it holds water and nutrients.
- There are many soil types in Ghana, including Forest ochrosols and Akuse clays (Tropical Black Clays) which are high in nutrient content which supports crop growing making them both socio-economically important.
- The climate, natural vegetation and soils provide Ghana with socio-economic benefits for farming, forestry, tourism, support biodiversity, provide water resources and environmental stability.

THE CLIMATE OF GHANA

The climate of Ghana is influenced by factors such as latitude, altitude, prevailing winds and the presence of the Atlantic Ocean. Situated just a few degrees north of the Equator means the country has a tropical climate but the movement of the Inter-Tropical Convergence Zone gives it distinct wet and dry seasons. Within the land area of Ghana, variations to the tropical climate can be recognised. Four regions can be identified where climate characteristics like temperatures and rainfall are different.

Major Characteristics of Ghana's Climate

1. Temperature

- The temperature is warm in Ghana throughout the year with minor variations depending on the time of the year and location.
- The average monthly temperature in Ghana is between 26°C and 30°C. This is because the country is located in the tropics.
- The hottest months in Ghana are March, April and May. March records the highest temperature in Ghana, making it the hottest month.
- The coldest months in Ghana are July and August. August records the lowest of temperatures in Ghana, making it the coldest month.

2. Rainfall

- Ghana has a high annual rainfall but there are variations in the year and over the land area.
- In the north of Ghana, there is one rainfall period (single maxima) between May and September, while in the south, there are two rainfall periods (double maxima) between March and July and between September and November.
- The area with the highest amount of rainfall is the southwestern part of Ghana (around Axim) which receives more than 2,000 mm of rainfall per year.
- Kumasi receives more than 1,500 mm per year, Tamale around 1,100 mm, and Bawku on the northeast corner around 1,000mm. High rainfall amounts are more common in mountain areas than in the surrounding lowlands, and this is due to the relief effect. For instance, Abetifi receives around 1700mm of rainfall per year.
- The driest climatic region in Ghana is the Dry Equatorial or the south-eastern coastal plains, east of Accra, where the dry season is between December and March with less than 1000mm of rainfall in a year.

3. Humidity

- Ghana has a humid climate, which means the amount of moisture or water vapour in the air is relatively high throughout the year.

- The humidity level in Ghana is typically high during the wet season. This because the south-west monsoon winds bring moisture from the sea. During the wet season, the humidity levels may reach up to 80-90% and be as low as 30% in the northern parts during the dry season.

Factors affecting the climate of Ghana

1. Air Masses

An air mass is a large body of air that has the same temperature and humidity at any given altitude. The climate of Ghana is influenced by three main air masses:

a. Tropical Continental (cT),
b. Tropical Maritime (mT)
c. Equatorial Maritime (eM).

i. **Tropical Continental (cT)** air is hot and dry. This air comes from the Sahara Desert. The Harmattan wind (a North-East Trade wind) connected to this air mass brings hot dry air to northern Ghana, often carrying with it large quantities of dust.
ii. **Tropical Maritime (mT)** air is warm and moist. Known as the Southwest Monsoon Winds, it comes from the South Atlantic Ocean ('maritime' means related to the sea). It brings rainfall to the entire country during the wet season, especially from May to September.
iii. **Equatorial Maritime (eM)** air is very warm and moist. The air comes from the sea around the Equator. It brings the rainy season in southern Ghana, particularly from April to June and September to October.

2. Seasons

The climate of Ghana has distinct wet and dry seasons.

a. **The wet season** has high temperatures, high humidity and high rainfall. The wet season in Ghana begins in April and ends in September.
b. **The dry season** has high day temperatures and low night temperatures, lower humidity and lower rainfall. The extreme dryness in parts of Ghana is usually linked to the Harmattan winds blowing from the northeast. The dry season in Ghana usually begins in November and ends in March. In northern Ghana, it can sometimes extend beyond March.

3. Inter-Tropical Convergence Zone (ITCZ)

The Inter-Tropical Convergence Zone (ITCZ) is a region near the Equator where the northeast and southeast trade winds converge. The warm moist air brought by the southeast trade winds from the Atlantic Ocean is forced to rise, creating low pressure, clouds, frequent thunderstorms and heavy rainfall.

A combination of the Earth's axis tilt and orbit around the sun causes the ITCZ to move position. In summer in the northern hemisphere the Earth is tilted so this part is closest to the sun and the rays are more concentrated. The intense heating causes moist air to rise, clouds to form and heavy rains. The reverse is true for winter in the northern hemisphere when the Earth is tilted furthest away from the sun and heating is less intense. This creates a dry season for Ghana.

a. The ITCZ reaches its northernmost position in July when it is located around 20°N latitude. At that point, every part of Ghana will be experiencing the wet season, with most rains occurring.
b. The ITCZ moves south in October, reaching its southernmost position in January, around 5°S latitude. This is the dry season in Ghana when the country receives very little rainfall.
c. The movement of the ITCZ is also affected by the presence of mountains. This is why the wet season in Ghana starts a few weeks later in the western part of the country than in the eastern part.

Figure 10.1 gives a detailed picture of the movement of the ITCZ.

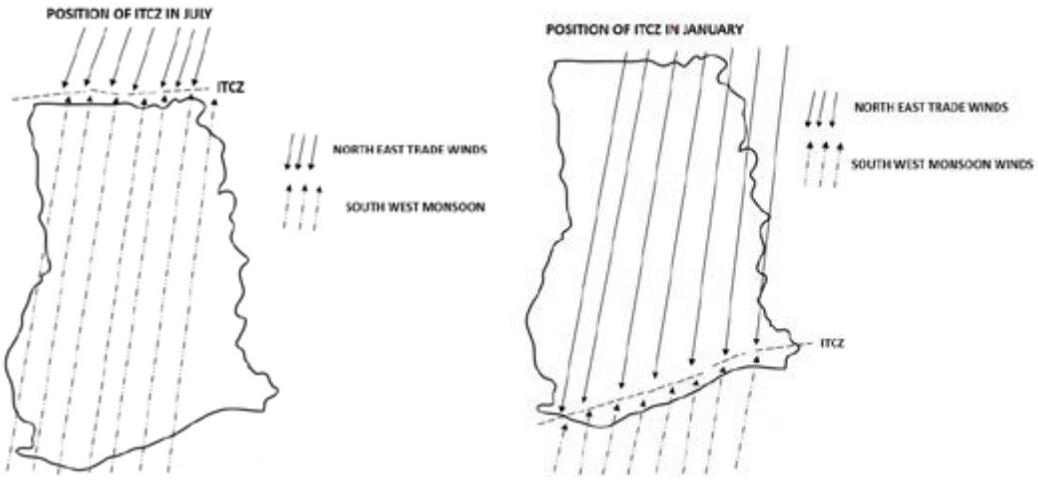


Fig. 10.1: Position of the ITCZ in July and January

4. Latitude

The location of Ghana just north of the Equator makes its climate warm and humid.

5. Prevailing Winds

These are winds that blow from a particular place and direction over a specific area. In Ghana the winds that have the biggest influence on climate are the northeast and southwest trade winds. These winds influence the climate of Ghana due to their characteristics in terms of temperature and humidity. Between May and September, when the southwest winds are dominant, the country experiences a wet season. From November to March, when the northeast trade winds are dominant, Ghana experiences the dry season.

6. Altitude

The altitude influences the climate of Ghana. Temperatures get lower as altitude increases. Those living in hilly areas such as parts of the Eastern and Volta regions have relatively cooler climates than those living in relatively flat and low-lying areas.

7. Ocean currents

Ocean currents are movements of water in the oceans caused by a number of things like winds, the rotation of the earth and temperature differences. In Ghana, the current that moves along our coastline is called the Guinea Current. This is a warm ocean current. This partly contributes to the wet and humid nature of Ghana's climate since it warms and adds moisture to the air over it.

Distance from the sea: Areas that are close to the sea such as southern Ghana are humid and wet because moist air is blown by winds onto the land. Away from the influence of the sea, areas are drier, such as the northern part of Ghana. This partly explains why southern Ghana has warm, humid and rainy conditions while northern Ghana is warm, less humid and drier.

Climatic Regions of Ghana

A climatic region is a continuous geographic area in which similar climatic characteristics are observed. These characteristics include temperature, precipitation, humidity, and wind patterns. Ghana can be divided into four main climatic regions:

1. South-western Equatorial
2. Wet semi-Equatorial
3. Dry Equatorial
4. Tropical Continental

The location of the four regions is shown in figure 10.2.

I. South-western Equatorial Climate
II. Wet semi-Equatorial Climate
III. Dry Equatorial Climate
IV. Tropical Continental Climate

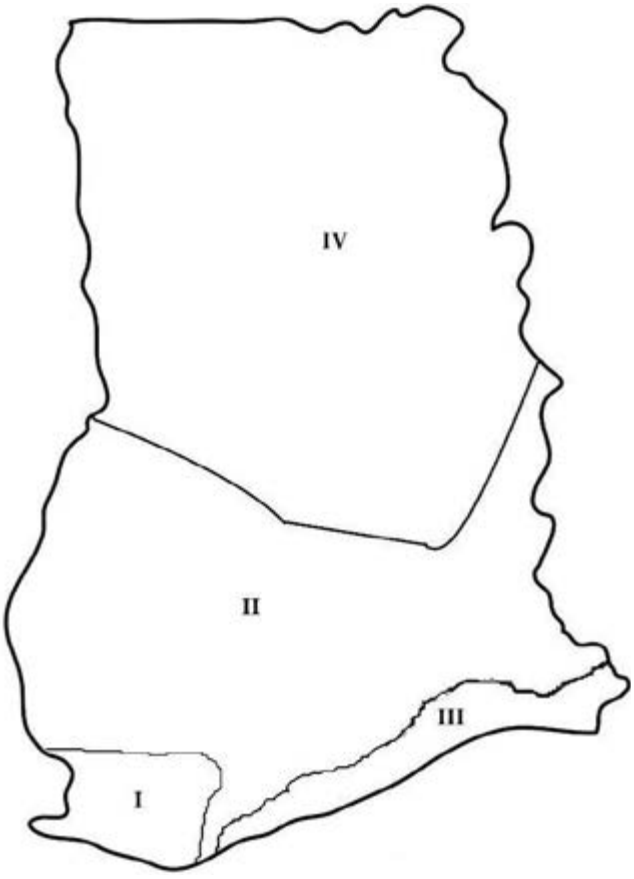


Fig. 10.2: Climate map of Ghana, indicating the four main climatic regions, types or zones. *Where do you normally live in Ghana? Which one of the climatic zones in the map is your area located? Go ahead and learn the characteristics of these climatic regions and you will understand a lot of weather and climatic activities that happen in your area.*

1. South-Western Equatorial Climate

Location: This climatic region covers the south-western part of Ghana, mainly Axim, Dixcove, Essiama, Half-Assini and Tarkwa.

Climatic Characteristics

Note that the characteristics are discussed, based on the elements of weather and climate as they occur in Ghana.

a. **Rainfall**

- This is the only climatic region in Ghana that records rains throughout the year. This means, there is no month without rainfall, though the trend is gradually changing. This is the wettest climatic region in Ghana, with Axim, being the main climatic or weather station.
- This region has two main rainfall seasons. The major and minor rainfall seasons are mainly referred to as double maxima rainfall seasons or regimes. The major rainy season is from - April to July and the minor season is between September and October).
- The mean or average annual (yearly) rainfall is about 2000mm.
- The rainfall type is convectional, mostly accompanied by lightning and thunder (thunderstorms).

b. **Temperature**

- The temperatures are relatively high throughout the year, about 27°C.
- The daily or diurnal (over 24 hours) range in temperature is between 6°C and 8°C.
- The annual (over 1 year) range of temperature is very small, varying between 2°C to 4°C. Range is the difference between the highest and lowest temperature within the year.

c. **Relative Humidity**

- It is very high, between 80%-90%. This means that, in the south-western corner of Ghana, the air is mostly moist or humid throughout the year. This is one of the reasons for the high amount of rainfall in Axim and its surrounding areas.

d. **Winds and Ocean Current**

- This climate is influenced by the southwest trade winds and warm ocean currents called the Guinea Current. These winds carry moisture and have warm temperatures, giving a higher rainfall in this climatic region.

2. Wet semi-Equatorial

Location: It is found mainly in the middle belt. Covers towns like Kumasi, Oda, Koforidua, Kade, Assin Fosu and Offin Dunkwa among others. Kumasi is one of the most important weather stations in this region.

Climatic Characteristics of Wet Semi-Equatorial Climate

a. **Rainfall**
- The region records annual rainfall between 1250mm and 1700mm.
- The rainfall pattern is double maxima, meaning it has two rainy seasons. The major season is from May to July while the minor season is from September to October.
- The rainfall types are mainly relief (orographic) and convectional. Highland areas like Kwahu-Mampong Scarp and Akwapim-Togo Ranges in the area experience relief rainfall.

b. **Temperature**
- It has high temperatures throughout the year.
- The mean temperatures range from 30°C to 31°C between March and April and about 26°C in August.
- It has a low annual range of temperature of around 6°C, there is not much difference between the maximum and minimum temperature.

c. **Relative Humidity:**
- The relative humidity is high between 75% and 80%. It is lowest in the dry season.

4. Dry Equatorial

Location: It is found in the southeastern coastal part of Ghana. It stretches from the eastern portions of Cape Three Points to the southeastern corner of Ghana. It includes areas like Komenda, Cape Coast, Saltpond, Winneba, Accra, and Ada through to the border at Aflao. A typical station is Accra.

Climatic Characteristics

a. **Rainfall**
- The region records low annual rainfall with an average of 750 mm to 850 mm. The Annual rainfall is thus less than 1000mm, making it the driest climatic region in Ghana.
- Though the rainfall amount is low, this climatic region experiences double maxima or two rainy seasons, from April to July and between September and November
- The rainfall type is mainly convectional.

b. **Temperature and Humidity**
   - Temperatures are high in the hottest month about 30°C and about 26°C in August (Dadson, 2019).
   - Relative humidity in the wet season is over 75 percent but can drop to about 60 percent in the dry season. This is because this climate is mostly under the influence of the moist southwest winds.

3. Tropical Continental or Savannah Climate

Location: This climatic region is found in the Northern belt of Ghana. It covers areas such as Wa, Bolgatanga, Tamale, and part of Bono and Bono East regions. A typical station in this climatic region is Tamale.

Climatic Characteristics

a. **Rainfall**
   - The region records low annual rainfall of about 1000mm to 1500mm, with rainfall decreases with increasing latitudes. This means that the southern portions of this climatic region such as Kintampo and its surroundings have relatively higher rainfall than those further north such as Tamale, Navrongo and Wa.
   - The rainfall pattern is single maxima (May to September). It has single rainy season from May to September.
   - The rainy season is followed by long dry season from November to April.
   - The rainfall type is mainly convectional.

b. **Temperature**
   - The mean monthly temperatures vary from 36° C in March to 27° C in August during the rainy season.
   - It has an annual range of temperature varying between 9°C to 11°C.
   - The region mostly experiences relatively warm conditions throughout the year, though there are fluctuations during the harmattan season with high day temperatures and low night temperatures.

c. **Relative Humidity**
   - The relative humidity is between 70% and 95% during the wet season and around 20% in the dry season.

d. **Winds**
   - The climate is mostly under the influence of the northeast trade winds or the Harmattan winds which are hot and dry.

Reasons why the Dry Equatorial Climatic region records low rainfall

The following are the reasons for the dryness of the dry equatorial climate

1. **Rain Shadow Effect:** The Southeastern region of Ghana is located in the rain shadow of the Akwapim-Togo Ranges, which are a series of mountains running parallel to the coast. This means that the rains coming from the eastern side fall on the windward part of the Akwapim Togo rages. After the rains, the cold dry air descends on the leeward Accra plains with no moisture to produce rain.
2. **Uneven Topography:** The Southeastern region's topography is characterised by a combination of rolling hills and valleys, resulting in an uneven topography. This uneven topography usually obstructs the circulation of moisture-rich air masses, resulting in infrequent rain clouds and uneven rainfall distribution.
3. **Coastal parallelism:** As the coast runs west to south the Southwest Monsoon Winds blow almost parallel to it, east of Cape Three Points and therefore do not bring rain to the land.
4. **Presence of cold current:** The Canary ocean current flows southward along the northwest coast of Africa and this body of cold water off the shore of Cape Three Points is very stable, cooling the winds which hold less moisture so they produce less rain.
5. **Absence of thick vegetation cover:** The area does not have thick forest and other vegetation cover to release moisture adding to that brought by winds to produce rain.

Activity 10.1

Click on the link to watch a video on the climatic regions of Ghana and their characteristics (THE CLIMATE & SEASONS OF GHANA GH (youtube.com) .

1. After watching the video:
   - List the characteristics of each of the of the four climate zones of Ghana.
   - Explain in words and diagrams why there is a wet and dry season in Ghana
   - List the effects of the Harmattan wind. Why are the effects of this wind felt mainly in the North?
   - Share and discuss your work with a friend in class.

If you cannot access the video, check your school or local library or look for an internet café near your home.

2. Sketch a map of Ghana, either on plain paper or any other flat surface. Divide the map into the four main climatic regions of Ghana.

i. Indicate each of the climatic regions with a distinct colour

ii. Show it to a friend in class

iii. Discuss with your friend the unique characteristics of each of the four main climatic regions in Ghana

3. i. Identify the climatic region for your locality.

ii. Describe the annual rainfall pattern.

iii. State the months of the wet and dry seasons (remember in some regions there are two wet seasons)

4. Write a short paragraph to compare and contrast the Tropical Continental and Tropical Maritime air masses which influence Ghana's climate.
5. Write four paragraphs to explain the influence of the Inter-Tropical Convergence Zone (ITCZ) on the seasons in Ghana. Share your work with a friend and ask them for their thoughts.

VEGETATION AND SOILS OF GHANA

Vegetation

Vegetation refers to all the plants and plant life in a particular area. It includes trees, shrubs, grasses, and other forms of plant cover.

Factors that Influence Vegetation Distribution in Ghana

The following factors influence vegetation distribution in Ghana

1. **Climate:** As a whole the climate of Ghana is tropical, meaning it is warm and humid yet has a wet and dry season. Different plants grow in the four climatic zones of Ghana. In wetter areas of Ghana tropical rainforests grow, while drier areas have mainly grass and a few trees.
2. **Topography:** This is the shape of the land, including hills, valleys, and plains. In Ghana, areas with high mountains such as Abetifi, and Amedzofe have steep slopes so may have different types of vegetation compared to relatively flat areas like around Accra and Tamale. At higher altitude temperatures are cooler and may support different plants from the warmer lowlands.
3. **Soil:** It is the earth's upper layer where plants grow. The type of soil in Ghana varies across the country, affecting what plants can grow. Some soils are rich in nutrients and support fresh vegetation, while others might be poor and can only support hardy plants. For example, fertile soils are great for farming and growth of different plant species.

4. **Presence of Water Bodies:** Water bodies like rivers, lakes, and ponds are important for plant growth. In Ghana, places near water bodies often have more vegetation because plants need water to survive. Areas with lakes or rivers may have fresh green plants, while dry areas far from water bodies may have less vegetation.
5. **Human Activities:** People can have a big impact on vegetation. Activities like farming, lumbering, and building can change the landscape and affect plant growth. For instance, if trees are cut down for timber or to make space for farms, this can reduce or change forest areas.
6. **Time:** Time is also a factor because vegetation can change over years or decades. Natural processes, like succession (where one type of plant gradually replaces another), and human activities, like reforestation (planting trees), can alter the types of vegetation in an area over time.

Vegetation zones in Ghana

The following are the vegetation zones of Ghana

1. Tropical rainforest
2. Moist semi-deciduous forest
3. Coastal scrub and grassland
4. Strand and mangrove
5. Guinea savannah
6. Sudan savannah

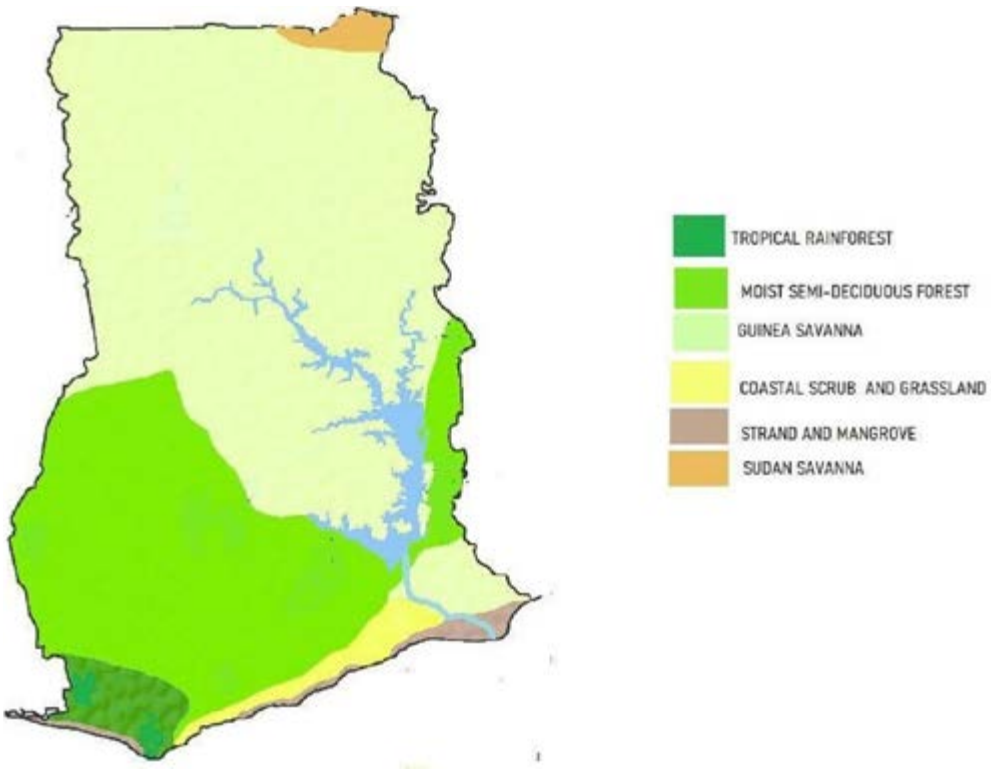


Fig. 10.3: Vegetation zones of Ghana

1. Tropical Rainforest

Location/Areas: It is located in the south-western climatic region of Ghana. The most important towns in this vegetation are Tarkwa, Nsuta, Prestea, and Samreboi in the Western Region.

Characteristics of Tropical Rainforest

a. The trees are tall with buttress roots to support them.
b. The trees are evergreen with broad leaves.
c. Other plants include climbers, creepers, epiphytes, and parasitic plants. For example, mistletoe, lianas, ferns and mosses.
d. The tree species in the forest include odum, mahogany, sapele, ebony, and wawa.
e. The forest trees have three main layers. The upper or emergent layer (32m-60m), the middle layer(15m-30m) and the lower layers (up to 15m or 17m).
f. The middle- and lower-layer tree branches form umbrella like canopies that merge to shade the forest floor so plants cannot grow so there is little or no undergrowth.

Fig. 10.4: Tropical rainforest and their layers

Visit the link to watch a video on tropical rainforests **What are tropical rainforests? (youtube.com)** – a very short introduction covering location, climatic characteristics and features of plants.

2. Moist Semi-Deciduous Forest

Location: This forest belt is found in the wet semi-equatorial climate. It covers regions or areas like Ashanti, Eastern, and parts of Bono, Ahafo, Bono East, Central, Volta and Western Region. The most important towns in this vegetation zone include Kumasi, Koforidua, Akim Oda, Sunyani, Goaso, Jasikan, and Kadjebi. It is the second-largest vegetation zone in Ghana.

Characteristics of Moist Semi-Deciduous Forest

a. The tall trees have buttress roots that support them against strong winds.
b. The trees are mostly deciduous, that is, they shed their leaves during the dry season.
c. Trees are spaced apart so sunlight can reach the forest floor.
d. The trees are not often found growing together and may be scattered all over the forest.
e. The trees are different heights forming three canopy layers; upper, middle and lower.
f. The forest is made up of tree species like odum, mahogany, wawa, sapele, and makore.
g. Other plant species include climbers, creepers, lianas and other parasitic plants.
h. The forest has dense undergrowth because sunlight can reach the forest floor.

Fig. 10.5: Semi-Deciduous Forest in wet and dry seasons

Climatic Conditions Promoting the Growth of Forest Vegetation

1. **High temperature**: The temperature is very high throughout the year about 21°C -27°C. The temperature range is small thus, 3°C. It is warm throughout the year.
2. **High daily sunshine**: The daily percentage of sunshine is quite high. The midday sun is high in the sky throughout the year.
3. **High annual rainfall**: The total annual rainfall is high throughout the year about 1500mm-2000 mm and well distributed. It rains in the afternoon and is mostly conventional. Do you remember what you learnt about the southwestern equatorial climate of Ghana?
4. **High relative humidity**: The relative humidity is high throughout the year ranging between 70%-80%. There is light or stagnant wind.

Adaptations of Tropical Rainforest/Moist Semi-Deciduous Forest Trees to the Climate

Fig. 10.6: A large Tropical Rainforest tree with supporting buttress roots.

1. Large trees have buttress roots support their great height and stop them being blown over by strong winds.
2. Trees have shallow roots that spread over a large area as there is always plenty of water on the surface from the high rainfall.
3. The branches interlock or intertwine to give a continuous canopy in Tropical Rainforest, preventing sunlight from reaching the ground.
4. Most trees are straight and tall because of the competition for sunlight.
5. The leaves are evergreen because growth can take place throughout the year due to continuous rainfall and high temperatures.
6. Fruiting and flowering also occur throughout the year due to constant high temperatures
7. The leaves are broad and open to help with moisture loss in the high temperatures.

Benefits of Rain Forest and Semi-Deciduous Forest Vegetation to Economic Development of Ghana/Economic Importance of Forest Vegetation

1. **Provision of Food:** Forests provide a variety of foods, like fruits, nuts, and vegetables. Some of these fruits are wild and germinate by themselves. These foods are not only delicious but also necessary for our health and energy.
2. **Provision of Fuel Wood:** Many people use wood from trees such as firewood and charcoal as a source of energy. This wood can be burned to cook food, especially in places where other fuel sources are not available.
3. **Sources of Herbs for Medicine:** Lots of plants found in forests are used to make medicines. These herbs can help treat illnesses and improve our health, showing that nature is a valuable source of healing.
4. **Provision of Foreign Exchange / Timber for Export:** Ghana exports timber (wood) to other nations. This trade brings money into the country, which is known as foreign exchange. It helps improve the economy.
5. **Provision of Jobs:** Forests create many job opportunities. People can work in areas like lumbering, agriculture, and tourism, forestry, which helps support families and communities.
6. **Provision of Wood for Construction:** Wood from trees is a key material used in building houses, bridges, and other structures. It is strong and durable, making it perfect for construction.
7. **Provision of Habitats for Wildlife:** Forests are home to many animals and plants. They provide the shelter and food that wildlife needs to survive, helping maintain biodiversity. For example monkeys, elephants, and antelope are found in Kakum National Park, and Mole National Park.
8. **Provision of Raw Materials for industries:** Many industries rely on materials from forests, such as wood for furniture, paper, and packaging. These materials are essential for making products we use every day. Artists and craftspeople use materials from forests, like wood and leaves, to create artwork and handmade items. This supports creativity and cultural expression.
9. **Tourist Attraction:** Beautiful forests attract tourists who want to hike, camp, or explore nature. This can help local economies by bringing in money from visitors. For example Bobiri Forest Reserves, Kakum National Park

Human Activities in Ghana's Forest Vegetation

1. **Lumbering Activities:** Lumbering activities take place in Ghana's forest vegetation. For example, chainsaw operators, sawmill companies and individuals cut down trees to build houses, make furniture, and create paper products. While lumbering provides important materials, it is important to do it responsibly to protect forests.
2. **Mining Activities:** In Ghana, some of the minerals are located in areas of forest vegetation. Due to this, some mining activities take place in these forest regions including small-scale mining. This causes damage to our forest vegetation.
3. **Hunting**: It involves tracking and catching animals in the forest for food or other uses. It has been a traditional activity for many cultures. For example, hunters enter the forest to hunt for animals such as grass cutters (Greater Cane rat), antelope, and deer, either for sale or for the family. However, it is important to hunt responsibly and follow laws to ensure that animal populations remain healthy.
4. **Agricultural Activities:** Agriculture in forest areas includes farming crops and raising animals. People clear parts of the forest to grow food crops fruits vegetables and cash crops, like fruits and vegetables. This can provide food for families and income, but it's important to manage land wisely to prevent deforestation. For example, Ghana's cocoa is mostly produced in the forest region.
5. **Manufacturing Activities:** Manufacturing in forest regions often involves making products from wood and other natural resources. For example, most sawmills and timber companies are located in the forest vegetation example Mem, Samraboi, Bibiani and Oda. This includes furniture, paper, and various goods. Factories can provide jobs and help the economy, but they need to be environmentally friendly.
6. **Food Gathering:** Food gathering is the practice of collecting wild plants, fruits, nuts, and mushrooms from the forest. Many communities rely on this for food. It is a sustainable way to use natural resources, as long as it is done carefully and without harming the environment.
7. **Tourism:** Some forest reserves in Ghana such as Atiwa, Kakum, and Ankasa attract tourists due to their unique nature. Tourism in forest areas includes activities like hiking, camping, and birdwatching. Tourists visit forests to enjoy nature and learn about wildlife. This can generate employment for local communities, income for local communities and foreign exchange for government.

Human Activities that Cause Depletion or Destruction of Ghana's Forest Vegetation

1. **Poor System of Farming:** When farmers use methods that harm the land, like planting the same crops repeatedly without giving the soil a break, it can lead to soil depletion. This means the soil loses its nutrients, making it harder to grow healthy plants. Sometimes, this can also lead to cutting down more trees to make space for farming.
2. **Lumbering Activities:** Indiscriminate cutting down of trees leads to deforestation. This means there are fewer trees, which affects wildlife habitats and the overall health of the forest. For example, illegal chainsaw operators enter our forest reserves and cut trees which is causing the depletion of Ghana's forest.
3. **Settlement Purposes:** With the increase in Ghana's population, people move into forested areas to build homes and communities, they often clear large sections of trees. This can lead to significant loss of forest land, impacting the plants and animals that live there.
4. **Bush Burning:** Some farmers and hunters set fire to our forest to carry out their activities. While it can make farming easier, uncontrolled fires can destroy large areas of forest and harm wildlife. It can also lead to air pollution and soil erosion.
5. **Mining Activities:** Mining requires clearing large areas of forest to access minerals. This can lead to deforestation and pollution of nearby rivers and soils, harming both the environment and the creatures that depend on those ecosystems. This is mostly caused by small-scale illegal miners who run operations referred to as 'galamsey'.
6. **Construction of Transportation Networks:** As Ghana increases its infrastructure such as roads, highways, and railways it often requires cutting down trees and clearing land. While these transportation networks help connect communities, they can fragment forests and disrupt the habitats of many animals.

3. Coastal Scrub and Grassland

Location: This type of vegetation is found in the south-eastern coastal plains of Ghana i.e., on top of Strand and Mangrove Forest. The most important towns of this vegetation are Nsawam, Agona Swedru, Winneba and Apam

Characteristics of Coastal Scrub and Grassland

a. This vegetation is made up of low, woody plants known as scrub and grass.
b. The scrub grows in small groups and the grasses grow in between them.
c. The plants appear green during the rainy season and brown in most parts of the year.
d. The common plants in this vegetation are neem tree, raffia palm, coconut, and wild oil palm.

Fig. 10.7: Coastal Scrub and Grassland

4. Strand and Mangroves Vegetation

Location: This vegetation is found along the south-east and south-west coastal margins of Ghana. The important towns of this vegetation are Axim, Keta and Ada.

Characteristic of the Strand and Mangrove Forest

a. The vegetation is made up of red and white mangrove trees.
b. The trees are very close to each other, and they are evergreen throughout the year.
c. The trees have thick barks which help them to withstand the corrosion of the salty water.
d. The trees have aerial roots and long tap roots.
e. The important trees in this forest include mangrove, coconut and raffia palm.

Fig. 10.8: Strand and Mangrove vegetation

5. Guinea Savannah

Location: It is found in the Northern belt of Ghana. The important towns are Tamale and Wa. This vegetation is found between the strand and mangrove and moist semi-deciduous forest to the north.

Characteristics of Guinea savannah

a. This vegetation is made up of tall grasses like elephant grass and wiregrass.
b. The grasses grow in tussocks (longer and thicker) and can reach a height of 3 metres or more.
c. The grasses look green in the rainy season, turn brown in the dry season and may even wither.
d. A few short trees are widely scattered in the grasses.
e. The trees are deciduous, that is, they shed their leaves during the dry season.
f. The trees have long tap roots, big trunks and thick barks.
g. The common trees include acacia, silk cotton, shea tree, locust bean, baobab, and dawadawa.
h. Gallery or fringing forests are found along the edges of rivers like Kulpawn, Sisili, Mole, Oti, and Black Volta.

Fig. 10.9: Guinea Savannah

6. Sudan Savannah

Location: It is found in the extreme north-eastern corner of Ghana. The most important town of this vegetation zone is Bawku.

Characteristics of Sudan savannah

a. This vegetation is made up of short grasses.
b. A few short trees are widely scattered in the grasses.
c. The trees have thick barks and are drought resistant.
d. The trees are deciduous, that is, they shed their leaves during the dry season.
e. The vegetation looks green during the rainy season but turns brown in the long dry season.
f. The common trees in this savannah are silk cotton, acacia, dawadawa, shea tree, and baobab.
g. The gallery or fringes of the forest are along river basins of White and Red Volta.

Fig. 10.10: Sudan Savannah

Adaptation of Savannah Vegetation to the Climate

1. Trees like the baobab store water in their trunks against the dry season.
2. Some trees lose their leaves to prevent loss of water from their trunk and roots.
3. Most trees have long roots to reach layers of moist soil several metres below the surface.
4. Some trees like acacia conserve soil moisture by developing an umbrella-shaped crown that provides shade around the trunk and roots.
5. The roots of the grasses remain dormant during the dry season and germinate again in the wet season.

Activity 10.2

1. Draw a map of Ghana and locate the various vegetation zones.
   a. Describe the characteristics of each vegetation zone to your friend in class.
   b. How will the vegetation zones influence the farming activities of your community?
   c. With reference to the vegetation map that you have drawn, write down the major human activities that can destroy the vegetation
2. Do a nature walk in your community to observe local vegetation.
   a. Identify the type of vegetation zone in which you find yourself.
   b. How does the vegetation in your area differ from other vegetation zones in other parts of Ghana?
   c. What factors do you think have sustained vegetation zones in your area?
3. Each of the statements below describes some characteristics of vegetation types. Name the type of vegetation each statement refers to:
   a. I am a vegetation zone located in the northeastern corner of Ghana
   b. I am the largest vegetation zone by area in Ghana.
   c. In my vegetation zone the trees are very tall, evergreen with broad leaves.
   d. My vegetation zone is all grasses, with a few scattered trees like baobab and acacia.
   e. In my vegetation zone the trees have thick barks helping them to survive the salty water.
   f. In my vegetation zone trees form three layers, but sunlight can still reach the ground.
   g. In my vegetation zone includes lianas and creepers but no forest floor plants.
   h. The important trees in my vegetation zone include raffia palm and coconut.
   i. In my vegetation zone the trees have long tap roots, big trunks and thick barks.
   j. My vegetation zone includes the towns of Nkawkaw, Kumasi, Koforidua and Sunyani.
4. Draw a table which compares and contrasts the characteristics of forest and savannah vegetations in Ghana.

SOILS IN GHANA

Soil is the top layer of the Earth's surface where plants grow. It is made up of tiny bits of rock, minerals, organic matter (like decomposed plants and animals), water, and air.

Factors Influencing Soil Formation

1. **The Type of Parent Material:** Parent material is the rock or any other material from which soil is formed. Different types of rocks break down into different minerals, which affect the soil's characteristics. For example, granite turns into sandy soil, while limestone creates more fertile soil.
2. **The Climate of the Area:** The climate (temperature and rainfall) affects soil formation. In warm, wet climates, like southwestern equatorial climates, soil develops quickly because weathering (the breaking down of rocks) happens faster. In dry warm climates such as the tropical continental, soil formation is slower. The climate also influences what plants can grow, and these contribute organic matter to the soil.
3. **Vegetation Cover:** Plants play a crucial role in soil formation. The type of vegetation affects the amount of organic matter added to the soil when plants die and decompose. Forests, for example, add more organic material to the soil than grasslands. That is why soils in Ghana's forest vegetation are different from those in the savannah vegetation. More vegetation also helps prevent erosion, roots keeping the soil in place.
4. **Living Organisms:** Soil is full of life. Organisms like earthworms, insects, and microorganisms help break down organic matter and mix it into the soil. They also help aerate the soil, making it easier for plant roots to grow. Healthy soil has a diverse range of living organisms. For example, the activities of soil microorganisms are faster in the forest vegetation zone than in the savannah
5. **Relief or Topography:** Relief refers to the shape of the land—whether it's flat, hilly, or mountainous. This affects how water drains and how soil is eroded. In hilly areas, soil may wash away more easily, while flat areas may accumulate more soil over time. For example, soils in hilly areas such as Kwahu, Amedzofe, Gambaga are different from those in low hilly areas such as Accra plains, Tumu gap and savannah high plains.
6. **The Length of Time the Soil Has Been Formed:** Soil takes time to develop. The longer it takes soil to form the more distinct and thicker the layers become and the more nutrients there are. Young soils may be less fertile, thin and have fewer distinct layers, while older soils tend to be thicker, richer in nutrients and have more complex soil profiles.

Soils in the Forest Regions (Rainforest and Moist Semi-Deciduous Forest)

The common soils found in the forest regions of Ghana are:

1. **Forest Oxysols**:
   a. Develops from weathered granite rocks (Tarkwaian and Birrimian).
   b. Acidic due to heavy rainfall.
   c. Brownish-orange, porous, well-drained, loamy.
   d. Found in Tarkwa and Elubo.
   e. Supports tree crops like oil palm and rubber.

2. **Forest Ochrosols**:
   a. Develops from weathered granite rocks (Tarkwaian and Birrimian).
   b. Alkaline, high nutrient content.
   c. Found in Kumasi, Koforidua, and Sunyani.
   d. Supports crops like coffee, cocoa, banana, and kola nut.

3. **Forest Oxysols-Ochrosols Intergrade:**
   a. Intermediate between oxysols and ochrosols.
   b. Not purely acidic or alkaline, nutrient-rich.

4. **Lithosols (Stony Soils):**
   a. Young soil, found in highland areas like Akwapim Togo Ranges.
   b. Poor in nutrients due to short formation time.

5. **Rubrisol-Ochrosol Intergrades:**
   a. Similar to dark red soil and ochrosols.
   b. Sometimes called Red Soil due to its colour.

Soils in the Interior Wooded Savannah

1. **Groundwater lateritic soils/Ferruginous soil zone/savannah soils**: This soil covers the Interior Wooded Savannah. The lateritic soils support crops like yam, groundnut and cereals.

Characteristics of Lateritic/Ferruginous Soil Zone

a. It develops from granite and shale.
b. It is not deeply weathered.
c. It has a few mediums of soil fertility.
d. The soil has reddish to brown colours and contains a lot of stones.
e. It is generally sticky when wet.

f. It cracks into irregular blocks during the dry season.
g. It is impervious to water. That is water cannot easily pass through especially when it is wet.

2. **Savannah ochrosols:** This soil develops from Birrimian rocks which consist of schist and metamorphosed lava. It is poor in organic matter content, but it is loamy, well-drained and porous.

3. **Acid gleisols:** This soil is very silty, clayey and often leached. It is usually acidic and occurs with savannah ochrosols. They are easily saturated by water during the rainy season.

Soils in the South-East Coastal Savannah

1. **Coastal Sandy Soils:**
   a. Pale yellow, poor in organic matter.
   b. Supports coconut; with manure, can support cassava, maize, and shallot.
   c. Found in Keta (Volta Region); also supports beans, millets, groundnuts.

4. **Akuse Soils (Tropical Black Clay):**
   a. Develops from basic gneiss, alkaline.
   b. Heavy and sticky when wet; hard, compact, and cracked when dry.
   c. Known locally as “Akuse black soil”; dark brown to black colour.

4. **Tropical Grey Earth:**
   a. Developed over acid gneiss, purely acidic.
   b. Firm grey sand over hard compact clay.

3. **Sodium Vleisols:**
   a. Associated with coastal lagoons, alkaline.
   b. Common near the mouth of the Volta River at Ada

Alluvial Soils (made from water borne sediments)

This soil type is located around the lower Densu and course of Black Volta, especially in Bamboi, Yeji and Kete-Krachi.

Characteristics of Alluvial Soil Zone

a. This soil is associated with water deposits along rivers like Black Volta and Densu.
b. The soil colour varies from black to dark grey.
c. The soils are made up of mud, silt and other debris.
d. The soils are sticky, and it supports waterlogging.
e. The soils are very sandy, porous and permeable.
f. Soils support the growing of crops like swamp rice, raffia palm, and coconut.

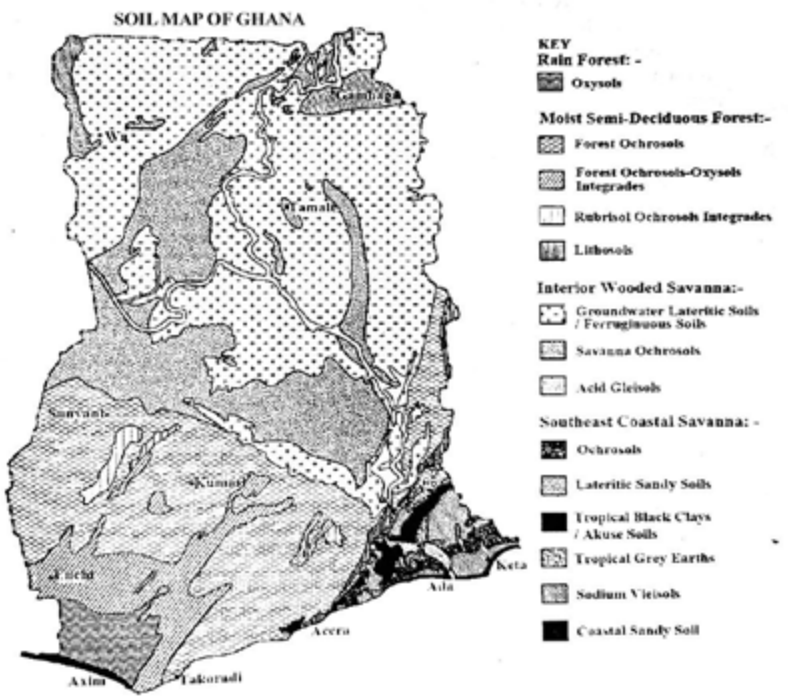


Fig. 10.11: Map of Ghana showing soil types

Importance/Uses/Benefits of Soil

1. **Provides Medium for Agriculture:** Soil is essential for growing food. It serves as the foundation for plants, providing the nutrients and support they need to grow. Farmers in Ghana rely on healthy soil to grow crops like fruits, vegetables, and grains.
2. **Provides Sites for Building and Other Constructional Purposes:** In Ghana, soil provides the basis for building houses, roads, bridges and other structures. Engineers and architects need to understand the type of soil in an area to ensure that buildings are safe and stable.
3. **Source of Constructional Materials:** Soil such as clay, sand, and gravel are used for construction in Ghana. For example, clay can be used to make bricks, while sand is essential for making concrete.
4. **Habitat for Organisms:** Soil is home to many living organisms, including insects, worms, and micro-organisms. These organisms play important roles in breaking down organic matter and maintaining soil nutrients.
5. **Storage of Nutrients:** Soil stores essential nutrients that plants need to grow, such as nitrogen, phosphorus, and potassium. Fertile soil helps ensure that plants have the right nutrients for growth.
6. **Provision of Employment:** Soil-related activities, such as farming, construction and landscaping create jobs for many people in Ghana. This includes farmers, builders, and soil scientists.

7. **Income to Workers:** Jobs related to soil, like farming and sand mining, alluvial mining, and construction, provide income for workers and their families. This income helps support local economies and communities.
8. **Revenues to Government:** Governments in Ghana collect taxes from agricultural businesses and construction companies. This revenue helps fund public services like schools, roads and healthcare.
9. **Holds Water and Air:** Soil plays a critical role in holding water and air. It absorbs rainfall and stores water for plants. Soil also allows air to circulate, which is essential for the roots of plants and the organisms that live in them.

Activity 10.3

1. Click on the links below for more information on soil:
   - SOIL - Different types and the importance of Soil (youtube.com)
   - Uses of Soil | Science | iKen | iKenEdu | iKenApp (youtube.com)
   - Types of Soil (Quiz Edition) (youtube.com)
   - Soil | Science for Kids | Grade 3 | Periwinkle (youtube.com)

   a. Discuss the information with a friend and assess the value of the clips to your learning.

   b. Explain how the information in the video helps you understand the economic importance of soils to Ghana.

   If you cannot access the videos, check your school or local library or search on the internet for the same topic.

2.
   a. Draw an outline map of Ghana. On your map shade with different colours the location of the following soil types:
      i. Rainforest – oxysols
      ii. Moist semi-deciduous forest – forest ochrosols
      iii. Interior wooded savannah – Groundwater lateritic soils and savannah ochrosols
      iv. Southeast coastal savannah – Tropical black clays

   b. Compare your soil map with the maps of Ghana's climate and vegetation. Describe the extent to which climate and vegetation zones can be related to the location of soil types in Ghana.

3. Identify the soil type in your locality using the soil map above. Describe the farming activities the soil is used for in your locality – crops grown, animals kept, productivity, management practices. How are local farmers looking after the soil?
4. Write an email to a local farmers cooperative that explains the importance of protecting the soil in Ghana.

What did I learn?

Review Questions

REVIEW QUESTIONS 10.1 : THE CLIMATE OF GHANA

1. What are the main climatic regions found in Ghana?
2. List four of the characteristics of the Tropical Continental climate in Ghana.
3. Which climatic region in Ghana experiences the driest conditions and why?
4. What is the main difference between the Tropical Continental climate and Wet Equatorial climate in Ghana?
5. Explain the factors that influence the climate of Ghana.

REVIEW QUESTIONS 10.2: VEGETATION AND SOILS OF GHANA

1. State three characteristics of the following vegetation zones with reference to Ghana:
   a. Rainforest and Moist Semi-Deciduous Forest
   b. Interior Wooded Savannah
   c. Guinea Savannah
   d. Coastal Strand and Mangrove
2. Write a paragraph to describe the main socio- economic benefits of forests to Ghana.
3. List the main characteristics of Rainforest Forest oxysols and Moist Semi-Deciduous Forest ochrosols.
4. Draw an outline map of Ghana showing the four vegetation zones and add, using a label, two of the soil types found in each.
5. Write a paragraph to describe the main socio-economic benefits of soils to Ghana.
6. Discuss the interrelationship between climate, vegetation and soils in Ghana.

Answers to Review Questions

ANSWERS TO REVIEW QUESTIONS 10.1: THE CLIMATE OF GHANA

1. Tropical continental, south-western Equatorial, wet semi-equatorial, Dry Equatorial.

2.
   i. high temperatures
   ii. relatively high humidity in the wet season and low humidity in the dry season
   iii. single rainfall season from May to September
   iv. has a long dry season from November to March due to the influence from the Harmattan winds

3. The Dry Equatorial. Reasons are:
   a. **Rain Shadow Effect:** Akwapim-Togo Ranges block rain, leaving the Accra plains dry.
   b. **Uneven Topography:** Hills and valleys obstruct moisture-rich air, causing uneven rainfall.
   c. **Coastal Parallelism:** Southwest Monsoon Winds blow parallel to the coast, bringing little rain.
   d. **Cold Ocean Current:** Canary current cools winds, reducing their moisture content.
   e. **Lack of Vegetation:** Sparse vegetation means less moisture release, contributing to dryness.

4. **a. Tropical Continental Climate:**
   i. Location: Predominantly in the northern part of Ghana.
   ii. Temperature: High temperatures throughout the year.
   iii. Rainfall: Short rainy season (April to October) and a long dry season.
   iv. Winds: Influenced by the Harmattan winds from the Sahara, bringing dry and dusty conditions.

   b. Wet Equatorial Climate:
   i. Location: Southern parts of Ghana, including the coastal areas.
   ii. Temperature: Warm and humid throughout the year.
   iii. Rainfall: Two rainy seasons (April to June and September to November) with high annual rainfall.
   iv. Winds: Influenced by moist maritime winds from the Atlantic Ocean

5.

a. Latitude: Proximity to the Equator results in a tropical climate.
b. Altitude: Higher elevations experience cooler temperatures.
c. Ocean Currents: The Canary Current cools coastal areas.
d. Winds: Harmattan winds bring dry, dusty conditions from the Sahara.
e. Rainfall Patterns: Influenced by the West African Monsoon/ITCZ migration brings wet and dry seasons.
f. Topography: Mountains and valleys affect local climate conditions.

ANSWERS TO REVIEW QUESTIONS 10.2 :VEGETATION AND SOILS OF GHANA

1. Three characteristics of the following vegetation zones are:
   a. Rainforest and Moist Semi-Deciduous Forest
      i. Dense, tall trees with a closed canopy.
      ii. High biodiversity with numerous plant and animal species.
      iii. High rainfall and humidity.

   d. Interior Wooded Savannah
      i. Scattered trees and shrubs with open grasslands.
      ii. Seasonal rainfall with a distinct dry season.
      iii. Frequent bushfires during the dry season.

   d. Guinea Savannah
      i. Mixed grassland and woodland with scattered trees.
      ii. Moderate rainfall with a long dry season.
      iii. Dominated by drought-resistant plants.

   d. Coastal Strand and Mangrove
      i. Sandy beaches with salt-tolerant plants.
      ii. Mangrove forests along the coast and estuaries.
      iii. High salinity and tidal influence.

4. Forests in Ghana provide many important benefits for people and the economy. They offer jobs in logging, collecting non-timber products, and ecotourism, helping many rural communities earn a living. Forests also contribute to the national economy by exporting timber and other products. They support food security by providing fruits, nuts, and medicinal plants. Additionally, forests help maintain water cycles, prevent soil erosion, and reduce the effects of climate change, which benefits agriculture. Overall, forests are essential for both the economy and the environment in Ghana.

5. Forest oxysols - develop from weathered granite rocks, acidic and low nutrients due to heavy rainfall quickly washing them away, brownish-orange, porous, well-drained, loamy, supports tree crops like oil palm and rubber. Forest

Ochrosols - develop from weathered granite rocks, alkaline, high nutrient content, lower rainfall means less washing out, supports crops like coffee, cocoa, banana, and kola nut.

6. Map answer which depends on choice of soils.

7. Soils in Ghana are very important for the country's economy and people's lives. They provide the foundation for farming, which is a major source of food and income for many families. Good soils help grow crops like cocoa, maize, and yams, which are essential for both local consumption and export. Soils also support forests that provide timber and other products. Healthy soils help prevent erosion and maintain water quality, which is crucial for agriculture and daily living. Overall, soils are vital for food production, economic growth, and environmental health in Ghana.

8. In Ghana, the climate significantly influences both vegetation and soils. The country's climate varies from the hot, dry conditions in the north to the warm, humid conditions in the south. These climatic differences determine the types of vegetation that can grow in each region. For example, the northern regions, with their dry climate, support savannah vegetation, while the southern regions, with higher rainfall, support dense rainforests and semi-deciduous forests. Vegetation, in turn, affects soil quality and composition. Dense forests in the south contribute a large amount of organic matter to the soil, giving it fertility and structure. This organic matter helps maintain soil moisture and provides essential nutrients for plant growth. In contrast, the sparse vegetation in the northern savannah regions results in soils with lower organic content and fertility. Soils also play a crucial role in supporting vegetation and are influenced by the climate. In the humid south, soils like oxysols and ochrosols are rich in organic matter but can be heavily leached due to high rainfall. In the drier north, soils are less fertile and more prone to erosion, especially during the dry Harmattan season. This interplay between climate, vegetation, and soils creates distinct ecological zones across Ghana, each with its unique characteristics and challenges.

Extended Reading

1. Visit this link to watch a video on vegetation distribution in Ghana https://youtu.be/libE1Iq8wgM
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