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# **Module for Bachelor Education Programme (Primary and JHS)**

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## **EBS159SW: THE NATURAL ENVIRONMENT**

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**DR. ANGBING HIPPOLYT DICKSON  
DR. ASAMOAH COLLINS DEBRAH**



**REPUBLIC OF GHANA**



**INSTITUTE OF EDUCATION, UCC**

**IoE/MoF/TUC/GHANA CARES TRAINING AND RETRAINING  
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## **UNIT 1: THE ENVIRONMENT**

This unit introduces students to the natural environment in which they live in. The course introduces your natural environment. The units have been selected to enhance your awareness of not only the nature, but also the components of our interactions with the natural environment affects the environment in which we live in. The units are meant to enhance your understanding of your environment, how it looks like and what we can do to protect the environment from destruction.

### **Learning outcome(s)**

By the end of the unit, you will be able to:

- Explain the environment and types of the environment.
- Identify the components of natural environment.
- Examine the main arguments in the nature/nature theories and explain connection between the two theories
- Examine the origin and structure of the earth
- Examine some natural resources in their environment and how some of these resources can be effectively utilised
- Examine some social problems that affect the natural environment

## **SESSION 1: UNDERSTANDING NATURAL ENVIRONMENT**

In this session, we will focus on the concept of the environment and examine how each component is different from one another

### **Learning outcomes**

**By the end of the session, you will be able to:**

1. Define the components of the environment
2. Examine the characteristics of the biotic environment
3. Examine the characteristics of the abiotic component of the environment

### **Meaning of the environment**

The term ‘environment’ refers to the immediate social and physical surroundings. It consists of both living and non-living things. It must be realized that all living and non-living things that occur naturally on the earth is referred to as ‘the natural environment’. The living things form the biotic environment and the non-living things constitute the abiotic environment.

- a) **Biotic Environment:** The biotic environment refers to such living things as food (vegetables, fruits, cereals, etc.), plants and animals as well as things that help living organisms to survive. The biotic environment is characterized by interactions of organisms. The relation between an individual organism of the same species is called intraspecific effect. On the other hand, the relationship between organisms of different species is known as interspecific.

- b) **Abiotic Environment:** The abiotic environment, which is also called the physical environment, is made up of non-living things such as the climate, soil, water, air, atmosphere, nutrients, energy, etc.
- c) **The Physical Environment:** The physical environment refers to the earth in which man animals and plants live. It includes physical resources like the vegetation, minerals, water bodies, land, the air as well as the climate.
- d) **Biological Environment:** The biological environment is the part or area of the physical environment, which supports plants, animal and other living organisms.

### **Characteristics of the biotic (living) elements of the environment**

- a) **Reproduction:** Reproduction is the process by which a plant or an animal gives rise to another of its kind through sexual or asexual means. All living organisms reproduce their kind to enable life continue after the death of the old ones. Reproduction is necessary because the life span of all living organisms is limited and without reproduction, life would soon come to an end. All living organisms have the ability to perpetuate life by reproducing offspring. The resulting offspring have the same general characteristics as their parents. The ability to reproduce is therefore, one feature that differentiates living and non-living things. While living organisms are able to reproduce to perpetuate life, their non-living counterparts are not able to do so.
- b) **Movement:** Movement is another feature that differentiates living things from non-living ones. All living organisms exhibit some form of movement. Some living organisms such as animals have the ability to move the whole body from one place to another. This form of movement is called locomotion. Locomotion is necessary for such living organisms to search for food and escape from danger including predators.
- c) Other living organisms such as plants also move but do not locomote. They are able to make their own food from raw materials obtained at the place they stand. Even though plants are unable to locomote, they are able to move parts of their bodies. Example of this form of movement includes growing shoots, towards sunlight and opening and closing petals. A few plants such as mimosa exhibit rapid movement by closing up their leaves in response to touch. Non-living things are not able to move by themselves. They can do so only on application of external force.
- d) **Nutrition:** Nutrition refers to the process by which living organisms receive the food necessary for them to grow and be healthy. Living things need food on daily basis to maintain life and perform activities. Green plants prepare their own food, whereas animals obtain their food from other living organisms. The food living organisms eat serve as a source of energy and materials for the processes of life such as growth and repair. Non-living things do not need food to enable them to exist.

- e) **Respiration:** It is the process by which an organism takes in air or dissolved gasses. Living things respire while non-living things do not. When living things take in air, some chemical reactions takes place which helps to break down food to release energy. This is referred to as oxidation. Not all the air taken in by an organism is used for oxidation. The unused part of the air or gas is normally expelled from the organism together with the bye-product of the chemical processes. For example, plants take in carbon dioxide and expel oxygen while animals take in oxygen and expel carbon dioxide.
- f) **Growth and Repair:** Growth and repair is another feature off living organisms. All living organisms grow from within, using the food obtained from nutrition. Both plants and animals grow in size, height, and weight. In the early part of life, some is used to repair broken down or worn out tissues. Non-living things like ice or gravel may increase in size by the addition of new materials to their surface but not from within. Also, non-living things are not able to repair broken down or worn out tissues as living things are able to do.
- g) **Excretion:** Excretion is the process by which an organism gets rid of waste products such as urine, excrements and sweat from its body. Many chemical processes take place inside the body of an organism when it engages in different forms of activities. These activities produce waste materials, some of which are harmful to the organism if they are allowed to accumulate. Through the process of excretion, organisms get rid of these harmful waste materials. For example, the food that animals and human beings eat is normally broken down by a process called metabolism. Through this process essential components of food are absorbed by the body and the waste products are eliminated from the body in the form of urine and sweat.
- h) **Irritability/Sensitivity:** The ability for living organisms to detect and respond to changes in their environment is referred to as irritability. In general, animals react very quickly to stimuli by some sort of movement.

### **Characteristics of Abiotic (non-living) Elements of the Environment.**

#### **Non-living things are distinguished by the following:**

- a) **Absence of protoplasm:** One major feature of non-living things is the absence of protoplasm. Protoplasm is the living substance of cells. Because non-living things lack protoplasm, they are unable to reproduce, grow, move and respire.
- b) **Growth by Accretion:** Non-living things are able to increase in size, but they do so by accretion. Accretion is a process by which an object increases in size by addition of layers of materials from outside. For example, a crystal in a solution or snowball of a grain of gravel may grow larger in size but due to accumulation of its own units on the surface of the original body.
- c) **Immortality:** Because non-living lack protoplasm, they do not die. Immortality is therefore, one of the characteristics of non-living things. However, they can be destroyed.

- d) **Movement by External Stimuli:** Non-living things are not capable of movement by themselves. They can do so only as a result of some external influence. For example, a rock is not capable of moving by itself. It moves with the assistance of external forces such as gravity or a push by a human being.
- e) **Absence of Reproduction:** Non-living things are incapable of replenishing themselves through the process of reproduction. Metallic minerals such as gold and iron ore cannot reproduce offspring of its kind. Only living things can reproduce offspring of their kind.

### Key ideas

- The term 'environment' refers to our immediate social and physical surroundings.
- The environment consists of both living and non-living things.
- All living and non-living things that occur naturally on the earth is referred to as 'the natural environment'.
- The living things form the biotic environment
- The non-living things constitute the abiotic environment.

### Reflection

- What are some of the things we do in the environment that destroy the abiotic component of our environment
- In which ways do these things destroy our natural environment?
- What alternatives are there for the sustenance of people without destroying the natural environment?
- If you had the opportunity, which particular aspect of the culture of people or place where you live would you want to change and why? (your responses must promote environmental wellness).

### Discussion

- What is the environment?
- What is a biotic part of the environment?
- How will you explain climate and soil as abiotic parts of the environment?
- Explain any three ways in which the culture of the people negatively affect the environment
- If you were the chief of your town, using five examples, show how you can make the people of community maintain the natural environment.

## **SESSION 2: UNDERSTANDING THE TYPES OF OUR ENVIRONMENT**

In this section, you are going to learn about the main types of the environment.

### **Learning outcomes.**

By the end of the session, you will be able to:

1. Examine the types of the environment
2. Describe the characteristics of each of the types of the environment
3. Explain how the main types interact with each other.

### **Types of the environment**

The environment consists of two types. These are the physical environment and the social environment.

#### **i. Characteristics of the Physical Environment**

This is also known as the natural environment. It includes all the natural things that surround us. Some of these are water, land, the air (atmosphere) and living organisms (plants and animals). The physical environment is composed of the lithosphere, hydrosphere, atmosphere and biosphere. The physical environment provides human kind with all the resources needed for survival.

#### **The following are some characteristics of the physical environment:**

- a) **It is the creation of nature:** Both living and non-living natural objects are created by natural processes unlike the social environment which is the creation of human beings.
- b) **The Natural environment consists of both living and non-living thing:** Living organisms such as plants and animals as well as non-living elements, including the sun, water and stone are all products of natural processes.
- c) **It comprises both tangibles and intangible elements:** Tangible elements include the solid part of earth, water bodies, mineral deposits, plants and animals, while the intangible elements include temperature, gasses and force of gravity.
- d) **The natural environment influences the social environment:** Human creations such as architectural designs, clothing, agricultural activities and fishing are influenced by the natural environment. In Ghana, for instance, farming activities are dependent on the weather and climatic conditions.
- e) **It consists of both renewable and non-renewable resources:** Some natural resources such as vegetation, water bodies and solar energy are renewable. Non-renewable natural resources include crude oil, mineral deposits and clay. Both renewable and non-renewable natural elements in the environment constitute a resource bank which can be exploited by human beings for survival and development.



## ii. **The Social Environment**

This refers to the environment developed by human beings as contrasted with the physical environment. In fact, it is the society as a whole including its cultural setting, especially in its relation to the individual. In other words, it is the immediate physical and the social setting in which people or in which something happens or develops.

It is within the social environment that human beings interact to create a conducive atmosphere for social harmony. If the people in a particular society have good social interactions among themselves, a good social environment is created. In effect, social environment can be referred to as the interpersonal relationship and the interaction that exist among people in a given society, giving it a positive or negative outlook. When this relationship is enhanced, it can lead to social development, translating into the improvement in the life of the people. This may be seen in the positive attitude to work, developing more interest in community affairs and being more responsive to things in and around their various localities and the country in general.

Social environment is created and developed by important institutions set up by society. These institutions help to bring us together and also regulate our behavior through socialization processes the individuals go through during their life time. Some of these institutions are the home/family, school, church, mosque shrine, law courts, workplaces, etc. These institutions when properly organized help to build strong social cohesion, a force and strength that determines the strength of a country for national integration and national development.

It is worth noting that, whereas the natural/physical environment is created by natural processes, the social environment is created by human beings. The social environment is used as a platform to exploit the natural resources for the comfort off and survival of humankind, while the product of their interactions with the physical environment determines their cultural outlook.

### **Characteristics of Social Environment**

**The social environment is distinguished by the following features:**

- a) It concerns people and focuses on their activities which affect the behaviour of the individual and other organisms.
- b) The social environment involves inter-personal relationships and other human creations such as political systems economic systems, religious beliefs and tangible things such as agriculture implements, machine and infrastructural facilities.
- c) There is a close relationship between the social and natural environment. Most human creations are directly or indirectly related to the natural environment. In fact, the social environment depends on the natural environment to strive.
- d) The social environment is characterized by conflict and harmony. Competition for control of resources often results in conflict between individuals and communities.

### **The Reciprocal Relationship between the Natural Environment and the social environment**

In recent times, some environmental researchers recognize that the physical surroundings make up our environment. Some of these include social and economic aspects of our being including our cultural activities and how the interaction between them affected the physical environment (Dangol, 2009; Ngaaso & Attom, 2011). The relationship between the natural environment and socio-cultural environment can be explained as follows:

- a) The natural environment provides space for human beings to move from one place to another, put up infrastructural facilities, do farming and fishing.
- b) Similarly, some religions practices are possible because the natural environment provides the medium for such practices. For example, in African traditional religion, it is believed that certain natural objects such as trees, stones, rivers, etc are inhabited by spirit and are therefore worshipped. In Hinduism, natural objects like the domestic cow and the River Gauge are worshipped. In the same way, Christians and Muslims construct their chapels and mosques respectively using sand, stones and wood. These are natural objects. All these point to the fact that the natural environment exerts some control over our lives. We wear clothes to protect ourselves from the harsh weather conditions like cold and rain.
- c) Human activities in turn affect the natural environment. For instance, through farming, living organisms such as plants and micro-organisms are destroyed. Hunting also results in the disappearance of some animal species from certain areas.
- d) Strained relations or conflict can also adversely affect the natural environment. Conflict, especially violent conflict, can negatively affect the environment through the destruction of animal life, water bodies and the air. The use of weapons of mass destruction in war, for example, can pollute the air and result in the destruction of both human and animal life.

#### **Key ideas**

- The environment consists of two types.
- These are the physical environment and the social environment.
- It includes all the natural things that surround us.
- Some of the physical things in the environment are water, land, the air (atmosphere) and living organisms (plants and animals).
- The social environment is the society as a whole including its cultural setting, especially in its relation to the individual.
- It is within the social environment that human beings interact to create a conducive atmosphere for social harmony.
- The physical and social environment interact at different levels and these forms of interaction shapes the environment in several ways.

### Reflection

- Can any living thing exist without the natural environment?
- Why is this situation so?
- What should be done to protect the interdependence among organisms

### Discussion

1. Study the list below  
*...the liana and tree, the dog and teak, the cattle and the eaglet.*
  - a. Provide any other 3 examples of same interactions in your environment that cannot live without the other.
  - b. What principle explains this relationship?
2. Explain how strained relations or conflict adversely affect the natural environment of a place. Provide any 3 examples to support your answer.
3. What is a social environment? Describe any 5 elements of your social environment.

## **UNIT 2: COMPONENTS OF NATURAL ENVIRONMENT**

**Under this unit, you will learn the components of the natural environment.**

### **Learning outcomes**

**By the end of the session, you will be able to:**

1. Examine the structure of the earth.
2. Examine the structure of the atmosphere

### **SESSION 1: THE STRUCTURE OF THE EARTH**

In this session, we will focus on the structure and to learn about how each component is different from one another.

The earth's structure is grouped into two main zones or regions. These are the inner or internal and the outer structure. As shown in the diagram below.

#### **The Internal structure of the Earth**

The inner/internal structure of the earth consists of three concentric layers. These are:

- a. the crust (lithosphere)
- b. the mantle (mesosphere) and
- c. the core (barysphere)

#### **The Crust (Lithosphere)**

##### **Characteristics**

- a. The crust is the outermost layer of the earth. It is called the crust or the lithosphere.
- b. It extends from the surface of the earth to a depth of about (35km – 40km) beneath continents and about (6 – 10km) beneath the ocean basins.
- c. The crust is divided into two distinct sections: the upper part called the sial which consists of granite rocks forming the continental crust. It is rich in silica and alumina, hence the name sial. The sial has a density of 2.7.
- d. The continental crust is mainly composed of sedimentary, metamorphic and granite rocks
- e. The lower part of the crust beneath the sial is the sima.
- f. It is made up of denser a basaltic rock which forms the ocean floor.
- g. The mineral components of the basaltic rocks are mainly silica, iron and magnesium, hence the name sima, the sima has an average density of 3.0.
- h. The sial and the sima form the earth's crust.
- i. As the sial is lighter than the sima, the continent is said to be floating on a sea of denser sima.
- j. The boundary that separates the crust from the mantle beneath is called the Mohorovicic discontinuity (Moho for short), named after a Yugoslav scientist who first detected it in 1909.

## The Mantle (Mesosphere)

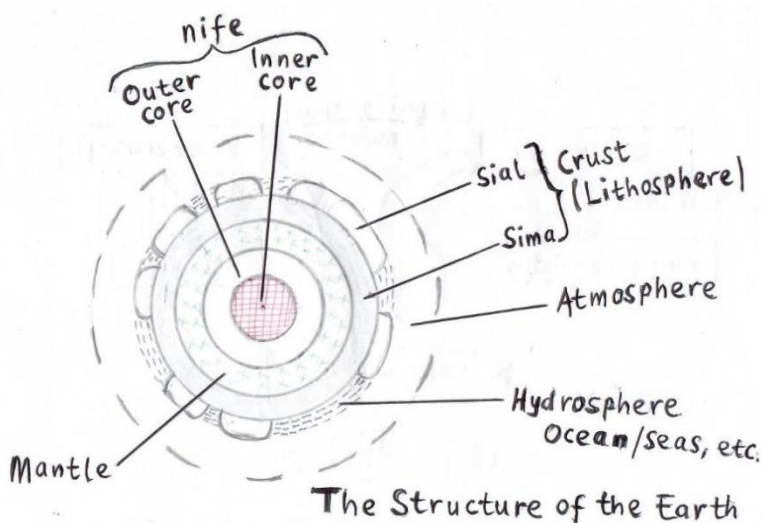
### Characteristics

- The mantle lies beneath the crust and extends downwards about 2,900 km.
- Most of the mantle is very dense – roughly twice as dense as the rocks that occur at the surface of the earth.
- It has a density between 3.3 and 6.7.
- Its main mineral is olivine.
- The upper part of the mantle is in solid state while the lower part is in plastic and semi-liquid form called magma due to tremendous pressure exerted on it which produces intense heat.
- Magma may flow from the mantle to the crust through crevices, cracks and cavities when the pressure is relieved locally.

## The Core (barysphere)

### Characteristics

- The core is the innermost zone of the earth.
- It lies beneath the mantle and it is also known as centrosphere.
- It has a radius of about 3,500 km.
- It is made up of outer core and inner core.
- The outer core extends for about 2,100 km into the interior and it is made up of mostly iron and nickel in a hot plastic or fluid condition. It has a very high temperature of about 2,000 degree Celsius.
- The remaining distance to the earth's centre which is about 1,370 is the inner core.
- The inner core is mostly made of iron and nickel but in a solid state (crystalline solid mass).
- The outer and the inner core together is referred to as nife because the mineral composition of their rocks is nickel (Ni) and iron (Fe) (NiFe).
- The average density of the core is between 12 – 18 owing to the great pressure exerted on it by the outer layers.



### Key ideas

- The earth's structure is grouped into two main zones or regions.
- These are the inner or internal and the outer structure.
- The inner or internal structure of the earth consists of three layers. These are:
  - the crust (lithosphere)
  - the mantle (mesosphere) and
  - the core (barysphere)

### Reflection

- The earth is not as solid as can be seen outside. What accounts for this development?
- What specific strategies can be used in our communities protect the environment?
- If you were in a position to plan your community, what specific considerations will you consider as most important?

### Discussion

1. Using simple diagram, describe the internal structure of the earth.
2. As an environmentalist, describe how the crust is the source of supply of rock materials for the building industry
3. Explain how the crust gives the ocean floor.

## SESSION 2: THE ATMOSPHERE

In this session, we will focus on the structure of the atmosphere and to learn about how each component is different from one another.

### Learning outcomes

By the end of the session, you will be able to:

1. Examine the types of the environment
2. Describe the characteristics of each of the types of the environment
3. Explain how the main types interact with each other.

The air that surrounds the earth is referred to as the atmosphere. The atmosphere is divided into four layers based on temperature. It does not have uniform mass of air. It consists of well-defined horizontal layers whose boundaries are marked by temperature changes. The first of the three broad categories of warm layers lie close to the surface of the earth. The third layer lies roughly above 120 kilometres above the surface of the earth and the second layer lies between the first and the third, roughly from 50-60 kilometres above the surface. The thickness of the atmosphere (from the ground surface) is about 330 kilometres.

The atmosphere contains wide range of gases. These gases constitute the composition of the atmosphere. The proportions in which these gases of the atmosphere are mixed remain

constant up to a height of at least 50 kilometres over the land surface of the earth. In addition to the gases, the atmosphere contains significant volumes of water vapour and aerosol particles (particles of smoke, dust, and sea salt)

The atmosphere below the first 35 kilometres of altitude mainly comprises Nitrogen (78.08%), oxygen (20.94%), Carbon dioxide (0.03%), Argon (0.93), Neon (0.0018%), Helium (0.0005), Ozone (0.00006) and Hydrogen (0.00005). In the lower layers of the atmosphere up to about 10 to 12 kilometres above the land surface, water vapour makes up to 4% of the volume of the atmosphere. It is important to note that evaporation from water bodies (seas, rivers, springs and lakes) and transpiration by plants supply water vapour to the atmosphere.

### **The Structure of the atmosphere**

The earth's atmosphere is structured into four major horizontal layers. These layers are the troposphere, stratosphere, mesosphere and thermosphere.

#### **The Troposphere:**

The troposphere is the first and the nearest layer to the earth. It contains about 75% of the gases of the atmosphere, as well as dust and water vapour. This layer is the zone where weather and clouds occur. Temperature decreases with increasing height in the troposphere. Near the top of this layer between 8 and 20 kilometres from the earth, a boundary called tropopause acts as a ceiling to the weather zone. Just below the tropopause are strong winds called jet streams.

#### **The Stratosphere:**

Above the tropopause lies the stratosphere, which extends upward to about 50 kilometres from earth. In the lower part of this zone, temperatures are constant at about -50-degree Celsius. However, at about 50 kilometres, temperature rises to about) degree Celsius, which means, temperature increases with ascent. The stratosphere contains the ozone layer.

#### **The Mesosphere:**

The mesosphere extends upward from about 50 kilometres to between 80 and 85 kilometres. This layer is the coldest zone of the atmosphere. The temperatures decrease to near -100 degree Celsius at the top of the mesosphere.

#### **The Thermosphere:**

The thermosphere extends from about 80 and 85 kilometres upward into space. Temperatures in the thermosphere increase quickly because of absorption of energy from the sun. the thermosphere is divided into two parts, the ionosphere and the exosphere. Above the ionosphere, the exosphere begins at an altitude about 500 to 700 kilometres above the earth and extends out to interplanetary space.

Interactions within each of the Four Spheres or Zones of the Earth: Lithosphere, Hydrosphere, Biosphere and Atmosphere.

**A. Within the Lithosphere**

- a. Rocks are broken down to form soils.
- b. Some of the rocks are transformed with time to form minerals like coal and crude oil.
- c. Molten magma solidifies to form rocks.

**B. Within the Hydrosphere**

- a. Water from rivers, streams and rainfall form the oceans.
- b. Seas and ocean water evaporate to form clouds which falls as rain, rain, etc.
- c. Rainfall and snow fill rivers streams lakes and ponds.

**C. Within the Biosphere**

- a. Micro-organisms in the soil promote plant growth.
- b. Some animals depend on plants for food. For instance, goats, sheep and cow eat grass.
- c. Some animals eat other animals. For example, lions eat deer.
- d. Animals decompose to provide manure for plants.
- e. Animals and human beings depend on plants for oxygen.
- f. Plants depend on animals for carbon dioxide.

**D. Within the atmosphere**

- a. Water vapour accumulates to form clouds.
- b. Animals absorb oxygen and they release carbon dioxide.
- c. Molecules of oxygen combine to form ozone.
- d. Animals absorb carbon dioxide and release oxygen.

**Interactions or Relationships between and Among the Four Zones**

- a. Plants and animals live in the lithosphere and the hydrosphere.
- b. Plants depend on soil (lithosphere) for their nutrients.
- c. Soils depend on plants for humus.
- d. Soils depend on plants for cover.
- e. Soils depend on the atmosphere and hydrosphere for water.
- f. Plants depend on the atmosphere for sunlight which they use in photosynthesis.
- g. Oxygen and carbon dioxide are made constant in the atmosphere through photosynthesis by plants and respiration by animals

**Problems Resulting from the Interactions of Living Organisms in the Biosphere**

- a. Deforestation: Unfavourable farming practices, mining, logging and bush fires reduce the size of forests.
- b. Depletion of Forest Resources: Lumbering reduces economic trees like mahogany, odum, sapele and wawa, etc.
- c. Extinction of Animals: Hunting and poaching lead to the extinction of animals like the elephants, deer, antelopes, etc.
- d. Poor Disposal of Waste: Domestic and industrial wastes dumped into water bodies destroy aquatic life
- e. Disturbances in the Ecosystem: Man's activities like bush fires, farming and logging disturb



### Key ideas

- The air that surrounds the earth is the atmosphere.
- The atmosphere can be divided into four layers based on temperature.
- The atmosphere does not have uniform air mass.
- Each layer of the earth is marked by boundaries with different temperature changes.
- The first of the three layers are warm and lie close to the earth surface.
- The first layer lies roughly above 120 kilometres above the surface of the earth.
- The second and third layers lie between 50-60 kilometres above the surface.
- The thickness of the atmosphere (from the ground surface) is about 330 kilometres.

### Reflection

- Do you realize if conditions in the troposphere are not managed properly, we risk dying?
- What strategies do you think we can adopt to maintain conditions in the lithosphere to maintain safer places in Ghana
- What should be done to protect the interdependence organisms in the environment?

### Discussion

1. Using a table, examine the main gases that make up the atmosphere
2. Describe how the biosphere is regarded as the most part that support life.
3. What can be done to protect the biosphere to be able to support life?
4. If you had the opportunity to serve as the planning officer of your district assembly, show how societies can be planned to enhance lives on earth

## **UNIT 3: WATER AS IMPORTANT RESOURCE**

### **Learning outcomes**

**By the end of the unit, you will be able to:**

1. Explain fresh water sources and types
2. Describe the main types of oceans.

### **SECTION1: UNDERSTANDING SOURCES OF FRESH WATER AND TYPES**

The hydrosphere of the earth constitutes the water bodies and the water resources of the earth for mankind. Water resources are sources of water that are useful or potentially useful to humans. It is important because it is needed for life to exist. About ninety-seven (97%) percent of water on the earth is salt water and only three percent (3%) is fresh water; slightly over two thirds (2/3) of this is frozen in glaciers and polar ice caps. The remaining unfrozen fresh water is found mainly as ground water, with only a small fraction above ground or in the air.

The water bodies (resources) of the earth can be categorized in to two. These are groundwater or underground water and surface water resources.

#### **Underground water Resources**

This is water obtained from rocks underground such as spring water, wells, bore holes, etc.

Surface Water Resources: This is water obtained on the surface of the earth such as rain water, lakes, rivers, oceans and seas, etc.

#### **Characteristics of Water bodies/Water Resources**

- a) The hydrosphere of the earth constitutes the water bodies and water resource for mankind.
- b) The water bodies on the surface of the earth covers over 70% of which the ocean water is made up of about 97%.
- c) The hydrosphere holds water in the form of oceans, rivers, lakes, ice sheets and underground water.
- d) The (hydrosphere) water bodies differ in salinity with the oceans and seas having very high salinity.
- e) Only 3% of the water resources are fresh water.
- f) Water resources occur in three forms: liquid, vapour and solid.
- g) Water as a resource is renewable through hydrological cycle.

#### **Hydrological Cycle**

The hydrological cycle is continuous circulation of water in its various forms from the earth's surface to the atmosphere and back to the earth's surface. This process is brought by evaporation from surface water bodies and land evapo-transpiration from plants. This gives rise to water vapour

in the atmosphere which in turn condenses, forms clouds and return to the earth's surface as precipitation. The water that results from precipitation then finds its way into the oceans, seas, lakes, rivers, ponds or sink into the ground to become groundwater. The hydrological cycle is therefore, a process by which water enters the atmosphere from the earth's surface as vapour and returns to the earth's surface in a liquid form ((rain) or solid (snow or hailstones). Through the hydrological cycle, water is transferred from area of surplus to areas of deficit on the earth's surface. Without it many areas would be without water.

## **Groundwater**

Groundwater is water that is found underground within rocks. Its presence depends primarily on the type of rock. Permeable rocks have tiny spaces between the solid rock particles that allow water and other fluids to pass through and to be held within the rock structure. The layers of rock that hold groundwater are called aquifers.

Ground water is replenished or recharged by rain and other forms of precipitation such as rain, snow, sleet or hail that falls to the earth's surface. Precipitation that falls on the surface of the earth percolates into the aquifer. The level of water below ground is called the water table.

The depth that groundwater is taken from and the types of permeable rock it has passed through are important factors that affect its quality. Groundwater, particularly from deep sources, may provide water of good micro-biological quality. This is because bacteria, protozoa, virus and helminthes are filtered from the water as it passes through the layers of soil and rock. Groundwater sources are therefore preferable to surface water sources. However, groundwater can contain chemical contaminants which may render it unwholesome. Groundwater can be extracted from wells, boreholes or collected from springs.

### **Wells:**

A well is a deep sunk-hole, generally cylindrical in shape, which is dug or drilled into the ground to penetrate an aquifer. That is, a hole is dug or drilled into the ground below the water-table through which water seeps out. Wells that sunk far below the water-table always contain water, but those that are sunk just below the water-table often go dry in periods of drought. When a well is bored, the water usually has to be raised by hand or by mechanical pumping.

### **Boreholes:**

Boreholes refer to a narrow shaft vertically bored into the ground with the help of machines for water extraction. After drilling, pipes are sunk into the hole onto which a machine or mechanical pump is fixed to draw the water.

### **Springs:**

A spring is simply an outlet through which groundwater seeps gradually out of the rock or gushes out as a fountain onto the surface of the earth. In other words, it describes the place where water

flows naturally from rock onto the land surface. This happens in locations where the water table reaches the surface, or where the boundary between a permeable layer or underground rock and impermeable layer reaches the ground surface.

Springs are normally found at the foot of mountains and hills in lower slopes of valleys and near the banks of major rivers. The water emerging at a spring may vary in volume and contamination levels, in response to the amount of rainfall. Springs are likely to be polluted by direct contamination from run-off seeping through the topsoil unless the surrounding land area is protected. A spring supply issuing from a deep water-bearing layer can produce both a consistent volume and a better-quality supply than a permeable layer near the surface.

### **Importance of Underground water**

- a) Underground water serves as sources of streams. This is usually noticeable at the source watershed, where streams originally seep out from the underlying rocks.
- b) The purest source of water available to mankind is underground water. This lies beneath the ground surface having been filtered by layers of soil and permeable rocks. As a result, it is more likely to be free of pathogenic organisms and can be used without further treatment.
- c) Underground water provides all plant water requirements as they extend their roots to absorb from underground.
- d) Groundwater is a major economic resource, particularly in the dry areas where surface water is scarce. Many towns and farms pump great volumes of groundwater from wells.

### **Surface Water Resources**

This is water obtained on the surface of earth such as rain water, lakes, rivers, oceans and seas.

**Rainwater:** In regions where rainfall is abundant and frequent, rainwater can be a good source of water supply for individual families and small communities.

The storage of rainwater is very important in areas with a long dry season, or where groundwater or surface water is difficult to obtain or polluted. Rainwater harvesting is therefore very important. Rainwater harvesting is simply collecting or harvesting rainwater as it runs off from hard surfaces and storing it in a tank or cistern. Rainwater is relatively clean and reliable. Rainwater harvesting can be constructed and maintained at a low cost.

It is important to ensure that it is not contaminated by improper method of collection and storage.

**Rivers:** A river is a naturally flowing water course usually freshwater flowing from a higher ground to a lower ground towards an ocean, sea, lake or another river. In some cases, a river flows into the ground and becomes dry at the end of its course without reaching another body of water. Water generally collects in a river from a precipitation through a drainage basin from surface runoff and other sources such as groundwater recharge, springs and the release of stored water in natural ice and snow packs (for instance from glaciers)

## **Characteristics**

- a) A river flows in a basin.
- b) Larger rivers like the Amazon, the Congo, and the Mississippi have bigger basins than smaller rivers like the Gambia, the Volta, the Birim and the Prah.
- c) Small rivers can be referred to using names such as stream, creek, brook, rivulet and rill.
- d) Most rivers take their sources from highlands at the summit called watershed or water divide.
- e) Rivers that carry water only in the wet season are called ephemeral or intermittent rivers.
- f) Rivers that carry water in their basins throughout the seasons without drying up are called perennial or permanent rivers.

## **Importance of Rivers**

- a) Rivers have been rich source of fish and other edible aquatic life.
- b) They are major source of fresh water which can be used for drinking and other domestic uses through treatment plants.
- c) Rivers have been used for navigational purposes. Most navigable rivers provide a cheap means of transport by the use of ships, ferries, boats, etc. e.g. the Volta river.
- d) Rivers have been very important in determining political boundaries and defending countries.
- e) Fast flowing rivers and water falls are widely used as sources of energy via hydro-electric plants for the generation of electricity.
- f) The coarse sediments, gravels and sand generated and move by rivers are extensively used in construction.

## **Lakes:**

A lake is a body of water that is surrounded by land. Lakes vary greatly in size. Some measure only a few square metres and are small enough to fit a backyard. Such small lakes are often referred to as ponds.

All lakes fill bowl-shaped depressions in the earth's surface called basins. Lake basins are formed in several ways which may be through natural processes or artificial means. Those produced through natural processes are called natural lakes while those created through human ingenuity are called artificial lakes or man-made lakes

A man-made (artificial) lake is often called reservoir. It is deliberately created by damming across a (narrow, steep-sided sections of) river valley otherwise known as a gorge, for the purpose of storing water for one or more specific water needs. The water that fills the artificially created basin upstream eventually forms a lake. Examples of Artificial lakes the Volta Lake on River Volta in Ghana; Lake Nasser on River Nile in Egypt; Lake Kariba on River Zambezi Zambia and Zimbabwe; Lake Kainji on River Niger in Nigeria; Bratsk Reservoir on River Angara in Russia; Manicouagan Reservoir on River Manicouagan in Canada.

### **Importance of Lakes**

- a) Lakes are important in preserving wildlife. They serve as migration stops and breeding grounds for many birds and as refuge for a wide variety of other animals.
- b) They provide homes for a diversity of organisms, from microscopic plants and animals to variety of fishes.
- c) Lakes provide medium of inland routes for ferries, boats and canoes for transport. The Volta Lake and Lake Bosomtwe both serve this purpose.
- d) Farmers use lake water to irrigate their farms. For example, the lake created by the Aswam dam on River Nile provides sufficient water for irrigation of rice fields in Egypt.
- e) Lakes formed by dams also provide hydro-electric energy. The water is channelled from the lake to drive generators that produce electricity. Typical example is the Akosombo dam built on the Volta River.
- f) Because lakes are often very beautiful, they are popular recreation and vacation spots for tourists. People seek out their sparkling waters to enjoy boating, swimming, water-skiing, sailing, etc. for example, a lot of people travel to Lake Bosomtwe to catch a glimpse of its scenic beauty and enjoy recreation.
- g) Fishes that are found in lakes such as tilapia, eels, catfish and pike provide food for the people.
- h) Because water does not heat or cool as rapid as land does, wind blowing from lakes keeps the local climate condition even. This is the lake effect
- i) Lakes serve as sources of water for both domestic and commercial uses. The Volta Lake for example serves as a good source of water to the country.

### **Importance of Water Resources**

Water forms a very important part of the natural environment. It is one of the essential elements that make life possible on earth. Naturally, water can occur as precipitation in the form of drizzle, rain, snow or hail as well as dew, fog drip and mist. It also occurs in surface storage as oceans, lakes, rivers and ponds and in underground reservoir such as groundwater, artesian basins and aquifers. Water may also occur in the air in the form of moisture or water vapour and in plants. The following are some of the uses of water resources.

- a) **Life Support:** Water is one of the materials that make life on earth possible. All living organisms are composed of cells that contain at least 60% water. Also, the process of breaking down food to release energy in the body of an organism (metabolic process) takes place in water solution.
- b) **Domestic Use:** Within the domestic set up, water is vital resource used for drinking, cooking, washing and watering of domestic animals.
- c) **Industry and Commerce:** Water is a source of energy (hydro-electricity). In Ghana, the Akosombo and Bui Power stations generate hydro-electricity to meet part of the energy needs of industries and domestic consumers. Also, textile industries mix water with some chemicals to produce dye. The dye is used to give colour to various textile products. Besides, commercial enterprises such as food joints, restaurants, etc. use water in the

production process. Because water heats and cools more slowly than most other substances, it is used in large quantities as coolant for electric power generating plants and in other industrial processes.

- d) **Agriculture:** Water is required by plants (including agricultural and horticultural plants) for the process of metabolism. In areas where rain water is insufficient or irregular, river water is used for irrigation and for watering domestic animals. Also, Floods provide fertile soil material when alluvia is transported and deposited on flood plains such as the Nile Valley in Egypt and the Niger in Mali where crop cultivation is very important. The Tono and Veve dams in the Upper East Region are examples of irrigation projects in Ghana.
- e) **Environmental Sink:** Environmental sink refers to the ability of the natural environment to get rid of waste that is generated through human or natural processes. Water has the ability to dissolve substances. This ability makes water extremely important for industrial and social activities. It dissolves and transports substances ranging from nutrients to industrial, commercial and domestic waste. Runoff from rain water carries away filth or waste generated by industrial, commercial and domestic activities. This enables the natural environment to remain clean.
- f) **Moderation of Weather Condition:** The capacity of water to retain or store heat also helps to modify climatic conditions in areas near large water bodies. As a result, these areas do not experience wide temperature variability compared to other areas where there are no such water bodies. For instance, coastal areas have moderate temperature compared to inland areas. This is because the temperature of ocean water always influences coastal areas. In another instance, the northern part of Ghana has high temperature variations than the coastal areas such as Cape Coast and Keta.
- g) **Source of Food:** A great number of life forms exist in water and many of these serve as food for human beings and other organisms. In the coastal areas and other settlements along river banks, many people depend on fish, shrimps, crabs, etc. for their protein needs and for commercial purposes.
- h) **Recreation:** Water provides attractive natural sceneries which serve as tourism sites. For example, in Ghana the Akosombo dam, Wli, Boti, Bui and Kintampo Waterfalls and the Nzulezu Water village serve as tourist sites. Also, water bodies provide space for recreational and sporting activities such as swimming and skiing.
- i) **Transportation:** Water is also used as a means of transportation. For example, sea and river transport is provided by water. Large volumes of goods are transported by sea across the globe. Also, the Volta Lake in Ghana is an extensive waterway and facilitates transportation of goods and people between Akosombo and Bupe and between Yeji in the Bono East Region and Makongo in the Savannah Region. Other rivers such as the lower stretches of the Ankobra and Tano are water ways for the transportation of goods and people.

- j) **Religious Activities:** Some water bodies provide media for people to communicate with god and seek spiritual assistance. Water bodies such as the Ganges in India, Lake Bosomtwe in Asante Region and the Paga Crocodile pond in the Upper East are places of worship for people residing in those areas. People visit these sites and seek spiritual and material blessings from the spirits or divinities that are believed to be living in the river or lake. Also, in Islam, water plays an important role during prayers. Muslims use it to perform ablution, a rite intended to cleanse the individual before he/she can engage in prayer. Christians also use it to perform baptism and other spiritual exercises.

### **Factors Affecting Effective Utilization of Water Resources**

Water has been labelled as ‘blue gold’ because it is one of the most precious resources. While existing and known sources of fresh water are drying up or being polluted, the world’s consumption continues to increase (Ofosu-Kusi, 2006). It is estimated that more than 1.6 billion people in the developing countries lack access to potable water. The following are some of the factors affecting effective utilization of water as a resource.

- a) **Rapid Population Growth:** High population growth causes high demand and excessive pressure on water resources. The demand for water supply especially in the rapidly expanding towns and cities put a great deal of strain on supply networks. The situation may get worse in the near future because the United Nations estimate the world consumption of fresh water to increase by 70% of all known sources by 2025 due to increase in population. Increase demand for water will have implications for government with regard to the supply and distribution of the resource.
- b) The poor and vulnerable like children and women will suffer the most for irregular supply of water. Issues about sanitation in shanty settlements will aggravate.
- c) **Pollution:** Indiscriminate waste disposal and surface mining have contributed to high levels of pollution of water bodies in Ghana. For instance, Densu, Pra, Tano and Birim rivers have been seen to be highly polluted because of human activities such as agriculture, commercial and industrial activities and above all, surface mining. Unfortunately, these rivers provide sources of water to many people in Accra, Koforidua and Sekondi-Takoradi and if the water is not well treated, individuals who drink it expose themselves to microbial and chemical infections. Pollution also increases the cost of treating water for human consumption.
- d) **Climatic Conditions:** Unpredictable weather patterns in recent years have accounted for fluctuations in the water levels of some of the major rivers and lakes. For example, due to persistent droughts Lake Chad in Chad is virtually drying up. Again, in Ghana, the 1983 drought caused a drop of water level in the Akosombo Dam below the minimum operating level of 248 feet. Since then the water levels in the dam have been fluctuating. The effect of low water levels in the dam in 1983 and 1998 was power outages and rationing of electricity for both industrial and residential purposes. Also, in 2017, the Tano River dried up due to low rainfall in its catchment area.



- e) **Disruption of Aquatic Ecosystem:** Human activities have resulted in the disruption of the ecosystems of many water bodies. The use of unacceptable fishing methods such as the use of poisonous chemicals and inappropriate fishing nets have contributed to the depletion of some species of fish and other aquatic resources. For example, the sea turtle has become an endangered species.
- f) **Inefficient Water Management Systems:** In Ghana and other African countries, treated water is used for drinking, flushing and for industrial and horticultural activities. This tends to put excessive pressure on water supply of treated water. In addition, agencies that are mandated to supply water for these activities are unable to do so on regular basis and in sufficient quantities. This is due to broken pipelines, theft and wastage within the supply network.

### Key ideas

- The hydrosphere constitutes water bodies for mankind.
- These water resources are useful to persons and other living things.
- It is needed for life to exist.
- About ninety-seven (97%) percent of water on the earth is salt water
- Only three percent (3%) is fresh water; slightly over two thirds (2/3) of this is frozen
- Some of these can be found in glaciers and polar ice caps.
- The remaining unfrozen fresh water is found as ground water
- Only a small fraction of fresh water is found above ground or in the air.

### Reflection

- Do you realize that human survival is based on only 3% of the water for life?
- In the rate at which human activities disturb fresh water sources, what plans can be made to maintain environmental safety?
- Visit any fresh water site in your community and see the extent of water pollution. Determine the main materials that pollute habitats of the living organisms in the water.

### Discussion

1. As a Conservation specialist, examine any three ways fresh water bodies can be protected
2. If you had the opportunity to advice on ways people must protect water bodies, which practices of your people would you advice be stopped and why?
3. According to Ofosu-Kusi, (2006), 'while existing and known sources of fresh water are drying up or being polluted, the world's consumption continues to increase'. Examine any four factors that contribute to this increasing consumption patterns globally.

## SESSION 2: UNDERSTANDING THE OCEANS

### Learning outcomes

**By the end of the session, you will be able to:**

1. Explain fresh water sources and types
2. Identify the main types of oceans.

In this session, we will focus on the concept of oceans and examine how each type is different from one another.

The ocean is a continuous body of salt water that covers more than 70% of the earth's surface. The oceans hold about 1.34 billion cubic kilometres of water which is roughly 97% of the earth's water supply.

Sea water's weight is about 3.5% dissolved salts. The oceans are also rich in chlorine, magnesium and calcium. The oceans absorb the sun's heat, transfer it to the atmosphere and distribute it around the world. The oceans are home to millions of the earth's plants and animals, from tiny single-celled organisms to the gigantic blue whale. Fishes, octopuses, squid, eels, dolphins, whales and others swim the open waters while crabs, oysters and snails crawl and scoot along the ocean bottom.

Geographers divide the ocean into five major divisions and define an ocean as follows:

An ocean is a body of saline water composes of a large part of the hydrosphere. However, an ocean can also be referred to as one of the major divisions of the earth's World Ocean.

There are five oceans in the world. These are:

i)	Pacific Ocean	155,557,000 km <sup>2</sup>
ii)	Atlantic Ocean	76,762,000 km <sup>2</sup>
iii)	Indian Ocean	68,556,000 km <sup>2</sup>
iv)	Southern/Antarctic Ocean	20,327,000 km <sup>2</sup>
v)	Arctic Ocean	14,056,000 km <sup>2</sup>

### Source: CIA Handbook

The word 'sea' is often used interchangeably with 'ocean' but strictly speaking, a sea is a body of saline water partly or fully enclosed by land, for example, the Mediterranean Sea, the Caspian Sea, etc. The oceans and seas cover about 71% of the earth's surface.

### The Pacific Ocean

The largest of all the oceans is the Pacific Ocean. It is located between the western coastlines of the American continents and eastern coast lines of Asia and Africa. The Arctic Ocean lies to the north of the Pacific Ocean and the Southern Ocean in the south. The Pacific Ocean has the longest total shore line of about 135,663 kilometres.

The Pacific Ocean covers 46% of the total water surface of the earth and covers more than a third of the total surface area. It is actually larger than all the land area combined. The water in the ocean

represents around 50.1 % of the total oceanic water on earth. The Ocean can be demarcated as the North Pacific Ocean and the South Pacific Ocean with the equator passing through the middle. The deepest point on the earth, the Mariana Trench is in the North Pacific Ocean. The Pacific Ocean is known to be the most peaceful one.

### **The Atlantic Ocean**

The Atlantic Ocean is the second largest ocean in the world. It is bordered by the Americas in the west and Africa and Europe in the east. The Atlantic Ocean consists of the Mediterranean Sea, the Caribbean Sea, the Baltic Sea and the Gulf of Mexico. Like the Pacific Ocean, the Atlantic Ocean also reaches out to the Arctic Ocean in the north and the Southern Ocean in the south.

Up to the 15th century, the Indian Ocean and the eastern Atlantic Ocean were the only known voyaged seas in the world. It was the route for spice trade and colonization. The ocean is the home to a lot of marine species, including the sperm whale which is the largest living toothed animal.

The Atlantic Ocean is known to be the saltiest. The processes of evaporation, precipitation, river inflow and sea ice melting are the major contributors to the salinity. The water in the North Atlantic circulates in a clockwise direction, whereas the water in the South Atlantic circulates in an anti-clockwise direction. This is due to Coriolis Effect. This ocean is also the second youngest among all oceans. Before 30 million years ago, it did not even exist.

### **The Indian Ocean**

The Indian Ocean is the third largest ocean in the world. It has been the home to a rich variety of humankind throughout history. The Indian Ocean is bordered by the eastern coast of Africa, the shores of Middle East and India in the north. It is separated by the Pacific Ocean by south East Asia and Australia. The Indian Ocean is also rich in exotic plants and animal species.

Around 20% of all the water of the earth's surface is in the Indian Ocean. It is the youngest of all the major oceans on the earth. It is a major sea route that connects Africa, the Middle East, and East Asia with the Americas and Europe. Around 4% of the world offshore oil production is known to come from the Indian Ocean. The different bordering countries largely exploit the beach sand that contain a rich amount of heavy minerals.

### **The Arctic Ocean**

The Arctic Ocean is the smallest and shallowest of all the oceans in the world. It is almost the size of the whole of the country Russia. Arctic Ocean lies mostly in the Arctic Circle. The Arctic Ocean is surrounded by the Eurasian and the North American continents. It includes the Hudson Bay, the North Sea and the Barents Sea. For most of the time of the year, this area is covered with ice often thick as up to hundreds of metres. Even during the summer season, most of the ocean remains impassable.

Located in the Northern Hemisphere, the ocean is generally considered to be the northernmost part of the total world ocean. The salinity and the surface temperature vary according to the seasons because the ice cover freezes and melts periodically.

### **The Antarctic (Southern) Ocean**

The Southern Ocean is the fourth largest ocean in the world. The Antarctic Ocean has a great influence on the earth's weather patterns. It joins the waters of the Pacific Ocean, Atlantic Ocean and the Indian Ocean with a persistent easterly current. The cold, northward flow waters in the Antarctic mix with the warmer waters of the sub-Antarctic in the ocean zone. This ocean is considered to be the youngest of all oceans geologically. There are a wide variety of marine animals that exist and rely on phytoplankton in the Antarctic Ocean. This area is rich for a number of marine species. The Antarctic Ocean is a storehouse of natural resources. It contains giant oil and gas field and valuable minerals as well.

### **Importance of oceans**

- a) The oceans provide waterways for big vessels like ship tankers, badges, etc. This helps to transport bulky and heavy goods to long distances hundreds and thousands of kilometres away.
- b) The oceans provide aid to international trade. The oceans help to import and export heavy goods of trade like minerals, agricultural products, timber products and industrial product.
- c) The ocean is a source of sea foods like fish, crabs, sea snails which are good sources of protein and calcium the body needs to function properly.
- d) The oceans provide minerals like salt, diamond and petroleum which are mined offshore.
- e) They provide sites for sporting activities such as yachting and boating.
- f) The oceans provide beautiful coastal scenery for tourism development, e.g., landforms such as beaches, bays and headlands, deltas, spits, cliffs etc.
- g) The oceans provide important fishing grounds which (provide) give grant employment opportunities for the numerous fishermen the world over.
- h) The oceans moderate the temperature of the coastlands through the flow of the warm and cold ocean currents and the monsoon winds and the land and sea breezes.
- i) The oceans provide large quantities of water vapour which rise up and to result in different kinds of rainfall which provide fresh water for the world.

### **Key ideas**

- The ocean is salt water and covers more than 70% of the earth's surface.
- Sea water's weight is about 3.5% of dissolved salts.
- The oceans are also rich in chlorine, magnesium and calcium.
- The oceans absorb the sun's heat, transfer it to the atmosphere and distribute it around the world.
- The oceans are a habitat for the earth's plants and animals
- Fishes, octopuses, squid, eels, dolphins, whales and others swim the open waters

while crabs, oysters and snails crawl and scoot along the ocean bottom.

- Life in the ocean depends on phytoplankton, mostly microscopic organisms that float on the surface
- Geographers divide the ocean into five major divisions.

### Reflection

- Why do some people still engage in ocean dropping in Ghana?
- Visit coast along Ghana and identify the major materials that pollute the ocean
- What can be done to maintain the blue economy for the people who reside along the coast?

### Discussion

- b. What is the blue economy?
- c. Examine the main divisions of the ocean
- d. What can be done to maintain the coast of Ghana
- e. If you had the opportunity to improve livelihoods of the coastal areas, examine any four ways you will achieve this dream.

## **UNIT 4: THEORIES OF NATURAL ENVIRONMENT**

This Unit discusses some of the theories on the natural environment. In this unit, we shall go through a number of theories propounded by different people.

### **Learning outcomes**

By the end of the unit, you will be able to:

1. Explain nature and nurture theories
2. Explain how nature and nurture interact.

### **SESSION 1: NATURE AND NURTURE THEORIES**

In this session, we will focus on the concepts of nature and nurture theories.

#### **1. The Nature Theory**

One of the oldest debates in psychology is the nature-nurture problem. Is our behaviour governed by genetics (nature) or nurture (environment and culture)? Though the debate continues, most psychologists believe human behaviour is influenced by a combination of genes and the environment (Cacioppo et al., 2000; Plomin et al., 2003).

Heredity (nature) influences not only many psychological characteristics such as intelligence, shyness, aggressiveness, and sociability, but also special aptitudes in music and art as well as preferences for different types of occupations (Bouchard, 2000; Ellis & Bonin, 2003; Plomin & Crabbe, 2000; Schwartz et al., 2004). Genes (nature) may contribute to our tendency to have a happy or sad disposition and even to our propensity to marry (Johnson et al., 2004; Lykken, 1999). Heredity also plays an important role in many psychological disorders, including problems of anxiety, depression, alcohol and drug dependence, and schizophrenia (Merikangas & Risch, 2003; Plomin & McGuffin, 2003).

#### **i. NURTURE Theory:**

Nurture refers to all the environmental variables that impact who we are, including our early childhood experiences, how we were raised, our social relationship and our surrounding culture.

In the past, debates over the relative contributions of nature versus nurture often took a very one-sided approach, with one side arguing that nature played the most important role and the other side suggesting that it was nurture that was the most significant.

The debate, nature versus nurture centres on the relative contributions of genetic inheritance and environmental factors to human development. Some philosophers such as Plato and Descartes suggest that certain things are inborn, or that they occur naturally regardless of environmental influences. Nativists take the position that all

or most behaviours and characteristics are the results of inheritance (nature). Advocates of this point of view believe that all of our characteristics and behaviours are the result of evolution. Genetic traits handed down from parents influence the individual differences that make each person unique.

### Key ideas

- The reality is that there is not a simple way to explain how organisms grow and develop
- These are influences by genetic factors and how these factors interact with environmental factors as social experiences and overall culture
- Hereditary nor environmental factors do not determine how organism grows and develop.
- These explains the relationship between hereditary (nature) and environmental influences (nurture) on the growth of organisms on the surface of the earth.

### Reflection

- Can any living thing exist without the natural environment?
- Why is this situation so?
- What should be done to protect the interdependence among organisms

### Discussion

1. What is nature theory?
2. What is nurture theory?

## SECTION 2: HOW NATURE AND NURTURE THEORIES INTERACT

### Learning outcomes

**By the end of the session, you will be able to:**

- explain the connection between nature and nurture theories

What researchers do know is that the interaction between hereditary (nature) and environment (nurture) is often the most important factor of all. For example, Perfect pitch is the ability to detect the pitch of a musical note without any reference. Researchers have found that this ability tends to run in families and believe that it might be tied to a single gene. However, they have also discovered that possessing the gene alone is not enough to develop this ability. Instead, musical training during childhood is necessary to allow this inherited trait to manifest itself.

Height is another example of a trait that is influenced by nature and nurture interaction. A child might come from a family where everyone is tall, and he may have inherited these genes for height. However, if he grows up in a deprived environment where he does not receive nourishment, he might never attain the height might have, had he grown up in a healthier environment.

Today, the majority of experts believe both nature and nurture influence behaviour and development. However, the controversy still rages. While few people take the extreme nativist or radical empiricist approach, researchers and experts still debate the degree to which biology (nature) and environment (nurture) influence behaviour.

Increasingly, people are beginning to realize that asking how much hereditary (nature) or environment (nurture) influence a particular trait is not the right approach. Researchers no longer focus on which is more important, nature or nurture, but rather on how nature and nurture interact to influence and regulate our behaviour (Plomin, 1995). The reality is that there is not a simple way to disentangle the multitude of forces that exist. These influences include genetic factors that interact with one another, environmental factors that interact such as social experiences and overall culture, as well as how both hereditary (nature) and environmental influences (nurture) intermingle. At present, most experts recognize that both factors play a critical role. Not only that, but they also realize that nature and nurture interact in important ways all throughout life.

### **Examples of Nature versus Nurture**

- a) When a person achieves tremendous academic success, did they do so because they are genetically predisposed to be successful or is it a result of an enriched environment?
- b) If a man abuses his wife and children, is it because he was born with violent tendencies or is it something he learned by observing parents' behaviour?
- c) Examples of biologically determined characteristics (nature) include certain genetic diseases, eye colour, hair colour and skin colour. Other things like life expectancy and height have a strong biological component, but they are also influenced by environmental factors and lifestyle (nurture).
- d) An example of a nativist theory within psychology is Chomsky's concept of a language acquisition device (LAD). According to this theory, all children are born with instinctive mental capacity that allows them to learn and produce language.
- e) Some characteristics are tied to environmental influences. How a person behaves can be linked to influences such as parenting styles and learned experiences. For instance, a child might learn through observation and reinforcement to say 'please' and 'thank you'. Another child might learn to behave aggressively by observing older children engage in violent behaviour on the playground.
- f) One example of an empiricist theory within psychology is Albert Bandura's social learning theory. According to the theory, people learn by observing the behaviour of others. In his famous Bobo doll experiment, Bandura demonstrates that children could learn aggressive behaviours simply by observing another person acting aggressively.
- g) Even today, research in psychology often tends to emphasize one influence over the other. In biopsychology, for instance, researchers conduct studies in exploring how



neurotransmitters influence behaviour, which emphasizes the nature side of the debate. In social psychology, researchers might conduct studies looking at how things such as peer pressure and social media influence behaviours stressing the importance of nurture.

### Key ideas

- The reality is that both hereditary and environmental forces shape a person's behaviour
- A person's genetic make-up as well as the environmental conditions (social experiences and overall culture) interact to make us who we are eventually.
- Neither hereditary nor environmental factors alone do not determine how organism grows and develop.
- These explains the relationship between hereditary (nature) and environmental influences (nurture) on the growth of organisms on the surface of the earth.

### Reflection

- The gene alone does not make humans complete unless they are accompanied by the right environmental condition, how best do you agree with this assertion?
- Why are these situations so?
- What could be done to balance the genetic and environmental conditions of homes of learners?

### Discussion

- a. Examine how do nature and nurture theories combine to model the behaviours of organisms on earth?
- b. As an environmental biologist, which of these theories would you give more attention to regarding how they influence growth and development of organisms and why?

## **UNIT 5: NATURAL RESOURCES AND THEIR USES**

In this unit, you will learn the various natural resources and their uses. This unit will help you understand what is meant by natural resources, characteristics of natural resources among others.

### **Learning outcomes**

#### **By the end of the unit, you will be able to:**

- Identify some natural resources in their environment and how some of these resources can be effectively utilised
- Explain some social problems that affect the natural environment

## **SESSION 1: UNDERSTANDING NATURAL RESOURCES**

In this session, we will focus on the concept of natural resources and examine how natural resources differ from one another.

### **Learning outcomes**

#### **By the end of the session, you will be able to:**

- Explain the concept of natural resources
- Identify the types of natural resources

### **Resource**

The term ‘resource’ can be interpreted to mean different things in different context. For example, it used to be argued that all-natural phenomena were resources (Hutt, 2011). This means that all-natural things whether good or bad, effective or ineffective were classified as resources. This interpretation of the concept of resource has been found to be misleading since not all-natural phenomena can be classified as resources. Cunningham & Woodworth (1999) explained the term ‘resources’ as forms of matter or energy that are obtained from the physical environment or through human ingenuity to meet human needs. Environmental elements do not constitute resources until human beings finds uses for them and develop technology to extract them. For example, fossil fuel was once used as a useless fluid within the earth crust until human beings found use for it. Currently, fossil fuel is extracted and distilled into various compounds, including gasoline, aviation fuel and bitumen for use in manufacturing industry, aviation and, road construction. Similarly, coal and uranium were once useless rocks until human beings found uses for them. Our ability to discover, extract and make use of environmental elements depends on the level of technological advancement at our disposal. Other factors that affect the decision to use a particular material as a resource include cost of extraction and processing, cultural beliefs and the environmental effects of obtaining and using it. In conclusion, whether something can be classified as a resource or not depends on technological advancement, economic cost, cultural beliefs and the effects on the environment if it is extracted.

## **Natural Resources**

The natural environment has been described as a resource bank. This is because it contains almost all the materials which human beings can extract for food and development. Natural resources include environmental elements or phenomena which owe their existence to natural processes and found to be of human value. Natural elements such as land, water, air, plants and animals constitute actual or potential resources because they exist in nature. Based on the functional interpretation, natural phenomena become resources only after they have been discovered to be useful and can be extracted for use. Zimmerman (1943), (as cited in Miller, 1994), who represent this school of thought, explains that resources are not; they become. This means natural environmental elements become resources only if they have been found to be useful and their extraction is feasible, taking into consideration cost and technological advancement.

### **Characteristics of Natural Resources**

#### **Natural resources are distinguished by the following features:**

**Gifts of nature:** Natural resources are free material gift of nature and thus owe their existence to natural processes in the environment. For example, inorganic materials such as gold and diamond were formed as a result of geological processes. Also, plants and animals were brought into being through the process of reproduction; sexual and asexual means.

**They are Functional:** The term 'functional' is used to imply the capacity of a resource to satisfy a need. It is not every natural phenomenon that can be classified as a resource. For instance, there are floods, earthquakes, storms and some organisms such as mosquitoes, flies and viruses which are not considered as resources. These occurrences and organisms cause disruption to human development and health and are therefore not considered as having any functional value to be classified as resources.

Some natural resources are known to be functional in their original form and state, for example, sunshine which provides us with energy, the air we breathe and the solid earth on which we stand, are all functional resources in their original state and form. However, some environmental elements such as mineral deposits, waterfalls, soils, forests, etc. did not have functional capacities while their values as resources were unknown. These natural elements become functional resources after they were discovered to be useful and efforts were made to extract them for use.

**They are Dynamic:** Except solar energy, air, water and the earth crust, uses to which natural resources can be put vary from one society to another and from time to time. For example, while pork constitutes a resource of protein to some people, it is considered dirty and taboo among Muslims. Chlorofluorocarbons (CFCs) used to be highly valued resources in the refrigeration industry until 1980s when it was detected that these compounds were contributing to the destruction of the ozone in the stratosphere. Similarly, until the discovery and the use of fossil fuels, coal used to be a highly valued resource in industrial production and in automobile industry. Now coal is a resource only in limited industrial activities.

They are Unevenly Distributed: Natural resources are not evenly distributed throughout the earth. One part of earth can have a concentration of one particular resource while another area has less or none of it, for instance, the tropical forest can be found in the equatorial and tropical areas of the earth. Similarly, mineral deposits such as gold, diamond, uranium and fossil fuels are not found in every part of the earth. Areas such as Ghana and South Africa have high concentration of gold, while the Arab Peninsula has high concentration of crude oil.

### **Types of Natural Resources.**

Natural resources can be classified using any of the following criteria, source, renewability and stage of development.

#### **Source/Origin**

On the basis of origin, natural resources may be divided into biotic and abiotic. Biotic resources are obtained from the biosphere and include such organisms as plants and animals as well as the materials that can be obtained from them. These include fossil fuels such as coal and petroleum.

Abiotic resources are those that are derived from non-living, non-organic materials such as land, water, air and heavy metals, including gold ore, bauxite ore, manganese ore and copper ore. Other non-living resources include atmospheric elements such as wind, solar energy and oxygen. Land for example provides space for all human activities including settlements, agriculture, transportation, industrial production and recreation. Water is also needed by plants and animals for survival, maintenance of hygiene and industrial production. The atmosphere on its part, supplies the essential gases needed by plants and animals for transpiration and metabolism and without it life will not exist.

#### **Renewability:**

Resources may be classified as renewable or non-renewable. A renewable resource is one that is derived from an essential inexhaustible source (example, solar energy) or capable of being replenished in a relatively short time through natural processes. Examples of inexhaustible renewable resources include solar energy, wind, and ocean water. Such resources are in abundant supply and cannot be depleted through human use. For example, we may not worry about the air being depleted or exhausted but we should rather be concerned about its quality. Polluted air can be harmful to our health while clean air enhances good health.

Renewable resources such as forests, fertile soils, freshwater and animals are categorized as exhaustible. This means that such resources are capable of regenerating themselves as long as they are used at a rate that is slower than the rate at which their supply can be replenished by natural or human-designed processes. The maximum rate at which renewable resource can be used without impairing or compromising its ability to be renewed is called its maximum sustained yield. If the maximum sustained yield is exceeded a potential renewable resource is then converted into a non-renewable resource. In many parts of the world, the maximum sustained yields for non-renewable resources such as soils, grasslands, forest and some of the wildlife have been or are being exceeded.

In Ghana, the maximum sustained yields of the forest, freshwater and soils are being exceeded. The rivers are either drying up or are highly polluted.

### **Non-renewable Resource:**

A non-renewable resource is a resource that cannot be replaced or replenished by natural or human-designed processes. Examples of non-renewable resources include organic substances such as fossil fuels (petroleum and coal) and inorganic materials such as mineral deposits (gold, diamond) iron, copper, bauxite and uranium. They exist in limited or fixed quantities and cannot be regenerated when they are used up.

Non-renewable Resources that are Recyclable and Those that are not: Non-renewable resources can be grouped into two: those that can be recycled and reused and those that cannot. Recycling involves collecting and reprocessing a resource for use in different form whereas re-use implies using the same resource over and over again in the same form.

Non-renewable resources that can be recycled or re-used include non-energy resources found in the earth's crust in finite amounts. Examples are deposits of metallic minerals from which metals such as copper, aluminium and iron can be extracted and deposits of non-metallic minerals such as phosphate rock from which fertilizer nutrients are extracted. Natural geological processes that took place millions of years ago have created varying amount of deposits of such metallic and non-metallic minerals. Once such deposits are mined, they are not replacing fast enough to be useful.

Currently, there is no technology that recycles or reuses energy in fossil fuels. Once a fossil fuel is burnt, it is gone forever. The energy released when fossil fuels are burnt is eventually radiated from the earth into outer space as low-grade heat and cannot be used again on earth. Similarly, deposits of uranium will also be rapidly depleted if nuclear power is widely used unless nuclear breeder reactors are developed that convert some non-usable forms of uranium into other chemical elements that can be used to produce nuclear power.

### **Key ideas**

- The term *resource* is used to refer to all forms of matter or energy that are obtained from the physical environment and through human ingenuity to meet human needs.
- For any matter to be considered as a resource or not depends on certain factors.
- Some of these include level of technological advancement, economic cost, cultural beliefs and the effects on the environment if it is extracted.
- Natural resources include environmental elements or phenomena which owe their existence to natural processes and found to be of human value.
- Some natural resources include land, water, air, plants and animals because they exist in nature.
- Some people also use the function to which a matter can be put.
- These are called the functional interpretations
- A notable example of a functional interpretation was what offered by Zimmerman (1943),

(as cited in Miller, 1994)

- He argues that any natural phenomena become a resource only after they have been discovered to be useful and can be extracted for use.
- This phrase *resources are not; they become* became popular at the time in every resource analysis
- This school of thought, explains why natural environmental elements only become resources only if they have been found to be useful and their extraction is feasible, taking into consideration cost and technological advancement.

### Reflection

- Can you see that Ghana has for a long time discovered and mined gold, but many gold mining towns remain poor?
- What factors explain these situations?
- Again, visit places along the coast of Ghana and describe the conditions of the people living there. Examine why these situations happen.
- You can also explore the internet to see how Johannesburg in South Africa and many nations such as Dubai, Qatar and Norway have used their natural resources to enhance their socio-economic development
- Try and explain why we have the contrast in many African nations including Ghana, Sudan and Nigeria.
- Research on the concept of resource curse and see how this may explain the level of squalor among many people who have abundant supply of natural resources.
- What lessons do you learn from the above scenarios?

### Discussion

1. What is a resource?
2. What is a natural resource?
3. How can a material become a resource?
4. What did Zimmerman mean he said 'resources are not made, they become' ?
5. What is a resource curse? Examine how the problem of resource curse has been overcome.

## SESSION 2: UNDERSTANDING NATURAL RESOURCES

In this session, we will focus on the concept of best uses of natural resources in our communities to enhance their life spans.

### Learning outcomes

**By the end of the session, you will be able to:**

- Explain the uses of natural resources

## **Substitutes for Non-renewable Resources**

Sometimes a substitute is found to replace a resource that is not renewable. For example, aluminium and plastics have replaced steel in the manufacture of some vehicles to make them lighter and thus conserve gasoline. Similarly, aluminium has replaced copper for electrical wiring. However, it should be noted that some renewable resources have such unique properties that they cannot be replaced or that their replacements are either inferior or too expensive. For example, no substitute has been found to replace steel for the construction of bridges or sky scrapers and mercury in thermometers.

## **State of Development**

In terms of stage of development, natural resources may be grouped into two: potential resources and actual resources. Potential resources include natural phenomena that have been discovered to be useful but are yet to be extracted for actual use. For example, crude oil and natural gas were potential resources in Ghana until 2010 when actual production began in commercial quantities.

Actual resources are those that have been surveyed, their quality and quantity determined and are being extracted for use. The extent to which an actual resource is exploited depends on the level of technology available and the cost of extracting it for use. Mineral deposits such as gold, diamond and aluminium are actual resources in Ghana. Other actual resources in Ghana include the forest, rivers and soils. Some of these resources are protected from exploitation and are therefore referred to as reserved resources. Examples of reserved resources in Ghana are parks and game reserves which include the Kakum National Park, Mole Game Reserve and the Atiwa Forest Reserve.

The term 'land' can be interpreted in different ways. In its ordinary meaning, land refers to the solid surface of the earth that is not permanently covered by water. Viewed from this context we can talk of the land mass of the earth comprising approximately 29.9% of its total surface. The rest (approximately 70.8%) of the earth's surface is covered by water, mostly in the form of oceans and ice formations.

## **Characteristics of Land as Natural environmental Resource**

As a natural resource, land is distinguished by the following features:

- i. **Fixed in Supply:** The total amount of land available for use is limited in supply. For example, the size of Ghana is fixed approximately 239,460 square kilometres. While it may be possible for an individual to vary the amounts of land he or she can hold, the total land in a country is fixed and thus cannot be varied. It should be noted however, that the quality of land can be improved through a number of ways. For example, an infertile land can be made fertile through the application of fertilizers. This enhances the quality and not an increase in the physical size.

- iii. **Immobility:** Land cannot be transferred from one location to another. For example, it is impossible to move land from the Upper East Region of Ghana to the Ashanti Region. However, the products of land can be transferred. It is possible to transfer gold or crude oil from Ghana to Europe.
- iv. **Spatial Variation:** The nature and quality of land vary from one place to another. Land in one location may be fertile while in another location it is arid or infertile. In one location, mineral deposits such as gold or diamond or bauxite can be found while in another location crude oil is found. Similarly, some places are characterized by mountains and valleys, while in other places there are vast stretches of deserts.
- v. **Durability:** Land as a resource for productive activities is durable. This is because it takes a long time to depreciate. For instance, a piece of land at Airport Residential areas in Accra will continue to attract high price as long as the city maintains its place as the national capital of Ghana. In another context an agricultural land can be used for several years for the production of food crops if it is sustainably managed.
- vi. **Variety of Uses:** Land is also said to be durable because it has many uses. Agricultural land can be used for settlement, industrial or recreation. In this case if the value of land depreciates because it has become infertile, it could be turned into a commercial centre like a market or a recreational centre.

## Uses of Land

**Land is a multi-functional resource.** It is primary means by which most human activities are carried out. To a large extent, the use of land for a particular purpose depends on its form, resources, location and climatic conditions (Ofosu-Kusi, 2006; McGeary & Plummer, 1992). For example, the use to which a mountainous land can be put is different from that of a plain or valley land. Similarly, land which is rich in mineral resources such as diamond or uranium may be exploited for these minerals while a fertile land may be put to agricultural use. Also, the climatic conditions of a place influence the use to which a particular land is put. For example, shortage of water and infertile soil may affect the use of a particular land for crops farming. The following are some of the ways in which land is used:

**Space for Terrestrial Organisms:** Land provides space for all terrestrial organisms, both plants and animals to live. Wild animals find habitat on land or in holes in the ground. It provides space for the movement and interaction of organisms. This makes it possible for organisms to feed and reproduce. For plants, it provides space for them to stand on, and the nutrients for them to feed on.

**Human Settlement:** Land also provides the space for human beings to build their houses and commercial centres. A large portion of land is used for human settlements such as villages, towns and cities and the provision of related infrastructural facilities.

**Agriculture:** Agriculture is one of the most important purposes for which land is utilized. A significant portion of land is used for agricultural purposes including farming, animal rearing, plantation poultry and fishing. For instance, in Ghana, it is estimated that 60% of the population is



involved in agriculture and making use of 57% of the country's total land area (Kuranchie & Ansah, 2003).

**Forest Resource:** A significant portion of land is occupied by forest in its various forms (for example tropical forest, sub-tropical forest, temperate forest, etc.). In Ghana, about 6.4% of the land surface is covered by forest. Out of this, approximately 1.8 million hectares (20%) is reserved for the purpose of protecting the biodiversity (Francois, 2003). The remaining forest cover is exploited for timber, fuel wood and game. Examples of forest reserves in the country include Atiwa, Digya, Kakum, Bia and Ankasa reserves. Some of the reserves include the Mole, Bui, Bia Digya and Kakum also serve as game reserves where hunting is prohibited. The forest also performs other functions such as provision of space for wild life habitats, herbs for medicinal purposes and protection of water bodies.

**Mineral Exploitation:** The physical space provided by land accommodates different kinds of minerals and in different concentrations at various places. For instance, in Ghana, areas such as Obuasi, Prestea and Tarkwa are noted for gold mining while Akwatia has diamond deposits. In 2010, Ghana began the production of crude oil off Cape Three Points in the Western Region. Currently, surface gold mining (both legal and illegal) takes place in almost every part of the country. In West Africa, Nigeria has the largest deposit of crude oil while Sierra Leone has diamond. These mineral deposits contribute a significant proportion to the gross domestic product of the countries where they are mined.

**Industrial Activities:** Land provides space for the setting up of industries. In the major cities in Ghana, portions of the land are set aside for industrial activities. For instance, areas such as the North Industrial area in Accra and Tema are designed industrial enclaves.

Apart from these, other major towns and cities in Ghana have experienced the growth of small scale industrial and production activities by artisans such as mechanics, carpenters and spare parts dealers. Notable areas include Suame magazine in Kumasi and Abbosey Okai in Accra where industrial and commercial activities take place.

**Recreation:** Land serves as resources for recreational purpose. Tourism sites such as the Wli waterfall, Kintampo waterfall, Boti Waterfall, Mount Afadja and the Paga Crocodile Pond are all situated on land. Also, recreational centres such as the stadia, children's play grounds and gymnasias are sited on land. In addition to these, land provides space for parks and game reserves such as the Mole Game Reserve, the Kakum Park and Digya Park which are set apart for both ecological and recreational purposes.

**Transportation:** Land also provides space for the construction of roads, railways, airports, harbours and lorry parks. With the increase in population and urbanization, more land is being demanded for transportation and related activities. In the major cities such as Accra, Kumasi and Sekondi-Takoradi, large tract of land is being used to construct dual or multiple carriage ways for road transportation. Also, large tracts of land have been acquired in Kumasi, Tamale and Accra for the construction of airports.

## **Factors that Affect Sustainable Use of Land in Ghana**

A number of factors hinder the sustainable use of land as a resource in Ghana. These factors are discussed under the following headings: human factors and natural factors.

### **HUMAN FACTORS**

**Population Pressure:** The population of Ghana in 1984 was 12,296,081. In 2010, a period of 24 years, this figure more than doubled to 24,658,823 (GSS, 2010). The increase in population means more demand for land for various activities such as agriculture, settlement, recreation and other social amenities. In the rural areas of Ghana, good arable lands for farming and other agricultural activities are increasingly turning into infertile grasslands. This may be due to a reduction of fallow period because of population pressure. Generally, most soils in Ghana are not suitable for intensive agriculture over long period of time. Besides, urbanization has led to conversion of lands on the fringes of towns and cities into residential, industrial and commercial spaces. This has resulted in reduction of agricultural lands in those areas.

**Unsustainable Mining Activities:** Ghana is one of the countries in Africa that have mineral deposits. However, unsustainable mining activities such as small scale and large-scale surface mining and mining in water bodies are causing considerable damage to the lands in areas where such activities take place. Small scale artisanal mining (both legal and illegal) has caused wide spread land degradation and water pollution across the country. Satellite images show patches of degraded lands in almost every region where surface mining is dominant. The Ghana Water Company has complained of the astronomical increase in the cost of treating water from Pra and Tano rivers because of pollution of water bodies by illegal mining activities.

**The Land Tenure System:** The land tenure system is the traditional system of land ownership in which members of a family or clan collectively own a portion of land (Weiler, Ofosu-Kusi & Dake, 2015). This system does not ensure effective utilization of land in the country at present, because it results in the fragmentation of land into smaller units which cannot be used for large scale commercial farming. Besides, the system sometimes leads to land litigation in both rural and urban areas. Another problem of the system in relation to land utilization is that, it discourages investment in land related activities because investors sometimes have to deal with multiple owners of the same piece of land. This results in increase in the overhead cost of production and development or other land related investment.

**Deforestation:** Human activities such as agricultural practices, surface mining and lumbering have resulted in the destruction of much of forest cover in Ghana and elsewhere in Africa. Unsustainable exploitation of timber, coupled with inefficient agricultural practices, has led government to replace the 15 years felling cycle policy with a 40-year cycle to allow sufficient time for the forest to recover (Francois, 2003). However, this policy is not strictly enforced due to corruption and activities of illegal loggers. Logging has impacted on a selected number of Ghana's primary timber species. It has generally resulted in the creaming of the tree species and decline in the economic and ecological structural quality of the forest in many areas (Hawthorn & Musa, 1993). At current

levels of exploitation, most of the country's primary timber species will become economically extinct in a few years to come.

**Bush Fires:** Bush fires are common occurrences during the dry season in the savannah region and the transitional zones of the country. These fires are usually set by hunters to have access to a game or farmers to clear the area for cropping. Sometimes, the source of the fire could be traced to livestock herders who do so to enable fresh grass to sprout for their livestock to feed on. However, bush fires destroy the vegetation and animals, including micro-organisms and adversely affect the biodiversity. This destroys the quality of land to support agricultural activities.

## **NATURAL FACTORS**

Apart from human activities, natural factors also affect the use of land as a resource. These natural factors are related to changes in climatic conditions and earth movements.

**Climatic Factors:** Climatic conditions have been changing all over the world for some time now. Scientists believe that the world is currently experiencing a period of global warming and this has led to increase in average global temperature. This is evidenced by the melting of icebergs in the Polar Regions.

**Drought:** Droughts are natural environmental problems that are related to weather and climatic conditions. Drought is defined as a prolonged continuous period of dry weather (Baaberyir & Ngaaso, 2007). From geographical perspective, drought results when evaporation from water bodies and transpiration from living organisms (collectively called evapo-transpiration) exceeds precipitation. This creates moisture deficit which in turn results in dry conditions or aridity. Lands that have experienced prolong periods of drought lack the capacity to support plant and animal life.

**Floods:** Flooding is another natural phenomenon that affects the use of land. Floods occur when there is excess water on the earth's surface due to continuous heavy rain or from natural water bodies such as melting of ice bergs in the Polar Regions or when rivers and lakes overflow their banks. In recent times, floods have been frequent occurrences in Ghana. Urban areas such as Accra, Kumasi, Koforidua, Sekondi-Takoradi and Tamale experience flood almost on annual basis. Also, some of the major rivers like the White and Black Volta, Pra, Ankobra and Tano sometimes overflow their banks and cause flooding to farmlands and settlements along their banks.

**Volcanism:** This refers to volcanic activity, including the eruption of lava or rock fragments from a vent beneath the earth's surface. Volcanic activities often affect the effective use land to destruction of settlements, property and lives. For instance, on May 8, 1902, Mount Pelee erupted and destroyed the town of St. Pierre on the Caribbean Island of Martinique, killing between 25,000 and 40,000 people within a few minutes. In fact, the whole town was destroyed.

**Landslide:** Landslide is a generic term used to explain slow to very rapid descending rock or debris from a highland. Generally, landslide involves the sliding down of a mass land from a mountain under the influence of gravity. Landslide can also take the form of mudslide (movement of mass soil which has been made fluid by rain or melting snow). In places where landslides and mudslides occur, settlements have been buried and people killed. In 1985, the eruption of Mt. Nevada Del

Ruiz in Columbia caused mudslide that buried most of the town of Amero and devastated the town Chinchina resulting in the death of an estimated 25,000 people.

### Key ideas

- Natural resources have some of the following characteristics:
  - **Fixed in Supply**
  - **Immobility**
  - **Spatial Variation**
- In order for us to manage the use of resources efficiently, we must have substitutes for them.
- This calls for education and technology to identify substitutes that will replace resources that is not renewable.
  - For example, aluminium and plastics can replace steel in the manufacture of vehicles to make them lighter and conserve gasoline.
  - Again, aluminium has replaced copper for electrical wiring.
- But some natural resources cannot be replaced.
  - For example, no substitute has been found to replace steel for the construction of bridges or sky scrapers and mercury in thermometers.

### Reflection

- Examine the level of resources in your community.
- To what extent do the people of your area optimize the resources in the area for development?
- What is wrong with the approach? What can be done instead?
- Why are they stuck in their old ways of living?
- Reflect and describe any ONE innovative approach that you would want to use to improve the living conditions of your people.
- Share your responses in a video form to be watched in class

### Discussion

1. Describe any 3 reasons to explain why the land is a scarce natural resource
2. Examine any 4 ways by which land can be optimized in Ghana
3. Examine any 4 threats to the use of land in Ghana
4. If you had the opportunity to advice the president of Ghana on efficient uses of land, what suggestion would you give to him/her to optimize land use?
5. Which negative behaviours do you consider bad to the utilization of natural resources in your community? Describe you would want to address the challenge.

## **UNIT 6: SOCIAL PROBLEMS OF THE ENVIRONMENT**

This unit discusses some of the social problems of the environment. Environmental degradation and its causes will be discussed in this unit. The effects of environmental degradation will also be discussed.

### **SESSION 1: UNDERSTANDING PROBLEMS POSED BY SOCIAL INTERACTIONS WITH THE NATURAL ENVIRONMENT**

In this session, we will focus on the social problems and how these problems affect our environment.

#### **Learning outcomes**

**By the end of the session, you will be able to:**

- Identify and explain some social problems that affect the natural environment

Land, water and air are the main natural resources for the survival of human beings. As some of these are relatively free, the Ghanaian hardly values them. We use them to satisfy our wants and needs. Since these limited assets have no substitutes, any careless use of them constitutes a threat to us and the generations yet unborn. It is therefore important for us to make use of these properly in an environmentally friendly manner.

#### **The meaning of Environmental Degradation.**

It is the process by which the natural state and quality of the environment deteriorates in quality or is destroyed through the activities of man and animals or natural causes to the extent that the natural environmental resources are inadequate to support plant and animal life. This occurs when the natural replacement rate of the resource of nature already used is exceeded; such that the available supply shrinks, leading to deterioration in the quality of the environment.

#### **The meaning of land Degradation**

Land degradation refers to the deterioration of the land as a result of misuse or overuse of it such that it becomes less fertile or infertile for plant growth.

#### **Causes of Land Degradation**

- 1) **Overgrazing by animals**, especially, livestock deplete the vegetative cover of the area leaving the land bare for wind and water erosion, taking away the nutrients of the soil. Again, the trampling of the livestock on the land make the soil compact which in effect affect the aeration of the soil and killing soil organisms, for example, earth worms which contribute immensely to soil fertility.

- 2) **Sand winning** removes the top soil where plant nutrients are found. When this activity covers a wide area the entire land surface is spoilt, depleted of nutrients for plant growth. Again, the removal of the top soil and vegetal cover subject the land to erosion which may produce gullies to worsen the situation.
- 3) **Mining activities** introduce poisonous chemicals and metals such as copper, lead, arsenic, mercury, etc. into the soil which negatively affect plant growth. It also kills organisms that contribute to fertility of the soil.
- 4) **Dumping of waste** on the land such as plastic materials, industrial waste such as dirty oil, etc. kill soil micro-organisms because these substances may contain chemical. Besides. Plastics do not decay to provide nutrients to the soil. In effect, the soil becomes less fertile for plant growth.
- 5) **Bush fire/Bush burning** over large tract of land makes the land bare and vulnerable to wind and sheet erosional attack. Soil micro-organisms are destroyed and decay of organic material does not occur and as a result, rendering the soil infertile for plant growth.
- 6) **Deforestation** is one of the causes of land degradation. Timber species in the forests are felled and processed for export. Locally, due to rapid population growth and urbanization there is increased demand for housing as such trees in the forest regions are cut for housing and charcoal. Through this, large tract of forest lands is destroyed when the land becomes bare and subjected to erosion.
- 7) **Bad farming practices** such as shifting cultivation and slash and burn method of preparing the land for seasonal crops such as maize and vegetables render the land bare. When practised for years large tract of land is destroyed through burning and in the process, soil micro-organisms die and the land is made bare and exposed to erosion.

### **Effects of land degradation**

- 1) Land degradation leads to low yield of crops due to the fact that, top soil which contain plant nutrients is destroyed (removed), soil micro-organisms which contribute to soil fertility are destroyed; soil becomes so compact that aeration is almost absent. All these conditions do not make soil fertile for plant growth.
- 2) Land degradation affects water resources leading to water shortages. This comes about as a result of sand winning on river banks where trees are removed and the river is widened or large holes are dug on the river bed. The water in the river bed become sluggish and does not flow quickly. The water is now subjected to rapid evaporation leading to drying up of the river during the dry season, thereby creating water shortage.
- 3) Land degradation; especially surface mining cause death and injuries to people. This comes about when large holes are dug and are not covered. Rain water is collected in in holes which become death trap for unsuspecting victims, especially children. Cases of this nature

have been reported in Kyebi and other places where ‘galamsey’ activities have taken place. Besides, the stagnant in the holes become breeding place for mosquitoes increasing the incidence of malaria among the people around.

- 4) Land degradation can lead to decrease in fish stock in our water bodies. Deforestation leaves large tracts of land bare and subjects it to erosion. In this case, torrential rains wash large amounts of soil into the rivers which lead to siltation and making the rivers very shallow for only some aquatic animals to survive. There would be over-fishing and unfavourable temperature for the survival of fishes.
- 5) Land degradation can lead to floods occurring. This is due to the fact that deforestation, mining activities, bad agricultural activities may subject the land to erosion. When large amounts of soil are washed in to the river, siltation takes place making the river basin shallow and during wet seasons they overflow their banks to cause havoc to life and property.
- 6) Land degradation also lead to soil erosion which create gullies and do not make the land suitable for agricultural and other useful purposes.
- 7) Land degradation affect the micro-climate of the area affected. This happens when there is much deforestation which affects evapo-transpiration and its resultant cloud formation and rainfall.

### **Preventing/minimizing land degradation**

- 1) Land degradation can be prevented or minimized through re-afforestation. Planting trees in places where they have been cut. This will prevent the loss of topsoil, water plant nutrients from erosion. Humus would once again be formed through the decay of plant leaves, twigs, etc. to bring back the fertility of the soil for plant growth.
- 2) Another way of prevent or minimizing land degradation is controlling sand and stone winning. The Environmental Protection Agency (EPA) must ensure that the amount of sand and stone which people are permitted to remove from river banks, beaches, etc. do not exceed their limits. This will make sure that large quantities are not taken away.
- 3) Furthermore, the EPA must ensure that the scooped land surface and the holes created after mining and quarrying or sand winning must be filled with organic waste, leveled and cover plants planted to stabilized and bring back the fertility of the soil, and also preventing unsuspecting victims from falling into such holes.
- 4) In addition, land degradation can be prevented by embarking on proper agricultural practices. Land degradation resulting from bad/improper agricultural practices can be prevented/minimized when agricultural extension officers intensify their education to farmers concerning good/proper agricultural practices. Such good or proper agricultural

practices may include contour farming and terracing, especially in hilly area, mulching and composting, appropriate application of fertilizers, pesticides and weedicides.

- 5) Herdsmen who rear livestock should prepare fodder to feed their livestock to reduce grazing on the land.
- 6) Lastly, land degradation can be minimized and prevented through application of sanctions and punishments. The authorities who have the responsibility of protecting the environment such as the EPA must ensure that those who fail to comply with their rules and approved standards must be brought to book to serve as deterrent to others. This will go a long way to minimize and prevent land degradation.

## **AIR POLLUTION**

### **The meaning of Air Pollution**

Air pollution refers to the release of harmful or unpleasant substances or a form of energy into the atmosphere in amounts sufficient to cause discomfort and harm to plant, animal and human lives. Substances that are present in air lowering its breathing qualities and comfort making it harmful unpleasant to life are compounds of certain chemicals and noise. These chemical compounds and noise are referred to as air pollutants. These compounds may be found in the air in two forms as:

- 1) Gases such as nitrogen compounds, carbon dioxide, ozone, sulphur compounds, etc.
- 2) Particulate matter suspended in the air, that is, mixture of solid particles or liquid droplets that remain suspended in the atmosphere for appreciable time periods. Examples are dust, soot, smoke and salt particles, and water and sulphuric acid droplets (aerosol). Particulate matter, also known as particle pollution, is a complex mixture of extremely small particles and liquid droplets that get on to the air. Once inhaled, these particles can affect the heart and lungs and cause serious health effects.

### **Causes of air pollution**

- 1) Smoke from the chimneys of heavy and light industries that manufacture cement, iron and steel, soap, etc.
- 2) Smoke coming from the exhaust pipes of cars, heavy trucks, aircrafts, thermal plants, etc. as a result of combustion of fossil fuel in their engines.
- 3) Smoke from our homes (domestic smoke) emanating from the use of charcoal and firewood for cooking
- 4) Agricultural practices – burning of farmlands through the slash and burn method for preparing the land for crop cultivation produces much smoke into the atmosphere.
- 5) Incidence of bush fires by hunters/ palm wine tappers/ farmers during dry seasons emit large quantities of smoke into the atmosphere.
- 6) Discharge of dust into the atmosphere from movements of trucks and lorries on untarred roads and construction of roads and buildings. Again, during harmattan season winds blow much dust into the atmosphere and air around us.



- 7) Production of chloro-fluoro-carbons (CFCs) used as coolants in refrigerators and air conditioners and as propellants in aerosol spray cans – body sprays (perfumes), mosquito sprays, etc. are released into the atmosphere which affect the ozone layer.

### **Effects of air pollution on man**

- 1) Global warming and its associated high temperatures on the environment. Smoke released as a result of burning of farmlands, bush fires, burning of firewood and charcoal for cooking discharge large quantities of carbon into the atmosphere which combine with atmospheric oxygen to form carbon dioxide,  $C + O_2 \rightarrow CO_2$ . Further increase in the concentration of carbon dioxide in the air contributes to global warming, which is increasing the temperature of the world above normal.
- 2) Air pollution causes respiratory diseases and other diseases in humans. As plant tissue is burnt, it releases sulphur into the atmosphere. The sulphur combines with atmospheric oxygen to form sulphur dioxide ( $S + O_2 \rightarrow SO_2$ ). Sulphur dioxide is highly toxic and has the potential to cause coughs, sore throat and other respiratory diseases in humans through the irritations the gas causes to the lungs. The effects of sulphur dioxide in the atmosphere are the same as nitric oxide (NO) and nitrogen dioxide (NO<sub>2</sub>).
- 3) Destruction of plants and trees/forests. High concentrations of sulphur compounds in the atmosphere combine with oxygen and water in the atmosphere to form sulphuric acid which is responsible for acid rains which destroy plants and trees. In the destruction process plants get spots on their leaves and fall; and finally die.
- 4) Destruction of aquatic animals such as fishes. When acid rain gets into fresh water bodies such as rivers, lakes, streams, ponds etc. it increases the PH of the water body making it more acidic. In effect, it kills most of the aquatic animals including fish in the water body.
- 5) Polluted air can cause eye infections and respiratory diseases. When the air is polluted with dust such as dust from untarred roads, construction sites and during the harmattan season, and are inhaled, it can cause sore throat, catarrh, and trigger off asthmatic attacks on those who are prone to asthma. Again, when the dust gets into the eye, it can cause numerous eye infections. All these happen because, the dust particles carry some bacteria and when the wind blows or the dust is stirred up, they get into the air.
- 6) Thinning of the ozone layer and its associated health hazards. Chloro-fluoro-carbons (CFCs) released into the atmosphere destroy the ozone, a gas which absorbs much of the ultra-violet radiation before what is needed reaches the earth. As CFCs make the ozone layer thinner, unacceptable levels of ultra-violet radiation reach the earth directly which causes diseases in humans such as skin cancers, cataracts, premature ageing from wrinkled skin, and suppression of human immune system.

## **Minimizing/preventing air pollution**

- 1) Ghanaians should be encouraged to use natural gas for cooking which release very little carbon dioxide in to the atmosphere on burning instead of firewood and charcoal.
- 2) The government must enforce the law banning importation of very old cars in to the country since such cars produce much smoke into the environment.
- 3) Car owners must be educated to regularly service their cars and use appropriate fuel so that they do not emit much smoke saturated with carbon, sulphur and nitrogen compounds. Again, cars which are seen with huge amount smoke should be grounded and the owners brought before the law.
- 4) The EPA must ensure that factories that discharge large amounts of smoke in to the atmosphere install equipment that capture pollutants before they enter the environment, for example, Electrostatic Smoke Precipitator (ESP). This will remove soot from the smoke and much cleaner air emerges from the chimneys as a result. Alternatively, all factories that produce too much smoke must be made to build very high chimneys. This will help to reduce the negative effects of smoke close to human habitation. For example, The Volta Aluminium Company (VALCO) has built a 152.4-metre-high chimney and the EPA should ask other factories to follow that example.
- 5) Organic waste such as leaves etc. should not be burnt, but must be put in compost pit so that on decomposition, it could be used as manure. This will reduce the release of carbon and sulphur in to the atmosphere.
- 6) The government must embark on public education about the need to use bicycle or walking to nearby places to attend to our needs instead of using cars and other vehicles that consume fossil fuel.
- 7) Workers should be sensitized and encourages using buses and train (public form of transport) or carpooling to their places of work and back instead of their private cars. This will minimize the use of fossil fuel and the release of potentially dangerous carbon, sulphur and nitrogen elements into the atmosphere.
- 8) Planting trees, that is, embarking on afforestation and taking care of trees in our neighbourhoods so that much carbon dioxide in the atmosphere could be absorbed by the trees through the process of photosynthesis.
- 9) Car and thermal plants that run on fossil fuel must be fitted with catalytic converter to reduce the release of carbon, sulphur and nitrogen compounds into the atmosphere.
- 10) The government should as a matter of policy, exploit alternative sources of energy such as solar and wind instead of thermal, coal and nuclear to ensure pollution –free and healthy environment.

- 11) There should be massive public education to sensitize Ghanaians to conserve energy in our houses by switching off appliances and lights when not needed. Less energy means less emissions of carbon dioxide, sulphur and nitrogen compounds in our environment.

## **WATER POLLUTION**

### **The meaning of Water Pollution**

Water pollution is therefore explained as contamination of any water body with unwanted or harmful substances in sufficient amount (concentrations) to make the water unsafe for consumption, aquatic lives, agriculture and for other purposes beneficial to life.

### **Causes of Water Pollution**

#### **Numerous ways of water pollution include:**

- 1) Dumping of substances into water bodies such as rivers, the sea, lagoons, lakes, etc. Such substances include garbage (rubbish), dirty water from our homes, defecating along river banks and beaches with the faecal matter being washed into the water body by rain or waves.
- 2) Industrial waste (effluent) is also discharged into water bodies. These waste materials may contain some chemicals that are harmful to humans as well as other living things that depend on the water body for survival.
- 3) The use of chemicals such as Dichloro-diphenyl-trichloro-ethane (DDT) and dynamite for fishing contaminate the water source to an extent that it is dangerous to eat the fish let alone drinking the water from its polluted source.
- 4) Improper disposal of solid waste, especially polythene bags and other plastic materials from our various settlements are washed into water bodies which cause much siltation of the water body. Siltation makes the water bed too shallow for the survival of some aquatic lives (animals) such as fish, crab, etc.
- 5) Agricultural activities upland and near the banks of water bodies pollute the water to dangerous levels. Chemicals such as weedicides, pesticides and fertilizers are washed into the water bodies polluting them in effect.
- 6) Volcanic ash, lava, etc. ejected during volcanic eruptions pollute water bodies within reach and kill aquatic animal. Lava poured out from the interior of the earth is so hot that it boils the water; and the materials ejected alongside pollute the water body and make it impossible to use.
- 7) Animals such as goats, sheep, cattle and other domestic animals drink from nearby rivers, lakes, streams, etc., they leave their droppings around which washed into the water body thereby polluting it and making it unsafe to use, especially drinking it and using it to take a bath.

- 8) Mining activities pollute water bodies with chemicals such as potassium cyanide and mercury which are used to wash and extract the mineral. Such chemicals have the potential to cause cancer, kidney damage and other health hazards when they get into the body either drinking or using it for other domestic purposes.
- 9) Dredging for gold and diamond (alluvial mining) which involves direct dredging of the water body for the mineral pollutes the water directly by making the water very dirty to the extent that the water becomes colourfully brown which cannot be used to take a bath let alone drinking it.

### **Effects of Water Pollution**

- 1) **Diseases:** when one drinks polluted water, which has been contaminated with pathogen from faeces and animal dropping, etc. one is likely to be infected with diseases such as diarrhoea, dysentery, cholera, typhoid, etc. These diseases have the potential to kill the patient if left untreated at the right time.
- 2) **High cost of treatment:** When water bodies are very much polluted, the cost for treating it to be safe for consumption is very high and becomes a burden for the government and consumers.
- 3) **Death of Water body (river):** continuous pollution of the water bodies such as rivers, lakes, ponds, etc. may lead to the death of the water body eventually. This is because, aquatic weeds and organisms which maintain the aquatic ecosystem would not be present to maintain balance in the water body.
- 4) **Low stock of fish:** When a river, pond, stream, etc. is polluted, it leads to low stock of fish which affect commercial fishing activities in the area. The people who depend on fishing for their livelihood would suffer much economic loss.

### **Measures to prevent/minimize Water Pollution**

- 1) The District/Municipal/Municipal Assemblies should create awareness to the people through the media about the dangerous effects of dumping waste into the water bodies.
- 2) The District Assemblies should also embark on effective waste management programme to ensure that domestic and industrial waste are properly disposed of at far-away landfill sites which are properly fenced to prevent waste material from getting into our water bodies.
- 3) Alternatively, domestic waste as well as plastics, etc. should be recycled to prevent them from finding their way into the water bodies eventually.
- 4) At local and national levels, laws relating to environmental cleanliness must be vigorously enforced so as to bring defaulters to book to serve as deterrent to others.

- 5) Trees and grass should be planted around our houses and near water bodies to prevent erosion. This will minimize the discharge of chemicals such as pesticides and weedicides and solid waste into water bodies.
- 6) Toilet facilities should not be built near water bodies/ sources so as to avoid their contamination.
- 7) Animal should not be made to graze near water bodies or drink from them to pollute the water with their droppings. This can be done when the Unit Committees through the Assemblies enforce their bye-laws where strayed animals are caught and the owners fined.

### Key ideas

- Land, water and air are the main natural resources for the survival of human beings.
- These natural resources are relatively free.
- So in many cases, people underestimate their use and so turn not to be careful about how we use them.
- We need these resources to satisfy our wants and needs.
- But some have limited supply with no substitutes. Therefore making their careless use, very dangerous practice for our survival for to us and the generations yet unborn.
- It is therefore important to explore sustainable use of these resources in an environment.

### Reflection

- Watch videos of the rate of water pollution of major rivers in Ghana
- Look particularly at the Pra river and Birim.
- Examine what is wrong with the rivers and brainstorm on the way forward
- Determine what should be done to protect for yourself and the next generation of yours.

### Discussion

1. What is land degradation?
2. What are some of the ways in which land degradation comes about in your community?
3. Examine any three effects of land degradation on your people
4. Suggest any three approaches to address the problem of land degradation in your community
5. In your own words, explain air pollution
6. Show how air pollution is different from water pollution
7. Examine any four practices among your people that pollutes the air around you.
8. If you were the Environmental Planning Officer of your District Assembly, suggest any four ways to reduce the effects of air pollution in your area

### Group Project

Do a video to show the rate of water pollution in your area. In the video, explain how water is being polluted in your community, state at least four effects of the practice on your people and suggest four solutions to address the challenge.

## **SESSION 2: UNDERSTANDING PROBLEMS POSED BY SOCIAL INTERACTIONS WITH THE NATURAL ENVIRONMENT**

In this session, we will focus on the social problems and how these problems affect our natural environment.

### **Learning outcomes**

**By the end of the session, you will be able to:**

- Explain some interventions to reduce some of the social problems for safer communities.

### **Government Response to Environmental Degradation**

#### **I. Establishment of the Environmental Protection Agency**

One of the steps the government of Ghana has taken to protect the environment is the establishment of the Environmental Protection Agency (EPA). The EPA Ghana's mission is to manage, protect and enhance the country's environment and seek common solutions to global environmental problems. Its mission is to be achieved through an integrated environmental planning and management system with broad public participation, efficient implementation of appropriate programmes and technical services, advice on environmental problems and effective consistent enforcement of environmental laws and regulations.

#### **II. Attending environmental conferences and ratifying protocols and conventions**

Another response Ghana Government has given to tackling environmental issues is by attending conferences, acceding to and ratifying protocols and conventions on the preservation of the environment. Examples include the following:

- 1) United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and /or Desertification. It was held in Paris on 14th October, 1994 and Ghana ratified it on 15th October, 1994.
- 2) Montreal Protocol on Substances that Deplete the Ozone layer. Held in Montreal on 16th September, 1987 and Ghana ratified it in 1992.
- 3) Vienna Convention for the Protection of the Ozone Layer.
- 4) United Nations Framework Convention on Climate Change. Held in New York on 9th May, 1992 and Ghana ratified it on 12th June, 1992.
- 5) Convention on Biological Diversity. Held in Rio de Janeiro on 5th June 1992 and Ghana ratified it on 29th August, 1994.

#### **III. Environmental Education integrated in school curricula/syllabi**

Again, the government of Ghana response to environmental degradation is the integration of environmental education in school syllabi. The government of Ghana is committed to the promotion of environmental education and awareness among the Ghanaian populace from basic education the tertiary level. To this end, the government, through the ministry of Education has resolved to offer children access to quality education and improve the capacity of the education systems to prepare and develop curricula around environmental

sustainability as well as training teachers to handle education for sustainability. This is seen in the curricula developed across the various levels of education in the country.

In an address read on behalf of the then Minister of Education, Professor Naana Opoku Agyeman at a day's workshop organized by the environmental Protection Agency on Environmental Education Strategy Review, she had this to say: "The Ghana Education Service is particularly concerned about recent environmental issues, particularly climate change adaptation and its related disaster management and believes that environmental education is an answer to the challenges". The minister called for the need to start with children and said children were more receptive to change and likely to acquire the skills for environmental education.

#### **IV. Formulation of National Environmental Policy**

National Environment Policy was established in Ghana's Environmental Action Plan, which seeks to redirect development towards more environmentally sustainable practices. The main aim of the National Environmental Policy is to improve the environment, living conditions and quality of life for all citizens of Ghana. The policy aims to reconcile economic development and conservation and seeks to:

- 1) Promote the sustainable use and maintenance of Ghana's natural resources.
- 2) To maintain ecosystems and ecological processes.
- 3) Ensure sound management of natural resources and the environment.
- 4) Adequately protect against harmful impacts and destructive practices and preserve biological diversity.
- 5) Formulation of Environmental Sanitation Policy

In order to ensure that proper environmental hygiene and sanitation prevail across the length and breadth of the country, there is the formulation of Environmental Sanitation Policy under the auspices of the Ministry of Science and Technology and the Ministry of Rural and Local Government in collaboration with the Ministry of Finance and Economic Planning. The policy seeks to re-examine and deal more effectively with the issues that have led to the persisting underlying causes of poor environmental sanitation and its vital link to health.

#### **ENVIRONMENTAL PROTECTION AGENCY (EPA)**

The Environmental Protection Agency (EPA) was set up on 23rd May, 1973 as the Environmental Protection Council, but on 30th December, 1994, the name was changed to the Environmental Protection Agency.

The Agency began during a time of growing concern about the dangers to the environment from careless human activity, prompting the United Nations (UN) to convene a conference in Stockholm on the environment in June 1972. Guidelines for action were adopted at the conference, including the establishment of the United Nations Environment Programme (UNEP). The decision to establish the Environmental Protection Council was a direct result of the recommendations of the Stockholm Conference.

## **Functions of the Environmental Protection Agency**

The Environmental Protection agency has a lot of functions to perform so far as environmental issues in Ghana remain a matter of concern. Among others, the following are the functions of the environmental Protection Agency.

### **1) Co-ordinates with environmental management organizations**

The EPA co-ordinates with organizations that are involved in environmental management. It is also to work with all persons and groups in order to control or prevent the discharge of all forms of waste in the country. This is to help in the improvement in the quality of the environment. The EPA is also to collaborate with international organizations towards the protection and preservation of the environment.

### **2) Advisory role**

One of the functions of the EPA is the advisory role it plays. By this role, it is to conduct investigations into environmental issues and to advise the Central Government, through the Ministry Environment, Science and Technology, and the District, Municipal and Metropolitan Assemblies accordingly. It is also to co-operate with these organizations in order to protect the environment.

### **3) Environmental Education**

Again, it is the duty of the Environmental Protection Agency to educate the public on environmental issues, such as the causes and effects of pollution of air, water bodies, improper waste disposal, land degradation and a host of others. It is for this point that the EPA has a unit called the 'Environmental Education Department'. This unit is responsible for educating the public on the functioning of the environment, its problems and how each individual can help to protect it.

### **4) Enforcement of Environmental Laws**

Furthermore, the EPA is empowered to make and enforce all laws concerning the environment in Ghana. It is expected to prescribe standards and guidelines concerning pollution of the air, water, land, and other forms of environmental degradation, including the disposal of waste materials and to ensure that these guidelines are complied with.

### **5) Research**

In addition, the EPA is to conduct research into ways of solving environmental problems in the country. Particularly, this research is to cover such areas as noise pollution, recycling of waste and other environmentally friendly methods of utilization of resources for development. The agency is also to promote studies and research that would help in improving the ecological systems in Ghana.

### **6) Environmental Impact assessment (EIA)**

The EIA is responsible for assessing or examining human activities that are likely to have negative impact on the environment. It is expected to do this by conducting an



environmental impact assessment on such environmental issues as mining activities, location of industries, for instance, fuel stations as to how safe they are to the people around.

### Key ideas

To protect natural resources, there are global efforts to adopt the right kinds of policies and programmes to enhance use and manage resources.

Some of these include:

- Establishment of agencies to manage, protect and enhance the country's environment and seek common solutions to global environmental problems.
- Attending environmental conferences and ratifying protocols and conventions
- Environmental Education integrated in school curricula/syllabi
- Formulation of National Environmental Policy
- Formulation of Environmental Sanitation Policy

These are done to achieve the following:

1. integrated environmental planning and management system with broad public participation
2. efficient implementation of appropriate programmes and technical services
3. advice governments on environmental problems and
4. effective consistent enforcement of environmental laws and regulations.

### Reflection

- Do you think the fight against Galamsay in Ghana is a just fight?
- Research and examine the meaning of the following concepts in the utilization of natural resources:
  - a. Green economy
  - b. Blue economy
- Can a nation develop its natural resources alone or in partnership with every stakeholder?
- Design an innovative programme to address the challenge of galamsay menace in Ghana (you can model your plan or do a video to tell your plan)

### Discussion

1. In view of the destruction of water bodies and land resulting from illegal mining activities in Ghana:
  - a. would you say the establishment of Environmental Protection Agency in Ghana has been useful?
  - b. what do you see to be some of the challenges facing EPA?
  - c. examine any four strategies to make EPA effective?

This pack contains materials that will aid the delivery of the course. The materials contained in the pack are:

- i. Information on the course.

- ii. Materials needed to study the various units of the course. These materials are attached as folders or links.
- iii. Learning guide which aims to provide guidance on what learners are expected to pay attention to in each unit.
- iv. Schedule of tutorial sessions and tutorial questions to guide the sessions. These are provided for each unit.

## **OVERVIEW OF THE COURSE**

This course pack contains information about the course, the course outline, notes based on the content of the course will be made available to you as folders and internet links. There are also, a detailed schedule for tutorials and some tutorial questions to guide your study.