NATIONAL OPEN UNIVERSITY OF NIGERIA

SCHOOL OF SCIENCE AND TECHNOLOGY

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ESM 403: ENVIRONMENTAL PERCEPTION

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UNIT 1: COMPONENTS OF THE ENVIRONMENT

Contents

1.0 Introduction

The environment can be defined as all factors (living and non living) that actually affect an individual organism or population at any point in the life cycle (Botkin and Keller, 1998).

Similarly, Olomo (1999) defined environment as the whole sum of surrounding external conditions, within which an organism, community or object exist. It may be natural or man made. From the above definitions, the environment entails all the factors that affect the behavior and performance of an organism especially man in a given area. Environment is also sometimes used to denote a certain set of circumstances surrounding a particular occurrence.

There are four major components or elements of the environment, which include the atmosphere (air), lithosphere (land), hydrosphere (water) and the biosphere (life bearing layer). Because the biosphere is the life supporting layer of the atmosphere, hydrosphere and the lithosphere, it can simply be inferred that the air, land and water are the principal components or elements of the environment. It should be noted that the four major components of the environment do not exist in isolation. There is however, a continuous exchange of energy and matter amongst them. The discussions in this unit shall focus on the major components of the environment

2.0 Objective

The learning objectives are as follows:

(1) To define environment

(2) To list and discuss the major components of the environment.

2.0 Main Content

3.1 The Lithosphere (Land)

The lithosphere is the outer layer of planet Earth, with an approximate thickness of about 100 km; of which the plates that contain the ocean basins and the continents are composed. The term lithosphere has often been applied to the entire layer of the earth,

from the earth crust to the innermost crust. In recent times, the use of the term lithosphere has been largely restricted to the outermost layer of the earth consisting of the hard brittle rocks (Olomo, 1999). The lithosphere is not composed of uniform thickness. It is thicker in the core of the continents where it ranges between 80–100 km, and thinner beneath the ocean, where it lies approximately 40 km.

The nature of the lithosphere gives a false impression that it forms a continuous layer, which completely surrounds the earth; instead it occurs in several blocks, called lithosphere plates, which rests upon the atmosphere. The outmost layer of the lithosphere is called the earth's crust, which has direct contact with the atmosphere, biosphere and hydrosphere.

The lithosphere is the home of man and thousand of other living species (both plants and animals). The lithosphere houses several kinds of minerals and rock types. It is also a supporting pillar for agricultural practices which helps to sustain life. Most of the mineral resources required by man in his quest for industrial development are obtained from the lithosphere.

There are three major types of rocks in the lithosphere. They are igneous rock, sedimentary rock and metamorphic rock. Most of the sedimentary and metamorphic rocks are formed from an original igneous rock. Volcanic eruptions are usually the main sources of the formation of igneous rocks. When a molten magma from a volcanic eruption comes in contact with the atmosphere, or within the lithosphere, it cools and solidifies to form different types of igneous rocks, which are subsequently weathered on the earth surface and later deposited elsewhere to form sedimentary rocks. In situations where the chemical

or physical compositions of the rocks are altered through the application of heat and pressure, it forms metamorphic rocks.

The major processes in the lithosphere are weathering and continental drift. These processes take place at a slow pace. Their impacts are usually not easily noticeable, especially in the short term. Weathering which is the physical, chemical, and biological breakdown of rocks and minerals helps in the process of soil formation.

3.2 The Hydrosphere (Water)

The total free water of the earth in its three states – liquid, solid and gas is generally referred to as hydrosphere. About 97% of Earth's water is in the salty oceans, while another 2% is found in ice caps and glaciers. Together, the oceans and ice tie up more than 99% of the total water; unfortunately, both sources are generally unsuitable for human use because of salinity and location. Thus, the amount of water which all the people, plants, and animals on earth compete is much less than one percent of the total (Botkin and Keller, 1998).

Fresh water in the liquid state is found on and beneath the earth surface. Water occupying openings in soil and rock is called subsurface water; most of which is held in deep storage, while water held in the soil within the reach of plant roots is just about 0.011% of the hydrosphere. Water held in streams, lakes, marshes and swamps is called surface water. Figure 1.0 shows the various sources of water in the hydrosphere.

The oceans are the ultimate receptacle for terrestrial water flowing from rivers. Because of their size and mixing, the oceans dilute many human produced, wastes to less harmful or harmless levels. They play a major role in regulating the climate of the earth by helping

distribute solar heat through ocean currents and evaporation as part of the hydrologic cycle. They also participate in other major bio-geochemical cycles.

In addition, the oceans serve as gigantic reservoir of carbon dioxide, which helps regulate the temperature of the atmosphere. Oceans provide habitats for about 250,000 species of marine plants and animals, which are food for many organisms, including human beings. They also serve as a source of iron, sand, gravel, phosphates, line, magnesium, oil, natural gas, and many other valuable resources (Miller, 1996).

The total average annual water yield (runoff) from earth's rivers is approximately 47,000 km^3, but its distribution is far from uniform. Compare with other resources, water is used in tremendous quantities. In recent years, estimates of the total mass (or weight) of water used on earth per year has been approximately 100 times the world's total production of minerals, including petroleum, coal, metal ores, and non metals (Botkin and Keller, 1998).

The various location of water available in and on the earth surface are linked together by the hydrologic cycle-the movement and endless recycling of water between the atmosphere, the land surface, and underground.

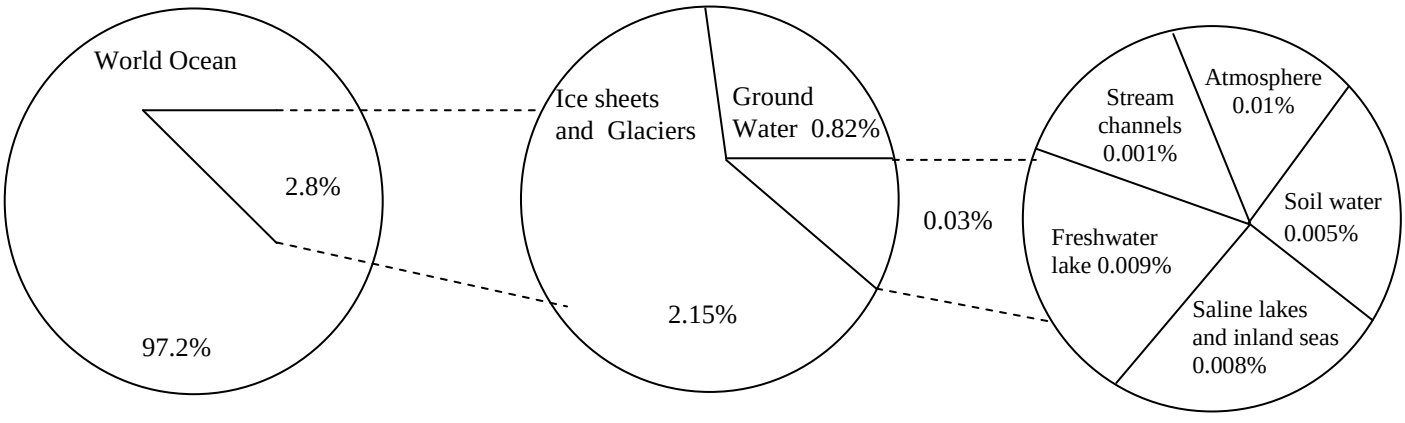

Figure 1.0: Various Sources of Water in the Hydrosphere

Source: Olomo, R.O. 1999 Elements of Environmental Studies.

3.3 The Atmosphere (Air)

The atmosphere is the gas or vapour envelope which surrounds a heavenly body. The atmosphere provides life's most fundamental needs for survival-oxygen, pressure and proper temperature. Without the atmosphere, one side of our planet would be frozen, while the other part would be over heated by solar radiation. Fortunately, the atmosphere transmits just the right amount of sunlight and contains just the right mixture of oxygen, nitrogen and carbon dioxide to sustain life (Olomo, 1999).

The atmosphere is divided into several spherical layers-much like the successive layers of skin on an onion. About 95% of the air is found in the innermost layer known as the *troposphere,* extending only about 17 kilometers above the earth's surface. About 99% of the volume of clean, dry air in the troposphere consists of two gases: nitrogen (78%) and oxygen (21%). The nitrogen gas is a key chemical in the nitrogen cycle and the oxygen is necessary for cellular respiration in plant and animals as part of the carbon cycle. The remaining volume of air in the troposphere has slightly less than 1% argon and about 0.035% carbon dioxide. Air in the troposphere also holds water vapour in amounts varying from 0.01% by volume at the frigid poles to 5% in the humid tropics.

Large masses of air in the troposphere are constantly churning and swirling as air heated by the sun rises and is replaced by cooler air. The physical processes causing these movements throughout the troposphere are a key factor determining the earth's climate and weather (Miller, 1996).

The *stratosphere* is the second layer of the atmosphere, extending from 17 to 48 kilometers above the earth's surface. It contains small amounts of gaseous ozone (O_3) that filters out about 99% of the incoming harmful ultraviolent (UV) radiation. By preventing large amounts of UV radiation from reaching the earth's surface, the thin gauze of ozone in the stratosphere protects people from increased sunburn, skin cancer, eye cancer, and cataracts. This global sunscreen also prevents damage to some plants and aquatic organisms.

By filtering out high-energy UV radiation, *stratospheric* ozone also keeps much of the oxygen in the *troposphere* from being converted to ozone. The trace amounts of ozone that do form in the *troposphere* as a component of urban smog damage plants, the respiratory systems of people and other animals, and materials such as rubber. Thus, our good health depends on having enough "good" ozone in the *troposphere*. Unfortunately, our activities are decreasing ozone in the stratosphere and increasing it in the *troposphere*.

The *mesosphere* is the next layer to the *stratosphere*. It extends from 50 to 80 km. The *mesosphere* is credited to be the coldest part of the atmosphere because of its steady declining temperature. In spite of its height the composition of the air at this point is similar to what obtains at sea level.

The next layer to the *mesosphere* is the *thermosphere,* which extends from 80 to 300 kilometers, characterized by high temperature. The temperature ranges from 500^0C to 2000^0C depending on the level of activity on the sun's surface. The composition of the atmosphere at this layer is quite different from other layers. Even within the thermosphere, the composition is not uniform; hence, the distance between 100 and 300 kilometers is called the *heterosphere*, and the atmosphere below is called the *homosphere*.

3.4 The Biosphere (Life bearing layer)

The biosphere can simply be defined as the life supporting or bearing layer of a planet. On planet Earth, the biosphere is the life supporting layer of the atmosphere, *hydrosphere* and *lithosphere*. This layer extends from the depths of the oceans to the summit of mountains. However, most life exists within a few meters of the surface. The biosphere can therefore be said to comprise of all the living organisms on earth and their interacting environment.

In the biosphere, there is a complex system of interactions between and among different species that make up the biosphere. The interactions involve exchange of energy and matter. The plants in the biosphere are the primary producers of food with the help of the sun's energy in the process of photosynthesis. The plants in the biosphere are generally referred to as *autotroph*. The herbivores-plant eating organisms; the carnivores-flesh eating animals; and *omnivores* – eater of both plants and flesh, e.g. man, all depend on one another in a complex food relationship called the food web. The exchange of elements between organisms and their physical environments is called biogeochemical cycle or nutrient cycle. Figure 1.1 shows a diagrammatic representation of the inter-relationship among the four components of the environment.

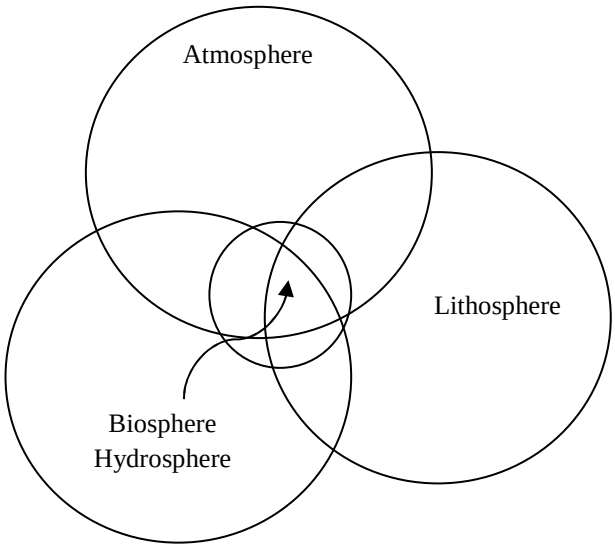

Figure 1.1: Diagrammatic Representation of the Inter-relationship among the Components of the Environment

Source: Olomo, R.O. 1999 Elements of Environmental Studies.

Self Assessment Exercise

Do you agree that there exist an inter-relationship among the four major components of the environment? Give reasons for your answer.

4.0 Conclusion

Having gone through this unit, you should by now be familiar with the definition of the environment and its major components. The processes in the four components of the environment interact and influence one another. The processes of interaction help to sustain planet earth as a habitable planet. It also throws up most of the environmental challenges confronting man in the biosphere.

5.0 Summary

- Environment can be defined as all factors (living and non living) that actually affect an individual organism or population at any point in the life cycle.
- There are four major components of the environment-hydrosphere (water), lithosphere (land), atmosphere (air) and biosphere (life bearing layer).
- Several dynamic processes take place in the four components of the environment, influencing one another. Also, there exist a complex inter-relationship among the living and non living components of the biosphere in the form of exchange of matter and energy.

6.0 Tutor Marked Assignment

(1) The four major components of the environment are _____, _____, _____ and _____

(2) The life bearing layer of the environment is also known as _____

(3) The three major types of rocks are _____, _____ and _____

(4) The layer of the atmosphere that does not extend beyond 17 km is called

(a) stratosphere (b) mesosphere (c) troposphere (d) thermosphere

(5) Which of the following is also referred to as the coldest part of the atmosphere?

(a) mesosphere (b) troposphere (c) stratosphere (d) thermosphere

(6) The primary producers of the biosphere are collectively referred to as

(a) herbivores (b) omnivores (c) carnivores (d) autotroph

7.0 References / Further Reading

Ayoade, J.O. (1983). *Introduction to Climatology for the Tropics.* Spectrum Books Ltd Ibadan.

Botkin, D.B. and Keller, E.A. (1998). *Environmental Science. Earth as a Living Planet Second Edition*, John Wiley and Sons Inc. New York

Miller, G.T. (1996). *Living in the Environment: Principles, Connections and Solutions, Nineth Edition*, Wadsworth Publishing Company, Belmont, California.

Olomo, R.O. (1999) "Elements of Environmental Studies" in *History ad Philosophy of Science* by Elakhame L.A; Azi S.O; Olomo R.O; and Ighodaho O.A. Edo State University Publishing House, Ekpoma.

UNIT 2: MAN-ENVIRONMENT RELATIONSHIP

Contents

1.0 Introduction

The relationship between man and his environment did engage the attention of early philosophers and scholars, and it became an important aspect of their studies. Because of the patterns of human settlements (a long river, such as the Nile) and other activities during the early civilization, researchers became pre-occupied with describing and explaining human behavior in terms of the physical environments which gave rise to the concept of environmental determinism. However, it was later recognized that man has the capacity to modify the environment to suite his needs, which led to the concept of environmental possibilism. These two concepts that offer explanations or man-environment relationship shall be the focus of this unit.

2.0 Objectives

The learning objectives are as follows:

(1) To discuss the concept of environmental determinism.

(2) To discuss the concept of environmental possibilism.

3.0 Main Concept

3.1 Environment Determinism

The concept of environmental determinism is based on the view that the human attributes of a place are largely determined by the physical attributes such as topography, soil and climate. Reasons for human behavior were seen as a result of only physical factors, with other possible explanatory variables being overlooked or ignored. The doctrine of environmental determinism was devised in an attempt to explain the relationship between man and the environment, resulting in distinct regional landscape.

According to Johnston (1979), environmental determinism is a theoretical belief that the nature of human activities was controlled by parameters of physical world within which it was set. The environment especially climate was regarded as the major factor underlying areal differentiation of geographic phenomena. The major theme of environmentalism is based on the foundation that nature determines what man can do.

During the nineteenth and early twentieth centuries, there were serious supporting views of environmental determinism. One of the major proponents Ellen Semple, in her study titled, “Influence of Geographic Environment”, published in 1911, was concerned with an examination of the influence of the physical environment on man. She declared on the first page of the book as follows: “Man is a product of the earth’s surface. This means not merely that he is a child of the earth, dust of her dust; but that the earth has mothered him,

fed him, set him tasks, directed his thoughts, confronted him with difficulties that have strengthened his body and sharpened his wits, given him his problems of navigation or irrigation and at the same time whispered hints for their solution".

She empirically observed various effects of changing environment on human activities and behavior. She asserted, "The mountain dweller is essentially conservative. There is little in his environment to stimulate him to change and little reached him from the outside world. Hence, innovation is repugnant to him, and that a mountain environment often occasions a forced development in the form of agriculture among peoples who still linger in a low stage of subsistence".

Another major proponent of environmental determinism is Demolins. His work in two volumes was concentrated on the influence of the environment on man. He claimed that environment conditions the types of work, and in part the social organization of man; and that the route, defined by him as including not just the regions passed by migrating folks but also the place where they eventually settled, moulds the character and social institutions of the people. Demolins thus liked climate to vegetation, type of food, occupation and kind of social and political organization of any society, for instance, he observed that hand crafts dominate in pastoral societies resulting in a sort of family workshop, communal work, which is neither intensive nor progressive. This means no division of labour, no problem of wages rate, no unemployment. Other prominent proponents of environmentalism include Ratzel Friedrick, Hacket, Buckle, and Ellsworth Huntington amongst others.

3.2 Environmental Possibilism

The concept of environmental determinism faced much opposition particularly if viewed along the argument that many works of man on the globe reveal many facts for which environmental forces alone can give no satisfactory explanation. This failure led to the advent of possibilism. The possibilists believed that environmental factors are only permissive, not deterministic. Thus, environmental factors like climate can only influence to a limited extent the location, growth and distribution of certain geographic phenomena.

Possibilism regarded man as an active rather than a passive agent and uphold the view that man has the capabilities to change his environment to suit him. For instance, man has tired to change the environment as his preferences changed, and this is exemplified in new landscapes, irrigated fields, discovery of drought resistant hybrids, industrial location and population distribution decisions etc.

The greatest advocates of possibilism came from France and Germany. They asserted that man himself was the controlling agent and that he determined the landscape, creating something very different from that which nature had originally provided.

In France, Vidal de la Blache was one of the major advocates of environmental possibilism. He pointed out the weakness of deterministic arguments, the futility of setting humanity's natural surroundings in opposition to his social milieu and of regarding one as dominating the other. He considered it even less useful to tackle these relationships along systematic lines in the hope of discovering general laws that might govern the relationship between human beings and nature. He further stated that it is unreasonable to draw boundaries between natural and cultural phenomena; instead, they should be regarded as united and inseparable. In an area of human settlement, nature changes significantly

because of the presence of human beings and these changes are greatest where the community's level of material culture is the highest.

Alfred Hettner was one of the most significant contributors to environmental possibilism in Germany. Initially, he was intrigued by the idea of humanity's dependence upon nature. Gradually however, he modified his environmentalism and in 1907, declared that "as far as we restrict discussion to the influence of nature upon human beings, we are only dealing with possibilities not certainties". In his monumental presentation of the history, content and methodology of geography, Hettner asserted that geographical synthesis is distorted when nature is regarded as dominant and humanity as subsidiary. Other major scholars whose works and writings are closely linked with environmental possibilism are Febvre and Brunches in France, and Isaiah Bowman and Carl Sauer in the United States of America.

Self Assessment Exercise

What reasons do you have to oppose environmental determinism?

4.0 Conclusion

The concept of environmental determinism is based on the foundation that man is subject to environmental dictates, that is, his activities are guided to the extent that the environment provides or offers. However, due to technological development, man has been able to modify his environment. The ability of man to influence his environment as an active rather than a passive agent, led to the concept of possibilism.

The man-environment relationship has impacted both negatively and positively on the four components of the environment, as would be revealed in the subsequent units of this module.

5.0 Summary

- The concept of environmental determinism is based on the view that the human attributes of a place are largely determined by the physical attributes such as topography, soil and climate. Reasons for human behavior were seen as a result of only physical factors, with other possible explanatory variables being over looked or ignored.
- Environmental possibilism regarded man as an active rather than a passive agent, and uphold the view that man has the capabilities to change his environment to suit him as his preferences changes.

6.0 Tutor-Marked Assignment

(1) The first attempt to explain man-environment relationship led to the concept of _____

(2) _____ regarded man as an active rather than a passive agent with capabilities to modify his environment to suit him.

(3) _____ was regarded as the major environmental factor underlying areal differentiation of geographic phenomena.

(4) The greatest advocates of environmental possibilism came from which of the following groups of countries

(a) France and USA (b) Germany and France (c) Germany and USA (d) None of the above

(5) Which of the following is a proponent of environmental determinism?

(a) Ellen Semple (b) Vidal de la Blache (c) Alfred Hettner (d) Carl Sauer

(6) Which of the following is a proponent of environmental possibilism?

(a) Ellen Semple (b) Ellsworth Huntington (c) Ratzel Friedrick (d) none of the above

7.0 References / Further Reading

Holt-Jenson, A. (1999). *Geography. History and Concepts. A Student's Guide, Third Edition,* Sage Publications Ltd. London.

Olomo, R.O. (1999) "Elements of Environmental Studies" in *History ad Philosophy of Science* by Elakhame L.A; Azi S.O; Olomo, R.O; and Ighodalo O.A. Edo State University Publishing House Ekpoma.

Onokerhoraye, A.G. (1994). *Geographic Thought: Philosophy and Methodology*. The Benin Social Science Series for Africa, University of Benin.

UNIT 3: MAN AND THE LITHOSPHERE

Contents

1.0 Introduction

Man's quest for food and technological development has impacted negatively and positively on the lithosphere (land), one of the major components of the environment. Some of the activities of man that have had profound impact on the lithosphere are agriculture, mineral exploration and exploitation and urbanization process. Thus, discussions in this unit shall be limited to these activities of man on the lithosphere.

2.0 Objective

The learning objectives are as follows:

(1) To identify the impact of agriculture on the lithosphere.

(2) To discuss how urbanization process affects the lithosphere.

(3) To assess the impact of mineral exploration and exploitation on the lithosphere.

3.0 Main Content

3.1 Effects of Agriculture on the Lithosphere

Agriculture is reputed to be the oldest and largest industry in the world. In fact, more than 50 percent of the world's working population is still engaged in agriculture. The various types of agricultural practices have serious implications on the lithosphere. These implications can be both positive and negative. For instance, the introduction of irrigation process has proved to be beneficial in increasing agricultural productivity in the semi-arid and arid regions of the world. Also, the use of pesticides have created a revolution in agriculture in the short time, but the long term effects of some of these chemicals have proved extremely undesirable, especially if not well applied.

Agriculture has both primary and secondary effects on the lithosphere. A primary effect, also called an on-site effect, is an effect on the area where the agriculture takes place. A secondary effect, or off-site effect, is an effect on an environment away from the agricultural site, typically downstream and downwind.

The major agricultural effects on the lithosphere include deforestation, soil erosion, overgrazing, accumulation of toxic metals and toxic organic compounds. For instance, Botkin and Keller (1998) stated that "since the end of World War II, human food production activities have seriously damaged more than 1 billion ha (2.47 billion acres) of land (about 10.5% of the world's best soil). Overgrazing, deforestation, and destructive crop practices have damaged approximately 9 million ha (22 million acres) to the point that recovery will be difficult, restoration of the rest will require serious actions".

When land is cleared of its natural vegetation, such as forest or grassland, the soil begins to lose its fertility. Some of this occurs by physical erosion. Once the protection of the

vegetative cover is lost, the soil is exposed directly to water and wind, which removed the loosed soil. In addition, the introduction of heavy, earth-moving machinery after World War II has led to a considerable increase in the compaction of soil and the loss of the proper soil structure for crop production. Farmed soil also loses fertility when chemical elements are dissolved in water and transported away in streams and sub-surface runoff.

The plowing of grasslands and cutting down of massive forest areas destroy and degrade the habitats of many forms of plant and animal wildlife, causing or hastening extinction. Poor management of many of the cleared areas can lead to greatly increased deforestation and soil erosion. Overgrazing of grasslands by huge herds of sheep, goats and cattle help convert once fertile land to desert (Miller, 1996). In addition, Botkin and Keller (1998) noted that feed lots have become widely known in recent years as sources of local pollution. The cattle are often kept at extremely high densities and fed with a grain or forage that is transported to the feedlot. Manure builds up in large mounds. When it rains, the manure pollutes local streams. Feedlots are popular with meat producers because they are economical for the rapid production of good-quality meat. However, large feedlots require intense use of energy and other resources and have negative environmental effects.

3.2 Impacts of Mineral Exploration and Exploitation on the Lithosphere

The technological development of man is heavily supported by the availability of mineral resources in the lithosphere. Without these mineral resources, the level of man's technological development today would have been different. Minerals are so important to people that the standard of living increases with availability, proper exploitation and management. Just image how transportation would have been today in the absence of petroleum resources.

In spite, of the associated importance of mineral resources to man, its exploitation have serious consequences on the environment. However, the impact depends on such factors as the quality of the mineral itself, mining procedures, local hydrologic conditions, climate, rock types, size of operation, topography, and many more interrelated factors. Botkin and Keller (1998) noted that the impact varies with the stage of development of the resource. For example, the exploitation and testing stages involve considerably less impact than do the mining and processing stages.

Exploration activities for mineral deposit may include recognizance survey, collection and analysis of remotely sensed data, drilling and host of other activities. As earlier noted, these activities have minimal impact on the lithosphere when compared to exploitation activities. However, care has to be taken in sensitive areas such as arid lands, marches, and areas underlain by permafrost. For example, some arid lands are covered by a thin layer of pebbles over fine silt several centimeters thick. The layer of pebbles, called desert pavement, protects the finer material from wind erosion. When the desert pavement is disturbed by road construction or other activities, the fine silts may be eroded, impairing physical, chemical and biological properties of the soil and possibly scarring the land for many years. Marches and other wetlands, such as the northern tundra, are very sensitive to even seemingly small disturbances such as vehicular traffic (Botkin and Keller, 1998).

A potential problem associated with mineral resource development is the possible release of harmful trace elements to the environment. At mine sites, surface drainage is often altered and runoff from precipitation may infiltrate waste material, leaching out trace elements and minerals. Trace elements such as copper, cadmium, cobalt, lead amongst others, when leached from mining wastes and concentrated in soil, plants or water may be

toxic or may cause diseases in people and other animals that drink the water, eat the plants, or use the soil.

Environmental degradation tends to extend beyond the excavation and surface plant areas of both surface and subsurface mines. Large mining operations disturb the land by directly removing materials in some areas and dumping waste in others, thus changing topography. At the very least, these actions produce severe aesthetic degradation.

3.3 Impacts of Urbanization on the Lithosphere

The rapid growth in world population has increased the rate of urbanization all over the world. The resultant urban centres impact significantly on the lithosphere. For instance, there are several studies which illustrate clearly that urbanization can create significant changes in erosion rates. The highest rates of erosion are produced in the construction phase, when there is a large amount of exposed ground and much disturbance produced by vehicular movements and excavation (Goudie, 1990). Studies by Wolman and Shick (1967) and Wolman (1967) have shown that the equivalent of many decades of natural or even agricultural erosion may take place during a single year in areas cleared for construction. In Maryland, U.S.A. they found that sediment yields during construction reached 53,000t km^{-2} y^{-1}, while in the same area; rates under forest were around 400t km-2 y^{-n}. New road cutting in Georgia were found to have sediment yields up to 20,000 – 50,000t km^{-2} y^{-1}.

Botkin and Keller (1998) observed that the nature of urban centre has a great impact on soils. They noted that most soil in the urban centres is covered by cement, asphalt, or stone; the soil no longer has its natural cover of vegetation and the natural exchange of gases between the soil and air is greatly reduced. Such soil loses organic matters, because

they are no longer replenished by vegetation growth. Soil organisms die from lack of food and oxygen. The process of construction and the weight of the buildings compact the soil, which restricts water flow. City soils are more likely to be compacted, water logged, imperious to water flow, and lacking in organic matter.

Another major impact of urbanization on the lithosphere is indiscriminate waste disposal. Most of our urban centres in Nigeria lack an efficient waste disposal system. It is a common practice to see people dispose of their waste in drainage systems, on the road or any available space. This practice has led to the pollution of the soil, encouraged flooding and reduced the quality and aesthetic value of the environment; with its attended consequences on human, animal, plant and other micro organisms that live on the lithosphere.

Self Assessment Exercise

Can you identify and discuss the various ways in which man impact on the lithosphere

4.0 Conclusion

Man's various activities have significantly impacted on the lithosphere as revealed from the above discussions. If these impacts, which are in most cases negative, are not well managed, the dream of achieving sustainable environment will not be attained.

5.0 Summary

- The major agricultural effects on the lithosphere include deforestation, soil erosion, overgrazing, accumulation of toxic metals and toxic organic compounds.

- The impact of mineral exploitation on the lithosphere depends on such factors as the quality of the mineral itself, mining procedures, local hydrologic conditions, climate, rock types, and many more interrelated factors.
- A potential problem associated with mineral resource development is the possible release of harmful trace elements to the environment.
- The potential impacts of urbanization on the lithosphere include increase in the rate of erosion, flooding, pollution, and the reduction of the quality and aesthetic value of the environment.

6.0 Tutor Marked Assignment

(1) Agriculture has both primary and secondary effects on the lithosphere. A primary effect is also known as _____

(2) Studies have revealed that the highest rates of erosion are produced during the _____ phase of work on the lithosphere.

(3) Which of the following is not an associated impact of agricultural practices on the lithosphere?

(a) erosion (b) deforestation (c) pollution (d) none of the above

(4) The impact of mineral exploitation on the environmental depends on all the following factors except

(a) The quality of mineral itself

(b) Mining procedures

(c) Exploitation rights

(d) Size of operation.

(5) Which of the following is not an impact of urbanization on the lithosphere?

(a) Increase in the rate of erosion

(b) Increase in flooding

(c) Reduce the aesthetic quality of the lithosphere

(d) Increase the rate of afforestation

(6) Which of the following statements is correct?

(a) Agricultural practices impact only on the lithosphere

(b) Forest helps to protect the soil from erosion

(c) Control grazing of grassland causes soil erosion

(d) None of the above

1.0 References / Further Reading

Botkin, D.B. and Keller E.A. (1998). *Environmental Science. Earth as a Living Planet; Second Edition,* John Wiley and Sons Inc.

Goudie, A. (1990). *The Human Impact on the Natural Environment, Third Edition,* Basil Blackwell Ltd. UK.

McDomell, M.J. and Pickett, S.T.A. (1993). *Humans as Components of Ecosystems. The Ecology of Subtle Human Effects and Populated Areas.* Springer-Verlag, New York Inc.

Miller, G.T. (1996). *Living in the Environment Principles, Connections and Solutions, Nineth Edition,* Wadswroth Publishing Company, Belomot, California.

Olomo, R.O. (1999). "Elements of Environmental Studies", in *History and Philosophy of Science* by Elakhame L.A; Azi, S.O; Olomo, R.O; and Ighodalo, O.A. Edo State University Publishing House, Ekpoma.

Osuntokun, A. (1997). *Dimensions of Environmental Problems in Nigeria.* Davidson Press, University of Ibadan, Ibadan.

UNIT 4: MAN AND THE HYDROSPHERE

Contents

1.0 Introduction

The impacts of man's activities in the hydrosphere are mainly felt in the areas of water pollution and depletion of freshwater resources. These impacts affect both surface and groundwater resources. Therefore, this unit will focus on how man's activities pollute and deplete freshwater resources in the biosphere.

2.0 Objectives

The learning objectives are as follows:

(1) To identify the various activities of man that pollute the hydrosphere

(2) To discuss the factors that lead to the depletion of freshwater resources.

3.0 Main Content

3.1 Water Pollution

Water pollution is the introduction into fresh or ocean water of chemical, physical, or biological material that degrades the quality of the water and affects the organisms living

in it. Water pollution has two underlying causes: industrialization and the human population explosion, both of which produce wastes products that we cannot dispose of cannot dispose of as fast as we produce them (Arms, 1994).

Pollutants, substances that cause pollution, get into the water supply at thousands of different points, which can be classified as point and nonpoint sources. Point sources are distinct and confined, such as pipes from industrial or municipal sites that empty into streams or rivers. Pollution from point sources is relatively easy to control because the source can be identified and regulated. Non point sources, such as runoff are diffused and intermittent and are influenced by factors such as land use, climate, hydrology, topography, vegetation, and geology. Common non-point sources include runoff from streets, or fields, agricultural farms, mining sites and forestry. Non point sources are difficult to monitor and control. Only efforts by every individual can control pollution from such widespread sources.

When surface water is polluted, groundwater also becomes contaminated because it is recharged from surface water supplies. Groundwater migrates slowly compared to surface water, hence, once contaminated, becomes difficult to clean up. However, surface water flows rapidly and flushes pollution downstream.

One method of solid-wastes disposal that has affected groundwater resources is the sanitary landfill method in which waste is not allowed to burn. Instead, layers of waste are continually buried, usually by sand or clay available on the landfill site. The waste is thus situated in the unsaturated zone. Here it can react with rainwater that infiltrates the ground surface. This water picks up a wide variety of chemical compounds from the waste body and carries them down to the water table, thereby polluting the groundwater supply and making it unsuitable for human consumption.

Another source of contamination in coastal wells is saltwater intrusion. Since fresh water is less dense than saltwater, a coastal aquifer can be underlain by a layer of saltwater from the ocean. When the aquifer is depleted due to over withdrawal, the level of saltwater rises and eventually reaches the well from below, rendering the well unsuitable for human use.

Studies in Nigeria have confirmed that man's activities impact significantly on the hydrosphere. For instance, Obasi and Balogun (2001) noted that as an environment gets urbanized, there is usually the influx/increase in population, with increase industrial development, which in turn increases waste generation, when discharged into watercourses affects the quality of water supply. In a similar vein, Kehinde (1998) revealed that groundwater in the entire Lagos metropolitan area is coming under increasing pressure from the consequences of uncontrolled exploitation and indiscriminate discharge of all types of wastes into domestic and industrial septic systems, and at illegal dump sites spread throughout the city, all of which are causing widespread subsurface contamination. Added to this problem is the fact that a considerable proportion of the urban population still depend on shallow domestic well and uses septic tanks or pit latrines. As a result both surface and groundwater, which are intricately linked in the hydrological cycle, are put at great risk of pollution and over exploitation by an undiscerning populace (Kehinde, 1998).

3.2 Depletion of Freshwater Resources

Over the years, groundwater has been extensively used in different parts of the world as a major source of fresh water supplies. For instance, in the United States about half of the drinking water (96% in rural areas and 20% in urban areas) 40% of the irrigation water, and 23% of all fresh water used is withdrawn from underground aquifers (Miller, 1996).

Overuse of groundwater however, can cause or intensify several problems: aquifer depletion (when groundwater is withdrawn faster than it is recharged by precipitation), subsidence (sinking of land when groundwater is withdrawn), intrusion of salt water into aquifers, and groundwater contamination, as revealed by several studies. For example, a study by Onwuka and Adekile (1988) on water supply in Ikeja area of Lagos revealed that static water levels in the area have been declining at an annual rate of about 2.0m as a result of over abstraction. According to them the total annual recharge to the aquifer system is not able to sustain the annual withdrawal rate from the system, thus leading to a situation of water mining, with all its negative consequences on water quality, the ecosystem and engineering structures.

Also commenting on the water supply situation in Ikeja, Kehinde (1998) noted that the inadequacy of public supply for both domestic and industrial uses led to the reliance on dug wells and boreholes for private supplies, which tap the uppermost aquifer system, putting the system under undue strain, with serious implications for the environment.

A by product of water table depletion is subsidence – a sinking of the land in response to the removal of water from underlying sediments. This problem according to Strahler and Strahler (2006) has plagued a number of major cities that rely heavily on groundwater wells for their water supply.

There are several cases of human interaction in the hydrosphere which has serious implications on the hydrologic cycle. Olomo (1999) identified three of such interactions, which include:

(i) Activity which affects precipitation input into the cycle. For example, cloud seeding with silver iodide, which alters the distribution of rainfall.

(ii) Creation of artificial lakes when building dams, thus increasing the rate of evaporation; and

(iii) Decrease of evaporation caused by draining of swamps, and other reclamation works, which reduces the amount of water available to the atmosphere.

Self Assessment Exercise

Can you account for how man's activity pollute and deplete the freshwater resources in the biosphere?

4.0 Conclusion

The various activities of man have several effects on the hydrosphere, which include but not limited to pollution and depletion of fresh water resources. These impacts are further re-enforced by rapid population growth rate, industrialization, agriculture and mining activities. The solution to these major problems require the concerted efforts of everyone, as all is involved in one way or the other in polluting or depleting our limited fresh water resources.

5.0 Summary

- The impacts of man's activities in the hydrosphere are mainly felt in the areas of water pollution and depletion of fresh water resources.
- Over use of groundwater can cause or intensify several problems; which include aquifer depletion, subsidence, intrusion of salt water into aquifers and groundwater contamination.

6.0 Tutor Marked Assignment

(1) The impact of man's activities in the hydrosphere are mainly felt in the depletion of freshwater resources and _____

(2) The various sources of pollution may be broadly classified into _____ and _____

(3) One method of solid-waste disposal that has affected groundwater resources is the _____

(4) Which of the following is not true/?

(a) Pollution of surface water may pollute groundwater

(b) Problems of groundwater pollution are difficult to remedy

(c) Ocean is the largest source of freshwater

(d) Non of the above

(5) Which of the following is not true of groundwater overuse?

(a) It can lead to subsidence

(b) It can lead to groundwater mining

(c) It can lead to salt water intrusion in coastal areas.

(d) It can lead to increase in evaporation.

(6) Which of the following is incorrect about pollution?

(a) It reduces the quality of water supply

(b) Its effect is limited to human health

(c) It can affect the value of the environment

(d) None of the above

7.0 References / Further Reading

Arms, K. (1994). *Environmental Science, Second Edition.* Sanders College Publishing U.S.A.

Christopherson, R.W. (2007). *Elemental Geosystems, Fifth Edition.* Pearson Prentice Hall Upper Saddle River, N.J. 07458.

Kehinde, M.O. (1998). "The Impact of Industrial Growth on Groundwater Quality and Availability; A Case Study of Ikeja Industrial Area', in Osuntokun, A (ed), *Current Issues in Nigerian Environment,* Davidson Press, Ibadan in Association with Friedrich Ebert Foundation, University of Lagos.

Miller, G.T. (1996). *Living in the Environment Principles, Connections and Solutions, Nineth Edition,* Wadsworth Publishing Company, Belomot, California.

Obasi, R.A. and Balogun, O. (2001). "Water Quality and Environmental Impact Assessment of Water Resources in Nigeria". *African Journal of Environmental Studies.*

Olomo, R.O. (1999). "Elements of Environmental Studies", in *History and Philosophy of Science* by Elakhame L.A; Azi, S.O; Olomo, R.O; and Ighodalo, O.A. Edo State University Publishing House, Ekpoma.

Onwuka, M. and Adekile D. (1998). "Demand Recharge Study of the Groundwater Resources of the Ikeja Area of Lagos State, Nigeria". In *Proceedings of the First Annual Symposium and Exhibition of Water and SanitationNigerian Water and Sanitation Association*.

Strahler A. and Strahler A. (2006). *Introducing Physical Geography, Fourth Edition.* John Wiley and Sons Inc.

UNIT 5: MAN AND THE ATMOSPHERE

Contents

1.0 Introduction

Man's technological prowess, increase in population, urbanization and agricultural activities have jointly impacted on the atmosphere. The impacts of man in the atmosphere are much more evident in the concept of global warming, ozone depletion and atmospheric pollution. These impacts are currently enjoying global debate and attention because of their potential implications for human, animal and plant lives. For this reason, man's impact in the atmosphere will be discussed along these three major divide, which are interrelated.

2.0 Objectives

The learning objectives are as follows:

(1) To account for the causes of ozone depletion

(2) To discuss the factors responsible for global warming

(3) To identify some activities of man that pollutes the atmosphere.

3.0 Main Content

3.1 Atmospheric Pollution

Several activities of man have contributed in polluting the troposphere – the lowest part of the atmosphere, which has direct contact with most living organisms. Activities such as bush burning, vehicular emission, industrial emission amongst others are responsible for polluting the atmosphere. It should be noted however, that many of the pollutants in the atmosphere have natural as well as human-related origin. Some examples of natural emissions of air pollutants include the release of gases, such as sulphur dioxide from volcanic eruptions; the geyser and hot spring activities and the emission of a variety of particles from wildfires and windstorms. Of importance to us in this discussion is the human-induced atmospheric pollution.

Beginning with the industrial revolution in the eighteenth century, air pollution became more noticeable. This is a clear indication that human-induced atmospheric pollution is very significant. The fact that the atmosphere is the fastest moving fluid medium in the environment has made it one of the most convenient places for the disposal of unwanted materials by man. The uncontrolled disposal of waste into the atmosphere, with the believe that it has an unlimited sink capacity for waste has increase atmospheric pollution.

As clean air moves across the earth's surface, it collects various chemicals produced by natural events and human activities. Once in the troposphere, these potential air pollutants mix vertically and horizontally and often react chemically with each other or with natural components of the atmosphere. There are hundreds of potential air pollutants in the

troposphere. However, Miller (1996) identified nine major classes of pollutants, which cause most outdoor air pollution:

(1) Carbon oxides: carbon monoxide (CO) and Carbon dioxide (CO_2).

(2) Sulfur oxides: sulfur dioxide (SO_2) and sulfur trioxide (SO_3)

(3) Nitrogen oxides: nitric oxide (NO), nitrogen dioxide (NO_2) and nitrous oxide (N_2O)

(4) Volatile organic compounds (VOCs): hundreds of compounds such as methane (CH4) benzene (C_6H_6), and chlorofluorocarbons (CFCs).

(5) Suspended particulate matter (SPM); thousands of different types of solid particles such as dust (soil), soot (carbon), asbestos, and lead, arsenic, cadmium, nitrate (NO_3) and sulfare ($SO4^{2-}$) salts and liquid droplets of chemicals such as sulfuric acid (H_2SO_4) oil, PCBs, dioxins, and DDT, malathion, and other pesticides.

(6) Photochemical oxidants: Ozone (O_3), PANs (petroxyaclyl nitrates), hydrogen peroxide (H_2O_2) hydroxyl radicals (OH), and aldehydes such as formaldehyde (CH_2O) formed in the atmosphere by the reaction of oxygen oxides, and volatile hydrocarbons under the influence of sunlight.

(7) Radioactive substances: radon-222, iodine-131, stontium-90, plutonium 239, and other radioisotopes that enter the atmosphere as gases or suspended particulate matter.

(8) Heat: produced when any kind of energy is transformed from one form to another – for example, when fossil fuels are burned in cars, factories, homes, and power plants.

(9) Noise: produced by motor vehicles, airplanes, trains, industrial machinery construction machinery, lawn mowers, vacuum cleaners, food blenders, sirens radio etc.

Each of these chemicals or forms of energy (heat and noise) can be classified as either a primary or secondary air pollutant. A primary air pollutant, such as sulfur dioxide, is one that directly enters the air as a result of natural events or human activities. A secondary air pollutant, such as sulfuric acid, is one that is formed in the air through a chemical reaction between two or more air components.

Most of the pollutants that causes atmospheric pollution are added to the troposphere as a result of human activities, mainly the burning of fossil fuels in power and industrial plants (stationary source) and in vehicles (mobile sources).

Air pollution has considerable effects on many aspects of our environment: visually aesthetic resources, vegetation, animals, soils, water quality, natural and artificial structures, and human health. Air pollutants can affect human health in several ways. The effects on an individual depend on the dose or concentration of exposure and other factors, including individual susceptibility. Some of the primary effects of air pollutants include toxic poisoning, causing cancer, birth defects, eye irritation, and irritation of the respiratory systems, an increased susceptibility to viral infections, causing pneumonia and bronchitis, an increased susceptibility to heart disease, and aggravation of chronic diseases such as asthma and emphysema (Botkin and Keller, 1998).

Botkin and Keller (1998) also noted that the effects of air pollution on vegetation include damage to leaf tissue, needles, or fruit; reduction in growth rates or suppression of growth;

increased susceptibility to a variety of diseases, pests, and adverse weather; and the disruption of reproductive processes. Air pollution can equally degrade soil and water resources when pollutants from the air are deposited.

3.2 Global Warming

This is the natural or human-induced increase in average global temperature of the atmosphere near the Earth's surface. The four major determinants of temperature at or near the earth surface are the amount of solar radiation reaching the earth; the amount of radiation reflected by the Earth; heat retention capacity by the atmosphere; and evaporation and condensation of water vapour.

The chemical content of the troposphere and stratosphere is one of the factors determining the earth's average temperatures. In the troposphere, carbon dioxide, water vapour, and trace amounts of ozone, methane, nitrous oxide, and chlorofluorocarbons play a key role in this temperature regulation processes. These gases, collectively known as greenhouse gases, act somewhat like a pane of glass in a greenhouse. They let in visible light from the sun but prevent some of the resulting infrared radiation, or heat from escaping back into space. They reradiate it back toward the earth's surface. The resulting heat building raises the temperature of the air in the troposphere, a warming action called the greenhouse effect (Miller, 1996).

The gases we are concerned with in this discussion are those that result in part from anthropogenic processes, that is, those that result from human activities. These gases include carbon dioxide, CFCs, methane, nitrous oxides and ozone, all of which have increased significantly in the atmosphere in recent years. The significant increase of these gases relates principally to two factors, which include the burning of fossil fuel, which

Botkin and Keller (1998) noted adds about 5.4 billion metric tons of carbon each year to the atmosphere, and deforestation, which adds another 1.6 billion metric tons per year, increasing the concentration of atmospheric carbon dioxide (CO_2); and other human activities that emit other greenhouse gases, such as CFCs, ozone, methane, and nitrous oxides.

Although the specific effects of global warming are still difficult to predict, however, two potential effects of global warming are climate change and sea level rise. Both effects if not checked have the potential to adversely affect plant, animal and human lives.

3.3 Ozone Depletion

Ozone (O_3) is a triatomic form of oxygen, in which three atoms of oxygen are bonded in an uneasy union. Ozone is a strong oxidant, which reacts with many different materials in the atmosphere. In the lower atmosphere, ozone is a pollutant produced by photochemical reactions involving sunlight, nitrogen oxides, hydrocarbons, and diatomic oxygen. In the stratosphere, however, ozone provides an essential shield against damaging ultraviolet radiation. About 90% of the ozone in the atmosphere are concentrated in the stratosphere, were the peak concentration is about 300ppb. The altitude of the peak concentration varies from about 25km near the equator to 15km in the Polar Regions. The ozone layer in the stratosphere is often called the ozone shield, because it absorbs most of the ultraviolet radiation that is potentially damaging to life on Earth.

The depletion of the ozone layer (life protector) is one of the major impacts of man's interaction with the atmosphere. The groups of gases called the chlorofluorocarbons (CFCs), which are responsible for the stratospheric ozone depletion, are human produced. They are used as working gas in refrigerators and air-conditioners, and as propellants in

aerosol spray cans. They are also used in cleaning electronic parts, hospital sterilants, and as blowing agents to puff liquid plastic into Styrofoam and other plastic foams used for insulation and packaging (Miller, 1996).

The hypothesis that ozone in the stratosphere is being depleted by the presence of chlorofluorocarbons (CFCs) was first suggested by two chemists, Mario Molina and Sherwood Rowland, in 1974. The major features of their hypothesis are presented by Botkin and Keller (1998), are as follows:

- The CFCs emitted in the lower atmosphere by human activity are extremely stable. They are unreactive in the lower atmosphere and therefore have a very long residence time (about 100 years).
- Because CFCs have a long residence in the lower atmosphere and because the lower atmosphere is very fluid with abundant mixing, the CFCs eventually (by the process of dispersion) wonder upward and enter the stratosphere. Once they have reached altitudes above most of the stratospheric ozone, they may be destroyed by the highly energetic solar ultraviolet radiation. This process releases chlorine, a highly reactive atom.
- The reactive chlorine released may then enter into reactions that deplete ozone in the stratosphere.
- The result of the depletion of ozone is an increase in the amount of ultraviolent B radiation that reaches the Earth's surface.

Ozone depletion has a number of serious potential environmental effects, including damage to Earth's food chains, both on land and in the oceans. The human health effects may include increases in all types of skin cancers and cataracts and suppression of immune systems.

An unfortunate aspect of ozone depletion is that if the emissions of all ozone depleting chemicals should stop today, the problem will still remain with us for about another 100 years, because of the high residence time of CFCs in the atmosphere.

This situation however, should not prevent us from taking actions against further emissions of CFCs into the atmosphere. If action is not taken now, the problem will be further aggravated.

Self Assessment Exercise

* Are you convinced of the concept of global warming? Explain

* Do you think the ozone layer is actually being depleted? Explain

4.0 Conclusion

Man's interactions with the atmosphere have created several problems, which include global warming, ozone depletion and atmospheric pollution. These problems as revealed in the discussions above have impacted negatively on the quality of the atmosphere, with dire consequences on human, animal and plant lives. Unfortunately, most of these problems are inadvertently caused as a result of man's quest for better living and comfort.

In spite of the huge problems, however, hope is not totally lost, as a collective positive action by everyone today, would go a long way in ameliorating the bad situation.

5.0 Summary

- Man's activities such as industrial emissions, vehicular emissions, bush burning, amongst others pollute the atmosphere.

- Some of the major air pollutants include carbon oxides, sulfur oxides, nitrogen oxides, volatile organic compounds, suspended particulate matter, photochemical oxidants, radioactive substances and heat.
- The greenhouse gases are responsible for global warming, because they let in visible light from the sun but prevent some of the resulting infrared radiation from escaping back into space.
- The ozone depleting substances, which are called chlorofluorocarbons (CFCs) are human produced and are used as working gas in refrigerators, air conditioners, and as propellants in aerosol spray cans.
- Atmospheric pollution, global warming and ozone depletion, have serious negative consequences on human, animal and plant lives.

6.0 Tutor Marked Assignment

(1) Man's impact in the atmosphere are much more evident in the concept of global warming, atmospheric pollution and _____

(2) Substances that pollute the atmosphere are collectively called _____

(3) The natural or human-induced increases in average global temperature of the atmosphere near the Earth's surface is called _____

(4) Which of the following is not a greenhouse gas?

(a) oxygen (b) carbon dioxide (c) water vapor (d) nitrous oxide

(5) Which of the following is a potential effect of ozone depletion?

(a) damage to food chain (b) skin cancer (c) cataracts (d) all of the above

(6) Ozone depleting substances are collectively called

(a) PCBs (b) SPMs (c) CFCs (d) UVB

7.0 References / Further Reading

Botkin, D.B. and Keller E.A. (1998). *Environmental Science. Earth as a Living Planet; Second Edition,* John Wiley and Sons Inc.

Miller, G.T. (1996). *Living in the Environment: Principles, Connections and Solutions, Nineth Edition,* Wadsworth Publishing Company, Belomot, California.

Osuntokun, A. (1997). *Dimensions of Environmental Problems in Nigeria.* Davidson Press, University of Ibadan, Ibadan.

MODULE 11

Unit 1: The Concept of Perception

Unit 2: Perceptual Process

Unit 3: Factors Affecting Perception

Unit 4: The Objective and Perceived Environment

Unit 5: Perception and Formation of Environmental Images

UNIT 1: THE CONCEPT OF PERCEPTION

Contents

1.0 Introduction

Our understanding and appreciation of the environment is influenced by our perception. What then is the nature of perception? What are the sensory systems of perception? Answers to these questions will be the focus of this unit.

2.0 Objectives

The learning objectives are as follows:

(1) To define perception

(2) To list and discuss the sensory systems of perception

3.0 Main Content

3.1 Nature of Perception

The word perception originates from the Latin word *percepio,* which means the process of attaining awareness or understanding of the environment by organizing and interpreting sensory information. Perception can simply be defined as the process by which an individual becomes aware of, and interprets information about the environment. All perception involves signals in the nervous system, which in turn result from physical stimulation of the sense organs. For example, vision involves light striking the retinas of the eyes, smell is mediated by odour molecules and hearing involves pressure waves. Perception is not the passive receipt of these signals, but an active process, which can be shaped by learning, memory and expectation (http://en.wikipedia. org/wiki/perception, 2011).

Our perception of the external world begins with the senses, which lead us to general empirical concepts representing the world around us, within a mental framework relating new concepts to preexisting ones. Perception takes place in the brain. Using sensory information as raw material, the brain creates perceptual experiences that go beyond what is sensed directly. Familiar objects tend to be seen as having a constant shape, even though the retinal images they cast change as they are viewed from different angles. This is because our perceptions have the quality of constancy, which refers to the tendency to

sense and perceive objects as relatively stable and unchanging despite changing sensory stimulation and information. Once we have formed a stable perception of an object, we can recognize it from almost any position, at almost any distance, and under almost any illumination. For example, a white house looks like a white house by day or by night and from any angle. The sensory information may change as illumination and perspective change, but the object is perceived as constant (Cherry, 2011).

There are different types of perceptual constancy, which include size, shape, colour and brightness constancies. The ability to perceive an object as the same regardless of its distance is known as size constancy; the sameness of an object irrespective of the angle it is viewed is called shape constancy. The ability to perceive familiar objects as retaining their colour in spite of changes in sensory information is called colour constancy. Brightness constancy is the ability to perceive an object to be the same, even when the amount of light reaching the retina changes. These constancies help us to relate and understand the environment, without which, the world would have been very confusing.

Perception can broadly be classified into internal and external. Internal perception, which is also known as *interoception* gives us internal messages in our bodies. Such messages may include hunger, thirst etc. On the other hand, external perception also known as *exteroception* or sensory perception, informs us of the world outside our bodies, with the help of our five sense organs-eye, tongue, skin, ear and nose.

3.2 Sensory Systems of Perception

A sensory system is a part of the nervous system responsible for processing sensory information. Our sensory systems comprise of the various components involved in vision, smell, touch, taste and hearing. A sensory system consists of sensory receptors, neural

pathways, and parts of the brain involved in sensory perception. Our senses are transducers (transform image formed at the retina into electrical signals) from the physical world to the realm of the mind. The receptive field is the specific part of the world to which a receptor organ (e.g. eye) and receptor cells respond. For instance, the part of the world an eye can see, is its receptive field (http://en.wikipedia. org/wiki/perception, 2011).

3.2.1 Vision (Eye)

Visual perception is the ability to interpret visible light information reaching the eyes, which is then made available for planning and action. The various components involved in vision are known as the visual system. The act of seeing starts when the lens of the eye focus an image of the outside world onto a light-sensitive membrane in the back of the eye, called the retina. The retina is actually part of the brain that is isolated to serve as a transducer for the conversion of patterns of light into neuronal signals. The lens of the eye focuses light on the photoreceptive cells of the retina, which detect the photons of light and respond by producing neural impulses. These signals are processed in a hierarchical fashion by different parts of the brain, from the retina to the lateral geniculate nucleus, to the primary and secondary visual cortex of the brain (Cherry, 2011). Ibn al-Haytham, who is credited as “father of optics”, pointed out that personal experience has an effect on what people see and how they see, and that vision and perception are subjective.

3.2.2 Hearing (Ear)

Hearing (or audition) is the ability to perceive sound by detecting vibrations. Frequencies capable of being heard by humans are called audio or sonic. The range is typically considered to be between $20H_z$ and $20{,}000H_z$. Frequencies higher than audio are referred to as ultrasonic, while frequencies below audio are referred to as infrasonic. The auditory system includes the ears and inner structures which produce neutral signals in response to

the sound. The primary auditory cortex, within the temporal lobe of the human brain, is where auditory information arrives in the cerebral cortex. Sound does not usually come from a single source in real life situation, sounds from multiple sources and directions are superimposed as they arrive at the ears. Hearing involves the computationally complex of sorting out the sources of interests, often estimating their distance and direction as well as identifying them.

3.2.3 Touch (Skin)

Haptic perception is the process of recognizing objects through touch. Gibson (1966) defined the haptic system as "the sensibility of the individual to the world adjacent to his body by use of his body". The process involves a combination of *somatosensory* perception of patterns on the skin surface (e.g. edges, curvature, and texture) and *proprioception* (movement) of hand position and conformation. People can rapidly and accurately identify three-dimensional objects by touch. The concept of haptic perception is related to the concept of extended physiological *proprioception*, which when using a tool such as a stick, perceptual experience is transparently transferred to the end of the tool.

3.2.4 Taste (Tongue)

Taste is the ability to perceive the flavor of substances including, but not limited to food. Humans receive tastes through sensory organs called taste bubs, or *gustatory calyculi*, which is concentrated on the upper surface of the tongue. The human tongue has 100 to 150 taste receptor cells on each of the roughly ten thousand taste buds. There are five primary tastes: sweetness, bitterness, sourness, saltiness, and umami. Other tastes can be mimicked by combining these basic tastes. All basic tastes are classified as either

appetitive or aversive, depending upon whether the things they sense are harmful or beneficial.

3.2.5 Smelling (Nose)

Smell is detected by the *olfactory epithelium* of the nose. The sense of Olfaction is complex. Odour perception is influenced by many factors unique to each individual as well as external environmental factor. The basis of odour perception is the contact between chemical molecules, mainly in the gaseous state, which can be detected by the *olfactory epithelium*. The odourous molecules come into contact with the *olfactory epithelium* at the top of the nasal cavity and stimulate multiple chemical receptors.

Self Assessment Exercise

How can you convinced someone that perception cannot take place without the sensory system

4.0 Conclusion

Having gone through this unit, you should by now know that all perception involves signals in the nervous system, which in turn result from physical stimulation of the sense organs. Perception being an active process is influenced by learning, memory, experience and expectation. This explains why two different persons would give different account of the same situation.

5.0 Summary

- Perception is the set of processes by which an individual becomes aware of, and interprets information about the environment.

- There are four major types of constancies – size, shape, colour and brightness. These constancies help us to relate and understand the environment, without which, the world would have been very confusing.
- Commonly recognized sensory systems are those for vision, hearing touch, taste and smell.

6.0: Tutor Marked Assignment

(1) The process by which an individual becomes aware of and interprets information about the environment is called _____

(2) The tendency to sense and perceive objects as relatively stable and unchanging despite changing sensory stimulation and information is called_____

(3) The five common sensory systems are _____, _____, _____ , _____and _____

(4) The various components involved in vision are known as the ____

(5) Haptic perception is the process of recognizing objects through

(a) smell (b) touch (c) vision (d) none of the above

(6) Humans receive tastes through sensory organs called

(a) taste cort (b) taste sic (c) gustatory calyculi (d) olfactory epithelium

7.0 References/Further Reading

Cherry, K. (2011). Perception and the Perceptual Process, About.com Guide 23/07/2011

http://en.wikipedia.org/wiki/perception, 10/07/2011.

http://blog.Octotech.com/bid/s6315/what-is-the process-of-olfaction-odor-perception, 23/07/2011.

http://managementconsultingcourse.com/lesson33 perception and person perception pdf.10/07/2011.

UNIT 2: PERCEPTUAL PROCESS

Contents

1.0 Introduction

Having been introduced to what perception is in the preceding unit, we shall now take a look at the perceptual process. This unit will therefore defined and analyze the steps involved in the perceptual process.

2.0 Objectives

The learning objectives are as follows:

(1) To define perceptual process

(2) To list and discuss the steps in the perceptual process.

3.0 Main Content

3.1 Perceptual Process Defined

Cherry (2011) defined perceptual process as a sequence of steps that begins with the environment and leads to our perception of a stimulus and an action in response to the stimulus. This process is continual, but we do not spend a great deal of time thinking about the actual process that occurs when we perceive the many stimuli that surround us at any given moment. As a matter of fact, the process of transforming the light that falls or our retina into an actual visual image happens unconsciously and automatically. The subtle changes in pressure against our skin that allow us to feel object, occur without a single thought.

The perceptual process begins with an object in the real word, termed the distal stimulus or distal object. By means of light, sound or other physical processes, the object stimulates the body's sensory organs. These sensory organs transform the input energy into neutral activity – a process called transduction. This raw pattern of neutral activity is called the proximal stimulus. These neutral signals are transmitted to the brain and processed. The resulting mental recreation of the distal stimulus is the percept (http://en.wikipedia.org/wiki/perception, 2011). For a better understanding, let us take an example of a person looking at a ball. The ball itself is the distal stimulus, the light that enters the person's eyes from the ball and stimulates the retina, that stimulation is the proximal stimulus, while the balls image reconstructed by the brain of the person is the percept. The different kinds of sensation such as warmth, sound, and taste are called sensory modalities.

Stimuli are not necessarily translated into a percept and rarely does a single stimulus translate into a percept. An ambiguous stimulus may be translated into multiple percepts, experienced randomly, one at a time, in what is called multistable perception. And the same stimuli, or absence of them, may result in different percepts depending on subject's culture and previous experiences. Ambiguous figures demonstrated that a single stimulus can result in more than one percept; for example, the Rubin vase which can be interpreted either as a vase or as two faces. The percept can bind sensations from multiple senses into a whole. For instance, the picture of talking person on a television screen is bound to the sound of speech from speakers to form a percept of a talking person (http://llen.wikipedia.org/wiki/perception, 2011).

3.2 Steps in the Perceptual Process

There are several steps involved in the perceptual process, which starts with an environmental stimulus and ends with an action. Cherry (2011) identified eight steps in the perceptual process. The steps include the following: the environmental stimulus, the attended stimulus, the image on the retina, transduction, neutral processing, perception, recognition, and action.

The Environmental Stimulus

As earlier noted, the environmental stimulus is the very first step in the perceptual process. It includes anything that has the potential to be perceived by or five senses (eye, nose, skin, tongue and ear). It might also involve the sense of proprioception, such as the movements of the arms and legs or the change in position of the body in relation to objects in the environment. Examples of environmental stimuli include buildings, cars, animals, rivers etc.

The Attended Stimulus

We have just learnt that environmental stimulus are numerous, however, the particular thing or object in the environment that captures, our attention is called the attended stimulus. Attended stimulus can be said to be discriminately, because it pays special attention to a particular stimulus of interest to the neglect of other stimuli in the same environment.

The Image on the Retina

Having selected our stimulus of interest (attended stimulus), it is then formed on the retina as an image. The first part of this process involves the light actually passing through the cornea and pupil and onto the lens of the eye. The cornea helps focus the light as it enters the eye, and the iris of the eye controls the size of the pupils in order to determine how much light to let in. The cornea and lens act together to project an inverted image on the retina.

Transduction

The process of transformation of the image formed at the retina into electrical signals is called transduction. This process allows the visual messages to be transmitted to the brain for interpretation. The retina contains many photoreceptor cells, which contain protein known as rods and cones. The rods and cones contain a molecule called retinal, which is responsible for transducing the light into visual signals that are then transmitted via nerve impulses. Rods are primarily for seeing things in low light, while cones are associated with detecting colour and shapes at normal light levels.

Neural Processing

The electrical signals transmitted during transduction, then undergone neural processing. The path followed by a particular signal depends on what type of signal it is (i.e. an auditory signal or a visual signal). Through the series of interconnected neurons located throughout the body, electrical signals are propagated from the receptors cells to the brain.

Perception

At this stage we actually perceive the stimulus object in the environment. It is at this stage we become consciously away of the stimulus object. It is one thing to be aware of stimuli in the environment, and quite another to actually become fully consciously aware of what we have perceived. In the next stage of the perceptual process, we will sort the perceived information into meaningful categories.

Recognition

The ability of an individual to interpret and make meaning of a perceived stimulus object is known as recognition. The brain does this by categorizing and interpreting what we are sensing. The recognition stage is an essential part of the perceptual process since it allows us to make meaning of the world around us.

Action

This is the final stage of the perceptual process, which involves responding to the stimulus object in the environment. The response may involve some type of motor action towards the perceived and recognized stimulus. Action could be of different forms depending on the nature of the environmental stimulus in question. For example, the action could be informed of tears, in recognition of someone in a fatal accident, or an explosive laughter to a funny comedian. Figure 2.0 shows a simplified diagrammatical representation of the perceptual process.

Figure 2.0: A Simplified Diagrammatic Representation of the Perceptual Process.

Source: http://managementconsultingcourse.com/lesson33 perceptionandpersonperception.pdf 10/7/11

Self Assessment Exercise

Cherry identified eight steps in the perceptual process; can you list and explain each of the steps?

4.0 Conclusion

The perceptual process involves a sequence of steps, which are interconnected beginning with environmental stimulus and ending with an action in response to the stimulus. Because the perceptual process could take place within some few seconds, makes us not to be consciously aware and appreciate the identified eight steps in the process.

The brain is the "engine box" of the perceptual process. It drives the process, without which, the process would be inconclusive.

5.0 Summary

- Perceptual process is a sequence of steps that begins with the environment and leads to our perception of a stimulus and an action to the stimulus.

- The perceptual process can be classified into eight interconnected steps, which include environmental stimulus, the attended stimulus, image on the retina, transduction, neutral processing, perception, recognition and action.

6.0: Tutor Marked Assignment

(1) The perceptual process begins with an object in the real word termed the _____ object.

(2) Anything that has the potential to be perceived by our senses is called _____

(3) The particular thing or object in the environment that captures our attention is called the _____

(4) Which of the following is the process of transformation of the image formed at the retina into electrical signals?

(a) neutral processing (b) transduction (c) perception (d) recognition

(5) Which of the following is not a step in the perceptual process?

(a) environmental stimulus (b) action (c) neutral pattern (d) non of the above

(6) Which of the following is an example of environmental stimulus?

(a) chair (b) river (c) bed (d) all of the above

7.0: References/Further Reading

Cherry, K. (2011). Perception and the Perceptual Process, About.com Guide.

http://en.wikipedia.org/wiki/perception.

UNIT 3: FACTORS AFFECTING PERCEPTION

Contents

1.0 Introduction

Having known what perception is, let us examine the factors that have the potentials to affect perception. These factors are numerous but thy can be broadly classified into two-internal and external factors. Internal factors are within the perceiver, which include sensory limits and thresholds, and psychological deposition. External factors include the stimulus object or target and the situation surrounding the environmental stimulus, which are outside the perceiver.

2.0 Objective

The learning objectives are as follows:

(1) To list both the internal and external factors affecting perception.

(2) To discuss how these factors affect perception.

3.0 Main Contents

3.1 Internal Factors

As earlier stated, internal factors affecting perception include our sensory limits and threshold, and psychological disposition. These factors have strong influences in our perception of environmental stimuli.

3.1.1 Sensory Limits and Thresholds

Our sensory organs (eye, ear, tongue, skin and nose) have specialized nerves, which respond differently to the various forms of energy they receive (see unit 1 of module II). For instance, our eyes receive and convert light waves into electrical energy, which are transmitted to the visual cortex of the brain to create the sensation of vision and subsequently leading to perception. Similarly, the ear perceives sound by detecting vibrations. The auditory system produces neural signals in response to the sound. It should be noted however, that each sense receptor requires a minimum level of energy to excite it before perception can take place. The minimum level is called the absolute threshold – a point below which we do not perceive energy. The differential threshold is the smallest amount by which two similar stimuli must be different in order to be perceived as different (http://managementconsultingcourse.com/lesson33 perception and person perception.pdf 2011).

Since our sense organs play a significant role in the perceptual process, it therefore means that the medical state of our senses influence our perception of environmental stimuli. For example, a blind person may lack visual perception but active in his auditory perception.

3.1.2 Psychological Factors

Our psychological dispositions such as experience, values, attitude, interest, habits, motives, learning and personality have a bearing or great influence on the formation of perception. The internal set or the inclination to perceive certain stimuli in a particular way also influences one's perception. This to a large extent explains why people have different preferences and react to environmental stimuli differently. Things compatible to one's learning, interest, attitude and personality are likely to get more attention than others. For example, an environmentalist may be more interested in news items on flooding or erosion than news items like motor racing.

3.2 External Factors

The two major external factors that affect perception are the target itself and the situation surrounding the target.

3.2.1 The Target

The characteristics of the target or environmental stimulus that is being observed can affect perception. Since the interest or attention of the perceiver is necessary for perception, researchers have shown that environmental stimuli, which have the following characteristics (large size, bright colour, loud, contrast, moving, intense and frequency), have the tendency to be given more attention. For example, the bigger the size of an environmental stimulus, the higher the probability of its perception. An environmentalist can easily perceive gully erosion than sheet erosion.

Researches on human behaviour have also revealed that the more intense the stimuli, the higher the attention or recognition it gets in the perceptual process. For example, a high velocity river may have more impact on a perceiver than a calm lake.

Repeated external stimulus usually gets more attention than non-repeated stimulus. For example, a regular footballer is better perceived than a once a while substitute in a football team.

In the same vein, stimuli that contrast with the surrounding are more likely to be perceived than stimuli that have poor contrast because the former are more attention catching. Hence, warning signs are written with black ink or paint on yellow background because it was found that the contrast is maximum for this set of colours, so it is clearly visible even from a far distance.

3.2.2 The Situation

The situation or the contexts in which we see an environmental stimulus affect our perception. For example, a light rain shower during the rainy season will not attract much attention compare to a heavy downpour that causes flooding during the peak of the dry season.

Self Assessment Exercise

What do you think is responsible for people having different perception of the same object or event?

4.0 Conclusion

The discussions have revealed that several factors, which could be grouped into two-internal and external factors, affect our perception. This is the reason why a group of

people viewing the same situation or stimulus gives different accounts. The account given by each individual in the group is dependent on their psychological make-up, past experiences and learning, assessment of the stimulus and the situation surrounding the target.

5.0 Summary

- There are several factors that affect our perception, which could be grouped into two-internal and external factors.
- The internal factors include psychological, sensory limits and thresholds; while the external factors include the target and the situation.

6.0 Tutor Marked Assignment

(1) Factors affecting perception can be grouped into _____ and _____

(2) The minimum level of energy needed by a sense receptor to excite it before perception can take place is called _____

(3) The target and situation are examples of _____ factors affecting perception.

(4) Which of the following is not an example of psychological factor?

(a) value (b) sensory limit (c) interest (d) motives

(5) Which of the following is a characteristic of environmental stimulus that affects perception?

(a) colour (b) contrast (c) frequency (d) all of the above

(6) In the study of perception, target can also be referred to as

(a) goals (b) objective (c) stimulus (d) none of the above

7.0: References / Further Reading

http://www.list4everything.com/list-of-factors-affecting-perception.html. 23/7/11.

http://www.notes forexams.com/wp.contact/uploads/2011/01/perception.pdf. 23/7/11.

http://managementconsultingcourse.com/lesson33 perception and person perception.pdf. 10/7/11

UNIT 4: THE CONCEPT OF OBJECTIVE AND PERCEIVED ENVIRONMENT

Contents

1.0 Introduction

This unit will be concerned with the examination of the relationship between objective and perceived environment. Since we have observed in the preceding unit that several factors affect the perceptual process, one may then ask, is the objective world or environment the same as the perceived environment? This question shall be the focus of this unit.

2.0 Objective

The learning objectives are as follows;

(1) To distinguish between objective and perceive environment.

(2) To examine the relationship between objective and perceived environment.

3.0 Main Content

3.1 Objective and Perceived Environment

Perception is a unique field of inquiry. In all other scientific disciplines, the purpose is to explain objective facts and events. Objective in this context means that the event to be explained is independent of the observer, is observable to all, and is not mere illusions. By independent of the observer, we mean that it can be safely assumed that these events are actually taking place whether anyone is observing them or not. If there is ever reason to think our observation of what is happening is faulty or illusory, then we correct it. For example, trees appear to be moving when one is in a fast moving vehicle. In reality, this is not true. Hence, the apparent movement of tree is disregarded.

Many objects or natural events studied in most scientific disciplines are open to direct inspection. For instance, the soil profile of a given area can be directly observed. In many cases, vision is aided by optical instruments, but that does not alter the fact that the starting point is what we perceive. As long as people agree about what they observe, and as long as there is no reason to suspect that our senses are deceiving us, scientists are quite willing to assume the objectivity of the event (Rock, 1975).

In the field of perception however, the interest is not in the objective event like in the physical sciences, but in how things appear. Thus, in the study of perception, it is the appearance of things that is the focus of attention rather than the objective reality. Rock (1975) noted that the facts to the explained are the sensory impressions we have of the world around us, via the different sense modalities of vision, audition, and others, and the task is to account for these impressions. Whether a given perception is veridical (i.e. truthfully reflecting the objective state of affairs) or illusory (i.e. not in accord with the

objective state of affairs) does not affect its status as a fact of perception requiring explanation.

With the development of modern science, it has become increasingly clear that the physical world or objective environment, as it might be described by the physicist, and the world as we perceive it are not one and the same thing. For example, physicists speak of electromagnetic waves, which are not perceptible. Since the environment as it appears to us differs in so many respects from the objective environment, it would seem that the environment we perceive is the end result of events that occur in the nervous system and in this sense is a construction. It bears a certain kind of similarity to the objective environment, but it also very different from it. Even though our conception of the objective environment as derived from physics is a construction, it is an intellectual and not a sensory construction.

When we consider perception such as color, taste, or smell, it becomes more evident that the perceived environment and the objective environment as described by physics are qualitatively different. Where for example, the physicist refers to electromagnetic vibrations of varying wavelength, we experience the hues, red, green, blue, and so on; similarly, where the physicists refers to certain chemical compounds, we experience tastes or smells. The point is that hues and tones have no existence other than as contents in the consciousness of living beings.

The sensations of hue, pitch, taste, and the like were distinguished by philosophers from those of size, form, and the like, presumably because they were purely psychological events, or constructions, as such do not exist in the objective environment. These sensations are called secondary qualities. Primary qualities were those that directly

correspond with the objects they represent. For instance, a perceived triangle has the same formal properties as the real triangle being perceived, namely, three sizes and three angles. Although the distinction between primary and secondary qualities is, therefore of great interest, it must not be permitted to obscure the fact that all perception, of primary as well as other qualities, is the end result of events in the brain and, therefore, is at most a symbolic representation of objects in the objective environment (Rock, 1975).

The question now is, if perception results from events in the nervous system of living beings, how do we obtain valid knowledge? Clearly we obtain such knowledge from our perceptions. Even though that the perceived environment is not the same with the environment that is the object of perception, one can still say that there is a high degree of correspondence. We can determine whether or not a correspondence exists between a particular perception and an object in the environment by performing certain kinds of operations. For example, we can measure whether two lines that appear to be the same length are indeed the same length.

Self Assessment Exercise

Do you think there is any difference between objective and perceived environment?

4.0 Conclusion

The discussions have shown that there is a degree of difference between the objective environment and the perceived environment most especially from the perspective of the physical sciences, especially physics. The major reason for the difference between objective and perceived environment is the fact that all perception of both primary and secondary qualities of an object, is the end result of events in the brain, which is at most, a symbolic representation of objects in the objective environment.

5.0 Summary

- In the study of perception, it is the appearance of things that is the focus of attention rather than objective reality.
- The perceived environment bears a certain kind of similarity to the objective environment, but also very different from it, because it is a sensory construction.

6.0 Tutor Marked Assignment

(1) In perceptual studies, when the explained event is independent of the observer, not illusions and observable to all, it is called _____

(2) In the study of perception, it is the _____ of things that is the focus of attention.

(3) When perception truthfully reflect the objective state of affairs it is said to be _____

(4) Perception that is not in accordance with the objective state of affairs is called.

(a) differential (b) illusory (c) false (d) none of the above

(5) Which of the following perceptual sensation is not a primary quality?

(a) hue (b) size (c) form (d) all of the above

(6) Which of the following perceptual sensation is an example of secondary quality?

(a) hue (b) pitch (c) taste (d) all of the above

7.0 References/Further Reading

Rock, I. (1975). *An Introduction to Perception.* Macmillan Publishing Co. Inc. New York.

UNIT 5: PERCEPTION AND FORMATION OF ENVIRONMENTAL IMAGES

Contents

2.0 Introduction

The formation of environmental images is heavily dependent on our senses, which are significant components of the perceptual process. Therefore, the formation of environmental images is within the ambit of perception and cognition. Thus, discussions in this unit will centre on cognition and perception.

3.0 Objective

The learning objectives are as follows:

(1) To define cognition

(2) To explain the factors influencing the formation of environmental images.

4.0 Main Content

3.1 What is Cognition?

Cognition is a scientific term, which originated from the Latin word “cognoscere”, meaning, to conceptualize”, “to know” or “to recognize”. Cognition can however be defined as the mental processes that take place in gaining and understanding information. It involves the basic thinking process of an individual, including his/her memory, perception, knowledge and judgment. Cognition involves the process of “knowing” things and handling information. The use of knowledge is said to direct our actions towards a particular goal. Our very own memories and past experiences defined what we know and will determine how we see and how we will react in the future.

The term cognition varies in different disciplines; however, in this discussion, we are concerned with its usage in psychology and cognitive science, where it refers to an information processing view of an individual’s psychological functions. Cognitive process is the way we process information. For example, when we think of a river, we associate it with information related to the use of a river, which include sailing, swimming, washing, fishing etc. The cognitive process influences how we form environmental images.

3.2 Cognition and Perception

Cognition and perception are both influenced by our senses. They are also associated with images, inner representation, mental maps and schemata’s in which personal experiences and values are used to filter the barrage of environmental stimuli to which the brain is subjected,; thus allowing the mind to work with a partial, simplified (and often distorted) version of reality (Knoy and Pinch, 2006).

The same environmental stimuli may evoke different responses from different individuals, because of the various factors that affect both perception and cognition. However, there may be situations whereby certain aspects of environmental images will be held in common over quite large groups of people due to similarities in their socialization, past experiences, learning and urban environment.

Knoy and Pinch (2006) noted that we do not have a single image or mental map that can be consulted or recalled at will. Rather, we appear to possess a series of latent images that are unconsciously operationalized in response to specific behavioural tasks.

Underlying the organization of people mental maps is the cognitive distance between image elements, and this is another aspect of imagery that has been shown to exhibit interesting and important regularities. Cognitive distance is the basis for the spatial information stored in cognitive representations of the environment. It is generated from a variety of mechanisms that include the brain's perception of the distance between visible objects, the use-patterns and structure of the visible environment, and the impact of symbolic representations of the environment such as maps and road signs. For majority of people for example, intra-urban cognitive distance is generally greater than objective distance, regardless of city size and their usual means of transportation, although there is evidence to suggest that this overestimation declines with increasing physical distance.

It has been suggested that people's images and cognitive distance estimates are a function of the number of environmental stimuli, or cues, they encounter along the parts. It is also suggested that different types of urban structure will result in the selection of different cues, thus generating a different metric of cognitive distance and producing different kinds of mental maps. For example, residents of concentrically zoned cities might be expected to

respond more to changes in land use than residents of sectorally structured cities, who might be expected to respond more to traffic-related cues along the typical path from suburb to city centre and back (Knoy and Pinch 2006).

Our primary interaction with the natural environment, as with other aspects of our experience, is through our senses, as earlier noted. This makes us to form feelings and impressions that both shape and are shaped by our basic cognitive structures and values. At deeper levels of processing, they form more explicit beliefs and attitudes, imageries, even theories and ideologies. These cognitions, perceptions and attitudes affect both individuals own well being and that of their environment. For example, people feel good in a healthy natural environment and feel better knowing that their natural environment is healthy.

Self Assessment Exercise

Can you account for the role of cognition and perception in the formation of environmental images?

5.0 Conclusion

Our environmental image construct is significantly influenced by cognition and perception, which in turn depend heavily on our senses. Since cognition and perception are influenced by several internal and external factors, there are usually variations between the natural environment and our perceived environment images.

6.0 Summary

- The formation of environmental images is influenced by cognition and perception, which is in turn dependent on our senses.

- Cognition is the mental processes that take place in gaining and understanding information.
- Cognition and perception help the brain to filter the barrage of environmental stimuli that it's subjected; thus allowing the mind to work with a partial, simplified (and often distorted) version of reality.

6.0: Tutor Marked Assignment

(1) _____ is the mental processes that take place in gaining and understanding information.

(2) The way we process information is called _____

(3) What part of the body processes and give meaning to environmental stimuli? _____

(4) Which of the following reasons may account for certain aspects of environmental images to be held in common over quite large groups of people?

(a) similarities in their socialization (b) similar past experience (c) similar learning (d) all of the above

(5) Which of the following statement is true of perceived environmental images?

(a) They are exactly the same with natural images

(b) They are not in any way like the natural images.

(c) They are similar to the natural images.

(d) none of the above.

(6) Which of the following help the brain to filter the barrage of environmental stimuli.

(a) the sense organs (b) perception and cognition (c) knowledge

(d) current experience

7.0 References/Further Reading

Forgus R. H. (1966). *Perception: The Basic Process in Cognitive Development.* McGraw-Hill Book Company, New York.

http://en.wikipediaorg/wiki/cognition and pinch5. 28/07/2011

Knoy, P. (2006). *Urban Social Geography: An Introduction. Fifth Edition* Pearson Prentice Hall, England.

Module III

Unit 1: Cognitive Development

Unit 2: Environmental Perception and Decision Making

Unit 3: Perception and Environmental Resource Management

Unit 4: Waste Perception and Management

Unit 5: Environment Perception and Renewable Alternative Energy Sources.

Unit 1: Cognitive Development

Contents

1.0 Introduction

In unit 5 of module II, we did say that cognition and perception influence the formation of environmental images. And we defined cognition as the mental processes that take place in gaining and understanding information. What then is the process of cognitive development? What are the stages of cognitive development? Answers to these questions shall form the major theme of this unit. In the discussions however, emphasis shall be on Jean Piaget theory of cognitive development. This theory examined cognitive development from infancy to adulthood. It is one of the most influential theories of cognitive development in the field of developmental psychology.

2.0 Objective

The learning objectives are as follows.

(1) To examine the process of cognitive development

(2) To list and explain the stages of cognitive development.

3.0 Main Content

3.1 Process of Piaget's Theory of Cognitive Development

Jean Piaget's interest in cognitive development made him to conduct studies in order to understand the intellectual development process of children. The outcome of his studies resulted to what is now popularly referred to as "Piaget's Theory of Cognitive Development". Cognitive Development involves changes in cognitive process and abilities. As earlier noted, Piaget's theory examined cognitive development from infancy to adulthood. In his view, early cognitive development involves processes based upon actions and later progresses into changes in mental operations. Piaget believed that

humans are unique in comparison to animals because human have the ability to do “abstract symbolic reasoning”.

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Piaget identified four major processes of cognitive development. They include schemas, assimilation, accommodation and equilibration. Let us now examine each of the four processes or concepts.

Schemas: Schemas are categories of knowledge that help us to interpret and understand the world around us. Piaget postulated that infants are born with schemas, which operate at birth. These schemas he referred to as reflexes, which are subject to replacement with constructed schemas, as the infant uses the reflexes to adapt to the world around him. For example, a child may have a schema about an apple. If the child’s previous experience has been with green apples, he might believe that all apples have green colour. However, if the child eventually sees a purple coloured apple, he will take in the new information; modify the existing schemas to include this new information, that apples could have both green and purple colours. In the case of animals, these reflexes control their behavior throughout life.

Assimilation: This is the process of taking in new information into or previously existing schemas. This process is somewhat subjective, because we tend to modify experience or information somehow to fit in with our pre-existing beliefs.

Accommodation: This process of adaptation to the environment involves altering existing schemas, or ideas, as a result of new information or new experiences. During this process, new schemas may also be developed. Both assimilation and accommodation processes are

used simultaneously and alternately throughout life as we increasingly adapt to the environment in a more complex manner.

Equilibration: The process, by which children try to strike a balance between assimilation and accommodation in the process of adaptation to the environment, is what Piaget referred to as equilibrium. Piaget believe that as children progress through the stages of cognitive development, they tend to maintain a balance between applying previous knowledge (assimilation) and changing behavior to account for new knowledge (accommodation). Equilibration helps explain how children are able to move from one stage of thought into the next (Cherry, 2011). Having gone through the process of cognitive development, let us now examine the stages of cognitive development as postulated by Jean Piaget.

3.2 Stages of Cognitive Development

Jean Piaget identified four major stages of cognitive development. They include sensorimotor, pre-operational, concrete operational and formal operational stages. We shall now examine each of the stages in turn.

3.2.1 Sensorimotor Stage (0 – 2 years)

Piaget's first stage of cognitive development, the sensorimotor stage occurs from 0-2 years. This stage is further subdivided into six stages, based on some unique characteristics, which include reflexes (0-1 month), primary circular reactions (1-4 months), secondary circular reactions (4-8 months), coordination of reactions (8-12 months), tertiary circular reaction (12-18 months) and early representational thought (18-24 months).

At the sensorimotor stage, the infant's knowledge of the world and behavior is limited to their sensory perceptions and motor activities, in response to sensory stimuli. Children learn more about their environment by depending on their reflexes (skills and abilities), which they were born with. Such reflexes include looking, listening, grasping and sucking. Let us briefly take a look at the distinguishing characteristics of each of the six sub stages of the sensorimotor stage.

Reflexes (0 – 1 month): At this stage, the child's interaction with the environment is solely through inborn reflexes such as looking and sucking.

Primary Circular Reactions (1 – 4 months): At this stage the child is involved in the coordination of sensation and new schemas and tends to repeat pleasurable actions. For example, a child may suck his finger by accident and then later intentionally repeat the action because the child finds it pleasurable.

Secondary Circular Reactions (4-8 months): At this sub stage, the child becomes more focused on the world and begins to intentionally repeat an action in order to trigger a response in the environment.

Coordination of Reactions (8-12 months): This sub stage is dominated by the exhibition of intentional actions, imitation of observed behavior of others and understanding of objects with their associated qualities. For example, a child may observe that a bell will make a sound when struck.

Tertiary Circular Reactions (12-18 months): This sub stage is characterized by a period of trial-and-error experimentation. For example, a child may try out different sounds or actions as a way of getting attention from a caregiver.

Early Representational Thought (18-24 months): At these sub stages, the child's understanding of the world is through both mental operations and actions. Children also develop symbols to represent objects and events in the world around them.

One of the most outstanding accomplishments during the sensorimotor stage of cognitive development according to Piaget is object permanence which is a child's understanding that objects continue to exist even though they cannot be seen or heard.

3.2.2 Pre-Operational Stage (2-6 years)

This is the second identified stage of cognitive development by Jean Piaget. This stage occurs at the ages of 2-6 years. One of the most outstanding characteristics of this period is language development. Also, there is development in memory and imagination, however, the child is unable to think logically. The child at this stage is involved in what Piaget called egocentrism – inability to take the point of view of other people.

During the preoperational stage, children also become increasingly adept at using symbols, as evidenced by the increase in playing and pretending. For example, a child is able to use an object to represent something else, such as pretending a broom is a horse. Role playing also becomes important during the preoperational stage. Children often play the roles of "mummy", "daddy", "doctor" and many others (Cherry, 2011).

3.2.3 Concrete Operational Stage (7-11 years)

This stage of cognitive development according to Piaget starts from 7 years and last to about 11 years. During this period, children have better understanding of thinking logically about concrete events, but face a lot of challenges in trying to understand abstract concepts. Piaget observed that children at this stage are capable of inductive reasoning – going from a specific observation to a general conclusion, but have difficulties in deductive reasoning-from general principles to make inference about specific events.

Another important characteristic of this stage is the understanding of the concept of reversibility, i.e. the consciousness that actions can be reversed. An example of this is being able to reverse the order of relationships between mental categories. For instance, a child at this stage might be able to recognize that his fruit is an apple, that an apple is a fruit, and that a fruit is a plant. Also, egocentric thought diminishes as the child begins to accept other people's point of view.

3.2.4 Formal Operational Stage: 12 years Adulthood

This stage, which is the last stage of Piaget's cognitive development theory, begins at age 12 to adulthood. At the early period of formal operational stage, egocentric thinking stages a comeback. It is however, overcome later. Those at this stage are capable of logical use of symbols related to abstract concepts.

Self Assessment Exercise

Jean Piaget identified four major stages of cognitive development. Can you list and state the dominant characteristics of each of the stages?

4.0 Conclusion

Having gone through this unit, you should by now know that cognitive development is a process, which occurs in stages from infancy to adulthood. The adaptation of a child to his or her environment progresses from the simple use of reflexes to abstract conceptualization of events at adulthood. The particular stage of cognitive development of an individual influences his or her environmental perception and formation of environmental imageries. Thus, cognitive development should be well understood in order to appreciate people's responses and actions towards their environment.

5.0 Summary

- There are four processes of cognitive development, which include schemas, assimilation, accommodation and equilibration.
- Piaget identified four stages of cognitive development, which include senserimotor stage (0-2 years), pre-operational stage (2-6 years), concrete operational stage (7-11 years), and formal operational stage (12-adulthood).
- Each of the four stages of Piaget's theory of cognitive development has some unique characteristics. For example sensorimotor stage is based on the use of reflexes to adapt to the environment; pre-operational stage is characterized by language development; concrete operational state is characterized by the ability of logical thinking about concrete events; and formal operational stage is known for logical use of symbols related to abstract concepts.

6.0 Tutor Marked Assignment

(1) _____ are categories of knowledge that help us to interpret and understand the world around us.

(2) The process of taking in new information into our previously existing schemas is called _____

(3) The first stage of Piaget's cognitive development theory is _____

(4) Which of the following is not a substage of Piaget's cognitive development theory? (a) formal operational (b) reflexes (c) secondary circular reactions (d) coordination of reactions

(5) Pre-operational stage is between what age brackets (a) 0 – 2 years (b) 2 – 6 years (c) 6 – 11 years (d) 12 – adulthood.

(6) Egocentrism is dominant at which of the stages of cognitive development (a) formal operational (b) concrete operational (c) pre-operational (d) none of the above.

7.0 References / Further References

Cherry, K. (2011). Background and Key Concepts of Piaget's Theory. http//www/psychology.about.com/od/piagetstheory/a/keyconcepts.htm 25-7-11.

http://www//en.wikipedia.org/wiki/cognition, 10/08/2011

Santrock, J.W. (2008). *A Topical Approach to Life – Span Development.* *4th Edition.* McGraw-Hill, New York.

UNIT 2: ENVIRONMENTAL PERCEPTION AND DECISION MAKING

Contents:

1.0 Introduction

Perception and cognition play fundamental roles in an individual behavioural pattern and process of adaptation to his or her environment, as have been revealed in the preceding units. Since the process of adaptation to one's environment requires choice selection, what then is the role of perception in decision making? This unit will therefore, focus on the examination of the role of perception in decision making, and the definition of environment perception.

2.0 Objective

The learning objects are as follows:

(1) To defined environment perception

(2) To examine the role of environmental perception in decision making.

3.0 Main Content

3.1 What is Environmental Perception?

Before we attempt the definition of environment perception, recall we earlier defined perception as the process by which an individual becomes aware of, and interprets information about the environment (see module II, unit 1). Having refreshed our memory of the definition of perception, it will now be easier to understand environmental perception.

Whyte (2011) defined environmental perception as the means by which we seek to understand environmental phenomena in order to arrive at a better use of environmental resources and a more effective response to environmental hazards. He further noted that the processes by which we arrive at these decisions include direct experience of the environment (through the senses of taste, touch, sight, hearing and smell) and indirect information from other people, science, and the mass media. They are mediated by our own personalities, values, roles and attitudes. The study of environmental perception has to encompass all these means of processing environmental information and to place the individual psychological processes of prediction, evaluation, and explanation into a relevant social and political framework. Having defined environmental perception, let us now examine its role in decision making.

3.2 The Role of Environmental Perception in Decision Making

Before we proceed to examine the role of environmental perception in decision making, it is pertinent to know what decision making is all about.

Decision making can be defined as the mental processes (cognitive process) leading to the selection of a course of action among numerous alternative options. The end result of

every decision making process is a final choice, which result to an action, whether positive or negative. If the process of our decision making is based on wrong information or premise, the outcome is most likely going to be negative and vis-à-vis.

The role of perception in the decision making process go beyond the five senses of touch, sight, smell, hearing and taste. The representation of perception in decision making is based on a person's internal understanding and personal analysis of environmental observations combined with past experiences. Consequently, choice selection in the decision making process varies from one individual to the next.

Decision makers make decisions based on how they perceive (i.e. sense and understand) the events, people, and the environment around them. Hence, they make choices within the framework of perceived alternatives and available information. Alternatives and information are profoundly affected by people's attitudes and values and the roles they play in relation to the decision to be made (Whyte, 2011).

The perception of environmental problems by the public and policy makers is heavily influenced by the magnitude, frequency, nature and distribution of the impacts of the perceived problem. For instance studies have shown that policy-makers and the public alike tend to disregard future risks and put resources instead into responding to more immediate problems. They are likely to attach greater importance to events which are likely to occur and about which there is some experience, or at least agreement, about what will happen. Thus, scientific uncertainty and controversy becomes translated into public apathy in a world where problems compete for attention and resources.

One way to understand the complex set of interactions between past events, future expectations, and perception processes within the decision makers according to Whyte (2011), is to imagine it in terms of a decision-frame. The decision-frame is composed of all the information, values and attitudes which the decision-maker brings to bear on a particular choice. The inclusion or exclusion of a particular piece of information can profoundly affect the eventual choice. Sometimes information is excluded from consideration in a particular decision, not because it is unknown, but because it is deemed not to be relevant or to belong to a different category.

In the climate context, the decision-frame can be powerfully affected by the imaginability of the climatic processes, or events (Slovic et al, 1974) as quoted from Whyte (2011). Thus, for the layperson, hurricanes provide well defined 'events', each of which can be added to the mental category of 'hurricane'. The victims of a hurricane sufficiently well grouped in space and time that they are attributed to a named event. In contrast, drought regions and drought periods have more blurred edges. When the "events" are less well defined, they are less likely to be remembered as falling in a sequence or as units in a longer category of events. The proportion of indirect victims is greater for droughts than for hurricanes and many losses will never be included in drought impacts. Put simply, the decision-frame for drought is likely to be based on a sub sense of past events and past impacts (Whyte, 2011).

The perception of policy-makers would depend on the decision that would be taken to solve an identified environment problem. While more accurate perception should obviously provide a stronger base for decision making; there are however situations where policy makers perceptions are obviously erroneous, resulting in poor decision. In such situations, the resultant consequences could be very costly. In order to avoid or reduce the

incidence of poor decision, policy makers should seek to understand the perceptual process better in order to develop the skills necessary to perceive problems, events and people more accurately, and thus have a better base for making qualitative decisions.

In order to enhance the abilities of policy-makers in achieving qualitative decisions, McMahon (2007) proposed seven steps, which are as follows:

First Step: Outline your goal and outcome. This will enable decision makers to see exactly what they are trying to accomplish and keep them on a specific path.

Second Step: Gather data. This will help decision makers have actual evidence to help them come up with a solution.

Third Step: Brainstorm to develop alternatives, which will enable the decision maker to see, which one of the alternatives can actually work.

Fourth Step: List pros and cons of each alternative. With the list of pros and cons, the decision maker can eliminate the solutions that have more cons than pros, making the decision easier.

Fifth Step: Make the decision. Once you analyze each solution, you should pick the one that has many pros (or the pros that are most significant), and is a solution that everyone can agree with.

Sixth Step: Immediately take action once the decision is picked, the decision maker should implement it right away.

Seventh Step: Learn from, and reflect on the decision making process. This step allows the decision maker to see what he or she did right or wrong when coming up, and putting the decision to use.

The above outlined steps, if judiciously adhered to, will help the policy maker in the decision making process.

Self Assessment Exercise

Decision making is the cognitive process leading to the selection of a course of action among numerous alternative options. In your opinion, what influences the process of decision making?

4.0 Conclusion

The factors that influence the decision making process are numerous, as you would have read from above. Apart from our senses, which offer us the opportunity of direct observation of the environment, our psychological make-up, and other external factors act in a complex mix to influence the outcome of our decisions.

The ability of the decision maker to make qualitative decision therefore, is vested in his or her abilities to develop skills to understand the perceptual process. This will sharpen his or her environmental perception, thus leading to qualitative decision, which will help in the proper management of the environment.

5.0 Summary

- Environmental perception is the means by which we seek to understand environmental phenomena in order to arrive at a better use of environmental resources and a more effective response to environmental hazards.

- Decision makers make decisions based on their perception of the event, people and environment around them.
- The perception of environmental problems by the public and policy makers is heavily influenced by the magnitude, frequency, nature and distribution of the impacts of the perceived problem.
- Accurate perception provides a strong based for qualitative decision making while erroneous perception results in poor decision.

6.0 Tutor Marked Assignment

(1) _____ is the means by which we seek to understand environmental phenomena, achieve better use of environmental resources and response to environmental hazards.

(2) The mental processes leading to the selection of a course of action among numerous alternative option is known as _____

(3) All the information, values and attitudes which the decision-maker brings to bear on a particular choice of alternatives is called _____

(4) The role of perception in the decision making process include all of the following except.

(a) the five senses (b) past experience (c) psychological disposition (d) none of the above.

(5) Which of the following is the final outcome of a decision making process? (a) choice (b) action (c) alternatives (d) objectives

(6) Which of the following is not true of the decision making process

(a) Perception has little or no impact in the process.

(b) Past experience influence the process

(c) Information from other people influence the process

(d) None of the above

7.0 References / Further Reading

http://en.wikipedia.org/wiki/DecisionMaking. 25/07/11

Whyte, A.T. (2011): Climate Impact Assessment httt:www.incsu-scope.org/downloadspubs/scope27/chapter16.html. 25/07/11.

UNIT 3: PERCEPTION AND ENVIRONMENTAL RESOURCE MANAGEMENT

Contents

1.0 Introduction

There has been a remarkable and refreshing interest in environmental resource management over the past few years. A major impetus was provided by the 1987 report of the World Commission on the Environment and Development (the Brundtland Report); the Rio Summit in 1992, sought to accelerate the impetus. Much of the discussions on environmental issues and sustainable development are about the better management of current activities in harmony with the environment.

Having gone through modules I and II, the word “perception” and “environment” should no longer be strange to you. To refresh your memory however, we did define perception as the process by which an individual becomes aware of and interprets information about the environment, while environment was defined as the whole sum of surrounding external

conditions within which an organism, community or object exist. It was further stated that the components of the environment include the atmosphere, lithosphere, hydrosphere and biosphere. At this point one may ask, what is resource management? How does perception affect environmental resource management? The answers to these questions shall be focus of this unit.

2.0 Objectives

The learning objectives are as follows:

(1) To define resource management

(2) To state how perception affects environmental resource management.

3.0 Main Content

3.1 The Concept of Resource Management

Before we explain the concept of resource management, it is important we offer a definition of a resource. According to Getis and Fellmann (1985), resources are naturally occurring materials that a population at any given state of economic development and technological awareness perceives to be necessary and useful to its maintenance and well-being. From the above definition, it can be summarized that a resource is anything that is of value to man. Resources can be both natural and human. However, for the purpose of this discussion, our attention shall be limited to the natural resources such as rocks, soil, water, air, mineral, vegetation and wildlife. A significant aspect of natural resources is that they are not evenly distributed in space. The distribution of natural resources is dependent on several factors which may include rock structure, prevailing climatic conditions, and age long physical and chemical processes amongst others.

Taking a second look at our definition of a resource, you will observe that the key word is perception. Hence, what is termed as a resource in a particular place may not necessarily be seen as such in another environment because of the differences in their perception. Thus, natural resources are regarded as “neutral stuff” until their presence are perceived, located and transformed to useable materials. A resource exists, then, only when it perceived to exist (Olomo, 1999). However, perception alone is not enough, accessibility to the perceived resource is important because it influences resources appraisal. Hence, Zimermman (1951) argued that “resources are not they become”. This means that it is the availability for human use and not mere physical presence that defines a resource. Spencer and Thomas (1978) in support of this point of view stated that no product, natural or created, thus becomes a true resource until its utility is properly understood, its technology becomes mastered, and its output becomes utilized by people somewhere on the earth surface. For example, in the Niger Delta region of Nigeria, prior to 1956, when oil was discovered, the region was seating on a large pool of oil resources without perceiving its presence. The oil which was a “neutral stuff” before its discovery has today become a valuable resource for Nigeria, since its utility became properly understood, its technology mastered and its output become utilized as a source of energy.

The utility of a resource is enhanced by development. Resource development is a process whereby resources are given specific value owning to development. When resource development takes place, a value is added to an existing resource. An example might be the damming of a river to create an irrigation scheme where the water is used for agriculture but can be more productive when also used for boating (Hugo, et al, 2000).

Having taken time to explain the concepts of resource and resource development, let us now turn to examine the concept of resource management. Oriordan (1971) defined resource management as a process of decision-making whereby resources are allocated over space and time according to the needs, aspirations and desires of human kind, within the framework of technological inventiveness, political and social institutions and a legal and administrative framework; and to this might be added, within the confines of the carrying capacity of the resources. From the definition, it is obvious that resource management is a wide concept, which involves control relating to the amount, quality, timing, availability and the general direction of resource development. Resource management strategies are therefore designed to promote exploitation, enhancement and the restoration of resources. Hence, resource management studies are concerned with the allocation of resources in the biophysical and social economic milieu in which resources are or ought to be developed. Resource management examines strategies and technologies for resources development in order to sustain economic growth without causing unnecessary environmental degradation and destruction (Hugo et al, 2000).

The term “resource management” has been used within the last few decades in place of “resource conservation” because the latter is seen to be ambiguous and vaguely conceived. Proponents also exhibit tremendous differences relating to varying points of view. The term “conversation” retains an implicit undertone of “no use” (preservation) thus leading to the understanding that conservationists advocated “no growth’. In contrast, resource management is a more comprehensive and positive term which does not allow resource allocation to be dominated by market forces or by quasi-political forums, but rather by a combination of compromises based on social, cultural, economic, ecological and

institutional processes (Omara-Ojungu, 1992). Having explained the concept of resource management, let us now examine the role of perception in resource management.

3.2 The Role of Perception in Resource Management

In our discussion of the concept of resources, we did established that something can only become a resource if first perceived and later extracted for use. By implication, perception is at the heart of resource management.

According to Simmons (1981), man sees the world around him through the spectacles of culture, and so, nature is thus transformed into resource. The elements of values, behaviour and technology, which are fuse together to make up culture are very varied, and the mix is different for diverse times and places. The sensory perception of the environment and the psychological translation and information of that knowledge into a decision to act or not to act upon the environment is a complex process. Culture, which can be defined as the way of life of a people, to a large extent determines a society's perception of their environment, and the way the society perceptive their environment determine how they relate and react to it (Olomo, 1999).

The approaches to environmental resource management have changed in space and time in accordance with changing technology, knowledge and perception. For instance, in the early years of human technological development some natural resources like groundwater, forest and even mineral resources were thought to be inexhaustible, or renewable irrespective of the exploitation method adopted. But the reality today is that mineral resources are exhaustible and even renewable resources such as groundwater can be turned to non renewable resources if destructive methods are adopted in their exploitation.

The acquisition of more knowledge and information has shaped our perception of the environment, thus, leading to changing approaches to environmental resource management. Some of the approaches to resource management according to Hugo, et al (2000) include historical approach, cost/benefit approach, ecological approach and human or ethological approach. Let us now examine the major focus of these approaches briefly.

Historical Approach: This approach was dominant during the early times of human development, when the prevailing perception was that human was subjected to the dictates of the environment, which was popularly referred to as environmental determinism. The perception later changed as a result of the industrial revolution, which brought the awareness that human kind can in fact modify the environment to suite his purpose. This was referred to as possibilism (see details in module 1, unit 2).

Cost/Benefit Approach: This approach to environmental resource management was based on the assessment of the total cost of a project in relation to the benefits and savings of the project. If the total cost is less than the total benefits measured in monetary terms, then the project will be allowed to go ahead. One of the major problems with this approach is that it often takes place at the detriment of the sustainable resource value (Hugo etal, 2000). In spite of the limitations of this approach, it is still being practiced in some developing countries.

Ecological Approach: According to Hugo etal (2000), this approach is based on the allocation of resources on the basis of an understanding of the functional components and interrelationships between the physical and biological environment. The community concept has great value in resource management owing to the fact that it emphasizes life in

an orderly manner. The concept demonstrates the dependence of an organism on the quality of the community of which it is part.

In the ecological approach to resource management, it is imperative that the ecosystem should be studied first in its total complexity. The interaction between all organism, the inorganic environment and natural processes need to fully understood before any changes are made. This is because any alterations to an ecosystem will always result in a sequence of side-effects, which are often impossible to identify beforehand (Hugo etal, 2000).

Human or Ethnological Approach: This approach to resource management is based on the point of view that the attitudes and perceptions of people (within the confines of the resource base) are the ultimate determining factors in resource management. This approach has its inherent drawback because people who do not have the background or technological knowledge are given a free hand to decide what is best for then. And very often their choices are influenced by their cultural heritage, selfish ideals, perception of the environment and of the potential value systems of the resource base (Hugo et al, 2000).

In order to achieve proper management of our environmental resources, the various approaches should be well integrated for optimal management of the available resources. Emphasis should be placed on the concept of sustainable development, which is defined as meeting the needs of today without comprising the abilities of future generations to meet their own needs.

Self Assessment Exercise

How does perception affect the management of environmental resources?

4.0 Conclusion

The above discussions have been able to demonstrate that the approaches to environmental resource management are influenced to a large extent by our perception. This is so because resource management is a decision making process, which is heavily influenced by cognition and perception. However, perception alone is not enough for the sustainable management of our environmental resources. There are situations were we have distorted perception of resources, which eventually leads to wrong approaches to resource management.

5.0 Summary

- Resource management is concerned with the examination of strategies and technologies for resource development in order to sustain economic growth without causing unnecessary environmental degradation and destruction.
- The approaches to environmental resource management have changed in space and time in accordance with changing technology, knowledge and perception.
- A resource exists only when it is perceived to exist. However, perception alone is not enough, accessibility to the perceived resource is important because it influences resource appraisal.

6.0 Tutor Marked Assignment

(1) Anything that is of value to man is called a_____

(2) Resources can be broadly classified as _____ and _____

(3) When a natural resource has not been perceived, located and transformed to useable material it is known as _____

(4) The process of enhancing the utility of a resource is called

(a) allocation (b) exploitation (c) development (d) exploration

(5) Which of the following statements is not true of resources?

(a) resources exist only when they are perceived

(b) the value of resources can be enhanced

(c) all resources are renewable

(d) resources are not evenly distributed

(6) Which of the following is an approach to resource management?

(a) ethnological approach (b) historical approach (c) cost/benefit approach (d) all of the above

7.0 References/Further Reading

Getis A. and Fellmann J. (1985). *Human Geography, Culture and Environment* MacMillan New York.

Hugo, M.L. et al (2000). *The Ecology of Natural Resource Management. The Question of Sustainable Living*. Kagiso Tertiary, South Africa.

Olomo, R.O. (1999). Nature and Resources: Renewable and Non-Renewable Resources in *History and Philosophy of Science,* Edo State University Publishing House.

O'Riordan, T. (1971). *Perspectives on Resource Management.* London, Pio Press. New York Academic Press.

Simmon, I.G. (1981). *The Ecology of Natural Resources.* Edward Arnold, London.

Spencer, J.E. and Thomas, W.L. (1978). *Introducing Cultural Geography.* John Wiley and Sons, New York.

UNIT 4: WASTE PERCEPTION AND MANAGEMENT

Contents

1.0 Introduction

Waste can simply be defined as anything or material which is no longer needed and thrown away. However, waste varies in space and tie. What may be considered as waste in a particular area may actually be a valuable resource in another area. Also, what may be considered as waste in a particular area at a given time may eventually become a resource in the same area over time. One of the reasons for this change is perception. As knowledge and technology improves our perception of environmental stimuli changes.

One of the consequences of production and consumption is waste generation. During the pre-industrial revolution, production and consumption levels were low, thus, waste generation was equally low, and its management did not constitute any serious challenge. However, after World War II, production and consumption levels increased dramatically, thereby posing serious challenges for waste management.

In this unit, we shall be discussing both the early and modern trends of waste perception and management. The management technique or approach adopted may also be influenced by the hazardous perception of the waste.

2.0 Objective

The learning objectives are as follows:

(1) To understand the early and modern trends in waste perception and management.

(2) To understand the relationship between perception and adopted waste management techniques.

3.0 Main Content

3.1 Early Trends of Waste Perception and Management

During the pre-industrial revolution as earlier noted in our introduction, waste generation level was low. In addition, the waste generated was not perceived as hazardous as those generated post World War II. Hence, the adoption of the dilute and disperse method of waste management.

At this period according to Botkin and Keller (1998), factories were located near rivers because the water provided a number of benefits, including easy transportation of

materials by boat, sufficient water for processing and cooling, and easy disposal of waste into the river. With few factories and a sparse population, dilute and disperse method seemed to remove the waste from the environment.

Unfortunately, after the Second World War, the industrial and urban expansion and growth that followed led to increase production and consumption, the consequence of which was a rapid increase in waste generation. The disposable life style that people were made to adopt by aggressive marketing companies most especially in the developed economies of Europe and America exacerbated the problem of waste management. Engner and Smith (2002) succinctly describe the situation thus, “a popular lifestyle was marketed as the wave of the future and as a way to cut down on household chores. “Use it once and throw it away” became a very popular advertising slogan in the 1950s”.

The perceived inadequacies of the dilute and disperse method in the face of increasing municipal solid waste, led to the embrace of the open dump method of waste managing. In this method, solid waste was usually accumulated in open dumps, where the refuse was piled up without being covered or otherwise protected. In this method, dumps are indiscriminately located provided land is available, without concern for safety, health hazards, and aesthetic degradation. Such open dumps according to Botkin and Keller (1998) created a nuisance by being unsightly, providing breeding grounds for pests, creating a health hazard, polluting the air and sometimes polluting groundwater and surface water. Unfortunately, this method of waste management is still common in some parts of the world, especially developing countries including Nigeria.

The increasing perception of some classes of waste as being hazardous led to the development of other management techniques such as the concentrate and contains method. This practice however revealed that containment was not always achieved. There have been reported cases of leakages or breakage of some of the containers used for this purpose, which have allowed waste to escape causing serious health and ecological disaster.

The current knowledge of the public on the value of a healthy environment for human survival and ecological balance; and the perceived hazards related to inadequate waste management have led to the evolvement of the modern trends of waste perception and management.

3.2 Modern Trends of Waste Perception and Management

As the public perception of the value of the environment for human survival and optimal functioning of the ecosystems continue to grow, better waste disposal technologies are developed. The era of simply dumping and burning of waste is no longer an acceptable practice because of its inherent health implications. The modern trend in waste management is to perceive waste as resources out of place. Recall in our introduction, we did say that waste vary in space and time. Instead of the throw away habit, emphasis is currently been put on how waste can be turned a resource-something which is of value to man. This current emphasis has led to several successful waste management programmes in some parts of the world. An example of such programme is the “waste to wealth” concept, where for instance waste is converted to energy for power supply.

The modern perception of waste as a resource out of place has led to the current concept of waste management called the integrated waste management (IWM) approach.

3.2.1 Integrated Waste Management (IWM)

Integrated waste management can be defined as a set of management alternatives, which can be comprehensively integrated to compliment and strengthen the observed inadequacies of a single management method. The set of management alternatives include reduce, reuse, recycle, landfill, incineration and composting.

3.2.1.1. Reduce, Rescue and Recycle

Enger and Smith (2002) noted that the most fundamental way to reduce waste is to prevent it from ever becoming waste in the first place. Waste prevention, also known as source reduction, is the practice of designing, manufacturing, purchasing, or using materials (such as products and packaging) in ways that reduce the amount or toxicity of trash created. Reusing items is another way to prevent waste at the source because it delays or prevents the entry of those items into the waste collection and disposal system (Enger and Smith, 2002).

Waste reduction and reuse have many inherent advantages, Miller (1998) stated that wastes reduction extends resource supplies, keeps high-quality matter resources from being reduced to low-quality matter waste, and reduces energy use and pollution even more than recycling. In addition, it reduces costs associated with recycling, composting, landfilling and incineration. It should be noted however, that waste is not just created when consumers dispose of any product. Throughout the life cycle of a product fro extraction of raw materials, to transportation, to processing manufacturing and use-waste

is generated. Reusing items or making them with less materials decreases waste significantly. Ultimately, fewer materials will need to be cycled or sent to landfills or waste combustion facilities (Enger and Smith, 2002).

Recycling as an integral part of the integrated waste management approach is concerned with the identification of resources in the waste stream that may be collected and reused. The ultimate aim of the three R's (reduce, reuse and recycle) is to reduce the amount of waste to be disposed in landfills, incinerated or compost.

Some of the strategies that can be adopted to reduce waste and pollution according to Miller (1996) include decrease consumption; redesign manufacturing processes to produce less waste and pollution; individuals should use less hazardous cleaning products; products should be design to last longer; eliminate or reduce unnecessary packaging; and green design and life-cycle assessment can help develop products that are easy to repair, reuse, remanufacture, compost, or recycle. Even with an effective and efficient practice of the three R's, waste will still be generated. The generated waste has to be disposed off either through composting, incineration or landfill.

3.2.1.2 Landfill

Landfill is still one of the modern methods of the final disposal of solid waste. Modern landfills are referred to as sanitary landfills because they are designed to concentrate and contain refuse without causing nuisance or hazard to public health or safety. The strategy is to confine the waste to the smallest practical area, reduce it to smallest practical volume, and covers it with a layer of compacted soil at the end of each day of operation or more frequently if necessary.

A modern landfill is normally situated in an impermeable clay layer that is lined with an impermeable membrane. For the selection of an appropriate site, consideration must be given to the soil type, groundwater geology and the local community effect. Because of the earlier associated effects of landfills resulting to groundwater pollution, the new ones correctly constructed have complex bottom layers to trap contaminant-laden water, called leachate, leaking through the buried trash. In addition, monitoring systems are necessary to detect methane gas production and groundwater contamination. In some cases, methane produced by rotting garbage is collected and used to generate electricity (Enger and Smith, 2002).

Sanitary landfills offer some benefits. For instance, it helps to prevent pollution caused by open air burning and to large extent groundwater pollution, if the location of the site is adequate. In addition, it can be put into use quickly, with low operating cost. An added advantage is its capacity to handle large volume of solid waste. Miller (1998) noted that after a landfill has been filled, the land can be graded, planted and used as a park, golf course, ski hill, athletic field, or wildlife area, or for some other recreational purposes.

3.2.1.3 Incineration

This is another method of waste management, where waste is burn in incinerators at very high temperatures (900-1000^{0}c), to consume all combustible material, leaving only ash and noncombustibles to dispose of in a landfill. Under deal conditions, incineration may reduce the volume of waste by 75% to 95%. In practice, however, the actual decrease in volume is closer to 50%, because of maintenance problems as well as waste supply problems (Botkin and Keller, 1998).

The newest form of incineration is called mass burn, which is an European concept. In this technique, the waste is fed into a furnace, where it falls onto moving grates and is burned at temperature up to 1300^0C. The burning waste heats waster, and the steam drives a turbine to generate electricity, which is then sold to a utility (Enger and Smith, 2002).

The major limitations surrounding the use of incineration method of waste management are the high cost of setting up, associated air pollution, and aesthetic concerns.

3.2.l.4 Composting

Botkin and Keller (1998) defined composting as a biochemical process in which organic materials such as lawn clippings and kitchen scraps decompose to a rich, soil-like material. It is a process of rapid, partial decomposition of moist, solid, organic waste by aerobic organisms. With proper management of air and moisture, the compositing process can transform large quantities of organic material into compost over a relatively short period of time. This method of waste management is a popular technique in Europe and Asia, where intense farming creates a demand for the compost (Botkin and Keller, 1998).

The major challenge of this method is the need to separate organic material from other waste. As an important component of the integrated waste management approach, its impact will certainly grow in future because the composting process of waste management is environment friendly.

Self Assessment Exercise

Do you think waste perception affects its management? Explain

4.0 Conclusion

The changing perception of waste over time, and the further appreciation of the environment as key to human well being, has led to the evolvement of different waste management techniques. From the early stage of dilute and disperse to the current emphasis on integrated waste management, efforts have been to achieve minimal environmental impacts.

The current perception of waste as resource out of place has help in turning what was earlier perceived as waste to wealth. This has gone a long way in reducing the volume of waste left for disposal. It has also help in wealth creation and reduction in resource depletion. It is expected that in no distant future, better waste management technologies will be developed, more people and industries will embrace the concept of reduce, reuse and recycle. This will help to reduce the current challenges of waste management being experienced all over the world

5.0 Summary

- During the pre-industrial revolution waste generation was low and perceived as less hazardous compared to post World War II. These led to the adoption of the dilute and disperse method of waste management.
- The further perception of the environment as key to human well being led to the search and development of better waste management techniques, such as incineration, sanitary landfills, composting, reduce, reuse and recycle, which is generally termed as integrated waste management.
- The current perception of waste as a resource out of place has help in waste reduction and wealth creation.

6.0 Tutor Marked Assignment

(1) Waste is currently perceived as a _____

(2) Waste vary in _____ and _____

(3) The pre-industrial revolution waste management technique is called _____ and _____

(4) The three Rs of integrated waste management are _____, _____ and_____

(5) Which of the following is not a method of waste management?

(a) composting (b) incineration (c) recycling (d) none of the above

(6) Which of the following is not true of landfill method of waste management.

(a) there is no production of leachate (b) low cost of establishment (c) accommodates large volume of solid waste (d) none of the above

7.0 References / Further Reading

Botkin, D. B. and Keller, E.A. (1998). *Environmental Science: Earth as a Living Planet.* Second Edition. John Wiley and Sons, Inc.; New York.

Enger, E.D. and Smith, B.F. (2002). *Environmental Science: A Study of Interrelationships*. Eight Edition McGraw-Hill Education.

Miller, G.T. Jr. (1998). *Sustaining the Earth. An Integrated Approach. Third Edition.* Wadsworth Publishing Company, Belmont

UNIT 5: ENVIRONMENTAL PERCEPTION AND RENEWABLE ALTERNATIVE ENERGY SOURCES

Contents

1.0 Introduction

Our current major source of the energy supply in the world is fossil fuel, which principally comprises of crude oil, natural gas and coal. Over the years, there has been a growing concern over the use of fossil fuel as our primary source of energy supply because of its environmental impact. The opposition to the use of fossil fuel has increased in recent years since the perception that the burning of fossil fuel is responsible for the increase in carbon dioxide – which have been implicated in the global warming debacle. In addition, the non renewable status of fossil fuel has increased the fear of sudden exhaustion, which informed the need for an alternative energy source.

The outcry has resulted in the development of alternative energy sources. These alternative sources are classified into two-renewable and non renewable energy sources. Non renewable alternative energy sources include nuclear energy and geothermal energy. While the renewable alternative include solar, wind, water and biomass energy sources.

The discussion in this unit shall however, be restricted to renewable alternative energy sources because of their potentials to be used without exhaustion. The discussion shall examine the perceived environmental relationship of each of the identified renewable alternative energy sources on the environment.

2.0 Objective

The learning objectives are as follows:

(1) To list the major sources of energy supply

(2) To assess the impact of solar energy on the environment

(3) To assess the impact of wind energy on the environment

(4) To assess the impact of water energy on the environment

(5) To assess the impact of biomass energy on the environment.

3.0 Main Content

3.1 Solar Energy Source and the Environment

Solar energy is the energy derivable from the sun. The amount of solar energy reaching the earth surface is very high however; the distribution over the earth surface is highly variable. This is dependent on the time of the year, cloud cover, topography, latitude and other local factors.

In spite of its variability, there is an increasing use of solar energy in some parts of the world. Solar energy is being used directly through passive or active solar energy systems. The passive system of solar energy does not involve the use of any mechanical power system. Instead, it is usually based on architectural building designs that take advantage of the natural changes of solar radiation reaching the earth surface, which occur throughout the year. The architectural designs help in maximizing the solar energy absorption capacity of the building during winter to heat up the rooms, while during summer the usual high-angle sunlight is prevented from entering the building to heat up the rooms with the aid of constructed overhangs on the building. Another passive method that is also popularly used is to construct building walls with materials that have a high rate of solar energy absorption, which are then emitted into the rooms.

On the other hand, Botkin and Keller (1998) noted that active solar systems require mechanical power, usually pumps and other apparatuses, to circular air, water, or other fluids fro solar collectors to a heat sink, where the heat is stored until used. Solar collectors are usually flat panels consisting of a glass cover plate over a black background where water is circulated through tubes. Short-wave solar radiation enters the glass and is absorbed by the black background. Longer wave radiation is emitted from the black material, but it cannot escape through the glass, so it heats the water in the circulating tubes to between 38^0c to 93^0c. This system is similar to the green house effect.

Studies have revealed that the use of solar energy has a lower negative impact on the environment and human health when compared to the use of fossil fuel. Since the use of solar energy does not involve the burning of fuel, which releases carbon-dioxide into the atmosphere, thereby contributing to global warning, has made it a preferable alternative to

fossil fuel. Another advantage of solar energy, just like other renewable alternative energy sources is, that it is not exhaustible. That is, it can be used over and over again.

As earlier noted one of the major drawbacks in the use of solar energy is its variability and dispersed distribution. Hence, a large area is needed to generate a large amount of solar energy. This problem can however be tackled by combing solar collectors with existing structures, as with the addition of solar hot-water heaters on the roofs of existing houses. Though it is recognized that the rate of pollution of the environment is minimal with the use of solar energy, when compared to fossil fuel however, the increasing development of active solar energy systems may lead to an increase pollution of the environment. We had earlier mention that the development of active solar system requires the use of mechanical power system. And the development of these mechanical power systems require the use of a variety of materials, such as metals, plastics, fluids, amongst others, which can cause environmental pollution, by producing toxic waste or by accidentally releasing toxic materials. This threat to pollution is not associated with passive solar energy systems that use water and rock.

The variability of sunshine on the earth surface has made solar energy to be site specific. Therefore, detailed observation in the field is necessary in order to have an informed knowledge of the likely potentials of solar energy present in a particular location. In other words, not all locations can yield the required amount of sunshine to warrant the establishment of a solar energy plant. In addition, some of the solar energy units such as solar power tower have a great impact on the land, because the construction requires a wide expanse of land, where the power tower and the surrounding mirror modules are located. The impact of solar energy systems can be minimized by locating centralized

systems in areas not used for other purposes and by making use of dispersed solar energy collectors on existing structures wherever possible (Botkin and Keller, 1998).

One of the reasons that account for the low useage of solar power has to do with its cost in relation to the cost of fossil fuel. In addition, the efficiency of the conversion of solar energy to electricity is still very low, contributing to the high cost of electricity generation. With further development in solar power technologies, with emphasis on large scale production at reduced prices, couple with increasing price of fossil fuel, solar energy will be competitive and economically attractive.

3.2 Wind Energy Source and the Environment

Wind energy is the energy derivable from moving winds. Winds are formed due to solar heating of the earth surface. The uneven heating of the earth surface produces air masses with varying heat contents and densities, which stimulus wind action. The potentials for wind energy is enormous, but unfortunately, just like in solar energy, its distribution varies significantly over space, time and intensity. In spite of this obvious limitation, wind energy has been put to several uses over the years. Such uses include pumping of water, propelling ship, and generation of electricity. Wind energy as a renewable energy resource can be used over and over again.

Wind energy is perceived as a green energy source because to a very large extent it is free of land, air and water pollution. Its development does not require the release of greenhouse gases or ozone depleting substances into the atmosphere. It also does not emit any dangerous pollutant to water bodies or the land. Furthermore, it does not have any significant negative impacts on the ecosystems where it is established.

Although wind energy is eco-friendly, it has its own limitations and impact on the environment. Its variability in terms of space, time and intensity, has been one of its limiting factors in its development. This is why its development is site specific, and can only be located were the potentials for wind movement in required intensity and duration is available. For this reason, areas which may be in dire need of this energy source may not be able to tap into its potentials, if the wind requirement in the location does not meet the required criteria for its establishment.

A major environmental impact of wind energy source is noise pollution. Studies have shown that windmills produce high level noise, which may be of serious discomfort to people leaving close to the site location. Apart from associated discomfort, such noise may probably affect the sense of hearing of the affected people. Researches have also revealed that windmills can interfere with both radio and television signals. The interference may course distortions in the social communication network. Added to the above limitation is the impact it has on the aesthetic quality of the area where it is located. Similarly, the development of wind energy as a source of electricity generation requires a large expense of land, which may not be available or where available, may encroached into other land uses, such as farmland, roads etc.

The rate of bird kill might likely increase in windmills locations. Birds such as falcons and hawks are highly vulnerable because they tend to move freely in the open sky for hours, and can easily be hit and killed by the rotating blades of the windmills.

In spite of the associated limitations of windmill, it is still perceived as a better alternative to fossil fuels because of its limited environmental impacts. The challenge now, is to

develop the technology to enhance the efficient use of wind energy and reduce its cost to make it more economically competitive.

3.3 Water Energy Source and the Environment

As noted above, water energy is also a renewable alternative source of energy. Water energy is energy derivable from the force of moving water, which is driven by the sun. The energy potentials of water have since been recognized and tapped by man dating back to the Roman Empire. Water energy have been used to power machineries, grain mills, sawmills, and currently heavily used for generation of electricity all over the world.

As common with other alternative sources of renewable energy discussed above, water energy potentials are not uniformly distributed on the earth's surface. Hence, their exploitation are only limited to areas where their potentials are available. Water power as a source of energy is also perceived by many people as environment friendly, just as both wind and solar energies. Botkin and Keller (1998) stated that water power is clean power; it requires no burning of fuel, does not pollute the atmosphere, produces no radioactive or other waste, and is efficient.

In spite of the advantages of the use of water power mentioned above, there are however certain negative environmental impact. Notable amongst which, are effects on stream biota and its productivity, sediment build up behind dams, and direct impact on fish lives. Studies have shown that water falling over high dams is most likely to pick up nitrogen gas, which is very harmful to fish. When the nitrogen gas gets to the blood of the fish, it expands and kills the fish. This situation impact on the fish population and has the potential of affecting the aquatic ecosystem. Similarly, the continuous growth in the

development of micro-hydropower plants has a combined effect on natural stream flow, with negative impact on stream biota and productivity. The establishment of these hydropower plants distorts or disturbs the natural balance of the environment, with affects on aquatic lives. In addition, dams tend to trap sediment that is being transported to the sea, which normally would have replenished the sand on beaches.

3.4 Biomass Energy Source and the Environment

Biomass energy is energy obtainable from plant materials (e.g. firewood) animal waste (dung) and peat – compressed dead vegetation. Before the discovery of fossil fuel, man depended heavily on biomass as a source of energy for heating, cooking etc.

Biomass energy can be obtained directly by burning firewood or cattle dung. Firewood can also be converted to charcoal and later burn to obtain energy. Combustible urban waste is also processed to generate electricity.

According to Botkin and Keller (1998), more than 1 billion people in the world today still use wood as their primary source of energy for heat and cooking. Energy from biomass may take several routes; direct burning of biomass either to produce electricity or to heat water and air; heating of biomass to form a gaseous fuel (gasification), or distillation or processing of bio-mass to produce biofuels such as ethanol, methanol, methane, or bio-crude.

One of the major limitations of biomass as an energy source is its low net energy yield, compare to other sources of energy such as fossil fuel and water.

The perception that biomass fuel can cause land degradation and air pollution has affected their preferences as an energy source. Burning of wood and urban waste releases carbon dioxide into the atmosphere, which contributes to global warming. Smoke produced from the burning of biomass has the potentials of causing respiratory track infections.

Biomass fuel may not be economically used in semi-arid or arid regions of the world, where forest resources are in short supply. Even in regions, with rich forest, if their use is not sustainable, it may result to forest depletion with dire environmental consequences. Such consequences may include and not limited to soil erosion, lost of biodiversity and destruction of animal habitat.

If the problem of forest depletion can be replaced with sustainable forest management, it will enhance the perception of biomass fuel as a dependable energy source. Some proponents of the use of biomass fuel argued that the use produces less carbon dioxide and other pollutants such as sulfur dioxide and nitrogen oxides, compared to fossil fuel. And that if biomass fuel replaces fossil fuel, the net carbon dioxide in the atmosphere will significantly reduce.

Self Assessment Exercise

Do you agree that renewable alternative energy sources are preferable to fossil fuel?

Explain

4.0 Conclusion

The perception of the associated environmental impacts of the use of fossil fuel as the world's major source of energy, has led to the search for alternative sources of energy

supply. The attention of environmentalists has focused on renewable alternative sources of energy supply, such as solar, wind, water and biomass. One of the major attractions of these energy sources are their potentials for renewal. Furthermore, they have minimal impact on the environment. For instance their uses except biomass do not release carbon dioxide (a major greenhouse gas) into the atmosphere.

In addition, some of the associated environmental impacts of the renewable alternative energy sources can be minimized or eliminated with sound practices and improved technology. From the above discussions, one may conclude that the future looks bright for the use of the alternative sources, most especially as fossil fuel gets depleted resulting to higher prices.

5.0 Summary

- Fossil fuels are currently the major source of world energy supply. However, their environmental impact and non renewable status has led to search for alternative energy sources.
- From an environmental perspective, environmentalists and other stakeholders are advocating for the further development and use of solar, wind, water and biomass as alternative energy sources, because they are perceive as environment friendly.

6.0 Tutor Marked Assignment

(1) The current major sources of energy supply in the world is _____

(2) Alternative energy sources are classified into _____ and _____ energy sources.

(3) Energy obtainable from plant materials and animal waste is called _____

(4) Which of the following sources of energy releases the highest amount of pollutant into the atmosphere?

(a) biomass (b) water (c) fossil fuel (d) peat

(5) Which of the following factors influence the amount of solar radiation received in a particular area?

(a) topography (b) cloud cover (c) latitude (d) all of the above

(6) One major common disadvantage of all the natural alternative energy sources is

(a) not evenly distributed (b) limited in potential (c) may be depleted if not well used (d) none of the above

7.0 References / Further Reading

Botkin, D.B. and Keller, E.A. (1998). *Environmental Science. Earth as a Living Planet. Second Edition*, John Wiley and Sons Inc, New York.

Pennington, I. (2008). Solar Energy and the Environment. http://ezinearticles.com/?solar-energy-and-the-environment&id=1346102 04/08/2011.

Spurgeon, C.H. (2010). Renewable Power. www.renewablepowernews.com/ archives/973. 04 /08 /2011.

ANSWERS TO TUTOR MARKED ASSIGNMENTS

MODULE I

Unit1: Components of the Environment

(1) Hydrosphere, Lithosphere, Atmosphere and Biosphere

(2) Biosphere

(3) Igneous, Sedimentary and Metamorphic

(4) (c) Troposphere

(5) (a) Mesosphere

(6) (d) Autotroph

Unit 2: Man-Environment Relationship

(1) Environmental Determinism

(2) Environmental Possibilism

(3) Climate

(4) (b) Germany and France

(5) (a) Ellen Semple

(6) (d) None of the above

Unit 3: Man and the Lithosphere

(1) On-site effect

(2) Construction

(3) (d) None of the above

(4) (c) Exploitation rights

(5) (d) Increase the rate of afforestation

(6) (c) Control grazing of grassland causes soil erosion

Unit 4: Man and the Hydrosphere

(1) Water Pollution

(2) Point and non point sources

(3) Landfill method

(4) (c) Ocean is the largest source of freshwater

(5) (d) It can lead to increase in evaporation

(6) (b) It can affect human health

Unit 5: Man and the Atmosphere

(1) Ozone depletion

(2) Pollutant

(3) Global warming

(4) Oxygen

(5) (d) All of the above

(6) (c) CFCs

MODULE 11

Unit 1:The Concept of Perception

(1) Perception

(2) Constancy

(3) Hearing, vision, touch, smelling and tasting

(4) Visual system

(5) (b) Touch

(6) (c) Gustatory calyculi

Unit 2:Perceptual Process

(1) Distal

(2) Stimulus

(3) Attended Stimulus

(4) (b) Transduction

(5) (c) Neutral pattern

(6) (d) All of the above

Unit 3:Factors Affecting Perception

(1) Internal and external

(2) Absolute threshold

(3) External

(4) (b) Sensory limit

(5) (d) All of the above

(6) (c) Stimulus

Unit 4:The Objective and Perceived Environment

(1) Objective

(2) Appearance

(3) Veridical

(4) (b) Illusory

(5) (a) Hue

(6) (d) All of the above

Unit 5:Perception and Formation of Environmental Images

(1) Cognition

(2) Cognitive process

(3) Brain

(4) (d) All of the above

(5) (c) They are similar to the natural images

(6) (b) Perception and cognition

Module III

Unit 1:Cognitive Development

(1) Schemas

(2) Assimilation

(3) Sensorimotor

(4) (a) Formal operational

(5) (b) 2-6 years

(6) (c) Pre-operational

Unit 2:Environmental Perception and Decision Making

(1) Environmental perception

(2) Decision making

(3) Decision frame

(4) (d) None of the above

(5) (b) Action

(6) (a) Perception has little or no impact in the process

Unit 3:Perception and Environmental Resource Management

(1) Resource

(2) Natural and Human

(3) Neutral stuff

(4) (c) Development

(5) (c) All resources are renewable

(6) (d) All of the above

Unit 4:Waste Perception and Management

(1) Resource out of place

(2) Space and time

(3) Dilute

(4) Reduce, reuse and recycle

(5) (d) None of the above

(6) (a) There is no production of leachate

Unit 5:Environment Perception and Renewable Alternative Energy Sources

(1) Fossil fuel

(2) Renewable and non renewable

(3) Biomass

(4) (c) Fossil fuel

(5) (d) All of the above

(6) (a) Not evenly distributed