

S.5 GEOGRAPHY PAPER 1
HOLIDAY WORK TERM 3 2024

Instructions

Copy all the notes

Leave spaces for the diagrams

Answer the questions below the notes

LAKES

A lake is a depression/ hollow in the earth's crust filled with water. They vary in size from small lakes to very large ones. Lakes are usually classified according to their mode of formation into lakes that are formed by faulting, man, warping, volcanicity, erosion deposition, mass wasting and many others.

Most lakes of East Africa are to a great extent formed by tectonic movements of faulting, volcanicity and warping.

Types of lakes

1.Lakes formed by faulting.

- Graben lakes/ rift valley lakes. They occur after the rift valley has been formed by tensional and compression forces. After its formation, secondary faulting occurs on the floor of the rift valley. Part of it is down faulted at a lower level than the rest of the floor to form a depression.
- When it's filled with water from rivers or rain, a rift valley lake is formed. They are characterized by being long, deep and narrow. Examples include Magadi, Albert, Edward, Tanganyika, Malawi, Nakuru, and Turkana
- Sometimes faulting is accompanied by tilting of the land on one side to form a tilt block. Water may collect at the base of the tilted block to form a tilt block lake like Ol-Bolossat in Kenya.
- Back ponded lakes. They are formed when uplift occurs across the river and water gathers behind the barriers. The gathered water forms a lake like Lake Kijambarola.

Diagrams

2. Lakes formed by down warping

Warping is the gentle bending of the earth's crust upwards known as up warping or downwards (down warping)

In East Africa, down warping occurred in central Uganda. Underneath the earth's crust there are sinking convectional currents which pull the land downwards. Down warping occurred to form two large depressions/ down warped basins.

At the same time in western Uganda, tectonic movements caused a reversal in the drainage of rivers. River Kafu reversed its drainage and flowed back filling its one of the depressions to form Lake Kyoga. River Kagera and Katonga also reversed their flow and filled the second down warped basin to form Lake Victoria. Such lakes are characterized by being irregular in shape, have many inlets and bays, are shallow and have swampy shore lines.

Diagram

3. Lakes formed by volcanicity

- Lava dammed lakes. When a volcanic eruption occurs in an area, the lava may flow out and block the course of a river. The lava dams the river/ ponds back the water to form a lake which is the same shape as the valley like lakes Bunyonyi & Mutanda in western Uganda.
- Explosion Crater Lake. It's formed on the ground and not on top of a volcanic cone. It occurs when an explosive gaseous eruption blows through the country rock to create a depression surrounded by a low rim of fragments. When it's filled with water, an explosion crater lake is formed. Like lakes Katwe, Nyamunuka, Munyanyange, all in western Uganda.
- Caldera lakes. A caldera is a very large depression found on top of a volcanic mountain and is formed by either explosion or subsidence. It's formed when the top of an existing volcanic cone is blown off by a gaseous eruption to create very large depression known as a caldera. When it's filled with water, a caldera lake is formed. Like on top of mount Longonot, Menengai and Suswa calderas in Kenya. Lake Ngozi in Tanzania.
- Crater lakes. They form on the summit of an extinct volcano. When the top of a volcano is blown off a depression is left behind. When filled with water, a crater lake is formed. Like on top mount Kilimanjaro.

Diagram

4. **Lakes formed by glaciations**

- Corrie/cirque lakes/ tarns. These are formed where depressions exist on the sides of glaciated mountains. The depression is filled with ice and is widened and deepened through the process of frost action and plucking. When the ice moves out a circular arm chair shaped depression is left behind. When filled with water a corrie lake forms. Like lac du Speke on mount Ruwenzori.
- Moraine dammed lakes. It's formed its formed where terminal moraine from a glaciated blocks a glacial valley. Melt water from the ice is trapped behind the moraine barrier and accumulates to form a lake. Like lac Gris on mount Ruwenzori and lake Tyndall on Mount Kenya.
- Rock basin lakes. Sometimes glacial erosion occurs on the floor of a U shaped valley to form an irregular depression. When a glacial moves away it may be filled with water to form a lake.
- Kettle lakes. They form from the retreat of glacial when big glacial are buried, they melt and sink overlying material forming a lake like Mahoma lake on mount Ruwenzori.
- Ribbon lakes. They are formed when rapid glacial erosion on weak rocks forms a depression that is later filled with water from fluvial glacial streams forming a lake like Lake Noir on Mount Kenya.

Diagram

5. **Lakes formed by man.** They are formed in several ways.

- Sometimes man constructs a concrete dam across a river valley. A reservoir is created upstream when the water accumulates and a lake is formed. Like the reservoir on river Kibimba in Eastern Uganda.
 - When old quarries are abandoned and are filled with water to form small lakes.
 - Sometimes man constructs numerous ponds which are used for fish farming like at Kajjansi.
 - The Kabaka's lake is also an example of a man made depression which was filled with water.

Diagram

6. **Lakes formed by wave deposition (lagoon).** These are lakes formed at the coast of lakes or oceans which have inlets or bays. Wave deposition leads to the formation of a bar across a bay at the coast. The water enclosed behind the bar forms a lake. Like Lake Nabugabo was formed when a bar cut off one of the bays of Lake Victoria.

The formation of coral reefs at the coast, barrier and fringing reefs also lead to the formation of lagoon lakes between the land and the reef.

Diagram

7. **Lakes formed by river deposition.** River erosion may lead to the formation of a very pronounced meander in the lower course of a river. When the river floods it may flow straight across to form a new straight course. River deposition then seals off the ends to form an oxbow. When the water remains in it, an oxbow lake is formed like along river Tana, Nyando, Nzoia and river Rwizi in western in Uganda.

Diagram

8. **Landslides** can block the course of a river leading to the formation of temporary lakes like river Mbaka which lasted for 8 hours after a landslide in Tanzania.
9. **Solution lakes.** They are formed in a depression created by the solvent action of water against soluble rocks like the ones found in Nyakasura limestone areas.

Importance of lakes to man

- Lakes are used for fishing
- Lakes can be used for transport
- Lakes provide water for both domestic and industrial purposes
- Lakes contribute to the formation of convectional rainfall

- Lakes provide minerals like salt, sand, soda ash and oil
- Lakes are tourist attraction like beaches on lake Victoria
- The lake sand is used as construction materials
- Papyrus swamps around lakes provide material for hand craft industry like around Lake Kyoga.
- They provide water for irrigation
- Lake Victoria acts as a reservoir for the generation of HEP
- Swampy areas along lakes provide unhealthy conditions like mosquitoes
- Low lying areas around lakes sometimes flood and destroy crops and property.
- Storms which occur on lakes destroy lives when accidents happen
- Lakes hinder the construction of communication like roads and railways which have to go round them
- Salty lakes like Katwe and Magadi cannot be used for domestic purposes

Revision question

1. UNEB 2011 QUESTION 4

GLACIATION

This is the process by which glaciers shape the earth's surface. Or it can be defined as the work accomplished by moving snow and ice. Glaciation is an important process which has affected the landscape in the mountainous areas with snow and ice. In East Africa, glaciation is taking place on mountains like Kilimanjaro, Kenya and Rwenzori.

Snow and ice can permanently occupy areas where;

- Temperatures drop to below freezing point such that snow and rain freezes to form ice.
- Areas which are highlands or mountains which rise above the snow line. In east Africa, the snow line starts at 5000m while in the temperate areas snow and ice can even form at sea level.
- It also exists in areas where snow falls (snow accumulation during winter) exceeds snow wasting during summer.

Glaciation is one of the denudation forces which takes place on top of the earth's surface. Glaciers pound the rocks as it passes over them or the materials being carried by the glaciers. This creates both glacial erosion and deposition features.

In east Africa, glaciation can only take place on very high mountains that rise above the snow line at 5000m namely mountain Rwenzori, Kenya and Kilimanjaro. On mountain Rwenzori, there are 37 glaciers e.g. stanely, speke, Bujjuku, Mubuku, Edward, Backer, Moore etc.

Mountain kenya has the second largest coverage of glaciers and best examples here include lewis, Gregory, krapf, dawin, tyndal, ford, diamond, heim etc.

On mountain Kilimanjaro glaciers include kibo, great penk, furt wangler etc.

A GLACIER

A glacier is a mass of moving ice which moves down slope along a pre-existing river valley under the influence of gravity. Glaciers move continuously from higher to lower ground and is enclosed within valley walls.

Formation of glaciers.

When the temperatures in an area fall below 0° , water vapor in the atmosphere condenses to form snow. The snow accumulates in pre glacial hollows. Under pressure, the air in it escapes melting and freezing occurs. Further compaction expels all the air and the bottom layers are compacted into ice. With time under the influence of gravity, the ice moves out of the hollow and is now known as a glacier.

Illustration

Glaciers can retreat or advance depending on the balance between winter accumulation and summer wastage.

Types of glaciers

- a) **Valley glaciers**; these are formed on highland or mountain peaks and upper valleys of mountain ranges. Valley glaciers move by sliding over the rock surfaces. Friction with the ground produces heat that in turn melts ice and helps to lubricate the sliding process.
- b) **Lowland glacier**; this is a glacier found in colder and higher latitude mainly between 60° latitudes and the poles. They are mostly found in Greenland, Arctic and Antarctica

Moraine

Is the material that is transported and deposited by the moving ice or glacier. Its composed of rocks, gravel, sand and huge boulders. Moraine carried at sides is called lateral moraine, moraine called in the middle is called medial moraine and the moraine at the top is debris called as terminal moraine.

Illustration

Snowline

Is the height above which is always permanent snow or above which snow doesn't melt. In east Africa it is found at 4700m above the sea level, Greenland it's at 650m and at the poles it's at any height above sea level.

REASONS FOR LIMITED COVERAGE OF GLACIERS IN EAST AFRICA

Latitudinal location of east Africa

Latitude refers to the distance from the equator. East Africa lies along or astride the equator at approximately 5 degrees north and south of the equator. For this reason, whether the apparent overhead sun shifts north or south, the angle of incidence of the solar rays is still small. So the sun rays strike the earth's surface at a wide angle and at a short distance hence ensuring maximum solar heating throughout the year. This implies that the temperatures in east Africa are high throughout the year. Therefore, its only in highland areas which rise above the snowline where temperatures drop to below freezing point that enables glaciers to form. However, these are very few areas where temperatures can drop below zero degrees hence limited coverage.

Altitude

East Africa lies on a raised plateau rarely rises above 3000m above sea-level. So very few areas in East Africa rise to the current snowline of 4800m above sea level hence the limited coverage of glaciers in East Africa.

Precipitation

East Africa generally receives moderate rainfall of between 1000 to 1500mm per annum. This is just sufficient to sustain life. However, glaciers form in areas where temperatures drop below freezing point and with torrential rainfall.

Mountain Rwenzori has the highest number of glaciers although it's the shortest among the three glaciated mountains in east Africa. However, it receives cool moist winds from Congo basin and the Atlantic Ocean which are forced to rise, cool and condense to form clouds hence giving torrential rainfall and very low temperatures hence glacier formation.

The highest is mountain Kilimanjaro but with the smallest coverage of glaciers due to the influence of the warm dry winds which brings about a warming effect and low rainfall.

Global warming

The world temperatures have been rising with time and this is attributed to human activities like burning fuels e.g. coal, oil and natural gas which increases carbon-dioxide concentration in the atmosphere and other greenhouse gases. These gases absorb a lot of heat from the sun during day and prevent heat loss at night (they act as a blanket). This accounts for the increase in the global temperatures by 2.5°C. this increase in temperature has led to the melting away of glaciers to the point of extinction of some glaciers e.g. the sempaya glaciers on mountain Rwenzori.

Aspect

This refers to the angle at which the slope receives the sun's insolation. East Africa lies between the tropics and therefore experiences direct over sun throughout the year. This implies that all

slopes of the mountain are subjected to at least 10 hours of great sunshine a day without any sheltered slope or obstructed slope to enable glacier formation.

All the precipitation received in east Africa is in form of rainfall but not snow. This also explains the little coverage. In the few areas where temperatures drop to below freezing point, rain water has to be first frozen to ice which is a long process.

Impact of volcanism

Some of the high mountains where glaciation would have taken are volcanic in nature. The temperatures in these mountains are high due to the hot interior which brings about the warming effect on the surroundings. This is therefore preventing glacier formation.

LANDFORMS RESULTING FROM GLACIAL EROSION

Glacial erosion occurs through the following processes;

Plucking

It is the tearing away of the blocks of rocks which have become frozen into the sides and bottom of a glacier (glacial depressions).

Abrasion

It's the wearing away of rocks underneath a glacier by the swirling of rocks embedded in glaciers. In this process, the glaciers use the materials being carried or transported as the grinding tool which is used to break up rocks along the floor and sides of the glacier trough. The flow is swapped and polished creating deep grooves deepening the valleys on the relative hardened rocks and that of the rock floor.

Sapping

This involves the breakup of rocks by alternate freezing and thawing of water at the bottom of cracks between a mass of ice on the sides and floor of a valley or the side of a mountain.

GLACIAL EROSION FEATURES / GLACIAL UPLAND FEATURES

CIRQUES/CORRIE

These are semi-circular steep sided rock basins which have been cut into the sides of a glaciated mountain. It is formed when water enters the rocks and freezes breaking them down. The joints become enlarged. Abrasion drags the debris over the rock floor deepening the depression, back wall cutting or recession also enlarged the depression as well as steepening the sides. Plucking also steepens the cirque, when filled with water, it forms a tarn (lake) such as teleki and mawenzi on mountain Kenya and Kilimanjaro respectively. Others are Lac du Noah, Lac du Catherin and Lac du vent on mountain Rwenzori.

Illustration

Pyramidal peak /horn

This is a jagged peak formed by the steepening of the back walls of several cirques which lie on the sides of a glaciated mountain. Two or more cirques cut back into the original mountain sides leaving an isolated peak called a pyramidal peak. These peaks become shaped by frost action. Examples include Kibo, Mawenzi on mountain Kilimanjaro and Margarita peak on mountain Rwenzori.

Illustration

Arête

This is a sharp knife like feature or narrow ridge in between two or more cirques on the mountain sides. It's formed when two or more cirques erode backwards (back to back) in the process of head wall recession. The wall between the cirques collapses by sapping. Best examples can be seen on my Rwenzori from Mount Backer up to Bujuku Valley and Point John and Midget peaks on mountain Kenya.

U-shaped valleys or glacial troughs

These are broad flat bottomed steep sided valleys with an open U shape in the cross profile. These were usually former river valleys which are filled by glaciers. Through the process of abrasion, plucking and sapping, the valley floor and sides were worn away hence deepening and widening the valley. So the valley is changed from a V-shape to an open U-shape hence its name. Within this widened valley or trough are a number of other landforms for example rock steps, moraine materials etc.

Examples of U shaped valleys include Mubuku valley, Bubusu Valley and Komusonso valleys on mountain Rwenzori, Hobley and Teleki valleys on mountain Kenya and the Karanga through on mountain Kilimanjaro.

Illustration

Hanging valley

These are small narrow short and V-shaped valleys found in highland areas through which river glaciers from the cirque pass. Hanging valleys are tributary valleys of the U-shaped valleys joining the U-shaped valleys at vertical slopes forming water falls at that point. For example, Nithi river is joined by the little Nithi from a hanging valley on mountain Kenya.

Truncated spurs

Interlocking spurs of a former river valley are cut off by lateral erosion resulting from accumulated glaciers in the valley forming a U-shaped valley with truncated spurs instead of interlocking spurs for example around Mubuku and Bujuku Valleys on mountain Rwenzori.

Rock basins

These are depressions that are filled with water to form lakes along the glaciated Valley. They are formed by glaciers when they scoop out rock protrusions along its paths to form hollows which are filled by water to form rock basins.

Similarly, the path of the glacier may have rocks of different types and resistance to weathering and erosion. Where a band of soft rocks alternate with bands of hard rocks, the soft rocks will be worn out to form a depression which is filled by water to form a basin lake. Best examples include Lac Michaelson on mountain Kenya, Lac Nour and Lac Vert in the Kamusoso valley on mountain Rwenzori.

Illustration

Rock steps

These are hard rock projections in the glacial valley forms as a result of differential erosion due to difference in rock resistance and variation in glacier thickness. The increased ice in the main valley makes it possible to cut deep in the valley creating step like features known as rock steps for example at Vivian falls on mountain Kenya
illustration.

Crag and tail

This is an elongated rock mass with a steep slope on the upstream which protects the softer leeward rock from being eroded or worn out by the glacier. It is formed when advancing ice meets a resistant rock protecting a weaker rock downstream from erosion leading to the formation of an elongated tail on the side of the weaker rocks while the resistant rock mass forms a crag with a steep slope.

Illustration

Rock montane

These are rock masses glacially molded with a smooth gently sloping upstream, smoothed by abrasion of ice. The downstream is steep and rough due to plucking of ice. Examples can be found at the Mubuku valley along the slopes of Mount Rwenzori and along the George valley on Mount Kenya.

Question

1. Account for the formation of upland glacial landforms in East Africa.
2. Describe the processes responsible for the formation of glacial erosion landforms in East Africa

Glacial deposition – landforms formed due to glacial deposition

Glaciers transport a variety of materials ranging from fine rock flour to large boulders. All these materials are deposited in the valleys just beyond the point of melting and can modify the landscape markedly. Glacial depositional landforms are mainly found in the lowlands in the lower slopes of the mountains i.e. the valleys. The moraine transported and deposited by the glaciers results in the formation of depositional landforms and these include:

Moraine

This refers to the rock debris that is eroded by flowing ice from the sides and base of the valley and deposited in the low-lying areas. Moraines are large and small fragments that are detached, transported and deposited when ice loses its capacity to transport the materials.

Terminal moraine

It's a ridge-like feature formed by accumulation of unsorted fragments of all sizes extending across the country rocks as a belt of low hills for many kilometers. It's formed by extensive deposition along the snout of an ice sheet and may cover a reasonable distance and height of 50 meters. It builds up when the glacier is static. At this point there is a balance between the amount of ice coming and the ice melting away. Melting ice carries away materials which are finally laid beyond the terminal moraine as an outwash plain. Examples can be seen in the low-lying areas of Rwenzori i.e. Mubuku valley, Kimberly plains of South Africa etc.

Lateral moraine

This is an elongated ridge or moraine formed along the valley glacier sides. The deposition is as a result of friction between the moraine and the valley sides.

Medial moraine

When two glaciers meet, the lateral moraine of the inner sides of both glaciers are joined to form medial moraine. Medial moraine forms at the center of the glacier when a glacier retreats and drops its moraine.

Ground or basal moraine

This is formed when moraine is deposited at the bed of the glacier. It's composed of mainly fine glacial moraine dropped by retreating ice. Ground moraine almost covers the whole width of the valley.

Illustration

Borders or erratics

These are rock fragments of varying sizes which are eroded, transported and deposited in areas where they are far different from the surrounding rocks where it's deposited. They are useful in determining the direction and source of ice movement. However subsequent erosion has pasted these rocks together to an almost level ground and they are known as perched blocks. Best examples can be seen at kamusoso and bujuku Valleys on mountain Rwenzori in western Uganda.

Till plains

These are extensive areas of monotonous relief or landscape formed when moving Ice transports boulders and clay hence burying former and hills e.g. teleki valley on mountain Kenya and Mubuku valley on mt Rwenzori.

Illustration

Eskers

These are long winding steep sided ridges of sand and gravel lying parallel to the direction of ice movement. They are more than 30 meters high and several kilometers long. Sometimes they are formed by rivers flowing beneath or within ice. they develop on areas of stagnant ice where rivers maintain sub glacier tunnels.

Its process of formation is attributed to stagnant ice sheets under hydrostatic pressure hence the ice develops melt water streams flowing with in the ice following permanent sub glacial tunnels thereby deposition takes place within the tunnels. When the ice finally melts, it leaves behind long and steep sided ridges known as Eskers.

Drumlins

These are low, rounded and elongated hills composed of bolder and clays lying parallel to the direction of ice movement. They are usually about 30m high and cover an area of up-to 1km. Drumlins occur till plains in large groups or swarms aligned to the direction of the former ice

advance. They are mostly formed when fragments or ground moraine are compressed by ice movements. Best examples are to be found in the teleki valley on mountain Kenya.

Illustration

Out wash plains

These are wide gently sloping plains of gravel, fine sand and silt. They are formed due to enormous volumes of melt water spreading volumes of sorted materials in great fans beyond the ice front. Braided streams drop coarse gravel first and then fine sand, clay and silt are deposited last. Best examples can be seen at Kibo and Mawenzi on Mt. Kilimanjaro, Mubuku and Bujuku Valleys on Mt. Rwenzori.

Kettle holes

These are circular holes in glacial drift. Kettles are depressions formed when an ice block is detached from the main glacier as it retreats. Such a block is then buried within the till by fluvial glacial deposits. The subsequent melting of ice blocks leaves behind depressions to form kettles. When water collects in these depressions, they form kettle lakes.

Kame moraine

These are irregular mounds of bedded sand and gravel deposited randomly. They are arranged in a chaotic and complicated or non-uniform manner. The process of development is attributed to melt water from long stagnant and slowly decaying ice sheet.

ECONOMIC IMPORTANCE OF GLACIATION OR GLACIATED REGIONS TO THE PEOPLE OF EAST AFRICA

- Melt waters from glaciers form important sources of rivers used for various uses e.g. the Chagga on the slopes of mountain Kilimanjaro use it for irrigation.
- The waterfalls formed at the hanging valleys are potential sites for hydroelectric power generation e.g. at Corinne falls on mountain Kenya.
- The beautiful scenery provided by glacial landforms such as arêtes, pyramidal peaks etc. attract tourists who bring in foreign exchange.
- The moraine deposited contains sand and gravel which can be extracted for building and construction purposes e.g. in Kasese.
- The boulder clay plains in the glacial lowlands are sometimes very fertile and suitable for agriculture especially arable farming e.g. in the Mubuku valley on the lower lands of mountain Rwenzori.
- Glacial areas may act as recreation and sports centers for example mountain climbing
- The U-shaped valleys form natural routes or ways for mountain climbers on the mountainous lands.

Negative

- Glaciers which move downhill lead to extensive loss of property e.g. on the low lands of Rwenzori
- Extensive areas are turned into myriads of lakes by moraine deposits. Such landscapes offer little scope for development by man.
- Upland glaciation has removed most of the fertile top soil making the region unstable for agriculture.

S.5 GEOGRAPHY PAPER 2 HOLIDAY WORK TERM 3 2024

Instructions

Print out and bind the notes and answer the questions provided

UTILIZATION AND CONSERVATION OF NATURAL RESOURCES

Basic concepts

- **Reserves**

These are resources which are known to exist but not used today.

- **Bio-diversity**

This means the variety of genetically distinct populations and species of plants, animals and micro-organisms co-existing with man and the variety of eco-systems of which they are functioning parts.

- **Environment**

This is an aggregate of complex sub-systems within which natural resources respond to human activity. In general the environment is categorized as the natural environment and artificial environment. The components of the (*natural*) environment include: lithosphere (solids-soils and rocks), hydrosphere (liquids-water resources), biosphere (plants and animals), and the atmosphere (gases).

NATURAL RESOURCES

A resource is anything that is beneficial or essentially beneficial to satisfy human needs. Resources expand and contract in response to human wants and actions. An object is originally neutral stuff but when human value is attached to it, it becomes a resource.

Natural resources refer to anything provided by nature /gift of the nature capable of satisfying human needs. Examples include: vegetation, soils, rocks, air, water resources, animals, insects, human beings etc

CLASSIFICATION OF NATURAL RESOURCES

Renewable natural resources

These are resources capable of self-reproduction. They are resources that can be regenerated once deteriorated and put back to use. If used with care, these resources are inexhaustible. Examples include: soils, climate, water resources, scenic beauty, natural vegetation, animals.

Non-renewable resources

These are resources which lack the capacity to regenerate themselves after deterioration. They diminish and get exhausted when used. They form slowly and from the human perspective their supply tends to be fixed especially mineral resources.

NB: Renewable natural resources should always be organized and sustainably utilized in a way that humans can yield the greatest for the longest possible time. Non-renewable resources need to be sustainably utilized emphasizing conservation through optimal use.

SOILS

Soil constitutes the upper most layer of the earth's crust. It is composed of minerals, organic matter, water, and air. The soil supports plants with nutrients. Soils degradation arises from the removal of natural vegetation by man and his animals, which produces non-productive soils (impoverished soils).

This is attributed to the activities of man like bush burning, deforestation, and pastoralism. Other activities leading to reduced soil productivity include use of fertilizers which, pollute the soil, cultivation along steep slopes carelessly, dumping of polythene papers which take years to decompose, monoculture etc

Possible remedies of soil degradation:

- Use of crop rotation
- Improving the use of organic matter
- Proper use of fertilizers
- Proper disposal of polythene material
- Sensitization of the masses
- Restricting settlement and agricultural practices in fragile zones such as along steep slopes.
- Use of soil erosion control measures such terracing, contour, strip bands of grass, control of livestock.
- Proper land use planning.

CLIMATE

Climate is a resource that growth of crops and rearing of livestock. It supports vegetation growth, wind to produce wind energy etc. Many activities have been responsible for the deterioration or changes in climatic conditions such as deforestation, swamp reclamation, pollution, and increased industrialization. Many areas are increasingly characterized by low and unreliable rainfall, and the dry season is long, yet the occurrence drought is frequent.

WATER RESOURCES

This combines the surface and ground water resources i.e., the lakes, rivers, streams, oceans, and swamps /wetlands. These sources are important for domestic and industrial use, irrigation, fisheries, H. E. P generation, transport etc. the water-related environmental problems include: water shortage, and deterioration of water quality through pollution and contamination. Whereas some areas receive enormous amounts of water, other areas receive hardly any or very little.

Regarding the quality, there is evident pollution of fresh water sources. Rivers and lakes have been polluted by agricultural chemicals, sewage and industrial waste disposals-which affects aquatic life makes the water unsafe for consumption. There is also overfishing and indiscriminate fishing leading to depletion of fish stocks, construction of many bore holes, which affects underground water sources. For oceans /seas, the international dumping of toxic chemicals and nuclear substances by industrialized countries is a problem of major concern.

Principles of management of water resources:

- Encouraging afforestation and reforestation
- Legislation of waste discharge
- Careful licensing of fishermen to minimize over fishing.
- Setting standard net sizes
- Restocking the overfished waters
- Encouraging fish farming
- Protection of catchment areas
- Emphasizing community participation such in conserving wetlands
- Treatment of industrial wastes before dumping water bodies
- Carrying out environmental impact assessment(EIA) for all projects

NATURAL VEGETATION

This includes forests, grasslands, scrub, thickets, and woodlands. For example the forests are useful for timber, rubber; protect water resources, wildlife conservation, recreation, soil erosion control etc. it is noted that much of tropical vegetation is being lost especially in west Africa, DRC, etc the savanna vegetation is continuously threatened by the ever growing population

requiring land for settlement and farming . Other activities for vegetation are: lumbering, charcoal, political etc

Possible solutions to vegetation degradation:

- Encourage afforestation and reforestation
- Control of lumbering activities by government
- Encourage the use of alternative sources of energy
- Use of energy saving stoves
- Prohibiting bush burning
- Creation of forest reserves
- Education/sensitization of the masses about vegetation conservation
- Enforce the laws involving of agricultural encroachers.
- Train more environmental management manpower
- Emphasize population control measures

WILDLIFE

This comprises of a combination of undomesticated plants and animals (flora and fauna) found in their natural found in their natural habitat and forming part of natural resources. Wildlife is basically restricted to national parks, sanctuaries, wildlife research centres among others. Wild life is more crucial as a tourist attraction and hence generates foreign exchange.

Wildlife is threatened by increased population settlement, poaching, uncontrolled cropping, bushfires etc a number measures can be taken to conserve wild life such as controlling agricultural encroachment, massive education about the value of the environment among others.

SCENIC BEAUTY

This includes the general natural features of an area such as mountains, valleys, drainage features (e.g. waterfalls, rapids), vegetation etc. the scenic beauty is degraded /destroyed through mining and quarrying, construction, deforestation, garbage, and waste disposal etc.

Guiding Questions

1. (a) Differentiate between renewable and non-renewable resources.

(b) With specific examples from either a developed or a developing country, examine the measures being taken conserve renewable natural resources.
2. (a) Giving specific examples ,assess the extent which the renewable natural resources of Africa have been deteriorated .

(b) Discuss the steps being taken to ensure sustainable utilization of natural resources.

3. Account for the deteriorating of renewable resources in Africa and suggest ways how the concerned government can combat these problems.

ENVIRONMENTAL DEGRADATION

This refers to fall in the biological productivity of environmental resources. Or It is the decline productive value of the components of the environment.

Environmental degradation/deterioration is characterized by desertification, pollution and global warming, deforestation, soil erosion, landslides and mass wasting, leaching, and loss of biodiversity.

Causes of environmental degradation in Africa

Recent studies in Africa have all found progressive environmental deterioration over the last decades, and this can be explained by both natural and man-made causes.

1. **Rapid population growth** which has over strained the natural resources and environmental systems such as the hydrological cycle. It has created imbalance between people and natural resources due to exceeding the carrying capacity. This has increased the clearing of natural vegetation for settlement, land fragmentation and reduced soil productivity.
2. **Poor farming methods /unsound agricultural practices** which include overgrazing, bush burning, monoculture, over cropping, cultivation along steep slopes, and river banks among others.
 - a) Overgrazing resulting from over stocking mainly in the pastoral communities such as the Fulani in the Sahel region (northern Nigeria), the Maasai of Kenya and Tanzania among others. The soils are left bare and hence exposed to severe soil erosion. This in turn reduces soil productivity /crop yields and also contributes to increased drought.
 - b) Bush burning mainly done by shifting cultivators, other peasant farmers and nomadic pastoralists, for example when clearing farming land, preparing for fresh pastures at the beginning of the wet season among other reasons. This also exposes the soils to the agents of erosion, destroys the useful living organisms and humus that contribute to soil formation. It also leads to the development of resistant grasses-not good for livestock.
 - c) Monoculture due to growing of especially perennial crops year after year and this also leads to deterioration of soil productivity.
 - d) Over cropping—continuous cultivation of land without giving it ample time regenerate, also makes the land to lose fertility and consequently reduced yields.
3. **Poor lumbering methods and increased deforestation** without selective cutting and failure to replace the cut down trees. Much of the tropical forests are being lost especially in West Africa (such as southeast guinea, Cameroon, Ghana, southern Nigeria). In Southern Nigeria there has been rapid deforestation in the Yoruba and Ibo states. Deforestation leads to

increased soil erosion, loss of soil fertility, reduced evapotranspiration /reduced rainfall, and unreliable water supply—hence general environmental degradation.

4. **Reclamation of swamps /wetlands** caused by land shortage and the desire to grow certain crops that require a lot of water (such as rice). Many swamps have been drained for crop farming coupled with industrialization and bricklaying. This leads to insufficient water for both livestock and man. It also affects the water table and the drained areas soon become arid and unproductive. More so the habitat of birds and animals is lost which negatively affects the tourism industry.
5. **Increased infrastructural development** which leads to destruction of vegetation such as clearing the forests to set up roads, railways, schools, health centres. There is destruction of the soil structure such as by leveling the ground to set up various infrastructures. This leads to soil erosion, mass wasting, and reduced evapo-transpiration.
6. **Over fishing** due to the growing demand for fish year after year and the increased use of modern fishing gargets leads to over fishing and depletion of fisheries resources such as the disappearance of certain fish species.
7. **Poaching** and this involves illegal hunting of wild animals especially in game parks and game reserves. Poaching leads to the reduction in the wild game, hence negatively affecting the tourism industry.
8. **Mining and quarrying activities** which leads to gradual depletion /exhaustion of deposits, leads to pollution of the environment (both air and water pollution),destroying of scenic beauty/ disfiguring of the landscape by leaving large quantities of waste rock and abandoned mining pits. There is also increased noise pollution through blasting of rocks. In fact many environmental problems in the Niger delta of Nigeria are associated with the oil mining industry such as oil spills due to leaking oil pipes ,and fires due to sabotage by certain groups. Oil spillage leads to contamination of underground water, affects aquatic life, and people in the surrounding areas.
9. **Increased industrialization in many parts of Africa** and this increases the exploitation of various resources such as minerals, forest resources, and water resources. Industrialization also leads to the destruction of grasslands, forests, wetlands, to provide room for industrial sites. It is still associated with pollution through the release of toxic substances and industrial fumes, which affect the ozone layer gradually leading to global warming. Industrial wastes are also disposed into water sources which affect urban water supplies and endanger aquatic life –hence increased environmental degradation.
10. **Rampant political instabilities in Africa** such as the West African countries (Liberia, Ivory Coast), DRC, Somalia, and Rwanda. These conflicts accelerate the cutting down of trees, burning of bushes and bombing of forests by rebel and government forces. This leads to reduced evapo-transpiration, increased soil erosion and resource degradation. The weapons used also increase the rate of environmental pollution.
11. **Insufficient technical knowledge about the environment/ Limited knowledge about the value of environmental resource.** Most people do not know much about ecosystems and

other life support systems. This explains the increased overstocking and over grazing, over fishing and indiscriminate fishing, charcoal burning, cultivation along riverbanks etc. The effects of human activities cannot be predicted with reasonable certainty. There is much gambling with survival than caring for life support systems or environmental resources.

12. **Increasing poverty and failure to understand the wealth of nature.** This leads to over using of natural resources such as fishing, forest cutting, illegal hunting of wildlife etc in attempt to look for survival/livelihood.
13. **Poor patterns of resource tenure and control** since in many cases the user rights are not specified which escalates degradation. For example the communal ownership of land among the pastoral communities (Maasai, kikuyu, Fulani) and shifting cultivators (such as Bemba of northern Zambia). This leads to over stocking, careless bush burning, and cutting down of trees—resulting into soil erosion, loss of soil fertility, reduced evapo-transpiration.
14. **Weak and conflicting government policies on environmental protection.** More effort is put on industrialization and agriculture at the expense of sustainable utilization of resources. For example there are policies targeting the conserving of wetlands yet at the same time other policies focus on modernizing of agriculture by draining wetlands such as rice schemes. Still many laws fail to focus on the causes of environmental mismanagement for example laws against poaching of wild animals.

Natural causes

1. Climatic hazards:

- **Influence of prevailing dry winds and cold ocean currents** for example the North East trades from the Arabian Desert are causing arid conditions over areas of northern Kenya and northeastern Uganda. The dry Harmattan winds affect northern Mali and Senegal negatively leading to desertification. The cold Benguela current has affected the coastal areas of south west Africa by creating aridity due to pre –mature condensation. This also explains the desertification effect such as the Kalahari and Namib Desert.
 - **There is also flooding due to excessively heavy rainfall** in many parts of Africa such as Malawi, Mozambique, Ethiopia, and Sudan. Flooding leads to the destruction of agricultural land, loss of property, loss of life, contaminating drinking water.
 - **Leeward /rain shadow effect.** This leeward side of a mountain has dry descending winds and lies in a rain shadow characterized by limited rainfall, limited/stunted vegetation growth, and it is here that arid conditions start.
2. **Absence of large water bodies** which would otherwise be recharging sources for winds, but their absence makes the areas dry lands, with reduced rainfall.
 3. **Presence of thin infertile soils/ sandy soils** not capable of sustaining plant growth. It is noted that desertification starts in such areas, leading to resource degradation. The absence of moisture conservation techniques in such areas to manage dry soil agriculture forces people to degrade even other areas/resources such as woodland and forest lands.

4. **The occurrence of locusts and other pests.** Locusts have greatly affected the irrigated fields of dry lands such as in Senegal, northern Nigeria, and Mali. Locusts have also destroyed large areas of vegetation in West Africa, north and north eastern Africa. This affects evapo-transpiration, leading to reduced rainfall totals and vegetation destruction further accelerates soil erosion. Other plant pests include: aphids, caterpillars, also coupled with livestock pests.
5. **Other natural disasters/hazards** such as volcanic eruptions, earth quakes, and landslides. These also affect slope stability; soil structure and in turn affect vegetation growth. Earth quakes also increase the incidence of landslides especially in highland areas, which degrade the environment further.

Research question

- a) Account for the occurrence of environmental deterioration in Nigeria
- b) What steps are being taken to solve the above problem in Nigeria?

Case study: NIGERIA

Nigeria is one of the countries in West Africa which is experiencing environmental degradation. The country is experiencing deterioration/ degradation of soils—landslides, erosion and reduced productivity; climatic changes-where the drought is becoming frequent especially in the northern parts, floods in the southern parts (like Port Harcourt, Warri and Benin city); destruction of swamps/ wetlands, contamination of water bodies like Niger river and the Atlantic ocean; pollution in various urban centres (like Lagos, Abuja, Ibadan and Enugu) destruction of natural vegetation such as tropical and mangrove forests in southern Nigeria (Ibo land and Yoruba land); threatening of wild life especially by increased population; and general destruction of natural beauty.

Causes of environmental degradation

Nigeria has experienced environmental degradation resulting from human and physical/ natural factors:

1. Poor farming methods such as over stocking and over grazing by the Fulani in northern part of Nigeria, monoculture in the southern parts of Nigeria where rubber and oil palm are grown.
2. Effect of mining activities such as the Niger delta states where the oil mining industry is based. There are slow contamination of waters of Niger River and the Atlantic Ocean. There is also destruction of vegetation and agricultural land by oil spills during petroleum operations such as due to destruction and leakage of pipelines. Some people destroy the pipelines and take oil onto the black market. Oil spillage has led to destruction of mangrove forests, contaminated underground water and also led to the death of fish.

Other minerals are tin, iron ore and limestone. Tin obtained by open cast method from Bauchi, Benue, Kano and Kaduna states has led to the creation of mining pits which are filled with water to act as breeding grounds for mosquitoes causing malaria, dumping of soil/rocks on the surface hence reducing agricultural land and also destroying natural beauty.

3. Effect of rapid industrialization. For example oil refineries, chemical, cement in Port Harcourt, Warri and Kaduna which lead to the emission of industrial gases and wastes which pollute the atmosphere and contaminate water bodies.
4. Deforestation especially by cultivators due to the ever increasing demand for agricultural land as population rapidly increases. This is seen in Yoruba and Ibo states.
5. Low and unreliable rainfall/ frequent drought in the northern parts of Nigeria which reduces the productivity of land.
6. The development of irrigation farming in the Sokoto, Gongola and Bornu states which has led to the spread of water borne disease such as malaria and bilharzia.
7. Reclamation of swamps in the delta states due to the need to increase settlement, industry and farming land.
8. The occurrence of pests such as locusts which destroy vast areas of natural vegetation especially in northern Nigeria.
9. Over fishing especially in the Atlantic marine waters.
10. Political instabilities such as between the government forces and the Boho Haram/ Islamic fundamentalists. This involves the use of dangerous weapons, which reduce the productivity of land (e.g. land mines) and also cause air pollution.

SAHEL REGION OF AFRICA

Sahel region is the land at the edge of the Sahara desert in northern Africa and covers countries like Senegal, Mali, Niger, northern Nigeria, Niger, Chad, Sudan, Somali and Ethiopia. This region is characterized by low and unreliable rainfall, long dry season and frequent drought. This is basically the semi-arid climatic region.

ENVIRONMENTAL CONSERVATION

This involves management of human use of environmental resources so that they may yield the greatest sustainable benefit to the present generations while maintaining their potential to meet the needs and aspirations of future generations.

The environmental conservation strategies include the following:

- 1) **Adopting population control measures** such as family planning; since population pressure is both a cause and symptom of environmental crisis. This should be coupled with resettlement of excessive populations.
- 2) **Using forest resource management programmes** such as afforestation and reforestation programmes. It should also involve planting of fast growing trees as well as agro forestry.
- 3) **Emphasizing alternative energy sources** to reduce the careless cutting down of trees. there should be a wide range of choices such as natural gas, HEP, biogas, use of coffee husks, and use of energy saving stoves.
- 4) **Improving the farming systems** for example encouraging agro forestry, crop rotation, mixed farming, intensive farming, ranching etc
- 5) **Establishment of irrigation projects** in specific areas and the use of moisture conservation techniques.
- 6) **Enforcing strict laws on environmental resource management** such as wetland protection/protection of forest reserves. This also calls for laws reforms coupled with their assessed impact on the environment.
- 7) **Reforming resource ownership /tenure rights** to return responsibility for management of natural resources such as the local forest reserves, bush lands.
- 8) **Improving solid waste management** such as by burning, burying, land filling, recycling, and re-use of solid wastes to reduce environmental degradation.
- 9) **Soil management strategies** such as terracing, planting cover crops, use of ridges, contour ploughing. There is also need for land consolidation.
- 10) **Strengthening education and awareness campaigns** about environmental management. This includes use of the media, local community, NGOs, wildlife clubs among others.
- 11) **Encouraging community participation in environmental management** and this empowers the local people to mobilize their own capacities to be social actors rather than passive subjects. It also involves sharing of social and economic benefits with the local populations.
- 12) **Campaigns for political stability in various parts to reduce insecurity** such as through peace talks, enhancing political and economic democracy.
- 13) **Effective coordination of natural resources management agencies** such as game departments, wildlife authorities, ministry of natural resources to avoid conflicting interests. There should be good policy formulation and implementation.
- 14) **Avoiding wastage at the industrial level**, that is, ensure total use of resources. For example, parts not suitable for pulp can give paper boards, fiber, and the remaining for fuel. In addition, the re-use of waste paper for news print among others.
- 15) **Environmental impact assessment (EIA)**—this is a systematic examination conducted to determine whether or not a project will have any adverse impacts on the environment.

Guiding questions:

1. Man is responsible for environmental degradation in Africa. Justify the statement.

2. 'Environmental degradation is not only man-made but also natural' explain using specific example from Africa.
3. To what extent is environmental degradation a consequence of man's misuse of the environment?
4. (a) What do you understand by the term environmental degradation?

(b) To what extent have human activities contributed to environmental degradation in the Sahel region of Africa?

Desertification

Qn. (a) Account for the extensive desertification in Africa

- define desertification
- Identify the characteristics/ indicators of desertification and identify areas experiencing desertification in Africa.
- Explain with specific examples the causes of extensive desertification in Africa

Desertification refers to the extension of the desert conditions to areas where it has not been experienced.

Desertification involves reduction of the biological productivity of land to low levels. The land becomes unproductive, and incapable of supporting livestock and crops.

The characteristics/ indicators of desertification include: desert-like conditions (such as low and unreliable rainfall, very hot temperatures, low humidity ,high evaporation rates); reduction in rainfall amounts and frequent occurrence of drought; reduced vegetation cover, reduced diversity of plants and animals; reduced resource productivity; increased areas of bare land; reduced water level in water bodies; reduced surface water(*lakes, rivers, streams, swamps*) reduced soil moisture , rising levels of salination in irrigated fields among others.

In Africa it is noted that the Sahara desert and Kalahari Desert are extending into the nearby marginal lands, thereby there destroying the productivity of the land. The Sahel region (margins of the Sahara desert) has been the most seriously affected area. Areas experiencing desertification therefore include the Sahel (northern Nigeria, Somalia, Sudan, Ethiopia, Chad, Mali, Senegal, etc); Botswana, southern Zimbabwe, northeastern Uganda, northern Kenya, central Tanzania among others.

The reasons for extensive desertification in Africa

- 1) ***Lack/absence of large water bodies***, which otherwise would be recharging sources for winds .this results into dry conditions and reduced rainfall totals. More so water bodies are reducing

in size due to high rates of evaporation and this adversely affects the climate of the surrounding areas.

- 2) **Poor sandy soils in the fragile zones** which are not capable of sustaining plant growth since they do not retain moisture. This leads to poor vegetation growth and hence reduced evapo-transpiration.
- 3) **The influence of dry winds** such as the North East trade winds from the Arabian Desert which causes continuous dryness in northern Kenya and Somalia, the dry Harmattan winds which contribute to the dry conditions of North West Africa.
- 4) **Influence of cold ocean currents** such as cold Benguela current and the cold Canary current which induce aridity over the nearby coastal areas. This is because their coldness induces pre-mature condensation in the on-shore winds near the cold currents, reducing the rainfall totals such as the Kalahari Desert extended into the interior partly explained by the cold Benguela current which blows along the western coast of southern Africa.
- 5) **Lee ward/rain shadow effect.** Some areas are located on the leeward sides of mountains such as Northern Kenya and North Eastern Uganda situated on the leeward side of the Ethiopian highlands, the Maasai lands found on the leeward side of the Kilimanjaro Mountain. Such areas are dry for most parts of the year due to dry descending winds.
- 1) **Influence of pests such as Locusts** which have particularly invaded the Sahel region destroying the green vegetation, resulting into reduced evapo-transpiration, and hence low rainfall totals.
- 6) **Rampant deforestation** by man, especially in Central Tanzania, West Africa, Namibia, Malawi. This has mainly affected the savanna woodlands and savanna grasslands due to increased demand for fuel wood, charcoal, building materials, and cultivation land. The removal of vegetation results into reduced rainfall and increased temperatures.
- 7) **Poor farming methods** such as nomadic pastoralism characterized by over grazing and destruction of pastures ; cultivation on steep slopes, monoculture, shifting cultivation, over cultivation, bush burning, and careless clearing for cultivation like in the Sahel (Mali , Somalia , northern Nigeria, northern Kenya) and Kalahari Desert margins, thus extension of dry conditions such as severe soil erosion, hard grasses and reduced rainfall totals.
(Over stocking and overgrazing such as in northern Nigeria by the Fulani cattle keepers, northern Kenya by the Turkana, Maasai land of Kenya and Tanzania. This leads to increased soil erosion since the soils are left bare).
- 8) **Reclamation of swamps / draining of wetlands** for cultivation reduces the water table and supply of water vapour into the atmosphere hence desert conditions—increased temperatures and reduced rainfall totals. This is one of the major causes of desertification in Senegal.
- 9) **Increased sinking/ drilling of bore holes and construction of valley dams**, which also lowers the water table and results into loss of soil moisture which could sustain vegetation growth—hence leading to natural drying of vegetation.
- 10) **Rapid population growth/population pressure** hence increased need for land for cultivation and settlement leading over use of the land, clearing of vegetation, swamp reclamation, land

fragmentation and soils deterioration. This in turn lowers the water table leading to dry conditions since the carrying capacity of land is exceeded.

- 11) ***Increased industrialization and urbanization***, which explains the destruction of the ozone layer by emitting carbons, methane and other pollutants into the atmosphere resulting into global warming. The ozone layer is gradually losing its natural ability to absorb the ultraviolet B radiation from the sun. Hence, the amount of heat reaching the earth's surface is higher than the expected normal amount.
- 12) Inadequate environmental awareness among the population.
- 13) Weak government policy implementation, regarding environmental resources such as laws against deforestation and swamp reclamation.

(b) Explain the effects of desertification in Africa

1. Famine results due to reduced rainfall totals and increased temperatures plus prolonged drought. There is scarcity of food since the land becomes too dry to support crop cultivation and livestock farming. There are changes in the planting seasons due to climatic changes.
2. Results into shortage of surface and underground water, which limits the survival of man and livestock. For example, Lake Chad has greatly reduced in the water level, almost drying out in the last three decades.
3. It accelerates the rate of soil erosion by both wind and running water. This reduces land productivity and also destroys the nature of the land by creating depressions and gullies.
4. Results into shortage of pastures and hence reduction in the livestock especially cattle. This is common in the Sahel region of Africa where the Fulani have lost large numbers of cattle. The same experience is in Somalia due to prolonged drought.
5. Results into further encroachment on marginal lands such as mountain slopes, wetlands for cultivation, hence further environmental degradation.
6. Worsens poverty and standard of living due to loss of wild life, loss of domestic livestock, reduced soil productivity, and reduced fisheries among others.
7. Results into loss of biodiversity—animal, bird and plant species which are not adapted to the arid conditions. It is only the drought resistant plant species that remain yet many animal species either die or migrate to other areas.
8. Results into shortage of fuel wood and other wood products since many forests and woodlands are destroyed.
9. Limits human settlement to only a few areas where surface water can be got, and this increases population pressure in such areas and thus further environmental degradation.

(c) Outline the steps being taken to control (combat) desertification in the Sahel region.

Examples should be cited from the Sahel region (such as northern Nigeria, Senegal, Algeria, Mali, Chad, southern Sudan etc).

1. ***Adopting population control measures*** since population pressure is both a cause and symptom of environmental crisis. This is coupled with resettlement of excessive populations.
2. ***Using forest resource management programmes*** such as afforestation and reforestation programmes.
3. ***Emphasizing alternative energy sources*** to reduce the careless cutting down of trees such as natural gas, Hydro electricity, biogas, use of coffee husks, and use of energy saving stoves.
4. ***Improving the farming systems*** for example encouraging agro forestry, crop rotation, mixed farming, intensive farming, ranching etc
5. ***Establishment of irrigation projects*** in specific areas and the use of moisture conservation techniques.
6. ***Enforcing strict laws on environmental resource management*** such as wetland protection/protection of forest reserves. There also law reforms coupled with their assessed impact on the environment.
7. ***Reforming resource ownership /tenure rights*** to promote responsibility for management of natural resources such as the local forest reserves, bush lands.
8. ***Improving solid waste management*** such as by burning, burying, land filling, recycling, and re-use of solid wastes to reduce environmental degradation.
9. ***Emphasis on Soil management strategies*** such as terracing, planting cover crops, use of ridges, contour ploughing.
10. ***Strengthening education and awareness campaigns*** about environmental management. This includes use of the media, local community, NGOs, wildlife clubs among others.
11. ***Encouraging community participation in environmental management***, which empowers the local people to mobilize their own capacities to be social actors rather than passive subjects. It also involves sharing of social and economic benefits with the local populations.
12. ***Campaigns for political stability in various parts to reduce insecurity*** and this also involves the use of peace talks, enhancing political and economic democracy.
13. ***Effective coordination of natural resources management agencies*** such as game departments, wildlife authorities, ministry of natural resources to avoid conflicting interests. There is improvement in policy formulation and implementation.
14. ***Avoiding wastage at the industrial level***, that is, ensure total use of resources. For example tree parts not suitable for pulp can give paper boards, fiber and the remaining for fuel. Also the re-use / recycling of waste material.
15. ***Environmental impact assessment (EIA)***. This is a systematic examination conducted to determine whether or not a project will have any adverse/ negative impacts on the environment.

Other guiding questions:

- 1(a) Examine the causes of desertification in east Africa.
- (b) What steps are being taken to combat the spread of the desert?

2. Examine the causes and effects of desertification the Sahel region of Africa.
3. “The increasing desertification in Africa in mainly a consequence of man’s activities.” Discuss

Famine

Question (a) “The famine problem in Africa is primarily a result of human factors”. Discuss.

(b) Suggest possible solutions to the above problem.

Solution (a)

- Define famine
- Identify the countries in affected by famine in Africa /locate the areas.
- Explain using specific examples how human factors have caused famine in Africa
- Explain how other factors (natural factors) are also responsible for famine in Africa

Famine is the state of extreme food scarcity characterized by extreme hunger and starvation for a relatively long period of time. OR Famine is the acute food shortages leading hunger, starvation and death.

The counties in Africa greatly affected by famine include: Ethiopia, Somalia, Sudan, Eritrea, Zimbabwe, Malawi, Chad, Burkina Faso, Senegal, Mali, Mauritania, Niger, northern Kenya, north eastern Uganda, and Tanzania. Some areas suffer from periodic famine, yet other areas are experiencing persistent famine. Famine results into starvation, malnutrition, epidemics, fall in standard of living and even death.

Human factors to a bigger/greater extent:

- 1) ***Political instabilities and conflicts in many parts of Africa*** which disrupt settlement, cultivation and food distribution such as prolonged wars in southern Sudan, Somalia, Ethiopia, Chad, Rwanda, Angola, northern Uganda, and Liberia. Wars are associated with attacks on land, burning of farmlands and also preventing people from settling down to grow food crops and rearing of livestock-hence leading to famine.
- 2) ***Rural-urban migration (in search for white collar jobs)***. Many people move into the rapidly growing towns like Lagos, Kampala, Nairobi, Cairo, and Yaoundé, Dakar; which also leads to movement of energetic labour away from rural areas, leaving agriculture for the old folk, women, and children who are less/not very productive, leading to acute food shortage.
Poor attitude towards agriculture as an occupation when compared to other occupations. Many people leave the rural areas to look for better paying employment in urban areas yet they continue depending on the farming community for food supplies.

- 3) **Cultural ways of life (conservatism in many areas)** such as nomadic pastoralists who do not practice food crop production like the Fulani of West Africa, Tuaregs of the Sahara desert, Maasai of Kenya and Tanzania. Other practices are extended funerals, traditional taboos and other cultural beliefs which limit food crop production as more time is spent on such activities instead of farming, causing famine. (*Some ethnic groups have long-honoured staple foods and consumption habits, hence reluctant to change to new foods*).
- 4) **Poor land tenure system** such absentee landlordism—denies many people access to land (*land is in the hands of few people who do not use the land for sufficient food production*), communal ownership of land—which denies exclusive rights over land and leads to irresponsible use of land and, limits the initiative to introduce modern methods of farming – all of which limit food crop production. Also the inheritance of land leads to land fragmentation since land is divided among sons and daughters—hence reducing yields due to over use of land.
- 5) **Poor farming methods** such as bush burning, over grazing, monoculture—which lead to soil exhaustion—loss of soil fertility and consequently reduced food production. Many farmers produce for subsistence /home consumption and thus producing less food—with no surplus for other people. Many farmers cultivate small pieces of land which cannot produce enough food to meet the requirements of the population.
- 6) **Poor post-harvest management of foods /poor storage facilities** which leads to loss of the produced food such as in Senegal, Nigeria, Mali, and Rwanda. During the peak harvests there is a lot of food wastage. There are storage pests which affect some cereals such as beans, maize; that could help during periods of disaster (*such as prolonged drought*) .Also the perishable foods are not properly handled/ preserved such as fruits, milk, and meat.
- 7) **Extreme poverty in many African countries /limited capital**. This also reinforces the production of cash crops and therefore inability to produce more food crops. It limits accessibility to modern technology and loans since they lack the required security. Limited capital has also forced farmers to cultivate small pieces of land and hence cannot produce enough food crops to meet the requirements of their families and other people.
- 8) **Low level of technology** used in many countries of Africa (such as Sudan, Eritrea, Sudan) involving poor like hand hoes, panga, sickles, shovels,; which lead to low food production. There is a little day's work per person and of course small harvests. More so, farming is highly dependent on nature and hence limited use of irrigation facilities.
- 9) **Over reliance on food aid** such as from World Food Program (WFP) and other countries. This has also promoted laziness among the people of Africa—with limited engagement in productive farming and thus causing famine. They always expect assistance from outside sources.
- 10) **Emphasis on cash crop production** for export in many countries and the crops include coffee, cotton, rubber, tea among others at the expense of food crops. This implies that more land has been used for cash crops and thus less land available for production of food crops,

leading to food shortages. Some countries even export large quantities of their staple food crops.

- 11) **Poor transport systems, with many remote areas inaccessible.** Most production areas do not have good feeder roads linking them to markets/ consumption areas. The roads become impassable during the wet season which affects food distribution and thus surplus output cannot easily be marketed. This limits the transportation of food from areas of plenty to areas of food scarcity.
- 12) **Unfavourable government policy /poor government planning for the agricultural sector;** which otherwise would ensure food security. The governments inject less money in farming, yet commercial farmland is offered for forestry, industry, or even putting more effort put on cash crops. The government in Zimbabwe has undertaken a controversial land re-distribution program.
- 13) **Limited research and education of the farmers,** hence limited innovation in the agricultural sector leading to low yields and continued growth of traditional crops. Agriculture is dominated by traditional varieties which are slow growing, prone to pests and diseases and yielding low output. Farming is mainly carried out by peasant farmers who are used to traditional methods of farming; leading to low output and acute food shortages.
- 14) **High/rapid population growth rates in Africa,** generally over 3% per annum. This exceeds food production leading to food shortages. There is also over use of land leading to the decline in crops yields. More so the population structure is characterized by very many young ones who are not agriculturally productive.

However look at other factors (physical factors) causing famine:

2) **Adverse climatic conditions:**

- **Heavy rainfall, floods and hailstorms.** Heavy torrential rainfall leads to the destruction of food crops. Some areas often receive bad and destructive rains characterized by hailstones and floods. People living within the river valleys such as Niger, and Senegal have occasionally been disturbed by floods. Large areas of farmland have often been submerged—hence low food production, leading to food shortages.
 - **Unreliable rainfall.** Low and unreliable rainfall also greatly limits food crop production. There are many cases of late rains, rain failure or limited amounts of rainfall far below the normal. This is common in many areas of the Sahel.
 - **Prolonged drought**—there is abnormal shortage of rainfall below that required for food crop production. The countries greatly affected by drought include; Somalia, Sudan, Ethiopia, Kenya, Tanzania, Zimbabwe, Niger, Zambia, Chad, Mali, Mauritania, and Botswana. This discourages cultivation and also results into low crop yields.
- 3) **Pests and diseases** also limit food production. Locusts have particularly invaded the Sahel region destroying the green vegetation including the planted food crops. There are also other crop pests and diseases such as cassava mosaic, maize rust, groundnut rosette, banana wilt,

bean anthracnose, halo blight (affecting tomatoes). This leads to low quality and quantity of output from farmlands leading to famine.

- 4) **Poor soil conditions** such as infertile, sandy or skeletal soils. This also limits food crop production, for example some parts have rocky, skeletal soils especially in the deserts of Sahara and Namibia, semi-desert areas.
- 5) **Rugged relief of some areas**, where farming cannot easily taken place. This also influences the rain shadow effect in northern Kenya, Ethiopia—where low rainfall is received leading to low farm output. Rugged relief also limits mechanization and thus limiting food crop production.
- 6) **Other natural calamities** which include: volcanic eruptions displacing many people like in eastern DRC (Nyirangongo), earthquakes along the fault zones, landslides
- 7) **Effect of natural vegetation** for example the thick forests of the Congo basin (DRC), Gabon; swamp vegetation which cannot easily be cleared to allow crop farming.

(b) Possible solutions to the above problem

1. Ensure political stability in all parts of the country such as through regional cooperation and peace talks.
2. Adopt /emphasize population control measures
3. Emphasize / intensify research in agricultural sector such as control of pests and diseases, soil improvement.
4. Development of technology used in agriculture
5. Establishment of irrigation projects/schemes
6. Land reform policies such as land consolidation and removal of unfair land tenure systems.
7. Development of transport infrastructure
8. Education to the farmers be encouraged such as about soils, fertilizer use, new breeds, and new varieties.
9. Provision of agricultural extension services
10. Encourage production of food crops rather than cash crops.
11. Encourage large-scale farming in food crops / increase land under food crop production.
12. Encourage cooperative farming and other farming groups.
13. Improving storage and preservation facilities
14. Set up a national food policy and effective regional agricultural planning.
15. Seeking aid from relief organizations as a temporary solution.

MULTI-PURPOSE PROJECTS

Multi-purpose projects are those put up to serve a number of purposes. These are examples of how rivers can be fully utilized to yield benefits for that particular country.

Examples of multi-purpose projects in the world include:

- Tennessee valley Authority (TVA) project in USA.
- Hoover dam in California.
- Aswan high dam project in Egypt.
- Akasombo dam project/Volta river project in Ghana.
- Kariba dam between Zambia and Zimbabwe
- Kainji dam in Nigeria

TENNESSEE VALLEY AUTHORITY (TVA)-USA

The Tennessee valley authority is a major (multi-purpose) project found in the Tennessee River valley basin in USA. The Tennessee River is a tributary of R. Ohio, which itself is a tributary of Mississippi river. The Tennessee valley authority is a corporation formed for large-scale rehabilitation of a vast region of the seven adjoining states of Tennessee, Kentucky, Virginia, North Carolina, Alabama, Georgia, and Mississippi.

Before the TVA the region had many problems such as; soil erosion, constant flooding of rivers due to heavy rains, diseases due to flooding, silting of rivers, unnavigable river Tennessee, unemployment and poverty plus lack of power/electricity. Therefore in 1933, the government had to step in and the TVA was established to rehabilitate and develop the region. It was started after the seven states agreed to cooperate for the purpose.

Aims of the Tennessee valley authority project

The primary aims of the TVA were:

- 1) To control floods and harness the rivers for self-reliance to raise the living standards.
- 2) To conserve soils such as through controlling soil erosion
- 3) To generate hydro electric power in the region

But the project was involved in many related activities such as:

- To promote industrial development within the region
- To promote forestry and wildlife conservation such as through afforestation and reforestation.
- To teach local people better methods of farming
- To improve navigation on the river so as to allow large vessels to sail on the river and its tributaries.
- To improve methods of mining of various minerals
- Above all it was to transform the economic and social environment involving: industrial development, road and railway construction, town planning, and sound agricultural techniques.

The basis of the scheme was the construction of dams; 9 on the main Tennessee River over its 1450 km long course and another 23 on its tributaries. All dams are capable of controlling floods, assisting in navigation and generating hydro-electricity. The major dams include Norris dam, Cherokee dam, Douglas dam, Fort Loudon dam, Fontana dam, Hiwassee dam, Watts bar dam, Chickamauga dam, Guntersville dam, Wilson dam, Pickwick dam, and Kentucky dam, among others. The huge **reservoirs** created by the dams hold back large quantities of water, reducing floods and this water also released for irrigation purposes. The project also involved construction of a deep navigation channel.

Contribution of the Tennessee valley authority project to the development of the region

1. **The region is now agriculturally productive** since better methods were introduced to control soil such as contour ploughing, strip cropping, crop rotation and also better varieties of crops brought. Afforestation and reforestation have controlled soil erosion.
2. **The farmers were encouraged to used modern farming methods** in order to conserve soil and maintain fertility. The factories in the region now provide cheap fertilizers to be used in the farmlands. There is soil and crop research was carried out and farmers were given advice on how to solve the problems facing them. Farm machinery especially adapted to hilly conditions was introduced and manufactured locally. Demonstration farms were also set up to teach farmers.
More so free agricultural extension services have been provided to farmers on problems they were facing such as by agricultural engineers and assistants on terracing, modern irrigation techniques.
3. **Incomes have been increased in agricultural production and from employment provided by the emerging industries.** For example the many farmers growing cotton and rice which have high demand in the country. When the rivers were controlled, soil quality improved tremendously and crop yields increased –hence increased farmers’ incomes so that hope and prosperity returned to a region which had been impoverished for many years.
4. **Flooding has been controlled by the dams** (such as Norris dam, Kentucky dam, and Douglas dam) that were constructed with their reservoirs, dredging and deepening of the river channel. The huge reservoirs hold back a lot of water, thereby controlling flooding in the region. By fighting soil erosion, the silting which causes flooding has also been reduced.
5. **Diseases were controlled** through controlling flooding in the Tennessee valley region. Bilharzia has been controlled since stagnant water from floods has been limited, which has also improved the living standards. There was also spraying and swamp reclamation. Cultivation near river banks was also discouraged by the authorities.
6. **Generation of hydroelectric power** for industrial and domestic purposes in the region since over 30 dams were constructed. Examples of dams include: Fontana dam, Cherokee dam, Wilson dam, Kentucky dam. The HEP generation has also reduced the rate of deforestation. By 1953, 80% of the homes had been electrified, hence better standards of living.

7. **The TVA has promoted industrial growth** due to controlled flooding and the hydroelectric power generated. Industries include: chemical industries, fertilizer, farm machinery, electrical appliances, aluminium smelting, pulp and paper mills, and food processing. Such industries provide jobs to people, pay taxes to government and uplift the general welfare.
8. **Transport along the river/navigation has been improved** especially between Kentucky and Knoxville. The river has been made navigable for about 630 miles by regulating water flow. The dredging and widening of river channel has improved water transport. The man-made lakes are also navigable. This has uplifted a number of activities such as promoting inter-state trade and commerce.
9. **Promotion of the tourism sector in the Tennessee region** with many tourists from Canada, Western Europe and south East Asia attracted to the recreation facilities at wildlife reservations, national parks, game reserves, improved scenic beauty, man-made lakes among others. They come for camping, hunting, climbing mountains, sport fishing, canoeing, and swimming among others. This generates foreign exchange as well as employment in the region.
10. **Promotion of urbanization** with many towns developed such as Paouchah, Nashville, Chattanooga, Knoxville, these towns are industrial centres, commercial centres, employment centres, mining centres, health centres, recreation centres among others.
11. Promoted development of fishing activities.
12. There has been technological development in the Tennessee region.
13. The Tennessee has become a model for multi-purpose projects in the river valleys worldwide.

Shortcomings /negative effects of the Tennessee valley project

1. Displacement of people.
2. Expensive resettlement of the displaced people.
3. Industrial-related problems.
4. Urban-related problems.
5. The TVA was very expensive to undertake—hence straining the budget.
6. Etc

ASWAN HIGH DAM PROJECT

This project is found in Egypt near the country's border with Sudan, and it is one of the biggest multipurpose river projects in Africa, together with Lake Nasser—the man-made lake behind the dam.

There are two dams at Aswan and both have power stations. The first dam was constructed in 1902 at Aswan to control flooding. But this was totally inadequate and in 1956 a new dam was set up south of Aswan called the **Aswan high dam**. This Aswan high dam was completed in

1970. It is 3600m long and 111m high. At the top its 40m wide and its base is almost a km wide yet it is a very strong dam. Behind the dam is Lake Nasser (500kmlong nearly 150km into Sudan).

Aims for the construction of the Aswan high dam

- To control flooding along the Nile river (therefore when the original dam was inadequate anew high dam was put up)
- To provide water for irrigation (since Egypt is largely a desert country).
- To generate hydroelectric power
- To create a reservoir for water supply for domestic and industrial use.
- To improve navigation by increasing the water level of the Nile river.
- To create employment for the people.

Note: The dam was financed Russian capital and expertise, and Egyptian labour was used in great part.

Factors that favoured the establishment of the Aswan high dam project include:

1. Presence of the Nile River with large volumes of water that is, sufficient head water supply for the dam to generate power. This water is stored in a reservoir and allowed to through the penstocks under great pressure and this is ideal for generating a lot of hydroelectric power.
2. Seasonal floods of River Nile which made it necessary to control floods by constructing a dam. The construction of the dam is of great importance in regulating river flow, with resultant advantages of both power generation and other purposes such as irrigation. By constructing the dam, the water is stored and its release controlled at a regular rate instead of reliance on the river flow which may fluctuate.
3. Presence of waterfalls –fast flow of water to turn the hydro-turbines for generating HEP power. The waterfalls increase the force of water (provide strong head of water) to turn the hydro-turbines to generate hydroelectric power. The waterfall is due to the steep gradient, otherwise a lower gradient cannot generate the force of head water required.
4. Presence of a narrow gorge which offered a suitable site for river damming, by connecting a smaller width of the deep valley and restricting the flooding area. Also because the valley is deep, it increases the water pressure behind the dam to generate a large amount of power).
5. Presence of a hard basement rock in the area which offered a firm/ strong foundation for the construction the dam and putting up the power transmission plant.
6. The country receives low and unreliable rainfall, as its part of the dry Sahara desert, which necessitated storing of water for use during the dry season. This was stored in the reservoir lake (Lake Nasser) and later pumped into the irrigation fields to increase food and cash crop production for Egypt.
7. Vast/ large tracts of land to accommodate the reservoir / man-made lake upstream, hence facilitating the plan for dam construction. This was due to the sparse population of the area,

allowing cheap /easy compensation of the displaced people. Still it requires that the valley behind the dam is deep enough to hold a sufficient supply of water to provide a good head.

8. Availability of a large market for hydroelectric power, both domestic and industrial use. The thermal power generated from oil was not sufficient to meet the development requirements of the country such as industrial use, pumping irrigation water, domestic use. Thus the large and constant demand for power warranted the establishment of the dam project.
9. Availability of adequate capital/large sums of capital invested in the construction of the project. This was provided by the government, World Bank and Russia. A lot of capital was needed in the dam erection, power plant construction, costs of transmission of power and also round-the –year maintenance of the project. There were also initial costs of compensating the people affected by the scheme.
10. Availability of skilled and unskilled/ cheap labour used in the construction of the dam project especially from abroad and cheap labor provided mainly by nationals. There was need for a team of skilled engineers, geologists and managers to dot the construction of the dam project, wiremen involved in the transmission and distribution of power and a lot of administrative staff in all the activities of the project including planning the reservoir lake and facilitating the irrigation part of the project.
11. The availability of high level of technology / modern technology used in the setting up of the project. For example the use of large hydro-turbines which are driven by the force of water against their blades to produce quality work. Also the use of high-tension cables for hydroelectric power transmission. Also the installation of pumps to supply water from the reservoir to the irrigation farmlands.
12. Supportive government policy towards the development of the multipurpose scheme in order to promote economic growth. The government for example mobilized the funds for the construction of the project such as from Russia and the World Bank. This was invested in erecting the dam, and construction the power plant. The government also encouraged investors in irrigation farming and water transport, to create employment; hence the success of various objectives of the scheme.

Contributions of the Aswan high dam to the economy of Egypt

1. The dam has controlled flooding of the Nile in Egypt which used to threaten life in the lower Nile, since the reservoir holds back a lot of water. It controlled the flow of the Nile River. Previously when the Nile flooded, cultivation was delayed and most of the water ended up wastefully in the Mediterranean Sea. The flooding of the Nile would lead to destruction of farmlands, life and property. As of today even production is no longer disrupted by floods, hence accelerating the development of Egypt.
2. The project has promoted irrigation, hence increasing cultivable land. Remember that Egypt is 90% desert and yet has a high population and hence the need to increase cultivation land. This has increased food and cash crop production such as rice, cotton, maize, orchards, and

wheat along the Nile and the delta zones. There is a large area under perennial irrigation all-year round and a large area has been reclaimed from the desert.

A number of irrigation schemes of reclaimed land from the desert are operational, most notably being New valley project and Tahrir scheme. The new valley project facilitates irrigation in the oases of the western desert such as Kharga, Dakhla, Farafra, Baharia and Siwa. The Aswan power enables pumping of water from over 900 m below ground level and distributed to the cultivated land. The new villages have social and health services, new roads, factories. El Kharga is the centre for this stage of development.

The Tahrir province scheme just west of the delta between Cairo and Alexandria, has large fields of wheat done by the cooperative combine harvesters and there is also mechanized crop spraying. The crops grown here include berseen, maize, cotton, orchards (plums, vines, and olives), vegetables, flowers, lemons, mangoes, oranges, and palms. The cooperatives organize fertilizers, pesticides, irrigation and marketing as well as giving advice to the farmers.

3. The generation of hydroelectric power which has promoted a number of activities such as trade/service sector. The Aswan high dam produces over 2100 megawatts of power, and the power has been used for domestic purposes and industrial development. Hydro power production has reduced Egypt's need for fuels like coal, oil in the industrial sector.
4. The project has promoted industrial development due to large quantities of hydroelectric power and water supply. For example there are many industries in Cairo and the free zone of the Nile delta such as the aluminium plant, phosphate / fertilizer and bauxite plants; grain mills at Luxor, sugar factories.
5. The project has led to the generation of employment of opportunities to the people of the region such as at the dam engaged in the production of hydroelectricity, irrigated farmlands, transport sector and industry—hence increasing incomes in a country experiencing high population and thus addressing poverty. The operations at the dam have created a skilled body of workers who are a valuable asset.
6. Promotion of tourism development has come from the project and hence valuable foreign exchange generated. The Aswan high dam at Aswan, Lake Nasser—the reservoir lake and irrigated farmlands in Baharia oasis and along the Nile are all tourist attractions. The foreign exchange generated is used to import foreign technology and consumer goods not available locally.
7. The project has led to the promotion of urbanization and associated infrastructural development such as Luxor, Qena, and Cairo. This has resulted from the electrification in many areas of Egypt and concentration of population in the industrial centres to look for employment. There is also a program of rural electrification especially along the Nile, leading to transformation of many areas through activities like trade and commerce.
8. Fishing has been developed by the river dam project. This is due to the creation of Lake Nasser—the man-made lake behind the dam by holding back water. This valuable source of proteins and also increasing incomes of the people.

9. Lake Nasser and the dam also supply fresh water regularly for domestic and industrial use.
10. The construction of the dam has improved navigation/ water transport along the Nile. This is because the former bends which used to hinder easy movement have been completely submerged by the increase in water level and this remains almost constant throughout the year. Still lake Nasser provides a 500km waterway into Sudan, which has been important as a route for goods and passengers.
11. Project has promoted the diversification of the economy by developing many economic activities in the region such as farming, trade, industries—hence increasing national income.
12. The project has increased government revenue through taxation of the various activities which have been developed such as industry, trade and commerce, crop farming.
13. The project has promoted international relationship between Egypt and other countries such as Sudan where the hydroelectricity is exported.

However several problems have been caused by the Aswan high dam project/ negative effects of the project as explained below:

1. Has led to the displacement of many people who used to live in the area now covered by Lake Nasser. For example over 42,000 people in Wadi Halfa and nearby areas with livestock were displaced across the Nubian Desert to Khasim-a small area of 70km². Therefore many people lost farmlands and settlements.
2. The project has led to expensive resettling of the displaced people (the nomads). They had to be given double hectorage of their former land/ increasing government expenditure. Irrigation and electric power had to be provided from the new dam. Also small market centres and administrations had to be put up which all required a lot of funds.
3. Pollution of the environment due to many industries setup in the region.
4. It has led to a decline in farming in some parts of the upper Nile delta region. This is due to the loss of silt which used to maintain soil fertility as it now settles out in Lake Nasser. Farm land along the Nile is becoming less fertile and productive. Farmers have attempted to use chemical fertilizers instead, but these are not as effective. And also the loss of water through irrigation and evaporation yet the ocean currents in the Mediterranean Sea continue eroding away the edge of the delta.
5. Decline in fishing industry at the coast due to loss of silt deposits now settling out in the lake, which would support plankton growth. Unfortunately Lake Nasser's fishing industry has not yet developed to replace this lost food source.
6. Due to loss of water through evaporation and irrigation, the fresh water in the soil near the mouth is being replaced by salty/saline sea water and some rendered unfit for cultivation. Drainage therefore has to be improved to wash these salts away. The high rate of evaporation is particularly true for river dam projects in arid areas.
7. The extension of perennial irrigation is resulting into spread of diseases especially bilharzia caused by cavin snails due stagnant water. This is attributed to the rise in the water table in

areas where canals carry water throughout the year. This affects negatively on the quality of life/ decline in the human resource.

8. The delta has reduced in size as it is not receiving significant silt deposits, and hence currents are eroding the edge of the delta, and this limits coastal/delta activities such as tourism.
9. The project has led to the destruction of natural beauty, because the construction of the river dam project destroys the rapids, waterfalls and gorges. This in turn negatively affects the tourism sector and thus limiting the inflow of foreign exchange.
10. Resulted into urban related problems in the towns which have come up such as high crime rate, traffic congestion.
11. The manmade lake is a barrier to communication in the area around it, since it occupies a large area. This undermined trade and commerce between the people of the opposite sides.

THE AKASOMBO DAM PROJECT (VOLTA RIVER PROJECT)

The Akasombo dam project was opened in 1966 and was built across the Volta River where the river passes through a narrow Akasombo gorge, in south eastern Ghana. The project involved the construction of a huge dam across the Volta River where it cuts through the Akwapim hills at Akasombo. The project was funded by Ghana, USA, Britain, and the World Bank.

In the subsequent years more generators were added and today the scheme accounts for about 99% of Ghana's total electricity production. Ghana's industrial and economic expansion increased the demand for power beyond what the Akasombo could provide. By 1981, a smaller dam was built at the town of Kpong, downstream from Akasombo.

The major Objectives of the Akasombo dam project

- To generate hydroelectric power especially for smelting aluminium and other industries. The large scale production of hydroelectricity would make the cost of smelting the ore before export economically feasible and refined aluminium would be less expensive to ship than the bulky ore. The Volta Aluminium company (VALCO) at Tema and other secondary industries consume a large proportion of electricity generated by the Akasombo dam project.
- To control and regulate the flow of river Volta which was characterized by seasonal fluctuations in the water level.
- To improve inland water transport / navigation.
- To improve agriculture through providing water for irrigation.
- To store water for industrial and domestic use.
- To create a lake behind the dam to act as a fishing ground and a tourist attraction.

Note: The Volta dam complex includes a power dam and station on the west bank and a flood control dam and saddle dam on the east bank. Lake Volta is the man-made lake which has developed behind the dam.

Ghana has also developed other dams such as:

- Bui dam project on black Volta
- Kpong dam near Akasombo dam

Ghana does not produce any coal, petroleum or natural gas. The generation of hydroelectricity has greatly reduced the need to import fuel for thermal power stations, thus saving the country valuable foreign exchange. Ghana earns foreign exchange from the export of hydroelectricity to the neighboring countries such as Togo, Benin and Ivory Coast. The project has promoted the growth of towns like Kpandu, Kete, Krachi, Yeji, Yapei, accra, Port Tema, Kumasi and Takoradi. The project has also promoted the agricultural sector through providing water for irrigation. There are state farms north of the lake and on the Accra plains. The crops grown include: rice, sugar canes, maize, tobacco, ground nuts and vegetables.

KAINJI DAM PROJECT (NIGER DAM PROJECT)

The project is located in the northwestern part of Nigeria across the Niger River at Kainji. The project was opened in 1969 and lies in a remote, thinly populated and very poor part of Nigeria. The dam has produced a manmade lake behind it, known as Lake Kainji (130 km long and 1300 km²).

The major aim of the project was to generate hydroelectric power (the main aim of building the dam). Today the dam generates electricity for all the large cities in Nigeria. Some of the electricity is sold to the neighboring Niger. In addition, occasional droughts have made the Niger's water flow unpredictable, diminishing the dam's electrical output. Other objectives of the project included: the need to control flooding of the Niger River, to promote irrigation, there by facilitating farming to increase food production, to promote the industrial sector.

KARIBA DAM PROJECT

The Kariba dam is located on the Zambia—Zimbabwe border on River Zambezi. It was built between 1955 and 1959. It is one of the largest dams in the world at 128m high and 579m long. The major reason for its establishment was the great demand for electricity by Zambia and Zimbabwe. This was due to the growing population in the two countries, the energy demands of the Zambian copper belt and the mines in Zimbabwe—encouraging dam construction. Today about 49% of the electricity from the dam is used by Zimbabwe and the remaining 51% used by Zambia.

The construction of the dam was na economic necessity. There has been a great decline in the importation of coal from the wankie fields and oil for thermal power stations. The kariba

supplies about 1320mw of electricity to both Zambia and Zimbabwe. It has provided plenty of power for mining, industrial expansion and the service sector.

A great burden has been lifted from the railways since they no longer have to carry huge supplies of coal to the industrial areas.

INGA DAMS

The Inga dams are hydroelectric power dams located at Inga falls in DRC. The falls are about 96m. Today the two hydroelectric dams, Inga I and Inga II, operate at low output. There are plans to rehabilitate the dams, and also to start Inga III and Grand Inga, which are to be more massive. The grand Inga would be one of the largest hydroelectric power projects in the world. The HEP project provides power to many towns of western DRC such as Kinshasa, Port Matadi etc.

Guiding questions:

- 1) Examine the significance of the Tennessee valley authority multi-purpose river development project to the economy of USA.
- 2) Discuss the contribution of multi-purpose development projects to economic development with reference to either USA or Ghana.
- 3) With reference to any multi-purpose river development project in Africa, assess its contributions to the economic development of the country or region in which it is located

S.5 GEOGRAPHY PAPER 3

HOLIDAY WORK TERM 3 2024

1. Geography Paper 3 UNEB 2018 Question 4