

**ILLUSTRATED LESSON NOTES FOR
THE TEACHER AND STUDENT
GEOGRAPHY**

FORM FOUR

FORM FOUR WORK MADE EASY AND INTERESTING

ALSO INCLUDES KEY KCSE TEST PAPERS

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STATISTICAL METHODS

The methods of statistical presentation that will be dealt with at this level will be age-sex pyramids, dot maps and Choropleth maps

Age sex pyramids.

This is a graph used to present population data showing the different age groups for males and females. It comprises of bars, drawn horizontally with the length of each bar indicating the number of persons in each age-group in a population. The population is usually divided into 5- year age-groups (0-4, 5-9, 10-14, 15-19.....). The youngest age group is always shown at the base of the graph.

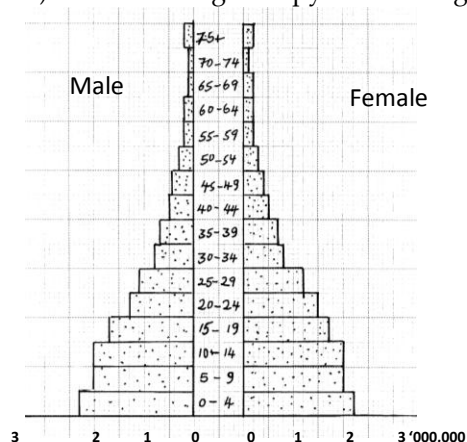
Steps followed in the Construction of an Age –sex pyramid.

Example.

The table below showing the population distribution in Kenya 1999(to the nearest 1000)

AGE COHORT	MALE (000)	FEMALE (000)	TOTAL
0-4	2292	2243	4535
5-9	2001	1963	3964
10-14	2035	2004	4039
15-19	1682	1721	3405
20-24	1329	1504	2833
25-29	1095	1165	2260
30-34	841	845	1686
35-39	695	724	1419
40-44	517	517	1034
45-49	420	419	839
50-54	345	340	689
55-59	224	236	460
60-64	195	215	410
65-69	141	160	301
70-74	119	136	255
75+	174	203	377
TOTAL	14105	14395	28500

- Establish the number of cohorts in the population.
- Determine the number or percentage of males and females in each cohort. Using the number of males and females in the cohorts, choose an appropriate horizontal scale. For example, **1 cm rep 500 000**.
- Choose an appropriate vertical scale as determined by the total number of cohorts. Each cohort is represented by a bar. The bars should neither be too wide nor too narrow. In our case the scale is **1 cm represents 1 cohort**.
- Draw two vertical lined at the centre of a graph paper with 2 cm space between them. At the base of each draw horizontal lines away.
- In the 2 cm space, indicate the cohorts beginning with the lowest age-group in ascending order.
- Mark the values on the horizontal lines appropriately. Then mark age-groups (cohorts) to the right to represent females and to the left to represent males.
- Draw respective bars in each cohort and shade them neatly.
- Frame the age-sex pyramid and give it a title.



Horizontal scale

1 cm rep 500 000

Vertical scale

1 cm represents 1 cohort

The analysis and interpretation of the Age-Sex Pyramids.

- The age sex pyramid with a **broad base** implies that the country has a *higher young population*, (more children and youths) characteristic of developing countries like Kenya. This indicates that there are more dependants who stress the working population and the economy. The broad base also indicates high birth rate. The narrow apex indicates that there are fewer older people due to low life expectancy
- Where the pyramid has a narrow base as in the case of developed countries, it means fewer young people. Such pyramids are broad in the middle and again narrow at the top. A narrow base is an indicator of low birth rate. There are fewer young people depending on the working population leading to high standards of living. The broad apex indicates high life expectancy.

Advantages of Age-sex pyramids.

- They give a clear picture of the characteristics of a given population by showing the proportion of males to females in each age-group.
- It is easy to construct, once age-groups are given.
- It is easy to read and interpret.
- It has a variety of useful information for planning purposes in a country.
- It can easily enable comparisons of population for various countries.

Advantages of Age-sex pyramids.

- If age-groups are many, the graph can take much space.
- It does not give an impression of the total population.
- It is tedious to draw and time consuming.
- It is difficult to choose a suitable horizontal scale.

Dot maps/distribution maps.

The map uses dots to describe distribution of phenomena. Each dot represents the number of items in an area such as a location a county or a country.

When drawing or constructing a dot map, the following factors are taken into account;

- Value of each dot.* This is important because each dot represents the actual number of items or phenomena in a given area. It also determines the number of dots to be put on a map.
- The size of the dot.* Extremes of dot sizes should be avoided. The dots should be uniform in size and nature. The dots should convey a clear impression of the differences in distribution.
- Location of each dot.* After calculating the number of dots to be used to show the distribution, place the dots as evenly as possible over the area concerned.

Construction of dot maps.

Example;

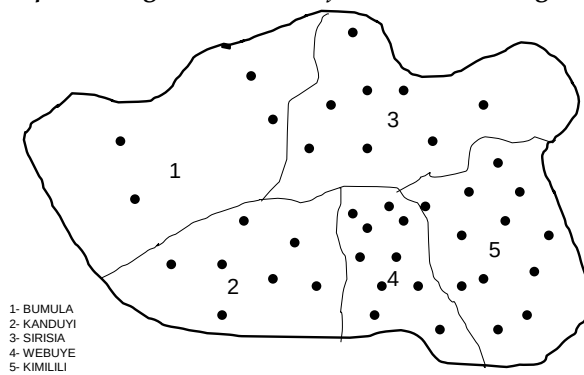
The number of livestock per division in Bungoma

DIVISION	No. of Livestock
Kanduyi	40,000
Bumula	70,000
Webuye	100,000
Sirisia	80,000
Kimilili	120,000
Total	410,000

The following steps should be followed when drawing dot maps;

- Examine the data and identify the total number of livestock in each division.
- Decide on an appropriate scale, determining the number of livestock that one dot would represent.
- Using the scale, calculate the number of dots required in each division by dividing the total population in each province by value of each dot.
- Draw a map of Bungoma showing boundaries of the five divisions.
- Using a suitable pen or pencil mark the dots evenly in each province.
- Complete your map neatly by framing it and giving it a title and a key.

Map showing distribution of livestock in Bungoma county.



Advantages of Dot maps

- It gives a good visual impression of comparative densities and distribution of phenomena.
- If the key is given, it is easy to calculate the total population.
- It has a wide use. If constructed as an overlay on transport paper, it can be used to make comparisons and correlations of different geographical phenomena. E.g rainfall patterns and population distribution.
- It can be used to show the distribution of different phenomena in the same geographical unit.
- If the dot value is known, it is easy to calculate the total population.
- They are easy to interpret.

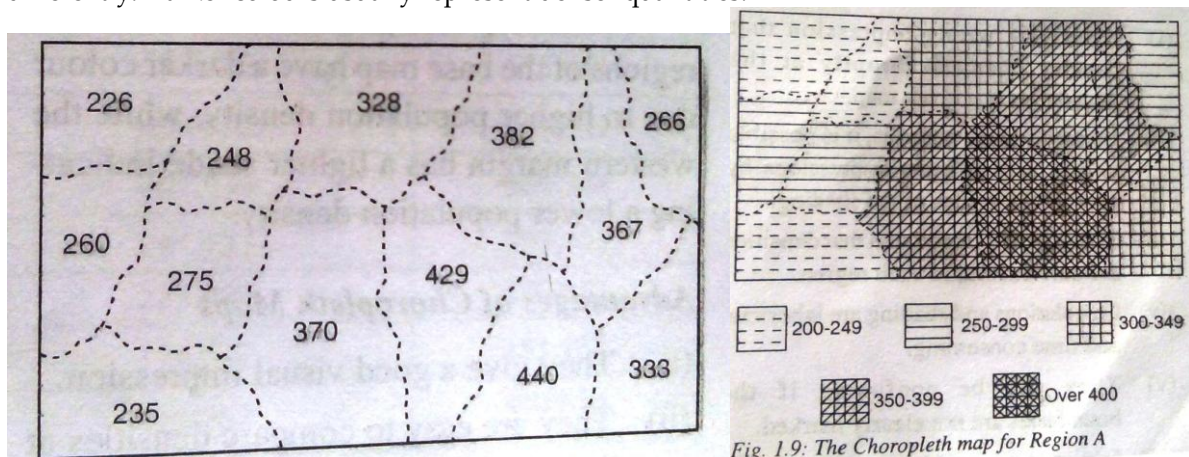
Disadvantages of dot maps.

- It is tedious to draw uniform dot sizes and shape unless special pens and pencils are used.
- Location of dots reflect to a certain extent a personal, subjective decision. Rarely will two dot maps produced by two different persons, using the same statistical data, be identical.
- When dots overcrowd, they give the impression that the distribution of phenomena is dense.
- Even distribution of dot gives false impression of the distribution of phenomena without putting in account the physical barriers to phenomena distribution.
- Calculations and placement of dots is time-consuming.
- Miscounting of dots can lead to wrong data of the total population of the phenomena.
- Rounding of fractions lead to wrong number of dots plotted on a map.

Choropleth maps/density maps.

Choros- area. *Plethos-* multitude or number.

Choropleth maps show the relationship between quantities and area. Different densities are shaded differently. Darker colours usually represent denser quantities.



Drawing Choropleth maps.

- a) Draw boundaries of the statistical units if they are not already provided on the base map.
- b) Calculate the average densities for each statistical unit by dividing the quantities in each unit by the unit area.
- c) Determine a suitable scale of densities to be used in shading the map.
- d) Indicate lightly in pencil on the map the grade of shading or colouring to be used for each area.
- e) Shade or colour the map, erasing figures and all other unnecessary information but leaving boundary lines.
- f) Give a title and key to the map.

Note the following;

- ~ The shading should show progressive increase in density. Avoid a blank since it gives a wrong impression.
- ~ The range of values may be divided in groups by either arithmetic progression, when the range is not great.
- ~ Variation in density can also be shown by proportional shading.
- ~ Do not show variation in density by merely drawing lines at different angles.
- ~ A more pleasing appearance of continuity and transition can be achieved if shading lines are carried across as far as possible from one statistical unit to the next.
- ~ It is advisable to use a key with individual boxes. The key should be complete with all the grades of shading.

Advantages of Choropleth maps.

- a) They give a good visual impression.
- b) They are easy to compare densities at a glance.
- c) They are easy to construct.

Disadvantages of Choropleth maps.

- a) They give a wrong impression that density changes abruptly at the boundaries in a given map.
- b) Using the same statistics, it is possible to give different impressions by altering the grades or the shading.
- c) They give the impression that densities are uniform within each region.
- d) Calculation and shading are tedious and time consuming.
- e) They can be confusing if the boundaries are not clearly marked.
- f) It is not possible to show the distribution of more than one phenomena on the same map.

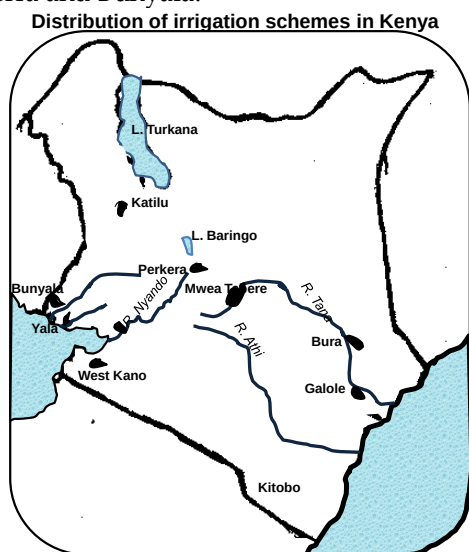
LAND RECLAMATION AND REHABILITATION

Land reclamation is the practice by which less useful land is converted into more useful land. This can be done through draining of swamps, irrigating dry land, control of pests from an area and draining a portion of the sea.

Land rehabilitation is the process of recovery of land which has been misused and destroyed through Human activities such as quarrying, overgrazing, deforestation and over cultivation. This can be done through planting of vegetation, making terraces, adding manure or filling up quarries.

A study of selected irrigation schemes in Kenya.

Irrigation schemes have been established in Mwea settlement scheme, Hola, Bura, West Kano, Ahero, Perkerra and Bunyala.



Physical requirements for irrigation farming in Kenya

- Gently sloping land that allows flow of water by gravity
- Presence of permanent rivers that provide regular and abundant water supply
- Availability of extensive land for land-scale cultivation of crops
- Availability of soils rich in mineral nutrients to support a variety of crop.
- Black cotton soils that retain water for a long period
- Warm weather suitable for growing of crops
- Some areas are semi- arid e.g. perkerra making it necessary to practice irrigation farming

1) MWEA-TEBERE IRRIGATION SCHEME.

This is the largest and most successful irrigation scheme in Kenya, covering about 10,000 hectares. It is located in Mwea Plains in Kirinyaga County. Water for irrigation is drawn from rivers Nyamindi, Murubara, and Thiba, all of them tributaries of river Tana.

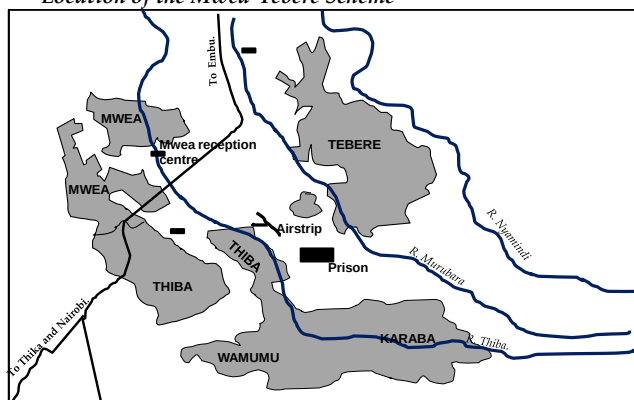
The scheme was established during the emergency period in the 1950s as a way of utilizing free labour provided by the mau mau detainees. The original location of the scheme was at Nguka, a flooding point of river Thiba. This formed the first block (Mwea Block). Two other blocks, Thiba and Wamumu were established southwards. Later, a fourth block was established (Tebere) to utilize the waters of River Nyamindi.

Factors that influenced the location of Mwea Tebere irrigation scheme.

- The presence of three permanent rivers-Thiba, Murubara and Nyamindi which provide regular and abundant water supply for irrigation.
- The plateau forms a gently sloping land which allows water to flow by gravity.

- c) Presence of black cotton soil which is suitable for rice cultivation since it is capable of retaining water.
- d) The warm climatic conditions experienced in the area promotes rice growing
- e) The area receives low annual rainfall of between 635mm and 1270mm falling only in April/may and october/November periods, which is unreliable thus making irrigation to be necessary.
- f) The Mwea plains were sparsely populated having been previously used as a communal grazing land.
- g) The presence of loamy soils made it possible to cultivate other crops to support the families that settled in the area.
- h) The need, by the colonial government, to urgently establish a project that would occupy the Mau mau detainees.
- i) The need to resettle the landless people from central Kenya who had lost their land to the white settlers.

Location of the Mwea-Tebere Scheme



Organization of the scheme

The National Irrigation Board (NIB) supplies water to the scheme but the overall management is undertaken, since 1999, by the Mwea Rice Growers Multi-purpose Co-operative Society.

The total area under irrigation is 5,784 hectares providing livelihood to over 8,000 people from various parts of Aberdere and Eastern Regions.

Each farmer was allocated 1.6 hectares though they are allowed to rent more land. Each farmer maintains a permanent nursery of 0.04 hectares. Seedlings are transplanted after 5 weeks when they are about 15 cm tall. Rice takes 5 months to mature and be harvested.

Cultivation.

The plots have bunks or ridges around them to hold water. There are canals dug from the main canal from the river that leads water into the plots. The low-lying terrain allows gravity flow of water and easy use of machinery. The paddy field is flooded to depth of 10 cm and tractors hired from the National Irrigation Board are used for ploughing.

Each tenant has to plant, weed, reap and thresh his/her crop. The threshed rice is then collected by the cooperative society which is responsible for taking it to the three major collecting centres namely Tebere, Mwea and Thiba.

Individual holdings register yields upto 14 bags per hectare (58 bags per acre.)

Processing of rice is done in Mwea by the numerous mills built in the area.

Reasons for the success of the Mwea Tebere Irrigation Scheme

- a) Initial assistance by the German government, through providing technical knowhow and machinery led to increased acreage under irrigation.
- b) The two tributaries of River Tana-Thiba and Nyamindi rise from the wet slopes of Mt. Kenya and thus ensure regular and abundant water supply for irrigation.
- c) The shape of the 4,000 hectares (10,000 acres) Mwea plains (a gently sloping land) allows the land to be irrigated from the run-off of river Thiba without the requirement of storage facilities.

- d) The high demand for Mwea Rice motivates the farmers to grow the crop the year after year.
- e) The land that was once barren and of little use has now been put into productive use.
- f) Sound management has ensured high standards of discipline among the tenants which is a pre-requisite for the success of a scheme of this nature.

Benefits of the scheme.

- a) *It saves the country foreign exchange.* The scheme produces foodstuffs (rice) that could have been imported thus saving foreign exchange which could have been used in importation.
- b) *Creation of employment opportunities.* Many people have been employed in rice farming and other related activities.
- c) *Increased food production.* The scheme has satisfied the domestic rice requirements.
- d) *Reclamation of unproductive land.* This has helped to reduce pressure on the available natural resources.
- e) *Settlement-* Mwea-Tebere irrigation scheme has created settlement to people who would be landless e.g the mau mau detainees.
- f) *Control of floods.* The dams have controlled floods during the rainy season.
- g) *Diversification of production.* Farmers are able to diversify production and the area today is successfully producing horticultural crops.
- h) *Economic development.* The scheme has led to the overall development of the once barren land. Rice is a raw material for the rice mills.
- i) *Source of income.* The scheme has raised livelihood to many people who earn an income through direct sale of rice. This has raised their living standards.

Problems experienced by farmers at the Mwea irrigation scheme.

- a) *Diseases.* The stagnant waters encourages the breeding of snails and mosquitoes which spread disease to people
- b) *Pests.* Quelea birds feed on rice and cause major losses and low yields.
- c) *Siltation.* Weeds growing in the canals encourage siltation that interferes with the flow the water into the field.
- d) *Inadequate water supply.* Unplanned irrigation development have overstretched water supply which was meant for 15,000 acres but now supplies more than 27,000acres.
- e) *Shortage of labour.* This is mainly during planting and harvesting which forces the farmers to hire labour which is expensive.
- f) *Delayed payment.* This kills the morale of farmers resulting from mismanagement of cooperative.
- g) *Unsuitable soils.* Soil in some areas is not suitable for rice.
- h) *Inadequate social amenities.* Health centres are inadequate thus necessitating long distances that results in losing many working hours.
- i) *Poor access roads.* This makes transport of rice expensive.
- j) *Mismanagement of finances.* Over the years, cases of mismanagement have cropped up in the scheme. The mills are forced to operate below capacity since they can't generate enough revenue to operate efficiently.

Perkerra irrigation scheme

The scheme was started in 1954. It is located in Baringo County and draws water for irrigation from River Perkerra. The main crops grown in Perkerra irrigation scheme are Maize seed, Paw paws, Onions, Water melons, Chillies and cotton.

Since 1966, the National Irrigation Board (NIB) has been assisting farmers in carrying out crop production by providing them with credit facilities, management and extension services.

In 1966, the Kenya Seed Company Limited contracted Perkerra farmers to grow seed maize, growing varieties like H511, H513, PH1 and H623. Farmers had also been contracted to grow paw paws for the Papaya wine industry at Marigat though this has been resisted due to low prices, non-collection and delayed payment by the Kenya Wines Agencies Limited (KWAL).

Factors that lead to the establishment of Perkerra irrigation scheme

- a) The presence of River Perkerra with a lot of water that used to go to waste.
- b) The area is gently sloping thus allowing the natural flow of water to the field by gravity. This reduced the expense of pumping.
- c) The area in which the scheme is located is semi arid. This made it necessary to practice irrigation farming
- d) Availability of deep fertile soil deposited by surface run –off in the valley plains from the highlands of Baringo & Koibatek where they were eroded.
- e) Availability of cheap labour and tenant farmers to work in the fields.
- f) High temperature which favour growing of seed maize and horticultural crop
- g) Low population which rendered large pieces of land for establishment of the scheme.
- h) Accessibility of the area by the Nakuru- baringo road

State the Give three reasons why Perkerra irrigation scheme was started.

- a) To develop land for agriculture and increase food production
- b) To settle pastoralists as farmers
- c) To utilize the detainee (mau mau) labour

Benefits of the scheme.

- a) *Source of employment.* Many local people have been employed.
- b) *The scheme has turned unproductive land into productive land.* This has helped to promote horticultural farming in the area.
- c) *Settlement-* perkerra scheme has led to settlement of previously landless people.
- d) *Diversification of production.* Farmers are able to diversify production and the area today is successfully producing horticultural crops.
- e) *Promotion of scientific research.* Research in production of high quality maize in collaboration with the Kenya seed Company Limited has been achieved.
- f) *Infrastructural development.* The scheme has promoted the construction of roads, schools, shops and electricity.
- g) *Source of income.* The tenants earn an income through direct sale of products like onions, chilies, paw paws etc. This has raised their living standards.

Problems facing Perkerra irrigation scheme.

- a) River Perkerra water levels fluctuates greatly due to drought. This has hindered expansion of the scheme.
- b) The scheme is in a remote area with poor transport and communication network. This has hindered production of perishable crops.
- c) The surrounding area is sparsely populated, thus limiting the market for its products.
- d) Desertification has led to the neglect of farming crops such as onions, chilies, water melons, cotton pawpaw for production of more profitable maize seeds
- e) High temperatures in the area make working conditions for farmers difficult under the hot sun.
- f) Discontent between the Tugen & Njemps. The Njemps complain that their land but Tugen are the majority in the scheme.
- g) Sometimes the scheme is the only area in the region with green vegetation. this creates Livestock - human conflicts caused by livestock which go to feed on the green vegetation

Significance of irrigation farming to the economy of Kenya.

- a) Irrigation farming *saves on foreign exchange*, which could have been used in importation, by producing foodstuffs and agricultural products that could have been imported.
- b) *It is a Foreign exchange earner*. Some of the crops are exported to other countries to earn foreign exchange e.g chilies, peas and flowers.
- c) *Creation of employment opportunities*. Many people have been employed in farming and related activities.
- d) *Improvement in standards of living*. The growing of cash crops in the scheme has brought income to the farmers hence raising their living standards.
- e) *Control of environmental hazards*. The setting up of irrigation has assisted in the control of floods.
- f) *Increased food production*. Irrigation has led to increase in farming land which in turn increases food production in the country.
- g) *Reclamation of unproductive land*. This has helped to reduce pressure on the available natural resources.
- h) *Rehabilitation and development of the areas*. Areas that have been reclaimed for successful farming through irrigation have also benefited from other developments like roads, schools, hospitals and other social amenities.
- i) *Settlement*. Irrigation schemes have created settlement to people who would be landless e.g detainees in Mwea and Perkerra.
- j) *Industrialization and growth of urban centres*. The crops are raw materials for food industries e.g rice, mills pineapple processing e.t.c .

Problems that face irrigation farming in Kenya.

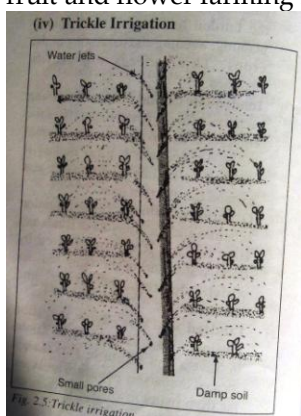
- a) *Pests and diseases*. Pests like cotton seed bug and quelea birds that feed on rice coupled with crop diseases leads to low yields.
- b) *Unreliable rainfall* in the river catchments leads to fluctuating of water hence reducing the amount of water availability for irrigation. This problem is particularly acute in Perkerra.
- c) *Occurrence of floods*. Some irrigation schemes like Bunyala in Busia and Hola in Tana River are affected by flood water during the rainy seasons which destroy the crops and infrastructure.
- d) *Silting of canals*. Frequent silting interrupts water flow in canals and reduces the amount of water available for irrigation. The dredging process is expensive.
- e) *Human diseases*. Stagnant water in fields encourages breeding of snails and mosquitoes which transmits bilharzias and malaria which weaken / kill farmers.
- f) *Inadequate capital*. Irrigation farming requires a lot of capital to purchase the equipment and to meet the operational costs. it has been difficult to initiate new projects due to inadequate capital.
- g) *Mismanagement of the irrigation schemes*. Due to mismanagement, several irrigation schemes have collapsed. For example, Hola, Bura, Ahero and West Kano.
- h) *Inadequate labour*. Irrigation farming is largely labour-intensive. Farmers are therefore faced with the burden of hiring labour during the planting, weeding and harvesting periods.
- i) *Poor extension services*. There are few agricultural extension officers. The badly needed technical advice to farmers is either inadequate or absent.
- h) *Limited markets*. The surrounding areas for schemes like Hola; Kitobo in Taveta, Perkerra and Katilu in Turkana is sparsely populated and far from major towns, thus limiting the market for its products.

Methods of land reclamation and rehabilitation in Kenya.

In Kenya, the following methods are used in land reclamation and rehabilitation.

- a) Drainage of swamps
- b) Irrigation of dry lands
- c) Planting of drought resistant crops
- d) Afforestation

- e) Eradication/control of insects/tsetse flies
- f) Filling up of quarries, mines, derelict land
- g) Application of manure
- a) **Drainage of swamps.** This is a method of reclaiming marshy or waterlogged land by removing excess water or lowering the water table. The water flows away by gravity through ditches into other drainage systems like rivers or canals. The reclaimed land can be used for farming or settlement. E.g reclamation of Yala and Bunyala swamps.
- b) **Irrigating land.** This is the artificial method of supplying water to a region which does not receive adequate rainfall to meet crop moisture requirement. The amount of water needed for irrigation depends on the type of crop and nature of the soil and land elevation. Rolling terrain is the most suitable for irrigation. The common irrigation methods include;
 - i. *Water lifting method.* The water is cooped from a river, a canal or a well by a bucket and splashed on the field. This is the method used in kitchen gardens to water crops grown near the water source.
 - ii. *Flood irrigation/Basin irrigation.* This involves flooding an area with water diverted from the river through main canal and subsiding canals to make it possible for irrigation farming. This is the most common method used in most of the irrigation schemes in Kenya.
 - iii. *Sprinkler or overhead irrigation.* Here, water supplied from mains through pipeline under pressure is applied in the field in form of rain by rotating sprinklers mounted on vertical pipes. This method is widely used in growing of coffee, pineapples and in horticulture.
 - iv. *Trickle irrigation.* Here, water is applied to individual plants along a row through plastic pipes, laid in the fields with holes at specific intervals to wet the plants. This is commonly used in areas of fruit and flower farming like Trans Nzoia and Central Kenya.



- v. *Canal irrigation.* The canals constructed from a perennial river pass through farms thereby wetting the soil. Occasionally, farmers draw water from the canals to water the crops. This method is used in Yatta in Machakos, Kitobo Irrigation Scheme in Taveta and Katilu in Turkana.
- vi. *Drip irrigation.* Here, bottles filled with water are inverted into the roots of plants. The plant slowly saps the water from the bottle. The method is used in low rainfall areas to grow trees, fruits and flowers.
- c) **Control of pests.** Insect pests like tsetse flies are controlled through bush clearing, trapping, spraying and sterilization of the males. This has successfully been carried out in Lambwe Valley. Mosquitoes are controlled through fumigation and draining stagnant water, spraying and clearing of bushes near settlements. Rodents, birds, porcupines and squirrels are controlled by trapping, poisoning, hunting or scaring them away.

- d) **Rehabilitation of quarries.** Quarries may be filled up with rocks and topped with fertile soil, making them suitable for farming and settlement. E.g Bamburi Nature Trail where trees and animals have been introduced after rehabilitation.
- e) **Afforestation and Reafforestation.** Afforestation is the process of planting trees in an area where there has never been trees. Reafforestation is the replacement of cut trees with new seedlings. The government has taken an initiative of rehabilitating areas where indigenous forests have been destroyed in the process of charcoal burning and felling of trees for timber. Such areas include Mount Kenya region, Rift Valley Western and the coast. Also, belts of drought-resistant trees have been grown at the edge of semi-arid areas to consolidate the efforts to rehabilitate the land.
- f) **Rehabilitation of eroded landscape.** Construction of terraces, strip cropping, contour farming and planting cover crops are the methods used to rehabilitate eroded areas in Nyambene, Kisii and Muranga. Building gabions is undertaken in Baringo, Machakos and Kisii Counties.
- g) **Agro forestry.** This is the practice of planting trees, such as graveria, alongside crops, within a farm to protect the soil from erosion and enrich it. Agro-forestry is commonly done in most parts of Kenya.
- h) **Control of floods.** These are controlled through building of dykes, dams, diversion canals, building embankments, dredging, channel widening and planting vegetation to reduce surface run-off. This is practiced in Budalangi along river Nzoia, Tana Delta and Kano Plains along river Nyando.
- i) **Planting drought resistant crops.**
- j) **Application of manure and fertilizer**

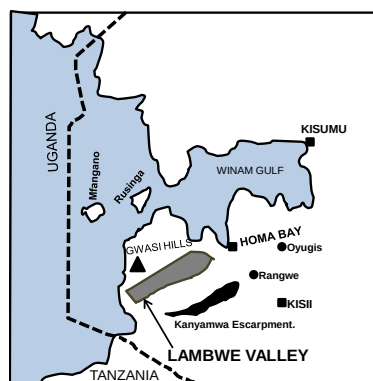
Related studies on land Reclamation in Kenya and the Netherlands.

KENYA

(i) *Tse-tse Fly Control in Lambwe valley*

The Lambwe Valley, that has conducive physical conditions for tse tse flies, is in the Lake Region in Suba sub-county. The project to rehabilitate the Lambwe Valley was initiated in the 1970s and funding was by the World Bank with the following objectives;

- ~ To eliminate the tsetse fly that is a threat to both people and animals.
- ~ To rehabilitate the area so as to make it a zone for keeping improved domestic animals.
- ~ To use methods of reclamation that would not have adverse effects to the area.



The following are the tsetse fly control measures in Lambwe Valley.

- a) *Sterilizing the male fly.* This is done by exposing them to Gama rays before being released to the wilderness.
- b) *Bush spraying.* Low aircrafts are used to spray the tsetse fly inhabited areas with insecticides.
- c) *Bush clearing.* Selective clearing to avoid soil erosion, targets the fly's habitat for destruction.
- d) *Creation of buffer zones.* A belt of about 5 km wide was introduced whereby the tsetse preferred environment was replaced with dense cultivated settlements.
- e) *Killing of the hosts.* Wild animals were selectively hunted and killed .for example buffaloes on which the fly fed and moved along with giraffes on the other hand were moved to parks. Like Tsavo.

(ii) Drainage of swamps: Yala and Bunyala

The project is found in the lower courses of Rivers Yala and Nzoia which are flooded during the long heavy rains. The project was conceived by the GOK in 1970 with the following objectives;

- ~ Free the area from pests through draining.
- ~ Prepare the area for settlement and profitable agriculture.
- ~ Reduce flooding and associated hazards of mosquitoes and other waterborne disease.
- ~ To achieve an overall development of an otherwise remote area.

The work involved the digging of drainage channels to collect and direct excess water to the main river channels. River barrages were built at certain strategic positions to control and regulate water flow and check floods. Water from the perennial streams provides irrigation water to the rice fields.

In 2003, a USA group of company called Dominion Farmers took over the management of the Yala – Bunyala project from the LBDA. By that time, the project had collapsed.

The group established fish farming, demonstration farms for cotton and soya-bean production and revived the collapsed dykes

Benefits of the Yala/Bunyala project

- a) *Source of employment.* Many local people have been employed thus raising their living standards.
- b) *Infrastructural development.* The scheme has promoted the construction of feeder roads from Siaya town to the project and Bondo- Usenge main road.
- c) *Source of income.* The farmers earn an income through direct sale of rice and other crops.
- d) *Increased crop production.* The scheme has led to rehabilitation of over 800 ha of land for agricultural use thus increasing production of Soya-beans, rice, cotton, maize and vegetables.
- e) *Control of floods.* The dams have controlled floods during the rainy season.
- f) *Disease control.* Malaria and other water related diseases have been controlled to some level.

Land reclamation in the Netherlands.

Netherlands, also called Holland is a country with much of its present dry land below sea level. The land was reclaimed from the sea, marshes or lakes.

Land reclamation began in the 13th century and continues upto date. Such projects were driven by disasters like the one that occurred in 1421 when the sea broke an embankment and killed 10,000 people.

What is a polder?

A polder is a Dutch word meaning a low lying area reclaimed from the sea and enclosed by dykes OR it is a land reclaimed from the sea in the Netherlands

Methods of land reclamation in Netherlands.

- a) And reclamation from the sea, marshes and lakes using dykes.
- b) draining rivers and marshlands. Embankments are erected then water is pumped out
- c) Upgrading sandy and barren areas through use of fertile soils or application of fertilizers.

Factors that led land reclamation in Netherlands.

- a) Increasing population placed demand for land for agriculture.
- b) Need to protect the land from flooding of sea
- c) To bar saline water from penetrating inland
- d) Need to improve drainage and the quality of existing land
- e) Creation of a fresh water lake to supply fresh water for both domestic and industrial use.

Description of the land reclamation from the sea in Netherlands.

Part of the low lying land covered by sea water to be reclaimed was enclosed using strong walls/ Protective dykes. Ditches were constructed to lead water to pumping station. Ring canals were

constructed to carry water from the area to be reclaimed into the sea or the freshwater lakes that had been created.

Pumping stations with wind mills were installed to pump water sea water from the area enclosed by the dyke. Water was pumped out of the area enclosed by the dyke.

Chemicals are added to the soil to reduce salinity/ fresh water is pumped into the enclosed land to reduce salinity. Oats, rye and sugar beets are planted to improve the PH of the soil and reduce the water further. Area was divided into rectangular portions using inner dykes and ring canals. The soils were treated with chemicals to lower their salinity. The drained land was flushed with fresh water to remove salt from the soil. Pumping out of the water from the polder was a continuous. The land is dry and ready for use Experimental crops are planted and buildings put up, for five years before the land is open for general use.

CASE STUDIES.

The two projects that were begun by the government in to put an end to the threat constantly posed by the sea were:

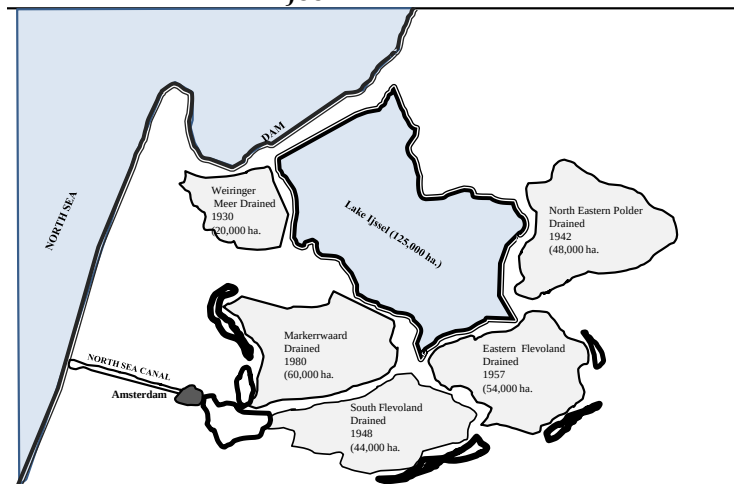
1. The Zuyder Zee Project/Ijssel Meer Reclamation Scheme.

The project as started in 1927 to reclaim the southern sea (Zuyder Zee). Initial reclamation started by building the main ring dyke (32 km long and 7 metres above sea level) known as the **Great Dyke** joining Netherlands through the Wieringen Island to the Friesland coast . The construction took 5 years (1927-1932).

The water enclosed by the dyke was drained away to form Lake Yssel. The lake is currently a fresh water lake because it is connected to river Rhine.

The whole project comprises five polders totaling 220,000 ha of arable land. Crops produced in the polders include barley, wheat, rye, potatoes, beet root, oats, vegetables and fruits.

LAKE IJSSEL



Benefits of Zuyder Zee project

- Creation of large fresh water lake in the middle of the country e.g. Lake Yssel which provide fresh water to the province of North Holland and Friesland for irrigation/domestic/industrial purposes.
- Reclaimed polders have attracted towns that have improved infrastructure and social amenities. e.g. roads have been constructed.
- The great dyke upon which a road has been build connecting north and South Holland has shortened the coastline distance by about 320km.
- The old dykes form a second line of protection against tides such that the new dykes are cheaper to maintain.

- e) The reclaimed land has increased arable land by about 10% of the total land. The land is fertile and suitable for arable agriculture.
- f) The degree of soil salinity in the polders has been lowered by the fresh water from Lake Yssel that seeps down from the lake into the surrounding areas to dilute the salts.
- g) The fresh water reservoir serves as a catchment basin during winter when the water levels on the other side prevent natural drainage.
- h) Project reduced the risk of flooding in the area through the use of dykes, canals, ditches and pumping stations.
- i) The Project is a tourist attraction earning foreign exchange.
- j) Road connection between the provinces of North Holland and Friesland has been shortened.
- k) Creation of employment opportunities from reclamation activities.

2. The Delta Plan

The project was initiated in 1953 after the February 1st 1953 disaster where floods killed about 1800 people and destroyed 152,000 ha of rich agricultural land. This was a project to reclaim the south west of Holland which has deep broad estuaries reaching farther inland.

The Delta plan was aimed at providing closure by means of massive dams of four broad , deep –sea inlets through Haring Vliet, Bronwershavensche Gent, Gawtern Scheldt and Veersche Gat.

Benefits from the Delta Plan Project.

- a) Control of salination and pollution of inland fresh water by controlling the movement of salt sea water.
- b) The islands to the South West were no longer isolated since infrastructural facilities were put in place.
- c) The provision of fresh water for domestic and industrial use.
- d) The area has attracted many industries and has become a major destination of tourists.
- e) Control of flooding and tidal destruction in the South West region.
- f) Dams and dykes have completely checked frequency of flooding and tidal destruction.

Comparison between Land Reclamation methods in Kenya and the Netherlands.

Similarities.

- a) In both, the reclaimed land is located in low lying areas such as shallow coastal areas, flood plains or swamps.
- b) In both areas, dykes are used to control water from entering the reclaimed lands.
- c) In both countries ditches and canals are used to drain water from the reclaimed areas.
- d) Scientific methods such as use of fertilizers to improve soil fertility are employed in both.
- e) In both countries, the government organizes the work of reclaiming land and divides it to the people.
- f) In both, the dykes have broken down leading to destruction of property and lives.

Differences.

- a) In Netherlands, the technology employed in reclaiming land is very advanced e.g use of underground pipes and pumping stations. In Kenya there is low technology that uses only canals and dykes.
- b) In Netherlands, the reclaimed land is mainly from the sea while in Kenya it is from swampy and marginal areas.
- c) In Netherlands, dykes are constructed mainly to prevent sea water from entering reclaimed land while in Kenya dykes prevent river waters from spreading onto the land.
- d) In Netherlands the main method used to reclaim land is the draining of the seas while in Kenya a variety of methods are used such as irrigation, tsetse fly control, planting drought resistant crops etc.
- e) In Netherlands, the methods employed are capital intensive while in Kenya the methods are less expensive.

FISHING

What is fishing?

This refers to the exploitation of water resources such as fish, seals, whales, crabs, lobsters, prawns, oysters and seaweeds.

Fisheries are the water bodies that contain fish and other related resources. They are also called fishing grounds. For example, rivers, oceans, ponds, lakes etc.

Fish farming is the rearing of fish in ponds under controlled conditions conducive for the survival of fish.

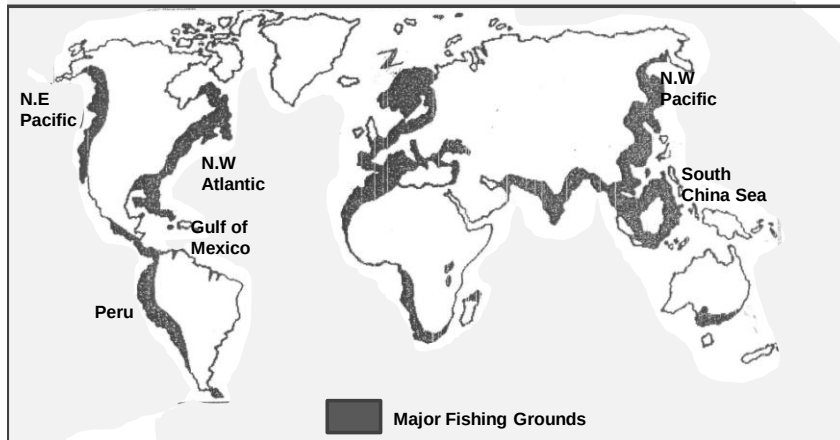
Factors influencing fishing.

- a) *Presence of planktons.* The presence of natural fish food known as planktons both zoo planktons (microscopic animal organisms) and phytoplankton (tiny vegetative matter) is important for fish availability. Planktons thrive in environments where the depth of water is less than 180 m to permit sun rays penetration.
- b) *Cool climate with temperatures below 21°C.* Excessively high temperatures kill the planktons hence few fish. This explains why there are fewer fish found in the ocean waters near the equator. Such fish are also salty, oily and unpopular.
- c) *Convergence of warm and the cold currents.* Large concentration of fish species are found where upwelling of the ocean water occurs. Upwelling mixes the water thereby spreading out the temperature of the water and bringing to the surface fish nutrients.
- d) *Availability of shallow waters.* Planktons need sunlight to manufacture food. Extensive continental shelves with depth not exceeding 180m are usually good fishing grounds.
- e) *Presence of land derived mineral salts.* A lot of fish is found in river estuaries and deltas where the rivers deposit land derived nutrients for the fish to feed on. E.g the Congo and Senegal estuaries and rivers Nile, Niger and Tana deltas
- f) *Nature of the coastline.* Indented coastlines form sheltered inlets where there is no direct influence of the sea. They form good breeding grounds. Wide continental shelves are good breeding grounds.
- g) *Availability of capital.* Large scale commercial fishing require heavy capital outlay for purchase of fishing gear, vessels, refrigeration facilities and fish processing equipment. This explains why marine fishing is limited along the Kenyan coast and more advanced in Japan, Norway, Canada, Britain and USA.
- h) *Level of technology.* The ability to carry out large scale commercial fishing largely depends on the type of technology to be used by the fishermen. Developed countries have the advantage of modern and sophisticated fishing equipment to carry out deep sea fishing.
- i) *Large market.* Areas with large population offer a good market for fish. The large population may also provide the required labour force for large scale fishing. Lake Victoria region in Kenya and the islands of Japan have a large population with a fish eating culture.
- j) *Reliable transport.* Efficient transport network will make it possible for the fish caught to get to the market while still fresh. Even when refrigeration is done to preserve fish, good roads still remain necessary to transport the fish to the market.

Distribution of major fishing grounds in the world.

The nature and type of ocean currents flowing a given coast has a great influence on the distribution of the major fishing grounds of the world. Coasts which are washed by cold ocean currents are rich fisheries since they have conducive conditions for the thriving of planktons.

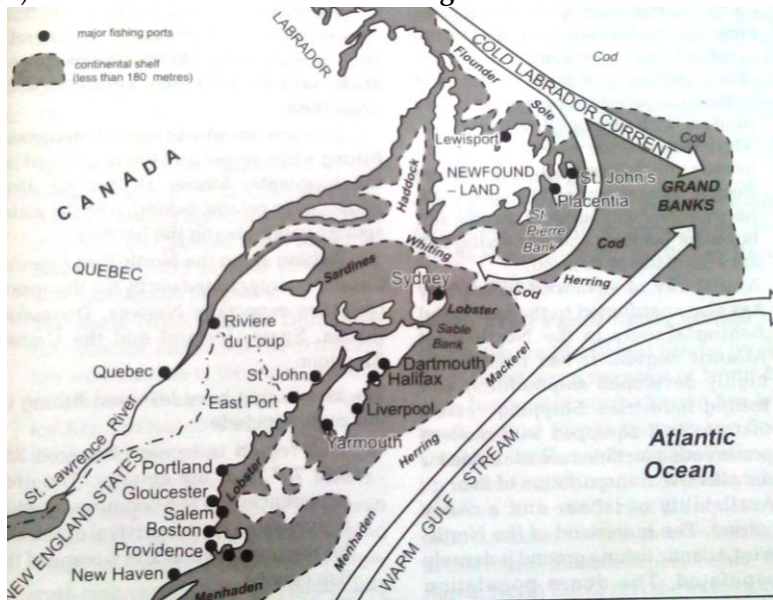
The major fishing grounds of the world (map)



Some of the major fishing grounds of the world include;

1. The Atlantic Fishing Grounds.

a) The North-West Atlantic Fishing Grounds.



The richest fishing ground in the world, it is located on the north-eastern coast of North America and stretches from eastern coast of Canada to New England in United States. It includes the Canadian provinces of *Nova Scotia*, *New Brunswick* and *Quebec*. The main fishing areas within it include the *Grand Bank*, the *Sable Bank* and *George's Bank* (they are rich in *cod* *herring*, *haddock*, *menhaden*, *mackerel* and *lobsters*)

Factors that favour fishing in the North-West Atlantic grounds.

- The large extensive continental shelf in the grounds areas is essential for the flourishing of fish as it supports the luxuriant growth of planktons, the food for fish.
- The convergence of the cold Labrador Current and the warm Gulf Stream current results in;
 - ~ Cool temperatures that favour the thriving of planktons.
 - ~ The warm current raises the area temperature to create an ice-free situation and enable fishing throughout the year.
 - ~ The cold currents carries with it land-derived minerals into the Atlantic coast of Quebec.
- The dense population in the surrounding area especially in the New England states of Rhode Island, Massachusetts, Vermont, Connecticut and Maine, provide a ready market for fish.
- The unfavourable physical conditions for agriculture (cold climate and rugged landscape) in Quebec province of Canada make exploitation of the fishing grounds the immediate alternative.
- The technological advancement in the region (self contained ships with radar and processing facilities and the wireless services I ships for communication and modern storage facilities both on land and in the ships) allow fishing to be carried out throughout the year.

2. North-East Atlantic Fishing Grounds

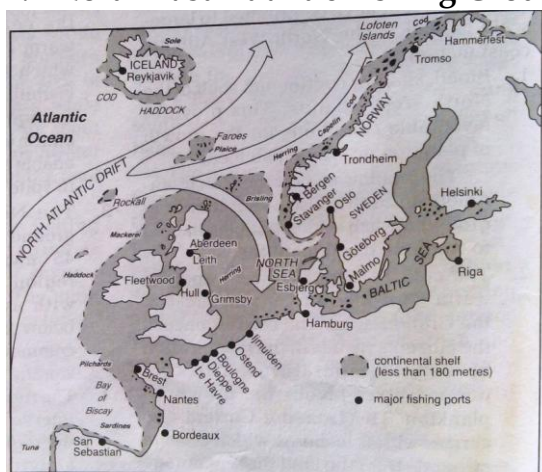


Fig. 3.2 North-East Atlantic fishing grounds

The area stretches from the Iberian Peninsula (Portugal and Spain) and stretches northwards through the North Sea and England Channel to the Arctic Ocean. It covers the coast of France, Germany, Denmark, Britain, Norway and Finland. The main fish caught here are cod, herring and Mackerel.

Why the fishing industry in the North-East Atlantic grounds is highly developed.

- High latitudes ranging from temperate to polar zones encourage the flourishing of fish.
- The numerous fiords along the coast, especially in Norway form inlets, which provide shelters for the spawning of fish.
- The ruggedness of the immediate surrounding especially the one of Norway neither favours crop farming nor livestock keeping, making fishing one of the appropriate alternatives.
- The prevailing warm Atlantic drift raises the temperature and therefore making fishing in the area possible throughout the year.
- The grounds have a large continental shelf which is abundant in plankton food for fish.
- Dense population of Western Europe offer ready market for fish.
- Highly developed technology has contributed to the development of fishing. Britain and Norway are among the leading ship builders of the world.

The fishing grounds in the southern Atlantic ocean

- The west coast of South America.* On the coast of Peru, fishing is favoured by;
 - ~ The presence of a continental shelf.
 - ~ The prevailing cold Peruvian current that favours flourishing of planktons.
- The Namibian Coast (South-Africa).* The coast of Namibia and the Cape Province of South Africa are rich in fish due to the presence of the cold Benguela current. The coast of Mauritania in North West Africa is favoured by the presence of the cold canaries current

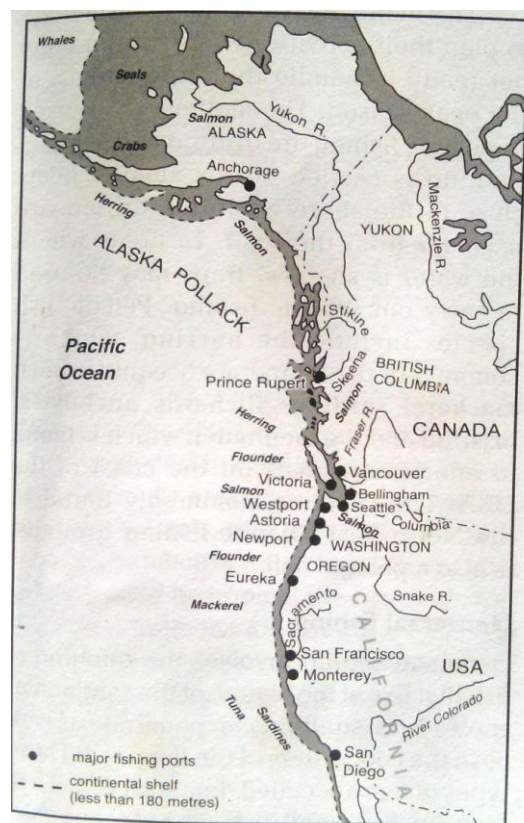
The pacific fishing grounds.

- The North-East Pacific (west coast of North America)**
- The grounds stretch from the Alaska state (USA) southwards through the British Columbia province (Canada), Washington and Oregon states to California (USA). The main fish caught is salmon which spawns and grows up in the fresh water inlets before swimming into the salty ocean water of the pacific.

Why the fishing is highly developed in these grounds.

- The Labrador Current moderates the area temperature to create an ice-free situation and enable fishing throughout the year.
- The cold Californian current converges upon the Warm current and the resulting cool temperatures are ideal for the growth of planktons.
- The coast has fiords which form inlets. This in turn provides favourable shelter for breeding of fish. The technological advancement in the region in the USA and Canada encourages deep sea fishing.

North-East Pacific



North-West Pacific

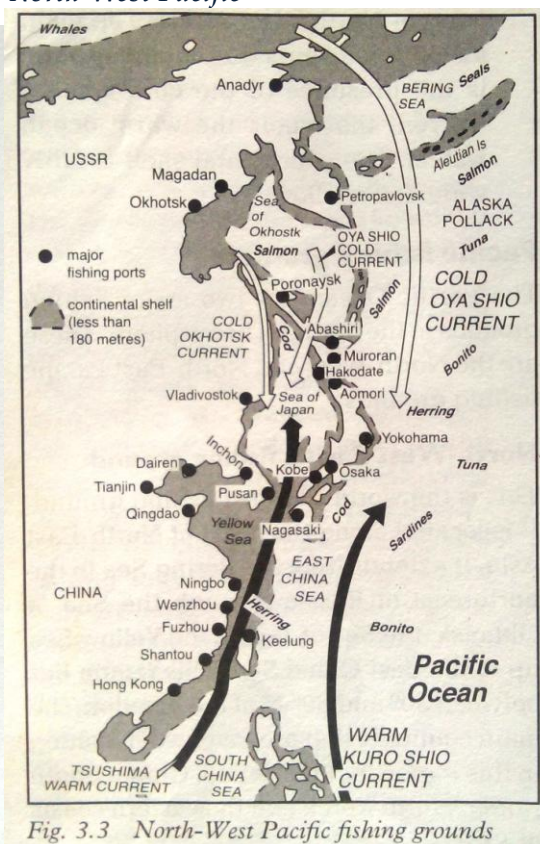


Fig. 3.3 North-West Pacific fishing grounds

3. The North-West Pacific (North East Asia)

These grounds comprise the fishing grounds of Japan, China, Malaysia and Indonesia and form the world's largest fishing grounds.

Why the fishing is highly developed in these grounds.

- The convergence of warm Kuroshio and cold oyashio currents which cause upwelling of water and favour growth of fish. The warm currents raise the temperature thus making the coast ice free for most of the year. The cold current makes the temperatures low and this favours the flourishing of planktons.
- The dense populated countries of Japan, China and Taiwan provide a ready market for the fish.
- The advanced technology in especially Japan in ship building and electronic technology which are used in large scale and deep sea fishing.
- The numerous islands within North Asian coast form good shelters for the breeding of fish. Japan comprises several islands.
- Extensive continental shelf which allows deep penetration of sunlight thus favouring flourishing of planktons.

Fishing Grounds in Africa.

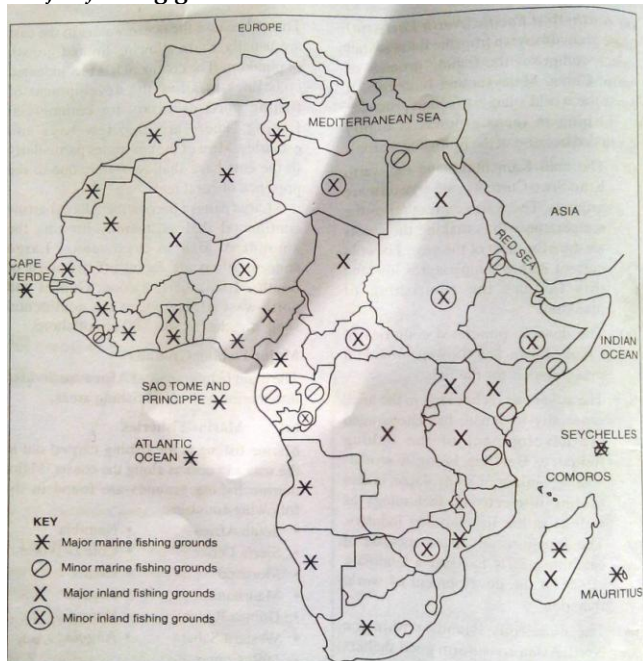
Africa is not a major producer and exporter of fish and fish products despite being surrounded by seas and oceans and possessing numerous lakes and rivers.

Reasons why fishing is not so much developed in Africa.

- The ocean waters in the east of Africa are warm thus limiting the growth of planktons.
- The continent has few indented coastlines to allow the development of fishing ports necessary for commercial fishing. There are few bays and estuaries on the African coast.

- c) Most of the coastlines particularly in the east have shallow waters due to the presence of coral reefs which hinders movement of large scale fishing vessels.
- d) Large parts of the continent have narrow continental shelves, thereby limiting the amount of fish in the oceans.

Major fishing grounds.



a) Marine fisheries.

Major marine fishing grounds are in South Africa, Sierra Leone, Morocco, Mauritania, Namibia, Cote D'Ivoire, Ghana, Nigeria, Kenya, Guinea Republic, West Sahara, Angola and D.R.C.

South Africa is the largest producer of marine fish in Africa and accounts for 5% of the world's fish catch. Other leading producers are Namibia, Angola and Morocco.

Reasons for successful fishing in these countries.

- ~ The countries are rich with adequate capital to support large scale commercial fishing.
- ~ South Africa and Namibia benefit from the confluence of the Benguela and Mozambique currents leading to mixing of water to create ideal fish breeding conditions.
- ~ Some also have well developed ports which allow large fishing vessels to anchor. Some of the fishing ports include Port Elizabeth, Cape Town and Durban in South Africa, Walvis Bay in Namibia; Abidjan in cote D'Ivoire, Lobito in angora, Lagos in Nigeria, Tema in Ghana and Casablanca in Morocco.

The main fish caught are *sardines, tuna, stockfish, sole, whales, lobsters, herring, shrimps* and *mackerel*.

The Kenyan coast has a large concentration of marine fish though oily, despite the warm waters. This is assisted by the divergence of the Indian Ocean waters as the Mozambique current divides into two to form the Somali Current and the Mozambique current. This divergence leads to upwelling which encourages the growth of planktons.

b) Inland fisheries.

This is the fishing that is carried out in the interior of the continent in rivers, lakes, dams and ponds. Some of the leading inland fisheries are found in Malawi, Zambia, Sudan, Nigeria, Ghana and Egypt.

Characteristics of inland fishing in Africa.

- a) Fishing is mainly on small scale to meet the families' subsistence and the little surplus for commercial purposes.
- b) The fishermen use traditional methods such as traps, hand lines and barriers to catch fish, hence the harvest is small.
- c) The industry is poorly developed because inadequate capital hinders expansion.

Apart from the inland lakes of Africa, the manmade lakes where fishing is carried out in Africa include Volta, Kainji, Nasser, Orange, Kariba, Caborra Bassa and Nyumba ya Mungu.

The main fish caught in the lakes are *tilapia*, *eels*, *dagaa*, *Nile perch*, *cat fish*, *shell fish* and *herring*.

The fishing rivers include Niger, Zambezi, Senegal, Nile, Orange, Tana, Limpopo, Congo, Pangani and Ruvuma.

However river fishing in Africa is limited because;

- ~ The rivers have a few stocks, rendering the activity to be for subsistence.
- ~ Some rivers are infested by crocodiles which attack the fishermen

The main fish caught is *salmon* and *pilchard*

Fish farming in Africa.

This is the breeding of fish in ponds under controlled conditions conducive for the survival of fish.

In some homes, fish farming provides the fish to supplement animal protein. The main fish bred is Tilapia, trout, eels and black bass.

Fish farming is carried out in Liberia, Kenya, Ghana, Nigeria, Cote D'Ivoire, Burkina Faso, Uganda, Egypt, South Africa and Sudan.

Types of fish

1. **Pelagic fish:** Are fish communities that live near the surface or at the shallow depth of the seas. Examples include herring, mackerel, sardines and tuna.
2. **Demersal fish:** These are fish communities that live at or close to the bottom of seas. Examples include cod and cat (mud) fish. Cod usually preys on other fish, whereas the catfish feeds on organisms buried in sediments. Fresh water bodies such as swamps and slow moving rivers are common breeding places for the catfish.
3. **Anadromous fish:** These are migratory fish moving either up or down a river course. Examples include the salmon and pilchard. Fishermen who depend on the anadromous varieties of fish are seasonal, since the fish move only during certain times of the year, either to mature or breed in a new environment.

Types of fishing.

1. **Pelagic fishing.** This involves the catching of fish that swim close to the water surface (*pelagic fish*). Examples of pelagic fish include *mackerel*, *menhaden*, *herring*, *sardines* and *tuna*. They are usually small in size and swim in shoals. They are migratory in character making pelagic fishing a seasonal activity. Fishing method: - *drifting* and *seining*.
2. **Demersal fishing/ground fishing.** Catching of fish at the bottom of deep water bodies where the water is cool. Demersal fish are not migratory in nature. They are large between 1 and 4 meters. They do not exist in shoals. Examples: - *cod*, *haddock*, *Pollock*, *hake*, *flounder* *halibut*. Chief Fishing methods: - *trawling* and *long lining*.
3. **Inshore fishing.** The fishing that is done close to the shores in shallow sheltered coastal waters and lower stretches of rivers by subsistence fishermen in coastal settlements. The fish caught: - *shell fish* and crustaceans like *lobsters*, *prawns*, *shrimps* and *crabs*. Chief methods: - *use of hooks*, *nets* and *lines*
4. **Freshwater fishing.** This is done in streams, rivers, lakes, ponds and padi fields to supplement the diet of the local people.

Examples of fish caught:-*sturgeon, carp tilapia* and *trout*.

Chief fishing method: - *lining* and *drifting*.

Methods of fishing.

The methods of catching fish are broadly categorized into two; traditional and modern fishing methods. Choice of method in fishing is factor of type of fish, the fishing environment and the level of technology.

Traditional fishing methods.

Such methods rely on simple tools such as baskets, arrows and hook

a) *Harpooning*.

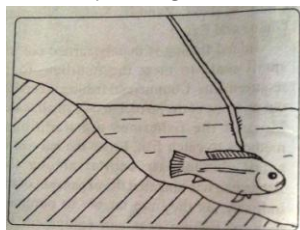
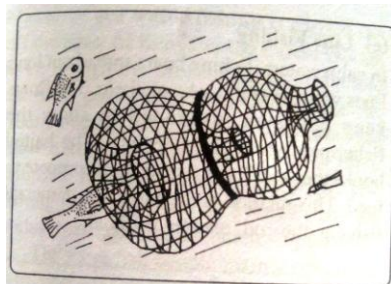


Fig. 3.9: Harpooning fishing method

This is the use of spears, arrows or sticks to strike the fish in clear water where the fish is visible. This is a subsistence fishing Technic since the catch is limited. It is also prone to threats of crocodile and hippo attacks to fishermen.

b) *Use of baskets*. The basket is funnel shaped to slow easy entry for fish.



At the mouth there is no -return valve which restricts the outward/escape movement of fish once inside the basket.

The basket is lowered in water with the mouth facing the direction from which the water is flowing. Bait is put in the basket. The basket is held in position with ropes/stones/sticks to prevent it from being swept downstream. The basket is left in that position for sometime/overnight for landing

c) *Use of traps*. Fishermen identify the paths of Anadromous fish and traps (made of woven reeds or baskets designed to trap the fish once it gets in) laid to catch them.

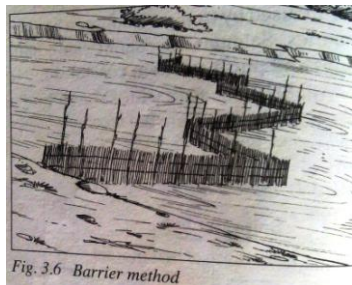


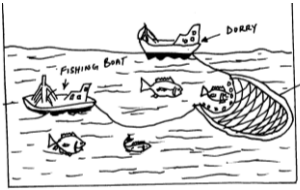
Fig. 3.6 Barrier method

- d) *Barriers*. In flood-prone areas, barricades are constructed during floods to catch fish. The barriers hold up the water containing fish. When the water level drops below the height of barriers as floods subside, the fishermen simply scoop out the fish.
- e) *Gill nets*. The nets have a mesh, which lets only the head of a fish to go through and then traps it by its gills. They are most effective in shallow water fishing. This is most suitable method for catching tilapia.
- f) *Herbs*. Some fishermen crush herbs and sprinkle in calm river water. The fish then become unconscious before they are simply collected by the fishermen.
- g) *Handlines*. The fishermen tie baits on hooks and throw them in water. Fish is attracted by the bait. The method is mainly used to catch catfish and eels.

Modern fishing methods.

These are large scale fishing methods used in major fishing grounds of the world. They include;

1. **Seining:** Here fishing boats with the help of dory (small) boats spread out the seine nets with small meshes in the sea/lake.



Once the nets are spread out, the boats may remain stationary or the nets be held in position using floats. The fishermen then give the fish sometime to be trapped. Once the net is full, it is hauled over and the fish emptied on to the ship. This method is used to catch pelagic and anadromous fish, which usually move to the shoals. It is the most effective method used to catch the *dagaa* on Lake Victoria and Tanganyika. If not appropriately used, seining leads to over-fishing because it does not discriminate the ages of the fish being caught

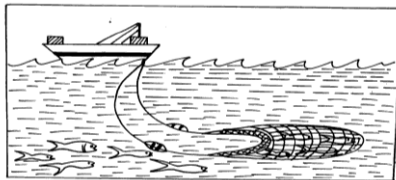
a) Haul seining.

Haul seine nets have weights at the bottom to keep them stretched. It also has corks to keep them floating stretched. The nets are stretched by two boats to surround the shoal of fish. The net is pulled from both ends by the two ends by two boats towards the shore. At the shore the fish are removed from the nets to the container. In shallow waters at the coast one end is pulled by fishermen and the other by small boats.

b) Purse-seining.

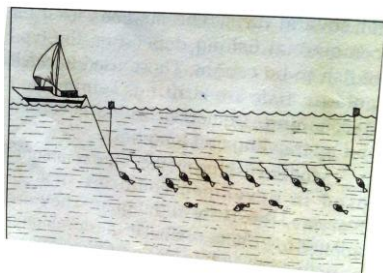
A dory or sounder is used to identify a large shoal of fish. The seine net is kept vertically in water by floats and weights. The top and bottom of the net has ropes passed through and one end of the net is tied to the main ship. The sounder /dory (smaller boat) pulls a large circle that is purse- shaped enclosing the fish inside. The fish are then emptied into the ship, and nets re- cast into the water.

Trawling: This involves the pulling of a net by a boat or ship.



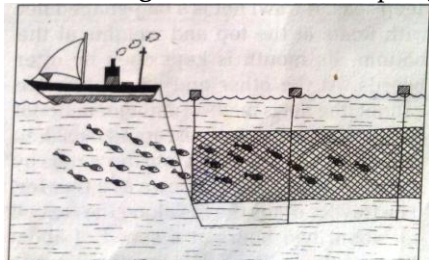
This method is used to catch demersal fish e.g. the cod in deep seas. A bag-shaped net is attached to a ship/trawler. The nets mouth is kept open by other boards/head beams. The upper part of the net is kept afloat by corks/floats. Weights are used to keep the lower parts of the net at the seabed. The trawler drags along the net. After sufficient fish is caught, the net is

2. **Line Fishing:** In calm waters, fishing boats spread out long lines with several hooks on them.



The floats keep the lines suspended to show the fishermen where the lines are. The baited hooks then catch the fish as they compete to feed. This method is also used to catch mainly demersal fish e.g. the cod, usually in shoals.

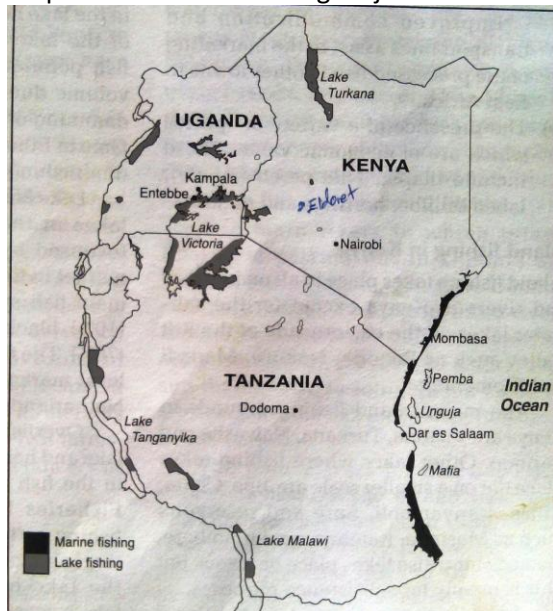
3. **Drifting.** It is used to catch pelagic fish. A drift net is hung vertically into the sea.



Floats on the upper edge and weights at the bottom keep the net straight and afloat. The nets hang just below the water surface, and are able to catch the fish by the gills as they try to swim through it. When a sufficient catch has been realized the net is hauled into the ship (drifter) and implied.

Fresh water and marine fishing in east Africa.

Map of East Africa showing major fisheries



Fishing in Kenya.

Despite having a long coastline and several inland lakes, fishing is not widely practiced in Kenya, nor fish eating culture popular among many Kenyans.

The fishing grounds in Kenya are divided into two;

Marine/sea fishing.

This is the fishing carried out off the coast of Kenya in the Indian Ocean. The common fish obtained are tuna, kingfish, mullet, bonito and sardines which are pelagic fish.

Marine fishing is not yet developed and accounts for only about 10% of the total catch.

Reasons why marine fishing is not yet developed in Kenya.

- The Narrow continental shelf has limited the area on which planktons can grow.
- The relatively warm tropical waters do not favour breeding of large fish. The warm current such as Mozambique discourages fish breeding.
- Competition from developed countries such as Japan and Korea that have advanced facilities and are able to tap the fish in the deep sea.
- Inadequate capital to purchase modern vessels and equipment.
- Limited market sizes for fish due to tradition beliefs e.g few people eat fish in Kenya. Also the price of fish is high thus discouraging many people from eating it regularly.
- Inadequate facilities for preservation and processing. The fishermen lack refrigeration facilities to enable them transport the fish from north coast to the markets in the south.
- Rough sea especially strong wave and sea tides are a great menace the fishermen as they cause vessels to capsizes.

Why Malindi along the coastline of Kenya is more advanced in fishing than other areas

- The influence of current.* The convergence of cold and ocean current improves circulation of oxygen and dispersal of nutrients for fish. Currents regulate the temperature of water favouring growth of

planktons. Warm currents moderate water temperatures enabling fishing to be carried out throughout the year.

- 2) *Indented coastline.* Indented coastlines provide ideal breeding grounds for fish and development of ports.
- 3) *Climate.* The cool climate allows growth of planktons. Cool climate has made fishing conditions for preservation favourable.
- 4) *Technology.* Advanced technology of the area has led to rapid growth of fishing industry e.g use of riders in fishing and presentation.

Inland (fresh water) fishing.

Kenya has many lakes and rivers but not all contain fish. The majority of the lakes are salty and not suitable for the existence of fish. The only alkaline lake containing fish is Lake Turkana. The main fresh water lake fisheries are Lakes Victoria, Naivasha, Baringo, Jipe and Chala. Kenyan lakes are the main suppliers of fish in Kenya.

The lakes are calm compared to the sea enabling the fishermen to reach the deep areas where fish catch is high. The fishermen only require simple equipment to carry out small scale fishing.

The inland fishing grounds.

Lake Victoria.

The lake contains many fish species, but the main one is Tilapia, herring, the Nile perch and Dagaa (omena).

The dense population around the lake and Kisumu town ensures a steady market. The fish people have cooperatives which assist them to market their fish.

The main fishing beaches are Usenge, Asembo, Mbita, Karungu, Wichlun, Muhuru, Dunga, Misoro and Kendu Bay.

Problems experienced by fishermen while fishing in Lake Victoria.

- a) The occurrence of strong winds leads to high waves causing accidental drowning/destruction of fishing vessels and nets.
- b) Most fishermen have poor fishing equipment/motor boats engines which are ineffective. This leads to low catch delayed landing
- c) Fishermen lack appropriate storage/preservation facilities which cause heavy losses of the catch/low catch.
- d) Presence of floating vegetation/water hyacinth which entangle and tear the fishing nets which is a loss to the fishermen
- e) Parts of the lake shores are swampy/marshy which makes the landing of the catch difficult.
- f) Insecurity/theft of fish and fishing equipment discourages the fishermen.

Lake Turkana.

The lake contains Tilapia and Nile perch despite being alkaline. The sparse population of the neighbouring communities (El Moro and Rendille) does not provide adequate market for the fish. The construction of an all weather road from Kitale to Kalokol has made it easier for the fish to get to the market.

Lake Naivasha.

Fishing in the lake is intensive and is assured of a steady market in Nairobi and Nakuru towns. The main fish here is tilapia. Some people do here sports fishing.

Lake Chala.

The lake contains the tilapia variety mainly. However, the sparse local population does not offer a ready market. Much of the fish is sold to Mombasa tourist hotels.

Lake Baringo.

The lake contains mainly the tilapia variety which is supplied to Nakuru town.

Fish farming.

It refers to the rearing of fish in ponds. The ponds are built in areas of heavy clay or loamy soils which are usually impervious. The ponds are usually located near rivers to ensure constant supply of water. They must have inlets and outlets to allow the entry and exit of water. The water therefore remains fresh providing the natural environment for fish.

Once a farmer establishes a pond, he/she gets fingerlings and puts them in the pond. He/she regularly feeds them until they mature. The farmers get the fingerlings from hatcheries at Sagana (Kirinyaga) kibos (Kisumu, Homa Bay, Kabaru (Nyeri)

The main types of fish kept are tilapia, trout (suited in cool areas) and mudfish

Fish farms are mainly found in the former Nyanza, Western, Central and Coast provinces and parts of Rift Valley province.

Reasons why the government should encourage fish farming

- a) Fish farming creates employment opportunities like in the construction of ponds thereby raising living standards.
- b) Fish farming leads to development of related industries as some are used as raw materials in making fertilizers and shoes, boat and net making.
- c) Fish farming provides animal protein and vitamins thus creating a healthy population.
- d) Some fish species like trout are exported hence bring in Kenya foreign exchange that is invested in development of infrastructures.
- e) Fish farming is free from inter territorial conflicts and disputes as it's within the state.
- f) Fish farming leads to utilization of wastes because fish feed on food remains.
- g) Fish farming occupies little space as compared to other activities such as livestock husbandry.
- h) Fish feeds on mosquito larvae. This is why it is useful to introduce fish in stagnant water as they suppress the breeding of mosquitoes.
- i) Fish farmers can use fish oil directly or indirectly as a source of cooking fat. Fish oil is also medicinal and is particularly popular for the alleviation of chest problems. (where Nile perch and cod are farmed)

Measures that the government of Kenya is undertaking to encourage fish farming.

- a) The government through the fisheries department is encouraging farmers to set up fish ponds.
- b) Sending extension officers to advise the farmers on the need to set up ponds and introduce fish in their diets
- c) The LBDA is setting up fish ponds and hatcheries as demonstration farms at Kibos and Sagana.
- d) Fisheries department provides technical and at times offers financial assistance to fish farmers.
- e) Campaign by the government on food policy has made communities that previously never ate fish to set up fish farms for both subsistence and commercial purposes

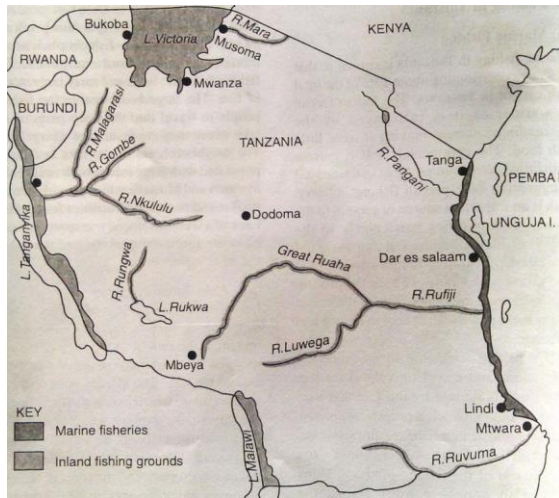
Fishing in Tanzania.

Marine fishing.

Like Kenya, it is not developed and accounts for only 13% of total catch since the same conditions prevail. Most of the coastal communities particularly in the islands of Pemba, Mafia and Zanzibar and along the coast of Tanga, Mtwara, Dar-es-Salaam and Lindi rely on fish as a source of animal protein. There is sufficient market from the dense population.

The fishermen use dhows guided by the trade winds and sometimes undertake deep sea fishing.

Fishing grounds in Tanzania



Reasons why marine fishing is not yet developed in Tanzania.

- The continental shelf is narrow with little fish.
- The warm current Mozambique has made the coastal waters warmer which discourages fish breeding.
- Competition from developed countries such as Japan and Korea that have advanced facilities.
- Inadequate capital to purchase modern vessels and sophisticated equipment.
- Lack of a well developed transport network discourages the trade of fish in the interior. .

Inland fishing.

In Tanzania, fishing as an economic activity is more intense than in Kenya and Uganda. About 49% of Lake Victoria is in Tanzania to add to the Lakes Tanganyika and Rukwa rich fishing grounds.

Lake Victoria.

The lake contains mainly Tilapia, the Nile perch and *dagaa*. The dense population around the lake and in town like Bukoba, Mwanza and Musoma ensures a steady market. The towns also provide processing facilities. The fishing vessels are large and travel to the deep sections of the lake using modern techniques.

However Lack of a well developed transport network discourages the trade of fish to other inland towns.

Lake Tanganyika.

The lake is deep and contains a lot of fish resources and is the richest in the region. The main fish species is *dagaa*. Kasanga and Musoma towns provide efficient landing facilities. The factory at Musoma preserves and processes fish for sale to other parts of the country. Some preserved fish are exported to Zambia to earn the country some revenue.

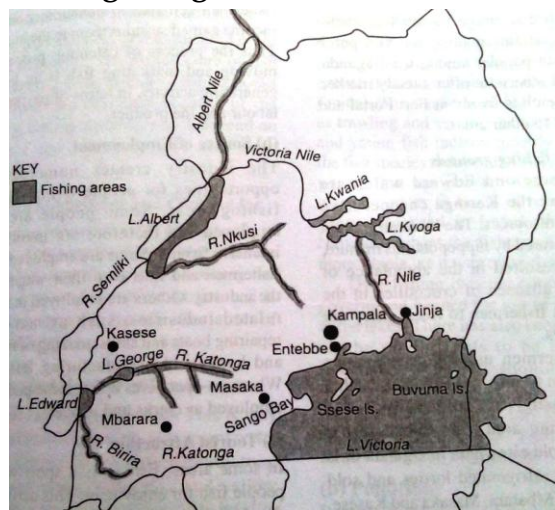
However, the rough storm discourages fishing into the deeper parts of the lake. The sparse population around the lake also means a small market for the fish

Other fishing grounds.

The main rivers like Mara, Malagarasi, Ruvu, Pangani, Ruaha, Rufiji, Kagera and Wami plus lakes Rukwa and Malawi are important fishing grounds. At the Malagarasi swamp the main fish caught is the catfish.

In Lake Rukwa which is rich in Tilapia, the biggest handicap is the fluctuation of water levels in the lake which affects the survival of fish.

Fishing in Uganda.



The country does not have marine fisheries since it is landlocked. Unlike Kenya, Uganda's few lakes like Victoria, Kyoga, Albert, George and Edward contain a variety of fish species, as the lakes are fresh water. The fish is sold up to western Kenya

Lake Victoria.

It accounts for 46% of the fish catch in Uganda.

Reasons why Lake Victoria is a successful fishing ground in Uganda.

- The fishermen use motorized boats to reach far into the lake and catch a lot of fish.
- The numerous islands provide good anchorage and resting points for fishermen.
- The dense population around the lake and in major towns of Entebbe, Kampala and Jinja provide a ready market.
- Fish is also popular in the diet of majority of Ugandans, resulting in extensive fishing on Lake Victoria.
- The town of Jinja has adequate processing facilities which motivate the fishermen to carry out their activities.
- The fishing cooperatives are well organized and assist the fishermen to sell their catch.
- There is also an extensive market in western Kenya.

Lake Kyoga.

Being a swamp through which the Nile flows, the lake has shallow waters thus enabling the fishermen to use baskets, nets and hand lines to catch fish. The lake has an irregular outline which the fishermen use to anchor their vessels however the large number of crocodiles in the lake make fishing risky in the lake. The swampy region is also not easy to access making it difficult for the fishermen to transport fish from the landing areas. The main fish caught is *Protopterus*.

Lake Albert.

Though the lake is rich in fish resources, it is not fully utilized. This is because of the following;

- The region is not accessible making it difficult to market fish.
- Fish eating is not popular among the people around the lake thus limiting the fish market.

- c) The area is infested with tsetseflies which discourage human settlement.
- d) The lake contains mainly the Nile perch which is not popular among the Baganda who would have offered a ready market.

The fish has therefore to be transported all the way to Fort Portal and Pakwach for marketing.

Other fishing grounds.

Lake George and Edward are rich in fish food nurtured by the hippopotamus manure. There is an abundance of tilapia. The absence of crocodiles in the lakes allows fishermen to freely carry out their activities. However there is low demand for fish in the surrounding areas. Fish has to be transported in refrigerated Lorries to Masaka, Mbarara and Kasese towns and the neighbouring DRC towns.

There is also fishing on Lake Katwe in the south and rivers Kagera, Kafu, Semliki and Katonga.

The fishing industry in Uganda has been interrupted by the regular and long civil strife in the country.

Why fresh water fishing is more popular than sea fishing in East Africa:

- a) Insufficient capital to buy the more expensive equipments, which the sea fishing requires.
- b) East Africa has a regular coastline especially along the Tanzania's coast line, thus lack suitable breeding ground for fish.
- c) East Africa has a narrow deep continental shelf, which is not suitable for the existence of planktons hence less fish.
- d) Sea/marine fishing is not popular amongst the people of East Africa hence low demand.
- e) East Africa faces competition in the open sea from developed countries whose fishermen have advanced fishing equipment and this discourages fishermen.
- f) The fishermen of East Africa lack knowledge on deep-sea fishing.

Significance of the fishing industry in Kenya:

- a) *Source of food rich in protein.* Fish provides animal protein and food for fishermen and consumers in the lake Victoria region, in fish farming areas and along the coastal strip
- b) *Source of revenue for government through taxation.* The revenue collected through taxing fishing activities is used to develop infrastructure in the areas. Export of fish earns Kenya foreign exchange.
- c) *Creation of employment opportunities.* The industry creates numerous job opportunities for the people living near the fishing areas either self-employee or employed by the fishermen. This earns them some income.
- d) *Development of related industries.* The manufacture of fish nets at Thika and the making of fish hook. Fish wastes are processed to produce lubricants fertilizers and cosmetics.
- e) *Source of medicine and cooking fat.* Fish provide essential minerals especially iron, calcium, iodine and cod-liver oil, rich in vitamin A and D.
- f) *Tourist attraction.* Sport fishing is a tourist attraction to Kenya at the cost, Lake Naivasha and Lake Victoria.
- g) *Development of transport.* It stimulates the development of ports and fishing villages as well as opening up remote areas to development. For example, the construction of the Kitale, Lodwar, Kalokol road to Lake Turkana.
- h) *Biological control of pests,* fish feeds on mosquito larvae.

Problems facing fishing in Kenya.

- a) *Inadequate capital.* Most fishermen use traditional methods of fishing which greatly reduce their catch. They lack adequate capital to purchase modern equipment.
- b) *Inadequate transport network.* Some roads leading to the fishing grounds are poorly maintained and rendered impassable during the rainy season leading to high perishability of fish. The fishermen are also left at the mercy of the middlemen who exploit them.

- c) *Limited internal market.* The demand for fish in the country is small because fish eating is not popular among the majority of communities. Some fishing grounds are also found in sparsely populated areas with little market. E.g. Jipe, Turkana and Chala.
- d) *Presence of aquatic weeds.* Fishing in Lake Victoria is greatly hampered by the growth of the water Hyacinth along the shores of the lake that chokes the fishing boats.
- e) *Pollution of fisheries.* Some industries release their wastes directly into rivers, lakes and ocean. This is hazardous as they reduce oxygen in the water.
- f) *Presence of dangerous animals.* On many occasions, fishermen are attacked by crocodiles and hippos found in fresh water lakes and rivers. E.g River Tana.
- g) *Over-fishing.* Some species of fish in the fresh water lakes have in the past been over-harvested to the extent that natural replacement has been limited. The methods used harvest fish indiscriminately. E.g on Lake Victoria.
- h) *Inadequate preservation facilities* refrigeration facilities and refrigerated trucks are expensive and *inadequate making most of the catch to go bad before reaching the market.*
- i) *Inadequate technology.* The level of fishing technology is still low and also there are inadequate trained personnel. This has made some fishing grounds to experience limited exploitation like marine fishing grounds
- j) *Inadequate research on fish species, breeding habits, fishing habitats and migratory behavior* has limited the growth of the fishing industry.

Solutions

- a) Formation of co-operative societies to advance loans and market fish.
- b) Ban on indiscriminate fishing in order to harvest only fish required sizes
- c) Restocking of overfished waters with fast maturing fish
- d) Legislation to control any form of pollution on the fisheries
- e) Improvement of infrastructure to the fish landing grounds
- f) Construction of cold storage facilities to preserve fish
- g) Establishment of research centers to research on fast maturing fish species
- h) Increased surveillance of fisheries to curb illegal gear and overfishing.

Fishing in Japan.

Japan is the leading fishing nation and produces ⅓ of the world's fish output.

Factors that have made Japan to be one of the leading fishing nations.

- a) The mountainous nature of the country does not favour farming and hence fishing is taken as an alternative economic activity.
- b) Extensive continental shelf which allows deep penetration of sunlight thus favouring flourishing of planktons.
- c) The convergence of warm Kuroshio and cold Oyashio currents which cause upwelling of water and favour growth of fish.
- d) The advanced technology in ship building which are used in large scale and deep sea fishing.
- e) Japan has a large population which likes fish and provides labour for the industry. The surrounding countries of China and Indonesia also have high population which provides ready market.
- f) Japan's coastline is highly indented with numerous bays and sheltered inlets that provide ideal conditions for the breeding of fish.
- g) The success of fish farming in the country where fish ponds and dams have been set up under intensive management. The shallow shores of the sea are also supplied with fingerlings of *oyster pearls, scallops, clams, octopus and prawns.*

- h) Introduction of studies on fishing in learning institutions in Japan has also led to the development of the industry/extensive research done on fish breeding.
- i) Fishermen have joined co-operatives societies which help them to market fish and advance loans to them.

Problems facing fishing in Japan.

- a) Over fishing along the coastal waters due to high demand for fish both locally and from other parts of Asia. This has resulted in the depletion of some fish species.
- b) Control of territorial waters. The Japanese fleet has been restricted from other nations territories.
- c) The need to cater for the increasing demand has made Japan extend her fishing grounds to other countries. The fishing companies pay for the use of other fishing grounds.
- d) Water pollution due to oil spillage from the shipping vessels and industrial water. This has led to reduction of fish species in high seas.

Comparison between fishing in Kenya and Japan.

Similarities

- a) In both countries, fishing co-operative societies have been formed
- b) Fisheries in both centres face the problem of overfishing and pollution of fisheries.
- c) In both countries, fish farming projects have been established to supplement the natural fisheries.
- d) Both countries carry out inland and marine fishing activities.
- e) There is overexploitation of fisheries in both countries.
- f) Similar methods (modern) of preservation and processing are employed in both cases.
- g) In both countries, the fish caught is consumed both locally and exported.
- h) In both countries, fish is used as a raw material in the manufacture of fertilizers, cosmetics and medicine.
- i) In both the government promotes fishing through legislation, research and conservation methods.

Differences.

- a) Japan has many fishing grounds on the many islands and an indented coastline while Kenya, regular coastline with few inlets has few fishing grounds.
- b) Fishing in Japan is developed because the country is small and is mountainous and so doesn't favour arable or livestock farming leaving room for fishing. Kenya however, has good arable land and people take on farming more than fishing.
- c) Japan has a high population density which favours sea food. However, Kenya has rich variety of food sources thus not favouring fish eating.
- d) Japan has a large ship building industry complete with refrigeration and processing facilities. Kenya lags behind in such technology no modern fishing is less advanced.
- e) The Japanese coastline has a shallow continental shelf for growth of planktons while most of Kenya's coastline has a narrow deep continental shelf that does not favour fish breeding.
- f) In Japan, most of the fish caught are cod, mackerel, Alaska Pollack, Tuna and Bonito while in Kenya it is Tilapia, Nile perch, dagaa and black bass that are most common.
- g) Japan has advanced fishing technology that ensures a heavy catch while in Kenya there is limited technology leading to low catch.
- h) In Japan, the marketing of fish is mainly done through the cooperative societies. However in Kenya marketing is done by individual fish people.
- i) In Japan, the fishing industry faces no competition from foreign countries. In Kenya, there is competition from other East African Countries, Japan and South Korea.

Reasons why fishing is more developed in Japan than in Kenya.

- a) Japan is made up of islands hence they have a long fishing tradition which has made them develop efficient fishing technology while Kenya is the mainland with little sea tradition.

- b) Japan is mountainous with thin permafrost soil which inhibit agriculture so the Japanese have turned to fishing as the main occupation while Kenya is an agriculturally oriented population hence little attention to fishing.
- c) Japanese have done extensive research on fishing while Kenya has little research on fishing.
- d) Japan's large population provides ready market for fish while Kenya has relatively few people who eat fish.
- e) Japan use well developed and advanced fishing methods, vessels and fleets while Kenya use traditional fishing methods and vessels e.g. canoes.
- f) Japan has indented coastline with many natural harbours while Kenya has a regular coastline hence has poor fishing ports and villages.
- g) Japan has extensive continental shelf which is shallow coupled with cold and warm ocean current hence rich in plankton which attract abundant fish while Kenya has narrow continental shelf resulting in few plankton to attract abundant fish.
- h) Japanese with strong fishing vessels can verger into deep off Shore Sea fishing while Kenya can only operate a few kilometers off the shore.

Management and conservation of freshwater and marine fisheries.

Management of fisheries refers to all measures undertaken for bibber and useful exploitation and rehabilitation of fisheries.

Conservation involves the proper utilization of fisheries to ensure little or no wastage.

Measures taken to conserve fresh water and marine fisheries:

- a) Licensing of fishermen by the government through the department of fisheries helps to regulate the number of fishermen and hence control their activities.
- b) Outlawing of poor fishing methods that may result in the depletion of fish from the fishing ground for example the use of trawler in fresh water lakes has been banned.
- c) Introduction of fast breeding and maturing species of fish in some fresh water lakes e.g the Nile Perch was introduced into L. Victoria.
- d) Provisions of the necessary infrastructure e.g. transport routes, enable exploitation of fishing grounds located in remote areas. This reduces overexploitation of the few accessible fishing grounds such as Lake Victoria.
- e) Promotion of Fish farming ; the development of fish farms compliment the fish being caught from the natural waters
- f) Restocking the overfished grounds ; done by restocking with fingerlings from the hatcheries or obtaining them from the overpopulated fishing grounds
- g) Protection from pollution through restrictions placed on disposal of waste into waters
- h) Forbidding indiscriminate fishing by introducing standardized nets/ Banning of fishing in the event that overfishing is detected in a given fishing ground
- i) Management of exclusive economic zones through legislation to protect marine fisheries from external exploitation. International agreement on territorial waters ; zones of jurisdiction have been established in the seas countries have full sovereignty over territorial waters extending for 19 KM from the coast
- j) Research is carried out on both fresh water and marine species to expand and improve fisheries and to sustain the industry
- k) Institutions have been set up to train personnel to manage fisheries.

WILDLIFE AND TOURISM

Definition of wildlife.

Wildlife Refers to undomesticated animals and plants in their natural habitat. It includes insects, birds and animals that live on their own in the bushes and forests.

Factors influencing the distribution of wildlife in East Africa.

- a) *Vegetation.* Different types of vegetation are habitats of different animals. Natural forest are habitats of elephants, buffaloes, baboons, gorillas, grasslands are habitats for a variety of herbivores e.g. antelopes gazelles, zebra, wildebeests, giraffes, buffaloes, rhinos etc. The herbivores attract carnivores e.g. lions, cheetahs etc.
- b) *Drainage.* Well- drained areas support a variety of plants and animals, while poorly drained areas support only a limited number of plants and animals. Rivers, lakes and seas are home to a variety of organisms- e.g. birds such as flamingoes, herons, and pelicans, and animals such as crocodiles, hippos, whales, fishes etc.
- c) *Presence of water.* Fish are found in fresh water lakes of Victoria, Kyoga, Turkana and Tanganyika and in the Indian Ocean. Animals like Hippos and crocodiles live mainly in fresh water lakes and rivers.
- d) *Climate.* Animal species are spread out over a wide range of altitude and climate in east Africa. Snakes for example are found in warm scrublands in holes and caves in rocks that are warm. Mountain gorillas inhabit the high and cold mountain regions of Ruwenzori. Arid areas have limited plant cover therefore have few animal species. Areas of high temperatures have particular types of vegetation, e.g. acacias. Cool areas near mountain tops have bamboo.
- e) *Soils.* Different soil types determine different plant species which in turn affect the type of animals inhabiting a particular area.
- f) *Human activities.* People are mainly responsible for the survival and distribution of wildlife. When people clear the vegetation animals tend to move away from those areas. Some areas have been set aside for the preservation of wildlife. Such areas include sanctuaries to protect endangered species. E.g. L. Nakuru N.P for the protection of the black rhino. There are also forest reserves and marine national parks to protect plants and marine life respectively.
- g) *Relief.* Areas of undulating relief tend to have luxuriant vegetation whereas steep slopes have poor vegetation and hence fewer animals. The gentle slope of mountains are forested and have a larger variety of wild animals e.g. monkeys, elephants etc

Distinction between Game Reserves, National parks and sanctuaries

Game parks are areas that have been set aside for wildlife to live in. They are protected areas and people are not allowed to settle. Some are fenced to prevent illegal entry of people and prevent the animals from getting out.

The three types of game parks in Kenya are:

1. *National Parks.* These are Game Park set up and controlled by the central government. Its boundaries or existence can only be altered by an act of parliament. They are managed and controlled by government agencies (the *Kenya Wild Life Services*, *Uganda wildlife Authority* and *Mali Hai* in Tanzania) that collect entry fees to the parks, take care of animals and assist in resolving people-animal conflicts.
2. *National Reserves.* This is set up and managed by the county government where it is located. The local communities interact freely with wildlife and are allowed to live and graze their animals in the game reserve. For example, Maasai Mara Game Reserve. Some game reserves are privately owned and are fenced off from the public. Government control over game reserves is limited.
3. *Wildlife sanctuaries.* These are areas which have been set aside for protection of specific animals or birds. For example, *Mwaluganje* National Reserve in Kwale County is an Elephant Sanctuary. *Tana*

River Primate Reserve is a Baboon and Monkey Sanctuary where species not found in other parts of Kenya are kept. Also *Lake Baringo Reptile Park* where various types of snakes are kept.

Location of National parks, Major Game Reserves and Sanctuaries in East Africa.

1. Kenya.

The major national parks include Amboseli, Marsabit, Tsavo East, Tsavo West, Lake Nakuru, Mt. Kenya, Sibiloi, Nairobi, Mt. Elgon, Shaba, Ol Donyo Sabuk, Aberdere, Ruma, Mwea, Meru and Kakamega Forest. The following are the major National Reserves. Maasai Mara, North Kitui, South Kitui, Bisanadi, Samburu, Marsabit, Ngai Ndethya, Rahole, Malka Mari, Lake Bogoria, Kora, Buffalo Springs, Shimba Hills and Arawale.

The Major Marine National parks include Mombasa, Malindi, Mpunguti, Diani/Chale, Watamu, Kisite and Kiunga.

2. Uganda.

The major National Parks include Bwindi, Semliki, Murchison Falls, Ruwenzori, Mgahinga, Kidepo Valley, Queen Elizabeth, Mt. Elgon and Lake Mburo.

The reserves include Pianupe, Bugungu, Katonga, Kyambura, Bokora, Ajai, Toro, Kigezi and Karuma.

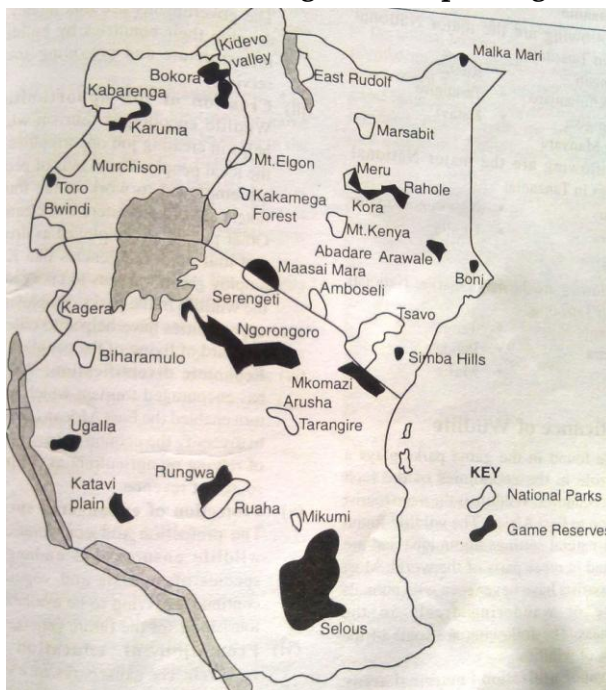
3. Tanzania.

The major National Parks include Serengeti, Ruaha, Mt. Kilimanjaro, Tarangire, Udzungwa, Katavi and Lake Manyara.

The major game reserves include Selous, Kigosi, Rungwa, Ngorongoro crater and Ugalla.

The major marine National Parks are Sadaani, Mtwara, Lindi, Tanga, Pande and Mafia.

Map of east Africa showing national parks, game reserves and sanctuaries



Significance of wildlife

- Wildlife is a major tourist attraction and earns the country foreign exchange when tourists are charged entry fees in foreign currency and pay for food and accommodation in local hotels.
- They create employment opportunities for the local people in the game parks and in hotels. This helps to raise standards of living.
- They promote education and research activities. Students from schools and colleges visit game parks to study the plants and animals there in.

- d) Tourism creates a large demand for food leading to agricultural development.
- e) Some provide raw materials for industries. For example the lumbering industry for timber used in building and construction.
- f) They provide game meat. Some of the animals in the privately owned parks are slaughtered for game meat and sold to local hotels.
- g) It leads to proper use of marginal land through setting up of national parks and reserves in areas that are too dry for arable farming.
- h) It leads to development of infrastructure through construction of good roads leading to game parks. This has helped to open up remote areas to the rest of the region.
- i) Forests act as water catchment areas and help in modification of climate resulting in increased rainfall and moderate temperatures.
- j) It has led to the development of hotel industry in some sections of the country.
- k) Protection of endangered species through protection and conservation of wildlife in the sanctuaries.

Problems facing wildlife in East Africa.

- a) Poaching has reduced the number of some animal species e.g. Elephant and Rhinos.
- b) Encroachment of land that was formerly reserved for wildlife by human beings for settlement and Agriculture. They affect habitat and pasture.
- c) Pollution of the environment by industries tourists and Agricultural activities e.g. Lake Nakuru and death of flamingoes.
- d) Adverse climatic condition- severe droughts in the savanna and semi arid areas bring shortage of water and pastures hence migration or death of the animals.
- e) Pests and diseases is a major threat Tsetse flies cause Nagana to Buffaloes, FIV- Feline Immune Deficiency Virus that affect lions have caused their deaths in East Africa.
- f) Overpopulation of certain species leads to destruction of vegetation e.g. excess elephants in the Tsavo National Parks which overgraze the pasture and destroy trees.
- g) Fires during dry months started by honey collectors – poachers destroy acreage of vegetation and death of animals.
- h) Insecurity. Some of the game parks such as Kidepo valley, Malka Mari and Kora are located in zones affected by either civil wars or banditry.
- i) Human-animal conflict. People neighbouring the game parks (especially when they do not get any direct benefits from the parks) view the parks as areas that are being wasted instead of being put into arable farming and human settlement. The conflict reaches fever pitch when animals stray into people's farms.
- j) The presence of lodges within game parks like Tsavo, Maasai Mara and Serengeti completely alter the habits of animals as many of them coalesce around the lodges and adapt to new lifestyles.

Management and conservation of wildlife in east Africa.

Wildlife management and conservation involves setting up of game parks and the measures that are put in place to care and protect wildlife.

The following are some of the measures being taken to conserve wildlife in East Africa;

- a) Establishment of national parks and game reserves to protect wildlife from human interference.
- b) Enacting laws and regulations to curb poaching and game trade. Also, creating of the anti-poaching unit to track down and arrest poachers/forest guards to protect forests.
- c) Educating the general public on the need to conserve wildlife and to support conservation practices.
- d) Enhancing international cooperation to help enforce the existing laws and conventions which protect wildlife especially the endangered species.

- e) Promoting ecotourism to reduce tourism related environment damage that may lead to extinction of wildlife species.
- f) Constructing electric fences around the parks to minimize human animal conflict.
- g) Setting up of wildlife protection agencies like KWS, UWA and TWT and establishing the ministry of wildlife to oversee to conservation process.
- h) Encouraging individuals to set up game ranches and animal sanctuaries on their farms for protection of rare species
- i) Provision of veterinary services for animals to treat those that fall sick or get hurt in the parks. This helps to increase the wildlife population.
- j) Animal translocation programmes have been began whenever the population of certain animals increases beyond the capacity of a park to host them. The animals are moved to other parks with fewer animals.
- k) Encouragement of domestic tourism where people are allowed to visit the game parks to watch and learn about the wildlife. This helps them to appreciate the value of wildlife.

Tourism

Definitions

Tourism is defined as an economic activity where people travel to visit places of interest either for leisure or for enjoyment. These people are known as tourists.

Eco-tourism is a term derived from tourism and Ecology. **Ecology** is the study of relationships between living things and their environment. Eco-tourism is therefore an environment friendly tourism whereby a tourist enjoys watching what nature has provided, while at the same time protecting what nature has provided by not polluting the air or littering the parks and beaches.

Characteristics of eco-tourism.

- a) Tourists move along marked trails instead of driving to the areas where there are animals for them to watch at close arrange. This is to avoid frightening the animals and destroying of the vegetation.
- b) It is characterized by a steady increase in campsites instead of large tourist lodges that would otherwise destroy the animal habitats.
- c) Telescope viewing of animals is being encouraged instead of moving close to where the animals are.
- d) The local communities have been made to understand and appreciate nature and be custodians of wildlife.
- e) **Soft or green tourism** is encouraged in some areas where the natural environment has previously been interfered with where policies are put in place to restore the damaged environment. An example of soft or green tourism is the Bamburi Nature Trail in Mombasa.
- f) Only particular types of vehicles are allowed entry thus controlling the number of visitors at each visit. Off-road driving is prohibited. E.g at the Taita Hills wildlife sanctuary.
- g) **Mass tourism** (where large institutional groups of students or staff in several vehicles visit game parks surrounding the animals of interest) is prohibited. Only small groups of tourists are allowed to visit wildlife sanctuaries.
- h) The benefits accrued from tourism are shared with the local communities through building of schools, health centers and roads. There is compensation whenever animals destroy their crops, eat their livestock or people are injured or killed by wild animals. This helps to create harmony between wildlife conservation and human settlements.

Ways through which eco-tourism can be achieved.

- a) Driving along marked trails instead of driving to the areas where there are animals.
- b) Telescopic viewing of the animals.

- c) Creating awareness among the local communities to understand and appreciate nature.

Domestic tourism.

This is a type of tourism whereby the local people/citizens of a particular country visit certain attraction sites within that country. For example, the visits to game parks, museums, pre-historic sites, rift valley lakes and beaches.

Reasons why domestic tourism is encouraged in Kenya.

- a) It makes the people aware of their environment and understands the features available in their country in order to appreciate them.
- b) Domestic tourism makes the people use the hotel facilities which are under-patronized during the low season of between April and October. This helps in the running of the hotels without relying on tourists from outside.
- c) It Enables people to appreciate their rich cultural heritage
- d) It may lead to an increased consumption of varied local products
- e) It Increases employment opportunities and thus enhances income generation
- f) It may enhance understanding for the need to conserve and preserve the environment.
- g) It helps to facilitate interaction and cultural exchange among different communities thus enhancing national unity.

Factors that have hindered the development of domestic tourism in Kenya

- a) Roads leading to the tourist sites are poorly maintained thus discouraging people from visiting such sites.
- b) Inadequate local campaign and advertisement of tourist destination leads to low public awareness.
- c) Lack of Familiarity with tourist attraction among some local people makes them fail to appreciate their beauty and value.
- d) Insecurity from gangsters/ poaches in some national parks and game reserves scare away people from visiting them
- e) High costs of accommodation in the game lodges and other tourist facilities discourages local people.
- f) High cost of hiring tourist vehicles discourages people from touring.

International tourism.

This is the visit by tourists to other countries. The countries which are popular to Kenyan tourists are Dubai, India, UK, US, Uganda, Tanzania and South America. Most Kenyans visit these countries for business trips (Dubai) and studies or employment. Most Kenyans visit Uganda and Tanzania on business trips or holidays because of their proximity.

Factors influencing tourism in Kenya.

- a) The government through the ministry of tourism and information make vigorous publicity campaigns to create awareness on the tourist attractions in Kenya to popularize Kenya as a tourist destination.
- b) Arrangements of group bookings (*Packaged tours*) are made in the tourist source countries to make travel and accommodation cheaper for the tourists.
- c) . High caliber personnel are trained at Kenya Utalii College for the tourist hotels that assist in providing excellent services in the tourist industry.
- d) Compared to neighbouring countries that experience frequent civil strife, our country has been enjoying relative peace and political stability which encourage tourism.
- e) The Threat of terrorism At times makes source nations for tourists to Kenya issue travel advisories due to insecurity.
- f) Presence of numerous tourist hotels in towns and game lodges in game parks in different parts of the country that offer excellent facilities to the tourists.

- g) The success of Measures to conserve wildlife like the banning of poaching and setting up of game parks has earned Kenya international recognition and promoted the country as a tourist destination.
- h) Promotion of local tourism has increased the number of visitors to various tourist attractions such as museums, wildlife sanctuaries and game parks.
- i) Participation of the government in the promotion of tourism in collaboration with the private sector has contributed to the flourishing of the industry. For example the setting up of the Kenya Tourism Development Corporation (KTDC) in 1965 to finance tourist related enterprises.
- j) The people of Kenya are friendly to visitors and even assist tourists by showing them the routes and direction to areas of interest. The tourists feel welcome and happy to be in Kenya.
- k) There are good roads leading to the tourist sites which enable the tourists to visit the attraction sites with relative ease.

Tourist attractions in Kenya.

1. *Wildlife.* The wildlife found in several game parks is the main attraction. The tourists make guided tours to the parks (game safaris)
2. *Beautiful sceneries.* The snow-capped Mount Kenya near the Equator, the rift valley sceneries with beautiful lakes some that are home to the famous flamingo birds, the beautiful waterfalls like Chetambe in Webuye, Nyahururu, the crying stones of Ikhonga Murwe and the marine parks are some of the attractions.
3. *Historic and pre-historic sites.* Areas of historical discoveries like Kariandusi near Gilgil, Olorgesailie and other sites of early man discoveries and Fort Jesus in Mombasa are attractions
4. Warm climate throughout the year in Kenya unlike most European countries. Many people escape the winter between October and March to come to Kenya.
5. Sandy beaches along the Kenyan coast are an inspiration to tourists who visit Kenya.
6. Cultural activities in Maasai homes and the bomas of Kenya are tourist attractions.
7. Agricultural shows each year where tourists visit the country to attend the shows in major towns.
8. Conference hosting. Many tourists visit the country to attend international conferences at KICC and UNEP and HABITAT headquarters.
9. Games and sports like volleyball rugby sevens, safari rally and football make our country receive some tourists.

Significance of tourism.

- a) Tourism is regarded as an invisible export which earns the country foreign exchange when tourists are charged park entry fees in foreign currency and pay for food and accommodation in local hotels.
- b) Tourism is a major source of revenue in the country. In 2004, tourism contributed KSh 426 Billion to the exchequer, second to agriculture.
- c) Tourism promotes good relations as it helps to bring people together from different countries of the world.
- d) It promotes cultural exchange. As tourists from different countries visit our country, they learn about our people's way of life, as we learn about theirs.
- e) Tourists provide a ready market for trade items such as handcrafts and other curios, thus earning Kenyan direct income and promoting the craft industries.
- f) Development of tourist facilities provide employment opportunities, thus reducing unemployment/improving the standards of living
- g) The need for more agricultural products by tourists in hotels and lodges has stimulated the growth of agriculture and other related industries
- h) The need to improve transport and communication has led to promotion of infrastructure to tourist sites which also benefits local people

- i) Establishment of national parks and museums as tourist attractions had enabled Kenya to protect preserve its rich cultural heritage, and environment
- j) The need for more labour in the tourism industry has led to the development of many institutions training personnel for the sector.

Problems facing tourism in Kenya

- a) *Insecurity in parks.* Some tourists are attacked and their property stolen from them. This scares the tourists who fear to visit again.
- b) *Terrorist attacks.* Our country has in the recent past been a victim of terror attack where hundreds of people have been killed and property destroyed. E.g, the recent Westgate Mall Attack in Nairobi and the Mpeketoni killings has made some countries to issue travel advisories to its citizens.
- c) *Civil strife in the region.* The civil wars that have been fought in neighbouring countries like Somalia, Uganda and Rwanda impacts negatively on the tourism sector in Kenya. Most of the would be tourists do not know the difference between the countries of Africa.
- d) *High travel costs.* Airfares are increasingly becoming unaffordable to many people. This forces tourists to use charter planes and travel in groups which restrict those who would want to stay in the country for longer.
- e) *Pollution in parks.* There is an increase in pollution in the tourist sites as tourists litter the sites with cans, bottles and plastic papers rendering the sites ugly, dirty and unsafe to visit.
- f) *High tariffs.* The high taxes charged on tourists discourage many from coming to our country. Visa charges and airport taxes in Kenya are said to be among the highest in Africa.
- g) *Attitude of Kenyans.* Most Kenyans believe that tourism belong to international travelers and therefore keep away from tourist sites. Also domestic tourists are discriminated upon in hotels in favour of foreigners.

Problems associated with tourism

- a) It encourages poaching as tourists demand for souvenirs in form of game trophies.
- b) Presence of tourists encourages crimes as they attract criminals.
- c) There is an increase in school drop-outs as children are enticed to leave school to show tourists around or to engage in illicit sexual behaviours with tourists.
- d) It increases use of drug trafficking and abuse. Some of the tourist traffic drugs and encourage the youths to use and abuse drugs.
- e) Tourism interferes with wildlife as tourists litter the parks – making wild animals to ingest the litter which changes their feeding habits.
- f) Luxury goods are imported to provide for the needs of tourist's hotel facilities. This drains the country of its foreign exchange.
- g) Tourist facilities are developed at the expense of other development projects like roads, airstrips, health facilities etc.
- h) Presence of tourists can lead to moral degradation/decay and interfere with the societal fabrics
- i) Most tourists pay for their upkeep abroad causing the country to lose some of the profits.
- j) Some of the tourists could be agents to spread some diseases like the HIV/AIDS.

Why the number of foreign tourists visiting Kenya has been on the decline in the recent past.

- a) Deterioration of transport infrastructure making travel treacherous and uncomfortable
- b) Insecurity due to politically instigated tribal clashes
- c) Negative publicity externally by the international/foreign media
- d) Poor management of wildlife resources which have been a major tourist attraction
- e) Competition from alternative tourist destinations/countries
- f) Unfavourable climate e.g. due to the El-Niño weather phenomenon
- g) Shortage of well trained personnel in the tourism industry

- h) Harassment of tourists by robbers or thieves while they are on expeditions
- i) Rising cost of holiday making
- j) Inadequate promotional activities abroad
- k) Economic recession/poor performance of economies in Europe making people unable to afford tours
- l) Recent killings of tourists e.g. near Aberdare's and Maasai Mara national parks
- m) Opening up of new destinations in Tanzania, South Africa and Uganda

Measures that Kenya should take in order to attract more tourists

- a) Improving transport infrastructure to all tourist sites, to make them easily accessible
- b) Improving security to guarantee the safety of the tourists
- c) Aggressively marketing the country as a tourist destination of choice, abroad
- d) Improve/train more personnel to serve tourists sensitize the citizen on the need to be hospitable to tourists
- e) Intensity domestic marketing to reduce reliance on foreign tourists
- f) Establish modernize tourist facilities in areas that have high potential e.g. western Kenya, where facilities are inadequate
- g) Establishing a diversity of tourist attractions/ avoid dependence on the traditional attraction to reduce competition with other tourist destination.

Tourism in Switzerland.

Switzerland is a landlocked mountainous country in central Europe that lies astride the Alps. It is one of the leading world destinations for international tourism. Tourism industry is highly developed and is the leading foreign exchange earner for the country.

Factors influencing tourism in Switzerland

- a) *Beautiful sceneries.* These are produced by the Alps with beautiful peaks and slopes that have undergone erosion by glaciers. The clear blue lakes in summer and cascading waterfalls are the major attractions.
- b) *Well developed transport network.* The country boasts of excellent infrastructural facilities with electrified rail cars, ski-lifts and cable cars which make it easier for tourist to view mountainous sceneries in the Alps.
- c) *Political stability.* Switzerland's policy of neutrality since 16th century has enabled her to avoid involvement in conflicts. People from any part of the world feel at home in Switzerland.
- d) *Language diversity.* Swiss speaks more than three international languages i.e. French, Germany and English. This makes it easier for foreign tourists to get excellent services in the country.
- e) *Central location.* The country is located in central Europe making it accessible to tourists from all major countries of Europe.
- f) *Climate.* During summer, the tourist enjoy visiting the towns of Lausanne, Geneva, Bern, Zurich, Locarno, Zermatt and Maggiore that experience warmer climate due to their proximity to the Mediterranean sea. During winter, the snow on mountain peaks and slopes provide excellent grounds for skiing and skating.
- g) *HQ of various international organizations.* The International Labour Organization (ILO) and the Red Cross International are based in Zurich. The country therefore hosts many seminars and conferences.
- h) *Excellent accommodation.* The country has numerous hotels of international standards that offer excellent accommodation facilities to visitors in addition to excellent campsites..

Significance of tourism in Switzerland.

- a) Tourism earns the country foreign exchange which is used to finance development.
- b) Tourism is a major source of revenue in the country through taxation and direct fee collection.

- c) Tourism promotes good relations with other countries. Through tourism, Switzerland has gained good international reputation and fame.
- d) Development of tourist facilities creates employment opportunities both in Switzerland and the wider Europe due to package tours.
- e) It has encouraged development of other related industries such as banking, insurance, hotels and transport.
- f) Many unproductive areas have been opened up and brought to productive use, for example glaciated landscape.

Comparison between tourism in Kenya and Switzerland.

Similarities.

- a) Both countries have similar tourist attractions such as snow-capped mountains, waterfalls and rich culture.
- b) Both countries have well established hotel industry offering excellent accommodation for tourists.
- c) There is a well established tour package system in both countries. This ensures quicker and cheaper travelling for tourists.
- d) Both have offices abroad to promote their tourist attractions to the international market.
- e) Both countries enjoy a peaceful political environment suitable for tourism.
- f) In both countries, tourism sector earns a significant fraction of the foreign exchange.
- g) In both countries, all major tourist sites are accessible by road, railway or air.
- h) In both countries, tourists visit are all year round. Switzerland has specific attractions for winter and summer. Kenya is warm throughout.

Differences.

- a) While the climate of Kenya is warm and sunny most of the year, encouraging sun bathing, in Switzerland there are cold winters which enable winter sports and hot summers that expose beautiful sceneries
- b) In East Africa, there are a variety of physical features that attract tourists like lakes, volcanoes, plains and plateaus while in Switzerland, the Alps Mountains form the main tourist attraction.
- c) In Kenya, there are marine attractions such as coastal beaches and marine life. However in Switzerland there are no marine attractions because the country is landlocked.
- d) Kenya lacks winter sports such as skiing and ice-skating which form major tourist attractions in Switzerland.
- e) There are seasonal fluctuations in the number of tourists who visit Kenya caused by political factors such as terror attacks'. However in Switzerland, the rate of tourist influx is high throughout the year due to political neutrality.
- f) There is efficient transport system made of electrified railways and cable cars to all tourist sites in Switzerland. However in Kenya, most tourist sites are accessed by roads which are not well developed.
- g) In Kenya, domestic tourism is not pronounced due to the low levels of income. On the other hand the Swiss form a large percent of tourists in their own country.
- h) It is easy to communicate with tourists in Switzerland due to the many languages spoken as opposed to Kenya where English is the only major language.
- i) In Kenya, Animals are kept in game parks while in Switzerland they are kept in zoos.

The future of tourism in Kenya.

The future performance of the tourism sector in Kenya will depend on the following factors;

- a) Conservation of wildlife by maintaining the existing national parks and game reserves in order to attract tourists.

- b) The development and maintenance of suitable facilities e.g. transport infrastructure and hotel facilities
- c) Enhancement of political stability and government projections. The government and other stakeholders are making concerted efforts to improve security situation in the country. This will increase the number of tourists
- d) Conservation of the rich traditions and cultural practices of the Kenyan communities
- e) Preservation and maintenance of tourist attraction site like fort Jesus in Mombasa
- f) Aggressive promotion by the ministry of tourism through the Kenya Tourism Board which portrays a good picture of the country and its touristic sites in major cities of tourists' origin by opening offices in such cities.
- g) Lowering of tariffs. Some tourists find the charges to the hotels, game parks and airport taxes a little high and expensive.
- h) Strength of the Kenya shilling has a bearing on the number of visitors who wish to spend their holidays in Kenya. If our shilling depreciates, it will attract tourists into the country who will find it cheaper to visit Kenya.

ENERGY.

Energy is power or fuel required to carry out an activity e.g. to run a machine that assist people to produce their means of survival.

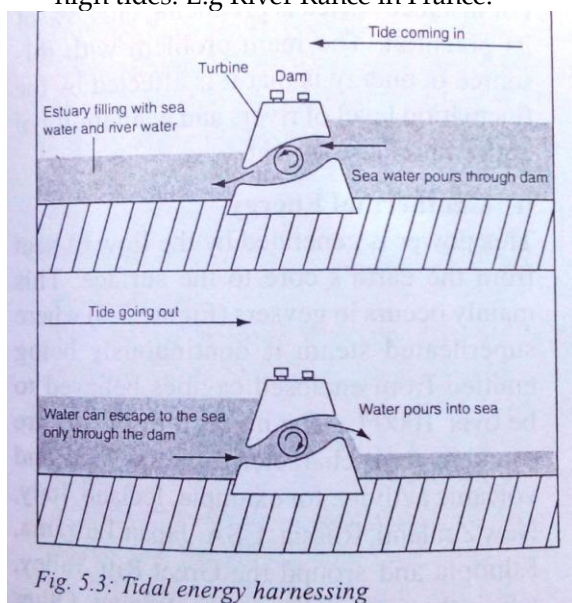
Types and sources of energy.

Energy emitted from different sources can be grouped into renewable and non-renewable sources.

Renewable source of energy

This is a type of source of energy that has the natural ability to reappear after being used, after quick recycling e.g water, solar, wind or animal traction

- Solar Energy.** This is the energy from the sun. It is available almost everywhere in the world. Tropical lands receive a very high supply. It is used for warming, drying, lighting and running electric appliances.
- Wind.** Wind is air in motion. Wind can be used to turn propellers and motors that run machines e.g windmills. However the use of wind for power is extremely unreliable as it depends on time and location of the windmill. In Kenya, the wind turbine power from the installations at Ngong Hills account for 0.35MW of power.
- Tidal power.** In places where sea tides are high, mills with turbines were set up to be driven by tidal waves to produce energy. This is hover today limited to a few estuaries and bays of the world with high tides. E.g River Rance in France.



- Wave energy.** This is the power resulting from sea waves set in motion by wind. However the tapping of wave energy is not safe in areas with regular incidences of storms, cyclones and hurricanes.
- Hydro power.** This is the energy derived from flowing water. Hydro-electricity is produced from the water turbines connected to generators that produces electricity. In Kenya, hydro-electricity accounts for 65% of the country's power generation capacity.
- Geothermal energy.** The power is generated by the flow of heat from the earth's core to the surface in geysers. The highest heat flows are found in areas characterized with seismic and volcanic activity. The heat harnessed may be used directly in industrial, commercial and domestic appliances or can be tapped to generate electricity.
- Biomass.** In the energy context, biomass means biologically produced material like trees and animals. Plant and animal matter can be turned into usable energy by means of biological or thermo-chemical

processes. Animal manure for example can be processed to produce methane and biogas. Fermenting sugar can be turned into fuel ethanol.

- h) *Charcoal*. The charcoal is produced when wood is burned with sufficient oxygen for combustion, in a process referred to as *pyrolysis*. When wood is heated, moisture and volatile materials evaporate, leaving carbon and inert materials in the form of charcoal. It is also obtained from coffee husks, cotton gin waste, peanut and hulls.
- i) *Fuel wood*. This involves the burning of wood to produce energy. In Kenya, wood fuel is the dominant form of energy accounting for 70% of the total national consumption.
- j) *Draught animals*. The most widespread draught animal is the bull or oxen. In western Kenya, it is used to pull the plough, but in central Kenya it is used to haul carts. Other animals include the horse, donkey, elephants in Thailand and llamas in Peru.

Non-renewable sources of energy.

These are energy sources that lack the capacity of recycling themselves after exhaustion. The energy sources include;

- a) *Petroleum*. It consists of gaseous and liquid hydrocarbons from animal and vegetative matter laid in sedimentary rocks. It is the most important conventional energy source and accounts for 23% of the total energy consumption in Kenya.
- b) *Coal*. It is made of vegetative matter laid down in swampy areas and buried under other materials. Coal was the main source of energy during the industrial revolution. However it is bulky and therefore most industries using it are located at the source. For example the Ruhr industrial conurbation in Germany and Pittsburg in the US. Coal contributes about 1% of Kenya's energy needs in the running of thermal power stations.

Why use of coal as a source of fuel/energy declined

- Has low calorific value. It's dirty compared to other sources of energy/pollution
 - It is bulky and cumbersome to transport
 - Development of other sources of energy e.g. like oil, solar, nuclear and HEP
 - Coal seams are exhaustible
- c) *Peat*. This is young coal consisting of partially decomposed organic matter and inorganic minerals that have accumulated in water saturated environments. It is used as an alternative source of fuel mostly in developed countries.
 - d) *Nuclear power*. Also known as Atomic Energy, it is derived from the alteration of atomic structures leading to release of heat that produces steam which is used to generate electricity. The process is by fission whereby radio-active minerals like Uranium are split in nuclear power stations to produce heat. Nuclear stations have risks which once they occur can cause great damage to human life.

Advantages of using uranium as a source of energy.

- It occurs in huge reserves.
- It produces large amounts of energy compared to other sources relatively small amount of uranium generates large quantities of energy

Hydro-electric power (HEP) stations in Kenya.

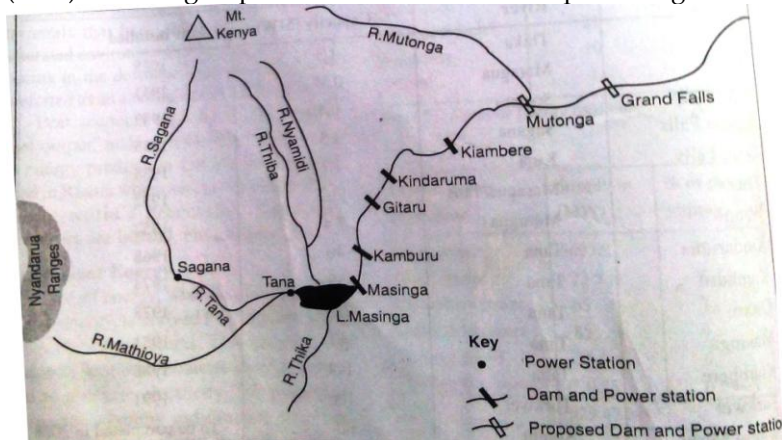
The power stations in Kenya are maintained by the Kenya Electricity Generating Company (Kengen) and power is sold by the Kenya Power and Lighting Company (KPLC). The earliest power stations in Kenya were Mesco on river Maragua, Ndula on river Thika and Sagana on river Sagana.

Kenya was also importing power from Uganda.

The seven forks power project on river Tana.

River Tana is the largest river with the highest potential for HEP production. That is why the Seven Forks Scheme was launched, starting with the **Kindaruma** power station in 1968 to produce 40MW of power.

Kamburu (1974) followed producing 88 MW. **Gitaru** station (1978) produces 225 MW, **Masinga** (1981) a multi-purpose project producing 40 MW of power and the lake water used also for irrigation. **Kiambere** (1988) is the largest power station downstream producing 144 MW



Between Masinga and Kindaruma, water is not allowed to follow its natural course during the dry season, but flows through a tailrace tunnel to the next dam. Power from all the stations is transmitted to Kamburu which is the main switchboard to the national grid.

Other proposed schemes to complete the seven forks scheme are **Mutonga** (60MW) and **Grand Falls** (180MW). Total power output of river Tana will be 993MW at the completion of all proposed stations.

Factors that favoured the development of HEP projects along the Tana.

- Presence of hard basement rock in the area that provided a firm foundation for the construction of a dam.
- Presence of large volume of water from River Tana with a large catchment area that was sufficient to drive turbines. The river flows without great fluctuations.
- Presence of waterfalls, rapids and sufficient steep gradient on river tana which provides a massive hydraulic force that turns the turbines.
- Presence of narrow steep sided deep river valley with enough space for reservoir. This minimizes the cost of construction of dams.
- Availability of space for reservoir since the area has a low population.
- The high demand for electricity in the country for industrial and domestic use ensures a ready market for the power produced.

Problems that affect hydroelectric power production along river Tana.

- Changes in the river regime.* There are unpredictable fluctuations in the volume of water in the river causing the stations to operate below capacity. For example, the 1999 drought that had a great effect on power production in Kenya.
- Silting or reservoirs.* The dams /lakes constructed to reserve the water have undergone siltation and occasionally blocking the tail race tunnels leading to low volume of water in the dam. There is an extra cost of dredging to return the water levels to normal
- Poor maintenance of machinery at the power houses.* This is caused by inadequate funds to purchase essential spare parts.
- Inadequate skills and technology.* The country still has inadequate skills against the level of technologies thus power generation is low.

Benefits from the development of the seven forks hydro- electric power scheme

- It has led to control of floods in the lower parts of river Tana, thus reducing the incidents of loss of life and farm produce in the area.
- The dams are used for generating electricity which is used for industrial and domestic purposes.

- c) The dams are tourist attractions which generates foreign exchange for the country. The Masinga tourist lodge provides recreational facilities.
- d) The scheme led to the development of industries thus creating employment opportunities to the people in the area
- e) Some of the dams in the scheme provide water for irrigation thus improving agricultural production
- f) The reservoirs provide fishing grounds which supply fish to the local people. Masinga dam is one of the main fresh water fisheries in country.
- g) It has led to the improvement of roads making the area more accessible.
- h) It has led to the reduction of importation of power, thus saving the foreign exchange.
- i) The dams have provided useful sites for educational purpose

Other HEP stations include Turkwel Gorge on river Turkwel (1991) producing 106 MW Sondu Miriu on R. Sondu (2008) producing 60MW

Hydro-electric power (HEP) Projects in Uganda.

The Owen falls on then site where River Nile flows out of Lake Victoria provides a natural waterfall from where power generation is possible.

In 1954, a dam was built across the site of the falls to form the Owen falls Dam which is East Africa's largest storage Dam. The station produces 162 MW of power and exports 30 MW to Kenya.

The presence of electricity in the area has stimulated industrialization in the neighbouring Jinja town.

The country is developing another power station below the Owen falls at Bujagali falls with an expected capacity of 150 MW.

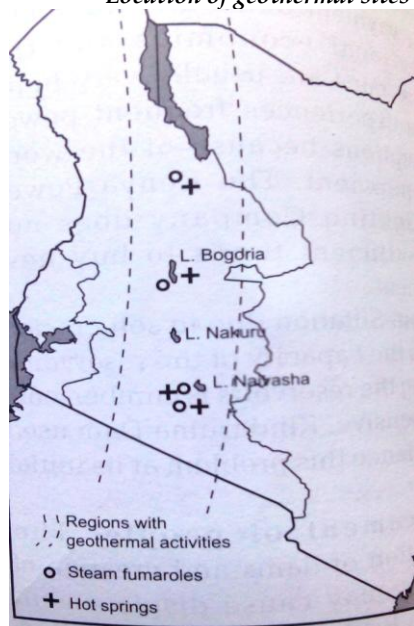
State the benefits of the Owen Falls Dam in Uganda.

- It has promoted the growth of industries within the region
- It has earned the country revenue through the exportation of electricity
- It has earned the country revenue through the exportation of electricity
- It has acted as a bridge across the lake
- It has acted as a bridge across the lake.
- It is a tourist attraction.

Geothermal power projects in Kenya.

In Kenya, the areas within the rift valley have the highest potential for harnessing of geothermal power.

Location of geothermal sites in kenya.



Power generation is being done at Olkaria, south of Lake Naivasha. Olkaria I, installed in 1981 produces 15MW and Olkaria II installed in 2004 produces 70MW. A private company, Orpower 4 is currently producing 12 MW at the same site.

Other potential geothermal sites are Eburru to the west of Naivasha, the Menengai crater region, areas around Lake Bogoria, Baringo, Magadi and Turkana. The hot springs in Homa Hills do not exert much needed pressure to run the turbines and generate electricity.

The factors limiting the expansion of geothermal power production in Kenya

- Limited number of suitable sites
- Inadequate capital for investment
- Inadequate technology
- Scarcity of skilled labour

Hydro-electric power projects in Africa.

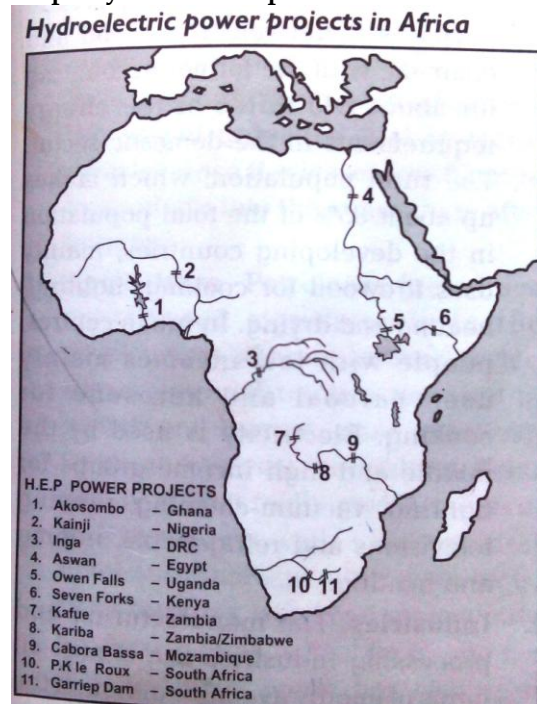
Africa has the largest concentration and potential areas for hydro-electric power generation in the world (43%). The continent has the following advantages;

- ~ Several falls and rapids provide good sites
- ~ Presence of hard basement rocks
- ~ High volume of water e.g. river Nile, Niger, Tana etc.
- ~ Regular flows of water throughout the year

However, hydro-electricity potential has not been fully developed (the continent only generates 3% of the total world output) due to the following factors;

- Inadequate capital resources in countries where such potentials are found. The putting up of huge Hydro-electric power stations requires huge capital investments.
- The sites for H.E.P projects are located in remote areas, which are not accessible to the dense population and industrial areas.
- Some of the rivers that have potential sites for power generation do not have constant volume of water throughout the year. The seasonal fall of rain makes the water levels in the rivers and reservoirs to fluctuate, affecting power generation.
- Foreign aid sought by many countries to put up the projects carries higher interest rates thereby overburdening countries with HEP potential.
- Limited research is carried out slowing the development of HEP projects.
- Some of the countries are lowly industrialized, rendering the power generated to be for domestic use, hence uneconomic to produce.

Map- Hydro-Electric power stations in Africa



Kariba Dam.

The power station, on river Zambezi in the Kariba Gorge was completed in 1958 and produces 1600 MW, the largest in Africa. Lake Kariba extends for 280KM and is 5,200 km². The project is shared by Zambia and Zimbabwe. Most of the power is used in the copper mines. It is a multipurpose project, controlling floods, a tourist attraction, fishing ground and providing water for irrigation.

Akosombo Dam.

The Dam on river Volta produces 885MW of power. The gorge on the river provides the necessary pressure to turn the turbines. The power is transmitted to major towns of Accra, Tema, Takoradi and Kumasi. Much of the power is used in aluminium smelting at Akosombo while is exported to neighbouring countries.

Significance of Energy.

- a) *Domestic use* – electricity is used in Cooking, lighting, heating and drying vacuum cleaning, running televisions and refrigerators, ironing and heating.
- b) *Industries* – industrial sector uses almost all forms of energy in Running machines lighting and heating.
- c) *Transport* – diesel is used by motor vehicles and aviation fuel used by aeroplanes.
- d) *Agriculture* – powered tractors, drying grains.
- e) *Water supply* – Windmills for pumping underground water to the surface: diesel powered water pumps.
- f) *Medicine purpose* – Health sector, diagnosing equipments

The energy crisis.

Energy crisis is the price and supply uncertainties they are usually accompanied by the rapid depletion of fossil fuels. This is mainly caused by the control of limited international resources by few countries and the inequitable pattern of resource distribution.

Causes of energy crisis

- a) *Escalation of oil prices triggered by a sharp rise in demand.* The Oil Producing and Exporting Countries (OPEC) increase oil prices without notifying the consumer countries. This affects the supply of oil.
- b) *Depletion of wood fuel in developing countries.* Because of increased demand, wood fuels are likely to get exhausted.
- c) *Exhaustion of coal mines.* The continued mining of coal has led to the increase in prices of coals in the world, making countries not to be able to afford it
- d) *Economical and political embargoes.* In the 1990's the UN declared sanctions on Iraq and Libya as a result of the Gulf war. This contributed to the decline in the supply of oil to the world market.
- e) *Over dependence on oil and its products.* Many countries of the world use petroleum and petroleum products in their industrial, agricultural and transport sectors and it becomes difficult to switch to other sources of fuel.
- f) *Artificial shortages may be created.* Some countries like USA and Russia depend on oil resources from other countries while conserving their own. This causes scarcity of the resource.
- g) *Waste and misuse of energy.* When energy resources are mismanaged, this can lead to exhaustion leading to shortage of supply.

Impact of energy crisis in Kenya.

- a) It results in increased transport costs due to increased cost of oil.
- b) It leads to general inflation due to increase in the prices of commodities as a result of increased transport cost.
- c) It may result in unfavourable balance of trade, because earnings from the goods exported will be lower than the cost of imports.
- d) Leads to industries experiencing high production costs which may lead to laying off some workers.
- e) Agricultural inputs would become more expensive due to increase in oil prices, leading to low crop production
- f) Leads to increase of prices of other forms of energy e.g. thermal power
- g) Leads to high expenditure of foreign exchange to import oil, which affects other sectors of the economy (e.g. agriculture)
- h) It triggers prospecting for oil by the counties not producing it.

Problems Kenya faces due to overdependence on petroleum.

- a) Artificial shortages caused when some countries decide to conserve their resources e.g. U.S.A
- b) Wastage and misuse of energy

- c) The country does not produce crude oil hence relies on importation thus ignoring other sectors of the economy
- d) Oil imports affects the countries' balance of payments
- e) When oil prices are high, the cost of manufactured goods and services increases causing inflation in the country
- f) The Oil producing and Exporting Countries dictate the prices without consulting the consumer countries such as Kenya. This necessitates higher taxation to increase revenue for importing oil
- g) Frequent shortage of petroleum products leads to destruction of forests

Management and conservation of energy.

Management of energy implies the need and careful use of energy resources while conservation of energy means the efficient use of energy to avoid wastage.

Measures taken by the government to conserve energy in Kenya.

- a) Encouraging Kenyans to use oil for essential services only
- b) The government uses consumer pricing to discourage unnecessary use of oil fuel (gasoline is taxed less than petroleum products)
- c) Encouraging Kenyans to use public transport instead personal cars
- d) Encouraging the use of solar power for heating and lighting
- e) Encouraging use of windmills to set up water pumps
- f) Encourage the industries to use coal rather than petroleum and electricity

Effects that the increase in oil prices has had on the economies of the oil- importing countries of Africa.

- a) The countries spend more of their foreign exchange on importation of oil, thus negatively affecting other sectors of their economies
- b) There has been increasing cost of transport causing a rise in the cost of movement of both people, goods and services
- c) Production costs have increased leading to an increase in prices of commodities thus reducing the demand on the commodities
- d) Some industries rely on by-products of petroleum have collapsed leading to redundancy and unemployment
- e) The countries have experienced low economic growth leading to general poverty among the citizens
- f) It has led to the need to establish/ look for cheaper sources of energy to replace/ supplement the oil
- g) It has created an awareness on the need to conserve energy
- h) The countries that have oil potential have started exploring the possibilities of drilling their own oil to reduce/ stop importation.

Efforts by Kenyan government to reduce cost on importation of petroleum.

- a) Proper maintenance and manufacture of fuel efficient vehicles.
- b) Improvement of public transport system encouraging people to walk, use public
- c) means of transport/use bicycles
- d) Making domestic appliances like refrigeration and cookers more energy efficient
- e) Switching off electrical gadgets when not in use
- f) Development of energy saving jikon and other techniques and technologies
- g) Developing alternative sources of energy other than petroleum.

Ways in which energy crisis affects the economy of Kenya

- a) The increase in the prices of crude oil makes Kenya to spend a lot of foreign exchange in importation. This lowers the foreign currency reserve which brings about unfavorable balance of trade which slows down the rate of economic growth.

- b) Increase in oil prices triggers the increase in the prices of commodities leading to low standards/high cost of living
- c) Increases in oil prices leads to increase in the prices of farm inputs which in turn leads to reduced agricultural production/leads to food crisis.
- d) The high cost of fuels increases the cost of production slowing down industrial growth.
- e) Oil crisis to scarcity of by-products of oil leading to shortage of raw material for certain industries.
- f) Increase in fuel prices leads to increased transport costs which trigger price increases in almost all the sectors of the economy.

Solutions to Kenya's energy deficit

- a) Expansion and establishing more power plants
- b) Increasing importation of bulky HEP from Uganda and SA to add to the national grid
- c) Encouraging and streamlining public transport so as to attract more commuters other than use of private vehicles reduce number of vehicles on the roads.
- d) Improvement expansion of road network to ensure easy flow of traffic to reduce fuel consumption
- e) Contacting foreign investors to explore oil in Kenya
- f) Encouraging use of bicycle by lowering or eliminating tariffs

Industry

AN industry is an enterprise which makes it possible for people to produce goods and services for their personal use or sale. ALSO.

Industry is an organized economic activity concerned with processing / manufacturing of raw materials into usable / useful products

Industrialization is the process and pace in which a country establishes industries / manufacturing industries.

It is the level of industrial production that makes some countries to be referred to as less industrialized countries or industrialized countries.

Factors influencing industrial location and development.

1. *Availability of capital.* Countries with plenty of capital have been able to buy necessary equipment and raw materials for the industries. Countries with acute lack of capital often rely on foreign aid and multi-national corporation to establish domestic industries most of these countries have political instabilities which discourages foreign investors. Capital can be available through sale of economic resources such as minerals.
Examples of countries with adequate capitals are Japan,, Hong Kong etc
2. *Government policy.* It may encourage or discourage the development of industries in one place for economical or political reasons. The government may encourage decentralization of industries in the rural areas to provide employment and to ensure development whole country and to reduce rural-urban migration and to check on congestion in already industrialized area. Government policy may influence the location of industries in order to encourage economic development of certain areas. The government may also give incentives for industries to be located in certain areas. Government may restrict the location of industries in certain areas for environmental issues
3. *Power.* Power influences the distribution of industries in that industries are decentralized since power can be transmitted to industrial region from the source of power. Availability of cheap power also influences the location of industries. Industries are located in areas with adequate supply of power such as coal, oil, natural gas and nuclear energy. Early industries e.g were located in coal mining e.g in the Ruhr region
4. *Transport and communication.* Transport is required for industrial development since industries require raw materials which must be transported from different sources. finished products have to be distributed to the market. Industries are located within or near urban areas where the transport system is well developed. Efficient communication network is essential for the development of industries since industries have to stay in touch with their suppliers and customers
5. *Nearness to a large market.* Market in this sense refers to people, companies or organizations that can buy the industrial products. All industries are commercially oriented and hence their products must find outlet. In Kenya, most industries are located in the highland region, Lake Region and coastal strip due to the dense population that provides market.
6. *Water availability.* Factories use considerable amounts of water in their operations. Therefore most are located close go places with enough water. Coffee pulping, sugar refining and paper mills in Kenya are located on rivers even when the source of raw material is far due to the high demand on water.
7. *Availability of site especially large enough size of land.* The cost of land may determine whether an industry can be located in an area. For example, land is expensive in Nairobi; hence more industries are now being established in the neighbouring Athi River and Kitengela.
8. *Industrial Inertia.* This refers to the inability of an industry to relocate even when the locational advantages change or no longer apply. Industrial inertia is caused by;
 - ~ The need to benefit from established infrastructure.

- ~ Availability of an established pool of labour.
- ~ The benefits of an already existing market.
- ~ The fear of the cost of building other industries elsewhere.

The major industrial centres would still attract other industries which use the finished products of other industries as raw materials.

9. *Personal decisions.* Industrialists may decide to overlook the economic factors and establish an industry at a place of their choice. Some people choose to set up firms in areas of adequate security to allow secure operations. Location of Small cottage industries that require individual attention may depend on family interest.

Types of industries.

The main types of industries found in Kenya are Primary, secondary and tertiary industries

1. Primary industries.

These are industries involved in the first stage of changing raw materials from one form to another that is more useful and valuable. Primary industries are involved in the exploitation of natural resources to provide raw material to the secondary industries. For example sugar cane processing to get sugar that may be more useful and valuable in directly making beverages.

Such industries are also known as *processing industries*. Examples include coffee pulp factories, cotton ginneries, milk dairies, sugar factories, and abattoirs, saw mills, leather tanneries, posho mills and sisal factories.

2. Secondary industries

Also known as manufacturing industries, these are industries that rely on processed goods to make final products. Secondary industries change raw materials into finished goods which are ready for consumption. For example, use of ginnery processed cotton to make strings, ropes and bags. Some secondary industries use raw materials directly to make final products. E.g use of crude oil to make petrol, diesel, kerosene and liquid gas. Other examples include the shoe factories, insecticide making, fertilizer making and glass making industries.

Other manufacturing industries are merely involved in **assembly of industrial products**. Some use imported parts to make articles that are not locally manufactured. For example, the motor vehicle assembly, radio, television and bicycle assemblies in Thika, Nairobi and Mombasa. The motor vehicle assembly companies in Kenya include the cooper Motors Corporation in Thika, the General Motors in Nairobi and the associated Vehicle Assemblers (AVA) in Mombasa

3. Tertiary industries.

Also know as service industries, they distribute commodities that have been produced in the primary and secondary industries to consumers. The industries render a supply service rather than produce or fabricate a commodity. These industries include medical, education, banking/finance, trade, maintenance, and communication. Others include printing and publishing industry. Service industries are the most widespread in urban and rural areas. Some require little capital and space to start.

Other classification of industries.

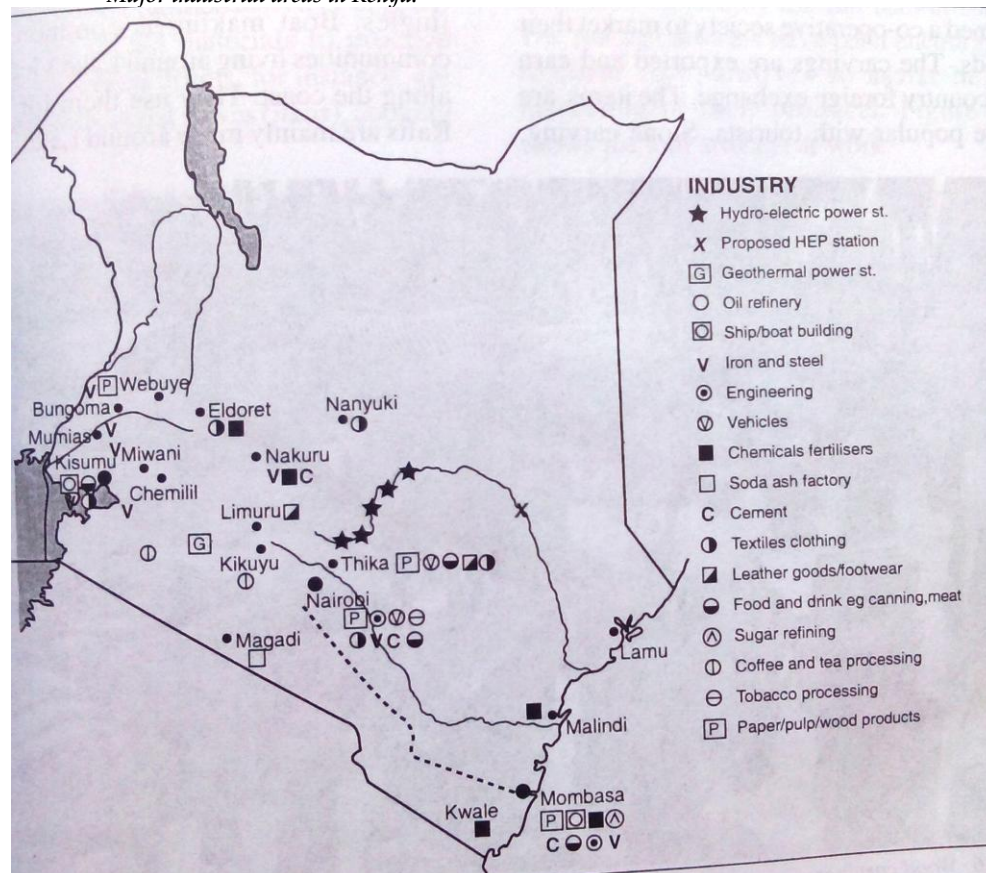
Industries may be classified according to the weight of the industrial activity (**light** or **heavy industry**)

- a) **Heavy industries.** This refers to industries that manufacture articles of considerable bulk of raw materials and are housed in huge industrial establishments. Examples include oil refineries, ship building, paper making, glass industry and fertilizer making.
- b) **Light industries.** These are involved in the making of goods that have little volume and weight. They also use relatively small amounts of raw materials. They include cigarette making, dairies, pulp factories, posho mills, bicycle assembly and watch repairing.

Distribution of industries in Kenya.

Kenya is the most industrialized country among the three East African nations.

Major industrial areas in Kenya.



The industries that exist in Kenya fall under the following categories;

a) Agricultural Processing industries.

These are industries that add value to the qualities of agricultural products. They include;

- 1) **Agricultural food processing industries.** These industries are located in areas where raw materials are produced because some of the raw materials require immediate processing or are bulky. For example, coffee factories, tea factories, maize milling, dairy mills, slaughter houses for cattle, brewing and blending of alcohol and sugar refining. Some of the industries produce final products while others produce what can be used as raw materials in other industries.
- 2) **Agricultural Non-food processing industries.** These include those that process cotton, sisal, tobacco, pyrethrum and timber which are not food stuffs. For example, the cotton ginneries in Kisumu, Busia and Kitui, the shoe making industries at Limuru, Tyre manufacturing by Sameer Company in Nairobi using imported rubber, sisal factories like Vipingo in Kilifi, Mogotio in Koibatek, the Mastermind Tobacco Company and British American Tobacco in Malakisi and the Pulp and paper mills at Webuye.

b) Non-agricultural manufacturing industries

These industries use already processed materials and articles to make more valuable articles. Some of the materials may be from different industries but are combined to manufacture one item. Such industries are located in major towns of Nairobi, Thika, Mombasa, Kisumu and Nakuru. They include the following;

- 1) **Cement production.** This is done at Athi River and Bamburi in Mombasa. The locations are near the raw material (located in limestone mining areas) since it is bulky. The main market is Nairobi central and western Kenya. Some cement is exported to COMESA countries.
- 2) **Oil refining.** Crude oil is imported from the Middle East via Kilindini Harbour and refined at the Changamwe Oil Refinery which is close to the harbour to reduce transport costs. The refined oil is then transported to inland urban centres such as Nairobi, Nakuru and Kisumu by means of pipeline.
- 3) **Metal products, glass making and steel rolling industry.** The metal Box Industry at Thika that makes cans to be used by food packaging industries like Del Monte, Uniliver and BIDCO industries. The glass industry uses Soda Ash, Sand and other imported materials to make glass at Mombasa and Nairobi (the Central Glass Company at Kasarani located near the main market- Kenya Breweries). Steel rolling mills are located in Ruiru, Kikuyu, Nairobi and Mombasa. Some mills use scrape metals while others use imported raw materials.

c) **Cottage industries.**

A cottage is A small industry whose labour consists of a few people working at home or in a small premise using simple tools/ machinery or hands to make products. In Kenya, this industry is also known as the *Jua Kali* Industry. Most of the *Jua Kali* Artisans acquire their skills informally as they learn to make the products.

Examples of cottage industries in Kenya include Pot making among many communities, Wood carving in Kitui and Machakos, soapstone carving in Kisii, Basket /mat weaving among Agikuyu women and coastal communities, Scrap metal fabrication e.g. making of swords, hoes, jikos, knives, and wheel barrows; and Boat making

The Kenya Government assists cottage industries in the following ways

- a) It has set up department of Technical Training and Applied Technology to impart skills for cottage industries.
- b) It has set up Kenya Industrial Estates(KIE) which provide loans to small scale industrialists
- c) County governments have set aside land for *Jua kali* artisans in various urban centres.
- d) Kenya Industrial Estates has put up some structures / sheds for *Jua kali* artisans.
- e) The government through the Ministry of co-operative Development has facilitated formation of *Jua Kali* Co-operative societies to provide loans, savings, marketing of products etc.

Importance of cottage industries in Kenya.

- a) They create employment thus reduce the employment problems.
- b) They cater for local needs providing the required goods.
- c) They diversify export goods and the government earns revenue through taxation.
- d) They provide consumer goods which are a good substitute for the expensive imported goods.
- e) Such industries require little skills while others enable the workers acquire skills while on the job.
- f) They require little capital to start and run.

Significance of industrialization in Kenya

- a) *Provides market to other sectors thereby facilitating the development of the country.* Industries buy raw materials from the primary sector, e. g. cotton from agriculture, soda-ash from mining, and timber from forestry. The industrial sector also buys services from the tertiary sector, e. g. banking, insurance, transport and communication. At the same time, industrial workers buy consumer goods from other sectors.
- b) *Provides inputs to other sectors.* The industrial sector provides agriculture with farm inputs such as tractors, fertilizers, chemicals and drugs. This makes it possible for these other sectors to operate and contribute to development.

- c) *Provides consumer goods to other sectors.* Consumer goods such as clothes, processed food, radios, television sets, vehicles, and furniture, are provided by the manufacturing industry. This raises the living standards of workers as well as their productivity.
- d) *Creates employment opportunities.* The industrial sector is an important employer for both skilled and unskilled labour. As industries expand, they account for a much share of employment thus alleviating unemployment.
- e) *Income earner for many Kenyans.* Industries offer wages and salaries to workers (are a source of income) there enabling them to acquire higher standards of living.
- f) *Infrastructural development.* Industrialization has stimulated infrastructural development like transport and communication networks, supply of social amenities like schools, health centres, social halls, power and water supply. For example the Mumias sports ground and booker academy in Mumias.
- g) *Conserves and earns foreign exchange.* Through production of goods that were previously imported, a country is able to conserve foreign exchange by reducing on imports. At the same time, where a country manufactures goods for export, it earns foreign exchange. This foreign exchange can be used to import essential capital goods and stimulate capital formation.
- h) *Adds value to primary products.* Primary Producers can benefit more by adding value to their products before export. Instead of exporting fruits in their raw form, they can be processed and tinned. By so doing, fruits will fetch a higher price.
- i) *Facilitates technological change.* Industrialization is conducive to development of ideas and facilitates invention and innovation. Through industrialization, people from different backgrounds have been able to improve on the utilization of resources. Industries are breeding grounds for entrepreneurs and managers. They also help train the skilled manpower needed in a country.

Problems associated with industrialization in Kenya.

- a) Inadequate capital to inset in the industrial sector local investors depend on basic provision from the government and foreign aid and grants which may not be adequate or has too high interest rates.
- b) Most industrial suffer from inconsistency in the supply of raw materials due to fluctuation in output especially agricultural raw materials, industries dependent on natural raw materials, e.g. minerals suffer shortage when the mineral deposits decline
- c) Most industries face the problem of limited market due to the fact that much of the population is unemployed hence has low purchasing power.
- d) The country faces inadequate managerial skills which result in mismanagement and embezzlement of funds and unnecessary spending.
- e) There is the problem of poor transport and communication which hinder transportation of raw materials to factories and industrial goods to the market.
- f) The country faces the problem of insufficient and expensive power supply which hinders industrial development especially in the rural areas.
- g) Some industrial in Kenya face stiff competition from industrial nations whose products have a big competitive edge over those from the country.

Problems that result from industrialization.

- a) Production of industrial waste has led to air, land or water pollution – acid rain destroys vegetation, kills aquatic etc.
- b) Erosion of traditional values due to mixing up of people of different cultures hence loss of cultural values.
- c) Industries have taken over land leading to displacement.
- d) Had led to rural-urban migration depriving the rural areas of the able bodied people hence low agricultural production.
- e) Increased application of new technology leads to unemployment e.g. use of robot

- f) There is a tendency to neglect agriculture leading to low food production hence food imports
- g) Concentration of infrastructure and services in the industrial centres has caused an imbalance in economic development
- h) Shortage of housing due to increased population has led to emergence of slums.
- i) Industrialization will lead to depletion of natural resources to satisfy demand.
- j) Some companies (multinationals companies) repatriate most of their profits leaving little money for investment in the country.

Possible solutions

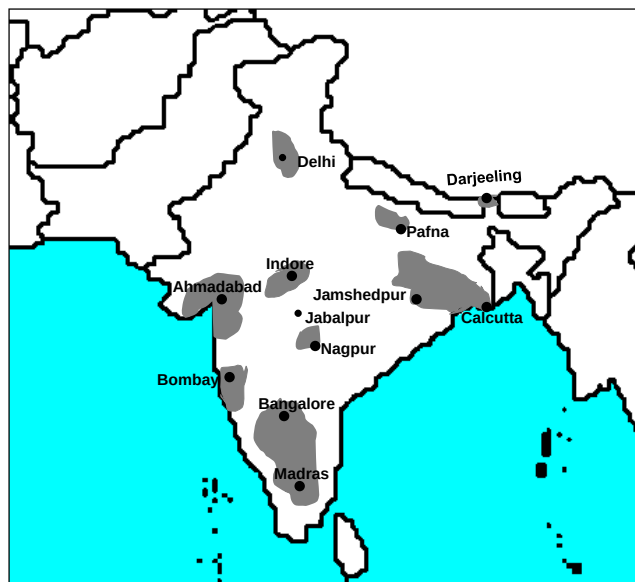
- a) Encouraging foreign investors from the developed world to invest in the country.
- b) Establishing industrial finance institution to provide loans for industrial undertaking e.g. the united nations industrial development organization (UNIDO)
- c) Setting up regional grouping the COMESA and ECOWAS to avail a wider market for local industrials.
- d) Working hard to supply the necessary infrastructure for industrialization in most parts of the country eg rural electrification.
- e) Providing training facilities at all levels for industrial planners and administrators.
- f) Establishment of the Kenya industrial Estate to promote development of small scale industries.
- g) Establishment the Kenya Bureau of standards to control the quality of products and hence sustain local and international market for local goods.

Cottage industry in India.

The cottage industry in India involves weaving, making clothes, brassware, silverware, ornamental ivory, jewellery, trinkets, carpets and handicrafts. It is practiced virtually in every village in India and on individual basis.

The major concentration areas are around Bombay, Lucknow (pottery), towns in Damodar Valley like Jamshedpur, the Madhya Pradesh state towns of Jabalpur, Magpur and Bhopal, Gujarati state (Ahmadabad) and southern India towns of Madras, Calcutta, Bangalore and Mysore.

The industrial towns



Indians are keen on decoration and the wearing of various precious wares. This habit has also sustained the development of the cottage industry. The technology of the Indian cottage industry has been exported to several countries in the world.

Characteristics of cottage industry in India.

- a) The work in the industry is usually carried out manually to in some instance they also rely on simple equipment/machines.
- b) They are owned by individuals, families or groups
- c) The Labour is provided by individual/members of the family.
- d) The industries are operated in homes or small workshops.
- e) There are middlemen who supply the industries with raw materials and market the finished products.
- f) They produce both for local and export markets
- g) They are widespread almost everywhere in the country.
- h) They are rural based

Factors for the development of cottage industry in India.

- a) The industry requires little capital to establish.
- b) India has a huge population which ensures a steady supply of cheap labour.
- c) The country has an abundant supply of locally available raw materials which are used in the cottage industry.
- d) The availability of hydro-electricity which is well distributed within the rural towns.
- e) The industries can be established anywhere. Eg in people's homes, or small rented rooms and they do not require big space.
- f) Majority of Indians are skilled weavers and ornamental ware makers.
- g) The high demand for products from high population coupled with the fact that Indians are keen on decorations and wearing of various precious wares.

Significance of cottage industry in India.

- a) *Creation of employment opportunities.* Since the industry is labour intensive, it is an important employer for both skilled and unskilled labour. This has raised the people's standards of living.
- b) *Earns foreign exchange.* Through production of goods for export, it earns foreign exchange. This foreign exchange can be used to import essential capital goods and stimulate capital formation
- c) *Utilization of local resources.* Cottage industry uses locally available material or recycles others that would have been wasted.
- d) *Decline in rural-urban migration.* The industry is established in rural set ups and therefore helps to check the influx of people to urban areas.
- e) *Manufacture of cheap products.* The industry produces cheap affordable products to meet the demands of the low income earners.

Problems facing cottage industries in India.

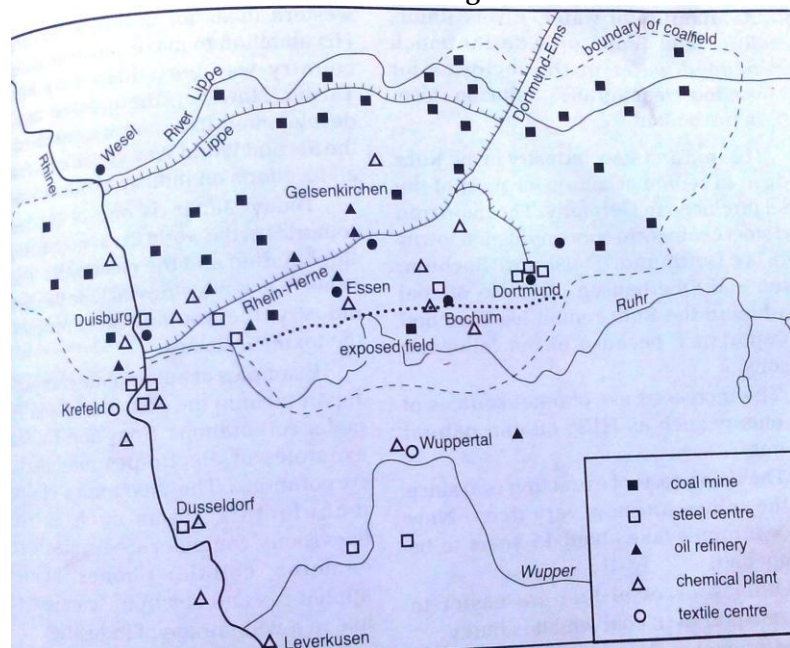
- a) *Inadequate capital.* Due to high levels of poverty in India, it is difficult for people to access loans from banks. The available capital attracts high interests. They therefore use old and simple machines.
- b) *High prices of raw materials.* The raw materials acquired through middlemen are expensive due to the exploitative nature of middlemen.
- c) *Low quality products.* Since most Artisans use simple tools/ machinery in their production, this results in production of low quality products which fetch low prices on market.
- d) *Stiff competition for market.* The Indian cottage industry products face stiff competition from products of modern industries and modernized cottage industries.

Iron and steel industry in the Ruhr Region of Germany.

The Ruhr is a heavily industrialized area of western Germany named after the river that flows through the region. It is the centre of Germany's manufacturing industry and includes the cities of Essen and Dortmund.

Natural resources such as coal, iron ore and limestone enabled the iron and steel industry to develop in the Ruhr. The chemical and textile industries also grew due to good transport links and available workforce. Canals and rivers such as the Rhine were used for transport and power. The area developed industrially in the 1930s and 1940s to supply arms for Germany. Up until the 1970s the factories and associated services were an important source of employment for people in the region. The Ruhr area is the region bounded by the Rhine River, the Ruhr River, the Lippe River, and Dortmund.

The main industrial towns in Ruhr region



- a) *Barmen and Elberfeld (Modern Wuppertal)*. Main centres for textile industries (centers of cotton, wool, and silk manufacture, bleaching, and dyeing).
- b) *Bochum*. Main producer of Coking coal thus mainly has steel industry.
- c) *Dinslaken*. A glue factory, a fuel ignition device factory, a rolling mill, and a liquor distillery, several steel-making and metal-using factories are located here.
- d) *Dortmund*. The leading industrial city in the iron industry. The Dortmund-Ems canal completed at the end of the nineteenth century greatly facilitated the import of overseas ore soon after exhaustion.
- e) *Duisburg*. The rise of sugar refinery, tobacco plants, and cotton manufacturing is attributed to the city's geographic advantage. Iron smelting and machine construction now occupied significant part of the Duisburg industry.
- f) *Düsseldorf*. One of the most important steel-making and steel-finishing works centers. It had cotton spinning, weaving, calico printing, yarn-spinning, dyeing and other various industries.
- g) *Essen*. Had large iron and coal fields. Krupp's company was also vital to the city's development.
- h) *Gelsenkirchen*. Coal production was the largest concern in Gelsenkirchen.
- i) *Hagen*. Possesses huge iron and steel works, large cotton print works, woollen and cotton factories, manufactures of leather, paper, tobacco, breweries and distilleries.
- j) *Krefeld*. Concerned with silk and dyeing. Chemical factory. A liquor distillery and steel production.

Factors for growth of the Ruhr industrial region.

- a) **Availability of coal/source of power:** The Ruhr region is located on the largest coalfield in Europe. The coalfield extends from river Rhine to Hamm (east), river Lippe (north) and river Wupper (south). The ready supply of coal, which was a basic raw material, has led to the development of the iron and steel industry.

- b) **Availability of Iron Ore:** Iron ore was available from the onset of the industrialization of the region within the Ruhr valley and the Sieg (Sieger) field to the South. However, with the intensification of the production of iron and steel in the region, Iron ore is now imported from Sweden, U.S.A. and Alsace-Lorraine (France)
- c) **Availability of Limestone:** Limestone is a necessity in the iron and steel industry. The Ruhr region is advantaged because limestone is also found within the locality.
- d) **Central Geographical position:** The Ruhr region is centrally located in Europe. It has direct connection with all parts of Europe by water, railway, air and road. The Rhine River is navigable from its mouth in the North Sea up to Basle in Switzerland. Iron ore from Alsace-Lorraine is transported downstream to Duisburg for use in the Ruhr region. Products are transported easily downstream through the river to Rotterdam and afterwards to the rest of the world. Canals connect the Ruhr region with Eastern Europe and the North Sea. Other canals like Mittelland Canal, which connects it at Berlin, are also used.
- e) **Availability of Capital:** Capital accrued from other industries like coal is invested in the iron and steel industry. Old rich companies also provide ready capital for the development in the region. Such old companies include the Ruhr Kohle A.C. and the Krupp group.
- f) **Availability of ready market:** Products from the iron and steel industries of the Ruhr region have a ready market within the locality as well as in other parts of the world. The Ruhr conurbation of large industrial towns like Duisburg, Bochum, Essen, Dortmund, etc. forms an immediate market. The products are also exported to other countries especially in Latin America, Africa and Asia.
- g) **Political stability.** After the end of the Napoleonic wars and after the unification, the area made more cooperative efforts to achieve industrial development, under the guidance of the Germany ruler Otto Von Bismarck.
- h) **Technology.** Technological developments also affected industrial patterns of the Ruhr area. The development of mining technology promoted the northward progression of the mining industry and brought light to the northern cities.
- i) **Tradition.** Long-standing traditions survived and even determined the industry in some cities during the nineteenth century. Krefeld prospered with silk industry. Metal products of international renown in Remscheid and Solingen were also results of the long local tradition and craftsmanship.
- j) **Entrepreneurs.** The pioneering work by a number of entrepreneurs led to improvements of the Ruhr area as a whole. *Friedrich Krupp* established *Krupp cast steel factory* in Essen in the early nineteenth century. *Eberhard Hoesch* founded *Hoesch*, one of the most powerful companies in Dortmund. *Jacob Mayer's Bochumer Verein* was renowned for the cast steel goods. The Haniel family prevailed in the coal trade in Ruhrort.

Significance of iron and steel industry in Ruhr region.

- a) *Improvement of transport network.* The need to transport raw materials and finished products related to the iron and steel industry has led to improved transport network. Land and waterways have been built in the region.
- b) *Growth and expansion of towns.* Many towns have sprung up in Ruhr as a result of iron and steel industries. For example, Essen, Dortmund and Duisburg.
- c) *Job opportunities.* Many people have been employed in iron and steel industry as loaders, drivers, clerks and operators.
- d) *Promotion of agriculture.* The need to feed the huge population in the industrial towns has promoted agricultural activities.
- e) *Provision of social amenities.* Health centres, schools, housing and recreational facilities have been set up to cater for workers in the industrial towns

Problems facing the Ruhr industrial region.

- Congestion and overcrowding. The large influx of people to the Ruhr region in search of employment has led to congestion in housing and social amenities.
- Pollution. The environmental legacy of the heavy industry in the area includes waste tips from coal mining, air and water pollution.
- Depletion of coal. Many of the original raw materials are exhausted or mining has become more expensive as the mines get deeper.

The issue of industrial inertia with reference to the Ruhr region

Despite the near exhaustion of the coal mines in the Ruhr region, industries have failed to relocate due to the following reasons;

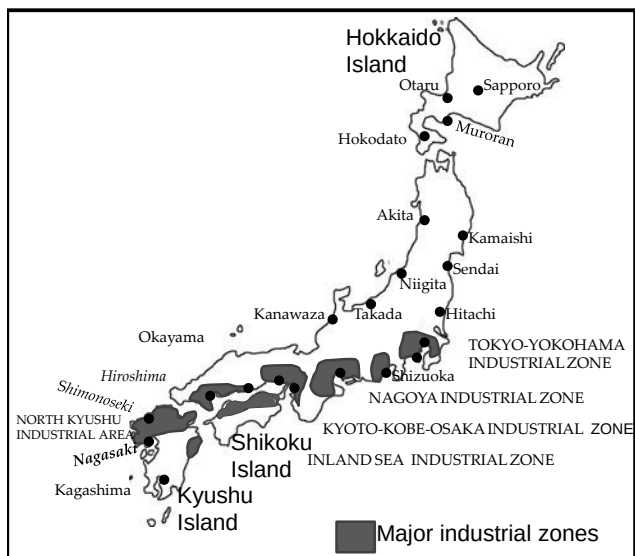
- There is still a large workforce living in the area that has had to learn new skills as industries have changed.
- New industries not related to coal or iron ore, eg electronics, are moving in to replace the traditional heavy industries.
- Much of the derelict land has been improved to provide a more pleasant living and working environment.
- The Ruhr has good access to much of the EU and is once again an attractive location for industry.

Car manufacturing and electronics industry in Japan.

Japan is made up of numerous islands with the major ones being Hokkaido, Honshu, Kyushu and Shikoku. The smaller islands include Okinawa, Nansei, Zu, Kagoshima and Chishima. 80% of the land surface is mountainous And does not favour agriculture. That is why manufacturing occupies the centre stage of Japan's economy.

It is the leading nation in ship building in the world. It also has iron and steel industry, chemical, textiles and machinery industries.(the country is well known for electronics and car manufacture in the world.)

Major car manufacturing areas of Japan.



- The Tokyo- Yokohama Industrial Zone.* This is the leading industrial zone in Japan. The major car manufacturing towns in the zone are Tokyo, Kawasaki, Hitachi, Chiba and Yokohama. Hitachi also houses electronic goods factories.
- Osaka-Kobe industrial zone.* The 2nd leading zone, located on Honshu Island like Tokyo-Yokohama zone. The cities in the zone include Osaka, Kyoto, Kobe, Nagasaki, Otsu, Akashi and Wakayama.

- c) *Nagoya industrial zone.* Located on Honshu Island between Tokyo and Osaka. The major cities include Nagoya, Toyota, Hondas, Okazaki and Yokkaichi

The car models from Japan include Isuzu, Toyota, Honda, Mitsubishi, Daihatsu, Datsun and Suzuki.

Factors that favour car manufacturing and electronic industry in Japan.

- a) Historical background associated with the rise of Emperor Meiji (1868-1912), who encouraged establishment and development of industries as Japan abandoned aggressive military policies.
- b) Availability of capital provided other industries like ship building, machinery, textiles, fishing and tourism, which is invested in the development of other industries. Japan is also a rich nation.
- c) Ready market provided by Japans' large population with high purchasing power and the external market. Japans products like cars and electronics are favoured all over the world. The vehicles have minimal fuel consumption and are durable.
- d) Availability of skilled labour in the industry. The Japanese are skilled and dedicated to their development ventures. They are also hard working which has led to production of qualitative and quantitative automobiles.
- e) Abundance of water to run the industry. The country is surrounded by the Pacific Ocean and has many rivers and small lakes whose water is used in the iron and steel industry..
- f) Rugged landscape of Japan which does not favour agriculture hence heavy investment in industries as alternative income sources.
- g) Availability of H.E.P which has led to the growth of the industry.
- h) Use of advanced technology e.g. use of computers which lead to mass productions of high quality products.
- i) Accessibility of the Japanese island to many parts of the world by sea ways making importation of raw materials and exportation of finished goods very easy.
- j) The government emphasizes on an education system with a technical bias to ensure ample skilled labour.
- k) Japanese free market policy encourages industrial investment in the country.
- l) Government support through loans and carrying out research.

Significance of car and electrical industries in Japan.

- a) *Improvement of transport network.* Roads and railway have been built in the region to cater for transportation of raw materials and finished products.
- b) *Foreign exchange earner.* Japanese cars and electric appliances are very popular in the international market thus earning the country foreign exchange.
- c) *Growth and expansion of towns.* Car and electronic industries have led to growth of towns like Yokohama, Osaka, Kyoto, Akashi and Okayama.
- d) *Job opportunities.* Many people have been employed in the car and electronics industry.
- e) *Provision of social amenities.* Health centres, schools, housing and recreational facilities have been set up to cater for workers in the industrial towns.
- f) *Establishment of training institutions.* Due to the need for skilled manpower in car and electronic industries, universities and colleges have been set up to train personnel.

Transport and communication.

Definition of transport.

Transport is the activity of moving people and commodities from one place to another

Mode of transport: refer to the way of moving goods and people by land water or air. Usually people are transported in buses, Matatus, personal vehicles, trains and aeroplanes. Commodities are transported in Lorries, vans, tankers and pipelines.

Units of carriage are forms of vehicles which are used to carry goods or people from one place to another e.g. Lorries, cars, aeroplanes and boats.

Communication. This is the process of relaying information from one person to another, or from a group to another through a certain medium, For example, talking on cellphones, telephone, communication through radio and newspaper or television.

Modes of transport in Africa.

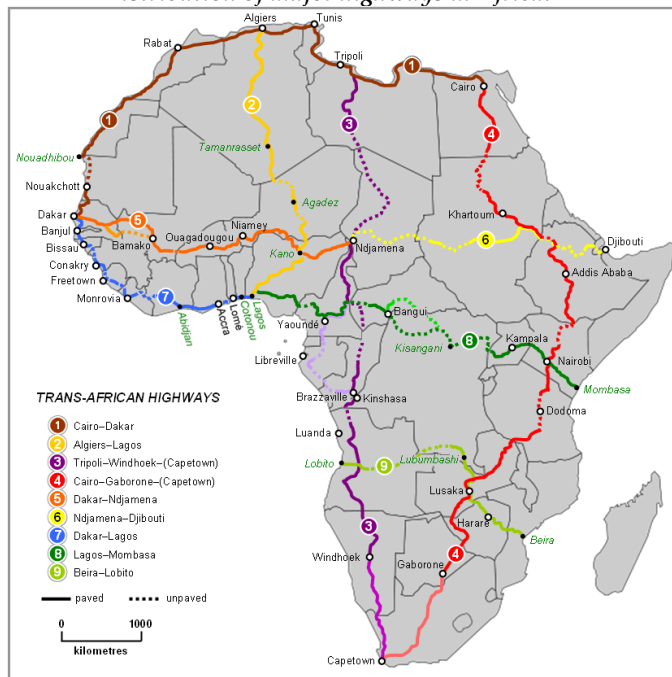
1. Road transport.

Road is the most common mode of transport in Africa. People travel by walking on foot, or using motor vehicles, buses, bicycles etc.

Road construction in Africa started during the colonial period to make it easier for the white settlers and traders to exploit the raw materials in the interior and transport them to the coast for shipment to Europe.

Road network refers to the pattern formed through the joining of roads from different regions. Some road networks start in one country and go through some other country.

Distribution of major highways in Africa.



Advantages of road transport

- a) *Less capital requirement:* - Road transport required much less capital investment as compared to other modes of transport such as railways and air transport.
- b) *Door to door services:* - The outstanding advantage of road transport is that it provides door to door or warehouse to warehouse services.
- c) *Services in rural areas:* - Road transport is most suited for carrying goods and people to and from rural areas which are not served by rail, water or air transport.

- d) *Flexible services:* - Road transport has a great advantage over other modes of transport for its flexible services. Its routes and timings can be adjusted and changed to individual requirements without much inconvenience.
- e) *Suitable for short distance:* - Delays in transit of goods on account of intermediate loading and handling are avoided. Goods can be loaded direct into a road vehicle and transported straight to their place of destination.
- f) *Lesser risk of damage in transit:* - Road transport is most suited for transporting delicate goods like chinaware and glassware, which are likely to be damaged in the process of loading and unloading.
- g) *Rapid speed:* - If the goods are to be sent immediately or quickly, motor transport is more suited than the railways or water transport. Water transport is very slow.
- h) *Saving in packing cost:* - As compared to other modes of transport, the process of packing in motor transport is less complicated. Goods transported by motor transport require less packing or no packing in several cases.
- i) *Allows for Privately owned vehicles:* - big businessmen can afford to have their own motor vehicles and initiate their own road services to market their products without causing any delay.
- j) *Feeder to other modes of transport:* - The movement of goods begins and ultimately ends by making use of roads. Road and motor transport act as a feeder to the other modes of transport such as railway, ships and airways.
- k) *Promotion of small scale business.* Comparatively to railway, the load carried by roads is small and this promotes small scale business.

Disadvantages of road transport.

- a) *Seasonal nature:* - Motor transport is not as reliable as rail transport. During rainy or flood season, roads become unfit and unsafe for use.
- b) *Accidents and breakdown:* - There are more chances of accidents and breakdown in case of motor transport. Thus, motor transport is not as safe as rail transport.
- c) *Unsuitable for long distance and bulky traffic:* - This mode of transport is unsuitable and costly for transporting cheap and bulky goods over long distances.
- d) *Slow speed:* - The speed of motor transport is comparatively slow and limited.
- e) *Lack of organization:* - The road transport is comparatively less organized. More often, it is irregular and undependable. The rates charged for transportation are also unsuitable and unequal.
- f) *Expensive to maintain.* Most African countries are poor and experience difficulties in maintenance of roads and construction of new ones.
- g) *Threat of robbery.* Road transport is affected by robbery of goods and carjacking especially in towns and along steep or lonely stretches.
- h) *Inability to transport Perishable goods.* If the distance to be covered is great, road transport may not be suitable for perishable commodities.
- i) *Traffic jams and congestion.* When it rains, all roads in Nairobi become congested as every motorist tries to escape the floods in the city.
- j) *Some countries drive in different sides of the road.* This makes it difficult for drivers to get used to the laws on different roads.

2. Railway transport.

Rail transport is the conveyance of passengers and goods by means of wheeled vehicles specially designed to run along railways or railroads.

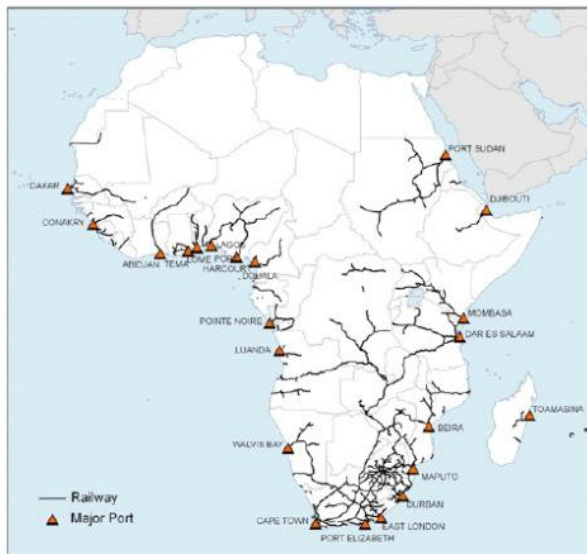
Railways carry 14 million passengers a day, making it one of the busiest railway networks in the world.

Railway lines in Africa were constructed by colonial authorities to transport bulky raw materials from the interior to the ports at the coast for export. i.e;

- In Kenya, railway building began in 1896 in Mombasa and reached Kisumu in 1901 with a diversion reaching Eldoret in 1924.
- By 1928, the Ugandan network had a link with the Kenyan network.
- In Tanzania the early railway network was completed in 1920 providing a link between Dar and Kigoma on Lake Tanganyika. The Tanzam railway linking Dar and Zambia was built in 1970.
- South Africa has the best railway network in Africa

Distribution of railway lines in Africa

Figure 2.1 Rail map of Africa



Source: AICD database.

Advantages of railway transport.

- It facilitates long distance travel and transport of bulky goods which are not easily transported through motor vehicles.
- It is a quick and more regular form of transport because it helps in the transportation of goods with speed and certainty.
- It helps in the industrialization process of a country by easy transportation of coal and raw-materials at a cheaper rate.
- It helps in the quick movement of goods from one place to another at the time of emergencies like famines and scarcity.
- It encourages mobility of labour and thereby provides a great scope for employment.
- Railway is the safest form of transport. The chances of accidents and breakdown of railways are minimum as compared to other modes of transport. Moreover, the traffic can be protected from the exposure to sun, rain snow etc.
- The carrying capacity of the railways is extremely large. Moreover, its capacity is elastic which can easily be increased by adding more wagons.
- It is the largest public undertaking in the country. Railways perform many public utility services. Their charges are based on charge what the traffic can bear principles which helps the poor. In fact, it is a national necessity.

Disadvantages:

- The railway requires a large investment of capital. The cost of construction, maintenance and overhead expenses are very high as compared to other modes of transport.

- b) its inflexibility. Its routes and timings cannot be adjusted to individual requirements.
- c) Rail transport cannot provide door to door service as it is tied to a particular track. Intermediate loading or unloading involves greater cost, more wear and tear and wastage of time.
- d) Due to huge capital outlay required, railway sector give rise to monopolies and work against public interest at large. Lack of competition may breed in inefficiency and high costs.
- e) Railway transport is unsuitable and uneconomical for short distances and small traffic of goods.
- f) It involves much time and labour in booking and taking delivery of goods through railways as compared to motor transport.
- g) Because of huge capital requirements and traffic, railways cannot be operated economically in rural areas. Thus, large rural areas have no railway even today.

Water Transport

Water transport is the process of transport a watercraft, such as a barge, boat, ship or sailboat, over a body of water, such as a sea, ocean, lake, canal or river.

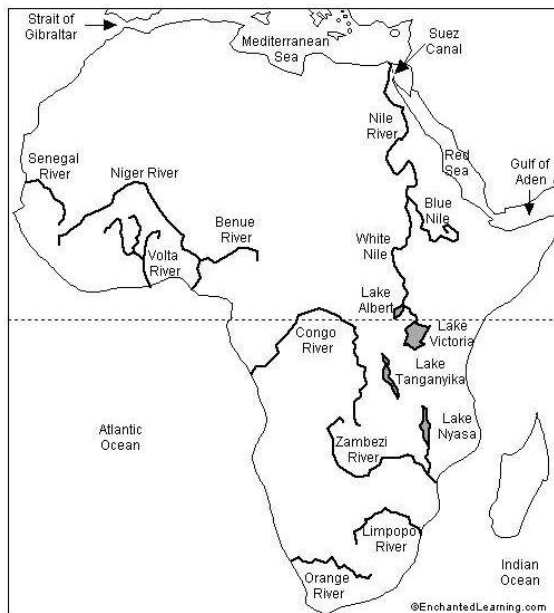
There is both inland and marine water transport in Africa.

The inland water ways include; major lakes such as Victoria, Chad, Tanganyika, Malawi and Turkana.

The Navigable Rivers are Nile, Congo, Niger, Tana and Zambezi. Human -made lakes like Kariba, Nasser, Volta and Kainji also serve transport purposes.

- Lake Victoria has major ports such as Kisumu, Homa Bay, Asembo Bay, Mbita, and Kendu Bay in Kenya, Jinja, Bukakata, Port Bell and Entebbe in Uganda and Musoma Mwanza and Bukoba in Tanzania. The vessels on the lake are managed by the railway corporation of each country.
- Lake Tanganyika serves Tanzania, Burundi, DRC and Zambia.
- Lake Chad serves Chad, Cameroon and Nigeria.
- Lake Malawi serves Tanzania, Malawi and Mozambique.

Navigable rivers in Africa



River transport is not well developed in Africa due to the following reasons;

- a) Most rivers in Africa pass through different climatic regions with alternating wet and dry seasons. This makes the volume of water fluctuate from season to season. making difficult to use the rivers
- b) Many rivers in Africa have floating vegetation to move through them
- c) Many rivers in Africa are either short , too shallow or too swift, making navigation difficult

- d) Rivers are affected by siltation of their mouths and along their courses .this reduces the ideal depth required for vessel to move
- e) African countries have insufficient capital to use in the development of water ways ,ports ,and for purchasing vessels
- f) African countries have inadequate technology. this hinders the process of developing river transport
- g) Some rivers in Africa flow across different countries. the countries involved have to negotiate with one another and this hinders development of river transport
- h) Most rivers have waterfalls, rapids and this hinder navigation
- i) Some rivers have waterfalls, rapids and cataracts along their courses.
- j) Some rivers are infested with crocodiles and hippos that disrupt navigation.
- k) Some rivers pass through regions of no economic value and with low human population.

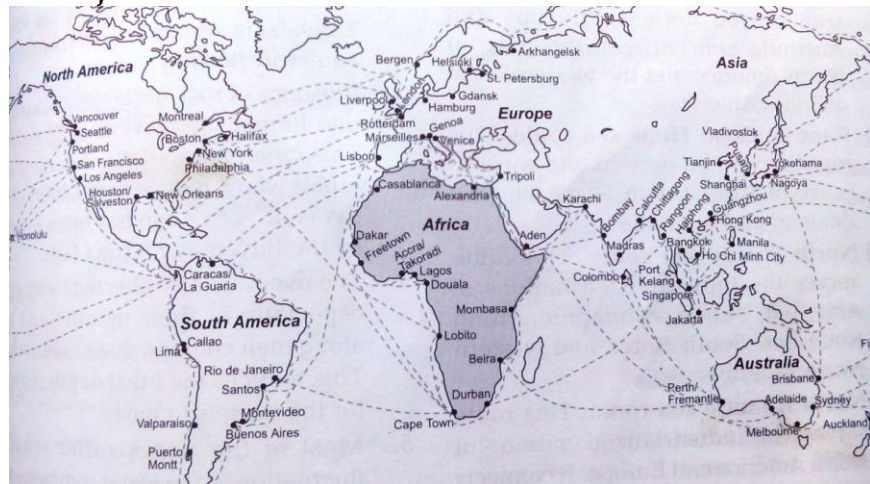
For example the Congo forest, Sahara and Kalahari deserts.

- l) Presence of huge rocks and boulders on the beds of some rivers.

Marine transport is more significant in Africa than inland transport. Africa is connected to other continents of the world via;

- The Mediterranean – Asiatic Sea Route that serves the North African states.
- The Cape of Good Hope Sea Route that Links Eastern and Southern Africa to Australia and Asia.
- The Trans-Atlantic Sea Route serving southern and western coast of Africa

Major sea routes of the world



Advantages of water transport.

- a) Although slow, modern sea transport is a highly effective method of transporting large quantities of non-perishable goods.
- b) Water transport routes are free of restriction unlike railways where routes are restricted by land laws.
- c) The mode of transport is free of congestion. Many ships can use route ways at the same since the waterway is large.
- d) Water ways are smooth and cause limited friction to the ships while rail way line has corners or bends.
- e) There is no maintenance of waterways while in railways requires regular inspection and repairs.
- f) It is cheaper to use water transport for heavy and bulky goods being moved between countries which are bordered by water masses than using trains.
- g) Delicate goods are easily and safely transported by water.
- h) Goods are transported either I large metal boxes called containers or in tankers. This protects the goods in case of any accidents in the sea.

Disadvantages of water Transport

- a) The sea in high altitude areas may freeze during winter making it hard for vessels to sail smoothly.
- b) Is confined to water bodies only.
- c) It is generally slow and therefore not good for perishable goods.
- d) Ports with poor and inadequate facilities make the process of Loading and off-loading of goods from ships tedious and time consuming.
- e) Most navigable rivers, lakes and seas may be found in areas of low economic value.
- f) Sea vessels Pollutes the water if there's oil spillage by ships carrying petroleum.
- g) Lack of political cooperation between various states in Africa makes it difficult to carry out joint construction on shared rivers or lakes.
- h) Insecurity in the oceans where the pirates steal and attack sailing ships.
- i) Ships are expensive to construct/ purchase
- j) Ports and harbours are expensive to construct and maintain.
- k) In case of an accident in the ocean, the losses are usually high as the vessel may sink drowning the goods and passengers.

3. Air transport in Africa.

The aircraft is the second fastest method of transport, after the rocket. Commercial jets can reach up to 875 kilometres per hour (544 mph), single-engine aircraft 175 kilometres per hour (109 mph).

In Africa, there are international airports that connect countries to the rest of the world.

Advantages of air transport.

The following are some of the advantages of air transport:

I. High Speed:

Air transport is the fastest mode of transport and therefore suitable carriage of goods over a long distance requiring less time. There is no substitute for air transport when the transport of goods is required urgently.

II. Quick Service:

Air transport provides comfortable, efficient and quick transport service. It is regarded as best mode of transport for transporting perishable goods.

III. No Infrastructure Investment:

Air transport does not give emphasis on construction of tracks like railways. As no capital investment in surface track is needed, it is a less costly mode of transport.

IV. Easy Access:

Air transport is regarded as the only means of transport in those areas which are not easily accessible to other modes of transport. It is therefore accessible to all areas regardless the obstruction of land.

V. No Physical Barrier:

Air transport is free from physical barriers because it follows the shortest and direct routes where seas, mountains and forests do not obstruct.

VI. Natural Route:

Aircrafts travels to any place without any natural obstacles or barriers. Because the custom formalities are compiled very quickly. It avoids delay in obtaining clearance.

VII. National Defence:

It plays a significant role in the national defense of the country because modern wars are conducted with the help of aero planes. Airways has a upper hand a destroying the enemy in a short period.

Disadvantages of air transport.

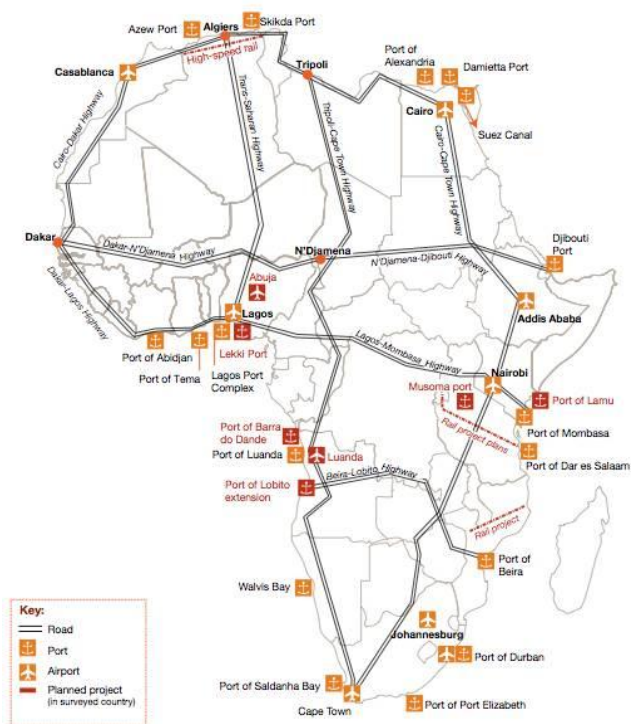
- a) Airports are very expensive to build. Buying and maintaining an aircraft is also expensive.
- b) In case of accidents they are Serious and fatal accidents leading to numerous deaths.

- c) Transport of bulky goods is tedious and expensive.
- d) Air transport is affected by bad weather resulting in delays and re-schedules. For example, heavy rainfall can make plane landing be diverted to another favourable destination.
- e) The volume of passengers and cargo on air transport is small, making it expensive for some airlines to operate.
- f) Insecurity in many parts of Africa is also discouraging use of air transport.
- g) Running airlines requires specialized skills and personnel with good training.

Limitations of Air transport in Africa

- a) The low standard of living in the majority of African countries makes it almost impossible for people to use air transport as a means of travel
- b) Maintenance, fuel and general care of aeroplanes and airports are very expensive
- c) Problem of air space – most countries impose heavy taxes in the form of fees for landing and flying rights to foreign aeroplanes
- d) Most African countries have not modernized their terminals mainly due to financial problems
- e) Other means of transport which are much cheaper than air transport also discourage its use
- f) Freight traffic amongst African countries is very limited because there are not many goods transported by air
- g) Poor weather especially when the sun is overhead

Major airlines and Airports in Africa



Pipeline Transport

Pipeline transport is the movement of fluid products through pipes from one place to another. Pipeline routes are practically unlimited as they can be laid on land or under water. Most commonly liquid and gases are sent, but pneumatic tubes can also send solid capsules using compressed air. Kenya pipeline company transports refined petroleum based products like gas, jet fuel and petrol from Mombasa to Nairobi and to Kisumu and to Eldoret

Advantages of pipeline transport.

- a) It is reliable and convenient means of transporting highly flammable products like petroleum.
- b) The cost of operating and maintaining pipeline is lower than that of other means of transport.
- c) Unlike other means of transport pipeline is not affected by bad weather.
- d) It is not affected by traffic congestion
- e) It does not pollute the environment except in cases of leakage which are rare
- f) Pipeline can be used over varied surfaces.
- g) Can be constructed through rough lands mountains and swamps where railways and roads cannot easily pass.

Disadvantages of pipeline transport.

- a) They are expensive to maintain.
- b) They are not flexible
- c) They do not serve intermediate locations
- d) They can cause excessive loss in case of leakages.
- e) A pipe can be used only for one type of oil product at a time.

Types of communication

Communication is the process of exchanging information in the form of messages, symbols, thoughts, signs, and opinions.

There are mainly four types of communication which are used in various ways to convey the final message to the receiver.

1. Verbal Communication

Verbal communication includes sounds, words, language, and speech. Speaking is an effective way of communicating and helps in expressing our emotions in words.

2. Nonverbal Communication

Nonverbal communication manages to convey the sender's message without having to use words. It involves the use of physical ways of communication, such as tone of the voice, touch, expressions, Symbols and sign language, Body posture and language.

3. Written Communication

Written communication is the medium through which the message of the sender is conveyed with the help of written words. Letters, personal journals, e-mails, reports, articles, and memos are some forms of written communication.

Unlike other forms of communication, written messages can be edited and rectified before it is communicated to the receiver.

4. Audio-Visual Communication

This form of communication involves the combination of sound visual display of information, wherein the message is understood or expressed with the help of audio-visual aids. For example, photography, signs, posters, banners and designs help the viewer understand the message visually. Movies and plays, television shows and video clips are all electronic form of visual communication.

Telecommunication services.

Telecommunication means communicating over a distance. telecommunication services that are in Kenya include;

1. Telephone services through landlines or mobile phones.
2. Telex services
3. Radio communication services
4. Electronic mail services facsimile (fax) services.
5. Postal and courier services.

Role of transport and communication in the economic development of Africa.

- a) *Promotes industrial development.* Means of transport influence the location of a given industry as they influence raw material availability, labour mobility and market accessibility for finished goods. Accessible areas are likely to attract more industrial establishments.
- b) *Promotes local and international trade.* Expanded transport and communication in Africa has opened new trade areas and markets and encouraged mass production. Trade within Africa and the rest of the world has been enhanced by improved transport.
- c) *Promotes tourism.* Air transport is instrumental in transporting tourists to various game parks throughout Africa. Other tourists visit Africa via cruise ships.
- d) *Opens up remote areas for exploitation.* Remote areas with vast forest and mineral resources have been opened up for exploitation through the establishment of transport and communication networks.
- e) *Enhances interaction among people.* The development of transport and communication has increased human contact thus leading to exchange of technology and promoting understanding among people.
- f) *Creation of employment opportunities.* Transport and communication are themselves individual industries that employ millions of people in sea routes, air routes, rail lines and roadways.
- g) *Development of urban centres.* Some towns develop along major highways while others develop at road junctions.
- h) *Promotion of national image.* In some countries, the government operates national airlines to promote the image of the countries e.g the Kenya Airways, Ethiopian Airlines and air Nigeria.

limitations facing transport and communication in Africa

- a) Some countries are landlocked and have no direct link to sea/ocean transport and international movement may be affected by political difference with countries they pass through.
- b) Other countries face Limitations of topography with rugged relief e.g. mountain with steep slopes which affect road, railway transport .construction of transport lines is expensive.
- c) Navigable rivers in Africa are few. Most rivers fluctuate in their volume seasonally thus making them not suitable for transport.
- d) Most areas are uninhabited land e.g. semi- deserts and deserts –these areas are low in population and it is uneconomical to construct transport and communication facilities
- e) The Thick vegetation; thick forests and swamps in most parts of Africa make it and expensive to construct transport facilities
- f) Africa also faces the challenge of inadequate communication facilities like satellites and internet facility. International news is received through western media houses like CNN, BBC or Reuters. Some countries totally lack internet facilities.
- g) Many countries have been bedeviled by recurrent civil wars which have resulted in mass destruction. For example, Burundi, Rwanda, DRC, Somalia and Mozambique.
- h) Different railway and road systems caused by land fragmentation by the colonial governments. Infrastructural links in Africa are unconsolidated with railway lines differing in gauges and differing traffic laws on roads.
- i) Inadequate capital to invest in the transport sector has hampered improvement and maintenance of the roads and other facilities.
- j) High fuel costs.
- k) Language barrier.
- l) Poor technology and shortage of skilled labour.
- m) Political barriers; animosity between countries and political instability hindering cooperation.
- n) Security. Increased terrorist activities.

Solutions to Africa's Transport and Communication problem.

- a) **Trans-African highways:** African countries have proposed to construct highways across the continent. These highways are intended to improve the quality and volume of international road

traffic in Africa. The principal axis is supposed to be from Gaborone to Cairo and from Mombasa to Dakar.

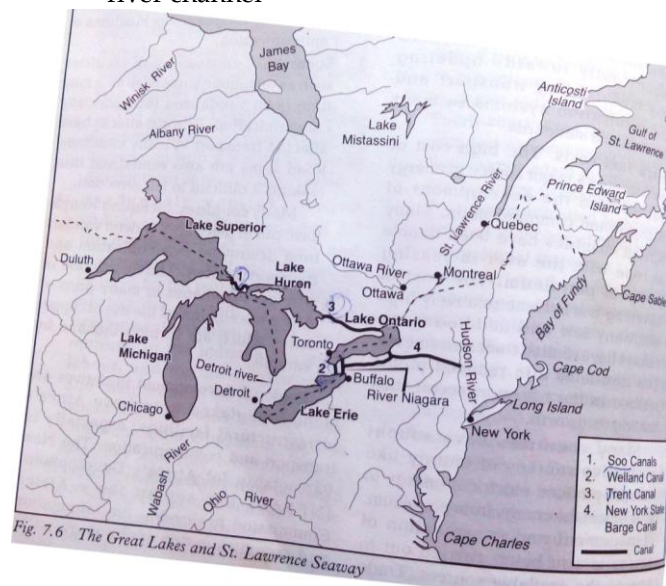
- b) **International Railways:** The presence of landlocked countries in Africa has made railway transport an attractive mode for transporting bulky raw materials to coastal seaports.
- c) **Regional Economic Co-operation:** The establishment of regional economic organizations has created conditions favourable to increasing the quality and quantity of transportation between neighbouring states. Regional economic groups in Africa include the Economic Community of West African States (ECOWAS) and PTA among others.
- d) **Establishment of National Airways:** Since the attainment of independence, every African country has established her own national carrier airline. Existing airports have been expanded e.g. Dar-es-Salaam, while international new ones have been established e.g. Jomo Kenyatta.
- e) **Establishment of ground satellite:** African countries have been endeavouring to improve on the existing telecommunications. Several ground satellites and radio and television boosters have been established to ease out communication problems.

A STUDY OF THE GREAT LAKES AND THE ST. LAWRENCE SEAWAY

The Great LAKES OF America include Superior, Ontario, Michigan, Huron and Erie. All the lakes apart from Michigan (is entirely in USA) occur on the border of USA and Canada. The lakes together with the St. Lawrence Sea way form the longest and busiest inland waterway in the world. The waterway covers 3800km stretching from the mouth of St. Lawrence River on the Atlantic to Duluth Port on Lake Superior. The construction of the seaway enabled large sea vessels to go beyond Montreal further inland.

The project began in 1954 and took five years to complete and was to accomplish the following;

- a) To construct canals by-passing the sections with Rapids like Long, Sault St. Marie and Lachine and waterfalls like Niagara that made River St. Lawrence not navigable.
- b) To establish locks along the river channel to regulate the flow of water as well as the movement of vessels.
- c) To create dams to generate hydro-electricity and regulate the flow of water as well as movement of vessels.
- d) To make St. Lawrence River more navigable by removing rock shoals, rapids and islands in the river channel



What was done in the project?

1. Construction of bypass canals like Welland Canal connecting Lakes Ontario and Erie, Soo Canal and

St. Marie Canal by-passing the Marie Rapids between Lake Hudson and Superior and Rudeau Canal connecting River Ottawa and Lake Ontario.

2. Dredging of the thousand islands section of the river near Lake Ontario.
3. Dredging of stretches of River St. Lawrence which had rocky Shoals (rocks were removed by blasting).
4. Drowning of rapids and numerous shallow waterfalls like Long, Lachine and St. Marie by creating Dams.
5. Construction of several HEP dams like Iroquois and Beauharnais.
6. Overcoming of Freezing of water along the St. Lawrence River.

Role played by the great lakes and St. Lawrence sea way in the economies of USA and Canada.

- a) *Boast to trade.* After completion in 1858, it has enabled the two countries to have accessibility to raw materials like iron ore from Mesabi range west of lake Superior, wheat and timber from the Canadian Prairies
- b) *It has led to industrial development in the area.* The production of HEP in the dams along the sea way has stimulated development of industries like grain milling, saw milling, paper and steel industries.
- c) *Improved navigation.* It provides cheap means of transport along the 3800km stretch of sea way for both exports and imports thus encouraging internal and external trade
- d) *HEP production.* The dams constructed along the route (like Iroquois, Beauharnois, Moses Saunders, Niagara and Sault St. Marie) provide hydroelectric power for both domestic and industrial use
- e) *Development of towns.* It has led to the growth of ports and towns like Montreal, Ottawa, Port Author, Duluth, Prescott and Kingston along the route. These have become focal points for various economic activities.
- f) *Promotion of tourism.* The sea way with some of the most beautiful and fascinating sceneries in the world is a tourist attraction which generates income in the region. The Niagara Falls is a favourite site for tourists from all over the world
- g) *Creation of employment opportunities.* The sea way has created employment opportunities in the transport industry and thus raised the standards of living of the people in the area.
- h) The lakes and the dam area a source of water for both domestic and industrial use
- i) The countries earn some revenue from charges levied on ships that use the route.

Trade

Trade is the exchange of goods or services for money or other commodities for mutual benefits. It is basically the buying and selling of goods. Trade originated during the New Stone Age. The need of satisfying various essential material needs therefore led to emergence of trade.

Barter trade and currency trade are the two existing forms of trade in the world.

Barter trade. This occurs when people exchange goods for other goods. In this case no established medium of exchange is used. In certain occasions, services are exchanged for goods. In Kenya, certain commodities e.g. agricultural products are exchanged for machinery and oil.

The Currency trade. This method of trade involves the use of money as a medium of exchange. Money may be used to purchase commodities or to pay for services.

Monetary trade can operate at three levels.

Internal trade.

It involves the buying and selling of goods within a country's borders. This type of trade is also known as domestic trade or home trade or local trade. The goods are either produced locally or imported.

The following are the forms of internal trade in Kenya;

1. Wholesalers.

They purchase goods in bulk from producers and sell them to retailers. They require a lot of capital and operate from large premises mostly in urban areas where they stock their bulk purchases. Some specialize in the sale of particular goods while others deal in assortment of goods from various producers.

2. Retailers.

These are traders who buy goods from the wholesalers and sell to individual consumers. They stock a variety of goods and are basically small scale traders as they sell goods in small quantities. The following are the categories of retailers in Kenya;

- a) *Shopkeepers.* They operate small shops from where they sell goods in prices set out by the producer. Some sell a variety of goods while others specialize in certain goods like footwear or textiles.
- b) *Hawkers.* These are retailers who move from place to place with their merchandise (*itinerant traders*). They sell their goods on streets, from house to house or from one market centre to another. They deal with light and small wares bought from wholesalers. They offer the consumers an opportunity to bargain.
- c) *Kiosk operators.* They put up temporary premises from where they sell their wares. Majority of kiosks deal with light goods. Most of them operate in urban residential areas where the shopping centers are far.
- d) *Open-air traders.* These sellers usually spread their goods on the ground in open-air markets on market days. The items of trade are mainly agricultural and their prices are according to demand and supply.

Types of trading premises.

1. *Departmental stores.* These are large retail organizations that sell specific goods with several branches of the organization in the country. E.g Bata and deacons.
2. *Multiple stores.* They are similar to departmental stores, but they deal with specific items or assortment of goods in their shops. Such retail organizations operate several branches of their shops in the large towns like Nairobi and Mombasa. E.g African Retail Traders (ART)
3. *Supermarkets.* These are large retail shops that stock a variety of items, usually household goods and sell them at a price lower than in rural shops. They are normally self-service systems. A self service system is advantageous to the management as it employs fewer shop attendants. examples of supermarkets include Nakumatt, Uchumi, Tuskys, Yako and Ukwala

External trade.

This is the trade carried out between two or more countries. Countries sell off goods that they have produced in excess to other countries. The trade exists in two forms;

- a) *Regional Trade*. This is the exchange of goods within a specified geographical region. Such trade operates in specified regional trading blocs like SADC, COMESA, ECOWAS and EAC E.g. the trade between Kenya, Uganda and Tanzania.
- b) *International Trade*. It refers to trade between two or more nations.

Where it involves two nations, it is called ***bilateral trade***. If it involves more than two nations, it is called ***multilateral trade***.

The trade is divided into export and import trade.

- i. **Export trade** involves selling of goods to foreign countries. There are two types of exports;
Visible exports. This involves export of tangible goods such as coffee, tea, textiles, machinery and petroleum.
Invisible exports. These are services that can earn foreign exchange without the physical transfer of goods Examples of invisible exports from Kenya include Earning from tourism Remittance from expatriates abroad, Services rendered by Kenyan owned institution abroad eg KCB, in sudan, insurance and shipping.
- ii. **Import trade** involves buying goods from other countries. There are also two types;
Visible imports. This involves import of tangible goods that are paid in foreign currency. For example, Kenya imports crude oil, pharmaceutical products, motor vehicles and machinery.
Invisible imports. These are services from other countries paid for foreign currency e.g educational, medical, consultancy, shipping, insurance, banking, hotel and airline services.

The difference in value between a country's visible exports and imports is called *Balance of trade*.

A favourable balance of trade is a situation where the value of exports exceeds the value of imports during a given year or trade period.

Adverse balance of trade is a situation where a country spends more money on imports than it earns from its exports. This is a situation facing many developing nations.

Causes of unfavourable balance of trade.

- a) Difference in value of the goods traded in.
- b) Difference in the level of development of different countries.
- c) Government policy on its exports and imports

Measures Kenya has taken to reduce her unfavourable balance of trade

- a) Government imposes tariffs on imported goods so as to discourage importation of non-essential goods and luxury goods
- b) Kenya has established the export processing zones and encouraged foreign investors to set-up industries which increases the volume of exports
- c) She (Kenya) signed the international trade agreement which increases her trade thus a wider market
- d) The government encourages production of high quality goods which are competitive in the world market
- e) The government has created the ministry of trade and industry to oversee matters relating to trade in the country
- f) The government organizes trade fairs to enable the business community advertise their products and this helps to widen the markets for the products.
- g) Development of other sources of energy, conservation of oil, e.g. gasoline, Hydroelectric power (HEP), solar, biogas, etc in order to reduce importation of fuels.
- h) Establishment of import-substitution industries to reduce imports of commodities.
- i) Encouragement of use of appropriate/local technology e.g. Jua Kali which does not require imports of heavy machines.

- j) Encouragement of local assembling of machine since importation of parts is cheaper.
- k) Encouraging of exportation of locally manufactures goods
- l) Diversifying agro-exports, e.g. horticulture crops
- m) Finding new markets for exports
- n) Increasing invisible trade, e.g. shipping, insurance, tourism, etc

Balance of payment is the difference in value of all transaction involving both visible and invisible trade (exports and imports) of a country with foreign countries. Some countries may have an adverse balance of trade but still have favourable balance of payment because the invisible exports may account for a significant proportion of the revenue being collected.

Factors that influence trade.

- a) *Demand and Supply*: Adequate demand for goods and a good source of supply are prerequisites for any transactions. Development countries usually demand raw materials from the developing counterparts. Developing countries on the other hand import finished products from the developed world. These forces of demand and supply thus, dictate the kind of trade that exists between various countries of the world.
- b) *Capital*: Traders require capital to start businesses either from their own savings or in the form of loans. In Kenya, for example, many businessmen get loans from Industrial and Commercial Development Corporation (ICDC) and Kenya Industrial Estates (KIE) to set up their businesses.
- c) *Transport and communication network*: The supply of items is facilitated by an adequate means of transport and communication. Efficient transport and communication system reduces the cost of transporting the finished products to the market and leads to a decrease in the final cost of the item when finally sold to the consumer
- d) *Security*. Trade does well where trader's security and that their goods can be guaranteed. Security encourages expansion of trade/discharge trade
- e) *Differences in resource endowment*. No country is completely sufficient and occasionally needs goods from another country.
- f) *Population*. The size, economic status and culture of the population affect trade in many ways. The cultural differences in various parts lead to distinctive specialization in production of goods for exchange. A high population with a high purchasing power is a source of market and therefore enhances trade.
- g) *Trade restrictions/ Taxation*: Trade between countries is restricted by the imposition of various taxes like tariffs and custom duties. To protect the local industries, a country producing similar goods like those being imported may charge higher duties to discourage importation.
- h) *Political relations*: Trading among countries require that they be in good terms. Political misunderstandings among countries discourage trade, hence denying their citizens the goods in demand.

Major Exports from Kenya.

Agricultural productivity, which contributes almost 25% to the national production, is central to Kenya's export industry. Horticultural produce and tea are the major items of export for Kenya. In 2006, the combined share of these two products was 10 times higher than the share of the other export items. The main export destinations for Kenyan products are the Common Market for Eastern and Southern Africa (COMESA) and the East African Community (EAC.), with Uganda and Tanzania as Kenya's leading export destinations.

Kenya's exports to the region are dominated by manufactured and semi-manufactured products, including refined petroleum products, metal scrap, wood manufactures, beer, cigarettes, oils, perfumes, polishing and cleaning preparations, medicinal and pharmaceutical products, disinfectants, insecticides, paper and paperboard, articles of plastic, consumer products and fabrics And agricultural products such as raw green maize among other products.

Within the EU, the United Kingdom, Netherlands and Germany are Kenya's leading export market. The range of Kenya's export products in the EU is dominated by primary products.

The main export products to the European Union markets include horticulture and tea, where our main markets are Pakistan, the UK, Egypt, the Netherlands and the USA. Other Exports to the EU are fish, miraa, tobacco and soda ash. Coffee exports (not roasted) depend largely on markets in Germany, the UK, the Netherlands, Sweden and the USA.

Previously a major export, pyrethrum extract has continued to decline with time due to the development of artificial substitutes.

WHAT DOES KENYA EXPORT?

1	Tea	\$1,061,003,711.07	21%
2	Cut Flowers	\$612,758,979.47	12%
3	Coffee	\$291,575,321.19	5.8%
4	Refined Petroleum	\$195,595,140.94	3.9%
5	Legumes	\$188,456,291.90	3.8%
6	Carbonates	\$80,989,679.77	1.6%
7	Cement	\$79,784,771.76	1.6%
8	Other Live Plants	\$77,405,177.37	1.5%
9	Rolled Tobacco	\$76,414,999.00	1.5%
10	Other Processed Fruits and Nuts	\$75,260,659.16	1.5%
11	Non-Knit Women's Suits	\$74,914,758.00	1.5%
12	Other Processed Vegetables	\$49,842,108.94	1.0%
13	Coated Flat-Rolled Iron	\$48,723,175.00	0.97%
14	Knit Sweaters	\$48,392,558.00	0.97%
15	Processed Tobacco	\$47,749,489.00	0.95%
16	Knit Women's Suits	\$47,261,228.00	0.95%
17	Packaged Medicaments	\$46,362,956.00	0.93%
18	Soap	\$44,790,889.48	0.90%
19	Feldspar	\$42,907,382.35	0.86%
20	Tanned Equine and Bovine Hides	\$41,308,276.38	0.83%

Kenyan Imports

Imports in Kenya averaged 54577.41 Million KES from 1998 until 2014, reaching an all time high of 136123 Million KES in August of 2011 and a record low of 13453 Million KES in January of 1999.

Kenya imports mostly machinery and transportation equipment, petroleum products, motor vehicles, iron and steel, resins and plastics.

Kenya main import partners are India, China, UAE, South Africa, Saudi Arabia, United States and Japan.

WHAT DOES KENYA IMPORT?

1	Refined Petroleum	\$1,042,227,480.00	8.5%
2	Wheat	\$417,104,532.00	3.4%
3	Hot-Rolled Iron	\$403,040,307.00	3.3%
4	Packaged Medicaments	\$352,466,145.00	2.9%
5	Cars	\$318,918,543.00	2.6%
6	Delivery Trucks	\$276,525,883.00	2.3%
7	Telephones	\$218,228,441.00	1.8%
8	Rice	\$208,105,571.00	1.7%
9	Broadcasting Equipment	\$205,875,764.00	1.7%
10	Raw Sugar	\$197,090,535.00	1.6%
11	Palm Oil	\$184,153,051.00	1.5%
12	Tea	\$163,245,818.00	1.3%

13	Rubber Tires	\$145,418,542.00	1.2%
14	Planes, Helicopters, and/or Spacecraft	\$138,075,651.00	1.1%
15	Mixed Mineral or Chemical Fertilizers	\$137,308,338.00	1.1%
16	Tractors	\$131,528,755.00	1.1%
17	Computers	\$127,230,861.00	1.0%
18	Coated Flat-Rolled Iron	\$110,232,656.00	0.90%
19	Synthetic Filament Yarn Woven Fabric	\$107,013,305.00	0.88%
20	Human or Animal Blood	\$101,968,561.00	0.84%

Top 5 Products exported by Kenya	Tea (21%), Cut Flowers (12%), Coffee (5.8%), Refined Petroleum (3.9%), and Legumes (3.8%)
Top 5 Products imported by Kenya	Refined Petroleum (8.5%), Wheat (3.4%), Hot-Rolled Iron (3.3%), Packaged Medicaments (2.9%), and Cars (2.6%)
Top 5 Export destinations of Kenya	Uganda (12%), Netherlands (10%), United Kingdom (10%), United States (7.6%), and Tanzania (6.7%)
Top 5 Import origins of Kenya	China (19%), India (17%), South Africa (7.0%), Japan (5.0%), and United Kingdom (4.6%)

Kenya is largely a trade deficit country. The negative balance of trade occurs because the country's exports are vulnerable to both international prices and the weather conditions. Since independence, Kenya has enjoyed close international relations, particularly with the western countries.

It is also a member of several regional trade blocs, such as the COMESA (Common Market for Eastern and Southern Africa) and the EAC (East African Community). These blocs are key components of Kenya's trade volumes.

Significance of trade to Kenya.

- Economic Growth:* Trade creates numerous job opportunities through the several industries set up to meet the demand of various goods. A high demand of certain goods encourages specialization in production, which lead to high quality of goods
- Foreign exchange:* Through international trade a country is able to acquire foreign currency which enables the said country to import goods from other countries.
- Industrial growth:* Goods with a high demand stimulate industrial growth because several manufacturers compete to put up industries to meet the demand.
- Source of revenue:* Trade generates revenue to a country through taxation of commodities and services rendered. Sales tax and other custom duties are some of the ways of raising revenue for a country.
- Development of Infrastructure:* Trade usually demands good transport facilities, as this enables goods to reach their destination in good time.
- Employment opportunities.* Trade creates employment opportunities in the industries that are established/creates self employment.
- Expansion of agriculture.* An increase in demand for agricultural goods will encourage the farmers to grow more of the items to meet the people's demands.
- Development of settlements.* Major trading centres attract dense settlements
- Regional cooperation.* Trade enhances cooperation between Kenya and the trading partners.

Problems facing trade in Kenya.

- Smuggling:* Some people sneak in goods from other countries and at the same time export Kenya's products to such countries through the black market. Such trade is detrimental to the economic growth of the country because such traders avoid paying taxes.
- Nature of Kenya's imports and the unfavourable balance of trade:* Most of the imports are heavy industrial materials and finished products. These products are expensive as compared to Kenya's exports thus results in a large deficit balance of payment.

- c) *Value of Kenya's Exports:* Kenya's exports are mainly based on processed raw materials. Minerals and processed agricultural materials from Kenya are generally bulky and of low value. Thus the total production and export cost is not commensurate with the profit accrued from such sales.
- d) *Poor trade Pattern:* Kenya patterns of trade still follows the line of flow established by her former colonizer Britain being mainly a supplier of raw materials; the developing countries provides the manufactured goods that Kenya requires so they form better trading partners. Currently the country is facing the problem of the ban of trade in Miraa in the UK.
- e) *Inadequate transport and communication facilities* .Transport and communication network not well developed between Kenya and other African countries. This affects the flow of goods to and from these countries.
- f) *Trade barriers.* The imposition of quotas regulates the supply from each country to avoid any economic glut, which has negative effects on Kenya that depends heavily on particular commodities for export. Coffee, a major export from Kenya, has for example, suffered with the introduction of quotas by International Coffee Organization.
- g) *Overreliance on agricultural products.* Given the fact that Kenya's trade items are mainly agricultural, they are vulnerable to climatic changes, pests and diseases. The fact that most of the other African countries also produce agricultural goods and other primary products the demand for Kenya's goods among the neighbouring states is reduced.
- h) *High charges.* Traders are charged high fees in form of trading license in order for them to carry out their businesses. High fees make the traders to earn little profits from the sale of their goods.
- i) *Poverty among the people.* Majority of Kenyans are poor making them offer a very small internal market. Some cannot afford the very basic needs in their homes.
- j) *Insecurity.* Sometimes traders are attacked by thugs who steal their goods or take away the money earned. Some businessmen are even killed in the attacks.
- k) *Scarcity of goods.* There are times in the remote areas of Kenya that the goods needed by people are not available in the markets or shops. Then scarcity makes such goods expensive.
- l) *Inadequate capital.* Most traders engage in small retail businesses because they lack adequate finances to expand their activities.

The future of international trade in Kenya.

The future of Kenya's international trade is promising. This is because of the following;

- a) Kenya exploring new markets in the Far East countries to avoid over reliance on the European market. (This is likely to increase the quantity of Kenya's exports.)
- b) Kenya has signed trade agreements with various countries in Africa and in America which will help improve trade.
- c) The government is making efforts to take advantage of the conditions set by USA in the African Growth Opportunity Act (AGOA), whereby various countries have been allocated quotas to export textiles to the USA.
- d) Kenya's trade with African countries is likely to improve through the membership in trade such as COMESA and EAC.
- e) Some Kenya entrepreneurs are setting up branches of their industries in the neighbouring countries in order to expand trading activities.
- f) Kenya is undertaking partial processing of some of the agricultural products before export in order to add value to increase earnings.
- g) Implementation of vision 2030 will lead to increased production hence increased trade.

- h) Kenya is diversifying and adding value to her export products through the export processing zone to attract a wider market for her goods.
- i) Kenya should be aggressively advertising her products to attract more buyers.
- j) Kenya should improve her international transport and communication links for efficient transactions.
- k) The county has improved infrastructure connecting neighbor counties.
- l) Members of East African community have a common customs union.
- m) The government has made efforts to reduce the cost of production of Kenyan goods so as they compete favorably in the regional market.
- n) Some Kenyan entrepreneurs have set up branches of their industries in neighboring countries eg Bidco Oil Company.

Role played by regional trade Blocs

In Africa, the main trading blocs are COMESA, SADC and ECOWAS.

The Common Markets for Eastern and Southern Africa

COMESA was formed to assist manufacturers and producers from the countries of eastern, central and southern Africa to expand their markets

The Common Market for Eastern and Southern Africa is a free trade area with nineteen member states stretching from Libya to Swaziland. COMESA was formed in December 1994, replacing a Preferential Trade Area which had existed since 1981. Nine of the member states formed a free trade area in 2000 (Djibouti, Egypt, Kenya, Madagascar, Malawi, Mauritius, Sudan, Zambia and Zimbabwe), with Rwanda and Burundi joining the FTA in 2004, the Comoros and Libya in 2006, and Seychelles in 2009.

Map of Africa indicating COMESA membership



Objectives of the COMESA

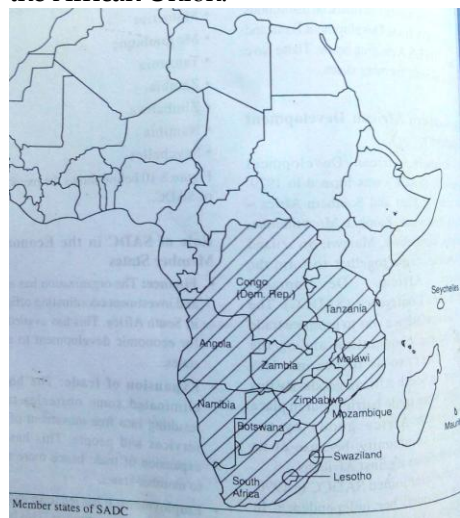
- a) To encourage member states to reduce duties charged on goods entering their countries from COMESA member states.
- b) To promote trade among member states.
- c) To acquire greater economic strength/higher bargaining power with other trading blocks of the world.
- d) To create political cooperation among member states.
- e) To establish a larger market for the goods produced in the region.
- f) To remove trade barriers among member states/create similar trade laws.
- g) To create specialization in order to improve the quality of goods.
- h) To create monetary/financial co-operation among member states.

Role played by the COMESA in the economies of member states.

- (a) The organization has led to expansion of trade in the region through reduction of non tariff barriers such as import and export quotas. This has led to economic growth among member states.
- (b) COMESA has provided its members a wide, harmonized and more competitive market for internal and external trading.
- (c) It has provided member states with a rational way of exploiting their natural resources for their welfare. Each country produces the products for which it is best suited, leaving other products to other member states.
- (d) COMESA has established harmonized monetary, banking and financial policies in the region.
- (e) COMESA has adopted measures to improve the administration of transport and communication to ease movement of goods, services and people.
- (f) The Common Market provides room for greater industrial productivity and competitiveness due to its large market.
- (g) COMESA has contributed to employment of many people in the region.
- (h) It has increased customs cooperation in the region through introducing a unified computerized customs network across the region.

The Southern African Development Community (SADC)

The Southern African Development Community (SADC) is an inter-governmental organization headquartered in Gaborone, Botswana. Its goal is to further socio-economic cooperation and integration as well as political and security cooperation among 15 southern African states. It complements the role of the African Union.



Its original members were the SACU countries (South Africa, Botswana, Lesotho, Namibia, and Swaziland). Next to join were Mauritius, Zimbabwe, and Madagascar. In 2008 Malawi, Mozambique, Tanzania, and Zambia joined, bringing the total number of SADC FTA members to 12. Angola, DR Congo and Seychelles are not yet participating.

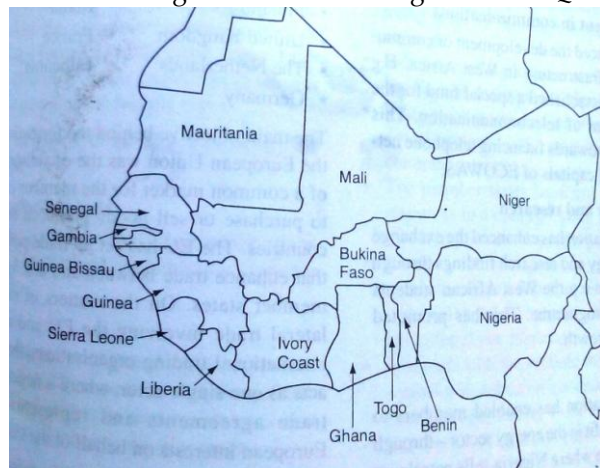
Role of SADC in the economies of member states

- (a) The organization has availed finance, through its finance and investment coordinating office in South Africa, to member states for economic development.
- (b) The organization has led to expansion of trade in the region through reduction of non tariff barriers such as import and export quotas. This has led to economic growth among member states.
- (c) Through joint ventures, SADC has promoted the development and transfer of technology among member states.
- (d) SADC has contributed to Agricultural and industrial expansion. The body provides room for greater industrial productivity and competitiveness due to its large common market.

- (e) SADC has contributed to creation of employment opportunities to many people in the region. This has been through the promotion of free movement of labour which has widened the labour market.

Economic Community of West African States

The Economic Community of West African States (ECOWAS) is a regional group of fifteen West African countries. Founded on 28 May 1975, with the signing of the Treaty of Lagos, its mission is to promote economic integration across the region. The HQs is in Lagos, Nigeria.



Members include Benin, Burkina Faso, Liberia, Côte d'Ivoire, Mali, Niger, Senegal, Togo, Guinea-Bissau, Gambia, Ghana, Guinea, Nigeria, Cameroon, Sierra Leone and Mauritania.

Objectives of (ECOWAS) Economic Community of West African States.

- (a) To promote trade among member states
- (b) To accelerate economic integration and shared development through Creating a monetary union and Forming a unified economic zone in West Africa
- (c) To eliminate trade barriers on locally produced goods
- (d) To promote free movement of goods and people in the region
- (e) To encourage agricultural and industrial development
- (f) To co-operate on matters of research in agriculture forestry and industrial development
- (g) To encourage improvement of transport and communication in order to facilitate trade.

Role of ECOWAS in the economies of member states

- (a) ECOWAS has provided a wider market for goods from member states. The states also benefit from tariff barrier removal. The volume of trade has been boosted as a result of an expanded in the region.
- (b) More transport and communication facilities have been constructed to link the member states of the Cooperation. In 1986, ECOWAS established a special fund for the development of telecommunication.
- (c) The removal of trade barriers has extended the market for the finished products/secured the market for the member states.
- (d) The organization has enhanced the exchange of technology and research findings through cooperation.
- (e) Member states benefit from Nigeria's sell of subsidized oil to them.

The European Union (EU)

This is the organization of European countries dedicated to increasing economic integration and strengthening cooperation among its members.

It was formed on 1st Nov 1993. Its HQs are in Brussels, Belgium.

The founder members were France, West Germany, Italy, Belgium, Netherlands and Luxembourg.

The objective of the European Union include

- (a) The promotion and expansion of cooperation among member states in economy and trade, social issues, foreign policy, security, defence and judicial matters.
- (b) Implementation of Economic and Monetary Union (EMU)
- (c) Establishment of a common market for the member states to purchase or sell goods produced in the countries

Role played by the EU in the economies of Europe.

- (a) *Expansion of trade.* The EU created a large internal market and adopted a common currency which expended trade among European nations.
- (b) *Finance.* The Union has established financial institutions like the European Investment Bank (E.I.B) aimed to balancing economic development in member states.
- (c) *Expansion of labour market.* Free movement of labour has been promoted in the region thus ensuring more job opportunities for people.
- (d) *Promotion of Agriculture.* The Union gives grants to member states and subsidizes farm produce to make them highly competitive in the world.

General Benefits of regional trading blocs

- (a) Countries enjoy wider markets and thus a favourable balance of trade.
- (b) Goods exported / imported within individual blocs enjoys preferential tariff to the benefit of member states.
- (c) Large market in the blocs has led to increased industrial production in member states
- (d) There is increased political co- operation within regions and members benefits from this cooperation
- (e) Improvement of means of transport between countries so as to meet the expended trade opportunities
- (f) members have began to specialize in providing what they can produce best at minimum cost
- (g) countries are benefiting from trade fairs organized in the different member states , which provide a forum for trade negotiations and advertisement of goods
- (h) membership in trading blocs puts countries in a better position to acquire assistance from developed countries and financial institution e.g. IMF

Problems affecting Regional Trading blocs

- (a) The civil wars taking place in some countries causes insecurity which affects trade between countries.
- (b) Political differences among the leaders of the member states affect cooperation among member states.
- (c) The member states are not at the level of industrialization, making some countries to rely on those that are more industrialized. E.g Kenya, Egypt, South Africa and Nigeria are more relied on by other African Nations.
- (d) Some countries produce similar goods making the volume of trade to be low and less rewarding.
- (e) Free trade affects local industries, as the imported goods without tax are usually cheaper than locally produced goods. This is what is ailing the sugar industry in Kenya
- (f) Free trade denies the importing countries the revenue they would earn from taxing imported goods.
- (g) Poor transport and communication linkage between members states limit inflow of goods and services
- (h) Some member countries do not remit their annual subscription which affects the operation of the organizations.
- (i) The flow of goods and services between the states is still low because of poverty among majority of the people in the regions.
- (j) Some people in the countries do not believe that goods made in the neighbourhood are of good quality. This reduces the demand for goods in the regions.

Population.

The word 'population' comes from a Latin word **populs** meaning peoples.

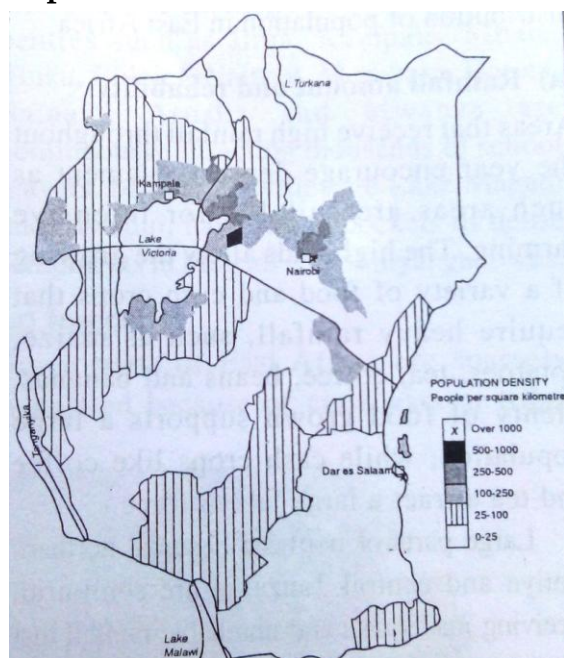
The study of population is often referred to as **demography**.

Population is the number of people living in an area such as a county, country or continent at a given time.

Population Density:

This is number of people living in a given area, usually per km². Singapore is a country with a very high population density and Australia is a country with a very low population density.

Population Distribution in East Africa.



Meaning of population distribution.

This is how a population is spread out around a country or an area. If a country's population is distributed in a regular pattern then we say it has an even population distribution. However, if there are areas with many people and then areas with few people, then we would say that it has an uneven population distribution.

Two other good words to describe population distribution are **dense** and **sparse**.

Sparse population: When not many people live in an area e.g. the centre of Australia.

Dense population: When a lot of people live in an area e.g. the Melbourne area.

Some areas of East Africa are densely populated. for example the large towns of Nairobi, Mombasa, Dar-es-Salaam, Zanzibar, Arusha, Kampala and Jinja., the shores of Lake Victoria, the Highlands of Kenya, Western Uganda, North – Western Tanzania, Coastal plains of Kenya and Tanzania.

Factors influencing population distribution in East Africa.

- (a) **Fertility of the soils:** areas with fertile volcanic soils have attracted population since they permit arable agriculture..

- (b) *Rainfall amount and reliability.* Areas receiving over 1000mm of rain support both subsistence and cash crops farming hence high population concentration. Large parts of Northern Uganda, northern Kenya and Central Tanzania are semi-arid and thus less populated.
- (c) *Pests and diseases.* There are some parts of East Africa that are infested with pests and diseases that discourage human settlement. For example Miombo woodlands of south western Tanzania, Lambwe Valley in Kenya and Bunya area in Busoga, Uganda which have tsetseflies.
- (d) *Establishment of game parks and forests.* Game parks and forests are protected areas where people are not allowed to settle making such areas sparsely populated.
- (e) *Flooding.* Areas prone to flooding and water logging are generally sparsely populated. For example, the Kano Plains and lower Tana Areas in Kenya and the swampy areas in Uganda.
- (f) *Insecurity.* Some parts of East Africa are sparsely populated because of civil wars or tribal clashes taking place in such areas. For example, northern Uganda, some parts of Rift Valley in Kenya, West Pokot, Marakwet and Turkana regions
- (g) *Urbanization.* Industrial and commercial activities in large towns like Nairobi, Kampala, Mombasa, Dar-es-Salaam and Arusha have attracted high population concentrations.
- (h) *Land ownership.* Areas where individuals own large tracts of land are generally sparsely populated despite having fertile soils and good climate. For example, the former white highlands in Kenya, areas of Arab occupation at the coast of Kenya.
- (i) *Relief.* Mountainous and hilly areas with rugged relief do not attract settlements and therefore are sparsely populated. For example, the escarpments of the Rift Valley in East Africa.

Population growth.

Population growth is the change that occurs in the number of people in a population over a given period of time. It may be positive growth (Increase) or negative Growth (decrease).

The growth is calculated in two ways;

1. Natural population growth.

This is the natural increase or decrease in population as determined by;

- a. *The crude Birth Rate (CBR).* The estimated rate of births in a year. It is calculated by dividing the total number of births recorded in the year by the total population in that year (by middle of the year) and multiplying the fraction by 1000
- b. *Crude Death Rate. (CDR).* The estimated rate of deaths in a year. It is calculated by dividing the total number of deaths recorded in the year by the total population in that year and multiplying the fraction by 1000

The term crude is used because other characteristics like age, sex and composition within a population are ignored.

Natural population growth = $CBR - CDR \times 100$

2. Numerical population Increase.

This is the actual increase in the number of people in an area within a given period of time. It is calculated by getting the difference between the two censuses.

EG

Factors influencing population growth.

1. Fertility

Fertility is then ability to conceive or to produce. Fecundity refers to the ability give birth to many children (high fertility). Where this potential is lacking, it is referred to as infecundity or infertility. There are two kinds of infertility;

~ *Primary infertility.* Involuntary childlessness

- ~ *Secondary infertility.* Involuntary infertility i.e. when after giving birth to one or more children, a woman is unable to conceive again.

Voluntary infertility happens when a woman takes measures to prevent conception

Fertility rate is The average number of children a female is expected to have in their lifetime. It is the ratio of live births in an area to the population of that area, expressed per 1000 of the population per year.

Reasons for high birth rates include:

- ~ Lack of education about family planning
- ~ Improved nutrition
- ~ improved health services
- ~ Poor availability of contraception and cost of contraception
- ~ Polygamy amongst some ethnic groups
- ~ Weakening of traditional customs like prolonged breastfeeding and sexual abstinence after birth.
- ~ High rate of sexual violence often leading to unwanted pregnancies

Causes for low birth rates in a country.

- ~ Late marriages
- ~ Effects of family planning campaigns
- ~ Low nutritional or health levels
- ~ Move towards small families in response to economic realities
- ~ Urbanized population – prefer fewer children in order to maintain their standard of living
- ~ Rise in the cost of feeding and educating children
- ~ Changing attitudes towards employment/wages verses family engagement – the changing role of women in the family today
- ~ Level of education attainment
- ~ Improvement of medical facilities

2. Mortality.

This is the number of deaths within a given population. **Death rate** is The number of deaths per 1000 of population per year. **Child mortality rate** is the number of deaths of children aged between 1 and 5 years per 1000 live births. **Infant mortality** rate is the number of deaths before the age of 1, per 1000 live births per year. Adult Mortality Rate is the number of adults dying per 1000 of the total population in a year. Mortality reduces the population in a given area as well as affecting its structure.

Causes of high death rates

- ~ Conflicts and wars
- ~ Poor medical care
- ~ Poor hygiene and sanitation
- ~ Poor diet (might be a shortage of food or unhealthy food)
- ~ Drinking alcohol, smoking or taking drugs
- ~ Lack of exercise (sedentary lifestyle)
- ~ Shortage of clean water
- ~ Diseases e.g. cancer and AIDS

Reasons for declining death rates in Kenya

- ~ Better testing for and treatment of HIV/AIDS
- ~ Improved water supply
- ~ Improved housing (although large numbers still live in informal settlements)
- ~ Better education about diet

3. Migration

This is the movement of people from one location to another location resulting in change of residence.

There are many different types of migration. The most commonly referred to are:

- ~ Internal Migration: Migration within a country.
- ~ Rural-urban migration: This is a type of internal migration. It is the movement of people from rural areas (the countryside) to urban areas (towns and cities).
- ~ International Migration: Migration between countries.
- ~ Temporary Migration: Migration for a limited period.
- ~ Permanent Migration: Migration with the intention of staying forever.
- ~ Forced Migration: When people are forced to migrate, often because their life is in danger.

Emigrant: A person who leaves a country to migrate to another.

Immigrant: A migrant arriving in a new country.

Causes of migration

- a) Population pressure which leads to landlessness in areas such as central province lead to migration of people to settlement schemes and to less populated rural areas in search of land.
- b) Insecurity in areas such as North-Eastern and Northern Kenya which have frequent attacks from bandits and cattle rustler shapes made some people to migrate to more secure areas.
- c) Establishment of large plantation near Thika town and rice irrigation schemes in Mwea and Ahero attract people from neighboring areas as they search for employment /mining/Lumbering/fishing.
- d) Natural catastrophes such as floods in Kano plains and lower Tana Valley cause people to move to more secure higher grounds.
- e) Pastoral communities such as the Maasai, Samburu and Boran migrate from one rural area to another in search of pasture and water for their livestock.
- f) Drought and famine sometimes cause people to migrate in search of food e.g some people who live in semi-arid areas of Kenya temporarily migrate to those districts where they can get food during the time of droughts)
- g) Availability of employment opportunities in urban areas motivates the rural people to move to urban areas in search of jobs.

Impacts of Migration

The process of migration can have positive and negative impacts on both the source country and the receiving country. Below is a summary of some of those impacts.

- a) Reduced unemployment. Migration of people from one place in search of job opportunities may create a situation where unemployment is reduced in the source area. It may even lead to underemployment.
- b) Reduced pressure on schools and hospital.
- c) Remittances sent by family and friends living abroad. Remittances go straight into the hands of the people, not the government.
- d) Improved relations with foreign countries
- e) Migrants may return home with new skills and knowledge of new technology
- f) Reduced birth and fertility rate and people in reproductive age range leave
- g) Receiving area will receive increase in population which exerts pressure in resources.
- h) It causes national integration where people from different communities live together in towns
- i) It enhances circulation of currency
- j) It leads to the spread of diseases
- k) It raises productivity in the receiving area as most of those involved are young and productive people who may engage in gainful employment (create employment – start business)
- l) Can cause unemployment – compete for available jobs, others miss jobs
- m) Increase in crime rates (prostitution, drug traffickers)

- n) Increase pressure on social amenities (over crowding) in hospitals, schools

Population structure

Population structure refers to the composition of a given human population in terms of age and sex.

It can be represented graphically using an age- sex population pyramid (refer to topic 1 on construction)

A population pyramid is a visual summary of the combined effect of past fertility, mortality and migration.

Population pyramids may have different shapes depending on the structure of a given population giving us differing interpretation.

The age sex pyramid with a **broad base** implies that the country has a *higher young population*, (more children and youths) characteristic of developing countries like Kenya. This indicates that there are more dependants who stress the working population and the economy. The broad base also indicates high birth rate. The narrow apex indicates that there are fewer older people due to low life expectancy

Where the pyramid has a narrow base, as in the case of developed countries, it means fewer young people. Such pyramids are broad in the middle and again narrow at the top. A narrow base is an indicator of low birth rate. There are fewer young people depending on the working population leading to high standards of living. The broad apex indicates high life expectancy.

Significance of population structure.

1. *Planning.* The breakdown of population by age and sex helps a government to formulate policies for socio-economic development
2. *Calculation of Dependency ratio.* This is the proportion of unproductive population aged below 20 and above 65 years in relation to the productive ones aged between 20 and 64 years

$$DR = C + OP$$

incomplete

3. *Calculation of sex ratio.* Sex structure or sex ratio is the number of males per 100 females. In a population where the ratio is more than 100 like in the case of urban centres experiencing frequent immigration of young men, social problems are common. Rural areas experience lower sex ratio which has an effect on fertility

Consequences of population growth and structure.

Population growth.

Population growth takes place when birth rates are higher than death rates (natural increase). In most continents of the world this is what is happening.

Population growth results in various changes to take place in a population of a given society. The changes are referred to as demographic trends or population trends.

Demographic trends.

Population trend indicates how a country's population may change as it develops putting in mind the birth rates, death rates and total population.

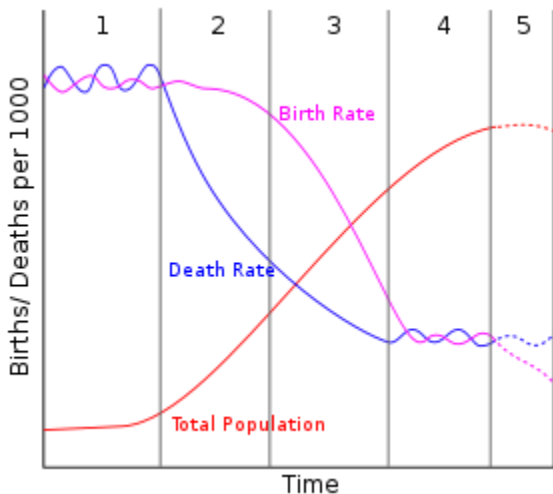
There are demographic transition stages;

1. *Stage 1:* Has birth and death rates. Because birth rates and death rates are both high (no contraception, agricultural based economy, poor medical care, etc.), total population remains low.
2. *Stage 2:* Birth rates remain high, but death rates begin to fall. This causes total population to increase (natural increase). Death rates fall because of introduction of basic medical care.
3. *Stage 3:* Birth rates begin to fall, but still remain higher than death rates so total population continues to increase. Birth rates begin to fall because of better education and availability of

contraception.

4. *Stage 4:* Birth rates and death rates are both low so the total population becomes constant (stays the same).
5. *Stage 5:* Birth rates start to fall below death rates so the total population actually starts to decline (natural decrease). This is because of delayed marriages, cost of children and emancipation of women.

Illustration of stage 5



Overpopulation.

This is a situation When there are more people that the resources available. Overpopulation might lead to unemployment, famine and homelessness.

Under population:

This a situation when there are not enough people to fully maximize the potential of a country. For example there might be vacant jobs or resources that cannot be fully exploited.

Optimum Population:

This is a situation when population and resources are perfectly matched. In reality this is almost impossible to achieve.

Population explosion:

Refers to a high population that has outstretched the available resources. An overwhelming increase of population resulting to pressure on the available resources

Life expectancy:

The average age that someone is expected to live within a country. Generally women experience a higher life expectancy than men.

Effects of population growth

The rapid population growth rate leads to:

- a) Inability to provide adequate education facilities such as schools, colleges, books and other equipments
- b) Poor health services as the population outstrips the available physical facilities like hospitals, medical personnel and drugs
- c) Inadequate provision of housing facilities leading to development/sprawling of slums
- d) Scarcity of adequate, thus, high rental rates for houses

- e) Inadequate and expensive transport services as demand for transportation outstrips available supply. This is exemplified by long queues in towns during rush hours (mornings and
- f) Population pressure leads to environmental degradation as people clear forests to create room for cultivation and settlement
- g) It leads to increased rural – urban migration in search of jobs
- h) It leads to land fragmentation. Fragmented land is uneconomical to operate and experience diminishing returns/low productivity
- i) It leads to over reliance on foreign aid/loans to sustain the fast growing population. This reduces foreign exchange due to loan repayment.
- j) It leads to balance of payment problems due to increased importation of food to meet food shortages
- k) It leads to high dependence ratio resulting into little savings by the working group / low investments / low living standard.
- l) There is likely to be a high unemployment rate since job opportunities may not increase at a rate that can cope with the increasing number of job seekers / may increase the rate of crime.
- m) Reduced income per capita and reduced gross domestic product (GDP). Expenditure while meeting demands for the large population reduces revenue that would be used for development of income generating projects hence slow economic growth.

The slow population growth rate can lead to;

- a) Small number of people in an area leading to underutilization of facilities such as schools and hospitals. It is expensive to run schools with fewer people.
- b) Small labour force forcing the country to import labour which may be expensive.
- c) Reduced market due to a low population. Exporting goods may face stiff competition and earn little revenue.
- d) Expensive to supply resources like water, electricity, schools and roads to a sparsely distributed population.
- e) Little revenue will be collected by the government in form of taxes.
- f) Limited investment will be experienced as a low population discourages investors that may require a lot of unskilled labour.
- g) Defenselessness in country as the population becomes vulnerable to attacks by other countries.

Impact of population Structure

The impact of a population structure can be beneficial or can result in constraints

Impact of Young Population:

This refers to young dependents (those under the age of 16). You might refer to a young population if there are too many or too few. Both can present advantages and disadvantages.

Problems of Young Population (too many)

- ~ Child care has to be provided so that parents can return to work.
- ~ Governments need to pay so that young people can go to school
- ~ Young people get sick so the government has to pay for healthcare
- ~ An increase in the dependency ratio

Below are some advantages of a large and small young population:

- ~ Potentially large workforce in the future (too many)
- ~ Population who has grown up understanding modern technology e.g. computers and the internet (too many)
- ~ Reduced dependency ratio (too few)
- ~ Reduced education and medical costs (too few)

Impact of working population.

This is the population aged between 15 and 64 years and is the economically productive population. The population maintains the economy. The population is need of work and leisure facilities. It supports the dependant population.

Ageing Population:

This is when the proportion of old dependents is increasing. This happens because life expectancy increases, but also because birth rates start to fall. This happens in stage 5 of the DT (it is currently happening in very developed countries like Sweden and Japan).

Problems of ageing population

- ~ There may be a shortage of workers (not enough economically active)
- ~ If there is a shortage of workers there are less tax payers and the government receives less money
- ~ Old people tend to get more sick, so there will be an increase in pressure on hospitals
- ~ In many countries retired people can claim pensions off the government. If there are a lot of old people this can be very expensive.

Despite there being many problems of an ageing population, there are some advantages, including:

- ~ Less need to spend money on schools
- ~ Older people are less likely to commit crimes
- ~ Old people tend to travel less (no commuting) so congestion and pollution might reduce.

Impact of imbalance between sexes.

A large sex ratio results in increased fertility. A low sex ratio (male deficiency population) results in decreased fertility. A large sex ratio means a large male labour force important for national development.

Comparison between population trends in Kenya and Sweden

Population growth in Kenya.

Kenya has been experiencing positive population growth rate as show in the summary below;

	1948	1962	1969	1979	1989	1999
Population in millions	5.4	8.6	10.9	15.3	21.4	28.7
%increase	-	2.8	3.4	3.8	3.5	2.9

In the last few years, there has been a decrease in fertility enhanced by factors like involvement of women in paid employment as opposed to their traditional roles of housewifery

Factors influencing rapid population growth in Kenya.

- (a) *Early marriages:* - Many people in Kenya get married and this allows them to a longer period of fertility resulting in many children.
- (b) *Improved medical care:* - This leads to higher chances of survival for mothers and infants as well as the general population thus increase the survival rates.
- (c) *Improved diet:* - This result s to better health for the entire population hence reducing the mortality rate.
- (d) *Cultural beliefs:* - Some cultures encourage large families due to the preference of one gender to the other. Some cultures discourage the use of contraceptives / family planning leading to couples getting many children.
- (e) *Migration:* - Due to political instability in Neighbouring countries eg Somali, Sudan there was an influx of foreigners which leads to high population of foreigners. Any 4 x 2 = (8mrks)

Factors influencing distribution of population in Sweden.

- a) Rugged and mountainous landscape. this discourages agriculture and settlement. Such areas are characterized by low and scattered of population.
- b) Fertile soils – the southern part of Sweden have fertile soils which favour agriculture and settlement therefore densely settled.

- c) Cold climate – if the Northern regions of Sweden experienced long winters with very low temperatures thus discouraging agriculture and settlement./ The southern parts of Sweden are warmer and summers are longer thus encouraging settlement/ Thus densely populated.
- d) Forest vegetation- large portions of Canada have forest vegetation which hinders agriculture and settlement
- e) Presence of numerous lakes – almost half of Sweden total land area is covered by water bodies thus reducing land for settlement.
- f) Mining centres. They form ‘islands’ of high population. for instance , major iron ore mining areas like Grangesbergy and Dennemora form enclaves of high population while the immediate neighbourhoods have very low population.
- g) Urbanization. The majority of the Swedes live in urban areas

Population problems of Sweden.

- a) A declining labour force because of aging population
- b) More ageing dependants straining national budget
- c) The inability of the population to replace itself i.e. population growth rate is zero.
- d) Less revenue from a declining population due to low tax base of the working population

Comparisons .

KENYA	SWEDEN
- Has relatively high population estimated at 40 million	- Has relatively smaller population estimated about 9 million
- Has high rate of natural increase at 2.3%	- Has low rate of natural increase at 0.1%
- Fertility rate is high at 5.0	- Fertility rate is quite low at 1.5 births per woman
- Population disregards high use of birth control measures	- Population embraces birth – control measures i.e. modern contraceptive

Other differences

- a) -In Kenya, the majority of the population is in the rural areas while in Sweden the majority is in urban.
- b) Kenya population has a large number of young people aged below 20yrs while Sweden has an aging population.
- c) Kenya’s population has a lower life expectancy while Sweden has a higher life expectancy.
- d) Population structure for Kenya has a broad base and narrows with increasing age while the structure for Sweden is narrow at the bottom, bulges out in the middle and a bit wide at the top.

Similarities.

Both countries have uneven distribution of population dictated by factors such as relief, climate and presence of economic activities.

Both countries have a low mortality rate due to improved medical care.

In both countries, population density in urban areas is high.

Both countries have population policies to study the trends and give recommendations

In both countries there is use of family planning methods and contraceptives in effort to control population growth.

Settlement.

Definitions

Settlement: A place where people live. A settlement can range from one an isolated building to a capital city of over 20 million people.

Site: The actual location or place that a settlement is built.

There are many different types of settlement, but these can roughly be divided into rural and urban settlements.

Rural Settlements: Settlements that are found in the countryside (rural areas) and contain less than 10,000 residents. Rural areas maybe farmland, forest, desert or savanna. e.g. hamlets and villages.

Hamlet: A small group of houses, normally about 5 to 10. There are often no services in a hamlet.

Village: A settlement of up to 10,000 people. Villages will have some services in them like small shops, a primary school, a doctor and bus routes.

Town: A settlement of over 10,000 people that has not be designated a city.

City: A large town, in the UK a town becomes a city when it has a cathedral in it.

Capital City: The main administrative centre within a country and the home of the national government.

Primate City: The largest and most important city within a country. The primate city will often have double the population of the next most important city. Most of the time the primate city is also the capital city, but there are some famous exceptions e.g. New York, Sydney and Sao Paolo.

Conurbation: Two or more towns or cities that have joined to together e.g. Birmingham, Walsall, Dudley and Wolverhampton in England.

Megaopolis: A conurbation or a clustering of cities with a population of over 10 million people e.g. Tokyo.

Factors influencing settlements.

- a) *Climate.* Most people live in the central highlands and Lake Victoria basins because these areas have suitable climate for human settlement and for agricultural production.
- b) *Soils.* Areas with fertile soil such as the central Highlands have dense population because the soil support agricultural production/ areas with poor soil have sparse population e.g most parts of Nyika plateau.
- c) *Relief.* Gently sloping and flats lands facilitate settlement and transportation while rugged slopes/steep landscapes have sparse population or nil higher and steeper slopes of Mt. Kenya and Elgon.
- d) *Transport network.* Transport and communication facilities have encouraged settlements. There are many market centres along the Kenya roads and centres such as Nairobi and Thika, which are, accommodate large population.
- e) *Industrial development.* Development of industries is a major factor influencing population distribution in Kenya. There are many people in the industrial centers such as Nairobi, Nakuru, Mombasa and Eldoret.
- f) *Disease.* Disease and pest discourages or discourages settlement in given areas. In Kenya, the government discourages population settlement schemes such as Mwea.
- g) *Water supply:* Water is essential when building a settlement. People tend to nucleate around water points like oases inn deserts and springs for supply of water.
- h) *Defensive position:* a good defensive location (on a small hill or surrounded by water) was a very important choice of settlement for some communities.

- a) *Trading Location*: Settlements may have also been built for their access to trading routes. Coastal areas often make good locations to trade from.
- b) *Resources*: It is useful being near resources like wood, coal, gold because you can use them to build things or trade with nearby settlements. Mining areas tend to attract settlement.

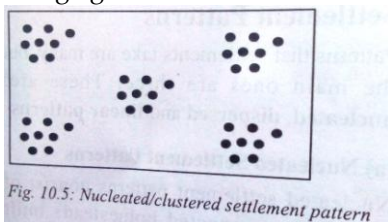
Settlement Patterns

A settlement pattern is an arrangement or layout of dwellings in a particular place. Settlement patterns especially in rural settlements can develop in many different ways giving them a unique shape.

The four main settlement patterns that you need to be able to recognize.

1. *Nucleated settlement pattern*

This is a situation when all the houses in a settlement are built very close together, often around a central village green or church.

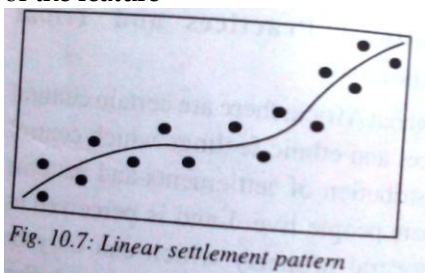


Causes of settlement nucleation

- a) Availability of social amenities such as schools and health centres. There are so many institutional settlements like schools, universities and hospitals
- b) The presence of an industrial plant or water and rich agricultural land.
- c) Limitation of building land leading to clustering of buildings in one place.
- d) Security concerns especially in banditry –prone areas.
- e) Availability of resources such as minerals – the mining at Magadi in Kenya, Mwadui in Tanzania and Kasere in Uganda is responsible for the population.

2. *Linear or Ribbon:*

This is a settlement that has grown in a line. The line doesn't have to be straight, but will normally follow a road, a river, the coast or the valley floor. Such settlements may form a curve depending on the shape of the feature



Causes of linear settlement pattern.

- a) Presence of transport lines e.g. roads, railways.
- b) Presence of springs which are a source of domestic water.
- c) Presence of lake/ocean shore.
- d) Presence of relief features like escarpments where people will tend to settle along the escarpment avoiding the steep parts.

Linear settlement is common along the shores of Lake Tanganyika and along some parts of lake Victoria and along many roads and foot paths.

Disadvantages of linear settlement

- a) If peoples are spread out, social amenities may not save maximum number of people

- b) Easy spread of diseases
- c) Where facilities are provided, they may not be fully utilized
- d) Where there is fire outbreak, controlling is difficult.

3. **Dispersed settlement.**

This is when individual buildings are separated by several hundred metres. They are individual isolated buildings and do not form a single settlement.

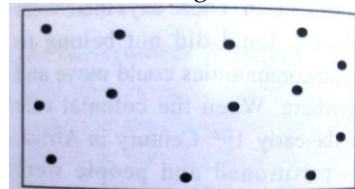


Fig. 10.6: Dispersed Settlements

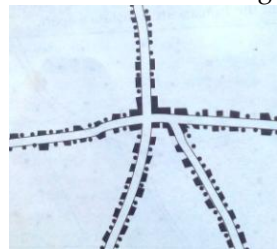
Factors that may lead to dispersed settlement in an area.

- a) Availability of land for settlement and cultivation. If the land is plenty, people tend to build their houses wherever they want.
- b) Availability of evenly distributed water resources. If water is available over a large area of land, settlements can be put in any place one deems fit.
- c) Good security over a wide area encourages people to build their houses anywhere since there is no need of staying close together for security reasons.
- d) Presence of pests/diseases which discourage settlements.
- e) Infertile soils which attract few people.
- f) Mts/forested areas which attract few settlements.
- g) Harsh climate/extreme weather conditions which may attract few people.

4. **Radial settlement.**

This settlement pattern occurs where there are crossroads. People tend to build their houses in all directions along the radiating roads. The resultant pattern is shaped like a star..

The main contributing factor is accessibility to transport.

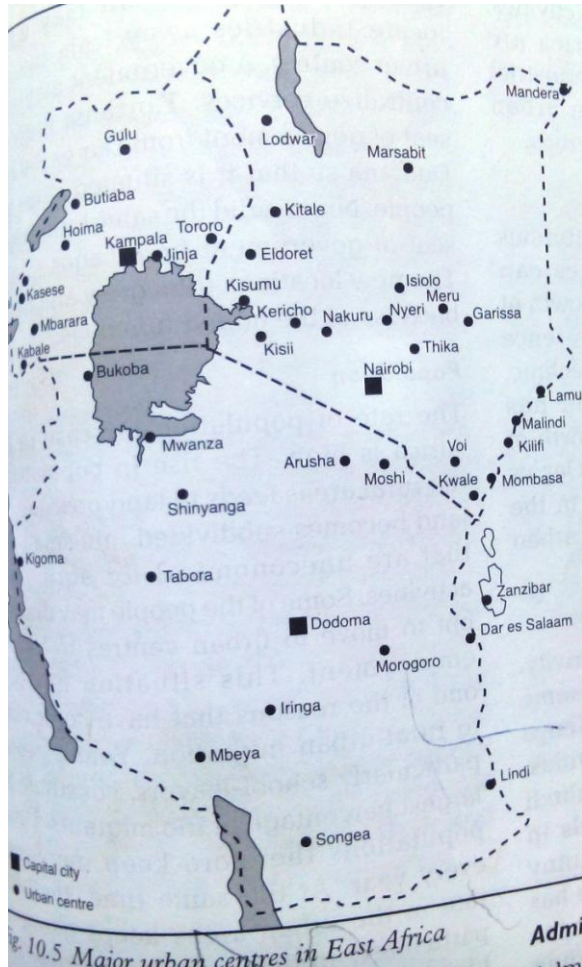


Distribution of major urban centres in East Africa.

Towns in East Africa are categorized as follows;

1. **Capital towns.** These are towns which are the main seat of governments/ housing National Assemblies/administrative HQs of respective countries. For example Nairobi, Dodoma and Kampala.
2. **Cities.** These are the largest towns of East Africa, some housing international organizations, referral hospitals and offering specialized services like banking, insurance, air travel and high class hotels. For example, Nairobi, Dar-es-Salaam, Kampala, Mombasa and Kisumu.
3. **Seaports.** These are located in the Indian Coast and include Dar-es-Salaam, Mombasa, Tanga, Malindi, Mtwara and Lindi.
4. **Lake ports.** Towns located on lake shores. Kisumu, Mwanza, Kigoma, Musoma, Bukoba, Mbamba Bay, Port Bell, Jinja and Masindi.
5. **Mining towns.** Towns which evolved from areas with mining activities. They include Shinyanga, Magadi, Mwadui, Kasese, Tororo, Mpanda, Kilembe and Kakamega.

6. **Industrial towns.** Towns whose main function is industrial activities. For example, Thika, Athi River, Tororo, Jinja and Tanga.
7. **Collecting towns.** Towns located in rich agricultural areas, whose original function was to collect agricultural produce and distribute to other areas. E.g Karatina, Nakuru, Eldoret, Kisii Mbarara, Mbale, Songea and Iringa. Some are periodic open air markets.
8. **Gap towns/makutano towns.** Towns located at points of convergence of transport routes. Many are located at road junctions. For example, Voi, Moshi, Tabora, and Hoima.
9. **Administrative towns.** Towns whose main function is administration. They are HQs of counties in Kenya and other government departments. These are common in all counties in Kenya and other East African Countries.



Factors that have led to growth of urban centres in East Africa.

- a) **Population increase:** Rapid population increase usually leads to increased pressure on land in rural areas.. Thus, people are forced to go and look for a way to earn a living elsewhere. They often migrate to urban centres resulting into high population growth rates and urban growth.
- b) **Industrialization:** Industrialization leads to increased income opportunities which attract people to reside close to them. Thika and Athi River are examples of towns whose population concentrations may be explained in terms of high concentration of manufacturing units in their vicinity.
- c) **Administration:** The concentration of administrative functions at a specific location often attracts public attention. People tend to prefer living close to leaders because they feel more secure and can easily receive the leaders' attention. This explains why most of the county headquarters in Kenya are also the biggest towns in their respective counties.

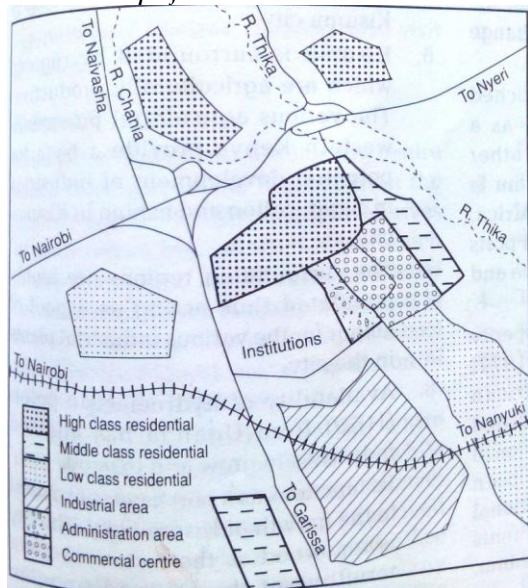
- d) *Mining*: Substantial deposits of a mineral ore can attract economic activity and subsequent population concentration. Population concentration leads to urbanization, as the mining community has to be provided with basic facilities such as shopping, houses, sanitation, medical and academic institutions. Examples of such towns include Magadi (Kenya), Shinyanga (Tanzania) and Kasese (Uganda).
- e) *Transportation*: Improved transportation enables urban residents to participate in more urban-based activities at greater distances from their residence. Urban centres can also develop from major junctions and points of inter-modal transfer (break-of-bulk). Coastal towns such as Lamu, Mombasa, Tanga and Dar-es-Salaam owe their origin to transport related advantages.
- f) *Agriculture*: Rich agricultural areas often witness the emergence of urban centres. Such areas require nearby local markets for their agricultural produce, and distribution outlets of agricultural inputs, such as fertilizers and farm implements. Examples include Mumias, Eldoret, Nakuru, Nyahururu, and Nanyuki.
- g) *Tourism*: Tourism may lead to urban growth and development. It is an economic activity and attracts infrastructure, investment and people. Examples include Ukunda and Malindi (Kenya).
- h) *Education*. Establishment of educational institutions such as universities and colleges can contribute to urban growth. The growth of Eldoret town is partly attributed to the presence of Moi University, University of Eldoret and Eldoret Polytechnic.

Growth and Functions of Selected towns in Kenya.

Thika. An industrial centre.

Thika is located 40km to the north –East of Nairobi, along the Nairobi – Nyeri Highway. The industries located in this town include Delmonte for processing and canning pineapples, metal box, Kenya Vehicle Manufacturers, Bidco for making cooking oil, and Coffee Mills.

Map of Thika Town



Factor that have contributed to the growth and development of Thika Town

- a) *Strategic location*. The town enjoys Proximity to Nairobi which provides some inputs required by the industries in Thika. There is industrial interdependent among the industries in Nairobi and Thika. Nairobi provides a ready / large market for the manufactured goods from Thika
- b) *Excellent road network*. Thika is served by the ultra-modern Thika Super Highway. The short rail and road connection between Nairobi and Thika provided cheaper movement of goods and services for the industries in Thika.

- c) *Availability of water.* River Chania which passes through Thika town provides fresh water for industrial use especially for coffee processing and fruit canning measures.
- d) *The hinterland.* Thika town has rich agricultural hinterland which provides raw materials for the industries. The hinterland is densely populated hence provides cheap labour for the industries.
- e) *Availability of land for industrial growth.* The town is located in an open area which is not densely populated. Industries can be located along Garissa Road, Nyeri Road or towards Nairobi.
- f) *Availability of local labour.* Thika is surrounded by regions with dense population which provides ready labour force.
- g) *Availability of building materials.* Sand used in construction is harvested in the nearby river Chania and Masinga Dam. Construction stones are readily available in the Ndarugu quarries.

Kisumu: Lake Port.

This is the third largest city in Kenya after Nairobi and Mombasa. The city is a focal point for road, railway and lake transport routes. It started as a small fishing settlement on the Winam Gulf. The following are the factors which contributed to the growth of Kisumu City;

- a) Kisumu grew as the terminus of Uganda railways. The Asian constructors settled in there and built shops to cater for African needs. This stimulated trade which led to the expansion of the town.
- b) Kisumu grew as lake port handling the regional lake trade. It handles goods from all the East African Countries.
- c) The high population in the surrounding areas provided the required labour force for the various industrial plants.
- d) It was a regional headquarters for colonial administration. Currently it is also a HQ of the Kisumu County and serves the rest of the lake region in many administrative functions.
- e) Water for domestic and industrial use was readily available in the area
- f) It has a rich agricultural hinterland providing food and industrial raw materials
- g) Availability of Hydroelectric power from Uganda has enabled industries to grow and expand.
- h) The development of industries has attracted people to the town seeking for employment

Functions of Kisumu city in Kenya

- a) A transport and communication centre since it harbours, airport, railway terminus, numerous roads.
- b) Administrative centre because it is headquarters for Nyanza province/ hosts the PC/ DC.
- c) Educational centre since it harbours Maseno University, several schools and colleges.
- d) Commercial centre since it harbours Nakumatt, Ukwala and several shops
- e) Financial centre since it harbours several banks e.g. equity bank, Barclays and several micro finances.
- f) Industrial centre because it has several industries e.g. floor mining factories etc.
- g) Tourists- centre as the Lake Victoria acts as a tourists appraisal and national museums among others.

Eldoret: an agricultural collecting centre.

The town began as a farming post in 1930 by a group of white settlers who had arrived in Uasin Gishu in 1908.

It is referred to as an agricultural collecting centre because of its initial function of collecting agric. Produce from surrounding farms in Uasin Gishu and Trans-Nzoia.

Factors which have contributed to the growth of Eldoret

- a) *Excellent transport connection.* Eldoret is accessible by the railway line/road from Mombasa to Kampala. This location makes the town a major collection centre.
- b) *Rich agricultural hinterland.* It is located in the heart of one of the richest agricultural hinterlands in Kenya. (the home of Maize and wheat farming in Kenya)
- c) Availability of social amenities. Availability of high class hotels, referral hospital, many schools and universities has led to a rapid population influx from the surrounding areas.
- d) Availability of water from River Sosiani for domestic and industrial use.

- e) The establishment of service industries such as banking and insurance coupled with excellent transport system.
- f) Availability of H.E.P led to establishment of industries such as plywood making, manufacturing of soft drinks tanning, hides and skins, textile making and milk processing.
- g) The high population in the surrounding region provides a source of labour for industries and a ready market for the manufactured products.
- h) Presence of plenty of land for expansion of the town and industries.
- i) Some industries were established as part of the government policy decentralizing.

Related studies on Nairobi and New York.

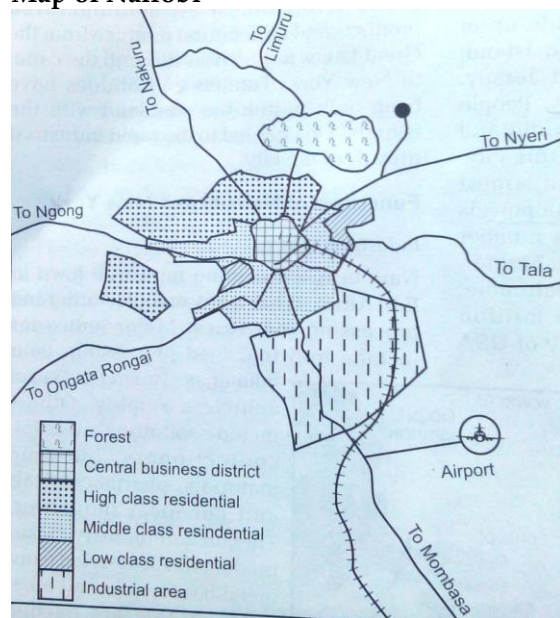
Nairobi is the largest urban centre in East Africa and the capital city of Kenya. The name Nairobi is derived from a Maasai name, *enkare Nairobi*, meaning something very cold I reference to the cool waters of Nairobi River.

The town was started by railway engineers and became the administrative HQs of the East African Protectorate in 1907.

It became a municipality in 1920 and a City in 1962.

Today, it is the HQs of all National government ministries and a seat for many international organizations.

Map of Nairobi



Factors influencing the growth of Nairobi.

- (a) *Existence of many industries.* Nairobi is the leading industrial city in Eastern African Region. The location of industries like motor vehicle assembling, milk processing, flour milling etc in Nairobi attracts influx of people leading to the growth of Nairobi.
- (b) *Existence of internationally recognised facilities.* Hotels like Norfolk, intercontinental, Serena; the KICC, international organisations and entertainment centres all existing in Nairobi boosts its growth.
- (c) *Administrative function.* Nairobi is the HQs of government in Kenya housing all the HQs of government departments and National Parliament. It is the HQs of Nairobi County.
- (d) *Availability of educational services.* The city houses many educational institutions including public and private universities, schools that draw students from the whole of Eastern African Region.
- (e) *Immigration.* Nairobi is a major destination for local and international immigrants. People from all parts of the country flock the city in search of better prospects. It is a recognised cosmopolitan city.

- (f) *Tourism*. Nairobi is an attractive international destination for tourists. The city is placed in a central position within the Eastern African air transport network.
- (g) *Transport and communication*. Nairobi is a focal point in the East African transport and communication. Wilson Airport is the main facility for domestic and regional flights.
- (h) *Commercial centre*. Nairobi is the leading business and commercial centre having the Nairobi Stock Exchange, several banks. And other financial institutions.

Problems affecting Nairobi City.

- (a) Large unemployed population which is idle and encourages Criminal/immoral practice e.g. parking boys and girls, beggars
- (b) Rapid growth of population which has led to an acute *shortage of housing*/leading to slums development.
- (c) Traffic congestion during rush hours on Uhuru highway, Mombasa Road and Outering Road leading to loss of time
- (d) Heaps of uncollected garbage which are health hazard as they can lead to Epidemic/land pollution
- (e) Perennial water shortages due to increased number of consumers.
- (f) Poor sewage system in some parts which is a health hazard for poor Drainage system Rapid growth of population has led to inadequate provision of health and Education services and facilities/social facilities.
- (g) Pollution of air/water/sound from industries and vehicles causing a health Hazard.

New York City.

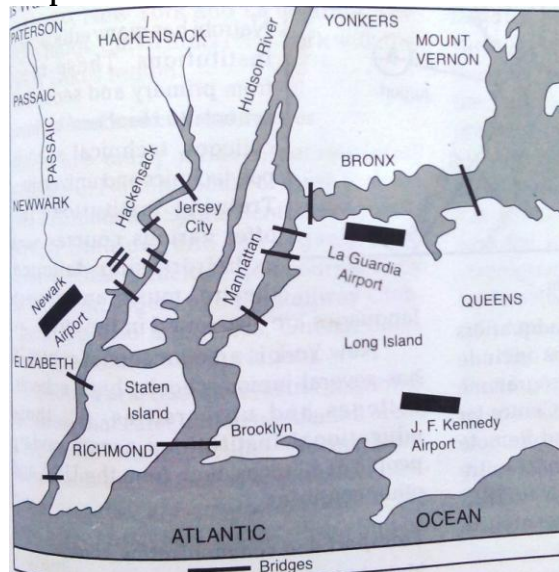
New York is one of the largest cities on the eastern side of USA located at the estuary of river Hudson. Part of it is made up of a group of islands namely Manhattan, Long island, Staten Island and Jersey.

Just like Nairobi, it is a cosmopolitan city with people from various countries found there.

It is part of the larger New York Megalopolis comprising the cities of Washington DC, Philadelphia, Boston and Baltimore.

It is not however the capital city of USA.

Map of New York



Factor that influenced the growth of New York City.

- (a) New York is a great Sea Port that handles over 255% of all trade in North America.
- (b) It is an international centre with several international organisations such as the United Nations Organisation. It is also a leading world trade and finance centre based on the Wall Street.

- (c) New York is a transport and communication centre connected to all parts of the world by sea routes. The city has three international Airports; J.F. Kennedy, Newark and La Guardia Airports. It has the Erie Canal connecting the great lakes and Hudson Bay.
- (d) It is an education and cultural centre with numerous universities, colleges, schools and training institutions. The city is internationally recognised as a fashion and art centre.
- (e) It is a leading industrial centre in North America.
- (f) There is a well planned internal City structure with a unique pattern of streets known as the 'Manhattan distance'. Such factors make the city attractive to immigrants, investor and workers.

Problems facing the city of New York.

- (a) Traffic congestion i.e. the road network is jammed with cars buses motorcycles and other kinds of vehicles especially during rush hour
- (b) Unemployment a rapid increase in population which does not match the rate of industrial and commercial growth in the city
- (c) Housing problems due to ever-increasing population in the city that has led to development of slums like Harlem, Brooklyn and Bronx
- (a) Limited space for expansion because of its site has led to emergence of skyscrapers
- (b) Social evils such as crime rates lawlessness and prostitution due to lack of employment
- (c) Pollution due to heavy concentration of industries, motor vehicles and domestic refuse leading to air, water and noise pollution
- (d) Loneliness due strenuous life and joblessness leading to homicidal tendencies
- (e) Climatic problems in which urban heat concentration makes the city residents feel uncomfortable. At times during winter, blizzards are common.

Comparison between Nairobi and New York cities

Similarities.

- (a) Both cities are HQs of international organizations. New York is the HQs of the UN while Nairobi is the HQS for Habitat and UNEP.
- (b) Both are the largest cities in their respective regions. Nairobi is the largest city in East Africa while New York is the largest City in the USA.
- (c) Both cities are well linked internationally through their respective airports.
- (d) In both cities, a high population density has led to the emergence of slums (ghettos). In Kenya, we have Kibera, Mathare and Mukuru slums while New York has Harlem and Bronx slums.
- (e) Both countries experience traffic congestions especially during rush hours.
- (f) Both cities are leading recreational and cultural centres wit sports grounds, disco halls, cinema and other social halls.
- (g) Both have open park for recreation within their CBDs. Uhuru Park for Nairobi and Rectangular Central Park in New York.

Main differences.

- (a) Nairobi is the capital and administrative town in Kenya while New York is not the Capital of USA.
- (b) Nairobi is an inland port (dry port) while New York is a sea port.
- (c) Nairobi is sited on a low lying swampy plain while New York is sited on an island of a long drowned mouth of River Hudson
- (d) Nairobi expansion is horizontal due to availability of large space, merging into adjacent rural areas while New York on the other hand is expanding vertically into the air due to limited space.
- (e) Mode of transport within Nairobi city is motor vehicles and in some cases railways while in New York apart from motor vehicles and railways, rivers and canals are being used.
- (f) New York is characterized by very high buildings known as skyscrapers while in Nairobi skyscrapers are very few.

- (g) Nairobi is a national commercial and financial centre while New York is an international financial and commercial centre.
- (h) The climate in Nairobi is warm and sunny throughout the year, New York City experiences summers and winters.

Related Studies On The Ports Of Mombasa And Rotterdam.

Mombasa Port.

The town emerged about 1000 years during the Shirazi and Arab Trade interactions between 9th and 13th Century. The Growth and development of modern Mombasa is influenced by the construction of the Kenya- Uganda Railway in 1896.

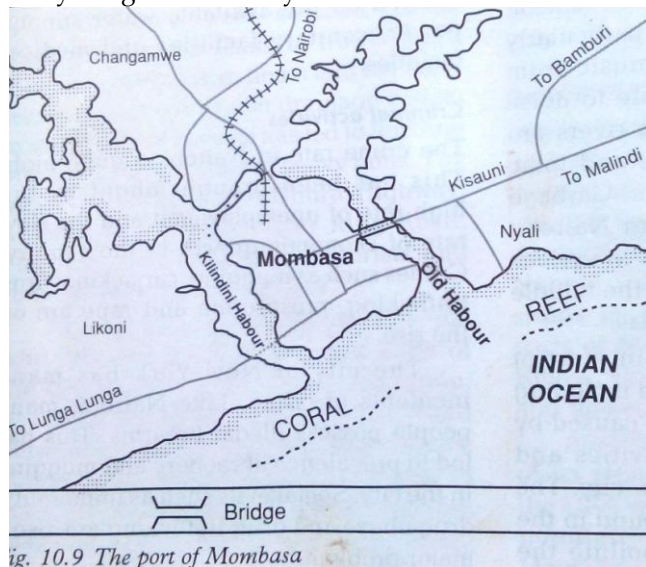


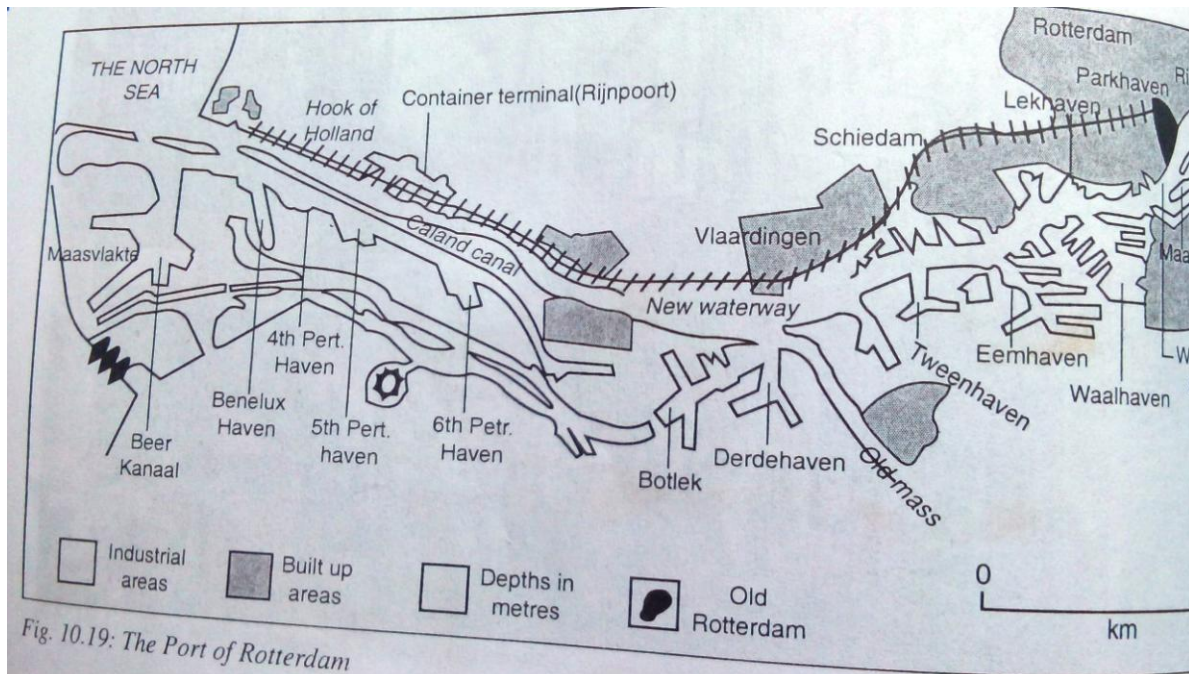
fig. 10.9 The port of Mombasa

Factors influencing Growth of Mombasa.

- (a) *Presence of deep and well sheltered harbour.* This enables large ships to dock at the port. Kilindini and Reitz are deep creeks located at the mouth of the river Mwachi and with advantage of handling large vessels.
- (b) *Existence of modern port equipment.* Kilindini harbour has eighteen deep berths fully equipped with modern port facilities handling bulk cargo. A berth is a place where a ship can stop and be anchored. This has made the port to grow and become an international sea port.
- (c) *Establishment of the oil refinery and other industries.* The refineries at Changamwe and Kipevu attracted large population of workers to the towns.
- (d) *Large hinterland.* Mombasa has a large hinterland rich in agricultural produce and minerals, and the port handles both exports and imports. This has made Mombasa to be a recognized international entrepôt.
- (e) *Tourist and cultural centre.* Mombasa is an international tourist destination. The development of tourists industry has boosted the growth of Mombasa.
- (f) *Strategic location.* Its strategic position on the Eastern coast of Africa has made it an ideal port at call for ships.

Rotterdam.

Rotterdam is the busiest and leading port in the world, in terms of the amount of Cargo it handles in a day, followed by Kobe (Japan), New York and London. It is located at the mouth of rivers Rhine and Maas on the North Sea. It is the most important entrepôt in Europe.



Factors that led to the growth of Rotterdam as an international entrepôt.

- Deep harbours and canals.* The construction in 1872, of the **New Waterway** canal (deep and free from silt) to bypass the shallow and migrating channels of rivers Meuse and Rhine and additional Canal and Beer Canals, which are dredged and widened over the years, have made them able to handle large sea going vessels.
- Suitable location and warm weather.* The port is strategically located at the focal point of sea routes to and from Europe, Africa, America and Asia. This has made it a call port where many ships stop for service and resting of sailors. The north Atlantic Drift keeps the port warm free from ice all year.
- Availability of modern facilities.* The coal and oil terminals, container terminals, loading-off equipment, wharves, quays and deep canals has enabled the port to handle a large volume of cargo and can serve many ships at the same time.
- Large rich Hinterland.* The rich hinterland covers Switzerland, Germany, Austria, France, Belgium, Netherlands and Luxembourg. The port is connected to many parts of Europe by many navigable rivers like the Rhine, Rhone, Danube, Oder and Elbe

Comparison between the port of Mombasa and Rotterdam.

Similarities.

- Both ports are open to use throughout since they are ice free throughout the year
- Both ports are located at the mouth of drowned rivers namely River Mwachi for Mombasa and river Maas for Rotterdam.
- Both ports have rich and extensive hinterlands. The Port of Mombasa serves as a developing and agricultural hinterland whereas Rotterdam serves developing and highly industrialized hinterland
- Both ports are industrial centres for oil refining and ship building and repair among other industries.
- The ports have modern cargo handling facilities which have increased the volume of trade.
- Both are large and well equipped. Mombasa is the largest business and best equipped sea port along the East African coast while Rotterdam is the world's leading business port.

Differences.

- Mombasa handles less volume of trade than Rotterdam
- Mombasa relies on road railway air and pipeline to link the interior which Rotterdam is linked to the interior through road railway river and canal transport

- (c) Mombasa port has technologically challenged in the provision of services while Rotterdam uses advance technology in providing services
- (d) Mombasa port has limited expansion while Rotterdam has expanded to the new outer port
- (e) Port facilities in Mombasa are not well developed while those of Rotterdam are well developed
- (f) Mombasa port is frost free throughout the year while Rotterdam is sometimes affected by frost but to a minimal extend.

Effects of urbanization.

Positive effects.

- (a) Influx of large rural population to towns Provides cheap and abundant labour which Encourages rapid industrialization
- (b) The large urban population with high purchasing power provides a large market for industrial goods.
- (c) Urbanisation Stimulates agricultural development in the rural areas because of the money remitted back home by the urban population.
- (d) The large urban population Justifies the provision of social amenities

Negative effects of urbanization

- (a) Industries in urban centres emit smoke and gases that pollute the air
- (b) Some industries discharge effluent into rivers polluting the water/noise from factories causes noise pollution
- (c) Many motor vehicles found in urban centres contribute to air and noise pollution
- (d) There is increased unemployment and idleness in many urban areas leading to high rate of crime and social evils
- (e) Urbanization has led to breakdown of cultural values and kinship as well as family separation and increased marital problems. Many urban centres have a higher concentration of males than females.
- (f) Urban pressure of life has made many people develop high blood pressure and poor mental health.

Management and conservation of the environment.

The environment refers all the external conditions which have influence over the behaviour of an organism (plants, animals and human beings).

There are two divisions of the environment;

- a) **The physical environment** – the natural physical conditions of weather, climate, vegetation, animals, soils, landforms and drainage.
- b) **The human and social environment;** including human activities such as farming, forestry, mining, tourism, settlement, transportation, trade and industry.

Biodiversity or biological diversity is a term used to refer to the variety of life that exists in a given living environment.

Management.

Management is the planning and implementation of the plan to ensure effective and proper utilization of the available resources in the environment. Human beings are the custodians of the living environment and therefore have the responsibility of managing it.

Conservation.

Environmental conservation is the protection, preservation and proper utilization of the resources in the environment. Conservation is regarded as a process of preventing something from loss, waste, damage or destruction

Conservation efforts ensure that the integrity of the ecosystem is maintained so as to continue providing survival support to all living things so as to guarantee their ecological diversity.

Why environmental management and conservation is necessary.

- a) *Sustenance of human life.* Environmental management and conservation is geared towards ensuring adequate food supply to the ever increasing human population. Food shortages stagnates economic growth.
- b) *Aesthetic value.* Human beings appreciate beauty. The natural resources like landscape and wildlife provide beautiful sceneries for recreation and tourist attraction.
- c) *Protection of endangered plant and animal species* some animals and plants are found in small numbers. It important to conserve them so that they don't suffer extinction.
- d) *Economic value.* The amount and value of resources found within a nation's borders determines the wealth of the nation. Once exploited natural resources are sold to earn income.
- e) *Protection of water catchment areas.* A regular supply of water in our rivers is important for HEP generation, domestic and industrial use.

Environmental Hazards

This refers to an occurrence in the environment that causes a disturbance in the equilibrium (balance) of an ecosystem.

The following are some of the environmental hazards that occur in different parts of the world.

- 1. Tropical cyclones: Powerful winds like Tropical Cyclones cause havoc in the environment over which they prevail. The cyclones are formed by depression (areas of low pressure). they are called hurricanes in Caribbean, typhoons in Far East, Willy Willies in Australia and Tornadoes in North America.
- 2. Waterspouts: these are violent whirling winds that form funnels of water that cause turbulence in the inland water bodies such as lakes. In Kenya, they have destroyed buildings (e.g. carrying away of classroom roofs), capsizing boats and destroying fishermen's nets in Lake Victoria.

3. Seismic disturbances: earthquakes cause a lot of damage to buildings, interfere with transport and communication and cause loss of life. Mild earthquakes are called tremors. Earthquakes may also cause Tsunami like the one that occurred in 2004 in the Pacific highlands and felt up to the East African Coast.
4. Volcanic Eruption: volcanic activities are usually violent resulting in damage to property and loss of life. For example, Mt. Nyiragongo in DRC erupted in 2000 killing more than 6000 people and altering the ecosystem.
5. Toxic gases: Whenever gas leakages in industrial plants occur, a lot of damage is witnessed. An accident on the nuclear reactor at Chernobyl in Russia in 1984 led to the death of 5000 people and hundreds deformed.
6. Fires. Fierce fires on residential buildings are usually caused by kerosene, stoves, candles or electric faults. Such fires cause deaths and destroy property. In 2000, an oil pipeline exploded in Nigeria killing 100 people in a radius of 20km.
7. Oil spills. Tractors and Lorries spill oils on roads, which not only make the roads slippery and dangerous but also choke vegetation and may kill animals if it gets in rivers. In 2005, a vessel spilled 150 tonnes of crude oil into the sea at the port of Mombasa
8. Drought and desertification. Drought is the Deficiency of water in the ground, stream, lakes and reservoirs resulting in prolonged deficiency of rain e.g. the drought experienced in the year 1984. It makes millions of people vulnerable to food shortages.

Impact of selected environmental hazards and measures to combat them

1. Floods:

This is the unusual covering of an area, by water, through a temporary rise in the river, lake or sea level. A river floods when its channel is unable to accommodate the discharge from its catchments. The eroded material from high rainfall highlands is carried downhill and deposited in the banks of the river at the old age stage. Where deposition is extensive much of the river water spills over the banks to find their way into the plains. The flood plain of a river may be extended into the sea by the formation of deltas.

In Kenya flooding is common in the low lying areas served by rivers Nyando, Nzoia, Kuja and Tana. River Nyando, for example, originates from the Nandi hills and is responsible for the annual flooding of Kano plains between the months of March and May.

Factors that lead to frequent flooding in parts of Kenya

- (a) Most of the land is low lying which causes the rain water to spread over wide area. For example the lowlands in the old stages of rivers Nyando, Nzoia, Tana, Kuja and Sondu Miriu are prone to frequent flooding.
- (b) The adjacent highlands receive torrential rainfall which releases large volumes of water resulting to rivers overflowing their banks.
- (c) Silt has filled the river beds making them shallow thus spilling their water over banks
- (d) The rivers in the flood prone areas are at their old stage, thus they have wide flood plains which allows water to spread over large areas.
- (e) Most areas have black cotton soil which is non- porous and when soaks up allow water to flow and spread on the surface.
- (f) The high amount of rain water discharged into lakes like Victoria makes their levels to rise thus flooding the adjacent lowlands. For example in 1962, following the heavy rains that were experienced, the low lying areas of Victoria was flooded.
- (g) A periodic rise in sea level along the Indian Ocean sometimes causes intrusion of sea water and flooding in some low-lying coastal plains. The Lamu area was in 1962 affected by the heavy discharge by the River Tana into the Ocean.

- (h) Poor environmental management cause blocked urban drainage through poor litter disposal is responsible for the floods experienced in major urban centers like Nairobi and Mombasa. Some of the worst floods recorded in Kenya *Uhuru floods* of 1961-1962 and the 1997-1998 el-Niño floods
- (i) Cultivation along river banks causing Sedimentation in rivers that reduces their capacity to carry its load of water, thus spilling to the adjacent lowlands.

Methods through which floods can be controlled

- (a) Dykes are constructed along river banks levee of rivers to increase their height in order to prevent water from over flowing
- (b) Dredging of river channels to deepen/ widen them to make it possible for them to accommodate excess water
- (c) Dams are build across the rivers to control the amount of water discharges downstream/ construction of earth dams to hold back water
- (d) draining/ re- directing a river/ straightening of a river to control its wild flow (draining means cut meander loops
- (e) Diversion channels have been constructed in the flood plain and water used for irrigation thus reducing the effect of the excess water.
- (f) Afforestation/Planting of vegetation/forest in the river catchments areas to reduce the surface run-off and increase seepage.

Effects of flooding.

- (a) Flooding creates stagnant water in which disease-causing breed resulting in diseases, which affect and weaken people and sometimes cause death
- (b) Flooding leads to loss of property/loves. It costs a lot of time and money to replace the property while human life cannot be replaced
- (c) Flooding causes soil water logging which lowers crop production
- (d) Floods disrupt farmers calendar/wash away crops. This leads to food shortages/famine.
- (e) Floods wash away bridges and roads/airfields/ railways. This disrupts transport and communications.
- (f) People are displaced/homeless,

Environmental problems associated with floods

- (a) Floods displace people - they disrupt human activities and force people to move away from their homes as they are displaced by the flood waters
- (b) Floods destroy property - there is a lot of loss and damage to property as buildings are destroyed, animals are killed and infrastructure damaged
- (c) Death of both animals and people - lives are lost as people drown, animals die
- (d) Floods can cause landslides - they cause sudden movements of land from upper to lower areas burying people and their property and destroying the landscape
- (e) A lot of diseases are brought about due to people congesting in some areas due to floods e.g. cholera, malaria, diarrhea and bilharzias

The floods in Kano plains have, however, been seen as a blessing in disguise in that they bring a lot of fertile volcanic soils from Nandi hills which are deposited on the flood plains as silt. During floods fish swim upstream from Lake Victoria into the plains. Consequently, the people of Kano plains catch a lot of fish with the advent of floods.

2. Lightning:

This is a visible electrical discharge in form of a flash. Lightning is associated with convectional rainfall and is experienced in regions that are intensely heated during the day, resulting in rapid transport of heat by convection in the atmosphere.

Lightning is disastrous, destroys property and lead to loss of life among other things. Hence there is need to provide protection where the likelihood of lightning is greater than normal. Regions prone to lightning in Kenya include the west of Rift Valley (especially Kisii and Nyamira districts), Kakamega and the Lake Victoria region.

To control lightning disasters, the government of Kenya has taken the following measures:

- (a) Establishment of a commission whose duty is to educate the people on dangers of lightning and how they can avoid the disaster.
- (b) Ministry of education has provided posters designed to educate people on precautionary measures against lightning.
- (c) Installation of lightning arresters in schools within the lightning prone areas.

Control of lightening calamities.

- By installing thunder arresters in tall buildings.
- Educating people to avoid sheltering under the trees when it is raining.
- Informing people to be indoors when it is raining. Avoid open fields.
- Avoid stepping down bare footed when it is raining.

3. Windstorms.

Winds travelling at a speed of 100km/h are called strong winds or gales, and are likely to be violent carrying objects along their path and damaging structures, hence the name *windstorms*.

They are common in the arid areas of Kenya

The best form of controlling windstorms in initiation of Afforestation programmes in the arid and semi-arid areas

4. Pests and diseases.

A pest is an organism that depends for its growth and survival on other organisms, and is capable of transmitting a communicable disease to the other organisms. Pests that damage crops include locusts, weevils, army worms, porcupines, moles and quelea birds. Aphids occasionally attack planted forests of cypress and eucalyptus

Animal pests include tsetseflies and ticks.

Human pest include mosquitoes, tsetseflies, snails, fleas and flies. They spread malaria, sleeping sickness, bilharzias, rabies, dysentery, plague or river blindness.

One of the major devastating environmental hazards is HIV/AIDS pandemic affecting many households in the continent.

Measures to combat pests.

- Spraying
- Use of herbicides to control weeds
- Use of fungicides
- Educating people on correct use of chemicals
- Maintaining a clean environment
- Immunization of human beings
- Creating awareness on diseases to prevent spread e.g. HIV/Aids

5. Pollution.

Pollution refers to the introduction of harmful substances into the environment/ contamination of the environment with materials that interfere with human health or quality of life. The added impurities in the environment are called *pollutants*.

The main types of pollution are;

- (a) **Air pollution.** This is the addition of substances in the air to a point that its purity is destroyed thus becoming dangerous to human beings to breathe. The major air pollutants are gaseous wastes like oxides of carbon, sulphur and nitrogen and suspended solids of dust, smoke, soot and tar.

Causes of air pollution

- ~ Forest fires
- ~ Emissions from factories
- ~ Soil erosion by wind
- ~ Poor garbage disposal
- ~ Emissions from motor vehicles.

Effects of air pollution on the environment

- (a) Gases emitted from some factories contain substances which corrode roofs of houses and metal structures
- (b) Some gases from factories contain substances which dissolve in water to form acid which make plants wither, maim or kill animals
- (c) Inhalation of smoke and soot particles / bad smell lead to discomfort / irritation of the respiratory system / discoloring of vegetable / building.
- (d) Gases emitted from factories may contain poisonous substance which can lead to poor health / death when inhaled / plant leaves turn yellow.
- (e) Gases / excess carbon dioxide increase the temperature affecting the climate of the affected areas / depletion of O₃ - Zone layer.
- (f) Smoke / dust / smog reduces visibility which may lead to motor accidents.
- (g) Dust particles that settle on leaves inhibit photosynthesis
- (b) **Water pollution.** Water pollution takes place when the state of quality of water is altered so that it no longer serves the purpose for which it is intended.

Causes of water pollution.

- (a) Direct discharge of industrial chemicals by industries to the rivers, lakes, seas and oceans
- (b) Discharge of non-decomposing materials e.g. plastics
- (c) Pollution of seas, oceans and lakes by shipping especially oil tankers which discharge oil at the sea
- (d) Using the sea as a dumping ground for the household and industrial wastes
- (e) Agricultural chemicals in runoff (fertilizers, pesticides or herbicides) end up in rivers which become polluted
- (f) Disposal of radioactive waste from nuclear power stations to the oceans
- (g) Sewage water treatment using recycle methods and chlorine chemicals, the chemicals end up in the water

Ways in which farming activities contribute to water pollution:

- (a) Poor farming methods such as ploughing down a slope/cultivating along river banks lead to soil erosion when it rains
- (b) Chemicals used on farms/fertilizers pesticides and herbicides are washed by rainwater into rivers causing water pollution
- (c) Animals from farms are taken to slaughterhouses. If such houses are poorly managed they discharge their wastes such as blood into rivers causing water pollution/ animals' waste i.e. urine/dung dirtying water.

Effects of water pollution on the environment

- (a) It may cause death of aquatic life
- (b) It destroys aesthetic/ beauty of beach/ water bodies
- (c) It leads to spread of waterborne diseases
- (d) Causes foul smell
- (e) Results to eutrophication/ water hyacinth/ water weeds/ alga

Measures that can be taken to control water pollution.

- (a) Limiting/controlling the size of human population (population growth rate)

- (b) Introduction of waste treatment plants
- (c) Introduction of public health services to monitor water supply for drinking
- (d) Introduction of strict anti pollution laws and enforcing them
- (e) Manufacturing of non-biodegradable products could be prohibited
- (c) **Sound pollution.** This occurs when there is an irritating sound or sudden bang. It is also called Noise. Noise is usually sound that is unwanted, obnoxious or disturbing.

Sound pollution is mainly caused by;

- (a) Motor vehicles through hooting and roaring of engines without silencers.
- (b) Riveting of machines in steel rolling mills and welding of metals.
- (c) Banging of metal containers by Jua Kali artisans as they fabricate drums, pans and boxes.
- (d) High pitched music played in vehicles, dance and disco halls, homes and religious gatherings using loud speakers.
- (e) Aircrafts as they take off or land in airports.
- (f) Blasts from mines and celebrations during Diwali.

Sound pollution may cause physical and mental illness associated with stress

- (d) **Land pollution.** This is the deterioration of the state of land through the addition of harmful and poisonous wastes. It occurs when solid wastes like polythene paper, glass, metals, plastics, vegetation and food remains are carelessly dumped on the ground. It also occurs where land is degraded through open cast mining.

Effects of land pollution on the environment

- (a) The garbage may result to foul smell/ air pollution, which is hazardous to human health.
- (b) When it rains, the dumped waste. Garbage is washed to rivers causing water pollution
- (c) Garbage can be a breeding ground for rodents/ flies/ cockroaches, which can cause disease outbreak e.g. plague
- (d) Accumulation of garbage leads to blockage of roads/ drainage systems
- (e) Garbage heaps are an eyesore as they make the environment ugly. Oil spillage/ Industrial wastes leads to destruction of flora.

Environmental Management and Conservation Measures in Kenya.

The following are the Ways through which the government promotes conservation of the environment.

- (a) Afforestation and re- Afforestation programmes have been started mainly in arid and semi arid lands to Improve water, soil and air management in the areas.
- (a) The government is also Encouraging agro forestry in many parts of Kenya in order to have [people engage in gainful agriculture as well as managing and conserving forest resources.
- (b) Protection of natural resources by limiting the use of pesticides and other toxic chemicals. This is also done through creation of national parks and game reserves.
- (b) Public awareness campaigns having been carried out through the regional administration, schools and other bodies like the mass media and NGOs to enlighten people on the importance of a safe and clean environment
- (c) The government has enacted laws which enforce proper management and conservation of the environment. For example, the water Act, the River Authorities Act, the Public Health Act and the Environmental Management and Coordination Act.
- (d) By setting up a committee responsible for environmental conservation permanent presidential commission of Environment and Solid Conservation/National \ Environmental Secretariat
- (e) By setting aside a national tree planting day which is an annual activity/Afforestation/ reafforestation
- (f) By introducing environmental education component in the school curriculum to educate future generations
- (g) The government is encouraging the Use of non-pollutant fuels and fuel switch from the use of wood

fuel and oil to electricity.

- (c) Kenya is a signatory to the International conventions on pollution control.
- (d) Establishment of environmental standards and ethics commission that among other things prohibits smoking in public, encourages people to use efficient fuel saving jikos, encourages the use of compost and organic manure in farms and prohibits playing of loud music.
- (e) Setting up a committee responsible for environmental conservation e.g. permanent presidential commission on environment and soil conservation