

Senior Secondary Geography

FORM FOUR



Linthipe River

Christopher M.Z. Kanyimbo

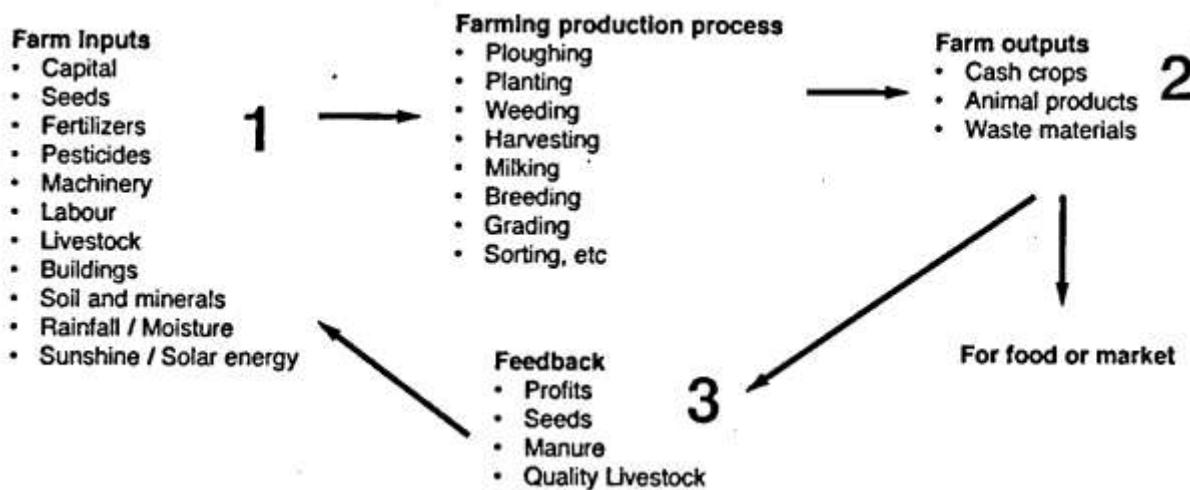
TABLE OF CONTENTS

TOPIC ONE: WORLD AGRICULTURE.....	Page 4
TOPIC TWO: NATURAL RESOURCES.....	Page 34
TOPIC THREE: FISHING.....	Page 49
TOPIC FOUR: INDUSTRY.....	Page 55
TOPIC FIVE: TOURISM IN AFRICA.....	Page 61
TOPIC SIX: SETTLEMENTS.....	Page 66
TOPIC SEVEN: POPULATION.....	Page 75
TOPIC EIGHT: TRANSPORT AND TRADE.....	Page 83
TOPIC NINE: THE ENVIRONMENT	Page 95
TOPIC TEN: CLIMATE CHANGE.....	Page 99

TOPIC ONE: WORLD AGRICULTURE

Agriculture is the growing of crops and rearing of animals for man's use or industrial production.

Farming as a System



To produce agricultural goods (**output**), farmers need factors of production (**inputs**) and they follow specific procedures (**processes**). The inputs help the system to function and the procedures help to produce agricultural produce. Being a system, what happens in one part affects the whole system. The quality of outputs depends on the quality of inputs.

FACTORS THAT INFLUENCE AGRICULTURE

A. PHYSICAL FACTORS

Physical factors include climate, topography, soil and biotic factors.

i. Climate

Temperature and rainfall together determine the type of climate experienced in an area. Rainfall provides water for crop and animal production. Temperature also affects agriculture in many ways. Temperature influences crop maturity depending on how much warmth, intensity and duration of sunshine is there. Rainfall and temperature are **climatic factors**.

ii. Soil

Soils should be fertile (rich in humus), well aerated, correct P^H and correct soil texture. Infertile and poorly aerated soils hinder agricultural production. Soil factors are called **edaphic factors**.

iii. Topography

Flat land makes mechanization easy. Gently sloping land is also required for surface irrigation. Crops like rice, sugarcane and wheat do well in flat and low-lying areas. Some crops do well in well-drained hilly areas such as coffee and tea.

iv. Biotic Factors

Biotic factors relate to living things. Crops do not grow well where fungi, diseases, weeds and pests are common. Animal production is also affected by diseases and parasites.

B. HUMAN FACTORS

Human factors include ownership and inheritance of land, government policies, religion and culture.

i. Ownership and Inheritance of Land

Land ownership and inheritance affects agriculture in several ways. Private land ownership is associated with commercial farming while communal land ownership is associated with small-scale subsistence farming.

ii. Government Policies

Government policies influence agriculture in the sense that some countries have farming policies on production, taxation and guaranteed prices of agricultural produce. Government may also provide **subsidies** to farmers to reduce cost of production. Government may also introduce **quotas** to control supply of agricultural produce. The government determines land ownership.

iii. Religion and Culture (Social Factors)

Religion and culture can determine the type of agriculture that people engage in. For example, some religions do forbid pork, this means the people cannot engage in pig farming. The Hindus believe cattle is sacred, this affects cattle farming.

C. ECONOMIC FACTORS

Economic factors that affect agriculture are market and capital.

i. Capital

The amount of capital available determines the type of agriculture farmers engage in. Capital is required to buy or rent land, to buy new machinery, seeds, fertilizers, etc.

ii. Market

Availability of market encourages farmers to produce more. Price fluctuations at the market may discourage farmers from producing more due to fear of making losses.

Transportation costs affect agriculture such that farms may be located near the market.

D. TECHNOLOGICAL FACTORS

Farming uses new scientific knowledge and implements to increase productivity. These are what constitute technological factors.

- i. **Mechanization:** this is the use of machinery in the process of agricultural production. Use of tractors, ploughs, and ridgers has enabled farmers to increase production as large areas are cultivated and farm operations are finished in time.
- ii. **Chemical fertilizers:** chemical fertilizers are used to improve soil fertility and maximize productivity of lands.
- iii. **Hybrid seeds and animals:** use of improved seeds and animals leads to increase in productivity.
- iv. **Greenhouses:** have encouraged growth of horticulture crops under controlled artificial climatic conditions.
- v. **Pesticides and fungicides:** have helped to increase production by controlling pests and diseases.

TYPES OF AGRICULTURAL FARMING

There are two types of agricultural farming: subsistence and commercial farming.

Subsistence Farming

This is the production of crops and animals for consumption by the farmer.

Characteristics of Subsistence Farming

- Use of simple tools
- Limited application of fertilizer and pesticides
- It is common in developing countries with low populations
- Produce is for consumption by the farmer

Examples of Subsistence Farming

- Shifting cultivation
- Rotational bush fallow
- Nomadic pastoralism
- Intensive subsistence farming

Commercial Farming

This is the production of crops and animals for sale. It is practiced mostly in sparsely populated areas.

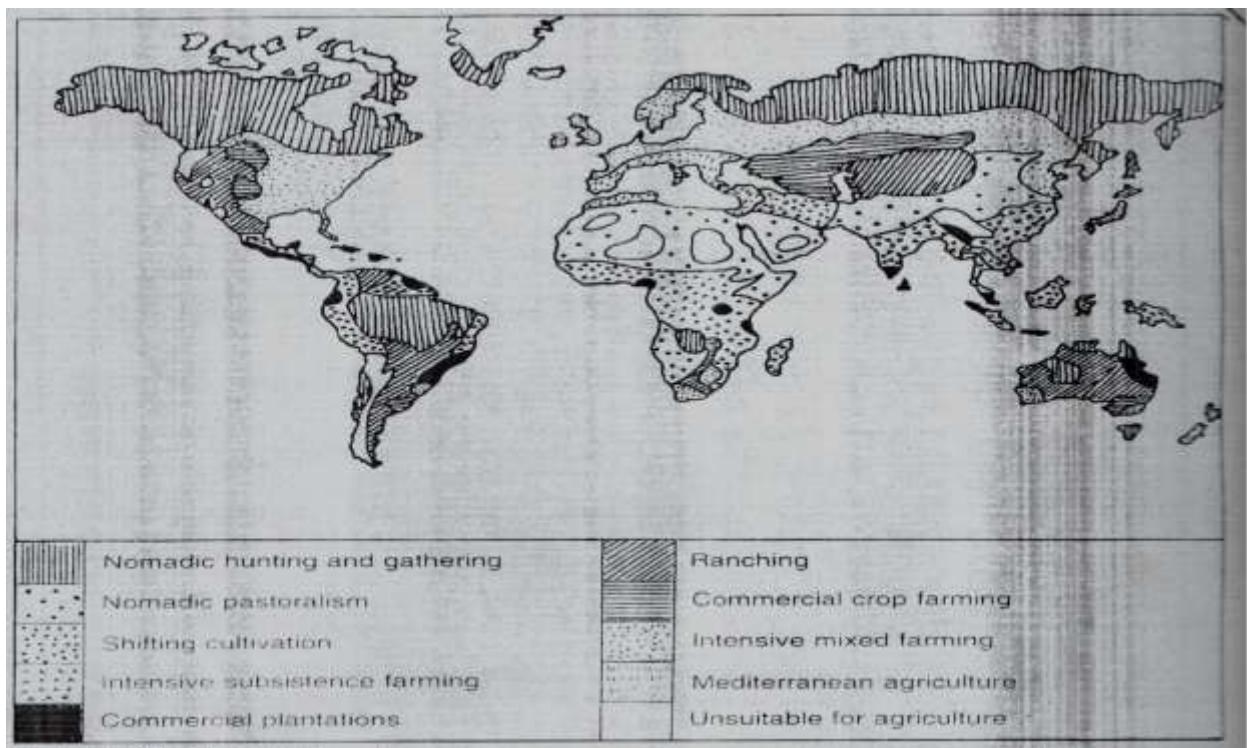
Characteristics of commercial Farming

- Produce is mainly for sale
- Uses skilled labour
- Land holdings are usually large
- Associated with private land

Examples of Commercial Farming

- Plantation farming
- Dairy farming
- Cattle ranching

Map of the World Showing Location of Farming Systems



INTENSIVE FARMING SYSTEM

Intensive farming is a system of farming where the farmer uses much labour, time, care and capital on a small area to obtain high yields.

CHARACTERISTICS OF INTENSIVE FARMING

- Small Farm sizes (holdings):** since intensive farming is practiced in areas with high population densities farms are small.
- High output per unit area:** due to high levels of inputs and systematic management of the farms, there are high yields per unit area.
- Labour intensive:** intensive farming requires a lot of labour
- High use of technology:** improved crop varieties, improved animal breeds, chemicals, irrigation and herbicides are used for high yields.
- Intensive land use:** the land is put to maximum use. The land may not be allowed to fallow (rest) due to scarcity of land due to high populations.
- Double or treble cropping:** since farming is intensive double or treble cropping is practiced.
- High soil maintenance:** Farmers apply a lot of both chemical fertilizers and organic manure.

DAIRY FARMING

Dairy farming is the raising of cattle for liquid milk production. Dairy farming is an example of intensive commercial farming.

MILK PRODUCTS

-butter, cheese, powdered milk, yoghurt, ice cream, condensed /sweetened milk

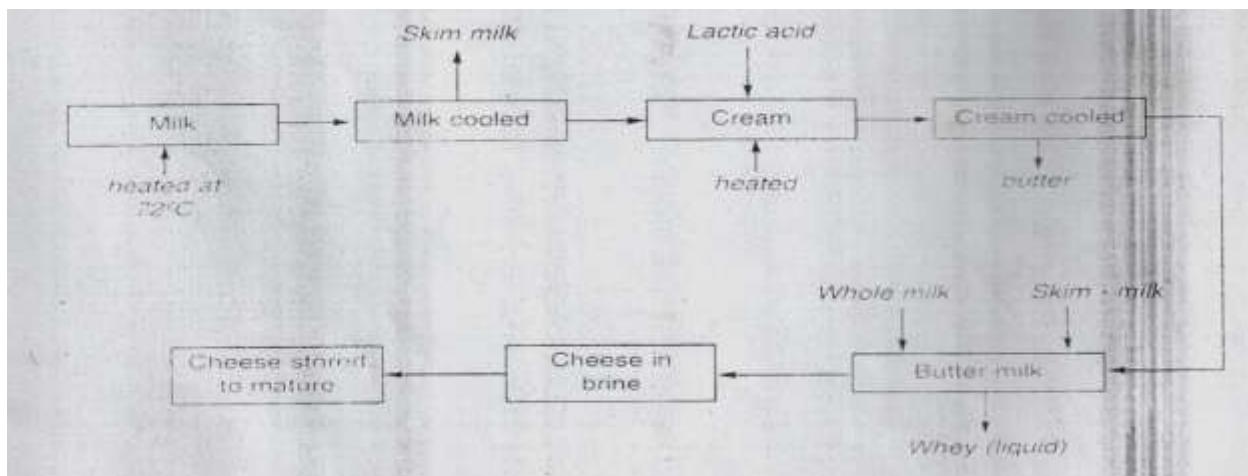
CONDITIONS FAVOURABLE FOR DAIRY FARMING

- a. **Mild and wet climate:** this is suitable for exotic breeds as the climate is cool. There are also rains almost throughout the year which ensures growth of folder crops and natural pasture all year. The climate is also not suitable for tsetse fly breeding which means the animals are safe from tsetse fly attacks.
- b. **Availability of pasture:** grasslands (natural or artificial) where animals graze must be available
- c. **Ready market:** since milk is perishable the availability of market is important. Most dairy farms are located close to urban areas because demand for milk is high and cost of marketing is low in urban areas.
- d. **Transport:** since milk is very perishable, there is need for good transport system so that the milk reaches the market quickly.
- e. **Capital:** a lot of capital is needed to set up and manage a dairy farm. The farmer needs capital for milking machinery, field equipment, building structures and good breeds of cows.
- f. **Land:** flat land is ideal for dairy farming. Land that has been over farmed can be used for dairy farming so that it regains fertility.

For dairy cattle to produce more milk:

- i. they have to be fed a combination of pasture such as hay clover, silage, and a mixture of grains and seed by-products
- ii. each animal should have enough space
- iii. Animals should be kept in a sanitary environment.

PROCESSING MILK (FROM MILK TO CHEESE)

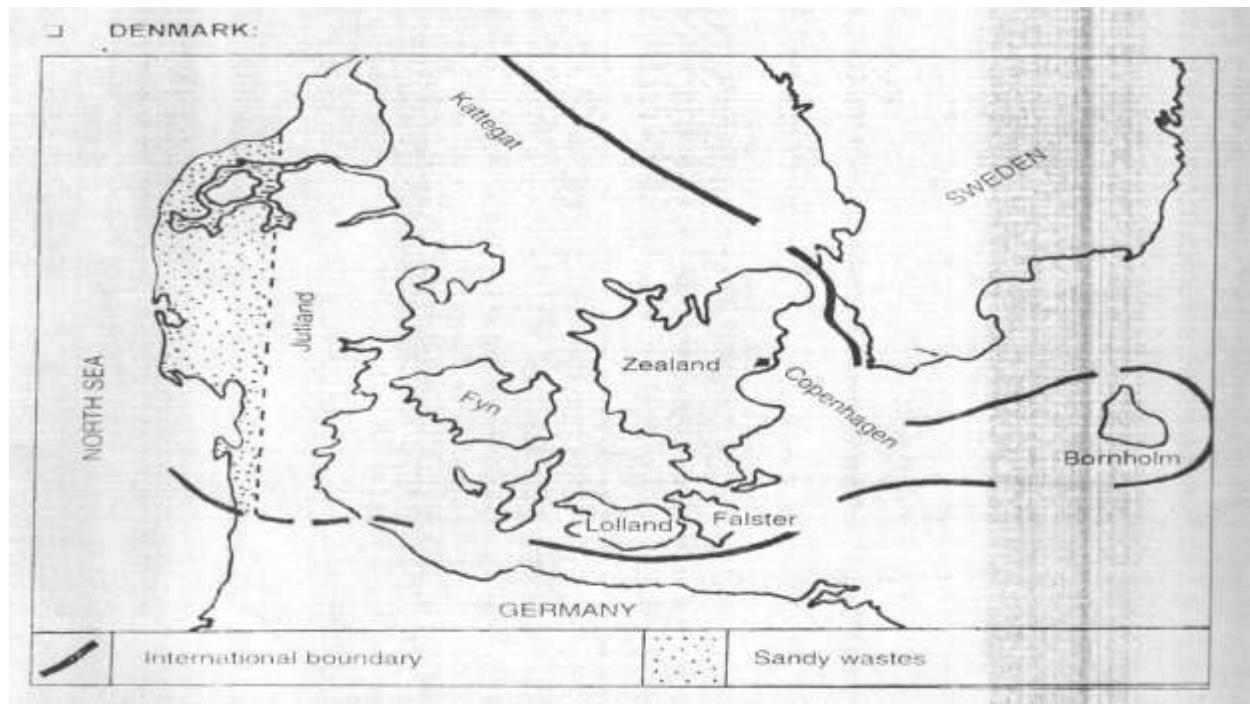


DAIRY BREEDS OF CATTLE

1. **Friesian:** black and white in colour. Produces highest milk yield
2. **Jerseys:** light yellowish to dark brownish or black. Milk is rich in butter fat
3. **Guernsey:** white in colour with some spots or patches
4. **Ayrshire:** white or red in colour

CASE STUDY 1: DAIRY FARMING IN DENMARK

Denmark is a small country in Western Europe. Its economy is mainly based on dairy farming. Denmark is the second exporter of butter and third exporter of cheese in the world.



Denmark is made up of four islands and the main land. The islands are: Zealand, Fyn, Falster and Lolland. The mainland is a peninsula called Jutland.

FACTORS THAT HAVE LED TO THE GROWTH OF DAIRY FARMING IN DENMARK

- a. **Flat Topography:** Denmark is a country that is generally flat with the highest hill 173m above sea level. The flat topography makes it easy to rear dairy cattle.
- b. **Favourable climate:** Denmark receives rains throughout the year and this ensures growth of natural and fodder crops. Temperatures are also moderate with mean annual temperatures of 12°C-15°C. Outdoor grazing is possible in summer, however for most part of the year livestock is kept indoors.
- c. **Soils:** most of Denmark has favourable soils for growing fodder crops. Most of the land on the west of Jutland is bordered by sand dunes and the inland part is marshy and poor. The poor land has been reclaimed and changed into polders. The soils have been improved by adding fertilizers and manure. Dairy cattle are reared on reclaimed land.

- d. **Good management of dairy farms:** farmers efficiently run their farms. Very little land is wasted since land is scarce due to high population density. The good management has led to high productivity.
- e. **Government supervision and support:** the government is interested in promoting dairy farming. It inspects and tests dairy products. Quality products are stamped. There are rules and regulations on dairy production that regulate dairy farming and also help in controlling disease outbreaks.
- f. **Education system:** there are Folk High schools that offer adult education for both men and women. Men are taught agriculture and women are taught home economics. There are also agricultural colleges. The adults undergo training in socio-economic issues relating to dairy farming.
- g. **Presence of cooperatives:** dairy farmers form groups called cooperatives. Membership to the cooperatives is voluntary but farmers cooperate in production, processing and marketing their products.

IMPORTANCE OF COOPERATIVES TO THE DANISH DAIRY INDUSTRY

1. The cooperatives have processing facilities that enable farmers to add value to their products and get profits
2. Cooperatives help in marketing of dairy products. They collect, grade and store farm produce to sell later.
3. Cooperatives buy farm inputs in bulk (large quantities) which means inputs such as fertilizers, animal feeds, farm tools and equipment are bought at wholesale and low prices.
4. Cooperatives also provide loans to members when the need arises
5. The cooperatives provide advice and research. Farmers receive advice on improved methods of farming to increase dairy production. They also conduct research that would help to improve farming as findings of the researches are shared among members.

A TYPICAL DANISH DAIRY FARM

Most Danish Farms are about 50 to 60 hectares. It consists of farm buildings such as farm house, animal sheds, barns, milking parlours, shed for machines and tool shed.

Equipment found on the farm: cream separator, cheese-making machines, churns, refrigerated storage tanks, pasteuriser, tractors, combine harvesters, plough harrow, etc.

Crops grown: barley, wheat, oats, sugar beet and potatoes. Barley, wheat, oats and potatoes are fed to cattle and pigs

Animals kept: cattle and pigs. Poultry may be kept.

Breeds of cattle kept: Danish red, Friesian, Guernsey, Jersey and Alderney.

Animal manure and artificial fertilizer are applied to improve the soils. Grass is grazed or used to make hay or silage. The farmer's milk is collected in refrigerated vehicles, by the cooperative dairy. The farmer is paid according to quality of milk (butterfat content). Skimmed milk from the dairy is sent back to the farmer to feed animals. Pigs are sent to a cooperative bacon factory. Farmers share profits made by a cooperative according to contribution.

IMPORTANCE OF DAIRY FARMING IN DENMARK

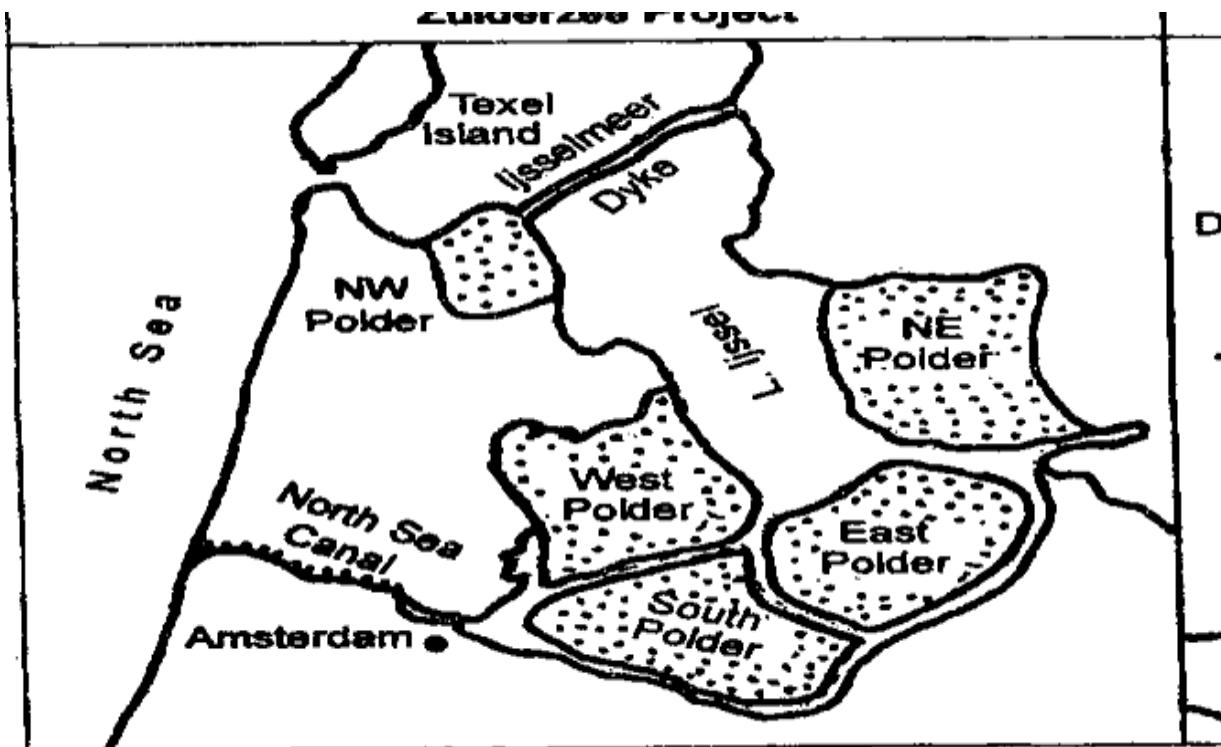
1. It is a source of foreign exchange (forex) earnings. Dairy products are exported and the country gets foreign currency.
2. The dairy industry is a source of employment for many people directly or indirectly. It means the dairy industry is a source of income to many people.
3. Dairy products are a source of food to people. People consume milk in liquid form, powdered form and other milk by-products like butter, cheese, ice cream and yoghurt.
4. Some drugs, plastics and synthetic fibres are made from **casein** a by-product of cheese making.

PROBLEMS OF DAIRY FARMING IN DENMARK

1. **Adverse weather conditions:** during cold winters the animals are restricted to indoor grazing. They have to be fed with supplementary feedstuff which is expensive.
2. **Labour scarcity:** many young, energetic and educated people choose white collar jobs rather than farming.
3. **Insufficient land for farming:** land is becoming scarce due to the rising population. However, more land is being reclaimed in the Jutland Peninsula.

CASE STUDY 2: LAND RECLAMATION AND POLDER AGRICULTURE IN THE NETHERLANDS

The Netherlands is located in Western Europe. It is the most highly populated country in Europe. This means land is not enough. The southern and eastern regions of the country are made of sandy and infertile soils. This has forced the Dutch to reclaim land from the sea.

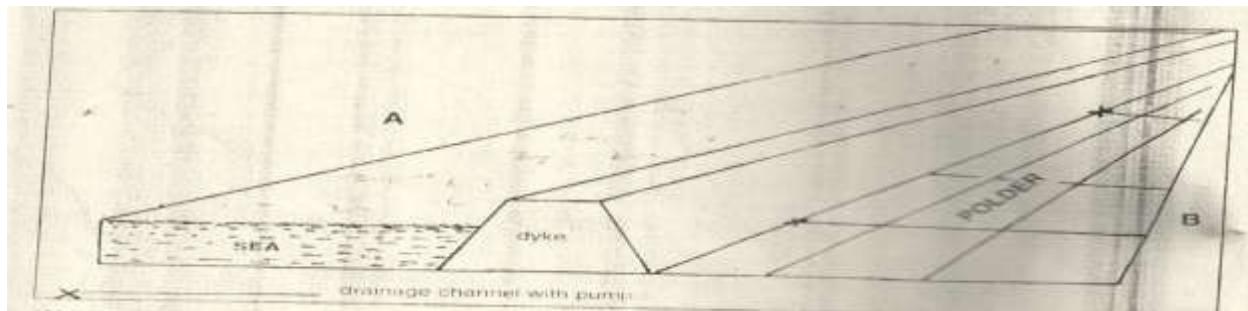


Land reclamation: the process by which the unproductive land, such as a desert, land under sea or marshland is changed to useful land for agricultural and other economic activities.

Polder: This is land that has been claimed from the sea, marsh or low lying areas for agricultural purposes.

Impoldering: the process of reclaiming or draining the land.

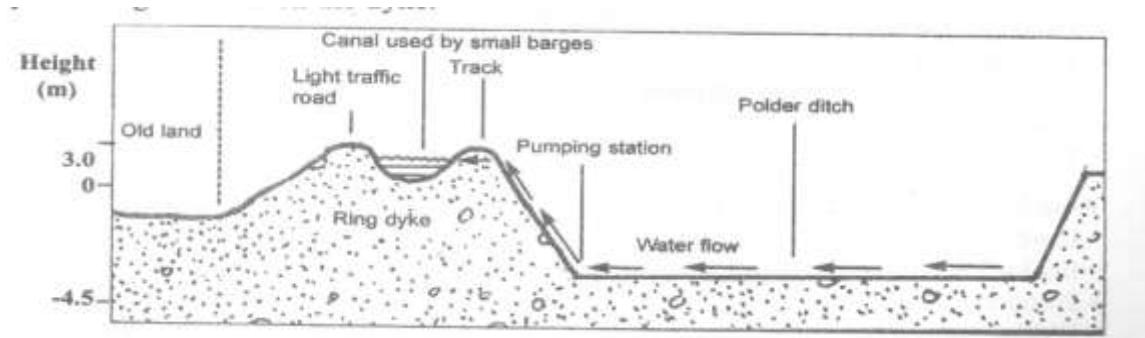
THE LAND RECLAMATION PROCESS



The area to be reclaimed is encircled with a dyke or dam wall often called the ring dyke. This dyke divides the sea.

Water is then pumped from the enclosed side to the open sea. Then drainage ditches are dug within the area to drain the remaining water. The main drainage ditches known as the central channels direct the water to pumping stations.

Cross-section of a polder



After draining the water, the soils are very salty for cultivation. Special grasses (reeds) are planted. The roots of the grass bind the soil together, the dead leaves rot to form humus and rainwater washes out the salts.

THE MAIN RECLAMATION PROJECTS

- **The Zuiderzee:** started as early as 1920 by a marine engineer named C. Lily. The aim was to dam Zuiderzee from north Holland to Friesland and drain five polders
- **Delta:** the group of islands which form the province of Zeeland at the mouths of rivers Waal, Lek and Maas.

LANDSCAPE OF THE POLDERS

- Dykes are common
- The ground is flat
- The polders are below sea level
- The land is geometrically planned to maximise land use.

PROBLEMS OF LAND RECLAMATION

- Salination as land dries out
- Maintaining dykes, pumps, drainage canals and reservoir collectors is very expensive
- High risk of flooding when a dyke breaks
- Land subsidence as it dries out.

ADVANTAGES OF LAND RECLAMATION IN NETHERLANDS

1. Land reclamation has reduced the dangers of flooding due to construction of dykes or sea walls
2. It has created more land for agriculture or farming
3. Land reclamation has improved fresh water supplies such as the creation of fresh water Lake IJsselmeer, in the Zuiderzee Project.
4. Transport has improved as road networks have been built on dykes. Canals also provide water transport.
5. The beautiful scenery presented by dykes, canals and flowers attract tourists.

FARMING TYPES ON THE POLDERS

Dairy Farming: it is concerned with the production of milk which may be sold in liquid form, or made into butter and cheese, or condensed or powdered. The farms are small and are intensively managed.

Arable Farming: crops grown are wheat, rye, oats and barley. On some polders mixed farming is practiced.

Horticulture: vegetables and flowers are also grown (uses mostly glass house cultivation)

FACTORS THAT HAVE CONTRIBUTED TO THE DEVELOPMENT OF THE HORTICULTURE INDUSTRY IN NETHERLANDS

- a. **Availability of the market:** since Netherlands is densely populated it means that there is high demand for horticultural products. The products are sold easily.
- b. **Advanced technology:** the farmers use glass house with artificial heating systems, sprinklers and humidifiers.
- c. **Adequate water supply:** there is abundant water supply needed by vegetables.
- d. **Cooperatives:** farmers have pooled their resources together. This has led to development of horticulture in Netherlands
- e. **Efficient transport:** there is easy access to transport. Air, water, railway and road transport are readily available. It is easy for horticultural produce to reach the market.

IMPORTANCE OF HORTICULTURE TO NETHERLAND

- a. Source of foreign exchange earnings
- b. Source of employment
- c. Vegetable are a source of food

Potential Reclamation Areas in Malawi

- Shallow lakes: Chilwa, Chiuta, Kazuni
- Wetlands: Elephant, Ndindi, Vwaza and Lake Chilwa Marshes

ADVANTAGES OF INTENSIVE FARMING SYSTEM

- a. There is high yield per unit area
- b. Land is put to maximum use as there is systematic management of farms
- c. Since there is heavy application of fertilizers land can be used continuously without losing fertility.

DISADVANTAGES OF INTENSIVE FARMING SYSTEM

- a. It requires a lot of labour
- b. Land holdings are fragmented and scattered making management difficult.
- c. It requires a lot of capital for various farming activities.
- d. Under-utilisation of animals
- e. Small plots discourage commercial farming
- f. Difficult to mechanize since farms are small and is negatively affected by shortage of labour

EXTENSIVE FARMING SYSTEM

It is a system of farming where a large piece of land is used with the aim of raising animals or growing crops for sale. Under extensive farming the farmer uses limited amount of labour and capital on a relatively large area.

Large areas of land are available due to low population densities.

CHARACTERISTICS OF EXTENSIVE FARMING SYSTEM

1. **Large Farms:** the farms are very large in size (about 400 to 1600 hectares)
2. **Mechanization:** the farms are highly mechanized. This means that machinery is used a lot. Machinery is used to cultivate, to sow seed, to apply fertilizer, weed and harvest.
3. **Scattered settlements:** extensive farming is practised in areas with low populations. This is also the reason why farms are very large.
4. **Monoculture:** usually farms grow the one type of crop every year on the same piece of land. The land may be left to fallow but the same crop will be planted when land will be reused.
5. **Low yields per unit area, high yields per farmer:** the system produces low yield per hectare (about three times less than in intensive system). This is because in extensive farming there is no maximum use of labour and capital per unit area as in intensive farming. However, the farmer obtains high yields because of use of machinery and cultivation of large areas.

6. **Export oriented:** this farming system is a commercial activity as the crop grown or animal raised are sold for profit. The production also targets foreign markets.

Crops Grown and Animals raised under Extensive Farming System

Crops: wheat, tea, sugarcane, cocoa

Animals: cattle, sheep, horses

PROBLEMS ASSOCIATED WITH EXTENSIVE FARMING SYSTEM

- High population growth has led to reduction in land for cultivation and ranching
- Price fluctuations can lead to farmers making big losses
- Since one type of crop is grown, it leads to build up of pests and diseases
- Droughts can lead to total crop failure. This can lead to big losses for the farmer
- It generally requires areas with flat land and low populations for mechanization. This means it is difficult to practice extensive farming in highly populated and hilly areas.

EXTENSIVE WHEAT FARMING

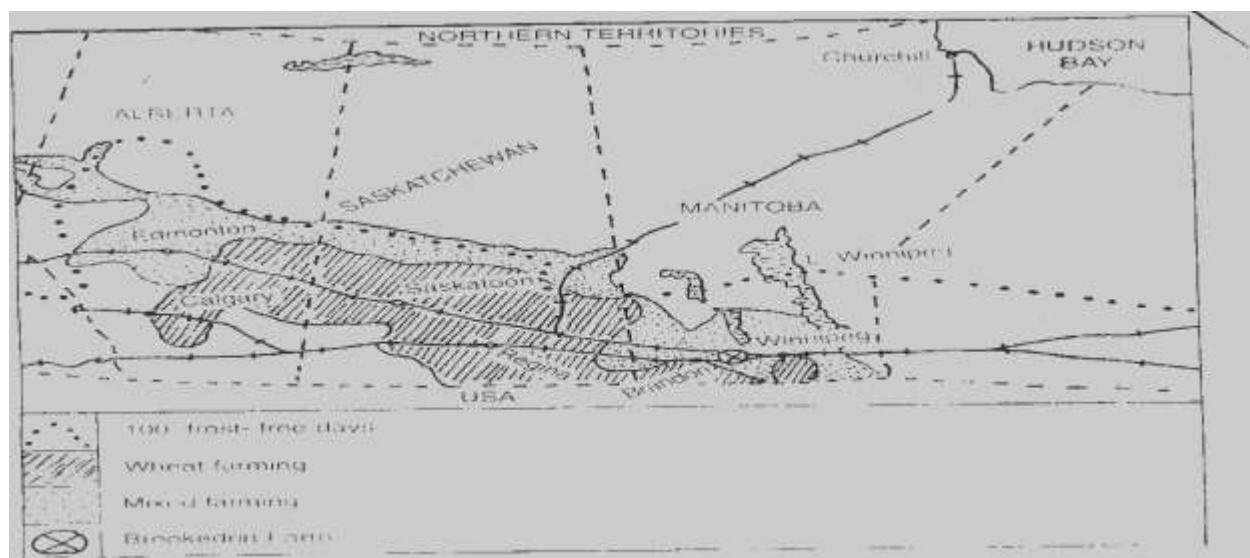
Location of main wheat growing areas: CIS, USA, China, and France

FAVOURABLE CONDITIONS FOR WHEAT GROWING

- Climate: temperatures between 15°C and 21°C are required. Annual rainfall of between 380 and 900 mm is needed.
- Soil: well drained loamy soils which can retain moisture
- Gentle or flat topography: this allows mechanization to be easy
- Growing season: a frost free period of about three months (about 100 to 120 days)

CASE STUDY: 1. EXTENSIVE WHEAT FARMING IN THE PRAIRIES OF CANADA

Prairies: means a large undulating plain covered in tall grasses and scattered trees.



The prairies in North America run from the southern regions of Manitoba, Alberta, and Saskatchewan in Canada and central USA.

Canada is made of several provinces. The provinces associated with extensive wheat farming are Alberta, Saskatchewan and Manitoba.

FAVOURABLE CONDITIONS FOR WHEAT FARMING IN THE CANADIAN PRAIRIES

1. **Flat relief:** the prairies are flat with undulating plains. This has encouraged use of machinery such as cultivators, drillers, combine harvesters, chemical sprayers and ploughs. The flat land has also made it easy to construct railway and road networks to transport harvest to markets.
2. **Fertile Soils:** wheat grows well in fertile light clay or loam soils which are also well drained. The soils in the prairies are rich in nitrogen, potassium and phosphorus which important to growth of wheat.
3. **Availability of cheap and large land:** there is a lot of land due to sparse (low or scattered) population. The land is also cheap. This has facilitated extensive farming and mechanisation.
4. **Suitable climate:** the temperature and rainfall are conducive for wheat growth.
5. **Good transport network:** there is road and railway transport in the prairies. This makes it easy for wheat to be transported from farms to the markets. It also makes it easier for inputs to be transported to the farms.
6. **Availability of local, continental and world markets:** this has ensured the growth of wheat cultivation in the prairies of Canada.

Typical climate in the Prairies

MONTH	J	F	M	A	M	J	J	A	S	O	N	D
Temperature (°C)	-18	-15	-8	3	11	16	20	19	13	6	-5	-13
Rainfall(mm)	26	21	27	30	50	81	69	70	55	36	29	22

IMPORTANCE OF WHEAT TO CANADA

- a. Wheat is a source of foreign exchange earnings (forex)
- b. Wheat is used for brewing whiskey, making spaghetti, glue and other adhesives
- c. Wheat is milled into flour which is raw material for baking bread, cakes, biscuits and ice-cream cone
- d. Wheat bran is used as livestock feed
- e. Wheat straw is used as livestock beddings

PROBLEMS OF WHEAT FARMING

- a. Climatic hazards like frost and droughts
- b. Insects, pests and diseases
- c. Hudson Bay and St. Lawrence freeze which cause transportation problems
- d. Sparse population means it is difficult to get labour to work in wheat farms
- e. Most young men after acquiring education prefer white colour jobs to working in the farms leading to migration to cities.

Contrasting land use on the prairies

MONTH	ACTIVITIES
October	<ul style="list-style-type: none"> • Land is cleared • Land is ploughed • Application of fertilizer
November-March	<ul style="list-style-type: none"> • The fields are covered in snow hence no field activities • Machinery and buildings are maintained and repaired
April-May	<ul style="list-style-type: none"> • Temperatures begin to rise and snow starts to melt • Wheat is sown • The melting snow provides moisture for germination and growth of seedlings
June-July	<ul style="list-style-type: none"> • Pest and disease control by spraying chemicals • Weeding
August	<ul style="list-style-type: none"> • Harvesting wheat
September	<ul style="list-style-type: none"> • Harvesting potatoes

After harvesting wheat is sold locally (about 90%) or exported to countries like Japan, Indonesia, and other European countries.

CASE STUDY 2: CATTLE RANCHING IN ARGENTINA

Ranching is large scale commercial livestock farming.

AREAS WHERE RANCHING IS PRACTISED

1. Argentina
2. Australia
3. North American prairies
4. The steppes of Eurasia
5. Natal and Botswana

CHARACTERISTICS OF RANCHING

- a. **Extensive farms:** ranches are very large with about 14,000 to 100,000 herds of cattle raised
- b. **Specialized farming:** only one type of animal is usually raised
- c. **Dependency on natural pasture:** ranches are usually located in grasslands which have a lot of natural pasture (natural grasses)
- d. **Scientific management:** there is use of improved breeds, use of vaccines, dipping, and use of supplementary feedstuffs.
- e. **It is usually practised in marginal zones:** it is usually practised on land that is not good for crop production or infertile land

Types of ranching

- Open grazing system:** animals are grazed on open land and are watched by herdsmen (cowboys)
- Paddock system:** animals are raised in paddocks. The animals are less guarded.

Location of Argentina



Definition of terms

Ranch: large piece of land where animals are kept

Estancia: cattle farm or ranch

Frigorifico: this is a place where animals are slaughtered; meat is frozen and prepared for sale.

Gauchos: these are herders responsible for estancias

Pampas: extensive temperate grassland where ranches are found

Chacras: these are cattle estates that are smaller than estancias

Saladeros: these are butcheries that process corned and salted beef.

Conditions necessary for ranching in Argentina

- Flat topography:** the pampas is a wide flat plain. This makes ranching easier
- Availability of natural grasslands:** the natural grasslands have supported the growth of ranching in Argentina by providing pasture
- Favourable climate:** it has good temperatures that are always above the freezing point. Rainfall is also well distributed which ensures pasture grows throughout the year.
- Good transport network:** the flat topography of the pampas has made it easy to construct roads and railways. It is easy to transport animals to fattening camps. The railways also lead to ports of Buenos Aires and Bahia Blanca. This has made it easy to reach the market for ranch products.
- Availability of market:** availability of both local and international markets has led to the growth of ranching in Argentina.

- f. **Nearness to sea:** Argentina is bordered by Atlantic Ocean. This makes it easy to export ranching products.
- g. **Sparse population:** low population in the pampas has created enough land for grazing

Activities on the ranch or estancia

JAN-FEB	• Repairing ranch fences
MARCH-MAY	• Cattle dipping
MAY-JUNE	• Sheep dipping and branding
JULY-AUG	• Lambing and lamb marking
SEPT-OCT	• Sheep searing
OCT-DEC	• Making hay and repairing fences

Breeds of cattle kept in the estancias

-Hereford, Shorthorn, Aberdeen, Angus, Brahman

Animal products

-hides (leather), fertilizer, glue (from horns and hoofs), fats

Crops grown

-maize, oats, wheat, vegetables, alfalfa

Meat processing in the frigorifico

Cleaning animals: cattle are washed using a strong spray of water to remove dirt.

Slaughtering: animals are killed using electric saw. Electric saws are also used to cut the carcass into pieces. Meat is chilled in big cold rooms and later sold. Some meat is processed in canning factories for export.

Hides are tanned into leather; bones are used to make handles for knives, fertilizers.

Countries that import meat from Argentina

-Arab states, UK, USA, Israel, France, Canada, Germany

Importance of ranching to Argentina

- a. It is a source of foreign exchange earnings (forex)
- b. Source of employment to many people
- c. Source of raw materials for industries
- d. Source of income to farmers after selling ranching products
- e. Source revenue for government through taxation

Problems of cattle ranching in Argentina

- a. Unreliable rainfall: this forces farmers to keep feedstuffs for use during drought or insufficient rainfall
- b. Cattle diseases: diseases like East Coast Fever, Trypanosomiasis and Foot and Mouth Disease are a problem
- c. Dry called winds called **pamperos** kill cattle in winter
- d. High incidences of parasites such ticks.

Cattle farming in Malawi

-50 % of cattle are found in the central region, 40 % in the northern region and 10% in the southern region as of 2009.

Why southern region has fewer cattle

- a. High population density
- b. A lot of tsetse flies especially in the lower shire
- c. Lack of grazing land as most of the land is under cultivation

Main features of cattle farming in Malawi

- a. Local cattle breeds: the Malawi Zebu and Sanga (Ngoni cattle)
- b. Subsistence use: for milk and meat for family
- c. Family ownership: cattle are usually owned by families. Grazing areas are communally owned
- d. Dependence on natural pasture

Problems of cattle farming in Malawi

- a. Diseases: such as East Coast Fever, foot and mouth and trypanosomiasis are a problem
- b. High human population density: has led to reduction of grazing land
- c. Unreliable pasture especially in the dry season
- d. Cultural influence: most people regard the number of cattle owned as a measure of wealth. They keep a lot of cattle without considering quality.

The dairy industry in Malawi

The dairy industry is very small in Malawi due to a lot of factors.

Sources of milk

- a. Formal sector: smallholder and large scale producers (12%)
- b. Informal sector (50%)
- c. Import sector (38%)

Challenges facing the dairy industry in Malawi

- a. Parasites and diseases
- b. Lack of capital

- c. Transport problem/poor transport infrastructure
- d. High temperatures and unreliable rainfall which are not suitable for improved breeds

Measures taken to improve dairy industry

- a. Provision of processing facilities in cities of Mzuzu, Blantyre and Lilongwe has helped in processing milk for sale
- b. Introduction of artificial insemination: the Zebu is artificially crossed with Friesian. The zebu is adapted to local conditions while Friesian has high milk production.
- c. Availability of extension services that equip farmers with information on dairy farming
- d. Establishment of smallholder dairy schemes: smallholder farmers form groups and have milk collecting centres where milk is collected for processing.

Comparison between beef industry in Malawi and cattle ranching in Argentina

ARGENTINA	MALAWI
1. Hybrids which produce high quality meat are kept	Local breeds which produce low meat and milk are kept
2. Animals are raised on large estates called estancias	Animals are raised on customary or communal land not ranches
3. Animals are scientifically managed	Lack of scientific management in most cases
4. Good quality pastures available such as alfalfa and fodder crops	Poor quality pastures leading to low output
5. Animals are raised only for commercial purposes	Animals are raised for both commercial and subsistence purposes

PLANTATION AGRICULTURE

Plantation agriculture is the specialized cultivation of perennial crops on a large area of land. It is usually done on an estate.

Plantation crops and their distribution

crop	Where grown
bananas	West Africa, Latin America
cocoa	Brazil, Nigeria, Ivory Coast, Ghana and Gabon
coconut	Malaysia, India, Indonesia and Philippines,
coffee	El Salvador, Angola, Brazil, Uganda,
rubber	Liberia, Sri Lanka, Indonesia, Malaysia
sisal	Uganda, Tanzania, Madagascar, Kenya
sugarcane	All tropical regions

Characteristics of Plantation Agriculture

- a. **Extensive farms:** plantations cover very large areas of land
- b. **Monocropping:** only one type of crop is grown on a plantation
- c. **It requires a lot of capital** for labour, constructions, inputs, etc.

- d. **On-site processing facilities:** plantation products are perishable in their unprocessed form. They require processing before they leave the plantation. This is done to avoid losses for the farmer.
- e. **Scientific management:** use of fertilizers, machines, pesticides, characterizes plantation agriculture. This helps to produce crops of best standards.
- f. **Skilled and unskilled labour:** for efficient management and high output plantations have skilled labour (technical and managerial) and unskilled labour from planting to harvesting.
- g. **Foreign ownership:** most plantations are foreign owned especially in Africa. For example the Brooke and Bond Tea Company owns some tea plantations in Malawi and Kenya.

Advantages of plantation Agriculture

- a. **Good quality crops are produced:** this is due to huge capital investment and technical know-how employed in plantation management.
- b. **Soil protection:** tree crops shade the soil thus conserving water and soil
- c. **Regular supply of produce:** once planted the tree crops take a long time before they become useless or unproductive.
- d. **Wastage control:** there is no wastage since waste products of processing are used as fuel, fertilizer or animal feed.
- e. **Source of forex:** since plantation agriculture is export oriented, it brings foreign exchange to the exporting country.
- f. Provides raw materials to industries
- g. Provides employment to a lot of people
- h. **Source of revenue for government:** government gets revenue from tax on workers' salaries, export duty on commodities and rentals on leased land.

Disadvantages of plantation Agriculture

- a. **Price fluctuation:** since the farmer depends on one crop changes in prices can lead to huge losses
- b. **Pests and diseases:** since it is monocultural, build up of pests and diseases is easy. Attacks by diseases and pests can lead to big losses.
- c. **It takes a long time to realize profits:** most plantation crops take long to mature. For example, cocoa takes 5-8 years and tea takes 3-4 years to start producing.
- d. **Soil deterioration:** due to heavy rainfall, there is excessive loss of soil fertility through leaching. This forces farmers to apply a lot of fertilizers to maintain soil fertility.
- e. **Requires a lot of labour:** it is difficult to grow plantation crops where there is shortage of labour
- f. **Climatic hazards:** the unpredictable weather condition can damage the plantation crops. Such climatic hazards include drought, winds, excessive rainfall and ice.
- g. **Foreign ownership:** usually plantations are foreign owned. This may create bad feelings among locals as it may seem that foreigners benefit more from plantations.

CASE STUDY 1: TEA PLANTATION IN MALAWI

Tea growing areas in Malawi are Mulanje, Thyolo and Nkhata Bay.

Map of Malawi showing tea growing areas



CONDITIONS NECESSARY FOR GROWTH OF TEA

- High rainfall:** the rainfall should be between 1200mm to 2400mm per annum to provide enough moisture for tea bushes.
- Cool or warm temperatures:** requires temperatures ranging from 21°C to 30°C.
- Suitable soils:** tea requires well drained loam soils. Soils should also be slightly acidic.
- Shade:** big trees are left standing throughout the estate to provide shade and protect the shrubs from strong winds.
- Large labour force:** tea cultivation and processing requires a lot of labour.
- High humidity:** high humidity produces morning mist or dew which enables young tea leaves to grow quickly

Importance of shade trees in the tea estate

- They conserve moisture for growing tea bushes by covering soil which reduces water loss through evaporation.
- Fallen leaves rot and add humus to the soil
- They provide shade to pickers for rest during harvesting
- Act as wind breaks to avoid damage to the estate.

Planting tea

There are two methods of planting:

- Direct method:** seeds are in the wet sand and are later transplanted into nurseries. After a year, the seedlings are transplanted into the main fields and planted in rows.
- Using cuttings:** tea is grown from tea cuttings called clones

Agricultural cycle on the estates

April -June	Old tea bushes are pruned to 1.2 m high
July-August	Topping or cutting the tips of growing tea bushes to level them off

September-October	Application of nitrate fertilizers
November-March	The main harvesting season

Why pruning and topping are done

- To encourage rapid production of fresh leaves
- To create a flat plucking surface

Harvesting Tea

Harvesting tea begins when the tea bushes are 3 years old. Tea is picked from November to March. A lot of labour is required. The young leaves at the tips are first to be picked because they have tannic acid concentration that gives the tea its flavor.

Tea processing

Black tea

- i. **Withering:** tea leaves are put in troughs in which hot air is blown. This done to reduce moisture content by half and to make the leaf soft for rolling.
- ii. **Rolling:** the withered leaves are directed to steel rollers which break the leaves into smaller pieces.
- iii. **Sifting:** smaller pieces are sifted and old leaves and mid ribs are removed.
- iv. **Fermentation:** tea is spread on aluminum trays with high humidity and temperature of about 24°C . The green tea starts to get its dark colour and smell. Fermentation is done to reduce tannic acid content.
- v. **Firing:** the tea is then passed through a hot oven or firing machine to dry it. The tea completely turns black.
- vi. **Sorting and grading:** the tea is passed into various machines where it is sorted through different grading holes. The tea is packed according to its grade.
- vii. **Blending:** blending is the mixing of different grades of tea to improve quality of lower grades.

Processing green tea

The processing of green tea is the same as black tea only that there is no fermentation

SMALLHOLDER TEA FARMING

Tea is also grown on small scale by smallholders in Mulanje and Thyolo.

THE SMALLHOLDER TEA AUTHORITY

It was started in 1967. There are over 4000 smallholders. The smallholder tea authority does the following:

- i. Manages smallholder tea growers
- ii. Collects tea produced by farmers in readiness for processing

Successes of Smallholder Tea Authority

- a. The smallholder tea farming has contributed to the formation of Malawi Tea Company (MATECO)
- b. It led to the opening of tea processing factory on the outskirts of Mulanje Boma in 1975
- c. Incentives given to farmers in terms of bonuses before 1990 led to economic progress

Failures of Smallholder Tea Authority

- a. Smallholder farmers are not paid a lot of money and are not paid in time. This discourages farmers. There is need to pay them handsomely so as to encourage them.
- b. Bonuses are no longer given to farmers. This discourages farmers. Resuming bonuses may encourage more smallholder farmers to grow tea.
- c. A lot of tea is sold to the tea estates instead of the Smallholder Tea Authority.
- d. Some farmers have stopped growing tea altogether. They use their plots to grow other crops

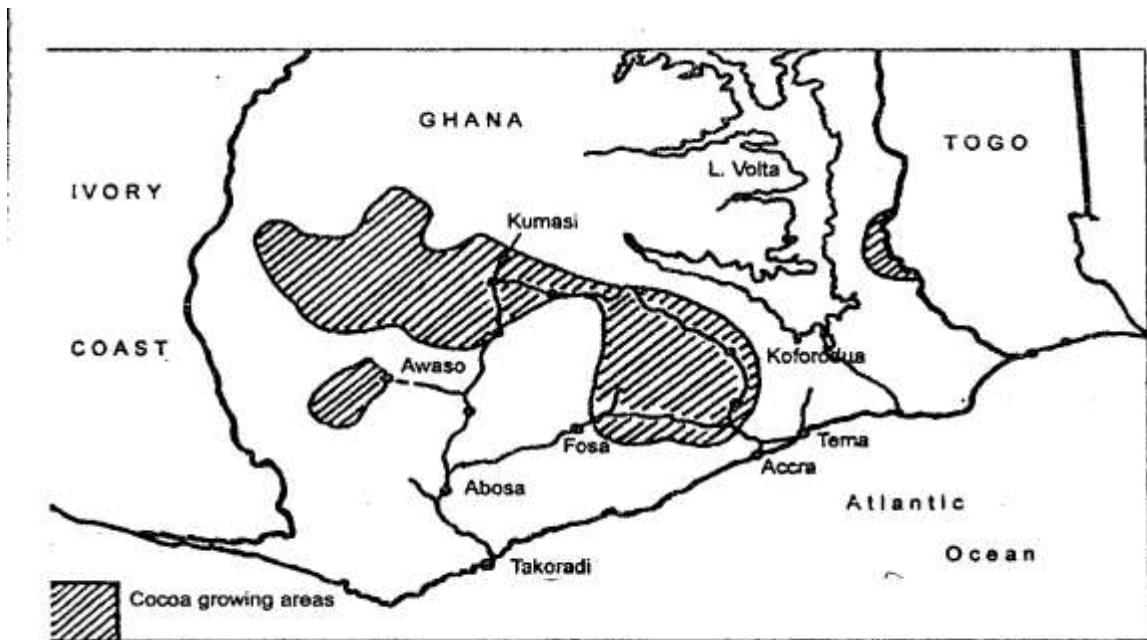
IMPORTANCE OF TEA INDUSTRY TO MALAWI ECONOMY

- a. Source of foreign exchange: tea is third export cash crop after tobacco and sugar.
- b. Source of employment: the tea industry employs over 34,000 people in Malawi
- c. Source of income to farmers: farmers get money after selling their tea.
- d. Source of government revenue: government gets revenue through taxation of workers' salaries and export duties

Challenges facing the Tea industry

- a. **Price fluctuations:** prices for tea change a lot. High prices lead to high profits. Low tea prices mean growers make losses.
- b. **Labour shortage:** sometimes there is labour shortage. For shortage of labour during plucking period and this may lead to wastage as some leaves may not be plucked.
- c. **Poor quality and aged:** some bushes were planted 30-70 years ago using poor quality materials. The bushes produce poor quality yields and low profits.
- d. **Infertile rocky soils:** some gardens are located in rocky infertile poorly drained soils which lower the yields.
- e. **Diseases and pests:** diseases like armillaria and pests affect tea production. They also increase cost of production.
- f. **Competition:** tea competes with other beverages like coffee and cocoa. This may affect demand for tea.

CASE STUDY 2: COCOA PRODUCTION IN GHANA



Cocoa is an evergreen tree that grows between 5-10 metres. Although it starts flowering in its third year after planting full production starts after 5-8 years. Productivity of the may go up to thirty years. Cocoa is extracted from seeds (beans) contained in a pod. The pods range from 20 cm to 25 cm.

Ghana is divided into three major regions

- i. Coastal plains in the south
- ii. Ashanti Plateau in the middle
- iii. Volta basin in the north

Major growing areas in Ghana

-Accra, Kumasi and Takoradi which form what is known as the **Cocoa Triangle**

Favourable conditions for Cocoa Growing

- a. **High temperatures:** requires temperatures ranging from 23°C to 28°C which must not fall below 20°C.
- b. **High rainfall:** annual rainfall between 2000mm to 3500mm without long drought
- c. **Soils:** soils that are deep, well-drained and rich in potash (potassium) are suitable for cocoa growing.
- d. **Absence of strong winds:** strong winds can blow cocoa pods from cocoa trees. Areas experiencing strong winds are not suitable for cocoa production.
- e. **High humidity:** cocoa requires high relative humidity. However, too high humid conditions encourage growth of fungal diseases such as black pod.
- f. **Tropical lowlands:** low lands and plains are favourable for cocoa growing since temperatures are not affected by attitude.

- g. **Shade:** young seedlings need shade to protect them from direct sunlight. Trees are provided to offer shade, the disadvantages of this are:
 - i. Trees may compete with cocoa for moisture and minerals
 - ii. Trees may encourage insects and diseases which are harmful to cocoa
 - iii. The shade provided is not even

Map of Ghana

Cycle of activities on a Cocoa Farm

- i. **Land preparation:** land is cleared, some trees are cut and there stumps are removed. Tall plants are left in the field for shade to cocoa plants. This is done from December to January.
- ii. **Planting:** this is done in March to April. There are two method of sowing cocoa. The first is **direct sowing:** cocoa plants are grown from seeds sown in nursery and later transplanted. The second is **using cuttings:** cocoa is planted using cuttings from cocoa plants.
- iii. **Transplanting :** is done in march because rainfall is adequate for growth of cocoa
- iv. **Harvesting:** a cocoa plant starts production after 8 years. It can produce up to 30 years if managed properly. When ripe cocoa pods become yellow-orange in colour. They are harvested using cutlass or panga knives. The harvesting is done twice from October to February and from May to August.

Processing Cocoa

- i. **Splitting:** the pods are split open and cocoa beans removed from the pods.
- ii. **Fermentation:** the beans are piled on a mat of banana leaves then covered with banana leaves for 5-7 days. The heat ferments the beans. Fermentation is done to:
 - a) Remove the juicy pulp
 - b) Give the beans chocolate flavor
 - c) To remove the bitter taste from the beans
- iii. **Drying:** the beans are washed, cleaned and placed on tables and covered by mats to dry in the sun. Dry beans look brown.
- iv. **Packaging and marketing:** dry beans are put in sacks and carried to Cocoa Farmers Union which buys the crop. It is taken by train to ports of Tema and Takoradi where it is exported to Britain, Germany, USA, Switzerland and other European countries.
- v. **Roasting and grinding:** cocoa is roasted and ground in factories. Fat (cocoa butter) is separated from paste. The remaining paste is dried and ground into powder.

Uses of Cocoa

- i. Cocoa powder is used for making chocolate and cocoa drink
- ii. Used to manufacture confectionary blended with sugar, milk and flavouring ingredients
- iii. Cocoa butter is used to manufacture cosmetics and drugs.

In 1947 the Ghanaian government set up the Ghana Cocoa Board (COCOBOD) as the government agency for developing the industry.

Mission of the Board

To encourage, production, processing and marketing of good quality cocoa, coffee and sheanuts in all farms in the most effective manner and maintain the best mutual industrial relations with its objectives.

Objectives of the Board

- i. To encourage production of cocoa, coffee and sheanut.
- ii. To initiate programmes aimed at controlling pests, diseases of cocoa, coffee and sheanuts.
- iii. To undertake and encourage processing cocoa, coffee and sheanuts and cocoa waste with the aim of adding value for export and local consumption.
- iv. To undertake, promote and encourage scientific research aimed at improving the quality and yield of cocoa, coffee and sheanut
- v. Regulating marketing of cocoa
- vi. Secure the most favourable arrangement for purchasing, grading, sealing, and certification, sale and export of cocoa, coffee and sheanut.

Importance of Cocoa industry to Ghanaian Economy

- a. Source of foreign exchange after exporting cocoa
- b. Source of employment: a lot of people are employed in the industry
- c. Source of income to farmers: farmers get money after selling the crop
- d. Source of government revenue through taxation
- e. Cocoa is raw material in industries such as chocolate making

Problems affecting the Cocoa industry

- a. **Price fluctuations:** this discourages farmers to produce more due to fear of losses
- b. **Diseases and pests:** **swollen shoot** and **black pod** are diseases that attack the cocoa plant. Swollen shoot is caused by virus and spread by mealy bugs. Black pod is caused by fungus. Caspid is the commonest pest that destroys pods. Diseases and pests lead to losses on cocoa farms.
- c. **Soil exhaustion:** due to continuous the soil loses fertility. This problem is solved by applying fertilizer and manure.
- d. **Lack of labour:** most young men are not interested in cocoa farming especially after getting educated. They migrate to town leaving only aged people to grow cocoa. This leads to shortage of labour in cocoa farms.
- e. **Land scarcity:** increase in population has decreased the land where cocoa can be grown.
- f. **Strong winds:** the Harmattan winds from Sahara desert blows off unripe pods
- g. **Ageing trees:** most the trees were planted long time ago and their productivity is poor.
- h. **Poor roads:** there are poor roads in most areas where cocoa is grown. These roads become impassable when a lot of rains fall. This means farmers fail to transport cocoa to the market.
- i. **Lack of credit and mechanisation:** farmers find it difficult to find credit and no machines are used.

IRRIGATION FARMING

Irrigation is the artificial supply of water to an area to meet moisture requirements for crop or plant growth.

- a. **Egypt and Sudan:** irrigation is practised along the Nile River. Aswan Dam, barrages such as Isna, Asyut, and Delta are used to hold water for irrigation in Egypt. Crops grown in Egypt under are cotton, rice, maize, wheat, beans and sugarcane.
In **Sudan:** the main irrigation scheme is the Gezira Irrigation Scheme located on the western side of the Blue Nile. The source of water is the Sennar Dam and main crop grown is cotton.
- b. Israel
- c. **India, Bangladesh, and Pakistani:** along the Ganges, Brahmaputra, and Indus river valleys.
- d. **Iraq:** along the Tigris and Euphrates valleys
- e. **USA:** in central valleys of California along Sacramento and San Joaquin rivers. Other irrigation schemes are Utah, Arizona and Colorado along the Columbia and Colorado rivers. Irrigation is also practised in the Tennessee, Missouri and Mississippi river valleys.
- f. **China:** irrigation is practised along Hwang-Ho and Yangtze-Kiang river valleys
- g. **Australia:** irrigation is done along the Murray River Basin.

Conditions for Irrigation Farming

- a. **Abundant and regular water supply:** irrigation requires a reliable source of water and the source should have a lot of water. Without water crops wilt and die.
- b. **Gently sloping land:** this allows free flowing of irrigation water by gravity. There is little need for pumping facilities to lift water into the main fields.
- c. **Soils with high water holding capacity:** soils like clay are able hold or retain water for plants. Sandy soils fail to hold water due their large air spaces. This encourages leaching of nutrients. Therefore, sandy soils are not good for irrigation.
- d. **Drought or dry climate:** where there is little or no rainfall, there is need to practice irrigation to enable crops to grow.
- e. **Land scarcity and population growth:** scarce land has to be used intensively under irrigation to produce more and support the growing population.

Advantages of Irrigation

- a. Enables cultivation of crops in arid (dry) and semi-arid regions
- b. Irrigation provides employment to people as people are employed to dig channels, install pipes, maintenance of irrigation structures, etc.
- c. Double cropping or treble/triple cropping allows the farmer to harvest twice or more a year.
- d. Irrigation may lead to surplus yield that may be exported
- e. Under irrigation there is a regular supply of water to crops unlike rainfall which is unreliable.

Problems of irrigation

- a. It requires a lot of capital to set up irrigation structures, therefore it is expensive
- b. There is high risk of spreading of water-borne diseases such as bilharzias under irrigation
- c. Sedimentation or siltation of water sources such as dams due to soil erosion
- d. It may lead to accumulation of salts in the soil (Salination). This is caused by applying water with too much salt, heavy application of fertilizers and evaporation.
- e. Loss of soil fertility due to continuous land use and leaching

CASE STUDY 1: IRRIGATION IN ISRAEL

Israel is located in the Middle East. It is located on the eastern shores of the Mediterranean Sea.

Relief, soils and climate of Israel

Soil

Israel has both fertile and infertile soils. Fertile soils are found along the Mediterranean coastal plains due to alluvial soils from the upper parts. The Hilly country to the north-east and east is infertile due to soil erosion. The Negev Desert has poor sandy soils that are infertile due to leaching.

Relief

The western region, the Negev Desert and Jordan River valley are flat. The central part (around the Judea Hill) is at high altitude.

Climate

The climate of Israel is hot and dry because of the Negev Desert that makes up to 65 % of Israel. There is high evaporation rates especially in the Negev Desert and sometimes the vapour fail to condense due to high temperatures. Little or no rain falls in the Negev Desert. The northern and western parts receive good amount of rainfall which is largely orographic influenced by winds from the Mediterranean Sea.

How relief, soil, climate, and Salinity discourage irrigation farming in Israel

Soils

The production of food and cash crops has been negatively affected in the Hill country due to erosion. In the Negev desert there are poor sandy soils that are infertile due to leaching. Sandy soils discourage irrigation because they fail to retain or hold water for crops.

Solutions to soil challenges

- i. Application of fertilizers and manure to improve soil fertility
- ii. Afforestation and reforestation to reduce run off and prevent soil erosion.

Salinity

Salinity is the accumulation of salts in the soil. Evaporation leaves salts on the surface, the water from Dead Sea contains a lot of salts and irrigation water raises the water table which brings dissolved salts near the surface. Most crops fail to grow and die in saline soils (saline soils are toxic to most plants).

Solution to salinity

- i. Desalination: desalination is the removal of salts from water. Salts are removed before irrigating crops
- ii. Application of lime to neutralize the salts
- iii. Continuous draining the soil which removes salts from the soil

Relief

The Hill country is at a high altitude which encourages orographic rainfall and erosion leading to loss of soil fertility. The high altitude does not enable irrigation to take place easily.

Solution

- i. Pumping water to reach the high altitudes for irrigation
- ii. Planting vegetative cover to reduce soil erosion

Climate

High temperatures cause a lot of evaporation leading to loss of water for irrigation. Some areas receive little or no rainfall.

-the Israeli National Water Carrier carries water with pipes, tunnels and conduits was designed to carry water from the sea of Galilee in the north to drier regions of the centre and south.

Solutions to climate

- i. Using greenhouse technology which uses artificial temperature measures
- ii. Using of pipes and tunnels reduces loss of water due to evaporation
- iii. Using irrigation ensure maximum use of water such as buried drip irrigation.

Sources of water

- i. sea of Galilee or Lake Kinneret
- ii. The Yarkon River
- iii. The Jordan River
- iv. The Dead Sea

Distribution of Water and Irrigation methods

The National Water Carrier was built to transport water from the wetter north to the arid or dry south. Water is pumped from Lake Kinneret through a canal, then through a tunnel and lifted to a point in the Galilee hills. From there it is carried by the Negev Conduit and distributed by several pipelines into the Negev region. Pumping stations and reservoirs are installed at various points to control the flow of water. Water is further harvested and conserved by construction of dams on small rivers where it is trapped during the rainy season. Wells and boreholes are also used.

Methods of Irrigation

The methods of irrigation are designed to make maximum use of water:

- i. **Drip irrigation:** type of irrigation which uses pipes with specially made small holes through which water drip out. Crops are planted at the holes so that water drips directly onto plant roots. Filter traps are installed at the holes to prevent blockage.

- ii. **Buried irrigation:** the form of drip irrigation where lateral pipes are buried at a depth of 50cm. water drips out providing moisture to the plants. Drippers are inserted and dirt is prevented by air valves that open when water is turned off.
- iii. **Spray irrigation:** each plant is irrigated by its own sprayer. This type of irrigation is applied in orchards and green houses.
- iv. **Sprinkler irrigation:** the irrigation uses sprinkles designed for crops that require irrigation of the whole field.

Crops grown under irrigation

-wheat, legumes, sunflower, corn, water melon, barley, citrus fruits, olives and cotton

The desalination process

Desalination is the removal of salts from water. There are two ways in which desalination is done:

- i. **Freezing method:** water is frozen inside a freezing chamber. Ice mixed with water forms and is separated. Ice crystals are finally washed to remove brine (salty water). The washed ice are put in a container and heated so that they melt into fresh water which is used for irrigation. The problem is that a lot of salts remain in the water.
- ii. **Distillation method:** large quantities of water are heated in big tanks. The water evaporates and is led to another tank where vapour condenses into liquid water. Salt remains in the first tank. The water can be used for irrigation.

Disadvantages of Desalination

- i. Desalination removes all salts even those needed by the plant.
- ii. It is expensive to set up desalination plants.

CASE STUDY 2: NCHALO SUGAR IRRIGATION SCHEME

Nchalo is located in Chikwawa district.

FACTORS THAT FAVOUR SUGAR PLANTATION AT NCHALO

Relief: the area is gentle or flat which enables irrigation and mechanisation to take place easily.

Soils: the soils are well-drained alluvial clay soils which are suitable for sugarcane growing.

Climate: high temperatures that range from 21°C to 23°C helps the canes to grow fast. The area receives low rainfall and has high evaporation rates which makes irrigation important.

Labour supply: there is abundant supply of cheap labour from the densely populated southern region.

Water resources: there is abundant supply of water for irrigation by the Shire River.

METHODS OF IRRIGATION ON NCHALO IRRIGATION SCHEME

Sprinkler method: specially designed sprinkles are used to supply water to the entire field.

Canal method: irrigation channels are dug to direct water from the Shire River to the fields.

HARVESTING SUGARCANE

Workers use panga knives to cut off the canes a few metres above the ground.

Fire is set before harvesting to:

- i. Scare away wild animals such as snakes and rodents
- ii. Increase sugar concentration in the canes

USES OF SUGAR

- i. Sugar is used to sweeten beverages such as coffee and tea
- ii. Used in ice-cream, bread and cake making
- iii. Bagasse is used as fuel or fodder or to make paper

PROBLEMS OF NCHALO IRRIGATION SCHEME

Vandalism: people steal irrigation equipment such as irrigation pipes. **Solution to vandalism:** tightening security at the scheme and civic educating communities.

High cost of investment and production: production of canes is very expensive. **Solution:** growing canes of high quality so as to make a lot of profit.

Poor waste disposal: most of the waste is disposed into the Shire River resulting in pollution of water. **Solution:** proper disposal of wastes and recycling.

High degrees of salinity: salts accumulate in the soil. **Solution:** apply lime to neutralize salts, and flooding the fields with fresh water.

Pests and diseases: pests and diseases reduce cane yield. **Solution:** efficient pest and disease control measures

Inadequate drainage: in some parts of the estate. **Solution:** constructing more drainage canals

Insufficient irrigation: in some parts of the estate. **Solution:** constructing more irrigation channels

IMPORTANCE OF NCHALO SCHEME TO MALAWI

Source of employment: People are employed in the sugar industry both at the scheme and sugar processing factories

Source forex: sugar is exported and the country gets foreign currency

Source of government revenue: government collects duties on sugar exported

Source of food: sugar produced from sugarcanes is used for consumption by people.

TOPIC TWO: NATURAL RESOURCES

Natural resources are things provided by nature. We derive the energy we use to do various activities from natural resources.

ENERGY

Energy is the power needed to do various activities and to drive machines.

Sources of Energy

There are two main sources of energy, namely

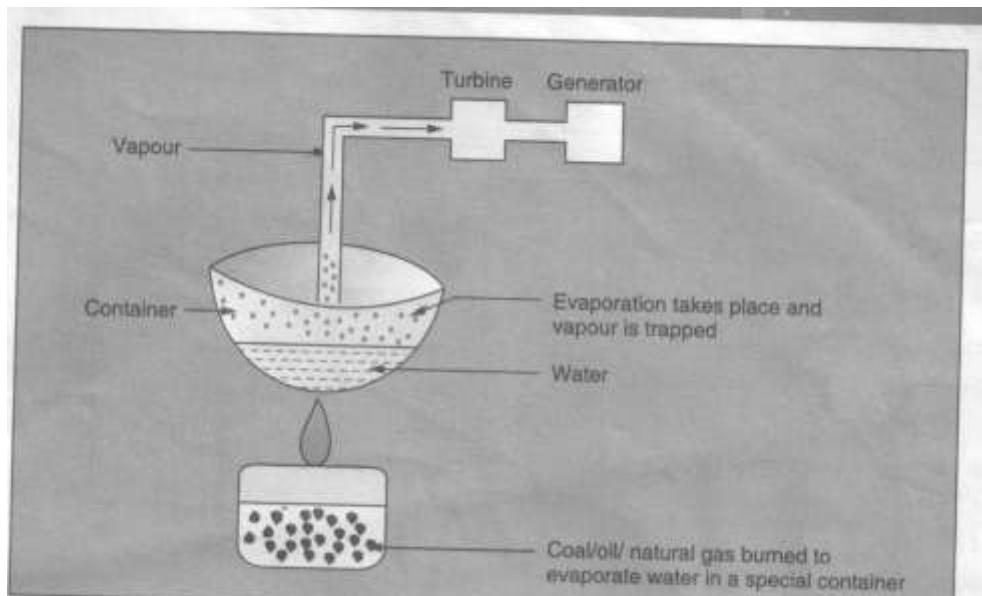
- i. **Non-renewable sources**-energy sources that cannot be replaced nor recycled once used e.g. coal, petroleum, natural gas and uranium.
- ii. **Renewable sources**-energy sources that can be replaced or recycled once used e.g. wind, water, and solar

Types of Energy

1. THERMAL ENERGY

This is energy produced by burning of fossil fuels e.g. coal

How thermal energy is produced



Using heat from burning coal, oil or natural gas water is heated to produce high pressure steam which drives turbines which in turn drive a generator to produce electricity.

Advantages of Thermal Energy

- a. Oil and gas are more efficient to burn and easier to transport and distribute
- b. It is safer than nuclear energy

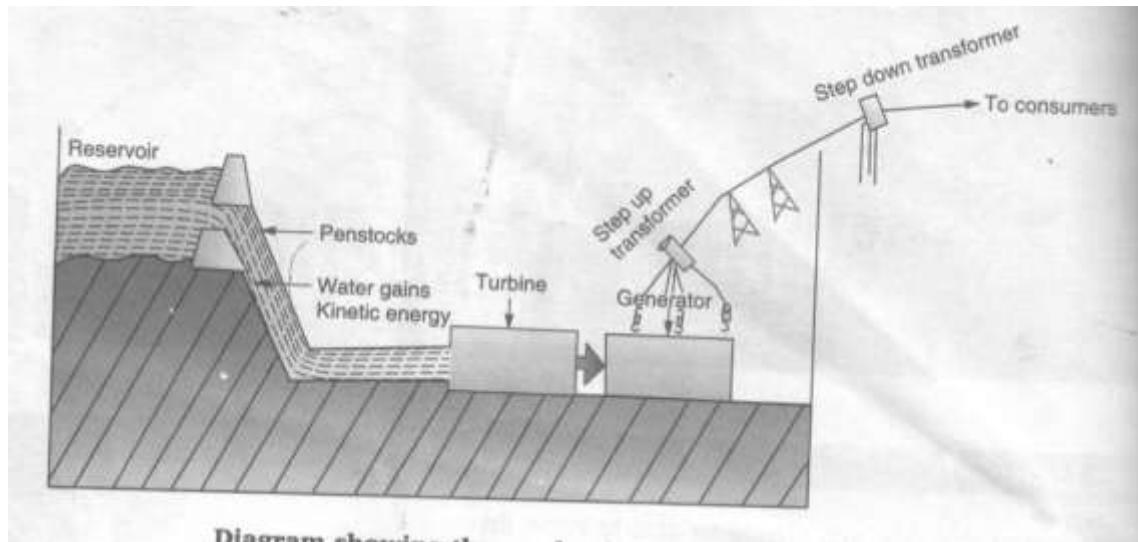
Disadvantages of Thermal Energy

- a. The burning of fossil fuels causes air pollution leading to global warming
- b. Destruction of the environment in deep mining of coal
- c. It is expensive
- d. Fossil fuels are non-renewable-they can be depleted

2. HYDRO-ELECTRIC POWER

This is the energy tapped from fast flowing water

How it is produced



Fast flowing water must fall from a good height (waterfall). The water is directed to the turbines through penstocks (pipes). The water hits the blades of the turbines and makes it to rotate at high speed. The turbines are connected to generators. The rotating turbines cause the generators to produce electricity.

Advantages of hydro-electricity

- a. It is sustainable since it uses water which is a renewable natural resource
- b. It is relatively cheap form of energy though expensive to set up
- c. It is clean because it does not cause air pollution
- d. Construction of dams or reservoirs for HEP has promoted fishing, irrigation and prevention of flooding

Disadvantages of hydro-electric power

- a. Expensive to set up
- b. High transmission costs due loss of energy in form of heat due to resistance of transmission cables and its expensive to install transformers
- c. There is no storage for surplus energy
- d. Damming destroys habitat for wildlife

- e. Creation of dams can encourage water borne diseases such as bilharzias and malaria
- f. Power fluctuation due to reduction of water levels as most tropical regions depend on regional rainfall

3. GEO-THERMAL ENERGY

Geo-thermal means heat from the earth.

How it is produced

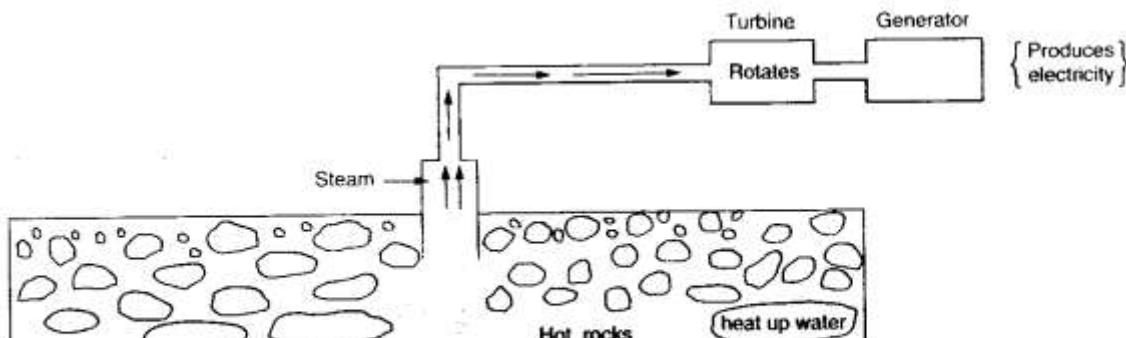


Diagram showing Geo-thermal energy production

Geo-thermal energy is produced when underground water comes into contact with hot rocks below the earth surface. The hot rocks heat the water to very high temperatures. The superheated water forms steam which is directed through pipes to a turbine that is connected to a generator. When the turbine rotates it makes the generator to produce electric energy.

Advantages of Geo-thermal Energy

- a. It is renewable
- b. It is clean
- c. It is reliable source of energy

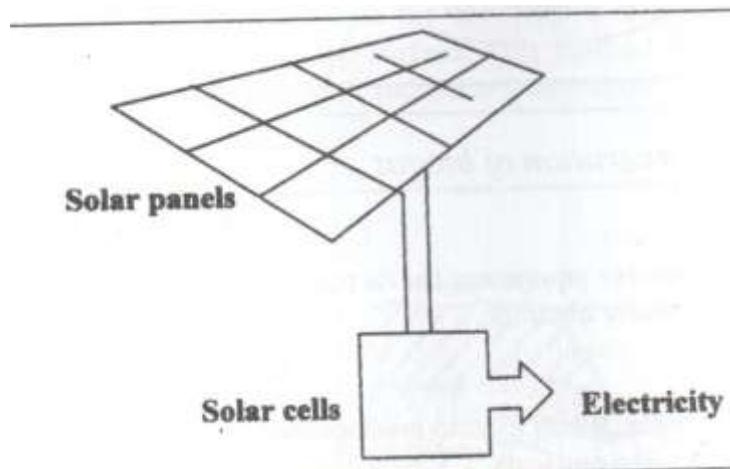
Disadvantages of Geo-thermal Energy

- a. There are limited suitable areas
- b. They are very expensive to develop

4. SOLAR ENERGY

This is energy tapped from sunlight.

How it is produced



Sunlight is captured by solar panels and directed to solar cells to produce electricity.

Advantages of Solar energy

- a. It is clean
- b. Suitable for small-scale energy needs
- c. It is renewable

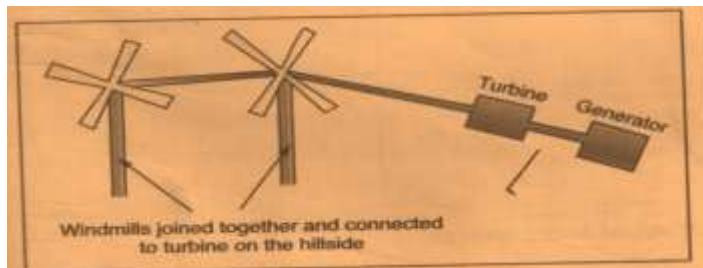
Disadvantages of Solar energy

- a. Expensive to buy solar panels and batteries
- b. Is affected by bad weather
- c. Is inefficient as only 30% of light is turned into electricity

5. WIND ENERGY

Energy derived from wind using wind mills.

How wind energy is produced



Wind mills are connected to turbines. Blowing wind propels wind mills. When the wind mills rotate the turbines also rotate. The rotating turbines make generators connected to them produce electricity.

Advantages of wind energy

- a. It is clean

- b. Low operation costs
- c. It is renewable
- d. Is ideal for small communities

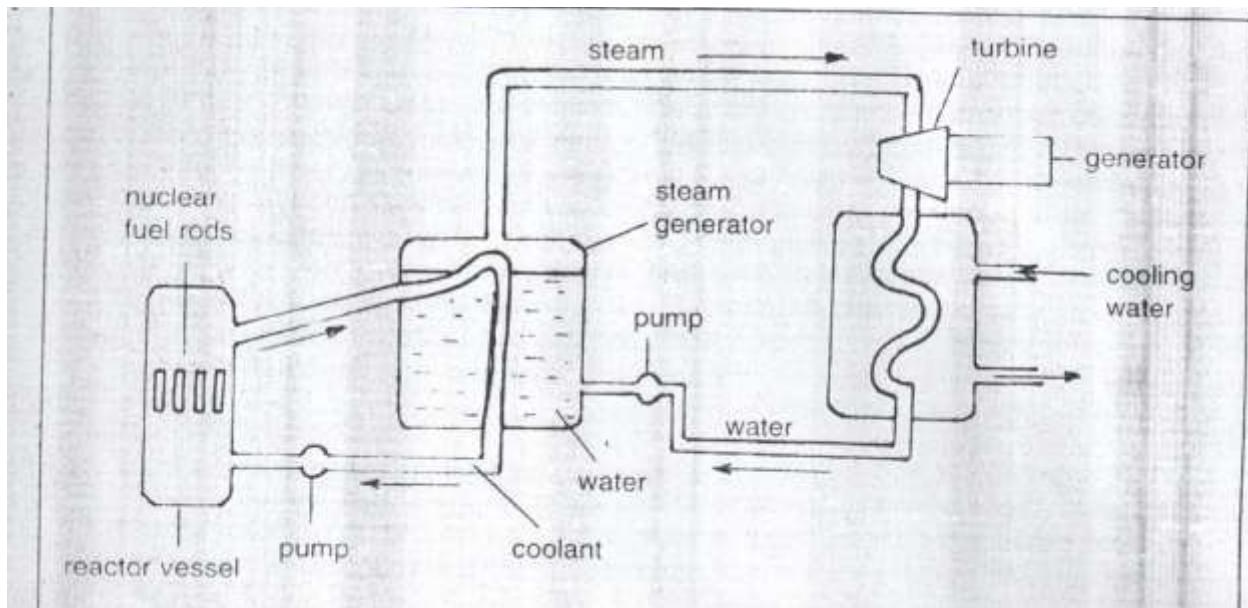
Disadvantages of wind energy

- a. Only possible in areas that have strong steady winds
- b. Causes visual and noise pollution
- c. Large numbers of turbines are needed to produce more energy
- d. It is not efficient

6. NUCLEAR ENERGY

This is the energy obtained from splitting nuclei of radio-active materials such as uranium.

How it is produced



It is produced by bombarding a nucleus with neutrons which splits the nucleus of uranium in a process called **nuclear fission**. The bombarding induces chain-reactions as more nuclei are split causing release of large amounts of energy. The energy from the reactor vessel or container heats up the water in the steam generator. The water produces steam that is directed towards turbines which are connected to generators in order to produce electricity.

Advantages of Nuclear energy

- a. Requires limited raw materials to be produced
- b. Cause little air pollution
- c. It releases a lot of energy
- d. Uranium is less bulky than other sources of power

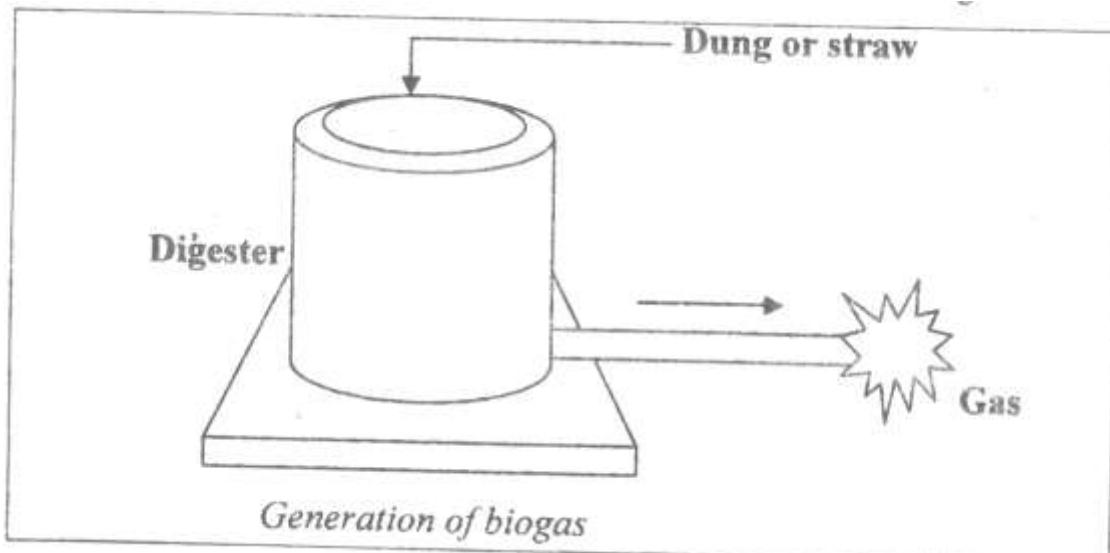
Disadvantages of Nuclear Energy

- a. It is expensive
- b. It is hazardous because the nuclear waste can remain radioactive for many years
- c. Poses health risks for those who live near power stations
- d. Nuclear accidents have very negative effects

7. BIOGAS ENERGY

This energy is produced from remains of biomass.

How it is produced



Animal or plant waste is put in a container and secured properly. As micro-organisms act on the dung, gas (methane) is produced. The gas is used for heating and cooking.

Advantages of Biogas

- a. It is cheap-does not need expensive equipment for its production
- b. Raw materials are easily obtained
- c. It can be stored
- d. It is from renewable resources

Disadvantages

- a. Burning methane gas produces carbon dioxide that leads to air pollution
- b. Waste and equipment for biogas digester may not be readily available
- c. Farmers may be forced to buy fertilizers since dung is used to produce energy

ENERGY AND DEVELOPMENT

Energy plays a significant role in development which includes:

- i. Helps in transport as fuel provides energy that drives vehicles, trains and airplanes.
- ii. Energy drives factory machines to produce goods
- iii. Provides lighting and heating in our homes

- iv. Helps in communication as it enables communication facilities and gadgets to function eg phones, tv, radios, etc.

ENERGY CRISIS IN THE WORLD AND MALAWI

Energy crisis refers to a situation where energy becomes scarce to the majority of the people in a particular country.

Energy Crisis in Malawi

In Malawi there is an energy crisis due to the following:

- i. High cost of petroleum fuels and electricity making people fail to afford them. This leads to cutting down trees for charcoal and firewood.
- ii. Low production of electricity. Less people access energy due to low production
- iii. Silt and plants block machines at power stations leading to power cuts which affects industrial output

This means very few people use electricity thus creating energy crisis in Malawi.

Energy Crisis in the World

In the 1970s, there were acute shortages of fuel world over and prices were higher. This affected industries that depended heavily on fuel. This caused a crisis in oil importing countries. The crisis came about due to wars in the Middle East which affected production of oil. Oil producing countries got a lot of profit while other countries started to explore alternative sources of energy.

Energy crisis leads to high production costs, travel and transport costs. Fossil fuels are non-renewable and their reserves are fast declining which means they can be exhausted soon. This means an energy crisis may occur soon.

Possible Solutions to Energy Crisis

- i. Use alternative renewable sources of energy such as biomass, wind and water
- ii. Reforestation and Afforestation to replenish depleted fuel wood energy
- iii. Employing energy saving mechanisms
- iv. Encourage use of public transport such as buses and trains to save fuel

MINERALS

Minerals are chemical compounds that make up rocks of the earth's crust.

Types of minerals

- i. **Metallic minerals:** these are minerals that can be processed into metals. Metallic minerals are subdivided into:
 - a) **Non-ferrous metallic minerals-** these are minerals containing no iron such as tin, aluminum and copper
 - b) **Ferrous minerals-**minerals containing iron
- ii. **Non-metallic minerals:** these include asbestos, sulphur and salt

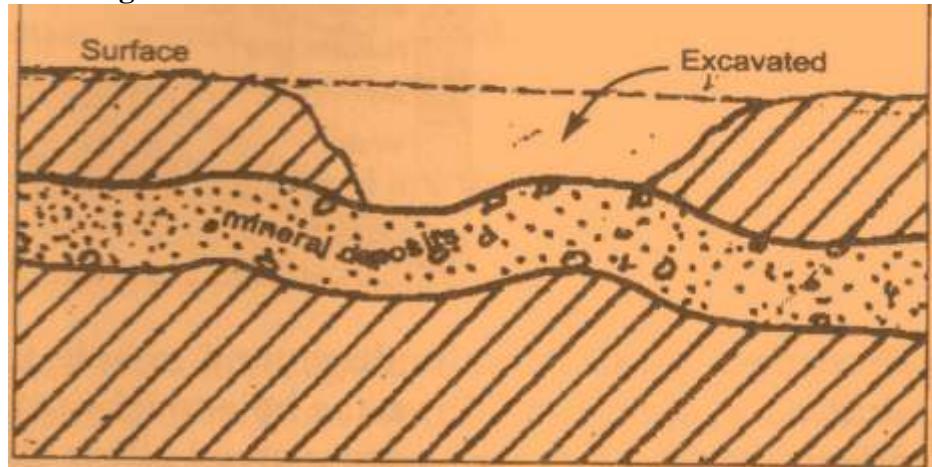
- iii. **Organic minerals:** these are minerals formed from living things such as coal and petroleum

World Distribution of Minerals

- Petroleum, bauxite, iron ore, coal, gold, diamond, uranium, copper

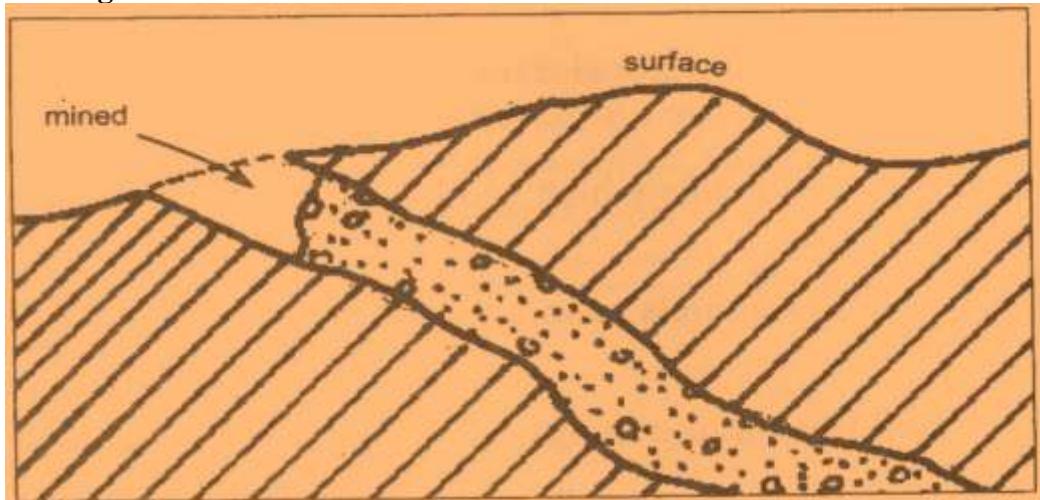
Methods of mining

a. Open cast mining



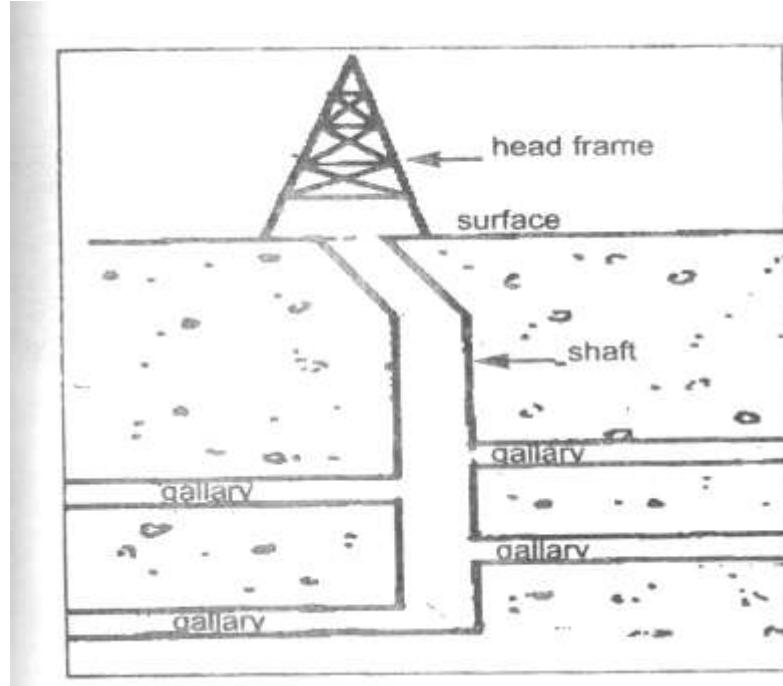
It is also called open-pit mining. It is used when mineral deposits are close to the surface. Overlaying material is blasted or removed to expose the minerals.

b. Adit mining



It is also called drift or slope mining. It is used to extract minerals that occur in horizontal layers.

c. Deep or shaft mining: this is used to extract minerals lying at great depths.



A shaft is sunk into the ground as the shaft gets deeper the rocks are blasted and brought to the surface.

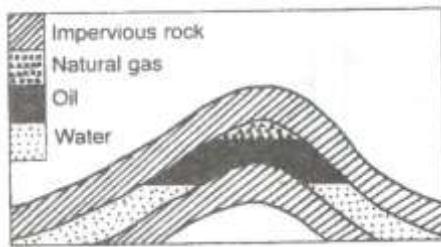
CASE STUDY 1: PETROLEUM

Petroleum occurs in its natural state called crude oil. It is a compound of hydrogen and carbon. Petroleum comes from Latin words with petra meaning rock and oleum meaning oil. Petroleum therefore means rock oil.

Formation of petroleum

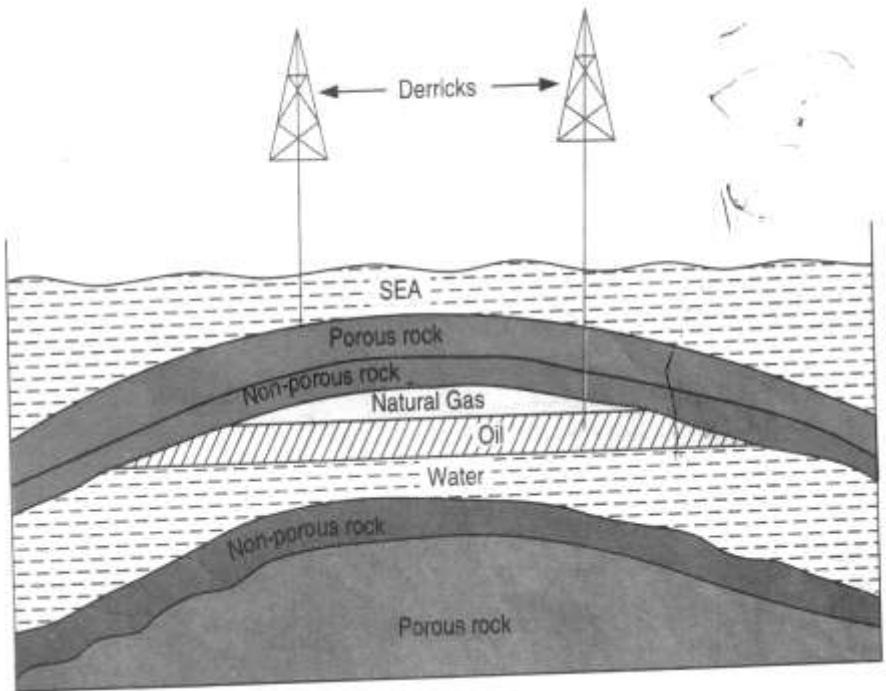
It is formed as a result of bacteria working upon bodies of remains of million sea creatures which got trapped in the sediments as they were being deposited at the bottom of the sea. With great pressure exerted by the sediments and in the absence of oxygen, a lot of heat was generated that encouraged decomposition of organic matter by anaerobic bacteria. Over millions of years successive piling of sand, mud and silt deposits, the flesh of dead marine creatures turned into small droplets of oil trapped in the pore spaces of sedimentary rocks. Due to earth movements oil and gases were squeezed out of the original sediments into porous rocks such as sandstone and limestone.

Occurrence of Oil



Oil bearing rocks also contain natural gas and water. They occur in the following pattern: gas on top, oil in the middle and water at the bottom.

Oil Extraction

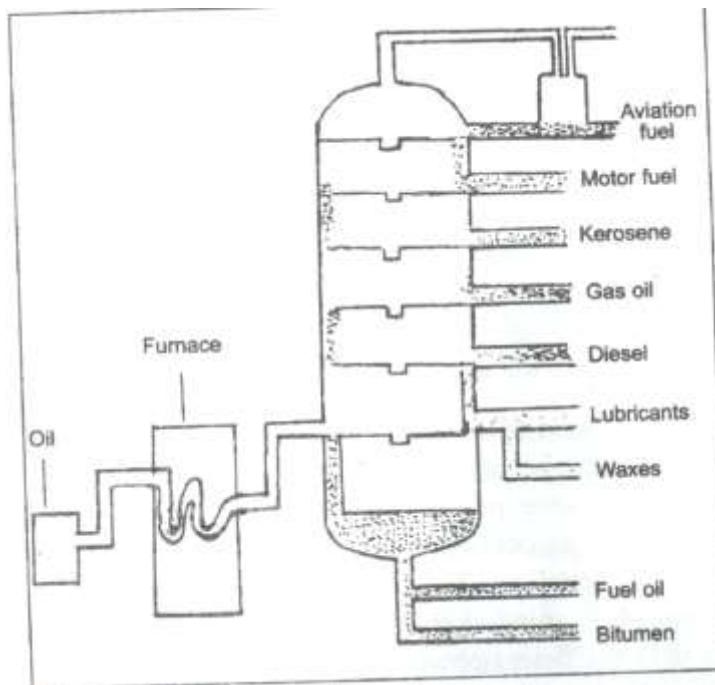


A hole is drilled from the surface by a metal structure called a **derrick**. A steel pipe originates from the derrick and its fit with a drill head called **diamond cutter** or **bit**. It cuts through rock strata. Mud is forced down the pipes to lubricate and cool the cutter and flush out broken rock particles. When oil is reached it gushes out if its under pressure if not it is pumped.

Oil Refining

Crude oil is made up of different hydrocarbons. It is made pure by the process called fractional distillation as the oil split into fractions under high temperatures.

Fractional Distillation: The crude oil is heated at more than 300°C . The groups of hydrocarbons in the fuel boil at different temperatures. Fractions with high boiling points condense at the bottom and fractions with lower boiling points condense higher up.



Lighter fractions are collected at the top and heavier ones are collected at the base.

Thermal Cracking: Heavier fuels are further broken down into other fuels through thermal cracking. Heavy fractions are subjected to very high temperatures and pressure to weaken the bonds that hold them together. The bonds crack or split to form lighter fuels such as petrol and benzene.

Polymerization: Simpler molecules collected from refinery gases are made to combine to create larger molecules or polymers. This increases the production of petroleum. Polymers are used to produce synthetic rubber, plastics, fertilizers and detergents.

Uses of Petroleum Products

Petroleum product	uses
1. Natural gas	for heating
2. Petroleum gases (butane, ethane, propane)	For making chemicals
3. Gasoline (motor fuel)	Used by land transport
4. Kerosene	Jet fuel
5. Gas oil	Made into diesel for vehicles
6. Bitumen/asphalt	For making roads
7. Lubricants	Used for manufacture of candles and polishes
8. By-products	Provide raw materials for industries such as plastic making, drugs, explosives, detergents and synthetic rubber.

Oil Transportation

Pipelines: they transport oil from oil wells to refineries or coastal shipping terminals.

Advantages of Pipelines

- a. They can be constructed anywhere
- b. Are cheapest and fastest way of transporting oil
- c. They carry a lot of oil per day

Disadvantages

- a. Expensive to construct and maintain
- b. They are insecure in times of war due to vandalism
- c. Difficult to detect and maintain leakages

Tankers: sea and land tankers

Sea tankers: these are large ships that transport. They have different compartments for liquid oil. The largest sea tankers are called super tankers.

Sea tankers are cheaper than pipelines; they also carry a lot of fuel at once. However, they are slow.

Road tankers and rail tank wagons: they carry oil to consuming areas, they deliver oil to cities and other urban areas.

World Producers of Oil

- ❖ USA, Middle East (Kuwait, Saudi Arabia, Iran, Iraq, Qatar, United Arab Emirates and Bahrain), Indonesia, Canada, Africa (Libya, Algeria, Nigeria, and Angola)

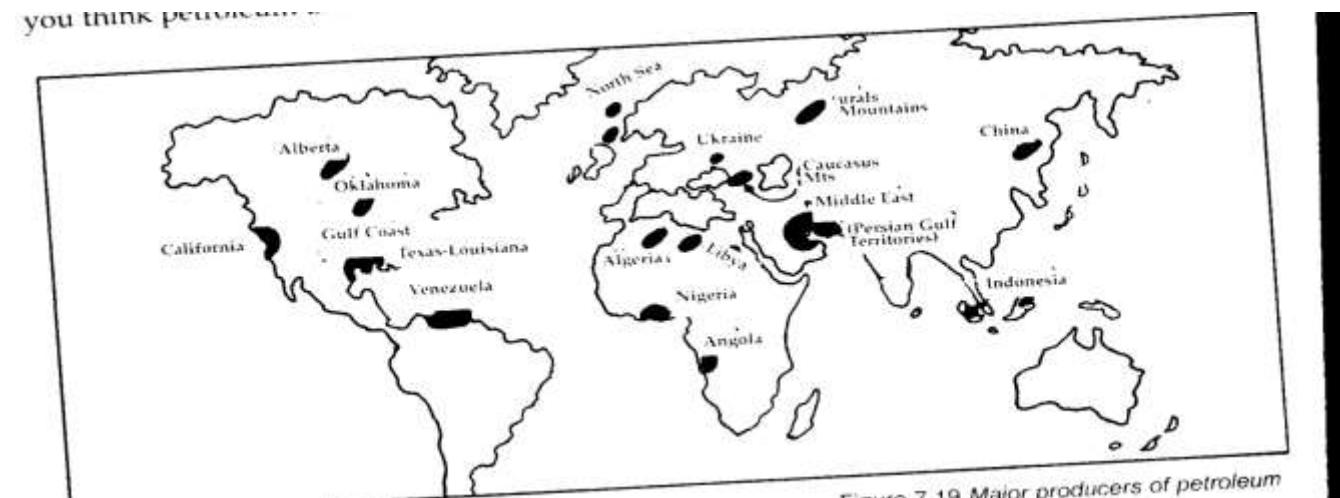


Figure 7.19 Major producers of petroleum

Organisation of Petroleum Producing Countries (OPEC)

This is a group of countries that export Petroleum. Member states include: Saudi Arabia, Iran, Iraq, Kuwait, United Arab Emirates, Bahrain, Qatar, Venezuela, Algeria, Libya, Gabon, Angola and Indonesia.

The Role of OPEC

- i. Controls the production of oil to avoid overproduction which affects oil prices
- ii. Fixes prices of oil per barrel (220L of oil)

- iii. Determines the production quotas of each member
- iv. Intervening in political misunderstanding with and among member states.

BAUXITE

Bauxite is the ore from which aluminium is obtained. It is made of aluminium hydroxide.

Formation of Bauxite

It is formed over a period of many years through the process of weathering and leaching. This occurs in hot and wet regions that alternate with very dry seasons. Parent rock becomes deeply weathered, its subsoil leached, resulting into a red clay type of rock which is rich in aluminium hydroxide which is bauxite—the ore for aluminium.

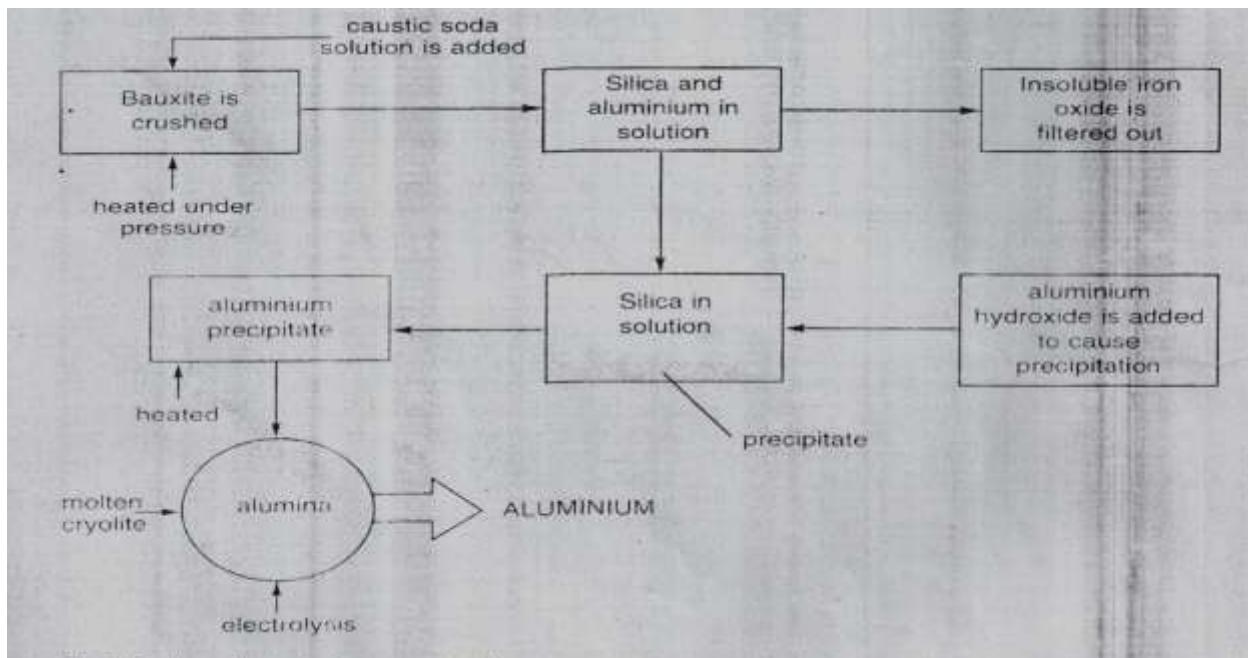
Associated minerals

Ore	Associated minerals	Gemstone
Bauxite	Iron and titanium	Ruby
Bauxite	chromium	Sapphire
Bauxite	manganese	Amethyst

Mining of Bauxite

Open cast mining is used since ores are near the earth's surface

Processing of Bauxite to Aluminum



Stage 1: bauxite ore is crushed. Caustic soda solution is added. Heat is applied under pressure. This results in formation of dissolved and aluminium and insoluble iron oxide.

Stage 2: insoluble iron oxide is removed through filtration process.

Stage 3: aluminium hydroxide is added to form aluminium precipitate.

Stage 4: aluminium precipitate is heated to produce alumina (aluminium oxide)

Stage 5: molten cryolite is added to the alumina and then electrolyzed to form molten aluminium at the carbon cathode.

Properties of Aluminium

- a. It is malleable-can be changed into any shape
- b. It is durable
- c. It is ductile-can be rolled into sheets
- d. It light in weight
- e. It's a good conductor of heat and electricity
- f. High melting point

Uses of Aluminium

- a. Used for manufacture of air crafts, railway carriages, buses and motor cars.
- b. Aluminium paint
- c. Utensils such as kettles and sauce pans
- d. Overhead electrical cables
- e. Aluminium foils for packaging

Bauxite in Malawi

Bauxite deposits are available on Mulanje Mountain on Lichenya and LinjePlateaux. It has about 28.8 million tonnes with an average of 4.5 metres. The deposits can be exploited for a period of 15-17 years before exhaustion.

Prospects and Problems of Bauxite Mining in Malawi

1. **Problem:** Inadequate power supply for processing ore. Prospect: importing power from Mozambique.
2. **Problem:** transporting ore from the mountain to the foot of the mountain is difficult. Prospect: there is need to use conveyer belts or pipes. This however expensive.
3. **Disruption of tourism:** this may destroy the beauty of Mulanje Mountain and disrupt tourism.
4. **Loss of biodiversity:** Mulanje is a host to scarce species of plants and animals which may be damaged.
5. Igneous intrusions and faults make mining prospects to be expensive
6. It can affect the matches industry since Mulanje cedar can be destroyed through excavation

Importance of minerals

1. Industrial development: energy from coal, uranium and oil stimulate industrial development
2. Development of transport systems
3. Source of employment

4. Urbanization-leads to urbanization as more people settle around mines looking for jobs
5. Source of foreign exchange earnings

Challenges Associated with Mineral Exploitation

- a. **Pollution:** water and air pollution caused by chemicals used in mining such as sulphuric acid
- b. **Health hazards:** radio-active minerals such as uranium (may cause cancer), water and air pollution may cause diseases
- c. **Scarring of landscape:** due to removal of vegetation and excavation of rocks and soils in open cast mining.
- d. Waste or loss of agricultural land
- e. High energy consumption
- f. Price fluctuations
- g. Exhaustion or depletion of minerals

TOPIC THREE: FISHING

-This is the primary industry involving catching of all aquatic animals including fish.

Fishing Piracy: the illegal fishing of endangered species

Factors That Influence Fishing

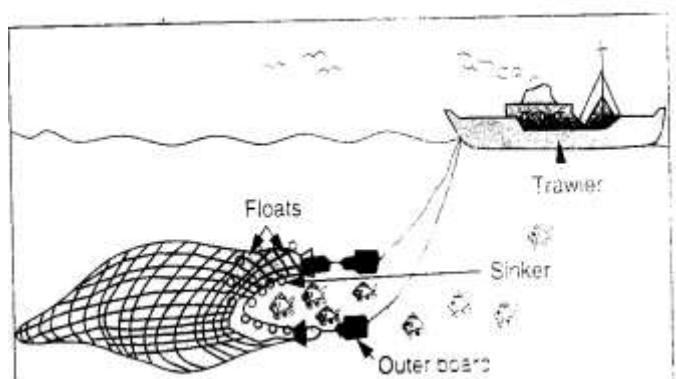
- a. The meeting of warm and cold ocean currents which encourage growth of plankton due to precipitation of minerals.
- b. Presence of good natural harbours
- c. Presence of continental shelves or shallow waters which allow sunlight to penetrate and encourage plankton growth.
- d. Fishing is labour intensive, therefore requires large population to provide labour to fishing and market for the fish
- e. Availability of plankton which is feed for fish
- f. Scarcity of cultivatable land in the coastal lands may force people to resort to fishing for livelihood.

Main Types of Fish

- a. **Pelagic Fish:** these are fish that feed and breed near water surfaces eg. Tuna, Pilchard, Mackerel, Sardines, Anchovy and Menhaden.
- b. **Demersal Fish:** these are fish that breed and feed near the sea beds of continental shelves, Sole, Cod, Haddock, Halibut, Hake, Skate, e.t.c.

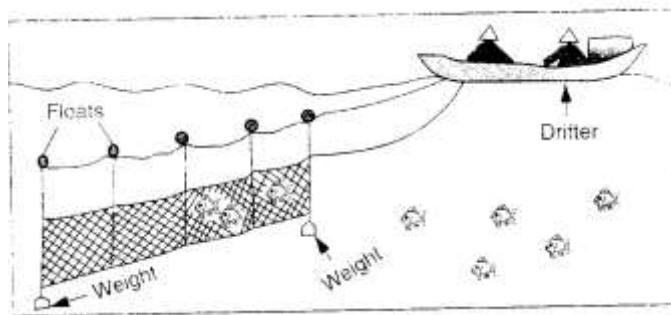
Fishing Methods

a. Trawl Netting



Fish is caught by dragging the net along the sea bed by trawlers. The net has a conical shape and is open at the base. The mouth is kept open by a system of floats on the top part and weights (sinkers) at the bottom. This is used to catch demersal fish

b. Drift Nets



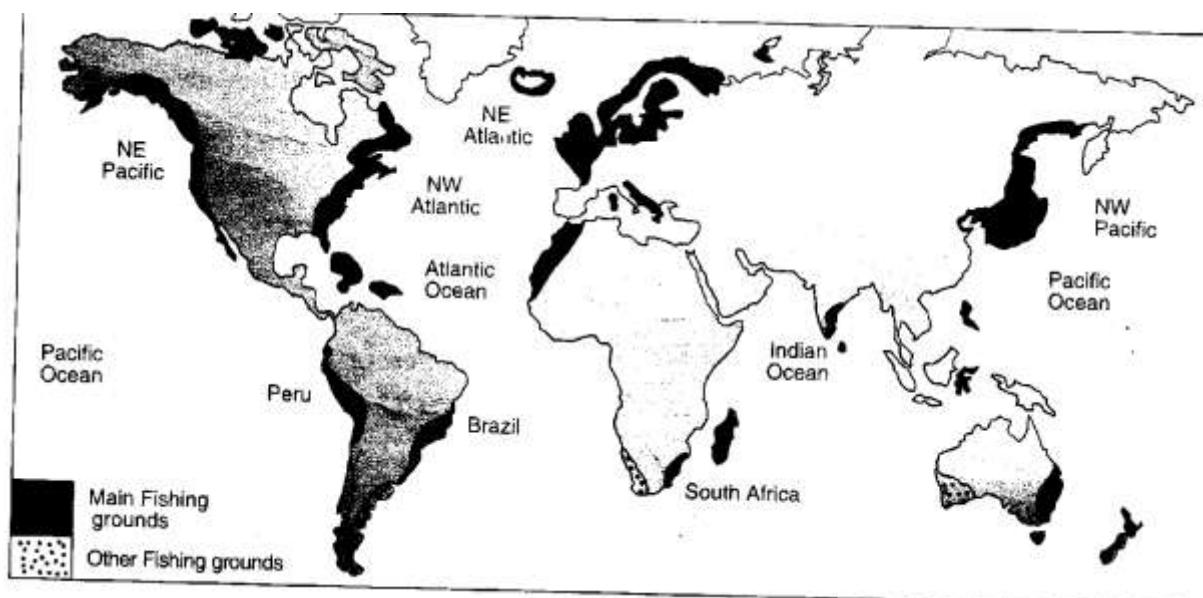
The nets are hanged vertically in the sea. They are lifted with floats on the upper edge and weights below. The fish are caught by their gills in the mesh of the nets. They are used to catch pelagic fish.

c. Seine Netting

There are of two types:

- Purse seine nets:** they are pulled by their end to surround a shoal of fish. These nets are stretched between two fishing boats. They are used for catching pelagic fish.
- Haul seine netting:** this resembles trawl netting and is used to catch Demersal fish.

THE MAIN FISHING GROUNDS OF THE WORLD



A. North East Atlantic/North West Europe

This is one of the main fishing grounds in the world. The fishing grounds include Barents Sea, Iceland, North Sea, and Bay of Biscay. Norway is the leading fishing country in this fishing ground. Why Norway is heavily indulged in fishing:

- Harsh climate makes farming difficult hence forcing people to focus to the sea for survival.

ii. Absence of extensive mineral and forest resources has forced Norway to the sea

Fishing is carried out throughout the year because of the presence of the North Atlantic Drift warm current.

Fish caught: main fish caught are Mackerel, Cod and herring. Other fish caught are haddock, plaile, halibut, sole, hake, and skate. This is the greatest fish exporting region.

Countries along the fishing ground: Norway, Denmark, Spain, Portugal, Great Britain, France and Germany.

Fishing methods: trawling and haul seine netting

B. North Western Atlantic/Eastern Canada

Extends from Cape Cod to Newfoundland, off the coast of Canada in North America. The fish caught are exported to South Africa, Southern Europe and North Africa and also sold to mainland America.

The main reasons for fishing in this region are:

- i. The vast North West Atlantic continental shelf has abundant plankton
- ii. The meeting of the warm North Atlantic and cold Labrador ocean currents encourage rapid plankton growth.
- iii. Lack of natural resources on the land and harsh climate has forced people to fish for livelihood.
- iv. It has indented coasts with good natural harbours

Fish caught: Cod, Haddock, Sardines, Halibut, hake, flounder and mackerel.

Fishing methods: trawl netting and haul seine netting

C. North Western Pacific /North East Asia

This is one of the major fishing grounds of the world. It takes place in the areas surrounding Japan. It extends from the Bering Sea to East of China. Japan is the main fishing country in this area because:

- i. Japan is poor in natural resources. 80% of Japanese land is not suitable for agriculture. This has forced Japan to turn to the sea.
- ii. The continental shelves around the islands are rich in plankton because of the meeting of Kurosiwo warm current and Oyashio cold current.
- iii. Industrialisation has made fishing to become scientific

Fish caught: Cod, Halibut, Herring, Salmon, Sardine, Tuna and Mackerel

Fishing methods: trawling and drift netting

D. North East Pacific or North West America

This extends from California to Alaska.

Fish caught: Halibut, Cod, Herring and Salmon

The Salmon

-it lays in rivers and lakes and eggs hatch there. When the fish are about one year old they return to the sea. When they are about four they return to the rivers to lay eggs. This is when they are caught

Fishing methods: trawl netting and seine netting

E. PERU

Chimbote is the main fishing port. Peru fishing ground is located on the western side of South America. Why Peru is one of the world's fishing grounds: the flowing of Humboldt or Peruvian cold currents enable plankton to grow.

Fish caught: Anchovy-for making fertilizers

F. South Africa

-the major fishing ports include Port Elizabeth, Port Nolloth, Durban and Saldana Bay.

Factors encouraging fishing in this area:

- i. Presence of shallow waters which enable plankton to grow
- ii. Availability of plankton for fish growth

Fish caught: Cape hake, cape anchovy and South African Pilchard

Importance of Fishing Industry

- a. It is source of raw materials for various products eg. Fertilizers, fish meals, glue and oils.
- b. Provides proteins and minerals. Minerals provided include: iron, magnesium, phosphorous, copper, calcium and iodine.
- c. Attracts tourists who study the species of fish
- d. Source of income to fishermen

Problems of the Fishing Industry

- a. Pollution of the sea: caused by discharging of untreated industrial wastes into water bodies. oil leakages and spills may also cause fish resources to be destroyed as it deprives fish of oxygen. Pollution leads to destruction of aquatic wild life.
- b. Overfishing-due to increase in population. Increase in population lead to increase in demand for fish. More fish are caught leading to overfishing.
- c. Indiscriminate fishing-catching of immature fish due to use of nets of small mesh sizes.
- d. Ignorance of fish management-people lack knowledge on how to manage and conserve fish.

Solutions to Fishing Problems

- a. Relocating fish from highly populated areas to overfished areas

- b. Imposing tough measures on those that catch small fish
- c. Enforcing international agreements that protect fish in the fishing grounds.
- d. Proper treatment and disposal of industrial wastes that cause pollution of water bodies.
- e. Fish farming may reduce overfishing.

Why is Fishing known as a robber industry?

The catching of fish is not balanced as more fish are caught than they are replaced due to rapid population growth.

Other Resources from the Sea

- a. Fresh water-produced through desalination process
- b. Sand and gravel-brought by erosion
- c. Oil- from dead marine plants and animals
- d. Natural gas-from dead marine plants and animals
- e. Food-prawns and shells
- f. Metals-such as iron, gold, tin and manganese
- g. Sea weed-raw material for ice-cream, malted milk, cheese, chocolate, jellies, mayonnaise, etc.
- h. Salts
- i. Minerals- such as potassium, magnesium, sulphur, phosphorites

FISHING IN MALAWI

Main fishing grounds in Malawi are: L. Malawi, L. Malombe, Shire River, LakeChilwa

Methods of Fishing

- trawlers
- handnets/baskets
- draw nets
- traps

Fish caught: tilapia, ntchila, utaka, mpasa, sanjika, kampango, mlamba, matemba and mcheni.

Problems facing the Fishing Industry in Malawi

- a. **Overfishing:** due increase in population more fish are caught.
- b. **Water hyacinth (namasupuni):** overgrowth of water hyacinth makes fishing difficult and the plant uses oxygen that could be used by fish. This may cause fish to suffocate.
- c. **Pollution:** disposal of untreated industrial wastes in water bodies may destroy fish resources. Use of poisonous herbs also pollutes water bodies and kills both matured and immature fish.

Solutions to Problems of Fishing in Malawi

A. Overfishing

- i. Enforcing regulations that control mesh sizes of nets used for fishing. This prevents overfishing in that ensures that only mature fish are caught.
- ii. Observation of closed season with the help of VBCs(Village Beach Committees)
- iii. Civic education

B. Pollution

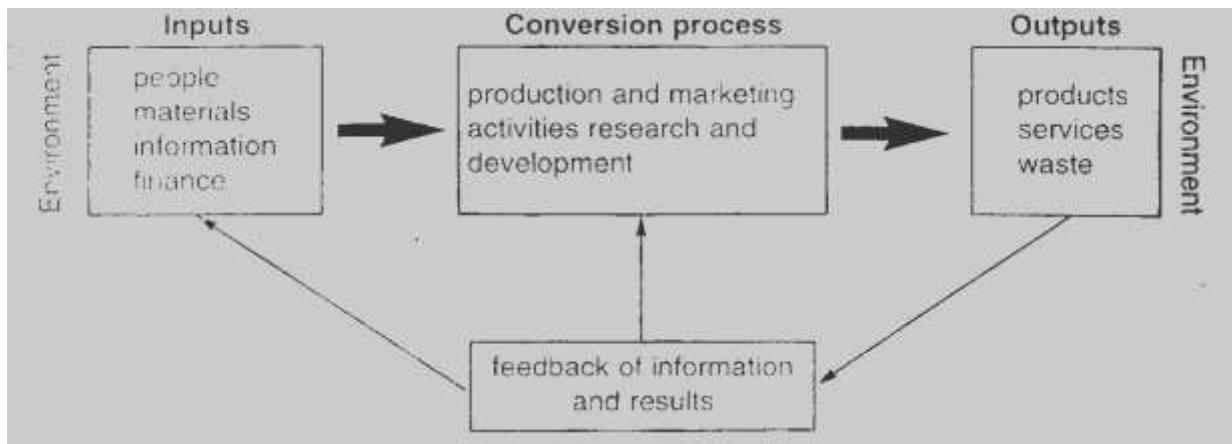
- i. Proper waste treatment and disposal by industries
- ii. Stop using poisonous herbs to catch fish

C. Water Hyacinth--removing the hyacinth from the fishing grounds

TOPIC FOUR: INDUSTRY

An **industry** is an organisation or set that produces goods or services to meet the needs of the people.

An industry is an open system. As an open system, it is made of a collection of interrelated parts.



The characteristics of an open system are as follows:

- It receives inputs or energy from its environment.
- It converts/changes inputs into outputs.
- It discharges its outputs into the environment.

Manufacturing: is the conversion of raw materials and refined materials by chemical or mechanical means into new products

Factory: this is the place where raw materials are processed into products. They are sometimes called industries.

Types of Industries

The types of industries are primary, secondary, tertiary and quaternary.

A. Primary Industry

These are industries that involve the production, collection and extraction of raw materials or natural resources. Industries relating to getting minerals from the ground are called **extractive industries**.

Examples of primary industries include:

- Forestry, farming, fishing, quarrying and mining.

B. Secondary Industries

These are industries that change raw materials into usable or consumable goods. They are also called manufacturing industries. They process material produced by primary industries.

Examples of Primary Industries

- Car manufacturing, sugar refining, cement manufacturing, textile manufacturing, cigarette and matches manufacturing.

Secondary industries can also be classified as **heavy** or **light industries**.

- 1) **Heavy secondary industries:** these need huge capital investment; they use large quantities of raw materials. They also use large and dirty machinery. They make heavy products such as ships, iron and steel, motor vehicles, etc.
- 2) **Light secondary industries:** they need small amounts of raw materials and use light and clean machinery. Examples are: watch making, camera making, textile manufacturing, cosmetics, etc.

C. Tertiary Industries

These are industries that provide for the needs of the population. They are also called the service industry. They also distribute goods produced by the secondary industries.

Examples of tertiary industries

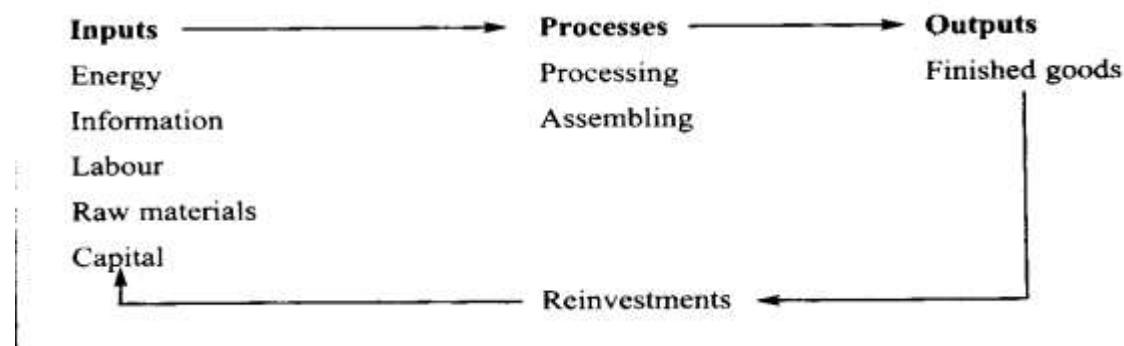
- Transport and communication, marketing, banking, insurance, tourism, etc.
- D. Quaternary Industries

These industries provide information and expertise in different fields.

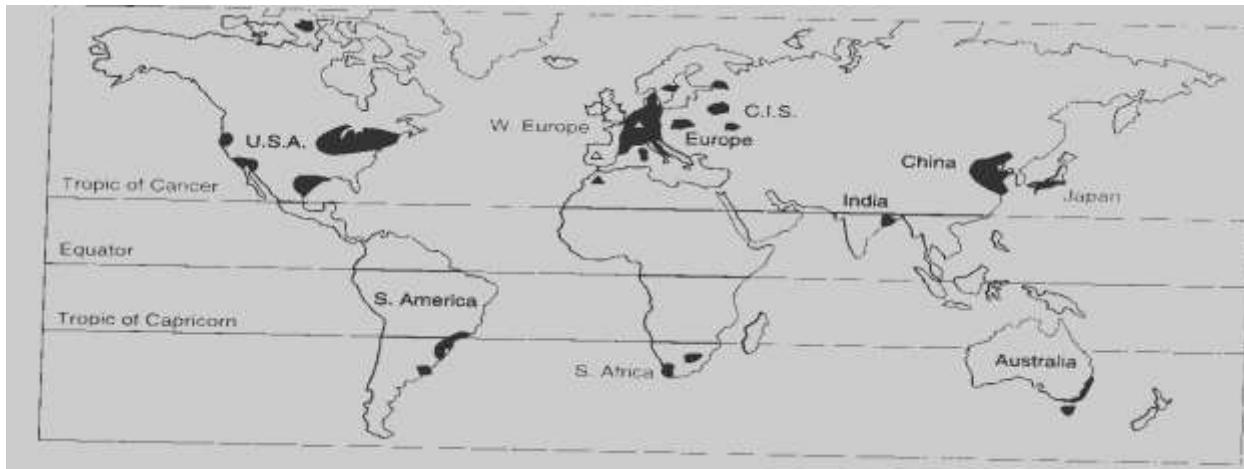
Examples of quaternary industries

- Universities, media houses, political policy units, research and development.

Industry as a system



Major Industrial Areas of the World



1. Western Europe

This is the greatest industrial area of the world. The industries are: ship building, steel steel, industrial machinery, agricultural implements, laboratory equipment, textiles, etc.

Western Europe is a major industrial area because:

- It has abundant hydroelectric power, coal and nuclear power for industrial purposes
- Raw materials are available such as iron, coal and steel
- Skilled labour force is available
- There is large town based industrial population that provide a market for industrial products

2. North America

It is located in North-east USA and Canada. The main industries are: car manufacturing, textile, food processing, etc.

North America is a major industrial area because:

- It is rich in minerals such as coal, oilfields, copper, aluminium, gold and iron.
- Hydro-electric power and coal provide enough energy to industries
- The Great Lakes and the St. Lawrence River provide cheap water transport
- There is high population which provide a ready market for industrial goods
- It is located across western Europe which has made trade easier

3. Japan

Industries include: ship building, motor vehicle manufacturing and chemical industries.

Japan is a major industrial area because:

- Has well-developed hydro-electric and nuclear energy
- Presence of large ports helps in importation of large raw materials from all over the world.
- There is skilled and hardworking labour force

- d. Mainland Asia provides a big market for industrial products.

4. South Africa

Industries include: textile, cosmetics, fishing, mining, etc.

Why South Africa is a major industrial area:

- a. Is rich in raw materials such as coal, iron, manganese and agricultural products
- b. Good transport system
- c. Improved salaries have increased the buying of people
- d. Good climate for both physical and mental work

5. Other areas

China, Brazil, India, Australia and Argentina.

Factors Influencing Location of Industries

a. Raw materials

Most industries are located near the source of raw materials especially if the raw materials are bulky. Some raw materials have to be processed where they are found such as sugarcane and tea.

b. Power supply

Energy is needed to run factory machines that change raw materials into finished products. Industries must be located where it is easier and cheaper to get power supplies.

c. Water supply

A lot of water is required for processing raw materials or cooling. For example, iron and steel industries, pulp and paper mills use large quantities of water. An industry has to be located closer to water supply or water source,

d. Land and site

The site of an industry must have access to power, water supplies and transport. The land should be flat for ease of transport of raw materials to the industry and finished goods to consumers.

e. Labour supply

Both skilled and unskilled labour is necessary when establishing an industry. Skilled labour involves educated people with expertise in different fields. Semi-skilled labour involves support staff whose work does not involve expertise in certain fields. Industries are located in urban areas because it is easy to get both skilled and unskilled labour.

f. Transport

A good transport network is important to easily transport raw materials to industries and finished goods to consumers. Industries must be located where transport costs are low.

g. Capital

A lot of capital is needed to set up an industry. Capital is needed for purchasing machinery, raw materials, salaries, etc. Lack of capital leads to failure to establish an industry.

h. Market

Most industries are located close to their markets. Urban areas have most industries because of high populations which provide a ready market for industrial goods. Again, industries that produce heavy or bulky goods are located close to the market.

i. Government policies inertia

Government can decide location of industries on political reasons or due to town planning.

j. Industrial inertia

This is the reluctance to relocate an industry even when the original reasons for its location have elapsed. This may be due to availability of skilled labour in the area or other factors.

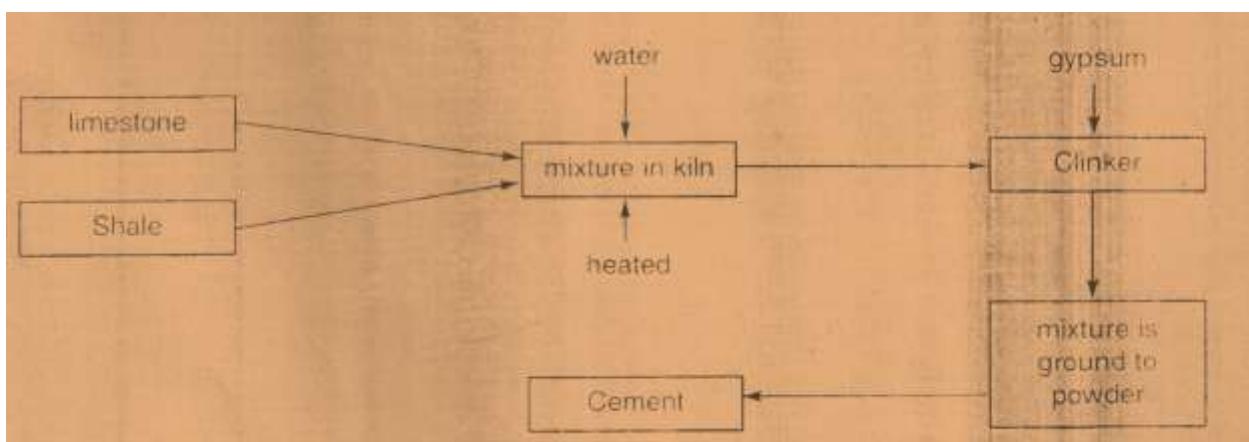
CASE STUDY 1: THE CEMENT INDUSTRY IN MALAWI

The cement industry is one of the secondary industries in Malawi. It is based in Blantyre. Limestone and gypsum are the raw materials for cement making. Limestone was mined in Changalume (Zomba), now it is mined in Kasungu and Balaka. Gypsum is imported from Zimbabwe and Canada.

Factors for Location of the Cement Factory in Blantyre

- a. Blantyre has a good road network hence is easily accessible
- b. There is good market for cement
- c. Blantyre is closer to source of power
- d. Storage facilities are present

Cement Making Process



Limestone and shale (clay) are crushed. They are mixed and water is added. The mixture is then put into a kiln and heated to 1500°C to evaporate water. When water evaporates it leaves a mass of hard and rough material called clinker. Gypsum is added to the clinker and ground to powder to produce cement.

Importance of the Cement Industry to Malawi

- a. Source of employment
- b. Source of government revenue through taxation
- c. It supplies cement to the construction and building industry such road and bridge building
- d. Source of forex when cement is exported

Challenges Facing Cement Industry in Malawi

- a. High cost of production
- b. Stiff competition from other brands of cement
- c. Limestone at Changalume is depleted

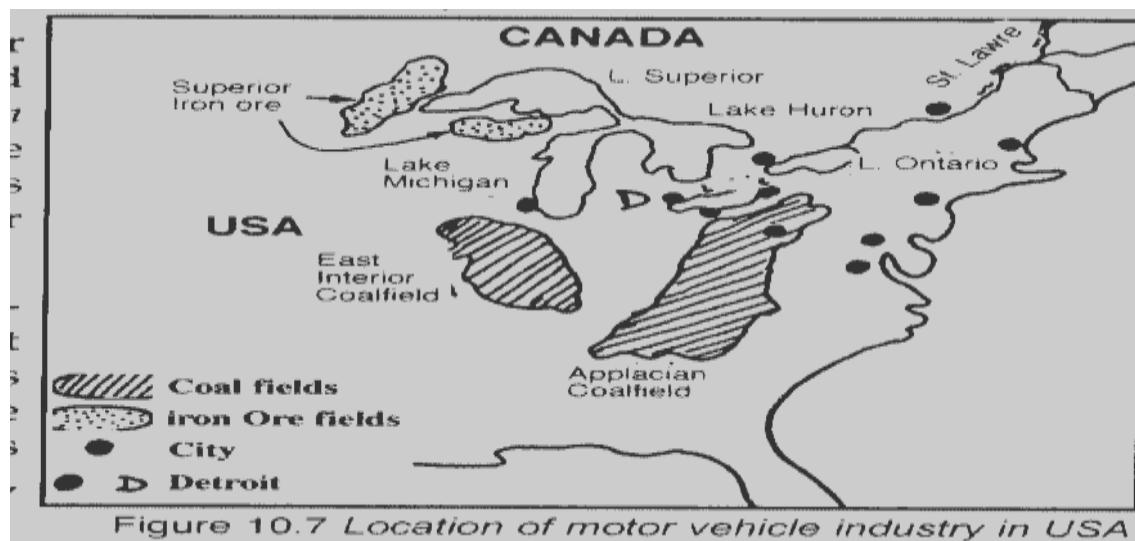
Environmental impacts of the Cement Industry

- a. Quarrying of limestone and shale destroys resources in the environment such as soil, water and vegetation
- b. Uses land which could have been used for agriculture
- c. It upsets ecological balance leaving the land scarred

Solutions to the environmental Problems

- a. Refilling pits
- b. Re-forestation and Afforestation in the refilled areas to maintain the water cycle and ecological balance

CASE STUDY 2: THE MOTOR VEHICLE INDUSTRY IN USA



Factors for the Growth of the Motor Vehicle Industry in USA

- a. Closeness to raw materials such as iron and steel industries
- b. The Great Lakes provide cheap transport for raw materials and finished products
- c. The presence of hydro-electric power in the Great Lakes region
- d. Availability of local and international markets
- e. Availability of both skilled and semi-skilled labour

Importance of Motor Vehicle industry to USA

- a. Creation of employment opportunities
- b. Source of foreign exchange earnings
- c. Helped growth of motor vehicle related industries such as paint, tyres, plastics, batteries, springs, etc.
- d. Source of revenue to government through taxation
- e. Increased mobility as many people own cars which have increased their mobility over both long and short distances.

Problems associated with the motor vehicle industry in USA

- a. Millions of cars cause air pollution by emitting carbon dioxide, hydrocarbons, oxides of nitrogen and sulphur.
- b. There is a decline in public transport as many people own cars.
- c. There are many vehicles on the road which has led to accidents resulting into deaths or injuries.
- d. There is stiff competition from car makers outside the USA such as Japanese cars.

Problems of Industries

- a. Environmental pollution (air, land and water pollution)
- b. Neglect of agriculture-as young people prefer working in industries to farming
- c. Rural-urban migration-people move from rural areas to urban areas to search for jobs in industries.
- d. Creation of towns: this affects the environment as large areas are cleared for buildings, roads and other land uses
- e. Erosion of traditional values: leads to loss of cultural identity as industries come with new ways of life.

TOPIC FIVE: TOURISM IN AFRICA

Tourism: the visiting of places of interest for pleasure or recreational purposes.

Tourist: a person who travels to places of interest for leisure or recreation

Tourist resort: the place which attracts many holiday makers

Assimilation: the process and results of interaction between different cultures. Local people copy the behavior of tourists.

Demonstration effect: the imitation of others' behavior and assimilating it as one's own.

Types of Tourism

- a. **Domestic tourism:** the visiting of local people to tourist attraction centres within their own country
- b. **Mass tourism:** concerned with a large number of people visiting places of interest
- c. **Health tourism:** deals with health workers and those who do not have knowledge in the field of health visiting places that offer medical services
- d. **Incentive tourism:** this deals with things that are attached to the visiting of places of interest such commission
- e. **Common interest tourism:** both local and international concerned with the visiting of places of cultural and historical.

Factors that Promote Tourism in Africa

- a. **Cultural factors:** there are many cultural factors that attract tourists such as the pyramids of Egypt, Great Zimbabwe ruins, different cultures and cultural entertainment.
- b. **Physical factors:** there are many attractive components of the natural environment such as Kilimanjaro, Atlas, Mulanje and Drakensburg mountains. It includes having good beaches along lakes such as Chad, Tanganyika, Victoria and Malawi. It also includes wildlife such Nyala, zebras, snakes, birds, etc.
- c. **Economic factors:** economic factors include good transport network leading to places of interest, good hotels that offer better accommodation, good entertainment resorts and guides.

Importance of tourism in Africa

- a. Source of foreign exchange for African countries
- b. Source of government revenue through taxation
- c. Source of employment
- d. Infrastructure development as more roads and airports are constructed

- e. Growth of local industries such curios industry

Challenges of Tourism in Africa

- a. **Foreign ownership and management:** most of hotels and tourist resorts in Africa are owned by foreigners, which mean African countries lose a lot of money.
- b. **Erosion of local cultures and tradition:** due an influx of foreign tourists, culture and tradition are lost as Africans copy Western or Asian way of life.
- c. **Limited infrastructure:** poor transport (roads and airports) and accommodation facilities (hotels) discourage tourism in Africa.
- d. **Poaching:** for ivory, skins and horns of wild animals affects tourism negatively.
- e. **Expensive tourist facilities:** tourist facilities cannot be afforded by locals.
- f. **Relocation of people:** as hotels are built next to beaches people may be moved and they may lose their livelihood as fishermen.

ECO-TOURISM

This is form of tourism where people want to see and experience untouched natural environment such as game reserves, national parks, mountains and forests.

Characteristics of Eco-tourism

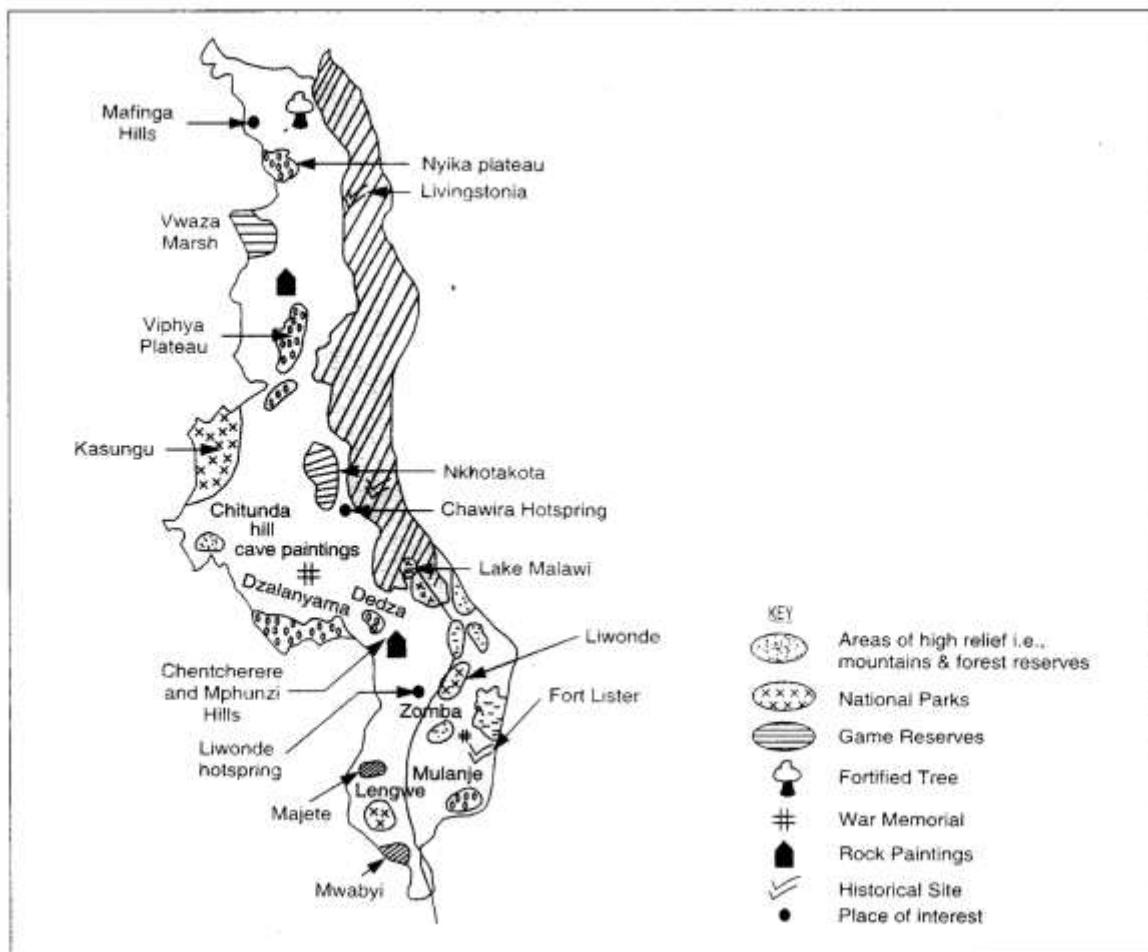
- a. Safeguarding of resources
- b. Resources used in sustainable manner
- c. Local people are involved in conserving and utilizing resources

Importance of Eco-tourism

- a. Leads to proper conservation and management of the environment
- b. Sustainable use of the environment
- c. Empowerment of local communities

TOURISM INDUSTRY IN MALAWI

Areas of tourist attraction in Malawi



Factors that Promote tourism in Malawi

- Attractive scenery:** which includes mountains, lakes rivers and wildlife
- Culture:** which includes museums and cultural dances
- Politics:** Malawi is a very peaceful country hence good for tourism
- Climate:** Malawi has a sunny climate (especially in summer) which is good for tourism
- Accessibility:** Malawi is easy to reach as it has two international airports (KIA and CIA)

Challenges of tourism in Malawi

- Diseases: malaria and bilharzias
- Insufficient accommodation
- Poor communication and transport facilities

d. Accessibility

Importance of Tourism to Malawi Economy

- a. Source of foreign exchange
- b. Source of employment
- c. Promotes small-scale industries such as curios
- d. Infrastructural development such as roads, hotels and restaurants
- e. Source government revenue through taxation

TOPIC SIX: SETTLEMENTS

Settlement: a place where a group of people dwell together.

Farmstead: a farm and its main buildings and the nearby ground

Hamlet: a loose group of farmsteads. There are two or three houses without shops schools or services.

Village: a dense grouping of several farmsteads

Town: a densely populated urban area.

City: a large town in which people live and work

Metropolis: it's a mother city. It is the main city of a region on which surrounding towns depend. The dependent towns are called satellite settlements. The satellite towns and the mother city are called metropolitan system or decentralized city.

Conurbation: means continuously urban areas. Several towns are joined together.

Megalopolis: urban complex formed by merging of several cities.

Urbanization: an increase in the proportion of people living in towns and cities

Counter-urbanisation: this is urban-rural migration-the relocation of people from urban areas to settle in rural areas.

Types of Settlements

- a. Rural settlements
- b. Urban settlements

Characteristics of rural settlements

- a. Farming
- b. Strong traditional attitudes
- c. Land is very cheap
- d. Largest percentage of land is owned customarily
- e. Poor social services such as poor schools, hospitals, markets
- f. Homogenous society-mainly made of one tribe
- g. People do not readily accept change or fashion
- h. Most buildings are semi-permanent

Characteristics of Urban Settlements

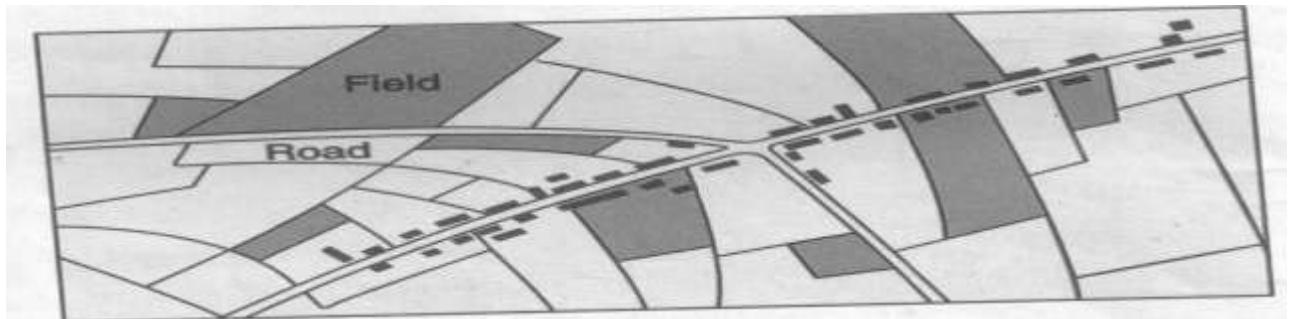
- a. Land is expensive
- b. Most buildings are permanent
- c. Society is heterogeneous-made of several tribes
- d. High population densities
- e. Modern social amenities such as banks, hospitals, hotels and schools

- f. Dominated by secondary and tertiary industries

Settlement Patterns

- i. Linear/ribbon/street
- ii. Nucleated or compacted
- iii. Dispersed or scattered

A. Linear/Ribbon/Street



Buildings follow a line which may be a track, road, river or railway line.

Factors that influence Linear Settlement Pattern

- a. Presence of roads, rivers or railway lines
- b. Business or farming along the roads, rivers or railway

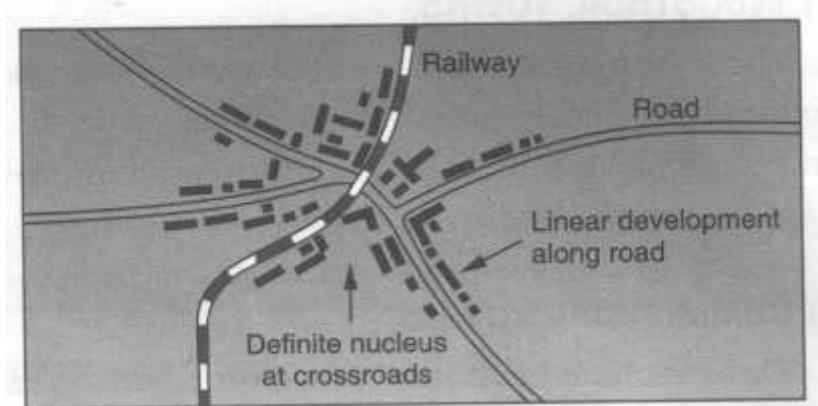
Advantages of Linear Settlement Pattern

- a. Easy to access social amenities
- b. Easy to do business activities
- c. Create enough land space for other important purposes

Disadvantages of Linear Settlement Pattern

- a. Noise disturbances by moving vehicles or trains
- b. Danger of flooding along rivers

B. Nucleated or Compacted Settlement Pattern



Houses are very close to each other. Buildings take the shape of a square or circle.

Factors influencing Nucleated/Compact Settlement Pattern

- a. Availability of flat land
- b. Presence of social amenities
- c. Presence of fertile soils
- d. Trade or commercial activities

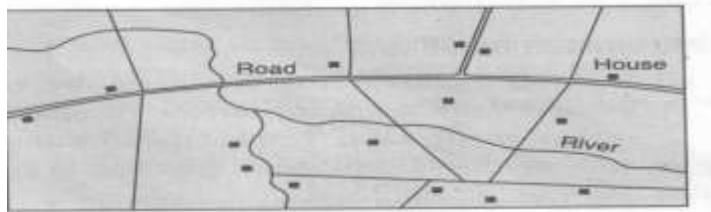
Advantages of Nucleated Settlement Pattern

- a. Ensures security to the residents
- b. Easy to provide social services to the people
- c. Enhances social interaction and unity
- d. Creates enough land which is used for other beneficial uses

Disadvantages of Nucleated Pattern

- a. Easy spread of diseases
- b. Pollution of environmental resources such as air, land and water

C. Dispersed or Scattered Settlement Pattern



Houses are far away from each other.

Factors that Influence Dispersed Settlement Pattern

- a. Hilly topography
- b. Waterlogged soils
- c. Presence of forest reserves, game reserves and national parks
- d. Land ownership-private land disperses people

Advantages of Dispersed Patterns

- a. Good hygiene
- b. Protection of environmental resources

Disadvantages of Dispersed Pattern

- a. Difficult to provide social services
- b. Lack of security
- c. Lack of unity and social interaction

Factors That Influence Settlements

There are two factors that influence Settlements: site and situation

Site

Site is the area occupied by a settlement. It is a point at which a settlement is located in relation to local relief, soil and water supply.

Characteristics of a Site

- a. **Bridging points:** this is where the river becomes shallow and narrow to enable a bridge to be built.
- b. A gap in the ridge or range of hills
- c. The convergence of valleys

Situation

This refers to the condition of the site in relation to its environment such as other settlements, mountains, rivers, and communications.

Characteristic features of a Situation

- a. Wet-point Site: this is the point which provide water in relation to dry areas
- b. Dry-point site: a point which avoids flooding in relatively wet areas
- c. Building materials : these include stones, wood and clay
- d. Defence: security of a settlement is important
- e. Nodal points: this is where several natural routes meet to create a central route or where rivers meet.
- f. Fuel supply: required for cooking and heating

FUNCTIONS OF SETTLEMENTS

Functions of Rural settlements

- a. **Agriculture:** most rural settlements are engaged in farming
- b. **Provision of social services:** these include religious services, education, health, communication, security. Usually these services are poor.
- c. **Businesses:** goods manufactured in urban areas are sold in rural areas and agricultural products are sold to urban areas
- d. **Fishing:** fishing is an important in most rural settlements along lakeshore areas, coastal areas and big rivers

Functions of Towns and Cities (Urban Areas)

- a. They are centres of industrial development-they have industries which process raw materials into finished products leading to development of the country. These industries also provide employment.
- b. Provision of market: urban areas are the major market of goods produced in rural areas as well as finished goods.
- c. Centres of social change: new ideas and social change usually begin in towns and cities.
- d. Centres of commerce: they are centres of trade with banks, insurance companies, etc.

- e. Centres of administration: most major towns are centres of public administration at national, regional or district level.
- f. Provision of social- cultural services: some towns serve as centres of higher education (universities and libraries), entertainment and religion.

Classification of Towns According to Their Functions

Market Towns: are centres of exchange which collect and distribute local products

Industrial towns: they have industries that process raw materials produced by primary industries into finished product

Commercial towns: includes centres of commerce and finance. They deal with trade having banking and insurance services

Mining towns: located in an unusual place provided it has enough mineral resources

Administrative towns: they deal with administration and organization of the country or a division within the country.

Cultural and education towns: these towns have renown universities and cultural centres

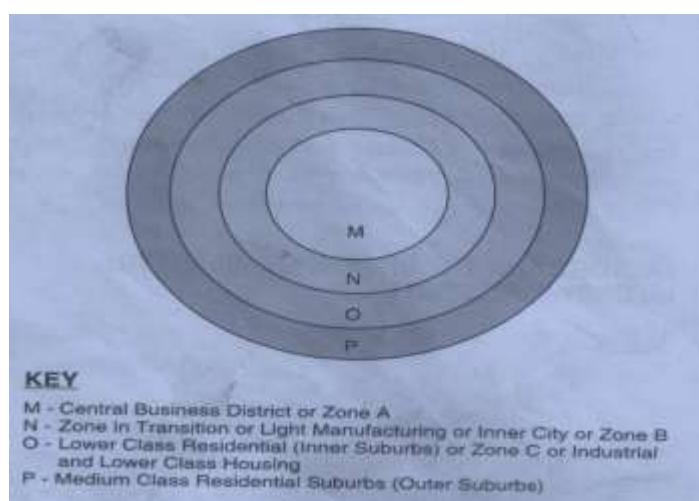
Ecclesiastical towns: these are historical and religious visited by pilgrims

Royal towns: these include traditional residences of monarchs, kings, queens and sultans and their consorts with beautiful palaces.

Holiday, hill and health resorts: Located in favourable geographical surroundings such as coastal regions for swimming and yachting

Port towns: places having deep deep waters warehouses, custom offices, banking and insurance services where steamers or ships dock.

Functional zones of an Urban Area



1. Central Business District (CBD) /Zone A

This is the heart of the city. Shops offices public buildings are located here. Buildings are usually tall due to shortage of land.

Characteristics of CBD

- a. It is highly accessible-it is where main routes from the suburbs meet.
- b. Land is expensive
- c. There are no residences/residential houses
- d. It is congested during day and depopulated at night
- e. There are no manufacturing activities in this zone
- f. It offers services such as hotels, banks, restaurants and hair dressing.

2. Transitional Zone/Zone B

Its characteristics are:

- a. It has high rise flats, old factories, railway stations and commercial houses.
- b. Little residential use
- c. There are some hotels and supermarkets and public buildings
- d. Little manufacturing is done here

3. Lower Class Residential and Industrial Zone/Zone C

Its characteristics are:

- a. Industrial plants are located here
- b. High population densities
- c. Land is cheap
- d. Streets are narrow and crowded
- e. Occupied by houses having gardens but few garages

4. Medium Class Residential Suburbs/Zone D

Its characteristics include:

- a. Marks the outskirts of the city
- b. Houses are better and streets are wider
- c. There is low noise
- d. Has new shopping centres, small modern factories and areas of open space.

URBANISATION

This refers to an increase in the proportion of people living in towns and cities in a country.

Factors for Urbanisation

- a. Rural urban migration: this is the movement of people from rural to urban areas. This contributes to urbanization.
- b. High birth rates: when birth rates are high in urban areas it results in natural growth of population in urban areas leading to urbanization.

Factors for rural-urban migration

- a. Lack of employment opportunities in rural areas
- b. Poor living standards in rural areas such as no electricity, hygienic water, etc.
- c. Lack of economic opportunities
- d. Poor social services such as education and health

Effects of Rural-urban Migration on Rural Areas

- a. Families break down
- b. Poor services as energetic people migrate to towns
- c. Decrease in food production
- d. Economic stagnation
- e. Abandoned and neglected houses

Effects of Rural-urban Migration in urban Areas

- a. Increased crime rate such as drug abuse, prostitution and armed robbery
- b. Shortages of housing
- c. Food production decreases because of loss of agricultural land
- d. Pollution of the environment

Ways of reducing Rural Urban Migration

- a. Empowering rural residents economically
- b. Improve employment opportunities in rural areas by creating small-scale industries in rural areas
- c. Creation of entertainment centres in rural areas.
- d. Establishment of satellite towns in rural areas

Factors for the Growth of Blantyre, Lilongwe and Mzuzu

BLANTYRE

- a. Good transport network (road, air and rail transport)
- b. It is a centre of trade and industry
- c. It was an early centre for missionary work
- d. The construction of Nkula and Tedzani HEP station boosted industrial development
- e. The large population provides a ready market for manufactured goods

LILONGWE

- a. It is the capital city and is in the middle of Malawi
- b. It is located at the centre of a rich agricultural area-produces a lot of tobacco, maize, groundnuts, etc.
- c. It is very accessible through road, rail and air.
- d. Kamuzu Dam provides regular supply of water both for domestic and industrial use.
- e. It is a centre of industrial activities-some industries are located in Lilongwe
- f. It is densely populated-which is cheap source of labour for industries

MZUZU

- a. It is a centre of trade such as the presence of Matayifa market
- b. It has good social services
- c. Presence of industrial activities
- d. It accessible by road and air
- e. It was a centre of administration of the tung estates.

EFFECTS OF URBANISATION

Positive Effects

- a. Create demand and provides market for manufactured goods
- b. There is abundant labour supply
- c. Bring social changes that change the elements of the social set up. The changes may be beneficial.

Negative Effects

- i. **Unemployment:** jobs become scarce since there are many people looking for jobs. This may result in increased crime rate or prostitution in order to make ends meet. The unemployed may turn to drug and substance abuse to try and forget their problems.
- ii. **Congestion of traffic:** roads are overcrowded with people and cars which lead to increase in accidents and noise disturbances.
- iii. **Housing problems:** shortage of housing, homeless people and overcrowded houses. Due to housing problems **slums** or **squatters** develop mainly in developing countries. Slums or squatters are illegal settlements in cities by poor people. Most of the houses in slums are very substandard; they are made of cardboard boxes covered with polythene sheeting or mud and are associated with unhygienic conditions.
- iv. **Pollution and health problems:** since urbanization is associated with high population densities there is a lot of pollution from gases emitted by industries and vehicles, poisonous industrial wastes may be dumped in rivers making water poisonous to people and fish, solid waste may cause land pollution as well as being breeding place for rats and cockroaches and there is noise pollution from cars and music from entertainment centres. Pollution encourage occurrence of diseases such as cholera and respiratory infections.
- v. **Urban sprawl:** this is the unplanned expansion or irregular spread out of rapidly growing cities over large space. This results in slums developing in the periphery of the city. Wealthier town dwellers also move out of the congested parts of the city to the outskirts.
- vi. **Inadequate infrastructure and other service:** several facilities and services become inadequate such as schools, hospitals, electricity, water, police stations and public transport.
- vii. **Centralization:** it is the excessive concentration of population in cities. This causes regional imbalances in the level of development and prosperity. This stagnates development in rural areas.
- viii. **Urban decay:** this refers to the development of slum conditions. This is characterized by social problems as overpopulation, unemployment, prostitution, crime and alcoholism.

The buildings are also beyond repair. Urban decay is caused by overcrowding, aged buildings, poor maintenance, mixing of land uses, etc.

Solutions to Problems of Urbanization

- a. Building new towns or satellite towns to reduce overcrowding, pollution and to create employment in building and construction industries
- b. Building skyscrapers to create space and reduce overcrowding
- c. Expanding existing commercial and industrial activities to provide employment
- d. Provision of parking areas, freeways, single way streets to reduce congestion
- e. Controlling population growth in both rural and urban areas.
- f. Better and effective town planning to prevent illegal settlements and to reduce environmental degradation.
- g. Urban decay can be solved by demolition and redevelopment, restoration and conservation.

TOPIC SEVEN: POPULATION

Terminologies

Population: total number of people living in a country at a given time.

Population density: the average number of people living per unit area.

Population growth rate: this is the net addition to the population through birth and migration. It is usually expressed as a percentage of the population.

Birth rate: the number of live births per one thousand people

Population explosion: very rapid population growth.

Population implosion: it is the rapid population decrease

Mortality/death rate: the number of people dying in a year per 1000 people.

Push factors: factors that force people out of an area.

Pull factors: factors attract people to settle in an area.

Youthful population: population mostly made by young people because the population growth is very high.

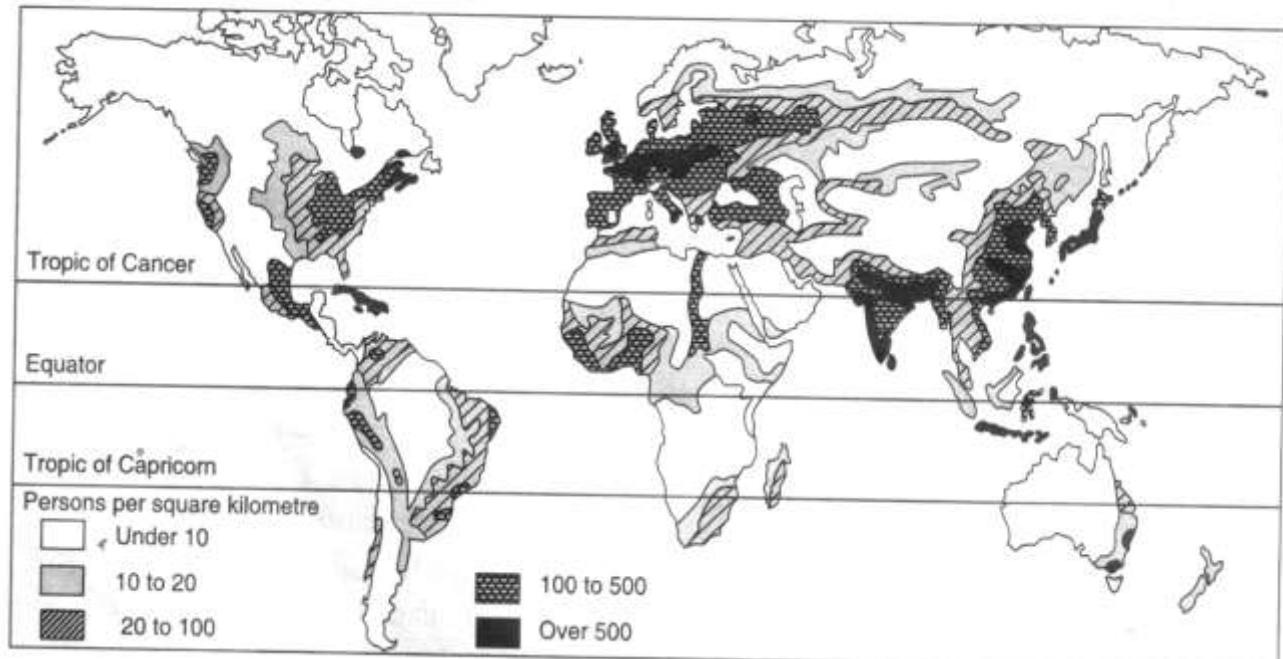
Ageing population: the population made of adults when population growth is slow.

Population distribution: the way population is spread out in a particular area.

Immigration: the coming in of people to other areas or countries

Emigration: the going of people to other areas.

WORLD POPULATION DISTRIBUTION



Factors Affecting Distribution

- Climate
- Soil fertility
- Industry
- Trade
- Water supply

Factors for high populations in the following areas:

a. Nile valley

- Presence of fertile alluvial soils
- Good water supply
- Transport provided by the Nile River
- Forced by the desert

b. South East Asia

- Fertile alluvial soils of Ganges, Yangtse and Hwang Ho valleys
- Commerce
- Peasant farming and the need for big families to help in farming activities
- Early civilization/settlements

c. Industrial North Western Europe

- Early settlement
- Good climate for human habitation
- Industrialization
- Improved agriculture
- Good sea transport
- Improved living conditions

d. North east America

- Industries such as car making
- Fertile soils which promote agriculture
- Centre of commerce
- Improved living conditions
- Proximity (nearness) to Europe (trade and immigration)
- Good transport provided by the Great Lakes and the St. Lawrence Sea Way

e. Witwatersrand in South Africa

- Centre of trade
- Industrialization
- Mining
- Improved living conditions
- Commerce

f. West African Coastal Region

- Improved living conditions
- Fertile soils
- Water transport
- Contact with early traders

Factors influencing low population in the following areas

a. Hot deserts

- Harsh climate (hot and dry)
- Poor soils
- Difficult transport due to sand
- No contact with outside world

b. Equatorial forest region

- Poor soil drainage
- Difficult transport due to wet and muddy soils

- Dangerous animals and diseases
 - Thick forests which make transport difficult
- c. Tundra lands of America and Eurasia or Polar regions**
- Short crop growing period
 - Poor climate-low temperatures
 - Poor soils (waterlogged and frozen)
 - Difficult transport due to snow and ice

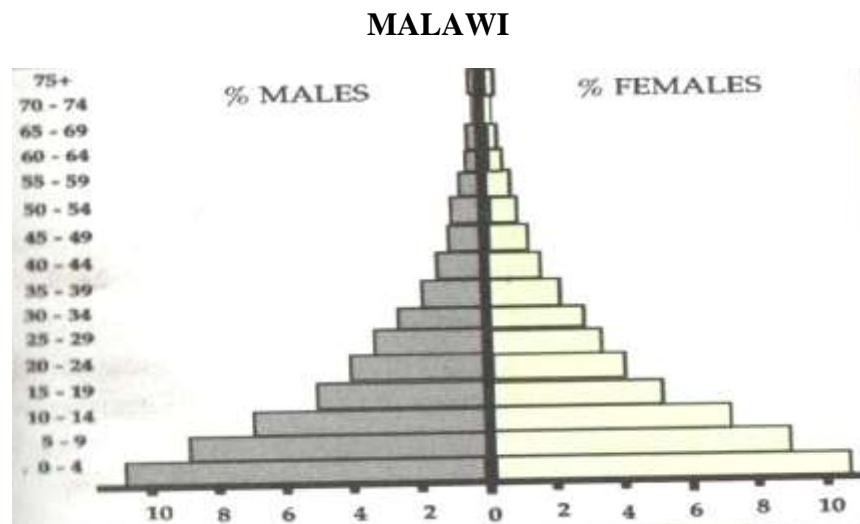
POPULATION STRUCTURE

Population structure refers to the age-sex composition of the population. This is shown in form of a **population pyramid**.

The population pyramid shows:

- i. Age-sex composition divided into five-year groups
- ii. Percentage of males and females in each group
- iii. Population of young and old people who depend on the economically active people.
- iv. Changes in birth and death rates

Pyramids of developed countries(such as Japan) and developing countries (such as Malawi)

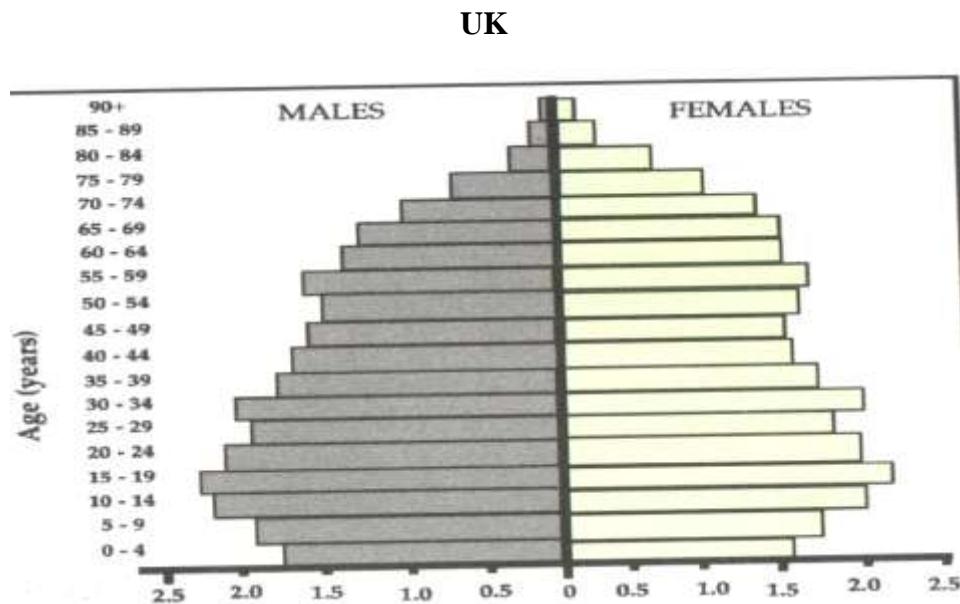


The pyramid for Malawi indicates:

- i. High birth rates
- ii. High death rates

- iii. Short life expectancy
- iv. Decreasing number of people in each age group

The pyramid indicates more young people than elderly people hence it's a **youthful population**.



The pyramid for UK indicates:

- i. Low birth rates
- ii. Long life expectancy
- iii. Low death rates

The population of the UK is an **ageing population** because there are more adults than young people.

Reasons for a youthful population in developing countries like Malawi

- a. Women's low education levels
- b. Low employment opportunities for women
- c. Lack of family planning services
- d. Children are a source of labour
- e. High death/mortality rates

Reasons for an ageing Population in Developed countries like Japan

- a. Long life expectancy
- b. High education levels of women
- c. Availability of family planning services
- d. Absence of child labour
- e. Provision of old-age security systems
- f. High employment opportunities for women

Population and Development

Development is the sustained elevation of an entire and social system towards a better humane life involving changes in social structures, popular attitudes and national institutions.

Objectives of Development

- a. To raise levels of living which include higher incomes, more jobs and better education.
- b. To expand range of economic choices to individuals by freeing them from dependence on other people, forces of ignorance and human misery.
- c. To increase the distribution of life-sustaining goods such as food, shelter, health and security for people.

Implications/effects of Youthful population Structure on development

- a. High levels of poverty: due to inadequate social services like education, health and lack of investments.
- b. Environmental degradation: due to high population growth which leads to deforestation, overfishing, water, land and air pollution.
- c. Lowering quality of services: due to high demand for services. This is case when health, education and transport become inadequate. This leads to low levels of development.
- d. Lack of security and peace: increased rate of crime due to lack of jobs which lowers the number of investors in a country.

Implications of an Ageing Population Structure on Development

- a. Increased investment and business activities: high standards of living enable people to have high incomes that enable them to do businesses. There is increased access to education which means more people can easily be employed.
- b. Sustainability of the world's vast resources in its environment: due to low birth rates resources in the environment are conserved and they can be used sustainably.

Causes of Rapid Population Growth

- a. High birth rates
- b. Low death/mortality rates due to improved medical care and sanitation
- c. Immigration

Effects of Rapid Population Growth on Development

- a. Pressure on schools: overcrowding, low teacher to student ratio, inadequate learning materials which lower education standards.
- b. Increased crime rate: due to poverty and unemployment. This scares investors.
- c. High unemployment levels: due to an increase in job seekers leading to low development
- d. Pressure on health care: such as overcrowding in hospitals, inadequate drugs and health personnel leading to poor health and death. This leads to low development
- e. Environmental degradation: may lead to destruction of the environmental resources such as water, forests and land leading to low development.
- f. Low levels of living/poverty: due to inadequate resources

Ways of Controlling Population Growth

- a. Family planning
- b. Wars
- c. Civic education
- d. Enactment and enforcement of laws against child labour
- e. Creation of old-age security system
- f. Raising the fees for secondary and higher education to remove heavy public subsidies

World Population Policies

MALAWI

- a. Advocates late marriages for girls
- b. Encourages education for the girl child
- c. Discourages child labour
- d. Provides family planning services such as contraceptives

NIGERIA

- a. Advocates late marriages-aims to reduce women who marry before they reach 18 years
- b. To achieve a birth rate spacing interval of 2yrs for half the country's mothers
- c. Advocates four children person per couple
- d. To reduce population growth through family planning

EGYPT

- a. Government backed family planning awareness campaigns
- b. Subsidizes small families through direct money payments

UNITED KINGDOM

- a. Family planning campaigns
- b. Provision of old-age social security systems and unemployment benefits
- c. Laws that prohibit marriage for girls below the age of 18 years

SWEDEN

- a. Family planning techniques
- b. Old-age security services
- c. Encouraging small families

ISRAEL

- a. Encourages for more children to be born due to labour shortage and Arab hostility.
- b. Also encourages Jews to return to Israel through a process called Aliyah

CHINA

- a. Discouraging early marriages
- b. Enactment and enforcement of laws that restricts families to have 2 to 3 children
- c. Advocates for family planning techniques
- d. Practicing abortion

INDIA

- a. Forcing people to have sterilization certificates
- b. Provision of gifts and money to those who possess sterilization certificates
- c. Family planning campaigns

TOPIC EIGHT: TRANSPORT AND TRADE

Transport: the act of moving and carrying goods and people from one place to another.

Trade: the buying and selling of goods and services.

Modes of Transport

Modes of transport can be divided into three: land (road and rail), air and water transport.

1. LAND TRANSPORT

a. Road Transport

Advantages of Road Transport

- i. Roads form direct links between producers and consumers
- ii. Roads can be constructed almost anywhere
- iii. It is faster over short distances
- iv. Stimulates economic activities such as farming along roads to urban centres.

Disadvantages of Road transport

- i. It is expensive to construct and maintain roads
- ii. Too many vehicles lead to traffic congestion at peak hours in urban centres.
- iii. Cause air and noise pollution
- iv. It is difficult to construct roads through dense forests and rugged topography

b. Railway Transport

Advantages of Railway Transport

- i. Carry a lot of bulky goods at one time
- ii. Can carry large numbers of passengers
- iii. There is no traffic jam or congestion
- iv. It is cheap over long distances with bulky goods

Disadvantages of Railway Transport

- i. It is very expensive to construct and maintain
 - ii. Not flexible as trains follow definite lines and stop only at railway stations
 - iii. Require flat terrain only
 - iv. Cannot be constructed in deserts or thick forests
- c. Pipelines

This form of transport is mostly used to transport petroleum, gas and water.

Advantages of Pipelines

- i. They are cheap-once constructed they continuously supply the commodity
- ii. They can laid on land or sea
- iii. It is fast
- iv. No problems of congestion

Disadvantages of Pipelines

- i. Expensive to construct and maintain
- ii. They are inflexible-they remain in position once laid
- iii. They are limited in the type of commodity being carried
- iv. Pose environmental when pipes break which may result in oil spills
- v. They are prone to vandalism especially during an unrest

2. WATER TRANSPORT

Advantages of Water Transport

- i. Carries heavy bulky goods at once
- ii. It is the cheapest form of transport
- iii. Uses existing routes except in the case of canals
- iv. There is very little congestion

Disadvantages of Water Transport

- i. It is easily affected by bad weather such as storms, fog, ice, e.tc.
- ii. It is slow because it follows indirect routes influenced by shapes of continents
- iii. Ports are very expensive to construct and maintain
- iv. It requires deep ports-ships anchor at ports with deep waters

3. AIR TRANSPORT

Advantages of Air Transport

- i. It is faster than land and water transport
- ii. It is not affected by physical barriers-follows direct routes
- iii. It more comfortable over long distances
- iv. The best means of transporting perishable goods such as fresh vegetables, flowers and dairy products.
- v. It is the best means in emergencies to deliver supplies

Disadvantages of Air Transport

- i. It is very expensive
- ii. Has limited carrying capacity
- iii. Routes are not flexible
- iv. It is less free-there is need to get permission before air space of a country is used
- v. Causes noise and some air pollution
- vi. It is affected by bad weather such as fog that may cause accidents.

INLAND CANALS

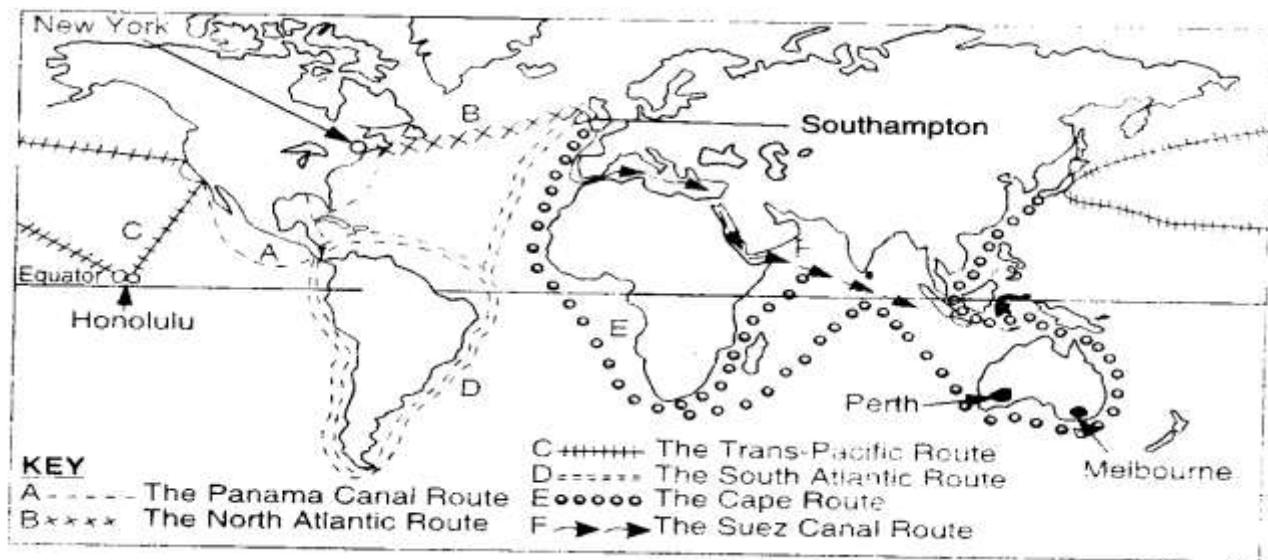
Advantages of Canals

- i. They are cheap over long distances
- ii. They carry bulky goods
- iii. They reduce distances travelled by ships
- iv. They are good for recreation

Disadvantages of Canals

- i. They are expensive to construct and maintain
- ii. They are narrow
- iii. There are few routes

MAJOR WORLD TRANSPORT ROUTES



World Sea Routes and Shipping Canals

i. North Atlantic Route

This connects industrialized North America and Europe.

From North America to Europe: wheat, cotton, paper, wood pulp, tobacco, iron, timber, copper, steel and transport equipment

From Europe to North America: textiles, chemicals, fertilizers, machinery and wine

ii. Panama Canal Route

Connects the European, Atlantic countries, the Far East and Pacific countries

From far-east and Pacific States to Europe and Atlantic States: oil, copper, tin, gold, nitrates, sugar, coffee, timber, wheat, dairy products, wool and meat.

From Europe and Atlantic States to Far-East and Pacific States: machinery, mining equipment, cars, drugs, textiles, chemicals, newsprint.

iii. The cape Route

Connects western and Eastern Countries

From west: meat, oil, copper, cars, diamonds and other manufactured goods

From the East: coffee, oil, copper, fruits, cotton, tea, tin, groundnuts, tobacco, manganese and diamonds

iv. The Suez Canal Route

Connects Europe and Eastern and far-east countries

From Europe: manufactured goods, textiles, chemicals, paper, machinery and fertilizers.

From East: coffee, oil, copper, fruits, cotton, tea, tin, groundnuts, tobacco, manganese and diamonds.

v. Latin America and European Route

From Latin America: cocoa, coffee, wheat, flax and meat.

From Europe: manufactured and semi-finished goods

vi. Trans-pacific Route

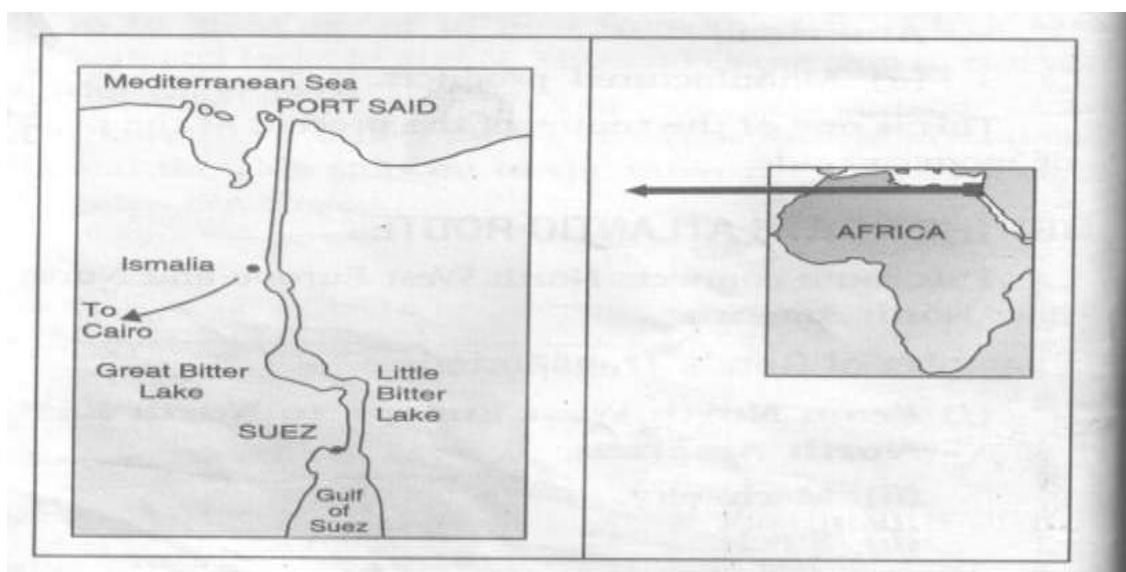
Connects the west with far Eastern countries

From west: machinery, cars and manufactured goods

From the east: oil, minerals eg copper, coffee, etc.

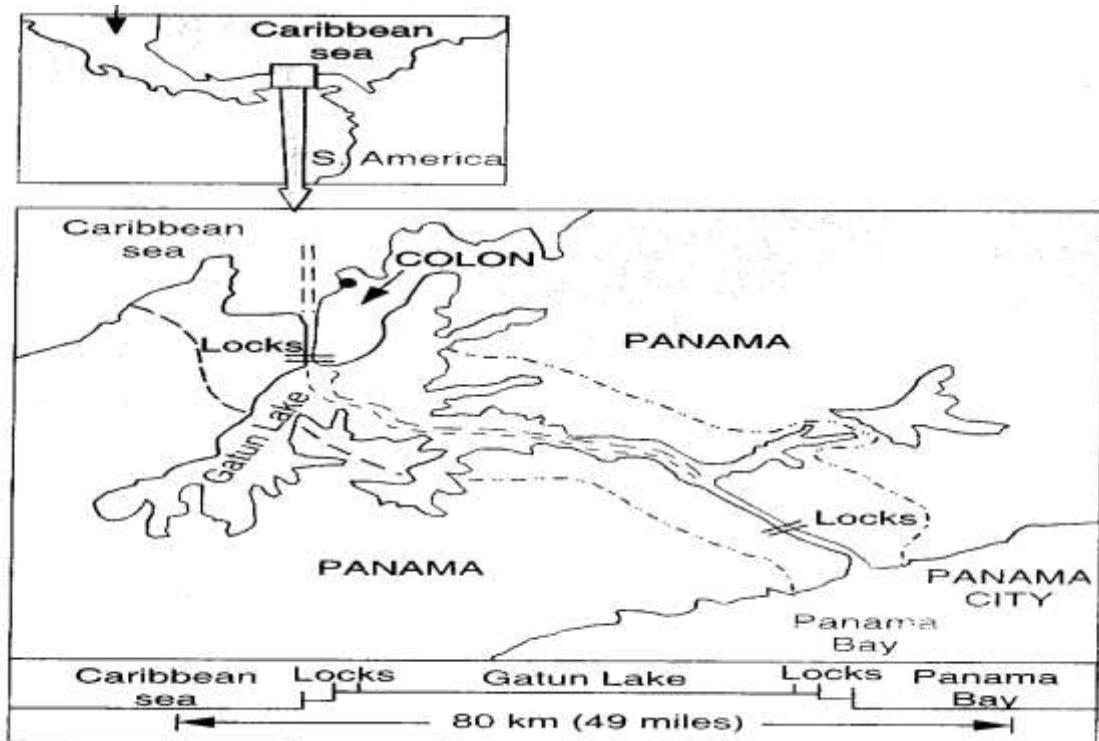
IMPORTANT CANALS AND INLAND WATERWAYS

1. Suez Canal



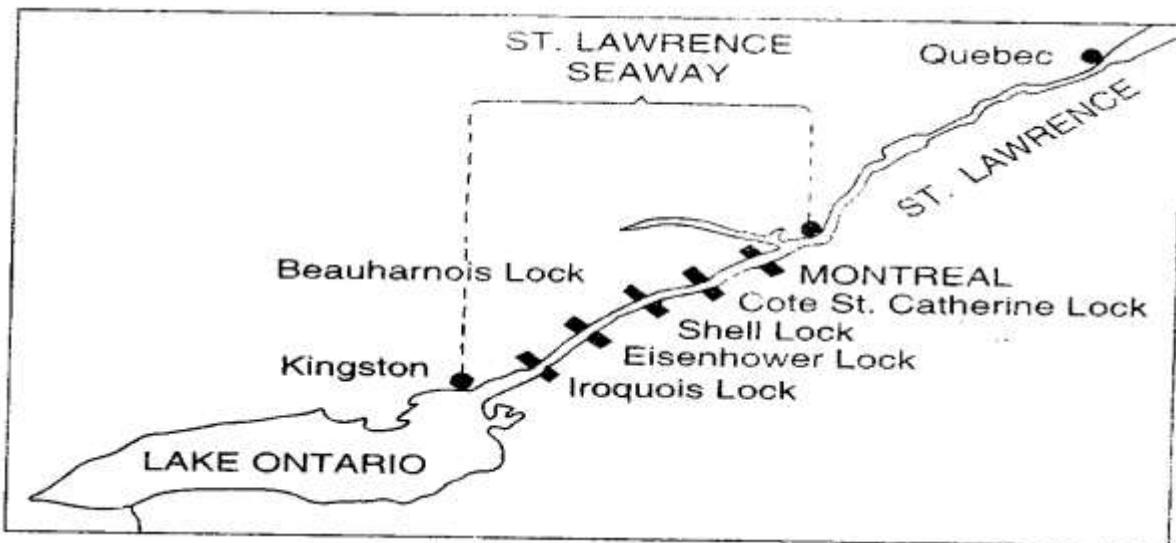
It connects the Mediterranean Sea and the Red Sea. It shortens the sea route between Europe and the Persian Gulf. It is 160Km long. It has no locks. The most transported commodity is crude oil from the gulf region.

2. The Panama Canal



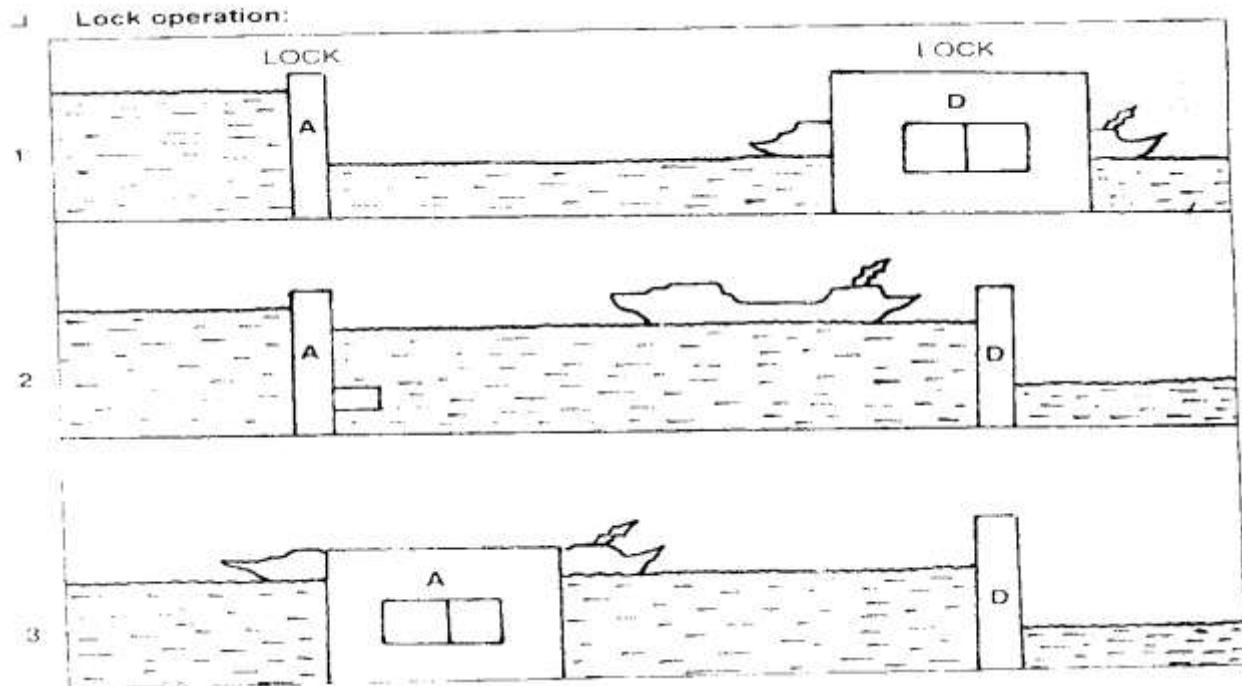
It connects the Pacific and Atlantic Oceans. It is located between North and South America. It has locks which slow down movements of ships through it.

3. St. Lawrence Seaway



It has locks. It enables ships to sail from the Great Lakes region to the Atlantic Ocean. It freezes in winter, as result it is closed for four months. Most items of trade passing through the seaway are iron ore, wheat, timber, furs and coal.

Lock Operation



In 1 the ship approaches **D**, the gate sluices are opened so that water level between **A** and **D** beyond is the same. This enables the ship to pass through **D**. In 2 **D** is now closed and **A** opens.

As water level rises between A and D the ship rises with it. When the water level between D and A beyond is the same the ship passes through A and sails on.

Types of Vessels Used on Sea Routes

- **Passenger ships:** carry passengers and mail
- **Cargo liners:** carry people and freight (goods)
- **Cargo ships:** carry goods

WORLD RAILWAY ROUTES

I. Trans-Siberian Railway

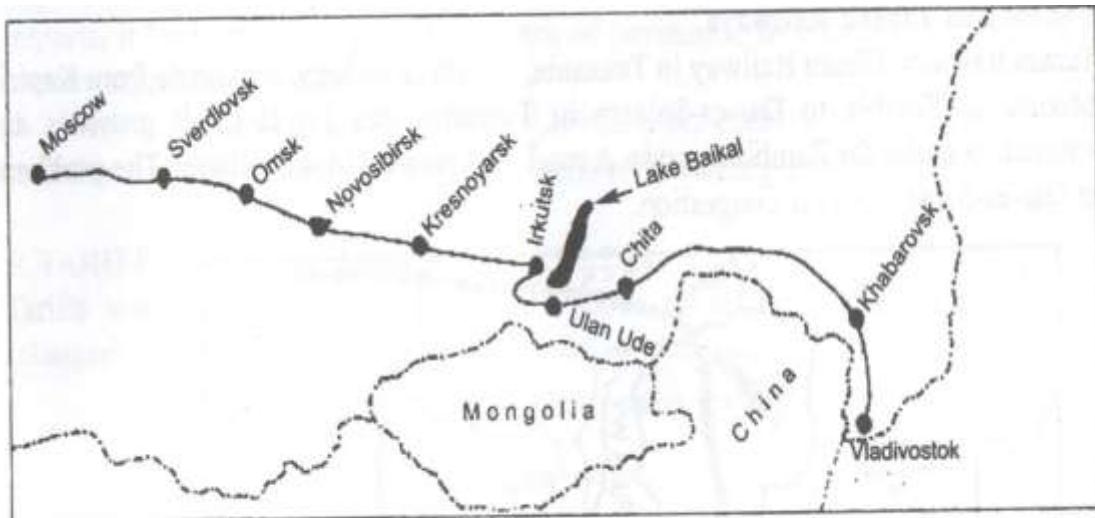
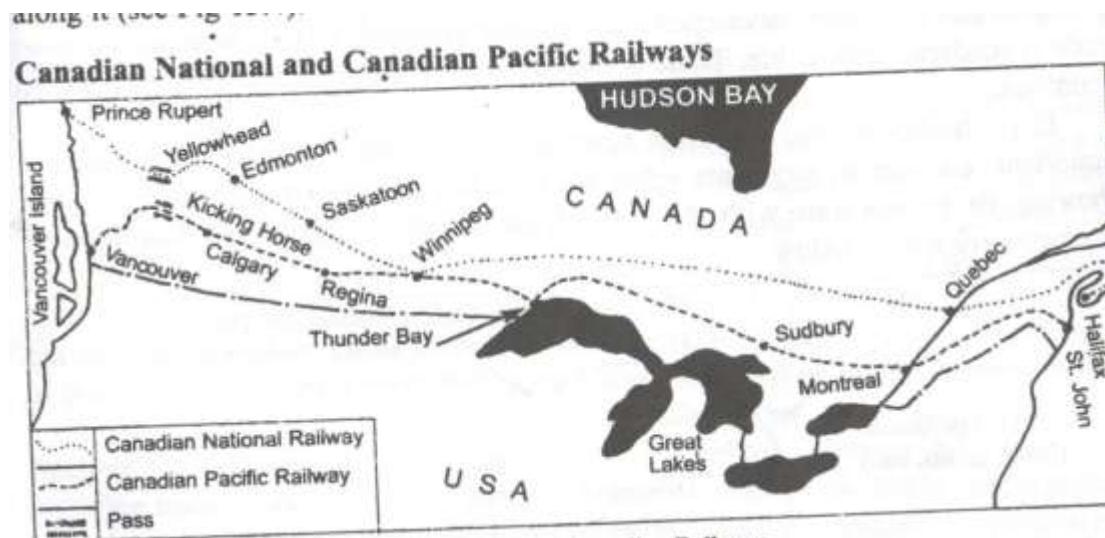


Fig 15.4 The Trans-Siberian Railway

This is 9000Km long. It connects the Siberian and Russian steppes.

II. The Canadian Railway



It is 4800Km long. It has helped in opening of the Canadian prairies where wheat is grown. It helps access to local and international markets.

Distribution of Railways in Africa

Factors That Influence Distribution of Railways in Africa

- Economic development/activities
- Fuel availability
- Meteorological occurrences such as floods, landslides and sandstorms make construction of railways very difficult
- Topography-railways require fairly flat topography.
- Thick forests also makes railway construction difficult

In Africa railway distribution is influenced by deserts, highlands, thick forests and economic activities.



Fig 15.2 Distribution of railways in Africa

1. North East Africa

Highlands and deep valleys affect railway network construction.

2. North Africa

There is low railway network due to:

- The Sahara Desert which is affected by sandstorms
- Low agricultural productivity due to infertile soils
- Low populations due to harsh climate and poor soils

3. Central Africa

There is low rail network in central Africa due to:

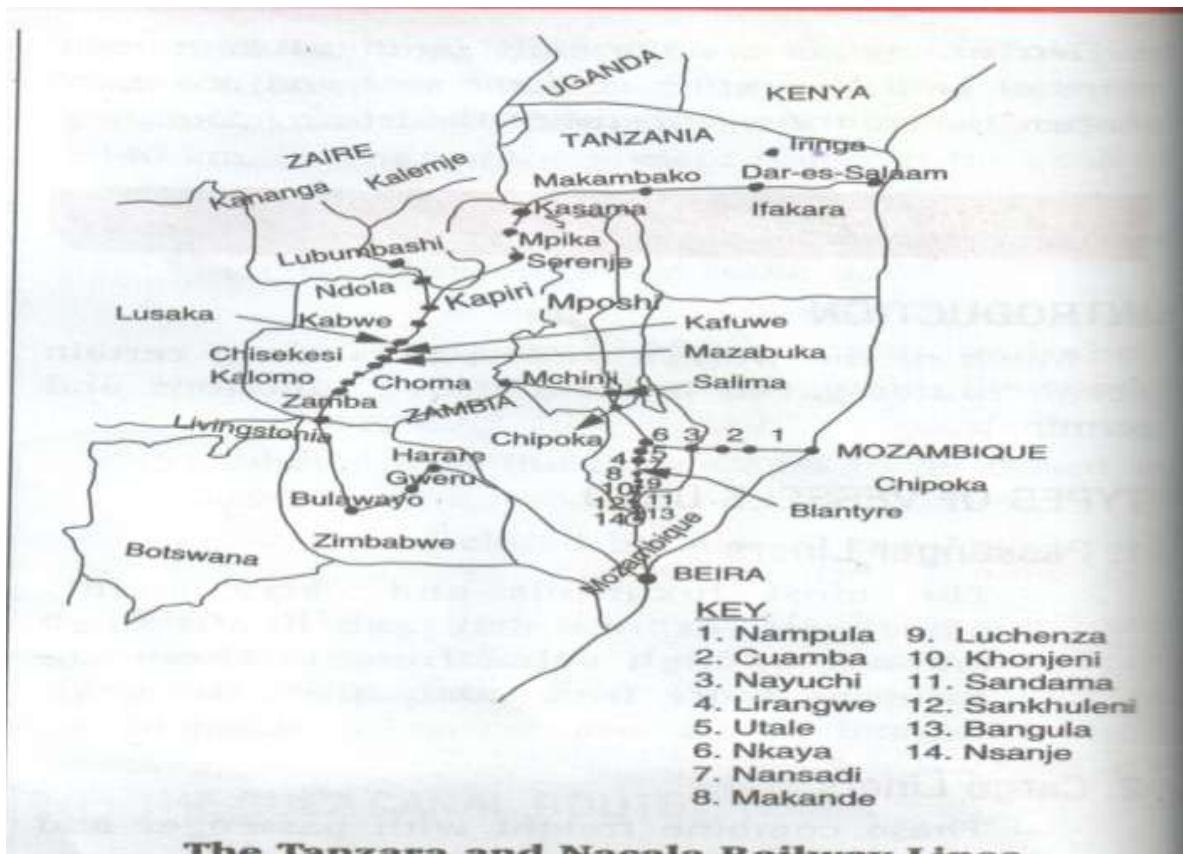
- i. Low degree of economic activities
- ii. Low productivity
- iii. Frequent landslides
- iv. Relief-presence of highlands limit development of railway networks

4. Southern Africa

It has highest railway network in Africa because:

- i. There is a high degree of economic activities such as agriculture and mining.
- ii. There is generally flat topography

Main Railway Networks



i. Tanzania-Zambia Railway Line (TAZARA)

It runs from the port of Dar-es-Salaam in Tanzania, through Iringa, and Mbeya to the Zambian railway system at Kapirimposhi. It serves the copper mining areas of Zambia and Democratic Republic of Congo.

The goods transported: petroleum products and manufactured products

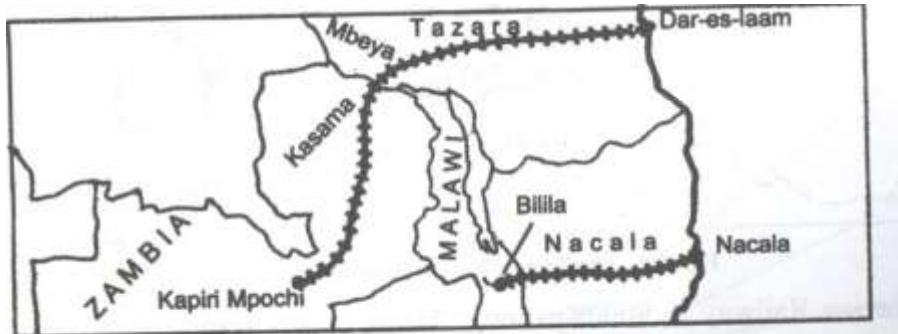


Fig 15.6 Nacala and Tazara Railways

--- Railways from Bilila in Malawi to Nacala port in Mozambique,

ii. Nacala and Beira Railway Lines

These serve landlocked Malawi and neighbouring countries. Goods from Malawi, Zambia, Zimbabwe, Mozambique and South Africa are tobacco, cotton, tea and sugar.

Goods from Zambia to Zimbabwe are lime for decorating buildings and gypsum for cement making.

Importance of the Nacala and TAZARA Railway Lines to Zambia, Malawi and Tanzania

- Promotes trade by transporting both raw materials and finished goods
- Trade facilitated by the railway lines contributes to development of the three countries

TRADE

This is the buying and selling of goods and services. A country cannot produce all the needs of its population. It has to buy some things (**imports**) from other countries. It also has to sell some things (**exports**) to other countries. To improve their standard of living countries produce more and export more and import less to have a favourable balance of trade.

Factors that influence the type of trade of a particular region

- Presence of natural resources such as minerals and petroleum
- Degree of industrial development, for example, South Africa manufactures several products
- Geographical position of countries
- High tariffs and import duties reduce trade among countries

Countries can come together and form groups to create a free trade area by reducing tariffs between member countries. Examples such groups include COMESA, SADC and ECOWAS.

REGIONAL TRADE GROUPINGS IN AFRICA

1. Common Market for Eastern and Southern Africa (COMESA)

It was founded in 1981 as Preferential Trade Area (PTA). It was launched in Uganda as COMESA in 1993. Member states include: Angola, Burundi, the Comoros, DRC, Djibouti,

Ethiopia, Eritrea, Kenya, Zimbabwe, Lesotho, Mozambique, Mauritius, Malawi, Rwanda, Seychelles, Somalia, Sudan, Swaziland, Tanzania, Uganda, Zambia and Madagascar.

Objectives of COMESA

- a. To promote trade among member states by reducing custom duties and removing tariffs
- b. To improve the volume of trade and investment among members
- c. To promote cooperation and development in trade and industry
- d. To promote peace and justice among member states

2. Southern African Development Community (SADC)

It was formed in 1979 and launched officially in Zambia in 1980. Members include: Angola, Botswana, Lesotho, Malawi, Mozambique, DRC, Namibia, Swaziland, South Africa, Tanzania, Zambia, Zimbabwe, Mauritius and Seychelles.

Objectives of SADC

- a. To facilitate trade in member states
- b. To ensure international cooperation among member states
- c. To help member states mobilize resources for the benefit of the region in areas such as hydro-electric power, forestry and fisheries.
- d. To promote social economic development by improving transport and communication among member states
- e. Ensure sustainable use of natural resources
- f. Encourage employment opportunities
- g. Develop common political values such as rule of law and good governance

3. Economic Community of West African States (ECOWAS)

It was formed in 1976. Members are as follows: Chad, Ivory Coast, Senegal, Ghana, Mali, Nigeria, Burkina Faso and Sierra Leone.

Objectives of ECOWAS

- a. To develop a common market among member states by removing trade barriers such as eliminating tariffs
- b. To bring about free movement of people by removing visa requirements
- c. To promote regional development and cooperation in fisheries, agriculture, manufacturing industry, energy, transport and telecommunications

Importance of Regional Trade Groupings

- a. They promote trade by reducing barriers to trade such as reduction of tariffs and import duties.
- b. They promote cooperation among member states as disputes may be resolved by the regional grouping
- c. They provide big domestic markets to member states
- d. They encourage rational division of labour and specialization of production among member countries

- e. There is full political and economic union achieved through proper industrial planning. Different member states are assigned different and specific industries.

TOPIC NINE: THE ENVIRONMENT

Ecology: the study of mutual dependence and interaction among organisms and their surroundings.

Ecosystem: all living organisms and their physical, biotic and non-living things.

Environment: the surroundings made up the biotic (living) and non-living things.

Endangered Wild and Aquatic Life Species

These are species that are facing the danger of extinction. The examples include: chambo fish, elephants, nyala and rhinoceros.

Activities Endangering Wild and Aquatic Life Species

- i. Poor farming Practices: such as shifting cultivation, pastoral nomadism may lead to destruction of natural habitats for the endangered species.
- ii. Deforestation: careless cutting down of trees destroy habitats for wildlife
- iii. Misuse of pesticides: destroy animal habitats and kill aquatic animal habitats when discharged in water.
- iv. Pollution: this happens especially poisonous waste is disposed of in water or use of poisonous herbs when fishing. This destroys aquatic species. This may lead to their extinction.
- v. Careless bush fires: leads to destruction of habitats of some species and may lead to their extinction.
- vi. Overfishing: leads to depletion of some fish species. For example the population of chambo fish is declining rapidly due to overfishing, it may become extinct.
- vii. Poaching: this is the illegal killing of protected wildlife. This may lead to extinction of some species.
- viii. Drainage of marshes and swamps: this destroys habitat for some aquatic species

Ways of Conserving Wild and Aquatic Species

- a. Establishment of conservation areas such as national parks, forest reserves, game reserves, etc.
- b. Catching game where they are facing extinction or they are overpopulated and relocating them elsewhere.
- c. Protection of rare and endangered species
- d. Civic education on conservation

Importance of Wild and Aquatic Life Species

- a. Promote tourism which brings foreign exchange
- b. Source of food-fish and wild life which provide proteins, calcium and other nutrients
- c. Source of income after selling game or fish
- d. They bring ecological balance

WETLANDS

This refers to swamps, marshes and bogs.

Wetlands in Malawi

- Ndindi and Elephant Marshes
- Lake Chilwa
- Vwaza Marsh

Importance of Wetlands

- a. They are producers of life for they provide feeding, spawning and nursery for fish
- b. They stabilize shorelines
- c. They lock carbon in form of peat hence reduce global warming
- d. They are a habitat for birds, endangered plant and fish species
- e. They beautify the environment, providing grounds where biological studies and recreational observation can take place.
- f. They filter and absorb pollutants that would degrade rivers and lakes thus providing clean water.

Threats to Wetlands

- a. Encroachment-as people drain them for farming

Effects of Draining Wetlands

- a. Lowers quality of water-there is less filtration as pollutants reach water bodies
- b. Increased flooding-wetlands hold back water or run-off
- c. Extinction of some plant and animal species

Management of Wetlands

By Govt

- Civic educating of people living near and where people drain wetlands
- Civic education to control population growth
- Passing laws to protect wetlands

By Individuals

- Avoid encroachment of wetlands

By Communities

- Joining hands in protecting wetlands by punishing those who encroachment
- Civic education

DESERTIFICATION

This is process that turns good and fertile land into barren and unproductive land.

Causes of Desertification

- Deforestation
- overgrazing

Problems of Desertification

- a. Disturbs the hydrological cycle since the rate of transpiration is tampered with. This may lead to drought and famine.
- b. Prevents regeneration of various valuable species-this degrades forests
- c. Causes land slides
- d. Encourages soil erosion which leads to silting of water bodies and flooding
- e. Leads to climate change
- f. Poor crop yields

Control of Desertification

- a. Afforestation and re-forestation
- b. Proper land husbandry
- c. Civic education
- d. Controlling rapid population
- e. Provision of alternative sources of energy.
- f. Use alternative sources of energy to firewood and charcoal

POLLUTION

This is the undesirable change to the environment caused by a harmful substance.

Pollutant: A substance that causes harm to the environment such as fumes, plastics, oil, pesticides and dust.

1. Air Pollution

This takes place when air is filled with pollutants that affect its quality.

Causes of Air Pollution

- a. Removal of Vegetative cover: vegetation purifies air by using carbon dioxide during photosynthesis
- b. Emissions from motor vehicles and industries. They emit pollutants such as carbon monoxide, nitrogen oxide and sulphur oxide.
- c. Poor waste disposal through burning
- d. Noise pollution-air is the medium of sound

Effects of Air Pollution

- a. Respiratory diseases such as bronchitis, asthma and colds
- b. Poor visibility-when smoke combines with fog to form smog
- c. Odour-bad/foul smells
- d. Acid rain-gases dissolve into nitric and sulphuric acid in the atmosphere. The acids kill off fish in lakes and rivers. It also kills off vegetation.

- e. Global warming-releasing of greenhouse gases like carbon dioxide leads to global warming

Ways of Reducing Air Pollution

- a. Use clean sources of energy
- b. Strict regulations on air pollution
- c. Burying of wastes rather than burning
- d. Civic education on causes and effects of air pollution

Water Pollution

This is the contamination of water.

Causes of Water pollution

- a. Domestic and industrial wastes: lead to water borne diseases and poisons aquatic life.
- b. Agricultural chemicals may lead to water pollution
- c. Oil spills-deprive aquatic animals of air as they suffocate

Effects of water Pollution

- a. Loss of aquatic life
- b. Diarrhoeal problems
- c. Scarcity of safe and portable water.

Ways of Controlling Water Pollution

- a. Proper waste disposal –not in water bodies
- b. Sewage treatment
- c. Ban the use of harmful chemical substances
- d. Legislation and laws to control water pollution such as penalties

Land Pollution

Causes of land Pollution

- a. Poor waste disposal on land
- b. Nuclear testing which is hazardous

Effects of Land Pollution

- a. Loss of biodiversity as organisms lose life in the soil.
- b. Visual pollution as litter damages the beauty of land.

Ways of Controlling Land Pollution

- a. Proper waste disposal
- b. Avoid doing nuclear tests on land

TOPIC NINE: CLIMATE CHANGE

Climate is changing all over the world. The main aspects of climate that have visibly changed are temperature and rainfall. Climate change is the gradual change of climate from one type to another caused by changing weather patterns.

Causes of Climate Change

a. Deforestation

This is caused by careless cutting down of trees due to rapid population increase. Destruction of forests disturbs the hydrological cycle due to reduction in transpiration. This leads to drought and famine. Plants also remove huge quantities of carbon dioxide from the atmosphere through photosynthesis and release oxygen. Destroying plants may lead to accumulation of carbon dioxide in the atmosphere which leads to global warming

b. Emission of Greenhouse Gases

The release of gases such as carbon dioxide, methane, nitrous oxide and chlorofluorocarbons (CFCs) into the atmosphere may lead to destruction of the ozone layer by reacting with the ozone gases hence creating holes in the ozone. This causes dangerous rays of the sun to reach the earth also leading to global warming. The greenhouse gases also trap the heat from the sun by preventing it to be reflected back into the atmosphere leading to global warming.

c. Desertification

Desertification occurs due to careless removal of plants. This brings arid or dry conditions.

Effects of Climatic Change

1. Global Warming

This is the warming up of the earth due to inability of heat to escape into space. It is caused by greenhouse gases such as methane, carbon dioxide, chlorofluorocarbons and nitrous oxide. The gases cause global warming in the following ways:

- i. They react with ozone layer gases which create holes through which dangerous rays (x-rays, gamma rays and infra-red rays) from the sun pass. These rays warm the earth surface hence global warming.
- ii. They trap heat radiation from the earth surface by reflecting it back to it causing global warming.

Global warming leads to:

- i. Melting of glaciers causing sea levels to rise resulting in flooding especially in low lying areas
- ii. Hot areas becoming hotter leading to desertification as temperatures go beyond dew point hence no rainfall
- iii. Difference in heating of land and air masses leading to differences in evaporation rates. This causes some areas to receive more rains while others receive little to no rainfall.

2. Increasing Storms

Increase in global warming reduces air pressure in many areas. Air from different places of high pressure converges in low pressure zones creating cyclones. This increases the probability of having increasing storms.

3. Changing Ocean Currents

Temperature influences the direction of ocean currents. Normally ocean warm ocean currents flow from the equator towards the poles and cold ocean currents flow from Polar Regions towards the equatorial belt. With increasing temperatures in the Polar Regions direction of such ocean currents may change.

4. Shrinking of the Antarctic Ice Cap Melting Glaciers

In the Antarctic belt normal temperatures are low leading to formation of ice cap. Due to increasing temperatures part of the ice cap is melting causing the shrinking of the Antarctic Ice cap. This leads to increased flooding.

Solutions to Causes of Climatic change

- a. Civic education-on avoiding deforestation and dangers of releasing dangerous gases in the atmosphere.
- b. Afforestation and re-forestation
- c. Reducing use of fossil fuels by introducing other sources of energy.
- d. Avoid use of machines that release greenhouse gases
- e. Reducing emission of greenhouse gases by international agreements such as the Kyoto Protocol whose aim was to reduce greenhouse gases by 5% by 2015.

