

TOPIC 1 REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEM

Success Criteria

Learners must:

1. Explain the meaning of the term remote sensing
2. Explain the meaning of the term geographical information system
3. Explain aerial photographs, satellite images and recognizing information
4. Explain geographical information
5. Identify relationships among phenomena by analyzing geographical information.

Meaning of the term remote sensing

It is the technique of obtaining information about objects using special equipment that are not in physical contact with the objects being investigated.

Or it refers to the science of acquiring information about an object or a phenomenon using equipment which is not in physical contact with them.

Energy required to detect the target is called electromagnetic radiation. The total amount of energy that strikes an object is called **incident radiation**. Electromagnetic radiation is the energy that travels through space in wave form at a speed of light. The intensity of light being detected is then translated into information that a computer can read.

Electromagnetic wave has two main characteristics such as

a. Frequency

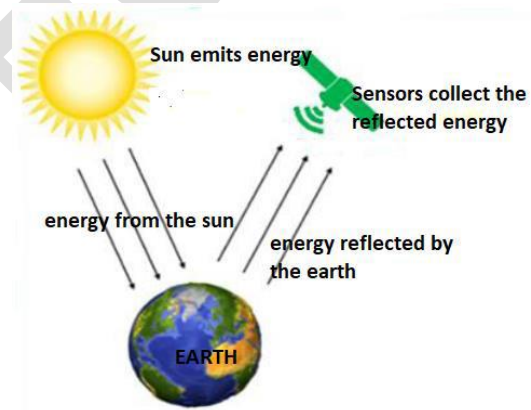
It is a number of wave peaks that pass through a fixed point per unit time.

b. Wavelength

It is the distance between two wave peaks.

NB: Longer wavelength has less energy content as compared to shorter wavelength which contains more wave peaks.

How remote sensing works



- Electromagnetic radiation is produced from the sun and other sources that reach the Earth's surface.
- On the Earth's surface, some energy is absorbed by surface features, some is reflected and the remaining is emitted to remote sensors which analyse, process it to produce sensor data output and transmit it to receivers on Earth's surface.
- Then the satellite images are displayed in computers, TV screens and other devices on the Earth's surface. Satellite

images show information like shape of land, drainage systems and weather phenomenon.

The total amount of radiation that the Earth's surface receives is called **incident radiation**. Sensor is a device that detects emitted electromagnetic radiation from an object. These sensors are mounted on satellites, aeroplanes, helicopters and other equipment.

Electromagnetic Spectrum

It is a range of all forms of electromagnetic waves. Types of electromagnetic spectrum are:

a. Radio waves

- Produced from radio and TV transmitters
- They are the longest wavelengths
- They also carry cellular signals.

b. Microwave radiation

- It is produced from short radio transmitters which are used for cellular communication, satellite communication and in microwave ovens.
- It can be used to provide information like temperature.

c. Infrared Radiation (IR)

- They are produced by warm and hot objects such as sun.
- It cannot be seen with naked eyes, unless you wear vision goggles.
- It is used in remote control devices that we use for TVs in our homes.
- Some snakes have this light to detect their prey.

d. Visible Light

- It is visible light that enables to see things and the colours.
- It is a narrow spectrum that helps us to identify colours.
- It is produced by fireflies, light bulbs and stars.

e. Ultraviolet (UV) Radiation

- It is produced by the sun and other hot objects in space.
- It has shorter wavelength, higher frequency and higher energy than light energy.
- It is only visible by some insects like bees.
- It responsible for causing skin cancer, however it is filtered out by the presence of ozone layer in the stratosphere

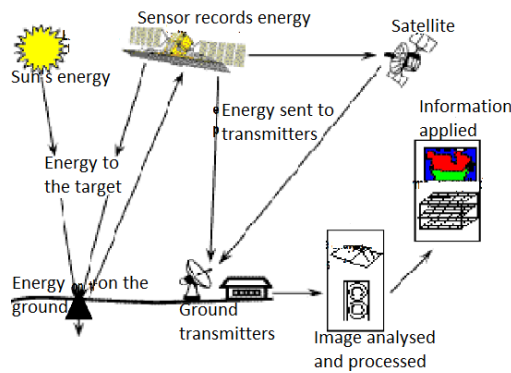
f. X-Rays

- They are produced naturally by neutron stars.
- Artificially, they are produced by x-rays.
- X-rays are used in hospital by doctors to detect broken bones. It is also used at check points to detect the contents of travelers' bags.

g. Gamma Rays

- They are produced by bursting cosmic or astronomic objects in the universe.
- They are used in hospitals to detect the inside the patients' bodies.

Process in remote sensing



Energy interaction with the atmosphere and Earth's surface

- It is reflected off the object
- It is absorbed by the object
- It is transmitted through the object

Basic components of remote sensing

- Sensor: an instrument used to record data such as computerized cameras.
- Platform: a vehicle used to on which the sensor is mounted such as tractors and aircrafts.

Types of remote sensing platforms

a. Land-based platforms

They are used to record detailed information about the surface which is compared with collected information from aircrafts or satellite. Examples include, towers tanks, tall buildings, ladders, tractors and vans.

b. Aerial platforms

They use aircrafts, balloons and helicopters with sensors.

Advantages

- Very detailed images are taken

- It facilitates the data collection at any time and at any point of the Earth's surface.

c. Satellite platforms

- Satellite is any heavenly object that revolves around the planet. For example, moon is the satellite of planet Earth. Artificial satellites are launched in space for remote sensing, communication and telemetry services. Solar panels are used to provide energy the operations of satellites.
- Images sent by satellites are viewed on the computer monitors or TV screens using computer software called **Google Earth** and **Geographical Information Systems (GIS)**.
- Satellites have sensors that react to bands of specific frequency and wavelength. The sensors convert photons falling on electrical signals that are assigned numerical or digital values which are then transmitted receiving stations to the ground. Then, computers on the ground convert them into the readable information or images.

Types of satellite platforms

a. Low Earth Orbits (LEO)

- It is placed at the lowest altitude of about 16km where there is minimum gravitational influence.
- It helps in installing new instruments, fixing broken things and inspecting damages of instruments.

- It orbits the Earth for 9 minutes. It moves very quickly.
- It aids short time visits and experiments in space.

Disadvantages

- Atmospheric drag slows down the satellites.
- It is not effective due to their speed.

b. Geosynchronous Satellites (GEO)

- They are placed at very high altitude of about 36 000km above the sea level.
- It orbits the Earth for 24 hours and remains at the same point above the position above the Earth's surface every day.

Uses

- To monitor weather at one point of the Earth.
- Use for telecommunication services.
- Beam television signals directly into the house. That why a TV antenna points to the same position.

Disadvantages

- It is expensive to launch
- It is not to repair it from the shuttle

c. Geostationary Orbit Satellite Platform

- The satellite remains high above the Equator.
- It remains in the same position where it is always directly above the same spot on the Earth's surface..

d. Highly Elliptical Orbits (HEO)

- They are located at oval orbits which enable them move slowly where they can be useful and quickly where they are of little use.
- It moves faster when it is closer to the Earth than when it is farther away.

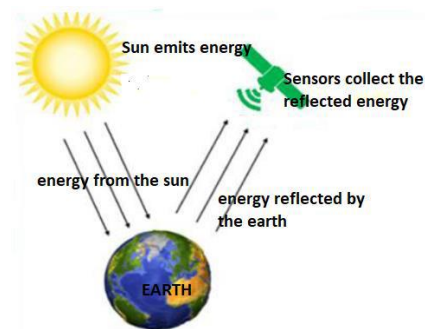
e. Sun –synchronous or Polar Orbiting Satellite Platform

- They are placed near the Earth's surface at the altitude ranging from 700km to 1000km above the sea level.
- They are numerous.
- They travel from north to south poles.
- They are placed in relation to the sun to ensure consistent illumination conditions when acquiring images.

Types of remote sensors

a. Passive sensors

- It detects radiation energy that is reflected or emitted by the object under observation.



It is used during daylight. Types of passive sensors include the following:

1. **Gamma-ray spectrum:** it measures the amount of gamma – ray energy emitted by upper soil due to radioactive decay

minerals. It is used for mineral exploration.

2. **Aerial camera:** it mounted on aeroplanes and low orbiting satellites to take aerial photographs.

3. **Our eyes:** we capture light energy and converts into images.

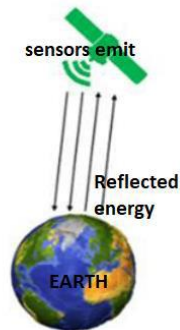
b. Active sensors

They provide their own source of energy to detect objects. Some types of active sensors are:

1. LIDAR (Light Detection and Ranging)

It is a technology that measures distance by illuminating a target with a laser light and analyzing the reflected light. It combines the distance with location to build an image of a terrain composition.

2. RADAR (Radio Detection and Ranging)



This device uses reflected radio waves to detect to determine the presence, location and speed of distant objects.

Uses

- **It is used for air traffic control:** to guide planes upon take off and landing. It also helps to track

down other planes on the ground and in the air.

- **It is used by the military** to detect the position of enemies and guide the weapons.
- **It is used for road traffic control** for speed trap.
- **It is used for weather forecasting** for detecting storms and rains.

3. SONAR (Sound Navigation Ranging)

This device uses sound to detect the position of objects underground or in water by transmitting sound waves and measuring time for an echo to come after hitting an object.

Geographical Information System (GIS)

Meaning of GIS

It is a computer-based mapping tool that can show where particular events, features or conditions are on Earth and give other information about them as well.

It is used for map making and show different types of data one set of data is layered on top of each other that show spatial patterns and relationships such as elevation, drainage system, amount of precipitation and mineral reserves.

Components of GIS

a. Appropriate hardware

It includes computer with large memory capacity, video and hard disk storage space.

b. Appropriate software

It provides the functions and tools that people need to store, analyse, manipulate and display information. It is easy to make maps showing different information for a particular area.

Properties of good GIS mapmaking software

- Ability to enter and work with land features and information such as names and location of features or places.
- **Database management system** to organize and manage information.
- **A map creator** to make maps easily viewed, rational and simple to interpret and analyse.
- Simple and usable graphical interface (**GUI**). For more accessible software to users.

c. Data

It is the information that you want display on the map. The two types of data are:

i. Spatial data

It is information about ground features such as roads, political boundaries, rivers, forests, buildings and towns.

ii. Attribute data

It shows information on the area of interests like population concentration or density and land use patterns..

d. People

GIS requires people with very high technical skills (in **ICT**) who understand

how GIS works and have knowledge about data being searched.

Aerial photographs, satellite images and recognizing information

Photograph is an image or picture created by a camera. There are **ground-level** and **aerial** photographs.

Aerial Photograph

It is a photograph which is taken high up in the air by aeroplanes or satellites.

Difference between maps and aerial photograph

Map	Photograph
<ul style="list-style-type: none"> • It is true to scale 	<ul style="list-style-type: none"> • It is not true to scale. Scale is reduced with distance from camera.
<ul style="list-style-type: none"> • Maps show features only put by map makers 	<ul style="list-style-type: none"> • Pictures include a lot of details of which some are not required
<ul style="list-style-type: none"> • Maps take a long time to draw 	<ul style="list-style-type: none"> • Aerial photographs can be taken within a short period of time
<ul style="list-style-type: none"> • Maps have labels and symbols that represent real ground features 	<ul style="list-style-type: none"> • Aerial photographs do not have names of places and heights of places
<ul style="list-style-type: none"> • It is easy to 	<ul style="list-style-type: none"> • Features are

interpret ground features on maps using symbols and signs

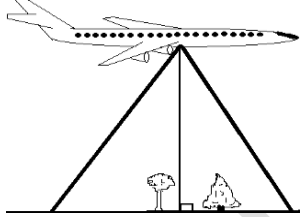
difficult to identify and interpret without symbols

- Maps show only those features that are important for the purpose of the map.
- Photographs show a lot of detail viewed through the camera.

Types of Aerial Photographs

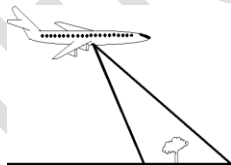
i. Vertical Aerial Photograph

It is taken at the right angle to the ground. There is no hidden ground. There are also two types of oblique photographs such as high and low oblique.



ii. Oblique Aerial Photograph

It is taken at an inclined angle to the ground. It has hidden ground and the landscape is not true to scale because pictures near the camera look bigger than those away from the camera.



There are two types of oblique aerial photographs such as **low oblique** and **high oblique aerial photographs**.

High oblique shows horizon while low oblique does not show horizon.

Uses of aerial photograph

- It helps cartographers to make maps

- It helps to determine land use and environmental conditions.

Satellite Images

- Satellite is a man – made object that is placed in orbit around the earth or planet in order to collect and transmit information.
- Satellite image is the image of the whole or part of the earth taken by artificial satellites. They are photographs of the earth from space.
- The modern technique of observing the earth space using satellite sensors and aircraft cameras is called **remote sensing**. **Remote sensing means** sensing things from a distance.
- Aerial photographs and satellite images are used by **cartographers** to make maps.
- **Cartography** is the art of making maps; therefore, cartographers are the map makers.
- Computer software used to view satellite images of the earth is called **Google Earth**. This allows people to zoom and glide over the photographs of the earth's surface and explore every part of the earth.

Differences between satellites images and aerial photographs

- Aerial photographs have better resolution while satellite images have poor resolution as they are taken very far and disturbed by weather conditions.
- Aerial photographs are taken at a lower altitude while satellite images are taken from above the atmosphere in space by satellites orbiting the earth.
- Aerial photographs are taken by cameras in aeroplanes, drones or balloons whereas satellite images are taken and recorded by electronic scanners mounted on satellites in space.

Advantages of Satellite Images

- Large amount of data is collected within a short time.
- Information collected does not recognize international boundaries hence there are no delays in collecting data.
- The data can be taken from areas where it is difficult to reach e.g. deep seas
- Promote human security as it is used by the army.
- Forms a basis for research.

Disadvantages of Satellite Images

- Since are taken from space, they are disturbed by weather changes such as clouds.
- There are low quality pictures since they are taken from very far from the ground.

Applications of Aerial Photographs and Satellite Images

- Used by cartographers to make maps.
- In archaeology, these are used for locating minerals under the ground.
- Town planners use them in urban studies to develop and locate infrastructure, roads and new facilities.
- In climate, these are used for detecting climatic hazards such as droughts, floods

Uses of GIS and remote sensing

1. They are used in environmental impact assessment
2. They are used by the law enforcement agencies to identify crime hotspots.
3. They are used in the military operations for attacking and defensive purposes.
4. They are used for disaster management purposes.
5. They help in making good natural resource management plans and policies that control the use of natural resources.

6. They help in urban planning by providing.
7. They provide information about farming areas, insect pests, crop diseases, fire, flooding and environmental issues.
8. They help doctors to identify the disease outbreaks and the causes.
9. They are used for water, road and air transport control
10. They are used in business management to promote the marketing functions like advertisements.
11. They are used to monitor weather phenomenon.

Other technologies related to GIS

a. Desktop Mapping

It is computer software that supports the creation of thematic maps of diverse application.

b. Database Management System (DBMS)

It is a computer program designed to large set of structured data and run operations on the data requested by numerous users.

c. Remote sensing

It is art and science of making measurement of the Earth using sensors which collect data.

d. Global Positioning System (GPS)

It is a worldwide global navigation system that provides information from the orbiting satellites. GPS is used to detect position, speed of moving objects and depth of places among others.

Google Earth

Relationships among phenomena by analyzing geographical information

GIS helps to understand the relationship that is there which helps in the following areas:

- It is used by policy makers to identify the source of threats to the environment.
- It helps to monitor rainfall patterns
- It assists in mapping the resource locations in an area.
- It also assists in planning of communication routes.
- It helps in studying agriculture and environmental degradation.

- It helps to monitor wildlife migratory patterns.

Uses of GIS and remote sensing

- It is used for mapping large scale fires
- It helps to explore mineral deposits under the ground.
- It helps to explore and study the floor and marine features.
- It is used in checking and monitoring elements of weather such as clouds.
- It helps in monitoring geological activities and natural disasters.

TOPIC 2 WETLANDS IN MALAWI

Success Criteria

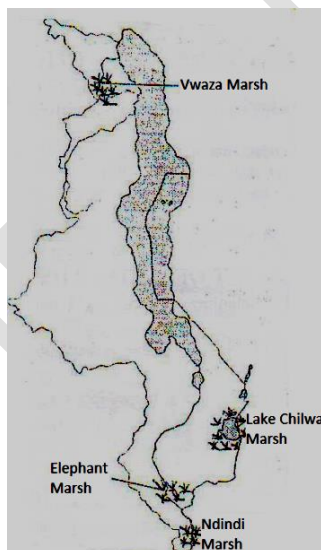
Learners must:

1. Explain the term *wetland*
2. Locate wetlands on a map of Malawi
3. Describe the flora and fauna of wetlands
4. Explain the importance of wetlands
5. Explain human activities that threaten wetlands
6. Explain strategies for managing wetlands

Wetland refers to an extensive low lying land which is seasonally waterlogged. It is also called swamp, marsh or bog.

Examples of wetlands in Malawi:

- Vwaza Marsh
- Ndindi Marsh
- Elephant Marsh
- Lake Chilwa Marsh.



Importance of Wetlands

- They are habitat for birds and other endangered species.

- They control flooding by holding excessive rain water temporary before it joins the main water body.
- They prevent water pollution by:
 - Filtering out sediments
 - Absorbing pollutants
 - Filtering pollutants.
- They beautify the environment.
- They provide a ground for scientific studies and research.
- They are good place for spawning, breeding and nursery for fish.
- They reduce the impact of global warming by locking up carbon and preventing it from entering the atmosphere.

Human Activities that Threaten Wetlands

- Draining wetlands for crop cultivation and settlements
- Deforestation
- Construction of dams and water diversion structures that keep wetlands dry.
- Dumping wastes into the wetlands that endanger life there.
- Mining

- Climate change: prolonged drought and excessive evaporation deplete water resources.

Strategies for Managing and protecting Wetlands

- Declaring wetlands as protected areas by law, e.g. Vwaza Marsh Game Reserve.

- Afforestation and reafforestation in deforested wetlands.
- Making and enforcing laws about the protection of wetlands to avoid encroachment into
- Practicing proper land husbandry practices.
- Providing public awareness on the importance of conserving wetlands

TOPIC 3 WILDLIFE IN MALAWI

Success Criteria

Learners must:

1. Explain the meaning of the term *wildlife*
2. Identify wild life reserves in Malawi
3. Explain the importance of wildlife in Malawi
4. Describe activities endangering wildlife in Malawi
5. Identify conservation measures of wildlife species

Wildlife refers to animals and plants that live in natural undomesticated state. They are not tamed by people. They include:

1. **Birds (Guinea fowls)**
2. **Mammals** (antelopes, rhinos, elephants, lions, leopard, buffaloes, hyenas, monkeys).



3. **Reptiles (lizards, alligators).**



4. **Snakes**
5. **Insects**
6. **Aquatic animals (fish)**
7. **Amphibians (frogs)**
8. **Micro – organism**
9. **Trees, e.g. Mulanje cedar**

Wildlife Habitat

Wildlife habitat refers to physical environment where animals live and get the

necessities of its life. The wildlife habitats include the following:

- a. Lakes and rivers
- b. Forest
- c. Wetlands
- d. Nature sanctuaries
- e. National parks
- f. Game reserves

Importance of wildlife

- They provide nutritious food to people.
- Plant and animal resources provide raw materials. E.g. timber for making furniture.
- Wild plants and animals are used for manufacturing of medicine.
- Plant and animal materials provide medicine.
- Forests are good sites for scientific studies and investigations.
- They are of high aesthetic value which attracts tourists and bring money to the country.

Wildlife Reserves in Malawi

- a. **National Parks**
Nyika National Park
Kasungu National Park
Liwonde National Park

Lengwe National Park
Lake Malawi National Park

b. **Game Reserves**

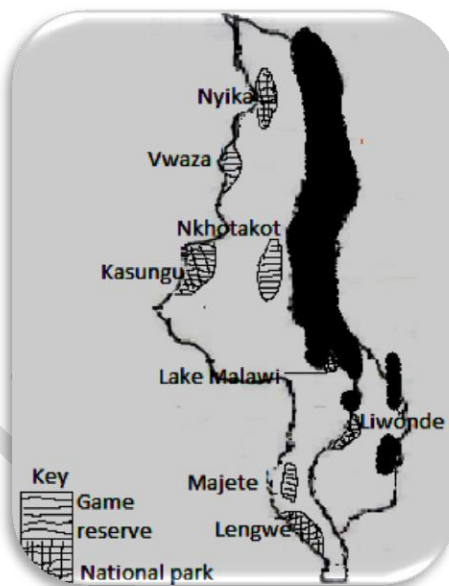
Nkhotakota Game Reserve
Vwaza Game Reserve
Majete Game Reserve
Mwabvi

c. **Nature sanctuaries**

- Lilongwe Nature Sanctuary
- Michiru Nature Sanctuary

d. **Forest reserves**

Dzalanyama Forest Reserve in Dedza
/Lilongwe
Chikangawa Forest Reserve in Mzimba
Chongoni Forest Reserve in Dedza
Ntchisi Forest Reserve



Endangered Species

It is a population of plants or animals which is at a risk of complete extinction because it either small in number or threatened by changing environmental conditions.

Examples of Endangered Species

- Aquatic Species:** Hippopotamuses, birds and other fish species like chambo, cichlids (mbuna fish) tooth fish, cod, sharks, whales and Whales.
- Wildlife Species:** golliras, leopards, lion, tiger, rhinoceros, eagles and other birds. This also includes other plant or tree species like muwanga and naphini.

How Human Activities Endanger Wildlife Species

- They destroy food and habitat of wildlife
- They kill plants and animals themselves.
- They deplete soil moisture

Human Activities that Endanger Wildlife Species

- Overfishing
- Deforestation.
- Setting bushfire.
- Drainage of wetlands.
- Deforestation.
- Poor farming methods that encourage soil erosion.
- Poaching.
- Expanded farming and settlement.
- Destruction of physical habitat.

Natural Factors that Endanger Wildlife Species

- Geological disasters like volcanoes and earthquakes.
- Climate change that alter ecological balance.
- Wildlife overpopulation that animals compete for space, food and water.
- Poor environmental conditions that fail to support the living organisms, such as inadequate food.

Possible Solutions to Endangered Species

- Making laws to prohibit hunting, transporting and trading animal plants and products of endangered species.
- Establishing protected areas like national parks and game reserves.
- Afforestation and reafforestation in order to restore the habitat and food of wildlife.
- Providing public awareness on the importance of wildlife.
- Afforestation and reafforestation.

Ways of Preserving Endangered Species

- Protecting rare plant and animal species.
- Establishment of conservation areas such as national park and game reserves.
- Catching game where they are prone to extinction or overpopulated and relocating them elsewhere.
- Civic education on environmental management.

- 1Legislating and enforcing policies that protect environment.

Reasons for Preserving Endangered Species

- They improve and maintain ecological balance.
- They provide medicine
- They modify climatic conditions by cleaning air and contributing to hydrological cycle.
- They beautify the countryside that attract tourists.
- They provide food to human beings.

Wildlife Conservation Efforts

- Declaring the world environmental commemoration days by the United Nations, e.g. World Water Day.
- Establishing environmental conservation clubs such as Wildlife Clubs and Village Beach Committees.

TOPIC 4 WASTE MANAGEMENT

Success Criteria

Learners must:

1. Explain the meaning of the term *waste*
2. Identify different types of wastes
3. Explain the effects of poor waste disposal
4. Discuss the term *waste management*
5. Identify strategies for managing wastes
6. Discuss the importance of managing waste

Meaning of Waste

Waste is any unwanted material that has been discarded by its user.

Types of Wastes

Wastes are classified into groups based on **source** and **properties**.

Types of Wastes Based on Sources

a. Municipal wastes

They come from homes, markets, streets and other public places such as garbage, plastics, metals, pieces of glass and rags.

b. Industrial wastes

They come from companies and factories such textiles, breweries, petroleum industries, food processing industries, cement industries and plastic manufacturing industries.

c. Construction and demolition wastes

They are debris that comes from the construction and demolition of various infrastructures such as metals, glasses wood, concrete and excavated soil.

d. Agricultural wastes

These are crop residues, animal remains and empty pesticides containers.

e. Clinical or medical wastes

They are waste from hospitals or health centers such as blood from patients, surgical tools, used bandages and cotton wool.

Types of Wastes Based on Properties

a. Biodegradable wastes

They are wastes that can decompose by means of bacteria. They include fruit peels, wood, food remains, sewage and human wastes.

b. Non-degradable wastes

They do not decompose and be dissolved into the soil. Examples include plastic papers objects, tin cans, scrap metals and remains of household appliances.

c. Hazardous wastes

They are wastes that are toxic to people, animals and general environment such as nuclear waste, pesticides, explosives and electronic waste.

d. Non-hazardous wastes

They are beneficial and can be reused, such as food remains, papers, crop residues and rags.

Waste Management

Waste management refers to the activities that deal with waste before and after it is used as well as its minimization, transfer, storage, recycling and final disposal.

Ways of Managing Wastes**a. Prevention or Reduction**

It means eliminating or using less quantities or amounts of resources so as to reduce amounts of wastes. E.g. one must use handbags for shopping instead of buying plastic bags that litter everywhere.

b. Re-using

This means using the same product for repeatedly either for the same or different purpose. For example, discarded bottles can be used for storing other liquids.

Advantages of Re-using

- It is cheap as it requires less energy, labour and capital.
- It does not need treatment that causes pollution.
- They substitute natural resources which help to conserve natural environment.
- It is cost saving for customers and business.

Disadvantages of Re-using

- It is time-consuming to sort and prepare the materials.
- Transporting and cleaning the materials have environmental costs.
- Some materials are hazardous to human health.

Disadvantages of Re-using

- Recycling of products is very expensive since it requires energy.
- Recycled products are not durable.
- Wastes can easily spread diseases due to lack of proper handling.

c. Recycling

It means processing or treating wastes to make them usable in future. E.g. paper recycling is a good example.

Advantages of Recycling

- It helps to reduce pollution.
- It helps to conserve resources for next use.
- It provides jobs to some people.
- Recycled materials are cheap.
- It helps to reduce the amount of wastes which minimizes the need for more landfills and incinerators.

d. Resource recovery

It involves extracting more valuable resources from wastes which can later be recycled. For example, some can be used to produce energy.

e. Incineration

It is the process of destroying or disposing of hazardous wastes by burning. Biological medical wastes are destroyed in this way. Incinerators are constructed like inn hospitals.

Advantages of Incineration

- It reduces the bulk of wastes from environment.
- Wastes are used to produce energy during burning.
- Incineration helps to destroy disease – causing organisms and poisonous chemicals.

Disadvantages of Incineration

- Incineration destroys important wastes that would be recycled.
- Incinerator locations produce bad smell.
- Building of incinerators is very expensive.
- Operation and maintenance of incinerators require skilled personnel.
- Ash from incinerators contains toxic substances which pollute the environment

f. Landfill

It involves disposing of wastes by burying or excavating them into the ground. It is commonly and traditionally used in homes and industries.

Ministry of Local Government through the **City Engineer Department** provides the City Cleaning Services. The department identifies the landfill sites. Already established landfill sites in the cities include:

a. Lilongwe

Mchinji Road Landfill
Area 38 Landfill
Area 55 Landfill

b. Blantyre

Mzedi Landfill

c. Zomba

Chikowi Landfill
Songolo Landfill

d. Mzuzu

Mchengautuwa Landfill

Advantages of Landfill

- It is relatively cheap.
- The wastes can be reused for energy production.
- Landfills can be for the production of compost manure.
- Landfills have specific location which can easily be monitored.

Disadvantages of Landfill

- Dangerous liquids that flow from landfills pollute the surrounding water and soil resources.
- Poisonous gases generated from landfills contribute to greenhouse effect.
- Landfills occupy land that would be used for other purposes.
- Landfills harbor dangerous and disease – causing organisms such as mosquitoes and houseflies.

Importance of Proper Waste Management

- It enhances public health by eliminating hazardous wastes.
- Some wastes can be turned into organic manure.
- Transporting, recycling and collection of some wastes provide employment to people.
- It helps to maintain clean and attractive environment.

- It helps to prevent pollution in the environment.

Challenges of Waste Management in Developing Countries

- Lack of funding from government to remove and manage wastes in cities and towns.
- Local authorities lack capacity to monitor and enforce regulations about waste management.
- Rapid urbanization which increases consumption and releasing of energy.
- Lack of knowledge on waste management.

TOPIC 5 RESPONSES TO CLIMATE CHANGE

Success Criteria

Learners must:

1. Identify climate change mitigation and adaptation initiatives in Malawi
2. Explain other climate change mitigation and adaptation initiatives
3. Describe policies, measures and instruments to mitigate and adapt to climate change in Malawi
4. Identify international agreements on climate change
5. Explain the challenges and benefits of the international climate change agreements
6. Explain ways of promoting climate change mitigation and adaptation initiatives at community level

Climate change brings about negative effects on the livelihoods. Some of the effects include global cooling and global warming, heavy storms, floods, frequent drought, outbreak of diseases and insect pests. These challenges disrupt the human activities on Earth and the quality of life. Therefore it is needed to take a step in to come up with climate change mitigation and adaption initiatives in order to maintain and improve the quality of nature.

Mitigation means actions or efforts that are aimed at reducing the harmful human activities that cause climate change. It involves preparing or planning for the next climate change problems such as floods.

Climate change adaptation refers to people's efforts to reduce the impact of climate change on vulnerable communities and their livelihoods.

Climate change mitigation and adaptation initiatives in Malawi

a. The National Environmental Policy (NEP)

It aims at reducing the emission of greenhouse and encouraging various stakeholders to reduce the impact of climate change.

b. The Malawi National Strategy on Sustainable Development (MNSSP)

It helps to reduce the damage caused by the effects of climate change. It also promotes sustainable industrial development.

c. The National Biodiversity Strategy and Action (NBSA)

It focuses key biodiversity issues and various intervention programmes by various stakeholders.

d. The National Adaptation Programme of Action (NAPA)

It helps to reduce vulnerability of communities to adverse effects of climate change and increase adaptability to climate change by:

e. The Malawi Government and Development Strategy (MGDS)

It deals with disaster management and climate change.

Other climate change mitigation and adaptation initiatives

- Countries are promoting afforestation and bio-fuel plantation programmes.
- The Malawi Government is promoting the development and use of renewable energy resources such as water, wind and sun.
- Promoting the use of low-cost modes of public transport instead of large buses.
- Integrating issues of climate change into the school curriculum to raise awareness to the public.
- The government is promoting family planning in order to reduce pressure on natural resources.

Policies, measures and instruments to mitigate and adapt to climate change in Malawi

a. National Environmental Policy (NEP)

It aims at reducing the adverse impact of climate by targeting on emission of greenhouse gases and air pollution.

b. The Malawi National Strategy on Sustainable Development

It aims at reducing the damage and loss of life caused by natural disasters as well as providing concrete actions for implementing NEP.

c. The National Biodiversity Strategy and Action Plan

It targets key biodiversity issues. It ensures monitoring, recovery and conservation of biodiversity that help to support local community livelihoods in the areas of food security and medicine.

d. The National Adaptation Programme of Action

The policy promotes community community's capacities to adapt to the effects of climate change through various measures such as:

- Improving sustainable rural livelihood.
- Improving agricultural production in low rainfall areas
- Restoring forests in Shire Valley areas.
- Promoting disaster preparedness to effects of climate change.

e. The Malawi Growth and Development Strategy

One of its priority areas is climate change and disaster management. Inadequate funding from government and effective early warning systems affect the implementation of the policy.

International agreements on climate change

a. United Nations Framework

Conventions on Climate Change

It deals with greenhouse emission mitigation, adaptation and finance.

b. Kyoto Protocol

Its main aim is to reduce the emission of greenhouse gases such as chlorofluorocarbon, methane, carbon dioxide and sulphur hexafluoride.

c. Copenhagen Accord

It aims at limiting the global temperatures by 2⁰C. The conference also agreed to support the developing countries in mitigating and adapting to the effects of climate change.

d. The Tripartite Agreement on Climate Change Adaptation and Mitigation

It was adopted by COMESA and SADC in order to address the impact of climate change through successful adaptation and mitigation actions aimed at building socio-economic resilience of communities through Climate-Smart Agriculture (CSA).

e. Global Methane Initiative

It encourages the use of clean energy to reduce the release of greenhouse gases. It also ensures proper waste disposal.

f. Group on Earth Observations

It observes the global climate and coordinates the climate change observations throughout the world.

g. Carbon Sequestration Leadership Forum

It focuses on developing and improving technologies that reduce concentration of carbon dioxide in the Earth's atmosphere.

Challenges faced by international climate change agreements

- Inadequate financial resources for achieving mitigation and adaptation programmes.
- Inadequate and contradicting information about climate change.
- Failure by countries or organisations and industries to comply with environmental conservation principles
- Some countries pulled from the international climate change agreements which weaken the effort by some countries to combat climate.

- Wars in some countries prevent the fight against climate change.

Benefits of the international climate change agreements

- They have helped to reduce emission of greenhouse gases.
- They have accelerated the development, use and transfer of cheap and environment-friendly technologies in the world.
- They strengthen international cooperation.

Ways of promoting climate change mitigation and adaptation initiatives at community level

- Growing drought tolerant crops
- Restricting irrigation farming
- Promoting afforestation and reafforestation.
- Engaging in irrigation farming
- Use of alternative sources energy to replace fuel energy.
- Practicing water harvesting and conservation
- Ensuring enough food reserves in stores
- Conducting public awareness and civic education campaigns
- Practice proper agricultural methods that do not cause soil erosion and silting.
- Providing emergency shelters to homeless victims
- Providing relief items and shelter to affected people in the affected areas such as food, clothing, utensils and beddings.
- Making settlement away from disaster – prone areas (e.g. mountain slopes and river banks).

TOPIC 6 MINERALS

Success Criteria

Learners must:

1. Explain the meaning of the term *mineral*
2. Explain types of minerals
3. Locate mineral deposits on a world map e.g. coal, copper, iron ore, gold, aluminium and uranium
4. Describe uses of minerals e.g. coal, copper, iron ore, gold, aluminium and uranium
5. Explain mining methods
6. Explain the effects of mining
7. Locate places where uranium is found on a map of Malawi
8. Describe the occurrence of uranium
9. Explain how uranium is extracted and processed
10. Describe the importance of uranium mining in Malawi
11. Identify the countries where uranium from Malawi is exported
12. Explain the possible impact of uranium on the environment
13. Describe the cost-benefit analysis of uranium mining in Malawi

Mineral refers to a chemical compound in the earth's crust which makes the basis of the rock. **An Ore** is a rock that contains minerals worthy mining. **Metal** is chemical element that can be processed by special treatment in order to produce metals.

Characteristics of Minerals

1. Naturally occurring. They are not manufactured in the industries.
2. They are inorganic in nature. Anything from animal and plant matter does not qualify to be a mineral. For example, coal and petroleum are not minerals.
3. They are solids and occur as solids at normal temperature and pressure on the Earth's surface.
4. They have regular chemical composition in fixed proportion. Substances that

contain more elements are called compounds. Most minerals are made by the combination of only 8 elements such as oxygen, silicon, aluminium, sodium, potassium, chlorine, iron and magnesium.

5. They have orderly internal structure. Their atoms are arranged in a regular, repeating and orderly pattern.

Types of Metallic Minerals

a. Metallic Minerals

They are processed into metals.

o Ferrous Minerals

They contain iron, e.g. Gold, nickel, platinum, chromite, iron and diamond

o Non-Ferrous Metals

They do not contain iron, **e.g.** copper, tin, manganese and aluminium.

b. Non-Metallic Minerals

They do not produce metals when processed, e.g. Halite, asbestos and gypsum

c. Organic Minerals

They are formed from dead organisms, such as plants and animals, e.g. petroleum, natural gas and coal. They meant to produce energy

Minerals and their Uses

Mineral	Property	Use
Aluminium	It has a high melting and boiling point. It is malleable. It is light.	Used for making aluminium paint, aluminium foil, aircraft, utensils, electric cables, refrigerators,
Gold	It has high melting and boiling point.	It is used for manufacturing gold tooth fillings, jewelries, ornaments and coins
Coal	It is a fossil fuel. It is brownish or dark in colour.	It is source of thermal energy. It is used to manufacture drugs, fertilizer, timber

		preservatives (creosols) and coke which is used to process iron and steel.
Copper	It is reddish in colour. It is resistant to corrosion.	It is for manufacturing electric cables, coins, parts of engines and phosphor bronze (an alloy of copper, tin and phosphorous.
Uranium	It is silvery white, shiny, radioactive, malleable, ductile and light in weight.	Used to produce nuclear energy, bombs and missiles. Other uses To propel space ships To detect leaks, pollutants, movement of underground water, x-ray machines in hospitals
Iron	It is hard, brittle and purely lustrous.	It is used for alloy preparations, magnetic extractions, metal extraction, reducing agent. It is also used for making body structure of a vehicle, surgical instruments and reducing agents.

Gypsum	It is soft soluble in water, low thermal conductivity, sound proof and non-combustible.	Building plaster Making cement Used as fertilizer Used as fire and sound barriers
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Formation of Minerals

Minerals are formed through two main processes that include

a. Magmatic process

- Here, minerals are formed by the cooling and crystallisation of magma. Heavier minerals sink and accumulate at the bottom of the liquid rock of the magma chamber to form ores. E.g. magnetite, chromite and ores of nickel.
- On the other hand, magma and the chemical solutions which it contains change the surrounding rocks in which minerals are introduced into the existing country rocks. E.g. iron ores and ores of copper (chalcopryrite, malachite, cuprite, chalcocite, and bornite).

b. Solution process

- Through leaching, minerals are washed down the layers of soil profile where they accumulate in the **zone of oxidation** or **subsoil**, e.g. bauxite.
- Insoluble minerals and weathered materials are carried by the running water down the valley where they are concentrated as ores on the flood

plain, e.g. gold, diamond, tin and platinum

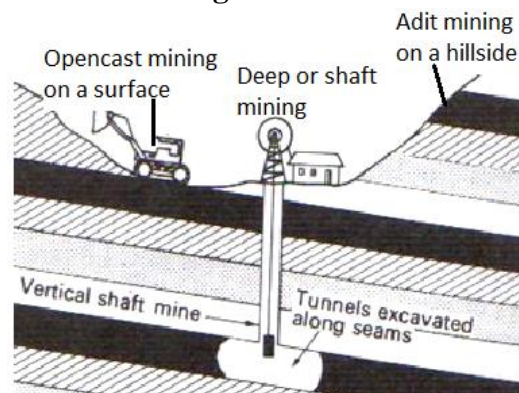
Mining

It is the process of extracting minerals from the earth's crust.

Factors to consider before mining

- Mineral content in relation to the cost of mining operations.
- The difficulties of mining operations. For example, deep mining is very expensive and risky in case in collapse of mines.
- Geological nature of the mining site. Some mining operations may trigger the earthquake.
- Accessibility of markets and favourable costs.
- Levels of technologies and availability of power supply.
- Demand for minerals should exceed the environmental problems likely to come

Methods of Mining



a. Adit or Drift Mining

It is the extraction of minerals on the side of the mountain or valley.

Horizontal tunnels called adits are dug following the **mineral seam**. **Mineral seam** is a band or layer of minerals.

Advantages

- It is cheap
- Simple tools are used

Disadvantages

- It destroys the environment on the mountain side
- It creates deep pits on valleys and mountain side

b. Opencast Mining

This is also known as **surface** or **strip mining**. This involves the extraction of minerals which are found near the earth's surface. Overlying soil is removed to expose mineral seam. Then mineral ore is dug out or blasted and transported to factories for processing.

Advantages

- It is cheap and easy
- Simple tools are used

Disadvantages

- It creates deep pits that cover land that would be used for farming, settlement and other developments
- Mining dust causes air pollution and poor visibility
- It leads to deforestation and ecological imbalance

c. Shaft or Deep Mining

This is done when minerals are found deep down the earth. A metal structure called shaft is sunk into the ground. Horizontal tunnels called **galleries** are

made following the mineral **seams**. Water is removed. Fresh air and lighting are provided to the miners. When a mineral ore is reached, it is dug and blasted.

Advantages

- More and valuable minerals are recovered.
- It does not affect physical environment on the land surface
- It does not cause noise pollution since sounds are confined to the underground.

Disadvantages

- It is very expensive
- High risk of deaths and injuries when mines collapse.
- It pollutes the underground water.

d. Solution Mining

The method involves the drilling of holes deep down into the ground to reach the mineral deposits. The minerals are then dissolved and pumped to the surface. Finally, water is evaporated by the process of recrystallisation. Copper, salt and uranium are mined in this way. This method is also called In-situ leaching (**ISL**) or in-situ recovery (**ISR**).

Advantages of Solution Mining

- It is safer than shaft mining where miners have to go underground.
- It helps to recover deep and rich minerals
- It is quick way of extracting minerals.
- It is cheaper than underground or shaft mining.

- There is no disturbance of surface natural resources. For example, there is little or no deforestation.

Disadvantages of Solution Mining

- It leads to land subsidence in old and abandoned mining sites.
- The mining liquids may contaminate the ground water resources.
- It requires large volumes of water to dissolve the minerals.

e. Alluvial Mining

It is used to extract heavier minerals of gold, diamond and tin. It involves the extraction of minerals that are mixed with water and other solid inorganic particles like sand, gravel, mud and small stones in rivers and lakes. Such materials are washed away leaving behind the minerals. Alluvial mining is done in the following ways:

i. Using forceful water from hose pipes.

This is used to extract minerals which are found in the dry lands. Water from hose pipes is blown onto the ground where light sediments are removed and leave behind heavy minerals.

ii. Panning

A simple pan is used to scoop out the mineral bearing sediments. When the mixture is stirred, the heavier minerals settle to the bottom of a pan and lighter residues are removed from or are allowed to spill out of a pan.

iii. Dredging or Sub-marine Mining

This is done when extracting minerals from the sea. A special equipment known as a **dredger** is used.

Advantages of Alluvial Mining

- It is easy mining method.
- It is cheap way of mining

Disadvantages of Alluvial Mining

- It may cause siltation in the nearby water bodies by a large amount of solid sediments.
- Dredging makes land surface unattractive due to large fragments which pile up on the surface.

The effects of Mining

a. Positive Effects

- It provides employment to miners.
- Minerals are raw materials.
- It gives the country foreign earnings.
- It is source of government's revenue through taxes.
- It promotes infrastructural development. Better roads and power lines are constructed to rural areas where mines are located.
- It encourages the development of industries, e.g. car industry.
- It facilitates the growth of towns.

b. Negative Effects

- Death of miners due to collapse of mines.
- Deep pits hold water that may be a breeding ground for disease causing organisms.

- It causes deforestation on the mining site.
- It creates deep pits that occupy land that would be used for other developments.
- It promotes unsustainable development when mines are shut down. Miners lose employment.
- It causes soil erosion as large lumps of rocks are removed.

Uranium

It is one of the most abundant minerals on the Earth's surface. Uranium is found in hard rocks or sandstone.

Types of Uranium Ore Deposits

a. Unconformity deposits

Mineral deposits lie between two rock stratas of different ages.

b. Paleoplacer deposits

It was formed by deposited sediments which were compacted and lithified like solid sedimentary rocks. Deep or shaft mining is used to extract the mineral.

c. Sandstone-type Deposit

It is formed when oxidized groundwater that has leached uranium from surface rocks flows down into aquifers where it is reduced to precipitate the primary ore mineral of uranium called uraninite. It is abundantly found in the sedimentary rocks. Mining is easier and cheaper since it is found near the Earth's surface.

Characteristics of Uranium

- It is radioactive
- It is malleable
- It is silvery white
- It is found inside ores

- It is one of the heaviest minerals.

The Occurrence of Uranium

Uranium occurs in black uranium oxide called **pitchblende** which is hydrothermal vein of sedimentary rocks. Groundwater easily transports highly soluble uranium called oxidized uranium.

Uranium is reduced and made relatively insoluble when it precipitates together with organic matter

Mining of Uranium in Malawi

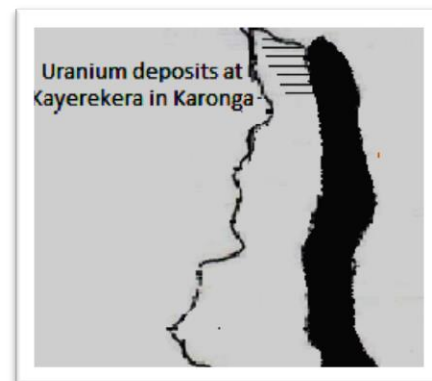
There are four Australian companies that own Malawi's uranium mines such as:

- Paladin (Kayerekera, Chilumba and Chilongo)
- Red Rock (Livingstonia, Nyika and Chintheche)
- Globe Uranium (Simulemba)
- Africa Energy Resources (Majete and Lisungwe at Kirk Range)

Kayerekera is where abundant uranium is extracted by Paladin.

Uranium Mining at Kayerekera

Kayerekera is located 52 kilometers west of Karonga town in the northern region of Malawi.



The uranium mine was first opened and run by Central Electricity Generating Board of Great Britain (**CEGD**). Thereafter, Paladin Africa Ltd took over the project after it was abandoned by the **CEGD**. Paladin Africa Ltd has 85% shares and Malawi Government holds the remaining 15%.

Methods of Uranium Mining

The mining methods of uranium are

a. Open pit mining

It is cheap but it releases large amounts of dust that cause breathing problem.

b. Underground mining

It is expensive and workers are exposed to hazardous gases to their health.

c. In-situ leaching (ISL)

It is done when minerals are in chemical solution which is pumped to the Earth's surface.

Importance of uranium mining in Malawi

- It provides employment
- It provides government revenue.
- It is source of foreign earnings
- It provides raw materials
- It promotes infrastructural development

Challenges faced in the uranium mining in Malawi

- Industrial strikes by workers who demand for salary increase
- Shortages of working materials such as dust masks.
- Low price of uranium at the international markets.

- Land slippage of uranium that negatively affects plant growth.

Processing of Uranium

The following are the steps taken in the processing of uranium:

a. Milling and refining

The uranium ore is crushed and then treated with acid solution which percolates through the ore. In in-situ mining, uranium is already in solution which drains from the rocks and collected.

b. Precipitation and drying

A chemical solvent is added to uranium solution to turn it into a solid material which is dried as a yellowcake (uranium oxide concentrate). A yellowcake is packed in steel drums and transported to enrichment facility for further processing.

c. Conversion

The chemical process turns a yellowcake into a hexafluoride which then heated to become gas and loaded into cylinders.

d. Enrichment

Uranium is made usable as fuel when lighter U-235 atoms are separated from heavier U-238 atoms in order to concentrate the U-235 atoms. Gas condenses into solid when it is cooled.

e. Fabrication

A fuel fabricator converts uranium dioxide powder and presses the powder into fuel pellet. Pellets are packed into tubes which are used to release heat in nuclear reactor vessels.

Uses of Uranium

- It is used to make x-ray machines and other devices for scanning and detecting diseases in hospitals
- It is used to generate nuclear energy.
- It is used as a colourant in pottery and glass manufacturing industries.
- It is used to determine the age of rock, the Earth and other historical events. In other way, it is used for atomic dating.
- It is used for making phosphate fertilizer.

Countries where uranium from Malawi is exported

- Russia
- Japan
- Canada
- France

The possible impact of uranium on the environment

- Serious health risks due to exposure to radiation and inhalation of radon gas which very lethal.
- Water depletion in the surrounding environment since the processing requires large volumes of water.
- Contamination of water and soil which affects ecological balance.

The cost-benefit analysis of uranium mining in Malawi

a. Benefits

- It provides employment to miners.
- Minerals are raw materials.
- It gives the country foreign earnings.
- It is source of government's revenue through taxes.
- It promotes infrastructural development. Better roads and power lines are constructed to rural areas where mines are located.
- It encourages the development of industries, e.g. nuclear energy industry.

b. Costs

- Uranium wastes contaminate water resources.
- Nuclear suspended elements and toxic substances pollute air.
- Uranium wastes have negative effects on human health.

TOPIC 7 PETROLEUM IN THE WORLD

Success Criteria

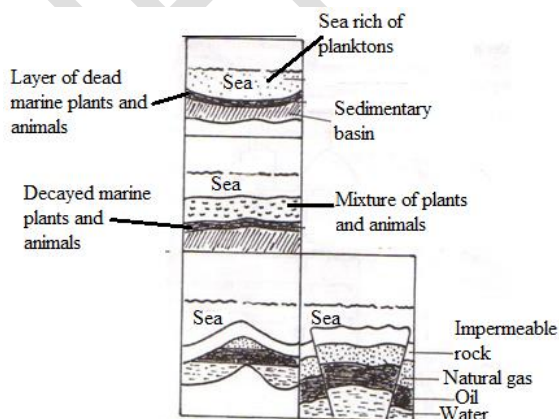
Learners must:

1. Explain the term *petroleum*
2. Locate places where petroleum is found in the world
3. Explain the formation of petroleum
4. Describe the occurrence of petroleum
5. Explain how petroleum is extracted
6. Explain how petroleum is transported
7. Describe how petroleum is refined
8. Identify petroleum products and their uses
9. Explain the roles of OPEC
10. Explain the environmental impact of oil drilling, refining and transportation

Petroleum is the mixture of hydrogen and carbon or **hydrocarbons**.

Formation of Petroleum

It is formed as a result of the action of bacteria on dead bodies of minute marine creatures buried at the bottom of the seas, swamps or lagoons.



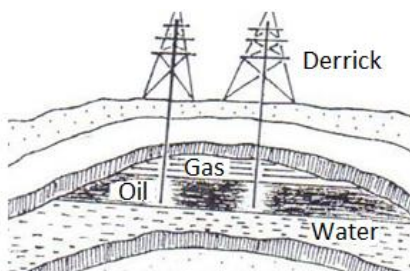
Later, the earth's movements squeezed the oil and gas from the **source rock** called shale into the **reservoir rocks** of sandstone and limestone.

Necessary Conditions for Oil to Form

- Pressure
- Heat
- Passage of time
- Exclusion of air

Oil Drilling and Extraction

A metal structure called **derrick** is used for drilling a hole into the ground. The end of a **derrick** is fitted with a **cutter** or **bit**. When drilling, but is forced down as a lubricant of a **cutter** and pieces of rocks are flushed out.



When oil is reached, it comes out in two ways as follows:

- It gushes out if it is under natural pressure
- It is pumped if it is not under natural pressure

Oil Refining

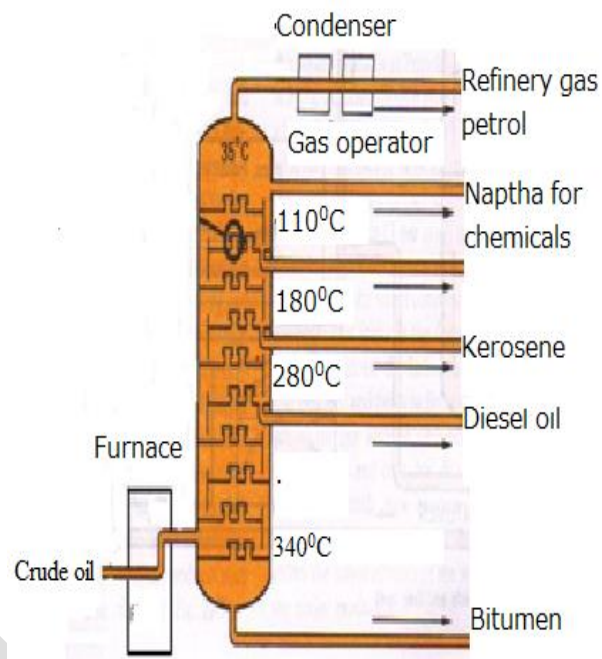
Oil refining is the process of turning **crude oil** into the usable form. **Crude oil** is oil in its natural state or unrefined oil.

Stages in Oil Refining

- Distillation or Fractionating
- Cracking
- Purification

Primary Distillation

This is the process of breaking down of crude oil into various **hydrocarbons** or **fractions**. In this process, crude oil is vaporized and vapour is allowed to condense at various levels of a tall tower called a **fractionating column**.



Vapour condenses into liquids or hydrocarbons which are collected for use.

Properties of fractionating column at the top

- Low boiling point
- Burn with clear flame
- Light coloured
- More runny
- Are smaller molecules

Properties of fractionating column at the bottom

- Have high boiling point
- Have longer carbon chains
- Are thicker
- Less likely to burn
- Are larger molecules

Cracking

This is also known as **secondary distillation**. This refers to the breakdown of

heavier fractions into the **lighter fractions** by reheating. In the process, a cat-cracker is used. For instance, gasoline is reheated to produce benzene. This is due to the increased demand for lighter oils. Thermal, catalytic and steam cracking involve reheating of oil to come up with lighter oils. On the other hand, hydrocracking involves diluting heavy oils to produce lighter oil.

Purification

This is the process of removing impurities from oil, such as sulphur compounds.

Location of Oil Refineries

- At the port near the oil producing region, e.g. Abadan in the Middle East
- At the entry port of oil consuming countries

Transportation of Oil

- a. **Pipelines:** they are used to transport oil from the producing region to consuming region over long distances.

Advantages of pipelines

- It is cheapest way of transporting liquid and gaseous commodities
- It is cheap to use
- It safe and environment friendly.
- It is cheap to use.
- It uses less energy

Disadvantages of pipelines

- They are expensive to construct, maintain and patrol.
- Fire accidents may occur if pipes leak.
- Pipelines are inflexible once they are laid down

- b. **Oil tankers** are used to transport crude oil over the sea from oil producing

countries to refineries. The goodness is that a tanker carries large quantities of oil over long distances at once. The disadvantages are that tankers are expensive to build a ship and construct ports, it is very slow, and it pollutes water due to leaking tankers.

- c. **Rail tankers, road tankers** are used to distribute oil to consumers or filling stations.
- d. **Aircrafts** are used by the military bases.

Oil Products and their Uses

Natural gas (methane) is used for heating and burning

- Making chemicals from butane, ethane and propane
- Gasoline is used for driving land transport
- Kerosene is used by jets
- Gas oil which is made into diesel is used by lorries, buses and other locomotives
- Bitumen is used for making tarmac. Bitumen is the end by-product of primary distillation
- Other uses of oil products are for making drugs, plastics, car antifreeze, adhesives and chemicals.

Organization of Petroleum Exporting Countries (OPEC)

The following are the roles of OPEC:

- It is responsible for regulating supply of petroleum to non-member states by assigning quota to member countries.
- It regulates prices of oil products at the world markets
- It coordinates and unify the petroleum policies of the member states.

Member Countries of OPEC

They are Algeria, Ecuador, Gabon, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, United Arab Emirates and Venezuela.

Reasons for Oil Nigeria's Oil Crisis

- Low oil refinery capacities. Most of crude oil is exported to other foreign refineries.
- Low oil productivity in relation to increased demand for refined oil.
- Conflicts and frequent attacks of oil infrastructure.
- Theft and vandalism of oil pipes and other infrastructures.

Possible environmental impact of oil drilling, refinery and transportation

- **Pollution**
Oil drilling pollutes water.
Oil spills from leaking oil tankers pollute water. It also caused by the leaking

pipelines. This causes death of marine animals.

- **Climate change** is caused the burning of oils that release carbon dioxide into the air and cause global warming.
- **Acid rain** petroleum products release a lot of sulphur dioxide and nitrogen oxides that when they combine with water vapour they forms acid rain.
- **Fires and explosions** as petroleum products are highly flammable. This destroys environment and causes huge fires in cities.
- **Chronic occupational hazards** as workers are exposed to heat, polluted air, noise and other dangerous explosives which may cause injuries and death.
- **Land degradation** by leaking pipelines that release large oil spills on land.

TOPIC 8 ENERGY

Success Criteria

Learners must:

1. Explain the meaning of the term *energy*
2. Identify types of energy
3. Explain how energy is produced from the sun, wind and water
4. Describe advantages and disadvantages of different types of energy
5. Explain the importance of energy
6. Explain the environmental impact of various sources of energy
7. State the energy crisis in Malawi

Types of Natural Resources

Natural resources are things which were provided by nature.

Renewable Resources

These are resources which can be replaced or replenished. They can be recycled. They include vegetation, animals, air and soil.

Non-renewable Resources

These are resources which cannot be replaced or recycled. They are completely used up. For example, there are minerals, petroleum and natural gas.

Natural Resources which are Source of Energy

Natural Resource	Energy Produced
Sun	Solar energy
Water and tidal waves	Hydro-electricity
Fossil fuels (petroleum, coal & natural gas)	Thermal energy
Wind	Wind energy
Hot springs and geysers	Geo-thermal energy
Biomass	Biogas energy

Alternative Energy

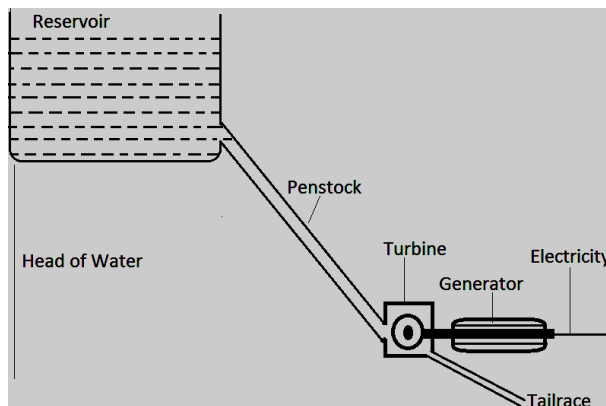
This is energy that cannot be depleted when used. It can be recycled. It is also called **renewable energy**. Examples of alternative

energy are hydro-electricity, geo-thermal energy. Wind energy, solar energy and biogas. **Thermal energy** is not alternative energy.

Types of Energy

Hydro – Electricity

It is produced when water from a good height moves with great force through the penstocks and turns the turbine. The turbine in turn causes generator to produce electricity.



- It can be transmitted over long distances without losing power.
- It is reliable since water is readily available.
- It does not pollute air.
- Power dams serve many purposes such as irrigation and fishing.
- It is relatively cheap to produce.
- There is unlimited degree of divisibility. It can be used in small to large devices or appliances.

Factors Necessary for the Generation of Hydro – electricity

- Sufficient and constant water supply from rainfall or melting ice on hill slopes.
- Availability of heavy capital outlay.
- Availability of rapids or waterfalls.
- Large domestic and industrial markets where electricity is used such as, industries.

Advantages of Hydro – electricity

- It is very efficient.
- It is renewable.

Disadvantages of Hydro – electricity

- River damming deprives farmers of their land for farming and settlement.
- Construction of dams destroys the environment.
- Constructing and maintaining dams are expensive.
- The dams become the breeding ground for disease causing organisms.
- Building up of silt in the dam deprives the flood plain downstream of soil nutrients.

- Rural inhabitants do not see any importance of using electricity.

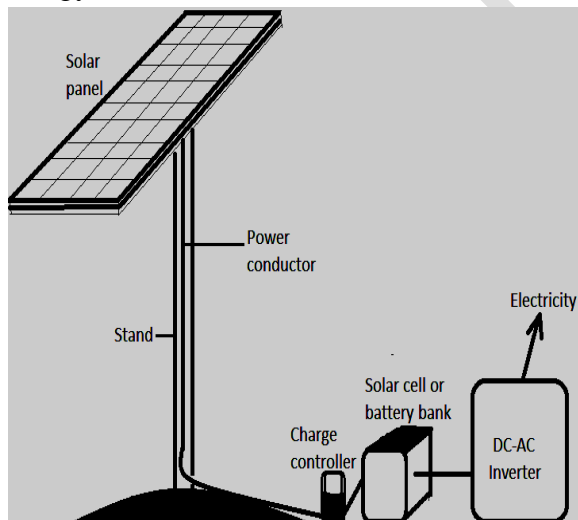
Solar Energy

Sun is the source of solar energy.

Solar panels capture the sun's heat and convert it into electricity direct to **solar cells** or **power banks** where unused electricity is stored and be used later. Inside solar panels, there are photovoltaic cells that convert solar energy into electricity.

Advantages of Solar energy

- It is renewable as sunshine is always available.
- It is good for small-scale energy needs.
- There is unlimited supply of sun's energy.

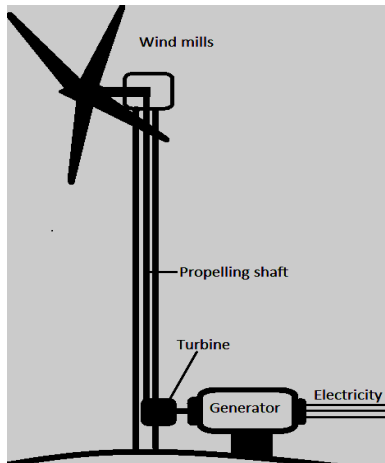


- It is cheap to generate and use since sun's energy is free of charge.
- It does not cause pollution of any form.

Advantages of Solar Energy

- Less electricity is produced during dense and extensive cloud cover
- Solar panels and solar cells are expensive
- It is very inefficient since a smallest percentage (only 30%) of sun's heat is turned into electricity

Wind Energy



As wind is blowing, it turns the wind mills that make the turbines rotate. Then turbines cause generators to produce electricity. The blades are connected to a long shaft that turns a turbine. Several wind mills are constructed in an identified piece of land which is known as a **wind farm**.

Advantages of Wind Energy

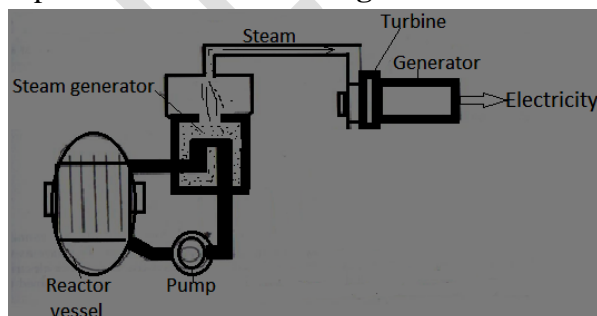
- It is renewable as wind is always available.
- There are low operation costs.
- It is cheap to generate and use.
- It can be used even in remote rural areas
- It does not cause water and air pollution.

Disadvantages of Wind Energy

- Wind mills cause visual and noise pollution.
- Wind mills are expensive.
- Large number of wind mills and turbines are required.
- There is erratic supply of electricity when wind speed is not constant.

Nuclear Energy

Uranium is the main raw material for the production of nuclear energy. Uranium rods are put in the **reactor vessel** where radioactive changes occur and release large amount of heat. Heat energy heats and vaporizes water in a **steam generator**.



Steam is directed to a turbine which is connected to a generator. Steam turns a

turbine to make generator produce electricity.

Advantage of Nuclear Energy

Generation requires limited raw materials.

- It is very efficient as it produces large amounts of energy from small amounts of fuel.
- It causes little air pollution.
- Risks of accidents are reduced due to many safeguards.
- Electricity can be transmitted over long distances.

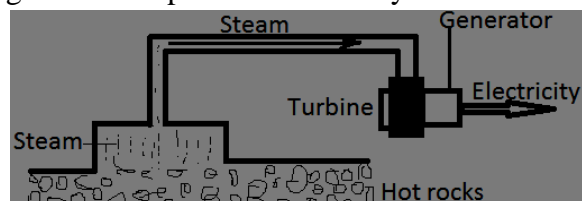
Disadvantages of Nuclear Energy

- Nuclear wastes are very dangerous as they are radioactive in nature.
- Nuclear accidents cause environmental hazards. It requires large capital to install power plants.
- Radioactive nuclear wastes are very dangerous to people and the whole environment.

- It is a source of fatal accidents.
- Many healthy problems to people who live near the nuclear power stations shutting down old power plants is very costly

Geo – Thermal Energy

It is produced at the volcanic sites, more especially at the hot springs, geysers and fumaroles. Steam is harnessed and directed to a turbine. Turbine turns and causes generator to produce electricity.



Sometimes, wells are drilled in order to reach hot rocks; any surface water is forced back into the reservoir to be reheated and produce steam.

Advantages of Geo-thermal Energy

- It is renewable.
- It does not cause air pollution.
- It is reliable.

Disadvantages of Geo - thermal Energy

- It is expensive to install.
- There are limited sites.
- It is expensive to construct and maintain the power plants.
- It can bring toxic substances onto the Earth's surface that may destroy the environment

Biogas Energy

Biogas is energy generated from dead and decomposed plant and animal matter. Such materials are called biomass which includes animal dung, dead wood, saw-dust, dead leaves, crop residues and garbage. Cattle dung is the best biomass as it produces a lot of methane.

water in a boiler. Water produces vapor which is directed to a turbine that turns and cause generator to produce electricity.

Landfill Method

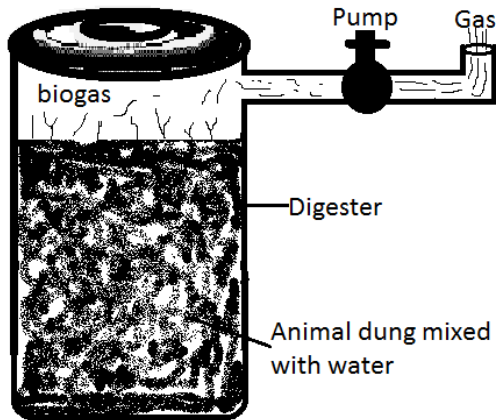
Dung is mixed with water and put in the **digester** buried into the ground and is properly secured.

Two ways of making biogas

- Burning
- Landfill

Burning Method

The biomass materials are placed in a furnace where they are heated and vaporize



Micro-organisms act on the dung and produce biogas which is used for heating, cooking and lighting.

Advantages of Biogas

- It is very cheap to buy the equipment.
- Raw materials are readily available in the local environment.

Disadvantages of Biogas

- Farmers are deprived of cheap source of fertilizer.
- It helps to reduce the amount of wastes from the environment.
- It can be difficult to collect sufficient quantities of wastes.
- If not handled properly, it can spread disease

Importance of Energy in the Country

- It is used for driving vehicles and other locomotives
- It helps for keeping houses warm
- It is used for processing and preserving food
- It used for manufacturing goods in the industries

Environmental impact of various sources of energy

- Burning of fossil fuels produces greenhouse gases that cause global warming and depletion of ozone layer.
- Production of biogas releases methane which pollutes air and cause global warming.
- Construction hydroelectric plants and generation of electricity destroy environment.
- Oil drilling has adverse effects on marine ecosystem.

Energy crisis in Malawi

This is the situation created by shortage or scarcity of energy resources due to increased demand. Fossil fuels are in insufficient supplies to support the growing population in the world. As a result, there are a lot of problems caused by shortage of fossil fuels such as:

- Rampant cutting down of trees for fuel trees and charcoal burning
- Rising costs of fossil fuels
- Dwindling of oil reserves which are never replaced

Causes of energy crisis in Malawi

- Wastage of energy resources
- Dependence on old and poor electric power plants or poor infrastructural development on hydroelectric generation.
- Unexploited energy options. This means that there are many energy resources such as wind that are left unused to ease the problem of electricity in Malawi.

- Rapid population growth that puts pressure on limited energy resources.
- Overconsumption of energy due to rapid population growth and increase in

technologies that pose great demand on energy resources.

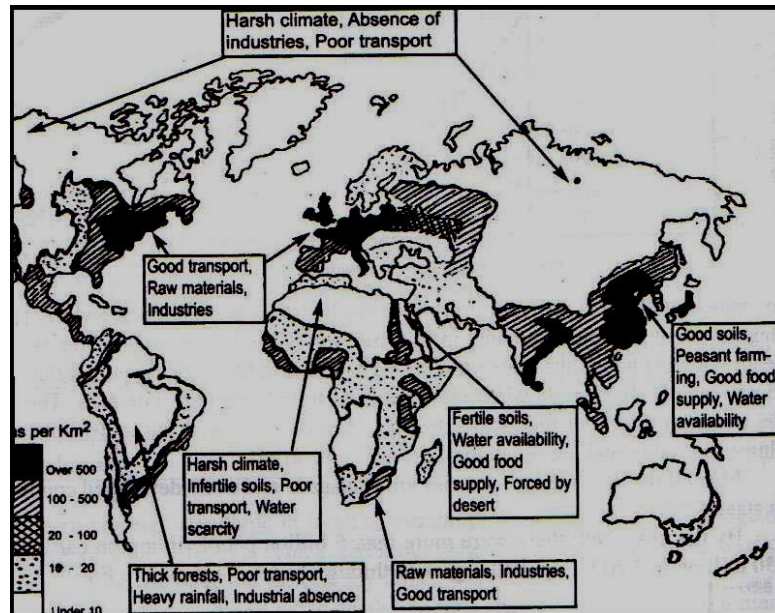
TOPIC 9 WORLD POPULATION DISTRIBUTION AND DENSITY

Success Criteria

Learners must:

- 1 Identify areas of low, medium and high population densities on a world map
- 2 Account for world population distribution
- 3 Explain world population distribution
- 4 Calculate population densities for selected countries

World Population Distribution and Density



Factors that affect world population distribution

a. Soil

Areas with fertile soils are more densely populated than those with poor soils.

b. Relief or topography

Flat and gently sloping areas are more densely populated than mountainous areas and valleys.

c. Climate

Very cold and dry lands (deserts) are more sparsely populated than areas that have good climate. Good areas receive rainfall that promotes various industrial activities.

d. Level of economic activities

Areas that have more economic activities (such as trading centres, mining towns, cities) have very high population densities as compared to very remote rural areas.

e. Natural resources

Areas with rich resources like minerals and fertile soil are densely populated rather than areas with poor resource deposits.

f. Transport and communication

High population densities are concentrated near or along the transport links.

g. Water supply

Large populations are concentrated around water point. Where water is a problem you cannot find many people as it is essential for human activities.

h. Political stability

Countries which are peaceful attract many people to settle there. Wars make people to abandon their homes.

i. Natural hazards

Disaster prone areas (like floods and earthquakes) have little or no population.

j. Government policies

Government may evacuate people from some areas due to a number of reasons, such as floods. It can also resettle people

in some areas in order to reduce pressure on natural resources.

Factors for High Population

South East Asia

- China has largest population (750 million people) in the world. Other countries in this region are India (540 million), Pakistan (112 million) and Bangladesh (105 million)
- Fertile alluvial soils along the Ganges, Indus and Yangtze Kiang Valleys.
- Peasant farming that depends on family members for cheap source of labour. This necessitates large families.
- Early trading activities
- Early settlement

Western Europe

There is very large concentration of populations in the region due to the following factors:

- Early trade
- Trade route and focus
- Industrial development
- Communication centre

North East America

The following are the factors that encourage large populations:

- Industrial development
- It is worldwide centre of commerce
- Good agricultural land
- There is good future and development

Witwatersrand Region in South Africa

- Mining
- Industrial development
- Commerce
- Better living standards

Coastal Regions of West Africa

In this region Nigeria is largest populated country in Africa with the population of 120 million people. Some of the reasons for highest populations in the region are:

- Improved living conditions
- Fertile soil for farming
- Water and transport
- Contact with early traders

Factors for Low Populations Hot Deserts

- Harsh climate which is very hot and dry
- Poor soil
- Difficult transport due to sand dune
- No contacts with outside world

Equatorial Forests

- Poor soil drainage
- Difficult transport due to very thick forest and slippery roads
- Dangerous animals and diseases that attack people

Tundra Region

- Very short crop growing season
- Extremely cold climate where soil is permanently frozen.
- Difficult transport because land and water are permanently frozen

Population density

This is the total number of people living in a square kilometer.

Factors for Low Population Density

- Extreme climate
- Rugged and hilly landscape

- Extreme remoteness (areas are hardly reachable)
- Infertile soil

Factors for High Population Density

- Moderate climate for settlement and farming
- Fertile farm land
- Low land with gentle slopes and fertile soil
- Good water supply for drinking and irrigation
- Wealthier areas in terms of industries that offer more jobs
- Poverty in developing nations tends to encourage large family sizes.

Calculating population density

The following is the formula for calculating population density

Country	Population	Area (km ²)	Ppl density (ppl/km ²)
A	26 738	629	
B	7 452 234	17648	
C	5 762 721	53424	
D	6 534 217	12335	

$$\text{Population density} = \frac{\text{Number of people}}{\text{Area of the land}}$$

$$\begin{aligned} \text{Population density for country A} &= \frac{\text{Number of people}}{\text{Area of the land}} \\ &= \frac{26738 \text{ people}}{629 \text{ km}^2} \\ &= 43 \text{ people per km}^2 \end{aligned}$$

You can now use the formula to calculate population density for remaining countries.

Advantages of high population densities

- It provides a ready market for various goods
- There is abundant work force
- It promotes a great interaction of people which helps in the sharing of knowledge, skills and ideas vital to develop the area
- There is greater competition amongst people which aids development

Disadvantages of high population densities

- Shortage of food
- Shortage of land for crop cultivation
- More social problems, e.g. fighting for limited resources
- Poor living standards or poverty
- Difficult to provide basic necessities
- Pressure on forest resources which leads to deforestation, e.g. charcoal
- Shortage of social services, such as drugs and teaching/learning resources (social environment)
- Land degradation due to continuous cultivation of land.
- It leads to cultivation along the river banks which results to siltation.

Advantages of low population densities

- The land produces enough food for the inhabitants
- Land is readily available for maximum use
- It is not easy for disease outbreak to spread easily.
- It is quiet; there are low noise levels
- There is enough space for everyone which creates enough room for one's privacy and freedom.
- There are no social problems such as fighting, quarreling, prostitution and theft.

Disadvantages of low population densities

- There is lack infrastructure and services.
- People over long distances looking for social services
- It leads to boredom due lack of entertainment and social services.

- Shortage of labour supply
- There is no exchange of ideas due to lack of social interaction.
- Retarded development due to slow diffusion of innovations and ideas.

REVISION NOTES (Form 1)

Factors	Pull Factors in Recipient Areas
Social and Political Factors	<ul style="list-style-type: none"> • Entertainment • City life • Political stability • Political freedom
Economic Factors	<ul style="list-style-type: none"> • Job opportunities • Improved social services
Physical Factors	<ul style="list-style-type: none"> • Favourable climate • Good soil

Migration

- This refers to the movement of people from one area to another. Migration is categorized into **immigration** and **emigration**.
- **Immigration** is the movement of people into the country while **emigration** is the movement of people out of the country. The area where people are coming from is called a **donor area** while the area where they are migrating to is known as **destination** or **recipient areas**. **Immigrants** are people who enter the country while **emigrants** are people who leave the country.

Factors that Cause Migration

There are political, social and economic factors that cause people to migrate. These factors are put into two groups like **push** and **pull factors**.

Push factors are those factors that drive people away from the area. On the other hand, **pull factors** attract people to settle in the new areas.

Effects of Migration on

i. Donor Areas

- Neglected homes
- Empty schools
- Retarded development
- Poor road conditions

ii. Recipient Areas

- Rapid population growth
- Shortage of social services
- Overcrowding in schools, public transport and hospitals
- More social problems like high crime rate
- Shortage of land for farming

Population change

This is the difference between the size of the population at the end and beginning of a period of any given society or country. This can be in terms of increase or decrease in population.

Factors that Influence Population Change

1. Birth rate

- Birth rate refers to average number of babies born in every place for every 1000 people during a particular period of time.

Birth rate =

$$\frac{\text{no. of births} \times 1000 \text{ people}}{\text{total population in the area}}$$

- High birth rate leads to rapid population growth.

2. **Death rate:** it refers to number of deaths per 1000 who die in a particular area during a particular period of time.

Death rate =
$$\frac{\text{no. of deaths} \times 1000 \text{ people}}{\text{total population in the area}}$$

3. **Migration:** it leads to population growth in the recipient area whereas **emigration** depopulates donor area.

Population growth rate

This is the rate at which population of a country grows. There are different types of **population growth rate** that include:

i. Rapid growth rate

This is a situation where rapid growth of population is experienced due to higher birth rate than death rate.

ii. Slow growth rate

This is a nearly stagnant population growth experienced where both birth and death rates are low. E.g. in

Factors	Push factors in Donor Areas
---------	-----------------------------

Social and Political Factors	<ul style="list-style-type: none"> • Conflicts • Witchcraft • Wars • Insecurity • Disputes
------------------------------	---

Economic Factors	<ul style="list-style-type: none"> • Poverty • Unemployment
------------------	---

Physical Factors	<ul style="list-style-type: none"> • Natural disasters like floods • Poor soil and climate • Epidemics • Shortage of land for farming and settlement
------------------	--

Demographic Factors	<ul style="list-style-type: none"> • High population developed countries like Britain and Germany.
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iii. Zero growth rate

This is a stable population growth rate where both birth and death rates are almost equal. It is also known as **constant growth rate** or **stationary growth rate**. In this case, population growth rate is therefore zero.

iv. Negative growth rate

This is a situation where death rate surpasses birth rate. In other words, death rate is lower than birth rate. As a result, there is a declining population.

Birth rate

- It is the number of live births per year, taking 1000 persons. This is termed as the **crude birth rate** because puts

together all people who are not capable of giving birth (like men, women, young girls and old women) with those who are in a position of to give birth (such as mature, married and unmarried women).

- In short, crude birth rate refers to the total number of people who are not capable to give birth and those in a position to give birth.

$$\text{CBR} = \frac{\text{number of births}}{\text{total population}} \times 1000$$

Death rate or mortality rate

- This refers to the number of deaths per 1000 persons. This is known as a **crude death rate (CDR)** because it does not consider the age and sex composition of the population of the population at risk.

$$\text{CDR} = \frac{\text{number of deaths}}{\text{total population}} \times 1000$$

Reasons for High Death rates in Developing Countries

- Dirty and unreliable water supplies
- Poor housing conditions
- Poor access to medical services
- Epidemic diseases in some areas
- Diets that are short in calories and/or protein

Reasons for Low Death Rates in Developed Countries (USA, Germany and UK)

- Good housing conditions
- Safe water supplies
- More than enough food to eat
- Advanced medical services.

Natural increase

- This is the difference between the number of births and number of deaths. This happens when birth rate exceeds

death rate. Malawi's natural increase is 30% per year for every 1000 people.

Natural increase = birth rate – death rate

• Natural increase is caused by:

- High birth rates
- Low death rates
- Influx of people into the country

Natural decrease

- This is a condition that occurs when death rate exceeds birth rate. This leads to low population. Natural decrease is caused by:
Epidemics such as Ebola and HIV/AIDS
 - Natural hazards such as flooding
 - Severe drought
 - Pests and diseases that destroy crops.
 - Civil wars in a country.

Infant mortality rate (IMR)

- This is the number of children who die per year at the age of below 1 year per 1000 persons in the population.

$$\text{IMR} = \frac{\text{number of infant deaths}}{\text{total number of live births}} \times 1000$$

Factors for High Infant Mortality Rate (IMR)

- Shortage of medical services
- Greater number of children born to mothers
- Poor nutrition to mothers and babies
- Less knowledge of health matters
- Dirty water supply
- Gender inequalities and abuse of power

Maternal Mortality Rate (MMR)

This is the number of mothers who die during pregnancy or delivery.

$$\text{MMR} = \frac{\text{number of maternal deaths}}{\text{total number of live births}} \times 1000$$

Factors for Maternal Mortality Rate

- Early marriages and teenage pregnancies
- Inadequate health facilities and services
- Gender inequalities
- Greater number of children born to mothers
- Less knowledge of health matters
- Poor nutrition to mothers

Life expectancy

- This refers to the average number of years that a person can expect to live. Life expectancy is calculated at birth of a child.
- Life expectancy is higher in women than that of men.
- There is also higher life expectancy in developed countries (like Japan and UK) than in developing countries such as Malawi. For example, in Malawi life expectancy is at 34 years while in Japan is at 85 years for women and 80 years for men.

Reasons for Low Life Expectancy

- Poor nutrition
- Poor hygiene
- epidemics
- Poor sanitation
- Poor medical care

Reasons for Low Life Expectancy

- High living standards
- High medical care
- Increased use of vaccines
- High nutritional levels
- Improved hygiene and sanitation

Population explosion

Population explosion refers to the sudden rapid population growth in an area which is as a result of a marked decrease in death rate and an increase in birth rate.

Causes of Population Explosion

- High fertility rate
- Reduced mortality rate
- Influx of refugees into the country

Ways of Avoiding Population Explosion

- Making laws that limit the number of children per couple. E.g. in China the state controls marriages and prevents early marriages by imposing penalties on the offenders
- Convincing the population to accept family planning methods. E.g. men in India are encouraged to undergo vasectomy.
- Making laws that stop re – marriages after divorce
- Government should control under age marriages and single motherhood.
- Instituting laws that prohibit high fertility rate
- Encouraging the use of contraceptives among the population and increase their accessibility
- Encouraging education of girls

Population density

This is the total number of people living in a square kilometer.

$$\text{Population density} = \frac{\text{Number of people}}{\text{Area of the land}}$$

Overpopulation

It is the state of imbalance where there is an excessively high population in relation to potential resources in an area at a given time.

Causes of Overpopulation

- Natural increase in population
- Decline in resources
- A decline in the demand for labour

Under population

It is the condition where the country's population is too small to develop its resources effectively enough in order to improve the living standards. The

government is able to cut expenditures on education, health and other services thereby making savings for other development projects

TOPIC 10 POPULATION DYNAMICS

Success Criteria

Learners must:

1. Explain the structure of a given population

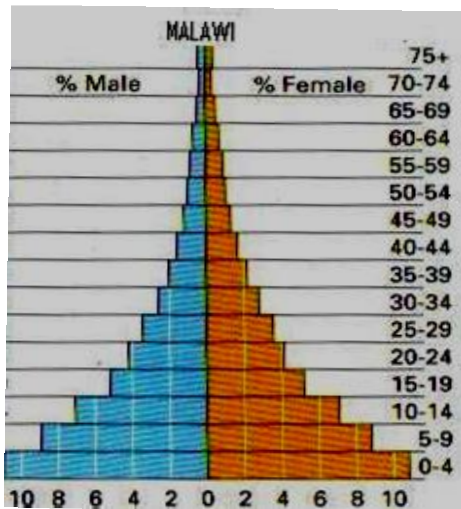
2. Compare and contrast the population structures of developed and developing countries
3. Describe the implications of various population structures on development
4. Explain the meaning of the term *dependency ratio*
5. Describe the demographic transition model
6. Explain the causes of rapid population growth
7. Explain the effects of rapid population growth on development
8. Suggest strategies for controlling population growth
9. Explain the benefit of controlling population growth

Population Structure

Population structure is the composition of the population based on age and sex.

Population structure is represented by the **population pyramid**.

Youthful Population Structure



It shows the population that mostly composed of children. It has the following characteristics:

- There are more children than adults
- It has wide base and narrow top
- It represents the developing countries like Malawi, Ethiopia, Kenya, DRC and Zambia.
- There is rapid population growth

Reasons for Youthful Population Structure

- Low levels of education of women
- Low levels of employment of women
- Lack of family planning services
- Peasant farming that encourages having many children as cheap source of labour
- Lack of social security system that force families to have many children to support them at their old age.
- High mortality rate that encourages bearing more children hoping that some may survive.

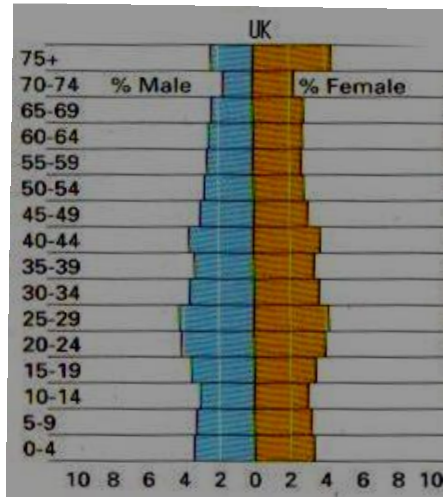
Implications of Youthful Population Structure

- Increased demand on natural resources leading to environmental degradation.
- Shortage of social services
- Shortage of housing
- Lack of job opportunities
- Shortage of food that causes malnutrition and ill-health
- Low levels of living and absolute poverty

Ageing Population Structure

This is the one that mostly composed of adults. Below are the characteristics:

- More adults than youths
- More women than men
- It describes population of developed countries such UK, Sweden, USA and Canada.



Causes of Ageing Population Structure

- High levels of education and employment for women
- High life expectancy or low mortality rates
- Availability and use of family planning services
- Presence of old age social security systems
- Prohibition of child labour by law

Implications of ageing population

- More money is needed to support the ageing population in terms of pension scheme and health care services
- There are fewer workers left to fill the gaps left by adults
- Rising taxes for the fewer workers in order to support the elderly people.
- Improved education and health care services to children in the population that can easily attain higher education and later enter into the work force.

Dependency ratio

Dependency ratio is the percentage of people in the non – economically active age group to that economically active age group.

Or it refers to the percentage of children under the age of 16 years and elders who are above the age of 65 who depend on the economically active people. More adults of up to the age of above 65 and children up to the age of 14 years create this dependency ratio.

Dependency ratio =

$$\frac{\text{Number of children (<16years)} + \text{elders (above 65years)}}{\text{number of economically active people (between 16 and 65)}} \times 100$$

Example

Calculate dependency ratio if in a country there are 13 435 221 under-16 children, 34 729 121 economically active people and 964 182 elders.

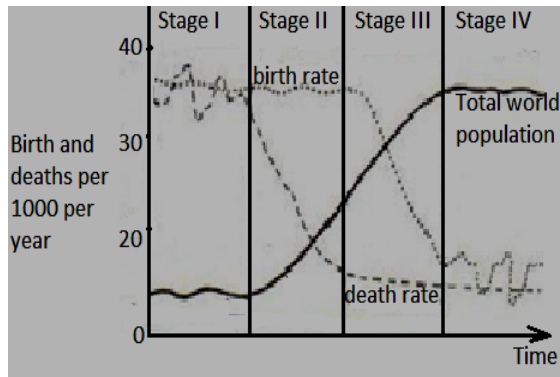
$$\text{Dependency ratio} = \frac{13\,435\,221 + 964\,182}{34\,729\,121} \times 100$$

$$= 41.46$$

Therefore, dependency ratio is 41%

Demographic transition model

It is a figure that describes the world's population trends in terms of birth and death rates. It shows how the world's population grows. It is divided into stages A to D. Each stage describes how population grows corresponding to birth and death rates.



Stage I or High Stationary Stage

- In this stage both birth rate and death rate are high due to the following factors:
- Lack of family planning
- Dependence on child labour
- Better living standards with poor education and medical services.
- Primitive thinking on uncontrolled number of children per couple.
- Population growth is slow

Stage II or Early Expansion Stage

- Death rate falls and birth rate remains high due to improvements in medicine, sanitation and hygiene because of the following reasons:
- Improved hygiene
- Improvement in medical care
- Better sanitation services
- Population grows rapidly. Countries depend on agriculture or depend on agrarian economy such as Malawi,

Stage III or Late Expansion Stage

- Death rate continues to fall and birth rate falls due to:
- Access to health care
- Improved diet

- Industrial development has also accelerated high populations in cities and towns.
- Population growth has started to decline. Countries in this stage are Egypt, Tunisia, Zimbabwe, South Africa, Costa Rica, Mexico and Turkey.

Stage IV or Low Stationary Stage

- Both death rate and birth rate are almost the same.
- Population growth levels off. All this is due to high living standards. A decline in both death and birth rate is called a complete demographic transition. In this Sweden.

Causes of rapid population growth

Effects of rapid population growth on development

- Increased demand on natural resources leading to environmental degradation.
- Shortage of social services
- Shortage of housing
- Lack of job opportunities
- Shortage of food that causes malnutrition and ill-health
- Low levels of living and absolute poverty

Strategies for controlling population growth some countries in the world

- Introduction and use of family planning programmes.
- Establishment of economic incentives and disincentives on a number of children per couple.
- Use of civic education programmes through mass media, curriculum and public rallies.

- Formulating, implementing and enforcing population policies.
- Improving women's involvement in some development programmes.
- Legislating and enforcing child labour laws

World's population policies

a. India

- Family planning services
- Use of contraceptives and sterilization when contraceptives fail
- Financial incentives are given to for voluntary sterilization
- Use of force to those who do not voluntarily sterilize

b. Taiwan

- Family planning campaigns
- Subsidizing smaller families

c. Great Britain

- Family planning campaigns
- Setting marriageable for girls by law
- Provision of old age social security system

d. Israel

- Family planning campaign

e. Egypt

- Government backed family planning schemes. However, some religions discourage people from following family planning methods.

f. China

- a. Family planning campaigns

- b. Encouraging late marriage
- c. Legally 2-3 children are allowed per couple
- d. Contraceptives, sterilization and abortion

g. Nigeria

- Family planning campaigns
- Use of contraceptives
- Government encourages smaller families
- 4-children per couple policy

h. Malawi

- Discouraging child labour by law
- Encouraging education for a girl-child
- Family planning campaigns

Institutions that help to control population growth in Malawi

- Banja La Mtsogolo
- Non-governmental organization (NGOs) such as Population Services International (PSI) and Print and Electronic Media (e.g. newspaper and TVs spread family planning messages).

Benefit of controlling population growth

- It reduces pressure on social services
- It reduces pressure on natural resources
- It reduces unemployment and its related problems
- It ensures adequate resources in the family, community and nation.
- It ensures quality services
- It helps to improve living standards of people in the country.
- It reduces the rate of crime cases in the country.

TOPIC 11 SETTLEMENTS

Success Criteria

Learners must:

1. Explain the meaning of the term *settlement*
2. Identify types of settlement
3. Discussing different types of settlement pattern
4. Examining different settlement patterns
5. Explain factors that influence settlement patterns

Settlement refers to a place where people live and have built homes

Elements of Settlement

The following are the factors that encourage the location of industries.

- People
- What the people do (occupation)
- Buildings and their functions
- Transport links

Important Terms in Settlement

Site: it is the actual piece of land on which settlement is situated e. g. relief features.

Situation: It is relationship of settlement with the immediate surroundings. It is also called location.

Pattern: this refers to the situation of buildings in relation to each other

Shape or internal structure of settlement: this is the appearance of individual settlement.

Factors that Influence Settlement Site

- Availability of arable land, fuel, drinking water and building materials.
- **Wet point** is the type of settlement which is attracted by the presence of

water. On the other hand, **dry point** is the settlement built in upland away from flood-prone areas.

- Flat land
- Climatic conditions
- Availability of resources
- Transport links
- Defensive reasons

Types of Settlement

There are two main types of settlement namely:

- a. Rural Settlement
- b. Urban Settlement

Rural Settlement

Rural settlement has the following characteristics:

- It is unifunctional (one main function such as farming).
- It is made up of homogeneous population (one ethnic group).
- There are permanent settlements with strong social relations.
- They are dominated by illiterate inhabitants.
- Population is smaller than in urban settlement
- It is concerned with primary activities, such as farming, fishing, and mining.

- The population is traditional since there is homogeneous population.
- Very low land values
- Dependence on communal land
- Rural settlement is classified into groups as illustrated in the following table.
- Abundance of semi-permanent buildings

Type of rural settlement	Description
Farmstead	Few main buildings and the surrounding piece of land without shops and other social services
Hamlet	A grouping of farmsteads
Village	Denser grouping of farmsteads with small shops, school, post office and other minor social services

Urban Settlement

Urban settlement is classified into a town, city, metropolis, conurbation and megalopolis.

Types of urban settlement	Description
Town	It is a densely populated urban settlement
City	It is a large town where people work and live.
Capital City	It is administrative centre and houses national government.
(Primate City) Metropolis	It is a main city of a region together with satellite towns which form metropolitan system. The satellite towns

	depend on the metropolis for some specialized services.
Conurbation	It is a large urban settlement formed by the merging or joining of individual towns and cities. E.g. Witwatersrand
Megalopolis	It is a very gigantic urban settlement formed by the merging of several conurbations and super-cities.

Characteristics of urban settlement

- There is high population density.
- It is multifunctional, meaning that there are diversified economic activities.
- It is dominated by literate people.
- It is composed by heterogeneous populations. There are varied of different cultural background.
- There is high mobility
- Land values are very high
- There are permanent buildings
- Population is heterogeneous (existence with multiculturalism).

Functions of settlements

- Residential
- Administrative
- Service delivery
- Industrial functions
- Commercial or trading functions
- Recreational functions

Difference between rural and urban settlements

Rural settlement	Urban settlement
Dominated by poor	Dominated by rich

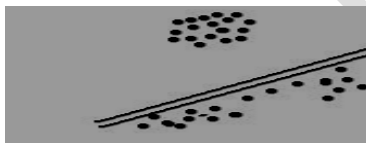
and illiterate people.	and literate people
It is unifunctional, e.g. agriculture only	It is multifunctional, serves many functions.
Poor transport and communication	Good transport and communication services
Low levels of technology	High levels of technology
Low population density	High population density

Functional relationship between rural and urban settlements

Rural areas are source of food and raw materials for urban dwellers. On the other hand, towns provide rural areas with processed food and important social services.

Types of Settlement Patterns

a. Nucleated Settlement Pattern



The buildings are constructed in clusters or groups.

Factors that Influence Nuclear Pattern

- Where water is a problem and houses are clustered around a water point.
- Estate farming that leaves more land for crop cultivation.
- Need for defence or security
- Presence of large flat land and fertile soil
- Presence of business activities

Advantages of Nuclear Settlement Pattern

- There is more social interaction between the households.
- There is more competition that accelerates development.
- It Is easy to provide social services
- Communication is not a problem
- There is more security.

Disadvantages of Nuclear Settlement Pattern

- Disease outbreak spread very easily from household to another household
- Overcrowding of houses leads to poor sanitation.
- There is lack of privacy.
- There are more social and sanitation problems due to high population density and competition for resources.

b. Dispersed Settlement Pattern

The settlements are made in isolated lands away from each other. They are linked by paths.



It is influenced by a number of factors that include:

- Physical barriers such as mountains and water.
- Presence of water almost everywhere
- The presence of hills or mountains
- Unproductive soil
- Private or communal land ownership where each households occupy large landholdings in isolation.

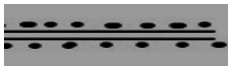
Advantages of Dispersed Settlement Pattern

- Land is available and put to maximum use
- Low noise levels
- Clean and quite environment
- There is privacy
- Difficult for diseases to spread between households

Disadvantages of Dispersed Settlement Pattern

- Loss of social interaction between the households
- Communication is a problem
- Lack of security
- People travel long distances to get the much needed services
- Sharing of innovative ideas is a challenge that slows development.

c. Linear and Cross Settlement Pattern



Linear settlement is made following the road or a stream except a railway line. While cross settlement develops at the road junction or river confluence.

Factors that promote these settlement patterns are:

- Need to access social services by the travelers
- Need for transport and communication services

Advantages of Linear and Cross Settlement Patterns

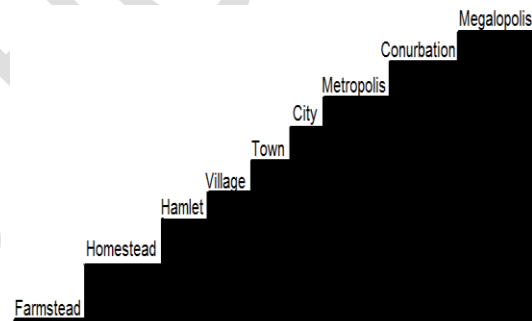
- Transport and communication are not a problem
- There is presence of social services.
- It promotes trading activities and good trade links between communities.

Disadvantages of Linear and Star Settlement Patterns

- Car accidents affect many people along the road.
- High noise levels by the moving vehicles.

Hierarchy of Settlements

This refers to the grouping of settlements which are ranked based on size, shape and services provided in each settlement.

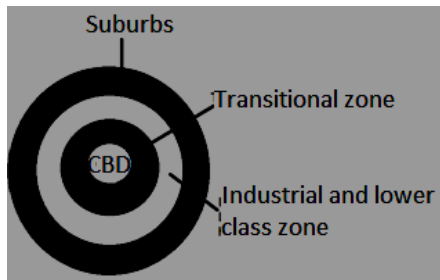


Variables that influence the hierarchy of settlements

- Population size
- Range and level of services
- Sphere of influence (distance that people cover to access the services)

Urban Zoning

This is also known as **functional** or **land-use structure**. This is also known as **functional** or **land-use structure**. It refers to the arrangement of various urban functions in relation to each other



The Functional Structure of a City

The diagram below shows the urban land-structure.

Characteristics of Central Business District (CBD)

This is the heart of the city. CBD has the following characteristics:

- There are high-order land values like administration, retail shops, entertainment, hotels, financial institutions, travel agents, cafes and good restaurants.
- Tall buildings
- High land values
- Highly accessible
- Absence of residence and industries
- High population during the day and depopulated at night

Characteristics of Transitional Zone

- There are commercial establishments that require large floor space.
- There are little residences
- There are warehouses
- There are poor types of shops and light industries
- There are more social problems
- Low grade housing: squatters and ghettos are located there.

Problems of Transitional Zone

- High rates of unemployment

- High crime rates
- Poor quality housing
- Overcrowding

Squatter settlement is the one occupied by poverty-stricken rural inhabitants, on the outskirts who migrate to cities in search of jobs and then settle in hastily built shanty houses.

Ghetto is settlement occupied by minority groups who are forced by economic conditions to live segregated from the rest of the population, under terrible slum conditions. Both squatters and ghettos are built with temporary materials like plastics, cartons, grasses and wood,

Industrial and Lower Class Housing

- There are heavy industrial establishments
- There are narrow streets
- There are generally high population densities
- There are relatively low land values

Problems of Industrial and Lower Class Housing

- Heavily polluted by noise from working machines and cars, effluents and smoke from industries
- There is a lot of heavy traffic

Suburbs or commuter zone

- This is the outskirts of the city
- These are new residential areas
- There are low noise levels and less pollution
- There are better houses and wider streets
- Land value is low with expensive housing

- Farms, airports, new residents, power stations and golf courses are located there

Problems of Suburb Zone

- Long distance to reach the CBD
- Expensive housing enclosed in tall fences and hedges.
- High costs of housing
- Poor public transport

JEKAPU HOLLY

TOPIC 12 URBANIZATION

Success Criteria

Learners must:

1. Explain the meaning of the term *urbanization*
2. Describe the concentric zonal model
3. Explain factors that influence urbanization
4. Explain the effects of urbanization
5. Suggest solutions to challenges associated with urbanisation
6. Identify environmental risks associated with settlements
7. Explain ways of dealing with environmental risks associated with settlements
8. Describe factors for the growth of Lilongwe city
9. Explain the challenges of rapid urbanisation of Lilongwe city
10. Explain solutions to the challenges of rapid urbanisation of Lilongwe city

Factors	Rural (push factors)	Urban (pull factors)
Social & cultural factors	<ul style="list-style-type: none"> - Conflicts - Witchcraft - Insecurity - Disputes 	<ul style="list-style-type: none"> - Entertainment - City life - Right lights - Education - More financial services - Better health care services
Economic factors	<ul style="list-style-type: none"> - Poverty - Lack of jobs 	<ul style="list-style-type: none"> - Job opportunities - Improved social services
Physical factors	<ul style="list-style-type: none"> - Floods - Drought - High population density 	
Demographic factors		

Urbanization is the process by which an ever-increasing percentage of the total population of a country is accommodated in urban rather than rural area.

Urban growth refers to increase in the number of people who live in urban areas.

Factors for Urbanization

- a. Rural-urban migration
- b. Natural growth or higher birth rate

Rural-urban Migration

It refers to the movement of people from rural to urban areas for settlement.

Reasons for Rural-urban Migration

Factors that influence urbanization are classified into **push** and **pull factors**. Push factors are those that force to leave rural areas for urban areas. On the other hand, **pull factors** are those that attract people to go to urban centres.

Problems Associated with Rural – Urban Migration

Rural	Urban
<ul style="list-style-type: none"> - Low economic development - Low food production - Insecurity - More abandoned and neglected houses - More elderly people than youths - Poor services - Half empty schools - Unmaintained roads 	<ul style="list-style-type: none"> - Shortage of housing - Deforestation caused by physical urbanization - Congestion - Pollution - Squatting - More social problems (prostitution, drug and substance abuse and crime) - Environmental despoliation

Importance of Towns

- They are centres of consumptions
- They are administrative centres
- They are centres of commerce
- They control imports and exports

Disadvantages of Towns

- They grow at the expense of rural areas
- They encourage the system that favours small but wealthy minority

Effects of urbanization

i. Positive effects

- Coming in of new ideas due to interaction of different groups of people.
- Availability of social services
- Better living standards

- Infrastructural development such as modern roads and office buildings.

j. Negative effects

- High unemployment levels
- Shortage of housing
- Increase in social problems, such as crime, prostitution and aggressive behaviours.
- Development of squatter settlement
- Lack of property rights due to illegal or unregistered settlements or slums.
- Breakdown of traditional family link. More town dwellers tend to be selfish by adopting foreign life style.
- Low food production as many youths migrate to towns leaving elders in rural areas managing farms.
- Traffic jam which may cause accidents

Solutions to challenges associated with urbanisation

- Providing parking areas in cities
- Providing free ways, one – way streets and traffic lights to accelerate traffic flow
- Discouraging cars from coming to CBD by introducing parking meters and parking fees for entry to CBD
- Demolition and redevelopment of outdated buildings and slums
- Restoration and conservation of buildings which have historical importance
- Building of new towns to reduce overcrowding in cities

- Establishment of rural growth centres
- Introducing small scale industries in rural areas that employ many people

Environmental risks associated with settlements

- Deforestation
- Water and air pollution due to various industrial activities and increased use of motor cars which release harmful gases.
- Substandard housing may be a breeding ground for disease causing organisms.
- Spreading disease outbreak due to overcrowding
- Poor sanitation which spreads diseases

Ways of dealing with environmental risks associated with settlements

- By proper waste management, e.g. by burying wastes to avoid bad smell.
- Location of industries should be properly planned.
- Practising afforestation and reafforestation
- Adopting proper mechanisms to reduce the emissions of harmful gases from industries.
- Promoting the use of renewable energy resources.
- Establishment of satellite towns and rural growth centres in order to reduce pressure on resources in cities.
- Conducting awareness campaign on the proper conservation measures of natural resources in towns.

The functional zones of Lilongwe city

Lilongwe City is rapidly expanding into different directions although the growth in some areas is far much faster than the other.

The City is divided into four main functional sectors that include:

1 Capital Hill Sector

It is a CBD of Lilongwe City. It is also called a city centre. It is where the capital city buildings are located. It is the administrative centre. There are also important high value businesses areas and banks.

2 Kanengo Sector

It is the major industrial site of Lilongwe. There is vast land to accommodate new industries.

3 Old Town Sector

It accommodates a variety of urban functions such as residential areas, commercial activities, administrative functions and recreation centres (golf club). There are light industries such as food processing and carpentry and joinery.

4 Lumbadzi Sector

Kamuzu International Airport (KIA) is located there. There are also residences, light industries, agriculture land and commercial activities.

Factors for the growth of Lilongwe city

- Relocation of capital city from Zomba to Lilongwe.
- Relocation of some leading administrative offices from Blantyre to Lilongwe.
- The transferring of parliament from Zomba to Lilongwe.
- It is a rich agricultural land that attracts many people to settle there.

- Accessibility by land and air. It has a good road network.
- Availability of social amenities like Kamuzu Central Hospital and high standard shopping centres.

Challenges of rapid urbanisation of Lilongwe city

- Water shortage
- High crime rate
- Unemployment
- Sanitation problems due to blockage of sewage pipes and drains.
- Traffic jam during rush hours.
- Air pollution
- Housing problems that influence the development of squatter settlement.

Solutions to the challenges of rapid urbanisation of Lilongwe city

- Providing parking areas in cities
- Providing free ways, one – way streets and traffic lights to accelerate traffic flow
- Discouraging cars from coming to CBD by introducing parking meters and parking fees for entry to CBD
- Demolition and redevelopment of outdated buildings and slums
- Ensuring proper waste disposal
- Building of new towns to reduce overcrowding in cities
- Protecting water catchment areas
- Establishment of rural growth centres
- Introducing small scale industries in rural areas that employ many people

Other terminologies in urban settlement

- **Compatibility of urban functions:** it means urban functions that attract each other. E.g. Banks and high value shops are compatible, but bars are not compatible to schools.
- **Urban decay:** this is the development of slum conditions.
- **Centrifugal forces:** these are factors that encourage movement from the CBD to suburbs. They are either push or pull factors.
- **Functional magnetism:** attraction of functions by others.
- **Functional prestige:** attraction of activities to the area which are of the same type.
- **Functional convenience:** this is place where people stay near their working place.
- **Rural – urban fringe:** it is a zone where rural and urban settlements merge into each other.
- **Greenbelt:** a band of land around the city on which development of new buildings is banned. It protects the countryside, prevent towns from merging and restrict urban sprawl.

TOPIC 13 WORLD AGRICULTURE

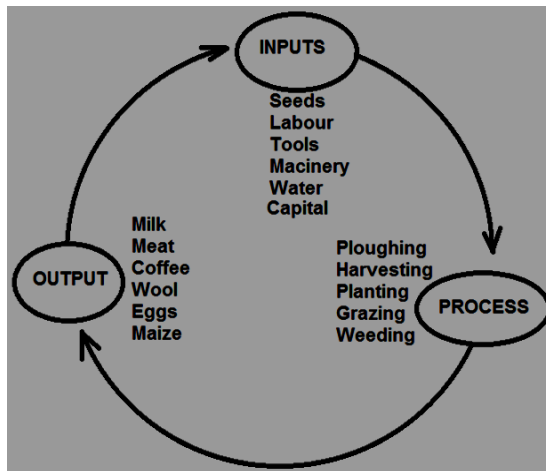
Success Criteria

Learners must:

1. Explain agriculture as a system
2. Explain factors that influence agriculture
3. Identify factors influencing agriculture (physical, economic, human and technological)
4. Identify types of agriculture
5. Explain the difference between subsistence agriculture and commercial agriculture
6. Locate on the world maps areas where different types of agriculture are practised
7. Differentiate between intensive and extensive farming

World Agriculture as a System

World agriculture is described as a system because it involves the extraction of resources from the environment and processes them to produce the new products.



In general, agriculture is described as a system because it contains three components which are interrelated such as input, processes and output. The diagram below describes world agriculture as a system. The outputs are returned back into environment for further production which serve as inputs again after selling or as manure and feed for animals.

Farming satisfies to be a system because:

- It is made up of interrelated components.

- It has a purpose to do.
- It needs supplies of energy to keep it going
- Farmers need to adjust the way they run and manage their work.

Factors that Influence World Agriculture

Factors that affect the world agriculture are classified into the following categories:

- a. Physical factors
- b. Biotic factors
- c. Social or cultural factors
- d. Economic factors
- e. Technological factors

Physical Factors:

- Warmth, intensity and duration of sunshine influence crop maturity and ripening.
- Rainfall provides soil moisture for crop growth.
- Harsh climate (aridity) hinders agricultural development.
- Flat topography enables mechanisation.
- It also determines the choice of irrigation method.
- Sloping land which is well-drained is good for the growing of coffee and tea.

- Well-drained, fertile soil encourages crop cultivation. Infertile soils hinder agricultural development.
- Different types of soil are suited to different types of soil.

Biotic Factors

- Pets, diseases and animal parasites reduce agricultural production.

Social or Cultural Factors:

- Some religions prevent particular agricultural practices.
- Culture has influence on the choice of agricultural practices.
- Government policies have a great influence on agricultural practices, E.g. quota system. Quota is the maximum amount of goods to be offered for sale. Quota helps to control the production and supply of agricultural products.
- The government also prohibits the importation of animals and crop products during the period of animal and crop disease outbreak.

Economic Factors

- Capital helps to purchase inputs and paying for other services.
- Financial institutions which provide funding for agricultural operations.
- Availability of markets helps farmers to produce more goods for sale.

Technological Factors

- Use of machinery
- Pesticides, herbicides, fungicides and drugs
- Improved crop varieties and animals breeds

- Soil conservation measures
- Irrigation
- Transportation technology
- Ploughing
- Crop processing and preservation

Types of Agricultural Systems Based on Purpose of Production

- a. Subsistence Farming
- b. Commercial Farming

Subsistence Farming

This is where the agricultural products are used for food or prestige and only the **surplus** is sold.

Characteristics of subsistence farming

- It uses family members as source of labour
- Crops and animals are meant for domestic consumption
- Variety of crops and animals are raised.
- Simple tools are used

Examples of Subsistence Farming

- a. Pastoralism or Pastoral Nomadism
- b. Shifting Cultivation

Characteristics of Subsistence Farming

- It uses family members as source of labour
- Crops and animals are meant for domestic consumption
- Variety of crops and animals are raised.
- Simple tools are used

Advantages of Subsistence Farming

- It is cheap as it uses simple tools and family members for labour.
- Farmers do not pay tax to government

- Farmers become food self – sufficient

Disadvantages of Subsistence Farming

- Small and fragmented landholdings do not allow mechanization
- Farmers do not pay government's revenue
- Traditional farming methods of farming are practised, e.g. use of simple tools
- It leads to soil degradation as farmers use simple tools.

Shifting Cultivation

It involves clearing a forest land and burn vegetation to grow crops for few years. It is also called **slash-and-burn** as the bushes are cleared and burnt. It uses simple tools such as hoes, axes and panga knives.

Crops are grown for few years where ash is used as fertilizer. After land is degraded, it is abandoned for another virgin land. This is a very primitive form of farming which causes deforestation.

Other names for shifting cultivation in other countries

Name of shifting cultivation	Country
Milpa	Zimbabwe and Mexico
Lading	Malaysia and Indonesia
Tamarai	Thailand
Taungya	Burma
Roca	Brazil
Caingin	Philippines
Poda or Bewar	India
Chitemene	Zambia
Visoso	Malawi
Masole	DRC
Chena	Sri Lanka

Advantages of Shifting Cultivation

- Fire kills weeds
- Ash is a cheap source of fertilizer
- Burning of bush save labour costs

Disadvantages of Shifting Cultivation

- It leads to deforestation
- Burning of bushes destroys habitat for wildlife.
- There are no permanent settlements and structures.
- Burning of bushes destroys humus which impoverishes the soil

Nomadic Pastoralism

This is the practice of rearing animals by moving them to different areas looking for food and water for animals. It is also known as **transhumance** (means seasonal movement of people with animals to different places where they can find food and water for animals).

The nomads keep animals just for food, transport and prestige. They are not meant for sale.

Pastoralism is practised in sparsely populated areas.

The groups of nomads

Region	Nomads	Animals
East Africa	Masai	Cattle
West Africa	Fulani	Cattle
North Africa (Sahel Region)	Tuaregs	Camel
Saud Arabia	Bedouins	Sheep
Scandinavia	Lapps	Reindeers
Central Asia	Kirghiz, Kalmuoks and Kazaks	Sheep

Problems of Pastoralism

- There is no settlement and development as herders keep on moving to different areas with their herds.
- Poor quality animals due to insufficient pasture and water.
- Herders keep large herds of animals which cause to overgrazing.

Commercial Farming

Crops and animals are raised for sale.

Characteristics of Commercial Farming

- Farmers specialize in one crop or animal
- There are generally high yields
- High levels of technology
- There is hired labour
- There is large capital input
- Estate farming is practised

Advantages of Commercial Farming

- Farmers pay tax which is source of government's revenue
- It employs many people
- It helps to improve food production

Disadvantages of Commercial Farming

- Being monocultural, diseases spread easily.
- It limits the growing of food crops.
- It requires heavy capital inputs.
- It degrades environment due to high chemical use.
- It is affected by drought, pests and diseases.

The difference between subsistence agriculture and commercial agriculture

Subsistence farming	Commercial farming
Variety of crops and animals are raised.	Farmers specialize in one crop or animal
Low yields	There are generally high yields
Low levels of technology	High levels of technology
It uses family members as source of labour	There is hired labour
Low levels of capital input	There is large capital input
Dependence on labour input with simple farm tools	Farms are mechanized
It is practised in small piece of land	It is practised in large piece of land
It is done in densely populated areas	It is done in sparsely populated areas
Crops and animals are meant for domestic consumption	Animals and crops are raised for sale

Types of agriculture based on the intensity of land use

- Intensive Farming
- Extensive Farming

Intensive Farming

It is the system of farming that uses high levels of capital, inputs, fertilizer, technology and labour on a small piece of land. It is done in areas where land is scarce with relatively high population density.

Examples of intensive

- Dairy farming in Denmark
- Polder farming in Netherlands

Characteristics of Intensive Farming

- Small land holdings
- Much land labour is used

- High application of input and labour
- Continuous land use or cultivation is done
- High yields per unit land
- Double or treble cropping per year
- Under-utilization of animals
- Irrigation is used in times of drought

Advantages of Intensive Farming

- It ensures high yields per hectare
- There are double or more yields per annum
- There is continuous use of land without losing soil fertility
- Soil acidity is avoided by means of irrigation
- Use of small piece of land helps to control damage of ecosystem, e.g. intensive animal system helps to control overgrazing

Problems Associated with Intensive Farming

- Very high labour input leads to rheumatism of wrists and ankles
- Under-utilization of animals
- Fragmented and scattered land holdings make it difficult to manage them effectively.
- Land is degraded due to continuous cultivation
- There is high demand for labour that may replace machinery

c. Extensive Farming

It is the system of farming that uses low levels of capital, inputs, fertilizer, pesticides and labour on a large area piece of land. It is practised in sparsely populated area.

Examples of extensive

- a. Cattle ranching
- b. Pastoral nomadism
- c. Extensive wheat farming in Canada
- d. Extensive rice farming in South East Asia

Characteristics of Extensive Farming

- Large landholdings
- It is monocultural
- Mechanization is practiced
- Yields are low per unit land but low per individual

Characteristics of extensive farming

- Use of machinery speeds up work
- There is improved animal welfare as they are allowed to move freely
- Less labour is required per unit land due to mechanization

Disadvantages of extensive farming

- It is negatively affected by price fluctuations at the international market
- It requires sparsely populated areas
- Irrigation is not possible due to size of land
- Use of machinery is expensive
- Large land limit the habitat for wildlife
- It requires flat land for easy mechanization.
- In case of extensive animal farming, it leads to overgrazing.
- It also leads to disease outbreak and multiplication of parasites in animals
- Animals lose energy as they travel long distances looking for pasture and water

Differences between intensive and extensive agriculture

Intensive farming	Extensive farming
Small land holdings	Large landholdings
Much land labour is used	Farms are mechanized
High application of input and labour	Low levels of labour and input
Continuous land use or cultivation is done	Land use is seasonal
High yields per unit land	Low yields per unit land, but high overall yields
Double or treble cropping per year	Crops are grown once a year or perennially
Irrigation is used in times of drought	No irrigation is used

Importance of Agriculture to the Country's Development

- It provides food to many people
- It provides income to farmers after selling agricultural products.
- It provides employment to farmers and those working agro – based industries.
- It provides raw materials for processing of new products, such as food and clothes.
- It provides revenue to government through taxation.

- It provides foreign exchange earnings to
- Government after exporting agricultural products.

Impact of Agriculture on Environment

- Deforestation as farmers clear large forest land for opening up new farms. Tobacco farmers use a lot of trees to cure tobacco.
- Soil erosion and land degradation when farmers cultivate in river banks and steep slopes that accelerate soils erosion.
- Climate change by increased cattle production whose dungs produce more methane which is a greenhouse gas.
- Damming for irrigation purposes creates breeding ground for disease causing organisms, e.g. mosquitoes.
- Water pollution due to excessive use of fertilizer and pesticides.
- High frequency of flooding due to erosion and silting of water bodies.
- Depletion of water resources due to destruction of vegetative cover.
- Pesticides and herbicides kill useful organisms in the environment that disturbs ecosystem.

TOPIC 14 INTENSIVE RICE FARMING IN SOUTH EAST ASIA

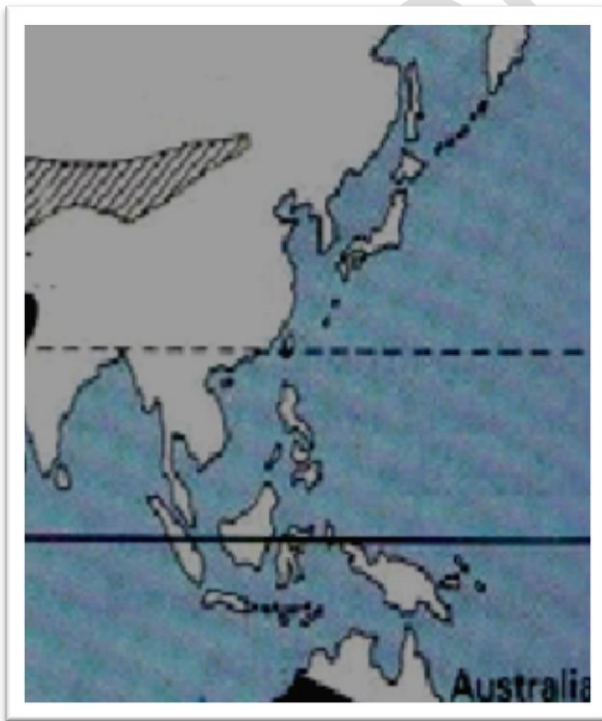
Success Criteria

Learners must:

1. Locate south east Asia on a world map
1. Identify countries where rice is grown in south eastern Asia
2. Describe the population density of south east Asia
2. Explain conditions favouring rice farming in south east Asia
3. Draw a pie charts showing the cycle of farming activities in a year
4. Relate the cycle of farming activities to the cycle of seasons
5. Describe the problems associated with rice farming in south east Asia
6. Explain problems associated with rice farming in south east Asia
7. Explain the importance of intensive rice farming to the economies of the countries in south east Asia

Rice Farming South East Asia

Rice is the staple food in the south Eastern Asia. China and India are the leading rice producers in the world. Other countries are Bangladesh, Indonesia, Malaysia, Philippines, Cambodia, Thailand and Vietnam



Population Density of South East Asia

South East Asia is the world's most densely populated area; this encourages intensive farming.

Types of Rice

a. Upland or dry rice

It is grown in the upland areas where monsoon rainfall is the source of moisture. In steeply sloping areas, terraces are constructed in order to hold the rain water.

b. Lowland or wet rice

It is grown in the low lying areas such as river banks or floodplains, deltas and coastal areas. Rice is grown in puddies. A puddy is strip of land enclosed by bunds which hold irrigation water. Flood irrigation is practiced Most of the rice is grown in puddies.

Conditions Favouring Rice Growing

- An average warm temperature of 18°C to 27°C throughout the year.
- Rainfall of 2000mm during the growing season; dry and sunny period of at least two months towards harvesting.

- Abundant water supply in dry season for flood irrigation.
- Flat land that facilitates flood irrigation.
- Water retentive heavy fertile loam and clay soil.
- Abundant labour supply for farm operations like land preparation, sowing and harvesting.
- Heavy capital outlay that assist to carry out farm operations.

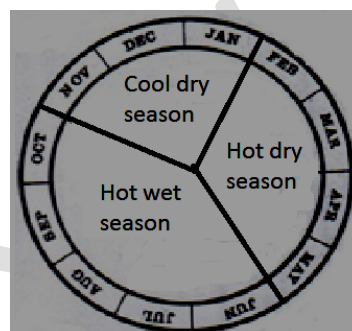
A cycle of Farming Activities

Month	Season	Paddy plantation activities
May	Rainy season approaches	Preparing rice fields and nurseries
June to July	The onset of rainy season	Sowing rice
August	Rains increase	Transplanting
September to October	Rains start to decrease	Main field operation (weeding, applying fertilizer, pest control and controlling water levels)
November	north – East monsoon winds starts to bring dry conditions	Draining the fields Draining the fields
December	Dry season	Harvesting, processing and storage
January	Dry season	Preparing rice fields and nurseries for the next growing season
February to	North – East	Sowing, field

April	monsoon winds subsides	maintenance and harvesting
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Relate the cycle of farming activities to the cycle of seasons

The region has the following cycle of seasons:



The Cultivation Operations of Rice

- 1. Preparations of rice nurseries**
Seed beds are prepared a month before sowing followed by selection of rice seeds.
- 2. Preparations of rice fields**
Ploughing the fields is done by hand using hoes or animals are also used. Then the large clods are harrowed.
- 3. Transplanting rice seedling**
Seedlings are transplanted when they are one month from sowing and with four to five leaves.
- 4. Controlling water level**
Water levels needs to be controlled in order to avoid seedlings due to excessive moisture that may submerge rice seedlings.
- 5. Weeding**
Weeds are uprooted.
- 6. Fertilizer application**

Fertilizer is broadcasted in three phases like:

1. Before transplanting seedlings
2. One month after transplanting
3. Soon before flowering

7. **Controlling pests**

Snare and traps are used to control birds and rodents. Some soil pests are controlled by flooding. Others are controlled by means of pesticides.

8. **Draining off the rice fields**

The fields are drained just 2-3 months before harvesting to facilitate ripening of rice.

9. **Harvesting and processing rice**

Rice plants are cut by sickles and bundled together. The bundles are then dried in the sun. After drying them, they are threshed and winnowed by tossing in the bamboo straw.

Problems Associated with Rice Farming

- a. Waterborne diseases
- b. Rheumatism or muscle diseases. Most Asian farmers do not mechanise their farms because:
 - They are poor to hire and buy machines.
 - The fields are very small to mechanise.
- c. Drought
- d. Deterioration of soil due to continuous mono-cropping. This also occurs due to irrigation in the uplands that erode soil.
- e. Salinity due to irrigation by dirty water
- f. Rugged terrain hinders irrigation
- g. Rising water levels and water lodging
- h. Pests and diseases attack rice plants.

Importance of Intensive Rice Farming to the Economies of the Countries in South East Asia

- It provides income to rice farmers.
- It provides employment to rice farmers and those working in agro-based industries.
- The countries earn foreign exchange
- It improves food security to the growing population. Rice is the main staple food to many people in the region.

Rice Farming in Malawi

Rice is grown by smallholder farmers in Malawi. Most of rice is along in:

- Lakeshore areas of Karonga, Nkhata Bay, Nkhosakota, Salima and Mangochi
- Shire Valley region
- Wetlands of Lake Chilwa in Zomba and Machinga.

Rice growing is not enough to meet market demand both at local and international markets. As a result, Malawi has to import rice from other countries.

Problems that Hinder Successful Rice Cultivation in Malawi

- Loss of soil fertility due to soil erosion.
- Most farmers lack adequate knowledge in rice growing.
- Frequent droughts that affects many parts of the country.
- Lack of machinery to boost the production.
- Lack of better and high yielding rice varieties.
- Poor prices that discourage farmers to grow more crops.

- Diseases and insect pests that attack rice fields.

Efforts to Rice Farming in Malawi

- Expansion and establishment of irrigation schemes through the **Green Belt Initiative**.
- Investing in research for better rice varieties.

- Searching for international markets where farmers can sell their rice.
- Development of simple machineries such as treadle pumps for irrigation.
- Providing fertilizer and input subsidies to farmers.

TOPIC 15 INTENSIVE ANIMAL FARMING IN DENMARK

Success Criteria

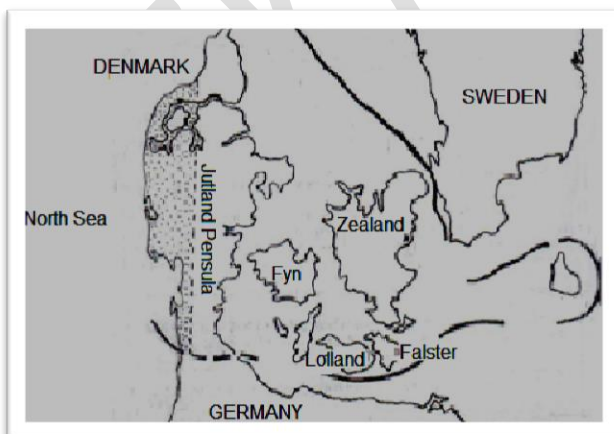
Learners must:

1. Locate Denmark on a world map
2. Explain factors favouring dairy farming in Denmark
3. Identify breeds of cattle raised on dairy farms in Denmark
4. Identify crops grown on dairy farms
5. Explain the importance of crops grown on a dairy farm in Denmark
6. Explain the use of the crops grown on dairy farms
7. Relate the cycle of seasons to farming activities on a dairy farm in Denmark
8. Identify products from dairy farms
9. Explain the term *cooperatives*
10. Explain the importance of cooperatives in dairy farming in Denmark
11. Explain the importance of dairy farming to the economy of Denmark
12. Locate other dairy farming areas on a world map

Countries Where Dairy Farming is Practiced

- Holland
- Denmark
- Switzerland
- New Zealand
- France
- South Africa

Dairy Farming in Denmark



There are four islands and a peninsula called Jutland that make up Denmark. The islands include Fyn, Lolland, Falster and Zeeland.

Eastern Jutland and all the four islands have fertile soil while in the western Jutland there is sandy and infertile soil. The infertile land is reclaimed by various means to make it worthy cultivatable

Dairy farming is the rearing of animals with the main purpose of producing milk. The western Jutland there is sandy and infertile soil. The infertile land is reclaimed by various means to make it worthy cultivatable.

Other animals raised on dairy farms include poultry, pigs and sheep. Milking short horn

Characteristics of Dairy Farming as Intensive Farming

- There are small land holdings
- It is labour, input and capital intensive
- There is use of intensive farming methods
- Milk is the main source of income

How to Manage Dairy Cattle

Dairy animals produce more milk when there is proper management as follows:

- Proper feeding: dairy cattle should be fed on the different types of pastures (e.g. hay and silage) and a mixture of grains and grain by-products.
- Proper housing: Each animal should have enough space and the house should be strong and leak-proof.
- Very high sanitary conditions: Each animal needs a very clean environment in terms clean food, water and the entire housing environment should be clean.

Favourable Factors that Encourage Dairy Farming

- Over-farmed land to restore soil fertility
- Availability of a large urban market
- Fertile soils for the growth of fresh and high grade pastures
- Skilled workforce needed in the management of dairy animals.
- High levels of technology.
- Availability of high grade pasture
- Mild and wet conditions that promote the growth of folder crops and natural pastures
- Availability of very efficient refrigerated transport as milk is highly perishable.

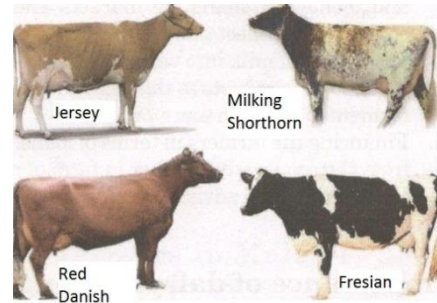
Crops Associated with Dairy Farming

Pastures for grazing in summer

Wheat, barley, potatoes and sugar beets

Folder crops for indoor feeding during winter

The Dairy Breeds in Denmark



- Guernsey
- Friesian
- Brown Swiss
- Jersey
- Alderney.

Cycle of Activities on Dairy Farms

Season	Farm activities
Spring (March to May)	<ul style="list-style-type: none"> • Mating dairy cows (using artificial insemination and bulls) • Stall feeding calves for six months • Planting crops for feeding animals, e.g. turnips and maize. • Branding calves
Summer (June to August)	<ul style="list-style-type: none"> • Hay making • Outdoor grazing • Irrigating pastures • Milking cows
Autumn (September to November)	<ul style="list-style-type: none"> • Cows finish milking • Maintenance and development of farm structures • Planning for next season
Winter (December to February)	<ul style="list-style-type: none"> • Stall feeding cows (hay and silage)

Other Animals Associated with Dairy Farming

- Pigs
- Poultry
- Sheep

- Beef cattle raised for other purposes

Products from dairy farms

- Cheese
- Butter
- Yoghurt
- Ice cream
- Condensed milk
- Powdered milk

Roles of Cooperatives in Dairy Farming

Cooperative is a group of dairy farmers who put their resources for the common benefit or purpose. Dairy farmers work in groups that assist each other to improve farming techniques.

Cooperatives play important roles such as:

- They provide loans to farmers.
- They assist farmers buy inputs in bulk at relatively lower prices.
- They process milk into various products on behalf of farmers.
- They provide marketing functions on behalf of farmers like storage, transportation and grading.
- They offer research and advisory services to farmers on new and better farming techniques.

Importance of Dairy Farming

- It provides employment to farmers.
- It is source of foreign exchange.
- Milk is very nutritious food.
- It is source of income to dairy farmers

Problems of Dairy Farming in Denmark

- Long severe winters prevent outdoor grazing which makes it difficult and expensive to stall feed animals.
- There is scarcity of labour force as youths migrate to towns for white collar jobs.

- Shortage of land for dairy farming due rapid population growth.

Dairy Farming in Malawi

There are smallholder farmers who practice dairy farming in Malawi either individually or in cooperatives. One of the cooperatives is Bvumbwe Dairy Farmers Cooperative Society.

Importance of Dairy Farming in Malawi

- It provides income to farmers.
- It helps to reduce importing of milk and milk products
- It encourages the development of milk processing and feedstuff manufacturing industries.
- It provides fresh milk to the growing population.
- It helps government to collect revenue from surtax from farmers.

Problems of Dairy Farming in Malawi

- High surtax charges limit farmers from making profits
- Lack of capital by farmers
- Lack of proper knowledge and skill about management of dairy animals.
- Insufficient feedstuffs during due to drought conditions.
- Prevalence of parasites and diseases

Efforts to Improve Dairy Farming in Malawi

- Training farmers on the management of dairy animals
- Providing dairy farmers with loans.
- Providing farmers with cooling facilities
- Providing farmers with veterinary services.

TOPIC 16 IRRIGATION FARMING

Success Criteria

Learners must:

1. Identify a world map showing areas where irrigation farming is practiced
2. Locate areas that depend on irrigation on a world map
3. Describe conditions which necessitate irrigation farming
4. Identify methods of irrigation, e.g. overhead, drip and furrow
5. Explain challenges associated with irrigation farming
6. Explain solutions to challenges facing irrigation farming
7. Identify areas where irrigation is practised in Malawi
8. Explain problems facing irrigation in Malawi
9. Explain how irrigation can be improved in Malawi

Irrigation is the application of water onto the land with an aim of growing crops. It is used as a supplement to rainfall more especially when rainfall is unreliable or in dry areas. Irrigation farming is an example of intensive farming.

Areas where Irrigation Takes Place

- Nile Valley in Egypt
- Gezira Irrigation Scheme in Sudan
- Indus Valley in Pakistan
- Hwang-Ho and Yangtze Kiang Valleys in India
- Israel
- Nchalo in Malawi
- Central Valley of California

Necessary Conditions for Irrigation to Take Place

- Arid or drought conditions such as in the deserts
- Adequate and reliable water supply in the area
- Flat land that holds water
- Heavy clayey soils that retain water

Irrigation Methods

These methods are classified into two main groups namely:

1. Traditional methods

- Well irrigation
- Basin or annual irrigation
- Furrow irrigation
- Tank Irrigation

2. Modern methods

- Overhead or sprinkler irrigation
- Trickle or drip irrigation

Traditional Methods

1. Well irrigation

A well is a hole sunk into the ground to reach the water table that provides water for irrigation.

2. Basin or annual irrigation

It depends on the seasonal flooding of the river during the period of heavy rainfall. The walls are constructed on the flood plain that store water. The irrigation ditches are dug that distribute

water to the fields where irrigation takes place. Sometimes, water is brought into the fields and flows all over the ground.

Advantages of annual irrigation

- Plants get sufficient moisture as water covers the whole field.
- It does not require any technical knowledge for the operation and maintenance.

Disadvantages of annual irrigation

- It requires lot of water, it is wasteful.
- It encourages water lodging, soil erosion, leaching of plant nutrients and soil salinity.

3. Tank Irrigation

It involves the construction of mud-bunds to make water reservoirs across called **tanks** that store water to be used later for irrigation.

4. Furrow Irrigation

Water flows in furrows or ditches.

Advantages of Furrow Irrigation

- It is cheaper as no special equipment is used.
- Large areas are irrigated.

Disadvantages of Furrow Irrigation

- It uses large volumes of irrigation water.
- It is difficult to move farm equipment throughout the farm due to slippery soil conditions.
- It time consuming and expensive to construct furrows.

- There is uneven distribution of water in the field.
- Moving water washes away nutrients from the furrows.

Modern Irrigation Methods

1. Trickle or drip

Water is supplied to plant roots through the pipes which are buried underground.

Advantages of Trickle Irrigation

- It controls loss of water through evaporation as water directly reaches the roots.
- It is easy to supply fertilizer to plants together with water.
- The dry ground between the furrows provides easy access to workers and machinery to move.
- It prevents the growth of weeds in furrows as water reaches the roots only.

Disadvantages of Sprinkler Irrigation

- It is expensive to install and maintain.
- It requires technical knowledge for the operation and maintenance.

2. Overhead or Sprinkler Irrigation:

Water is applied to crops in form of showers like rainfall. Water that falls on the leaves evaporates before reaching the roots.

Advantages of Sprinkler Irrigation

- There is uniform application of water
- It does require leveling of land.
- It is good for the application of fertilizer and pesticides in solution form.

Disadvantages of Sprinkler Irrigation

- It is expensive to buy and maintain irrigation pipes and pumps.
- It is less efficient during windy days as showers are deflected by strong wind.
- It is wasteful as some water may fall away from roots and some that falls on leaves evaporates before it reaches roots.

Characteristics of Irrigation as an Intensive Farming

- There is use of small land holdings
- Crop cultivation is continuous
- There is double or treble cropping
- There are higher yields per hectare

Problems Associated With Irrigation

- Spreading of waterborne diseases, i.e. Bilharzia
- It leads to salinity that encourages the formation of hard-pans
- Dam silting or sedimentation
- Theft of irrigation pipes.
- High cost of buying, installing and maintaining irrigation equipment and facilities.
- Water lodging due to excess application of water.
- Water pollution by some waste dumped in river or dams.

Solutions to the Problems Associated With Irrigation

- Desalinating water
- Reusing wastewater
- Proper waste management in order to prevent water pollution.
- Using efficient irrigation methods that save water.

- Afforestation to check soil erosion and silting.
- Storing enough water (water harvesting) during rainy season to be used during water crisis.

Irrigation Farming in Malawi

Irrigation is practiced in Malawi farming during the dry season by the smallholder farmers.

Areas where Irrigation Farming Takes Place in Malawi

1. Lakeshore areas
Karonga, Salima, Nkhata Bay and Mangochi
2. Lower Shire districts
Chikwawa and Nsanje
3. Lake Chilwa – Phalombe Plain
4. Wetlands
Limphepa dambo, Ndindi Marsh, Elephant Marsh and Vwaza Marsh.
5. Along the main rivers in Malawi, such as Bua, Lintipe, Bwanje, Rukuru, Dwangwa and Ruw.

Problems Affecting Irrigation Farming in Malawi

- Inadequate irrigation technologies that affects production. Most smallholder farmers use watering cane instead of irrigation pumps which can water a large land within a short period of time.
- Lack of local participation and ownership of irrigation schemes by local communities.
- Over-dependency on donor aid, meaning that when donor aid ceases many farmers are discouraged.
- Siltation of water bodies.

- Depletion of fresh water resources due to drought and silting as a result of mismanagement of resources.
- Lack of political will to invest in dam construction and other agriculture initiatives.
- Theft of irrigation equipment
- Flooding along the major rivers in Malawi that destroy the crops at the onset of rainy season

Ways of Improving Irrigation Farming in Malawi

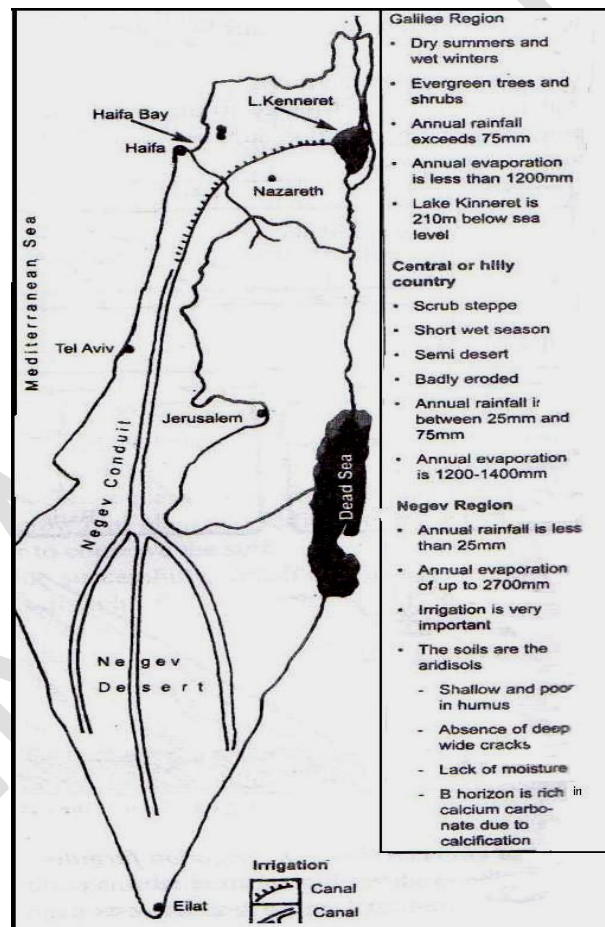
- In irrigation at smallholder level by government and non-governmental organizations.
- Rehabilitating the existing irrigation schemes
- Encouraging organic farming and minimizing agro-chemicals in order to check water pollution.
- Providing awareness campaigns on proper waste management in irrigation schemes.
- Training farmers on proper land and water management.
- Monitoring water lodging and salination of irrigation schemes.

TOPIC 17 IRRIGATION IN ISRAEL

Success Criteria

Learners must:

1. Locate Israel on a world map
2. Identify the climatic regions under which Israel falls
3. Relate the climate, relief and soil to water supply
4. Identify methods of irrigation in Israel
5. Locate areas where irrigation is practiced in Israel
6. Identify the challenges encountered in sourcing irrigation water in Israel
7. Identify the sources, treatment and distribution of irrigation water in Israel
8. Identify the crops grown under irrigation in Israel



Israel is a small country with an area of 20440km² and half of it is made up of a desert. It is under the Mediterranean Climate that has average rainfall of between 400mm

and 800mm in winter. Northern and Western parts receive rains and desert in south east.

There are four regions in Israel which are

i. **Mediterranean Coastal Plain**

It is flat and fertile.

ii. **Hilly Country of Galilee**

It is bounded by the Sea of Galilee in the north, Judea Hill in the centre and Jordan River valley to the east

iii. **The Rift Valley Region**

The region is below the sea level that extends from the Sea of Galilee to Dead Sea via Jordan River.

iv. **Negev Desert**

It is very hot and dry. There is no rainfall from May to October. Irrigation takes place here.

Importance of Irrigation in the Negev Desert

- It facilitates agricultural production in order to increase food production for the growing population.
- It influences settlement to take place in the region
- It induces business and employment
- It eradicates aridity in the area.

How Climate, Relief and Soil; Influence Irrigation Farming in Israel

1. Climate

- Aridity climate forced people to engage in irrigation farming in order to ensure food security.
- Scarcity of fresh water in the water bodies encouraged in the desalination of sea water.
- Use of drip irrigation method saves water that controls evaporation.
- Water is supplied to plant roots through the pipes which are buried

underground. It helps to control loss of water through evaporation as it directly reaches the roots.

2. Relief

- Since the fresh water is found below the sea level, people use pipes and other water conveyance systems that distribute water to where it is needed.

3. Soil

- Due to infertile sandy soils, they use drip irrigation method which reduce loss through evaporation.

Sources of Water for Irrigation in Israel

- a. Lake Keneret also known as Lake Tiberias or Sea of Galilee. It is reliable source of fresh water supply.
- b. Yarkon River which provides water directly to Negev Desert.
- c. Groundwater is tapped using wells

Major Reasons for Water Shortage in Israel

- a. Overconsumption of water by the rapid population growth and industrialization.
- b. Insufficient rain water and high evaporation rate. Evaporation exceeds precipitation which keeps the land always dry.

Methods of Obtaining Water from the Sources

- Use of pipelines. Pipelines are very important as they prevent loss of water through evaporation.
- Canals are also used to lead water to where irrigation takes place. The disadvantage of canals is that water is lost through evaporation.

Water Desalination Processes

Desalination is the process of removing salts from water to make it suitable for use. Due to scarcity of fresh water in Israel, water which is available is desalinated. Water desalination plants are located at Eilat and Haifa. The following are the desalination methods used in Israel.

Desalination Processes

a. Reverse Osmosis or Membrane Process

Salty water is pressed against a semi-permeable membrane where fresh water is allowed to pass through as **brine** (salty water) remains behind.

Advantages of Reverse Osmosis or Membrane Process

- It is cheap as it uses less energy.
- It is very efficient and produces large volumes of fresh water.

Disadvantages of Reverse Osmosis or Membrane Process

- It uses very sophisticated technology which requires high levels of technological investment.
- It can easily breakdown when the membrane blocks.

b. Evaporation or Distillation Process

Sea water is led into the hot chambers where it is boiled to evaporation. Steam is harnessed and condensed to produce fresh water ready for irrigation. This process is similar to the one that is used for brewing kachasu.

Advantages of Evaporation Process

- It produces high quality water.
- It is effective to treat water with high quantities of impurities.
- It is cheap as it uses simple technology

Disadvantages of Evaporation Process

- It requires a lot of energy.
- It increases greenhouse effect due to high energy consumption.
- It produces less fresh water than brine.

c. Vacuum freezing

Sea water is led into the freezing chambers where it is frozen to form a thin mixture of liquid water and ice crystals. Ice crystals are washed to remove the brine. Then the ice crystals are melted to produce fresh water. This process is used at Haifa. It is cheaper than other desalination processes.

Advantages of Vacuum Freezing

- It needs less energy
- It has causes less corrosion and salt precipitation.

Disadvantages of Vacuum Freezing

- It is expensive as it requires huge capital investment.
- Brine returned to the environment has negative impact on plants and aquatic animals.
- Desalination plants occupy large land that would be used for other developments, such settlement.

Irrigation Methods that are used in Israel

- Sprinkler irrigation method though it is wasteful sometimes.
- Drip irrigation method is widely used as it saves water.

The Challenges Encountered in Sourcing Irrigation Water in Israel

- There is conflict between the Arabs and Israelites over the use and ownership of Jordan River
- High cost of pumping water from Sea of Galilee to Negev Desert.

- High rate of evaporation
- Saline water
- Leakage of irrigation pipes
- Sandy soils are not water retentive

Crops Grown under Irrigation

- Crops grown include tomatoes, sunflower, sugarbeet, citrus fruits, apples, pears, peaches, apricot, cotton, wheat, barley, ornamental plants (flowers) and spring potatoes.

TOPIC 18 PLANTATION AGRICULTURE

Success Criteria

Learners must:

- 1 Explain the term *plantation farming*
- 2 Identify areas where plantation farming is practiced
- 3 Explain the characteristics of plantation farming
- 4 Explain the advantages and disadvantages of plantation farming

Plantation agriculture is the commercial cultivation of perennial crops done on the estate basis.

World Distribution of Plantation Crops

CROP	COUNTRY
Bananas	West Africa and Latin America
Cocoa	Brazil, Nigeria, Ivory Coast, Ghana and Gabon
Coconut	Malaysia, India, Indonesia and Philippines
Coffee	El Salvador, Angola, Brazil and Uganda
Rubber	Liberia, Sri Lanka, Indonesia and Malaysia
Sisal	Tanzania, Uganda, Madagascar and Kenya
Sugarcane	All tropical regions
Tea	India, Sri Lanka, Kenya, Malawi and Mozambique

Characteristics of Plantation Farming

- Estate farming is practiced. Sometimes smallholder farming is possible.
- Foreign ownership of plantation estates with local labour is used
- Plantation farms are scientifically managed to meet the required standards
- There is heavy capital input
- Onsite processing of the products

- It is labor intensive since crops need more care

Advantages of Plantation Farming

- It ensures regular supply of the produce for domestic and industrial use
- Workers are equipped with various skills about plantation farming
- Harvesting is done quickly, efficiently and cheaply
- It ensures no wastage of resources since the wastes are used as fuel or fertilizer
- It provides high – income earnings to government through export revenue.
- It supports local manufacturing industries.

Disadvantages of Plantation Farming

- Price fluctuations at the world markets reduce production
- Plantation crops are affected by the climatic hazards
- It depends on the presence of cheap labour leading to exploitation.
- Diseases spread easily due to monocultural practice.
- Plantation farms occupy large forest land that cause deforestation
- Lengthy period to start harvests
- Agro-based processing industries cause water pollution by effluent discharges in water.
- Heavy rainfall leads to leaching which deteriorates the soil. As a result, there is demand for heavy application of fertilizer.

TOPIC 19 TEA GROWING AREAS IN MALAWI

Success Criteria

Learners must:

1. Explain the conditions favourable for tea growing
2. Locate tea growing areas on a map of Malawi
3. Explain a cycle of farming activities
4. Explain the stages of processing of tea
5. Explain the importance of the tea industry to Malawi's economy
6. Explain showing the value of tea and four other major export commodities for Malawi

China is the world's largest producer of tea from which Malawi's tea originated. Other world's tea producers are Sri Lanka, Kenya, Malawi and Turkey. Britain is the largest tea consumer.

Tea growing districts in Malawi are Mulanje, Thyolo and Nkhata Bay. Large companies own tea estates in the mentioned districts, however there are smallholder farmers who are also allowed to grow tea.

Favourable Conditions for Tea Growing

- Rainfall of between 1150mm and 1500mm per annum
- An average temperature of about 18°C with no frost
- Well drained heavy loamy soil on gentle slopes.
- High humidity that produces morning which promotes the rapid growth of young tea leaves
- Abundant labour supply for harvesting and harvesting

A cycle of tea growing operations

1. The nursery

Stem cuttings from healthy tea bushes are raised in polythene tube.

Sometimes, seeds are sown on wet sand where germination takes.

2. Cultivation

After 9 months to 1 year, the seedlings are transplanted into the main fields in rows..

3. Fertilizer application

Fertilizer is applied between September and October using foliar method.

4. Pruning

Pruning starts during the fourth year of growth.. this promotes the growth of tea bushes.

The importance of pruning

- To promote the growth of new tea shoots.
- To prevent flowering and fruiting.
- It helps the tea bushes to form a **plucking table** along the close hedge in each row.
- To produce a healthy and well spread out canopy.
- To maintain a convenient height for easy harvesting.

5. Topping

Topping is the removal of tea tops; it helps the growth of young tea leaves which are

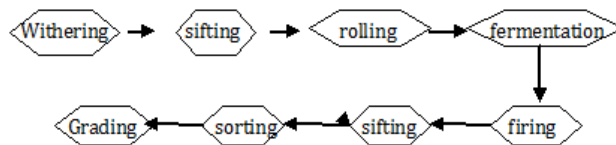
harvested. It helps the tea bushes to form a **plucking table** to ease harvesting.

6. Harvesting

Two top leaves and a bud are plucked because they have high tannic acid content. Then, the leaves are taken to the factory for processing. A lot of labour is required for harvesting.

Processing Tea

The flow chart below shows how tea is processed. There are three types of processed tea.



a. Black tea

- Tea leaves are put in a trough where hot air is blown in order to reduce moisture content through the process known as **fermentation**.
- Then they are rolled into smaller pieces and fermented to change colour from green to copper. This helps to improve flavour.
- Fermentation is stopped by heating or firing the leaves. Tea produced here is called **black tea**.
- Finally, the leaves are sorted out, graded and packed ready for sale.

b. Green tea

If **green tea** is wanted, fermentation is not done. Tea leaves are pan-fired to prevent fermentation. Other processes remain the same as in black tea.

c. Oolong tea

Green tea leaves undergo partial fermentation. After that, they are put in a

shade for 5 hours and roasted for 10 minutes. Then, they are rolled and twisted before they are finally re-fired.

The whole process requires a lot of energy that comes from electricity and wood. To the north of the estate, there is blue gum plantation which is a source of fuel wood.

Problems Faced by the Estate

- Old tea bushes become tough and affected by fungal diseases called armilaria.

Smallholder Tea Farming

Smallholder farmers are also allowed to grow tea because of the following reasons:

- They do not require large land as tea is high yielding
- They have tea growing knowledge as they already worked in the tea estates before
- They get alternative sources of income

Smallholder Tea Authority (STA))

It was created by the government where farmers are allowed to grow tea on contractual basis. The roles of STA are to:

- Provide marketing functions to tea farmers.
- Transport tea from farmers to markets.
- Maintain infrastructure such as roads that facilitate transportation.
- Procure inputs for farmers and provide them as loan.
- Provide credits to farmers.
- Provide extension services to farmers.

Countries that Import Malawi's Tea

Germany, Holland, Pakistan, South Africa, Great Britain, Canada, United States of America and Central Europe

Importance of Malawi's Tea Industry

- It is source of foreign earnings to the country
- It provides income to tea growers after selling
- Tea is used as a drink

- It provides employment to tea farmers and those working in agro-based industries.
- It promotes the growth of secondary industries

Health benefits of drinking tea

- It is rich in vitamins and minerals.
- It is a stimulant because it contains caffeine which enhances mental alertness.
- It promotes digestion

TOPIC 20 INDUSTRIALISATION

Success Criteria

Learners must:

- 1 Explain the term *industrialization*
- 2 Explain the advantages and disadvantages of industrialisation explain the term *industrialization*
- 3 Explain the advantages and disadvantages of industrialisation explain the term *industrialization*
- 4 Describe the advantages and disadvantages of industrialisation

Definition of the term *industrialization*

Industrialisation refers to the process in which a society transforms itself from a primarily agricultural society into the one which centred on the manufacturing of goods.

The development of industries started with **Industrial Revolution** in UK in 1840. Then the knowledge about **Industrial Revolution** spread to other countries across Europe such as Germany, Belgium and France as well as Japan and USA.

Factors that influenced the start of industrialisation

- a. Invention and modern technologies such as steam engine
- b. Increasing human population that provides labour and market.
- c. Agricultural production which increased food production.
- d. Financial innovations like banks and stock exchange market.
- e. Coal and iron deposits.
- f. Government policies that promote commercial activities.

New inventions during the Industrial Revolution

- a. The flying shuttle for weaving using a thread of yard by John Kay.
- b. The spinning jenny by James Hargreaves.
- c. The water frame that replaced a hand-driven spinning jenny by Richard Arkwright.
- d. The spinning mule that combined the features of the spinning jenny and water frame.

Characteristics of industrial revolution

- Production is by hand rather by hand.
- Expanded markets
- Development of transport network
- Increased capital accumulation
- Growth in large enterprises and increased specialization
- Increase in size and predominance of cities
- Emphasis is concentrated to manufacturing

Advantages of industrialisation

- It increases employment opportunities
- Working with large machines improves efficiency of production rather than human work.

- It increases the presence of affordable goods since machines produce large quantities of goods.
- It improves skills amongst workers.
- It helps countries to earn foreign currency through exports of domestically produced goods.
- It helps to utilize available resources in the country.
- It aids the development of towns.

Disadvantages of industrialisation

- Use of large machinery leads to unemployment. Machines replace many workers.

- Burning of fossil fuels in industries cause air pollution. This leads to serious environmental problems like global warming, depletion of ozone layer and erratic rainfall.
- Industries exploit natural resources that damage ecosystem.
- Dependence on machinery for production leads to loss of human skills and handicrafts.
- Some industrial products and activities cause severe accidents and disasters.

TOPIC 21 INDUSTRY

Success Criteria

Learners must:

1. Identify types of industries, e.g. primary, secondary, tertiary and quaternary
2. Explain the meaning of the term *system*
3. Explain industry as a system in terms of inputs, processes and outputs
4. Identify the major industrialised areas on a world map
5. Describe factors influencing the location of major industrialised areas
6. Explain the risk and disaster management impact of industries.

INDUSTRIES

Industry is places where raw materials are changed into new products. It is also defined as the process of changing raw materials into the finished products. An industry is an open system because it consists of three interrelated components which are **inputs**, **processes** and **outputs**.

Characteristics of Industry as an Open System

- It collects **inputs** from the environment, e.g. energy, labour, finance and seeds.
- Turning or **processing** of inputs into outputs, e.g. planting, marketing, production
- **Outputs**, i.e. goods and services are produced as a result of processing.
- **It** gets labour from environment

Types of Industries

There are four types of industries namely

a. Primary Industry

It produces raw materials from the environment, such as agriculture, fishing, forestry and mining.

b. Secondary Industry

It turns raw materials into finished products. Industries that manufacture

new products with employed labour is called **factory**. They include beer brewing, textile, cement making and soap making.

c. Tertiary Industry

It is concerned with distribution of goods and provision of services. E.g. there are postal services, transportation, teaching, and extension services. Manufacturing does not take place here.

d. Quaternary Services

There are research and provision of information as well as expert evaluation such as research and consultancy, marketing and journalism.

Both **tertiary** and **quaternary industries** are service industries.

Types of manufacturing industries

a. Heavy manufacturing industry

- They use large and heavy machines that occupy large space.
- They are located on flat land.
- They use large quantities (heavy and bulky) of raw materials which require them to be located near raw materials.
- There is hired labour and expertise.

- This requires high skills.
- It requires less hired labour with it without skills.

b. Light manufacturing industry

- They use light machines that occupy large space.
- They use small quantities of raw materials.
- They produce small and high value commodities such as tailoring, bakery and weaving.

c. Cottage industry

- It is located in the rural areas such as craft, farming and basket making.
- It is home – based industry as it depends on family members for labour.
- It uses simple tools such as knives.
- There is no hired labour.

Factors for the location of industries

1. Labour supply

Skilled, unskilled and cheap labour is essential for the growth and development of industries.

2. Market

There must be a large population provides market for the finished products.

3. Capital

It is used for infrastructural development, buying raw materials, buying machinery and paying for labour and other services.

4. Raw materials

Some industries are located to where raw materials are found abundantly. Locating industries near raw materials

saves costs of importing or transporting them over long distances. Some materials are bulky and heavy to be carried over long distances.

5. Transport

It is used to transport raw materials and dispatching finished products to various points of consumption.

6. Water supply

Water is needed in the manufacturing industries for mixing and cleaning things.

7. Government policies

Some government policies may attract or repel investors.

8. Political stability

Absence of wars and violence attracts many foreign investors.

e. Industrial inertia

It refers to the tendency of an industry to stay in an original place even if the factors which led to its location are no longer present.

The reasons for industrial inertia

- High cost of physical transfer to a new site.
- Fear of losing customers in old site.
- Fear of disrupting business by recruiting and training new staff at the new site.
- Proximity to skilled labour that has relevant experience.
- Desire to remain where business developed its roots.
- Presence of good transport and communication structures in the old site.

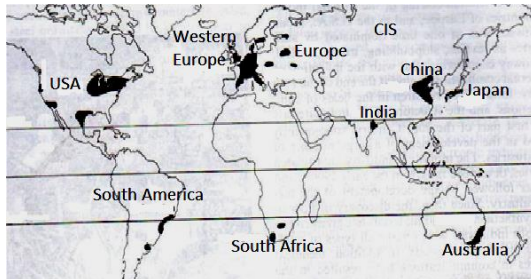
Industries that are located in any place not considering the presence of raw materials

are called **footloose industries**. E.g. tourism industry is an example of footloose industry.

Major Industrial Regions of the World

Western Europe

This is the largest industrial region of the world. The countries include Germany, UK, Spain and Portugal.



The factors for the development of industries are as follows:

- High levels of technology in engineering, chemicals, textiles and electronics
- Availability of abundant power supply, e.g. hydro-electricity, coal and nuclear energy.
- Availability of markets provided by large town-based industrial population

North America

In this region there are Canada and USA. The factors include:

- Presence of rich mineral reserves, E.g. iron and steel
- Abundant source of energy.
- Proximity to Europe for trade
- Cheap transport for raw materials and finished products, more especially in the Great Lakes Region.

China and India

- Large population densities that provide labour and ready markets to finished goods.
- Easy access to water transport.
- Presence of raw materials such as cotton, steel, iron ore, tin and tin.
- Abundant hydro-electric power supply.

Japan

Japan has the following factors:

- Abundant power supply of coal, nuclear and hydro-electricity.
- Presence of large ports which facilitates importation of raw materials and exportation of finished products.
- Presence of large markets in the Mainland Asia.
- Establishment of technically based education that promotes the growth of industries.

Australia

- Abundant power supply, hydro-electricity
- Presence of rich mineral reserves of aluminium, iron and steel.
- Good water transport that aids import of raw materials.

South Africa

- Rich gold reserves which promote the growth of other industries.
- Good transport for importation of raw materials.
- Abundant labour from within the SADC countries, like Malawi and Mozambique.

Others: Japan, South Korea and Argentina.

Disaster, hazard and disaster risk management issues related to industries

Disaster is any sudden event that causes much suffering to people during the time of occurrence.

Hazard is a situation that poses threat to human life, health, property and environment.

Disaster risk management refers to the systematic process that involves all activities done before, during and after the occurrence of a hazard event to prevent or reduce the impact of a disaster.

Industries pose a lot of danger that affect people and environment. Some of disasters include the following:

a. Acid rain

Industries produce sulphur dioxide that when it combines with water vapour in the atmosphere it produces acid rain. Acid rain destroys vegetation and statues.

b. Global warming

Burning of fossil fuel releases carbon dioxide and other greenhouse gases that absorb the sun's heat and raise the atmospheric temperature.

c. Ozone depletion

Chlorofluorocarbons (CFC) gases produced from industries destroy ozone layer and allow the sun's ultraviolet rays to reach the Earth's surface where it causes skin cancer in people.

d. Floods and land slides

Industries attract large populations that settle in river side, wetlands and lakeshore areas which accelerate silting and flooding.

e. Epidemics

Industries cause social instability and sexual exploitation which encourage the spread of HIV/AIDS. In addition, high population concentration facilitates the spreading of disease outbreak.

f. Water and pollution

Industrial effluents deposited in water cause water pollution.

g. Technological hazards

- Gas and oil explosion
- Industrial fire
- Toxic and chemical release
- Oil spills
- Nuclear accidents
- Plane crash
- Car accidents
- Train accidents
- Wars and terrorist attacks

Disaster, hazard and disaster risk management

- Ensure proper storage of hazardous materials
- Workers should be provided with safety tools and attire, such as fire extinguishers and gloves.
- Providing civic education and awareness on the mitigation evacuation of people.
- Upgrading structural designs of structure that may withstand forces of earthquakes.
- Establishing early warning systems.
- Recycling hazardous wastes in order to reduce chances of disease infections.
- Conducting safety audits.

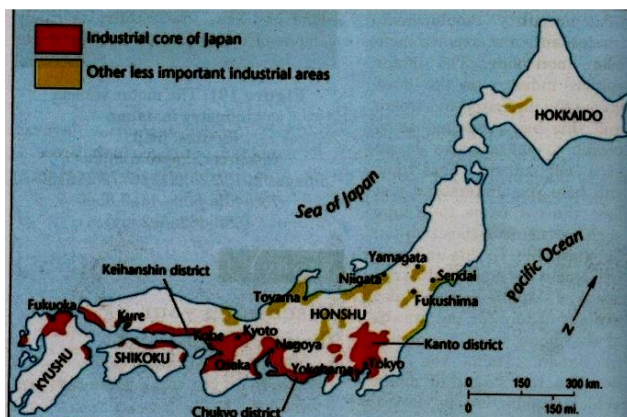
TOPIC 22 MOTOR VEHICLE INDUSTRY IN JAPAN

Success Criteria

Learners must:

1. Locating Japan on a world map
2. Locate major industrial areas in Japan
3. Describe factors for the growth of the motor vehicle industry in Japan
4. Explain the stages of motor vehicle production
5. Explain advantages and disadvantages of automation/robot technology in motor vehicle production
6. Explain the significance of the motor vehicle industry in Japan

Japan is made of four islands such as **Hokkaido**, **Honshu** and **Kyushu**. Honshu is the largest island and largest industrial area in Japan.



Motor Vehicle Companies in Japan

- Toyota is the largest car manufacturing company in Japan and the world.
- Others include the following:
Honda, Daihatsu, Yamaha, Mitsubishi, Mazda, Nissan, Suzuki, Lexus, Isuzu, Subaru and Kawasaki

Major Industrial Areas in Japan

- a. Keihin or Kanto Industrial Region:
Chiba, Kanagawa, Saitama and Tokyo.

- b. Nagoya Area or Chukyo – Takai Industrial Region: Aichi, Gifu, Mie and Shizuoka.
- c. Kinki or Keihanshin
- d. Setouchi or Southern Honshu and Northern Honshu
- e. Toyota City

Factors for the Growth of Motor Vehicle Industry in Japan

- Availability of iron and steel industries which are the main raw materials for car manufacturing industry.
- Availability of local and international markets
- Presence of cheap transport for assembled cars and car spares.
- Presence of abundant power supply, i.e. hydro-electricity and coal.
- Availability of skilled labour for technical work.

Stages in Motor Vehicle Production

Stage 1: Car Body Design

Computer-aided design (CAD) technology is used to draw car models that suit people's lifestyle and preferences.

Then clay models are constructed which are then studied by motor vehicle manufacturing experts to be accepted for production.

Stage 2: Building Production Technology

Car manufacturing tools (pressing machines) are made. The machines are used for manufacturing cars in after the models are accepted.

Stage 3: Production of Cars

There are activities in this stage such as:

a. Pressing

Steel sheets are pressed to make different body parts, such as doors and roof.

b. Body welding

The pressed metals are welded together to create the desired body.

c. Painting

The car is painted to make it look shiny and beautiful.

d. Assembling

Different autoparts are attached to body of a car such as engine, wiring, interior components, instruments, sensors, breaks, glasses, stirring, tires, and various microchips.

Stage 4: Inspection

Some car parts (breaks, headlights and emission) are rigorously inspected for safety purposes.

How Cars are Manufactured in Japan

- The system used when manufacturing cars is known as the **Assembly Line Technique** or **Taking Work to the Worker**.

- Under the system, a conveyor belt is used to bring parts to various points along the line to be assembled. When a car reaches the last point is now ready for use.

Advantages of Assembly Line Technique

- It leads to massive production
- There is high quality production as workers master their specialized skills.
- It brings about specialization and efficiency which speed up production.
- There is easy maintenance as each part is easily replaced with an identical one within the point along the assembly line.
- It creates high employment opportunities.
- There is low cost of paying workers.
- Automation is easier.

Disadvantages of Assembly Line Technique

- There are low wages for less skilled workers.
- It involves high capital and energy inputs.
- It leads to boredom amongst workers due repetitive and monotonous nature of the work.

Automation in Car Manufacturing

Automation in car manufacturing involves the application and use of robot technologies to do the work. Robots replace workers in some areas of car production.

Advantages of Automation

- It promotes safety of workers. Robots can work in work environment that

would be difficult and hazardous to human beings.

- Work is done very quickly.
- It increases production.
- It saves payments for workers.
- It reduces mistakes and boredom.

Disadvantages of Automation

- Development of robots is very expensive.
- It leads to unemployment as one robot may replace many workers.
- Robots do not make decisions like human beings; they depend on people to do the work.
- It needs more expertise.

Toyota Motor Corporation

It was founded in 1939 by a Japanese engineer, Kiichiro Toyoda. It is the largest car manufacturing company in the world. There are many Toyota Companies in many countries in the world. Toyota cars have three major labels such as Toyota, Lexus and SCION

Why Owning Cars is Scarce in Japan

- a. There are high car parking fees.
- b. There are high inspection fees for safety standards.
- c. Availability of excellent transport network.

Reasons for Scattered Car Assembly Plants

- Serve the scattered markets all over world.
- Save the cost of transporting assembled cars to the markets. It is more expensive

to transport assembled cars than the spare parts.

- Ensure that each factory has assembly line and output size that maximizes production
- Take advantage of cheap land in regional plants
- To save the cost tax charges of exporting cars.

Importance of Motor Vehicle Industry in Japan

- It provides employment opportunities
- It provides better and comfortable means of transport.
- It promotes the growth of other related industries to car manufacturing, e.g. rubber industry.
- It provides foreign exchange.
- It promotes the development of infrastructure, road network.
- It promotes transport and trade within and across the borders.
- It helps people to enjoy a leisure time.

Problems Faced by Motor Vehicle Industry in Japan

- Global economic crisis that weaken the purchasing power of cars.
- Natural disasters such earthquakes and volcanoes affect the industry.

Problems Associated with Motor Vehicle Industry in Japan

- Motor accidents
- Air pollution by car exhausts
- Noise in cities
- Traffic jams that cause delay in movement
- Over-exploitation of fossil fuels.

TOPIC 23 TOURISM IN AFRICA

Success Criteria

Learners must:

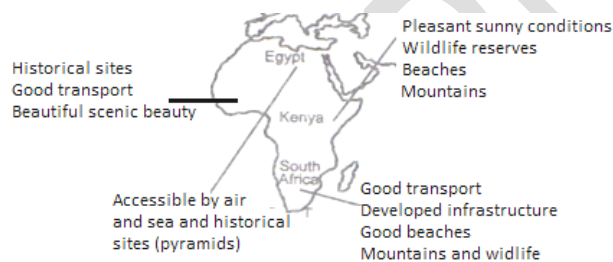
1. Locate major tourist centres in Africa
2. Explain factors that promote tourism in Africa
3. Explain the impact of tourism in Africa
4. Explain the meaning of the term *eco-tourism*
5. State the importance of eco-tourism

Tourism refers to a country's economic sector that involves travelling and visiting different places of interest.

Aims of Tourism

- Rest and relaxation
- To see new places of interest
- To study various parts of the world or to have a research of the world

Major tourist centres in Africa



1. Pyramids of Giza and Egypt
2. Victoria Falls
3. Masai Mara National Park in Kenya
4. Kilimanjaro Mountain in Tanzania
5. Cape Town in South Africa
6. Djenne in Mali
7. Zanzibar
8. Lake Malawi National Park
9. Marrakech in Morocco

Major tourist centres in Malawi

- Lake Malawi National Park
- Mulanje Mountain
- Liwonde National Park
- Game Reserves like Nkhotakota, Mwavi, Vwaza Marsh and Majete
- Lake Malawi
- National Parks, e. Kasungu, Nyika, Liwonde, Lengwe and Lake Malawi National Parks.

Types and Forms of Tourism

a. Ecotourism

It is a form of tourism which aims at avoiding negative and brings positive impact on the environment. It tries to conserve and sustain ecosystem. It involves a small group of tourists. It is also known as *green tourism*, *soft tourism*, *responsible tourism*, *appropriate tourism* and *alternative tourism*.

Advantages of ecotourism

- It promotes conservation of environment
- It does not interfere with ecological balance.
- The money raised in ecotourism helps to preserve natural environment

Disadvantages of ecotourism

- Reduced employment opportunities
- The government gets less money from few tourists.
- Tourists use air transport in remote areas which causes air pollution.
- It uses relocation of people so as not to interfere with ecosystem.

- b. Mass tourism:** It involves a large group of tourists. It brings negative effect on the environment.

Advantages of mass tourism

- It brings a lot of money as a large number of tourists visit the country.
- Many people get employment.
- It strengthens international relations as many people from different countries come together.

Disadvantages of mass tourism

- It depletes natural resources since more land is needed for infrastructural development.
- Loss of traditional values due to interaction with local inhabitants.
- It causes pollution due to increased consumption of resources.

- c. Incentive tourism:** it is a travel rewarded by commissions or organisations.
- d. Health tourism:** it is a visit to health resorts and establishment made by either medical or non-medical personnel.
- e. Domestic tourism:** it is travel by indigenous population of the country.

- f. Common interest tourism:** It is a form of tourism by people who have a cultural interest.

Factors that promote tourism in Africa**a. Physical Factors**

Attractive scenery like mountains and forests

Pleasant climate

b. Economic Factors

Accessibility by air, water and road

Good accommodation (hotels and motels)

Good shops, entertainment centres, good food, tour guides and travel agents

c. Cultural Factors

Historical sites

Entertainment centres

Impact of Tourist Industry**1. Positive impact**

- It provides employment to many people in various sectors such as transport, hotels, construction and manufacturing
- It is source of foreign exchange earnings
- It puts the destination centres on a map
- It helps to bring international standards to destination countries
- It promotes international understanding and public relations
- It promotes development of small scale industries, e.g. wood carving.
- It helps to improve the country's infrastructure, such as roads and airports.

2. Negative impact

- Employment is seasonal
- It is affected by some devastating factors like disease outbreaks, wars and natural disasters

- Breakdown of traditional values as a result of influx of large number of visitors.
- Pressure on resources in a host country
- Reduced food production as farmers lose farming land to tourism infrastructural development.
- It brings foreign diseases into the country.
- Employment is seasonal which puts local workers at a disadvantage in one season.
- Breakdown of traditional values as a result of influx of large number of visitors.

The interaction between different cultures is called **assimilation**. It is also known as **acculturation** or **accommodation**. On the other hand, **demonstration effect** refers to

imitating other people's behaviour and assimilate it as one's own.

Problems faced by tourism industry in Africa

- Foreign ownership of hotels and tourist resorts that send money to their countries at the expense of host countries.
- It is expensive to visit tourism destinations.
- Heavy tax on tourism services prevents some tourists from visiting some places.
- Poor and inadequate infrastructure such hotels and poor road conditions in some parts.
- Malaria scares away visitors.
- Poaching and deforestation reduce important animal and plant species which attract many tourists.
- Political instability in many African countries.

TOPIC 24 MAJOR WORLD TRANSPORT ROUTES

Success Criteria

Learners must:

1. Identify the major sea and air routes of the world
2. Explain the importance of the major sea and air routes
3. Explain the challenges faced by land-locked countries
4. Identify the major railway lines in Africa
5. Explain reasons for the distribution of railway networks in Africa

Transportation refers to physical carriage of goods and services from one place to another.

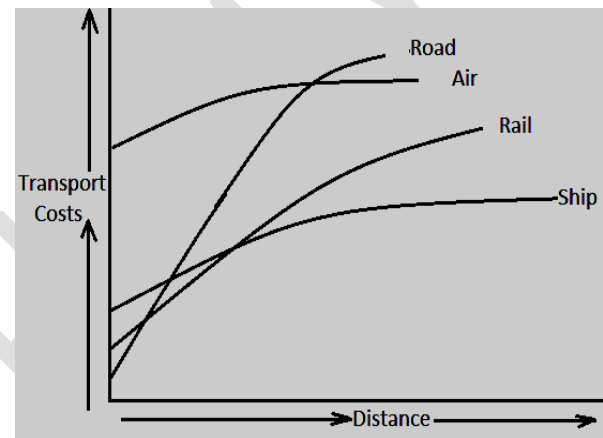
The main modes of transport are

- Air transport
- Water transport
- Land transport

Factors to Consider when Choosing the Type of Transport

- The **nature** of goods to be transported. Some goods are more perishable than the other and that perishable goods need specialized type of transport. For example, milk requires refrigerated transport.
- The **cost** of transporting it
- The **speed** at which goods are to be transported

Comparative running costs of water, rail, road and air transport



Below is an explanation of the diagram

1. Water transport is the cheapest mode over a long distance.
2. Rail transport is relatively cheap over medium distances.
3. Road transport is the cheapest over a short distance but the costs increase with an increase in distance.
4. Air transport is the most expensive.

Air Transport

It uses aeroplanes, helicopters and balloons. It carries passengers and high value goods.

Advantages of Air Transport

- It is fastest
- It uses direct routes
- It is relatively free of physical barriers such as mountains and valleys
- It can reach other areas which are not accessible by other means of transport.

- It is used for the military to support the national security systems

Disadvantages of Air Transport

- It very expensive
- Airports are located away from towns
- There is a limited carrying capacity
- Airplanes cannot use foreign air space without permission well in advance
- It cannot transport heavy and bulky goods
- Bad weather condition causes accidents
- Plane accidents are severely dangerous

Water Transport

Water transport is categorized into **inland water way** that uses lakes, rivers and canals as well as **ocean or sea transport**

Advantages of Water Transport

- It uses existing routes except in case of canals
- It is the cheapest means of transport for large quantities of goods.

- Water accidents are rare
- It promotes international trade.

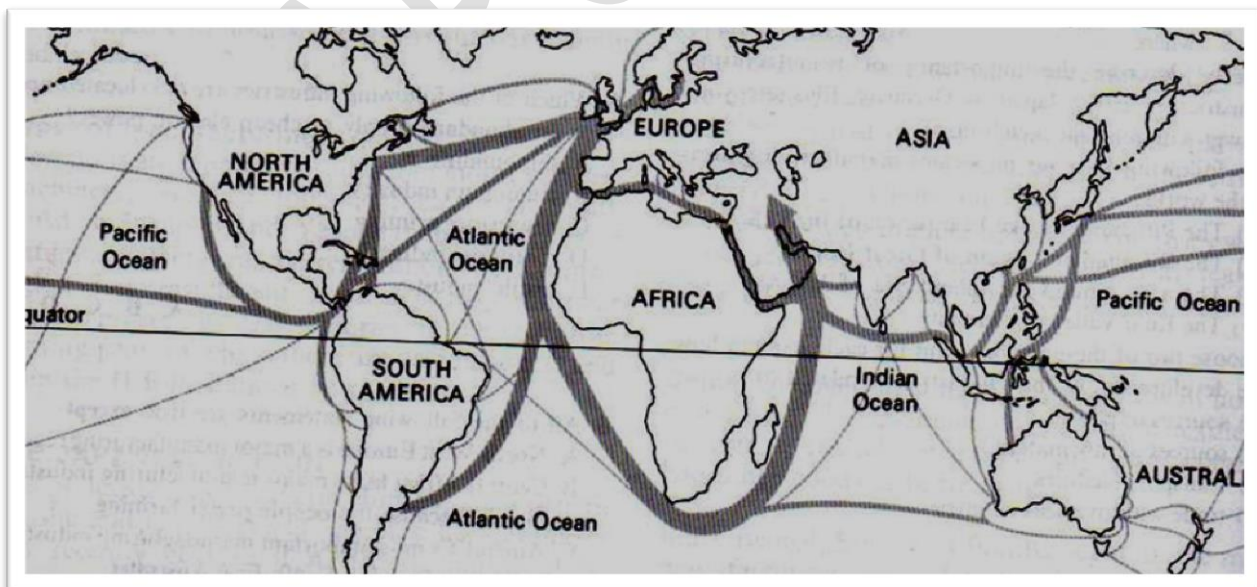
Main Disadvantages of Water Transport

- It uses indirect routes
- High cost of construction and maintenance of ports
- It is very slow
- If is negatively affected by physical factors like storms, fog and ice that cause accidents

The Main Ships that Sail on the Oceans

- Passenger ships:** They carry passengers and mail
- Cargo ships:** They carry freight such as container ships, oil tankers
- Cargo liners:** They carry people and freight
- Packets:** Type of ship used for crossing narrow straits. They are sometimes called **ferry-packets**.
- Others:** Dredgers that deepen the ports and Ice breaker

The Main World's Sea Routes



North Atlantic Route

- It is a busiest and richest route

- It connects North American Region and Western Europe
- Goods carried from America to Europe are wheat, cotton, copper, steel, iron and tobacco
- Goods from Europe to America are textiles, machinery, wine, fertilizer and chemicals.

Cape Route

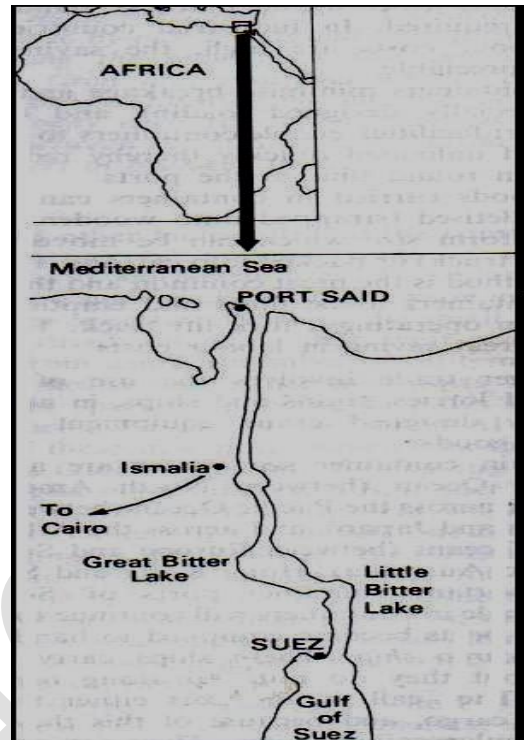
- It connects Europe with Australia
- It passes through South Africa Cape of Good hope
- It was very much used when Suez Canal was closed. Its importance has declined by the reopening of Suez Route in 1975.

South American Route or South Atlantic Route

- It connects South America with Europe

Suez Canal

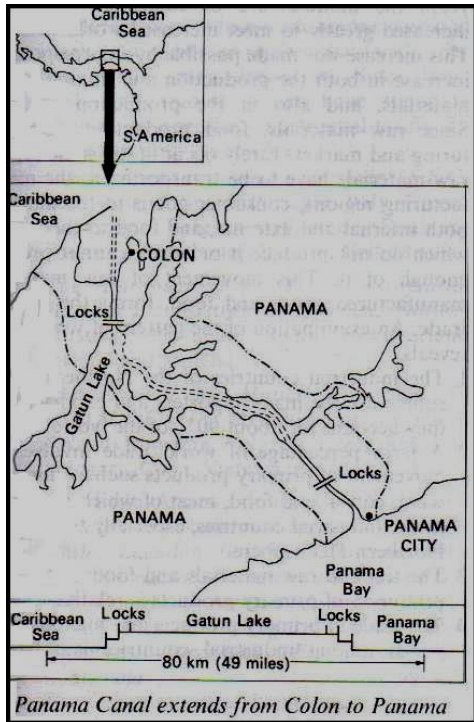
- Connects Red Sea and Mediterranean Sea, Europe with Asia and Australia



- It is 160km long
- It has no lock gates that delay transport
- There are two towns such as Suez on Red Sea side and Port Said on Mediterranean side
- Goods from Far East to Europe are petroleum, coffee, timber, wheat, meat and sugar while from Europe to Far East there are machinery, cars, drugs, textiles and chemicals

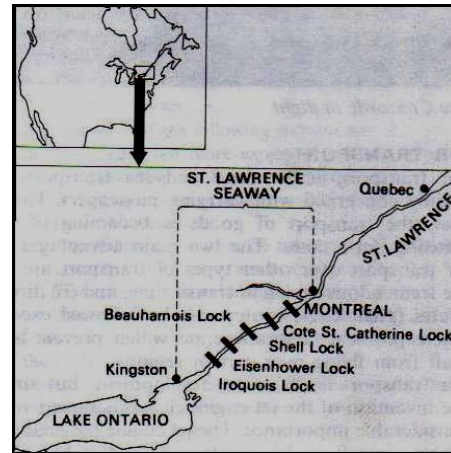
Panama Canal

- It connects east and west coasts of North America.
- The two towns are Panama City on a Pacific side and Colon on Atlantic side.



- It has three sets of locks that delay transit time. It also does not allow big ships to pass.
- Is 80km long but ships take longer time to pass than Suez because it has three lock gates whereas Suez has no lock gates that delay movement of ships. Lock gates are the structures along a canal which help ships to by-pass the rapids.
- It connects eastern and western coasts of North America with Asia and Europe

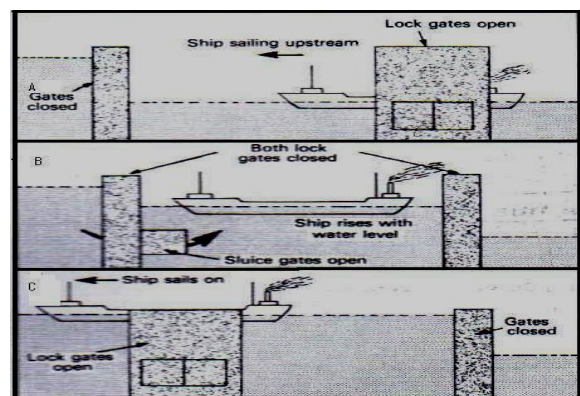
St. Lawrence Seaway



- It connects the Great Lakes Region and the Atlantic Coast through St. Lawrence River.
- It has about four lock gates.
- The goods transported here are iron ore, wheat, timber, furs and coal.
- The disadvantage is that it is closed in winter four months because it freezes. Another disadvantage is that it is narrow that it is difficult to accommodate large ships.

Lock Gate Operation

A lock is a structure that enables a ship to bypass the rapids or waterfalls. It is costly to construct, operate and maintain locks. Lock operation also delays transit. The lock operation is as follows:



- A. The gates are opened as the ship is approaching B because water level is the same between A and B.
- B. Both gates are closed to allow water level rise with the sheep. This enables the sheep to pass through gate M.
- C. Gate ahead the ship is opened so as to allow the ship to pass.

Factors that Influence Ocean Routes

- Supply and demand: availability of goods and passengers to be carried.
- Availability of ports
- Absence of physical barriers like fog, icebergs and storms
- Nature of cargo

Land Transport

There are two main types of land transport such **road** and **railway** transport.

Road transport

It uses taxis, buses, lorries and tankers. Ox – wagons use roads. Some people also travel on foot as pedestrians.

Advantages of Road Transport

- Road transport is very convenient
- Roads provide direct link between producers and consumers
- It provides direct link between producers and consumers
- It is fast over short distance
- It is flexible as it provides door to door service.

Disadvantages of Road Transport

- It is expensive to transport heavy and bulky goods
- High incidences of road accidents

- It is affected by traffic jams in cities and towns.
- Since many people own cars, it is the most polluting means of transport.
- Bad weather conditions negatively affect road transport.
- It causes noise pollution

Advantages of railway transport

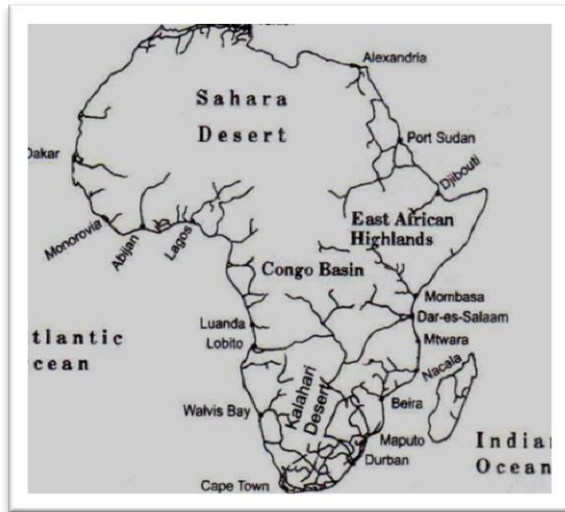
- It carries large amount of commodities at once.
- Rail accidents are very rare
- It is fast over long distances as compared to road and water transport.
- It is not affected by traffic congestion on rails.
- It is cheaper to transport heavy and bulky goods.

Disadvantages of rail transport

- Deep valleys and mountains prevent the construction of rail lines and roads
- High overhead expenses and running costs of railways
- High costs of laying and maintaining railway tracks and sleepers
- High costs of construction and upkeep of rail station
- It does not provide door to door service

Factors that Affect Rail Distribution in Africa

Railway lines are not evenly distributed in Africa due to a number of reasons. Some regions do not have even one while others have dense rail connectivity as illustrated in the figure below.



The main factors that affect railway connectivity in Africa are:

- Relief of the area
- Productivity of the area
- Availability of fuel to be used by railway transport
- Level of economic development of the area served by railway
- Frequency of thunderstorms, sandstorms and landslides

Reasons for Low or High Rail Connectivity in Some Parts of Africa

a. North Africa

- The area is very unproductive
- Sandstorms cover railways
- Absence of settlement in the Sahara desert

b. North East Africa

- There are very high Ethiopian highlands with their escarpments and deep valleys

c. Central Africa

- Frequent thunderstorms and lightning

- Landslides are common due to continuous rainfall in the Equatorial climate
- Presence of mountains, such as Kilimanjaro, Elgon and Ruwenzori
- Low level of economic activities

d. Southern Africa

There are a lot of economic activities, E.g. mining, farming and manufacturing industries

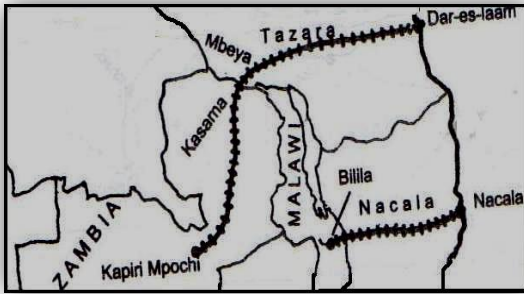
Nacala Railway

- It runs from Bilila in Malawi to Nacala port in the Indian ocean, a distance of 690km long
- It connects Malawi with Indian ocean
- Goods to Malawi are agricultural products (sugar, tobacco, tea, maize) and raw materials while from Nacala include finished products like fertilizer, machinery, chemicals, textile and stationary.

Tazara Railways

- It is an acronym for **Tanzania and Zambia Railway (TAZARA)**.
- It extends from Kapiri Mpochi in Zambia to Dar-es-Salaam a distance of 1667km long.
- It provides alternate outlet for Zambia to the sea
- The only disadvantage is that port of Dar-es-Salaam is congested which leads to delays in handling cargo.

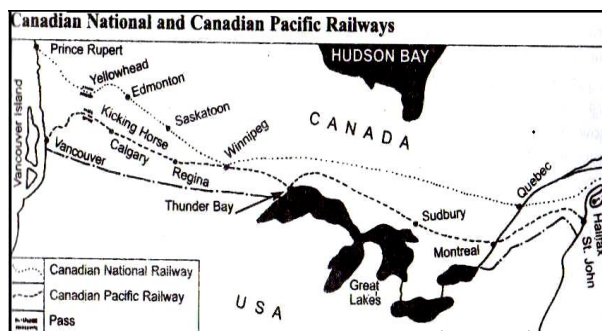
Tazara and Nacala Railway Lines



- The main disadvantage with these railway lines is that they are closed in winter as they are blocked by ice.

Road transport is cheaper than rail and ship over a short distance but it is most expensive over a long distance. **Ship** is very expensive over a short distance but the cheapest means over a long distance.

Trans- Canadian Railways



There are two main railways namely:

a. Canadian National Railway (5600km long)

It joins Port Halifax on the Atlantic Coast and Prince Rupert on the Pacific Coast

b. Canadian Pacific Railway (4800 long)

- It connects St. John on Atlantic Coast and Vancouver on the Pacific side. Goods exported through these railways include wheat, pulp, iron ore, oil, fertilizers, and coal.

Importance of the world transport

- It promotes trade and industrial development
- It helps to improve the living standards of people by transporting life sustaining goods to their homes.
- It facilitates the rescue systems in times of emergencies.
- It creates employment opportunities.
- It allows labour mobility as people move to different parts seeking job opportunities.

Problems of the world transport

- It causes fatal accidents
- Burning of fossil fuels in locomotives causes air pollution.
- Increased number of cars, ships, aeroplanes and trains deplete fossil fuels.
- Deforestation due to road and rail construction.
- Displacement of people and animals due to the construction of transport infrastructure.

REFERENCES

- Bunnet, R.B. (1999). *Physical Geography in Diagrams for Africa*. Essex: Longman
- Chanyenga, S. (2014). *Arise with Geography, Students' Book 4*. Blantyre: CLAIM
- Chawala, A.F.S. (2003). *Geography Module 8, Geomorphology*. Domasi: Domasi College of Education.
- Gareta, H.K. (2017). *Complete Human and Economic Geography, Students Book 4*. Lilongwe: Grey Matter Ltd.
- Leong, G.C. and Morgan G.C. (1982). *Human and Economic Geography*. Oxford. Oxford University Press.
- MIE (2014). *Geography Teaching Syllabus*. Domasi: Malawi Institute of Education
- Minns, W.J. (1984). *Geography of Africa, New Edition*. London: Macmillan
- Phiri, F.R. (2003). *New Social and Economic Geography*. Blantyre: E + V Publications.
- Phiri, F.R. (2006). *Senior Certificate Physical and Human Geography*. Blantyre: Dzuka.
- Waugh, D. (1995). *Geography: An Integrated Approach*. Surrey: Thomas and Sons Limited.
- White, R. (1990). *Africa in Focus: Physical, Human and Economic Geography*. London: Macmillan.