UNIT -1-ECOSYSTEMS AND BIODIVERSITY

1. What is an ecosystem? Describe the structure and function of various components of an ecosystem(8 M)

- ***Ecosystem***–A group of organisms interacting among themselves and with environment is known as ecosystem. (Or) Relationship between living and non-living organism

• **Abiotic components** (non-living) **I. Physical components** **II. Chemical components** **a. Inorganic substance** ***Micro elements*** ***Macro elements*** **b. Organic substance**	• **Biotic components** (living) **I. Autotrophic components (Plants)** **a. Producer** **II. Heterotrophic Components (Animals)** **a. *Primary consumers*** ***b. Secondary consumers*** ***c. Tertiary Consumers*** ***III.* Decomposers (microorganism**

2. Briefly explain the energy flow through atmosphere to an ecosystem (7 M)

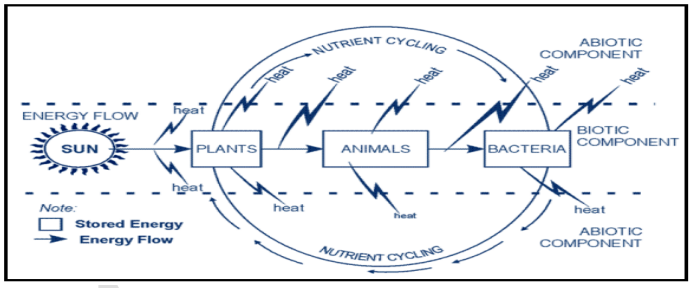
- **Ist Law of Thermodynamics:** Energy can neither be created, nor be destroyed, but it can be converted from one form to another

Examples, Photosynthesis- solar energy converted to chemical energy.

Photosynthesis Equation: $CO_2 + 2H_2O \xrightarrow{h\nu,\ \text{sunlight}} CH_2O + O_2 + H_2O$

- **IInd Law of Thermodynamics:** *Whenever energy is transformed, there is a loss of energy through the release of energy in the form of heat.*
- *Examples, Respiration process:* $CH_2O + O_2 \longrightarrow CO_2 + 2H_2O$

Relationship between structure & function:



3. Explain the stages in ecological succession using appropriate terminology? (8 M or 13 M)

Definition: The progressive replacement of one community by another till the development of stable community in a particular area is ecological succession.

Stages of ecological succession:

(i) Pioneer community,

(ii) Seral or seres stage

***Types of ecological succession*:**

- *Primary succession*
- *Secondary succession*

Process of Ecological Succession:

i) Nudation

ii) Invasion–migration and establishment

iii) competition
iv) Reaction and
v) Stabilization.

4. What is biodiversity? How is classified? Explain the values of biodiversity. (2 M)

Definition: *The variety and variability among all groups of living organisms and the ecosystem in which they occur.*

Classification of Biodiversity:

1) Genetic diversity → Diversity within the species is genetic diversity.(ex) teak wood varieties, Indian, Burma, Malaysian.

2) Species diversity→ diversity between different species. (ex) plant species = apple, mango, grapes,

animal species = lion, tiger, elephant etc.

Values of biodiversity:

1. Consumptive use:

- **Drugs:** Many plants are used in primary health care. (Ex)Penicillin – fungus is the source – Antibiotic
- **Fuels:** Fire woods are directly consumed by villagers.
- **Food:** A large number of wild plants and wild animals are consumed by human beings as food.

2.Productive use:

- ***Animal products:*** Silk from-silk worm, Leather from animals
- ***Plant Products:*** Wood for paper and Plywood, Cotton for textile industry

3. Social value:

- Holy plants: Tulsi, Lotus, Neem trees
- Holy animals: Cow, snake, bull, peacock

4.Ethical value:

- Holy river: River Ganga
- Holy tree: Tulsi, Vengai

5.Aesthetic value:

The beautiful nature of plants and animals insists us to protect the biodiversity.

- Ex, eco-tourism, colour of butterfly, flowers etc.

6.Optional value:

- *Growing biotechnology searching a causing the diseases of cancer and AIDS*

5. Which are the biodiversity hotspots in india? Identify and explain the present day major threats to the biodiversity of india. (13 M)

Definition: The hot spots are the geographic areas which possess high endemic species.

- **Eastern Himalayas** → Nepal, Bhutan, Indo-Burma region, 30% of endemic species,
- **Western Ghats** → Sri Lanka region, ex – Maharashtra, Karnataka, tamandu, Kerala. 1500 endemic species.

Threats to biodiversity:

Habitat loss: Loss of population of interbreeding organism.

Factors influencing Habitat Loss:

- *Deforestation:*
- *Destruction of wetlands:*
- *Developmental activities:*
- *Habitat fragmentation:*
- *Raw materials:*
- *Production of Drugs:*
- *Illegal Trade:*

Poaching: Killing / Hunting of animals is poaching.

Factors influencing Poaching:

- ***Commercial activities:*** Smuggling of wild life products for high profit.
- ***Wildlife products***=Furs, horns, tusk, live specimen, herbal products.
- ***Importers of wild life*** = Europe, North America, Japan, Taiwan, Hong Kong

Examples:

- Male gorilla for its body parts
- Elephant – for ivory
- Bengal tiger – soled for $1,00,000 in foreign market

Man-wildlife conflicts: When wildlife starts causing immense damage and danger to man.

Examples:

- **Sambalpur – orissa:** 195 humans were killed by elephants, In retaliation- 98 elephants were killed, 30 injured by villagers.
- **Royal Chitwan National Park – Kathmandu**

  Man-eating tiger killed 16 Nepalese, 4 yrs child

Factors Influencing man-animal conflicts:

- Shrinking of forest compels wildlife to move outside the forest
- Electric wiring around crops

6. What do you understand by conservation of biodiversity? Explain the in-situ and Ex-situ conservation along with their merits and limitations.

Definition: The management of biosphere for the sustainable benefit to meet the needs of future generation.

Types of Biodiversity: In-situ conservation (within habitat), Ex-situ conservation (outside habitat)

In-situ conservation:

Involves protection of fauna & flora within its natural habitat.

Methods of In-Situ conservation:

- Biosphere reserves,
- National Parks
- Wildlife sanctuaries
- Gene sanctuaries
- Other Projects for conservation of animals

Advantages or merits of *In-Situ conservation*
Disadvantages or limitations of *In-Situ conservation*

Ex-situ conservation:

- Involves protection of fauna & flora outside the natural habitats.

Methods of Ex-situ conservation:

1. NBPGR (National Bureau of Plant Genetic Resources)

2.NBAGR (National Bureau of Animal Genetic Resources)

3.NFPRCR (National Facility for Plants Tissue Culture Repository)

Advantages or merits of *In-Situ conservation*
Disadvantages or limitations of *In-Situ conservation*

UNIT - 2 -ENVIRONMENTAL POLLUTION

1. Explain the causes, effects and control measures of air pollution?

Definition: The presence of one or more contaminants like dust, smoke, mist and odor in the atmosphere which are injurious to human beings, plants and animals.

Sources of air pollution

- Natural pollution - volcanic eruptions, forest fires, biological decay.
- Man – made activities – Thermal power plants, agricultural activities.

Common air pollutants sources & their effects:

1. Carbon monoxide (CO) ❖ Description ❖ Human sources (Causes) ❖ Health effects ❖ Environmental effects	2. Sulphur dioxide (SO_2) ❖ Description ❖ Human sources (Causes) ❖ Health effects ❖ Environmental effects
3. Nitrogen dioxide (NO_2) ❖ Description ❖ Human sources (Causes) ❖ Health effects ❖ Environmental effects	4. Suspended particulate matter (SPM) ❖ Description ❖ Human sources (Causes) ❖ Health effects ❖ Environmental effects

Control Measures

1. **Source control**
   - ϖ Use only unleaded petrol
   - ϖ Plant trees along busy streets because they remove particulates and carbon monoxide and absorb noise.
2. **Control measures in Industrial centers**
   - ϖ Emission rates should be restricted to permissible levels
   - ϖ Air pollution control equipment's must be made mandatory
3. ***Equipment's used to control air pollution:***

Mechanical devices such as scrubbers, cyclone separator, bag houses & electro-static precipitators, reducing particulate pollutants.

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2. Explain the causes, effects and control measures of water pollution?

Definition: It may be defined as "the alteration in physical, chemical and biological characteristics of water which may cause harmful effects on human and aquatic life.

Types, effects and sources of water pollution

1. *Infectious agents*: ***Example:*** Bacteria, viruses, protozoa **Sources:** Human and animal wastes. **Effects:** Variety of diseases.	***2. In organic Chemicals:*** ***Example:*** Water soluble inorganic chemicals. **Sources:** Surface runoff, industrial effluents, **Effects:** Skin cancers & neck damage

3. **Organic Chemicals:** **Examples:** Oil, gasoline, plastics, pesticides, cleaning solvents, detergents **Sources:** Industrial effluents, household cleansers **Effects:** Causes nervous system damage, cancer, harm fish & wild life	***4. Point and non-point sources of water pollution*** **Point sources:** discharged pollutants Ex: Factories, sewage treatment **Non-point sources:** air shed that pollute water **Eg:** runoff of chemical from cropland to surface water.

Control measures of water pollution

- Industrial plants should be based on recycling operations.
- Awareness to public through radio, tv etc

3. Discuss the sources, effects and control measure's of Soil pollution and noise pollution? (13m)

Soil pollution: the contamination of soil by human and natural activities which may cause harmful effects on living beings".

Types

- **Industrial wastes**
- **Urban wastes**
- **Agricultural practices**
- **Radioactive pollutants**
- **Biological agents**
- **Control measures of soil pollution**

  - Population growth
  - Public awareness
  - Recycling and Reuse of wastes
  - Ban on Toxic chemicals.

Noise pollution: "the unwanted, unpleasant or disagreeable sound that causes discomfort for all living beings". Sound intensity is measured in decibel (dB).

Types of noise

- Industrial noise (drilling sound, mechanical saws)
- Transport noise (bus, trucks, motors, scooters, rail traffic noise)
- Neighborhood noise (Musical instruments, TV, VCR, Radios, telephones, loudspeakers ets)

Effects of Noise pollution

- loss of hearing due to excessive noise,
- Ultrosonic sound can affect the digestive, respiratory, cardio vascular system.

Control and preventing measures

- ***Source control***
- ***Transmission path intervention***
- ***Oiling*** – Proper oiling will reduce the noise from the machines.
- ***Receptor control***: Protection of the receiver by altering the work schedule, by using ear plugs etc
- ***Planting trees also act as effective noise barriers***

4. What are OHASMS? Explain it with any two-case study. (13m)

Definition: A fundamental part of an organization risk management strategy. It enables an organization to protect its work force and other control.

Case studies on OHASMS:

1. **A footwear manufacturing industry in Ambur, Tamil Nadu.**
   - ♦ Objectives
   - ♦ Production process
   - ♦ Some the encouraging approaches observed in Azim industry.
   - ♦ Deficiency observed in Azim industry and solution.
   - ♦ Report or conclusion
2. **Fireworks industry in Sivakasi, Tamil Nadu**
   - ♦ Objectives
   - ♦ Production process
   - ♦ Some the encouraging approaches observed in Kumaran fireworks.
   - ♦ Deficiency observed in Kumaran fireworks and solution.
   - ♦ Report or conclusion

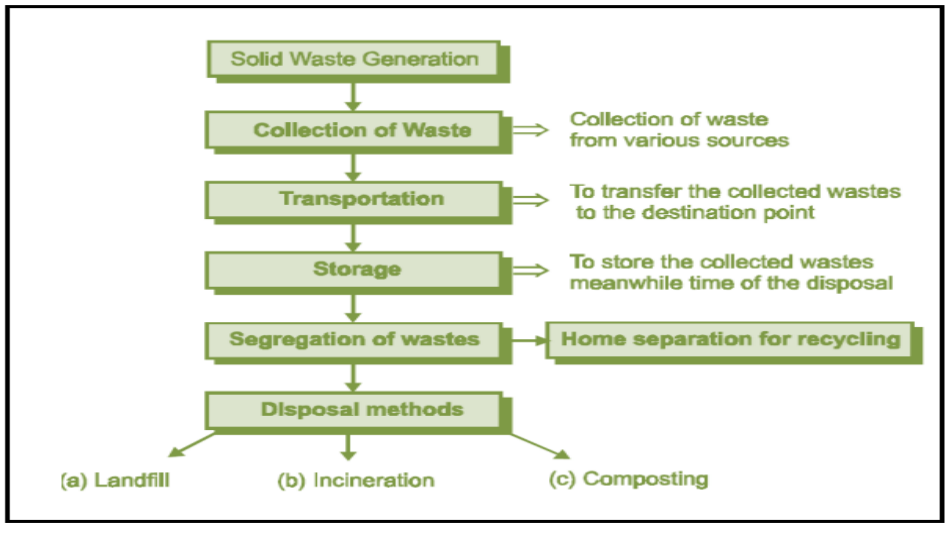
5. What are solid waste management? Explain the sources and methods of municipal solid waste management (13m)

Sources of solid waste management: Urban or municipal wastes, industrial waste, hazardous waste

Definition: The process of collecting, treating and disposing of solid waste.

Types of solid waste:

1. **Municipal waste:** including following wastes domestic waste (food waste, cloth, waste paper), Commercial waste (plastic, cans, bottle), construction waste and biomedical waste.
2. **Industrial waste:** Radioactive wastes, fly ash waste, hazardous and toxic materials, paint, dyes, acids, bases etc.



Landfill: definition, advantages and disadvantages**.**

Incineration: definition, advantages and disadvantages.

Composting: definition, advantages and disadvantages.

UNIT - 3 -RENEWABLE SOURCES OF ENERGY

1. **Write detailed notes on new energy sources (or) sustainable energy (or) renewable energy sources. (13 M)**

   Definition: They are natural resources which can be regenerated continuously

   Examples: ***Solar energy*** = Solar cells, Solar heat collectors, Solar water heater with diagram

   Wind energy = Wind mills, Wind farms with diagram

   Ocean energy = Tidal energy, Ocean Thermal energy, Geothermal energy with diagram

   Biomass energy = Biogas, Bio fuel, Hydrogen fuel

2. **What is energy conservation? Explain the ways through which conservation of energy made. (13 M)**

Definition: The practice of using less energy in order to lower the costs and reduce environmental impact.

Objectives of energy conservation

- ♦ To lower energy cost
- ♦ To lower the overall greenhouse gas emission.

Principle (or) Law of conservation of energy:

The principle of energy of conservation states that energy can neither be created nor destroyed but it can be transformed from one type to another.

15 ways to conserve energy (or) conservation

1. Adjust your day-to-day behaviors
2. Replace your light bulbs
3. Use smart power strips
4. Install a programmable (or) smart thermostat
5. Purchase energy efficient appliances
6. Reduce your water heating expenses
7. Install energy efficient windows
8. Upgrade your HVAC system
9. Weatherize your home
10. Insulate your home
11. Wash your clothes in cold water.
12. Replacing dirty air filters regularly can reduce energy consumption upto 15%.
13. As microwave is more energy efficient, microwave oven can be used instead of ordinary stove.
14. Using natural light, like sun, we can reduce the energy consumption.
15. Dress appropriately for the weather inside and outside.

3. **Explain the applications of hydrogen energy and ocean energy. (13 M)**

Application of hydrogen energy:

- ➢ Hydrogen fuel cell

- Hydrogen fuel cell vehicles
- Advantages and disadvantages of hydrogen energy

Application of Ocean energy:

- Ocean waves
- Temperature gradients
- Salinity gradients
- Ocean wave energy convertors
- Oscillating bodies
- Ocean thermal energy
- Advantages and disadvantages of ocean energy

4. Explain the origin, concept, manufactured and advantages and disadvantages of geothermal power plant (GTE) (13 M)

- **Geothermal Power:** It is the electrical power generated from geothermal energy.
- **Geothermal Energy:** It is the heat produced deep in the earth's core
- **Origin:** Geothermal energy is the thermal energy found in the earth's crust which originates from the formation of the planet and from radioactive decay of materials.
- **Concept:** Geothermal technology extracts the heat found within the subsurface of the earth, which can be used directly for heating and cooling (or) converting it to electricity.
- **Power plants of GTE:** Geothermal power plant uses hydrothermal resources that have both water (hydro) and heat (thermal).

Types of geothermal power plants

1. Dry steam power plant

- It uses steam directly from a geothermal reservoir to drive generator's turbines.

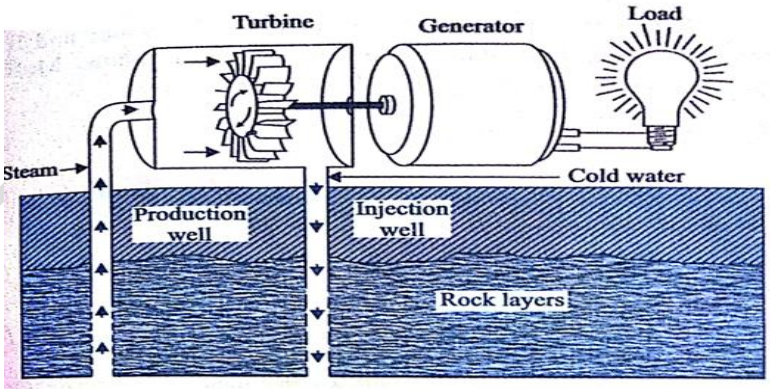


Fig. 3.2 Dry steam power plant

2. Flash steam power plant

- It takes high-pressure hot water from deep inside the earth and converts it into steam to drive generator's turbine.

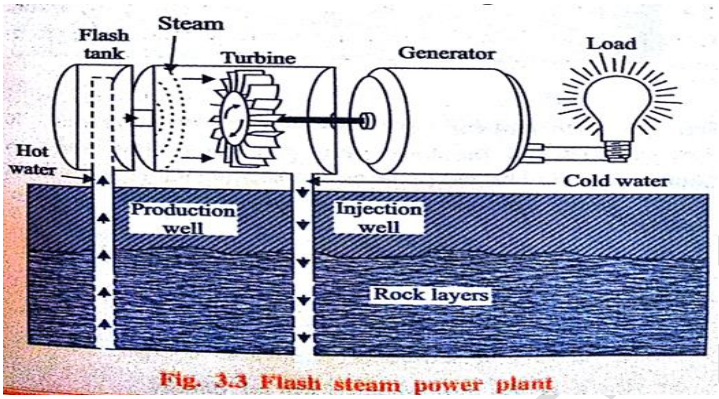
❖ 

Fig. 3.3 Flash steam power plant

3. Binary cycle power plants

❖ It transfers the heat from geothermal hot water to another liquid. The heat causes the second liquid to convert it into steam, which is used to drive a generator's turbine.

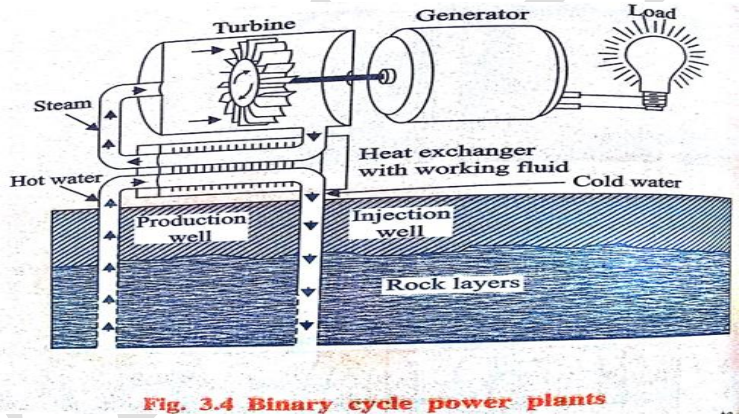


Fig. 3.4 Binary cycle power plants

Advantages of GTE

1. GTE is environmentally friendly.
2. GTE is a source of renewable energy.

Disadvantages of GTE

1) Location is restricted.
2) May cause earthquakes.

Applications of GTE

1. GTE is used for space heating and cooling
2. GTE is used to generate electricity.

UNIT - 4 -SUSTAINABILITY AND MANAGEMENT

1. Write notes on millennium development goals and sustainability protocols (13 M)

The Millennium Development Goals (MDGs) were 8 international development goals.

- To eradicate extreme poverty and hunger.
- To achieve universal primary education.
- To promote gender equality and empower women.
- To reduce child mortality.
- To improve maternal health.
- To combat HIV/AIDS, malaria, and other diseases
- To ensure environmental sustainability.
- To develop a global partnership for development

SUSTAINABILITY PROTOCOLS

Sustainability protocols are sustainability des and certifications. These are voluntary guidelines used by producers, manufacturers, traders, retailers and service providers to demonstrate their commitment to good environmental, social, ethical and food safety practices.

Few sustainability protocols

1. LEED
2. WELL
3. Fitwel
4. Living building challenge
5. BREAM
6. Passive house
7. National Green Building Standard
8. Built green

2. What are the causes, effects and possible solutions of climate change?

- **Definition: the long-term shifts in temperature and weather pattern.**
- **Causes of climate change**
- **Effects of climate change**
- **Possible solution to climate change**
- **Case studies of climate change**

Climate change on Chennai, east coast road (ECR) and old Mahabalipuram road (OMR)

3. Explain the sources, causes and remedy measures of carbon foot print?

Definition: It is the total amount of greenhouse gases (including CO2, and CH4) that are generated (emitted) by our direct and indirect activities.

Individual carbon footprint

Smaller your carbon footprint: better for the future

Bigger your carbon footprint: Have bigger negative impact on environment.

Sources of carbon footprint

1) Climate change. Natural process like volcanos.
2) Greenhouse gases emitted from human activities.

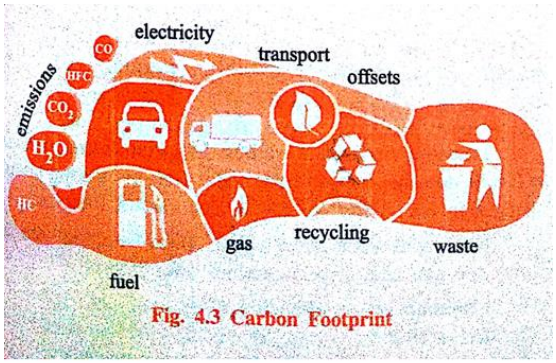


Fig. 4.3 Carbon Footprint

Causes of a carbon footprint

(i) food: (especially meat (beef))
(ii) consumption

How to lower (control) carbon footprint (or) 15 ways to reduce your carbon footprint

1) Travel smart
2) consider solar panels
3) Don't waste water
4) Eat less meat
5) Start a home garden.

4. What is environmental management? Explain the various steps of environmental management. (13 m)

Definition: Environmental management is a set of practices and processes that enable any organization, whether private (or) public, to reduce its environmental impacts and increasing its operating efficiency.

Objective (or) Aim of EM

1. To establish limits and standards
2. To protect environmental resources.

Principles of environmental Management

These principles are helpful in environmental decision making

1. **Principle of effectiveness and efficiency**
2. **The precautionary principle**
3. **The principle of responsibility**
4. **The principle of participation**
5. **The principle of proportionality**

Steps involved in environmental management

The following 5 steps are involved in environmental management.

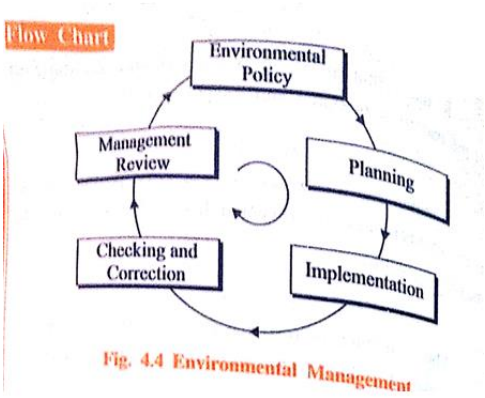


Fig. 4.4 Environmental Management

Benefits of Environmental Management

1) Improved environmental performance
2) Enhanced compliance
3 Pollution prevention

UNIT - 5 -SUSTAINABILITY PRACTICES

1. **What is R concept? Explain its concept and advantages and disadvantages of R concept (or) 3r concept (reduce, reuse and recycle) (13 m)**

Definition

The principle of reducing waste, reusing and recycling resources and products is often called 3Rs.

Fig. 5.3 3R Concept

Reduce: Reducing means choosing to use things with care to reduce the amount of waste generated.
Reuse: Reusing involves the repeated use of items (or) parts of items which still have usable aspects.
Recycle: Recycling means the use of waste itself as the resources.
Concept of 3R: The concepts of 3R refers to reduce, reuse and recycle, particularly in the topic of production and consumption.

Principle: 3R is the order of priority of actions to be taken to reduce the amount of waste generated and to improve overall waste management processes and programs.

Importance of 3 Rs

- The most effective way to reduce the garbage is reducing the amount of solid waste produced.
- By reducing waste at the source, the resources like water and energy can be saved.

Advantages of 3 Rs (or) Benefits of 3 Rs

- ❖ Reduce greenhouse gas emissions.
- ❖ Saves environment.

Disadvantages of 3 Rs

1) 3R generates pollutants.
2)Processing cost is high.

2. What is environmental impact assessment (EIA)? Explain the objectives and benefits of EIA. (7 m)

Definition: EIA is defined as a formal process of predicting the environmental consequences of any development projects. It is used to identify the environmental, social and economic impacts of the project prior to decision making.

Purpose (or) Aim of EIA

The main purpose of EIA is to determine the potential environmental, social and health effects of a proposed developmental projects.

Objectives of EIA

1. To identify the main issues and problem of the parties.
2. To identify who is the party.

Benefits of EIA

1. Cost and time of the project is reduced.
2. Performance of the project is improved.

Process of EIA (or) Key Elements of EIA

The key elements used in the process of EIA are

1) Scoping
2) Screening
3) Identifying and evaluating alternatives
4) Mitigating measures dealing with uncertainty
5) Issuing environmental statements

3. What are green materials? Give examples. Explain important green buildings materials. (7 M)

Definition: Green materials also called eco-friendly materials, building construction materials that have low impact on the environment.

Criteria for green materials

i)Local availability of materials.
(ii) Embodied energy of materials.

Characteristics of green materials

- ➢ Green materials are energy efficient products, it uses less energy to do the same task.
- ➢ It lowers energy cost and lessen pollution.

Important green building materials

- ❖ Stone: It is low maintenance and durable.
- ❖ Cob: (mud mixture of natural ingredients like soil, sand, straw and lime). It is cheap and energy efficient.

- ❖ Bamboo: It is durable and light weight.
- ❖ Cork: (Cork canes from oak trees). It is a very good thermal insulator and mold resistant
- ❖ Straw bale: Easily renewable and cheap.

Examples of green materials

Bamboo floorings, LED lightings, Reclaimed wood, Energy efficient appliances.

4. What is energy cycle? Explain the carbon cycle with neat diagram. (7 M)

Definition

Carbon cycle is the movement of carbon (or) carbon compounds continuously from the atmosphere to the earth and then back into the atmosphere.

Sources of CO, in atmosphere

- During respiration. plants and animals liberates CO_2 in the atmosphere.
- Combustion of fuels also release CO_2
- Volcanic eruptions also release CO,.

Various steps involved in carbon cycle

Carbon cycle involves the following 5 important steps.

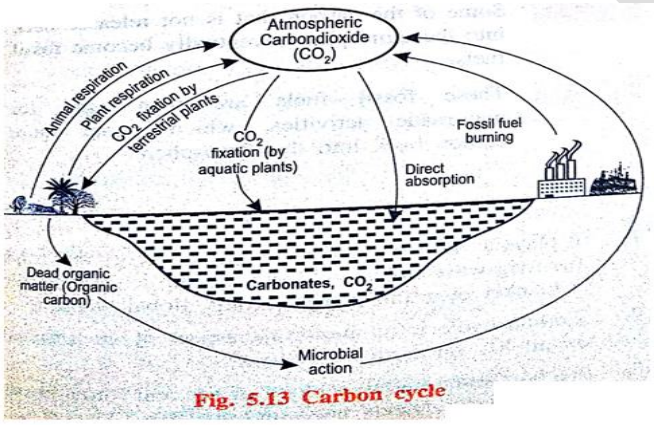


Fig. 5.13 Carbon cycle

Importance (or) benefits of carbon cycle

1. It plays a vital role in balancing the energy and traps the long-wave radiations from the sun ie., it acts like a blanket over the planet, avoids global warming.

5. Explain on the practical implementation of sustainable transports. (7 M)

Definition: any means of transportation that is green and has low impact on the environment.

Examples: walking, cycling, car sharing

Importance of sustainable transport

Key elements of sustainable transport

- Fuel economy
- Occupancy
- Electrification
- Pedal power
- Urbanization

How to promote sustainable transport

- Enhancing public transportation

- Encouraging car pooling
- Encouraging bicycle use
- teleworking

6. Enumerate and explain the various methods of carbon capture and carbon sequestration. (13 M)

Definition: process of capturing and storing atmospheric carbon dioxide.

Concept of carbon sequestration

Methods of carbon sequestration

- **Biological carbon sequestration**
- **Geological carbon sequestration**
- **Technological carbon sequestration**

Advantages of carbon sequestration

Disadvantages of carbon sequestration

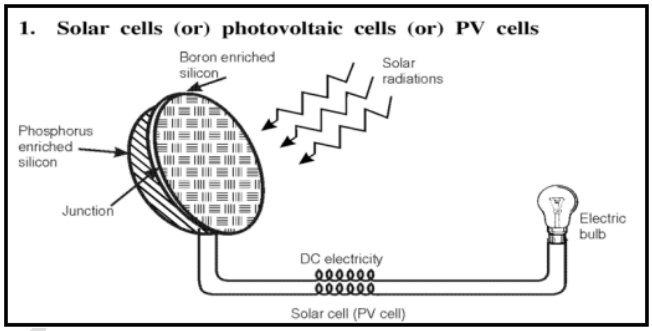
7. What is sustainable energy? Explain various sustainable energy sources with advantages and disadvantages (13 M)

SOLAR ENERGY:

The Energy that we get directly from the sun is called solar energy

Methods of Harvesting Solar Energy

Solar cells (or) photovoltaic cells (or) PV cells



Uses

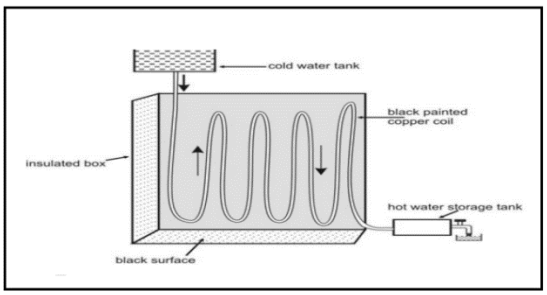
Used in calculators, electronic watches. Street lights, water pumps to run radios and TVs.

Solar heat collectors

Uses

Used in cold places, where houses are kept in hot condition using solar heat collectors.

Solar water heater



Significance of Solar energy:

They are noise & pollution free
Solar water heaters, cookers require no fuels
Solar cells can be used in remote & isolated forest & hilly regions.

WIND ENERGY

Definition

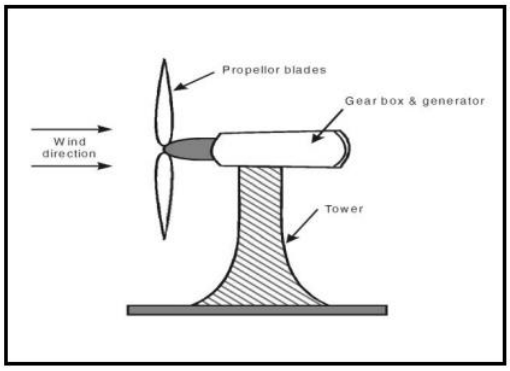
Moving air is called wind.

Energy recovered from the force of the wind is called wind energy.

Methods of Harvesting wind energy

Wind Mills

- The strike of wind on the blades of the wind mill rotates it continuously.
- The rotational motion of the blade drives machines like water pump, flour mills, electric generators etc.



Wind farms

- Wind farm consists of large number of wind mills .
- The wind farms produce a large amount of electricity.

Conditions

The minimum speed required for satisfactory working of a wind generator is 15 km/hr.

Advantages

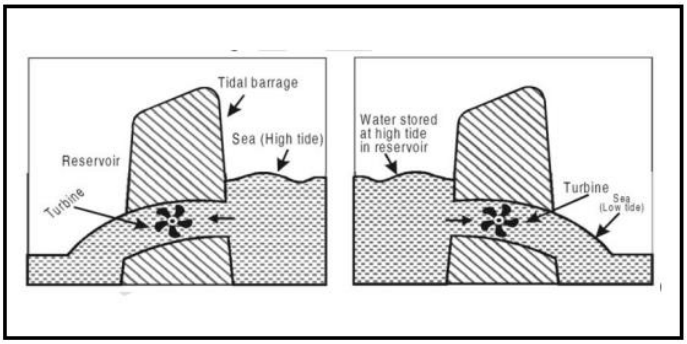
It does not cause any air pollution
It is very cheap.

OCEAN ENERGY

It can be generated by following ways.

Tidal energy (or) Tidal power

Ocean tides, produced by gravitational forces of sun and moon, contain enormous amount of energy.



Significance of tidal energy:

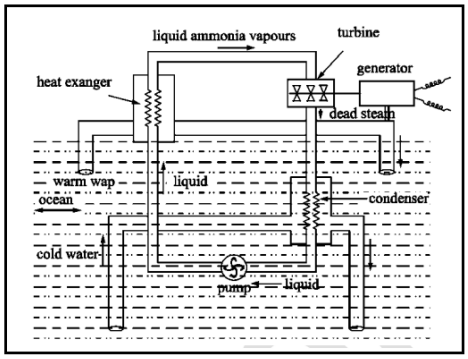
Do not require large areas

Pollution free energy source

<u>OCEAN THERMAL ENERGY (OTE)</u>

- The temperature difference between the surface level & deeper level of the oceans are used to generate electricity.
- The energy available due to the difference in temperature of water is called ocean thermal energy.

Process



Significance: OTE is Continuous, renewable, pollution free, used to produce H_2,

**********ALL THE BEST**********