Module I

NATURAL RESOURCES

NATURAL RESOURCES

Definition:

Sources which are useful to man or can be transformed into a useful product.

Types:

1.Renewable resources

2.Non- Renewable resources

1.Renewable resources

These resources are capable of being regenerated by environmental process

Example

Soil,Water,Air,Wild life,trees,plants

Types:

a)Continuous resources

b)Extrinsic resources

a)Continuous resources

Can be regenerated continuously

Eg : Solar energy, wind energy, Tidal energy

b)Extrinsic resources

Can not be regenerated continuously

Eg : wood

2.Non- Renewable resources

These resources are not capable of being regenerated by environmental process

Example

Minerals, Coals, Oil, Natural gas, Ground water

Land resources

1.Land is the important resources

2.It provides food,wood,fibre , medicine.

Uses

1.Land provide food,wood,minerals and shelter .

2.Land is used as water shed or reservoir

3.Land is dustbin for modern activities

4.It is used for construction of buildings, industries

Land degradation

Loss of fertility of the soil is called land degradation

Harmful effects of land degradation

1.Loss of soil texture

2.Loss of soil fertility

3.Increase in salinity, water logging

4.Loss of bio diversity

Causes of land degradation

1. Population
2. Urbanization
3. Fertilizers and pesticides
4. Damage of top soil

1.Population

More land is need for more population for food, house and industries

2.Urbanization

Increased population decreased the agricultural land.

3.Fertilizers and pesticides

It leads to the pollution of land, soil and water.

4.Damage of top soil

Nutrient depletion takes place

Water logging ,salinity, soil erosion and contamination of soil all cause land degradation

Introduction: Soil Erosion

- Soil erosion is the washing or blowing away (by wind or water) of the top layer of soil (dirt).
- Erosion also leaves large holes in the earth, which can weaken buildings and even cause them to collapse.
- Soil erosion is a natural process. It becomes a problem when human activity causes it to occur much faster than under natural conditions
- Soil erosion occurs when soil is removed through the action of wind and water at a greater rate than it is formed. If the soil has eroded, the crops will not grow very well.

Causes of soil erosion

Wind and water are the main agents of soil erosion. The amount of soil they can carry away is influenced by two related factors:

- speed - the faster either moves, the more soil it can erode;
- plant cover - plants protect the soil and in their absence wind and water can do much more damage.

Erosion occurs when farming practices are not compatible with the fact that soil can be washed away or blown away. These practices are:

- Overstocking and overgrazing
- Inappropriate farming techniques
- Lack of crop rotation
- Planting crops down the contour instead of along it.

Soil erosion

1. Removal of soil layer
2. Removal of soil component
3. Removal of surface

Harmful effects of soil erosion

1. Loss of soil fertility
2. Loss of water holding capacity
3. Pollute water
4. Kills aquatic life

Types of soil erosion

1. Normal erosion
2. Accelerated erosion

1. Normal erosion

The gradual removal of top soil.

It is very slower erosion.

2. Accelerated erosion

Caused by man made activities.

The rate of erosion is very faster.

Cause of soil erosion

1.Water

Water , rain, wave action

2.Wind

It carries away the fine particles of soil.

3.Biotic agents

Overgrazing , mining and deforestation

4.Land slides

It also causes soil erosion

5.Construction

Construction of road, buildings ,dams leads to the soil erosion

Simple five Solutions to Prevent Soil Erosion

1. Vegetation
2. Contour Farming
3. Build retaining walls
4. Wind Breakers
5. Conservation tillage
6. Mulching

1. Vegetation

- The **simplest and most natural** way to prevent erosion
- Plants **establish root systems**, which **stabilizes soil** and **prevents soil erosion**.

2. Contour Farming

- **Contour farming** or **Contour plowing** or **Contour bunding** is the farming practice of **level rows** around a hill, as opposed **to farming up and down on the** hill.

Each rows act as a small dam to hold soil and to slow water runoff

- **It reduce** :-

  (1)Amount and

  (2)Velocity of water moving across the soil surface

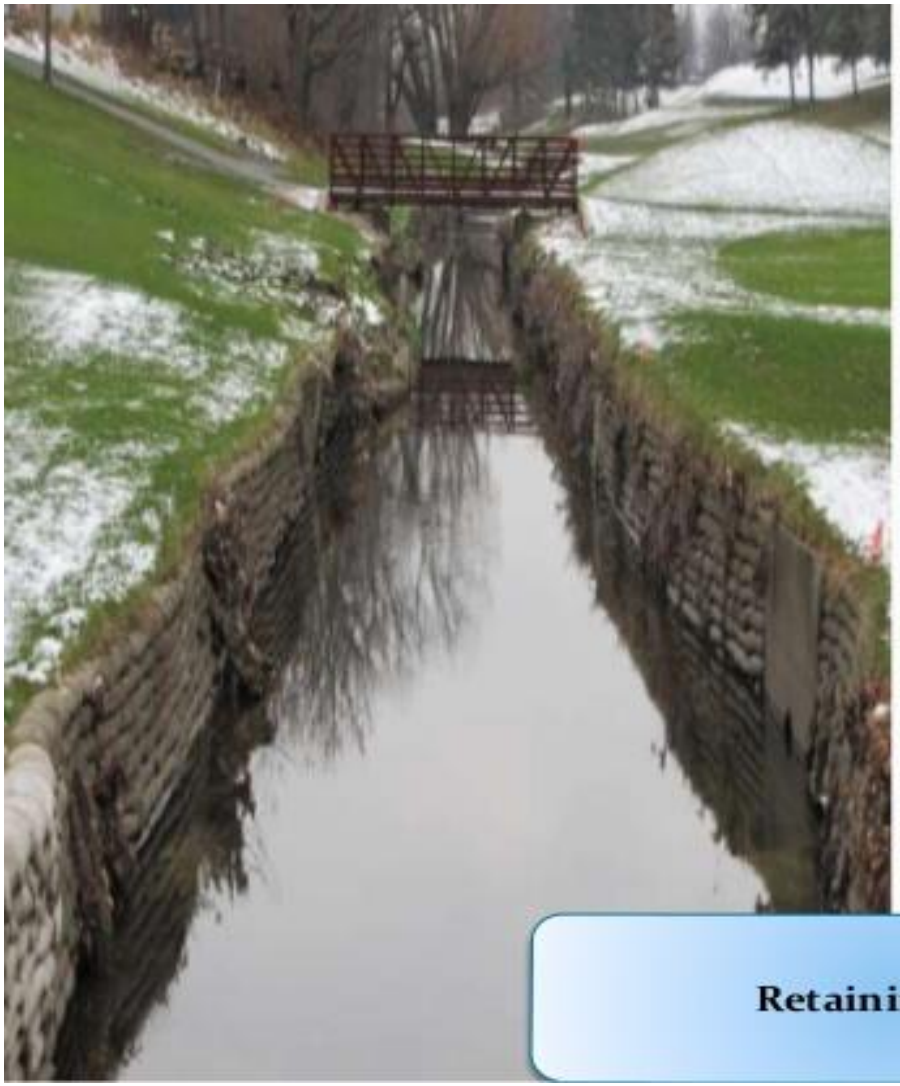
  or hill surface

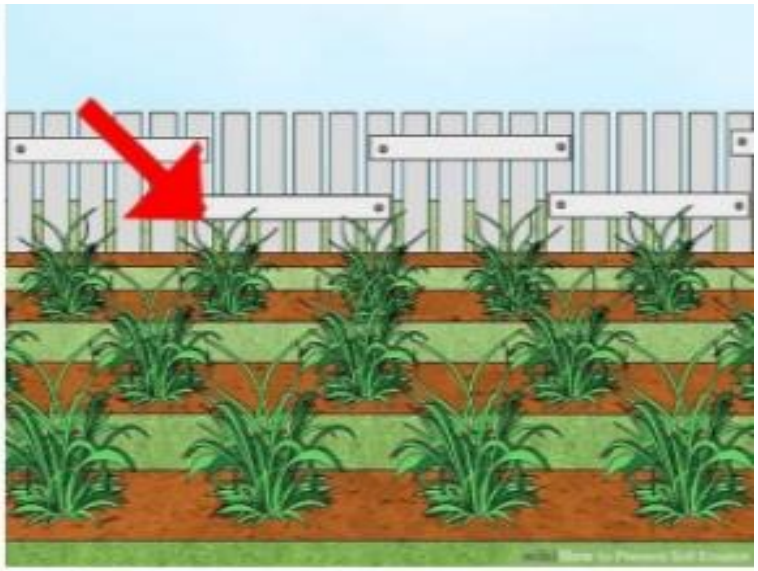
- The **water break** allows more time for moving the water by **infiltrate into the soil**.
- Can reduce soil erosion by as much as **50% as compare uphill/downhill farming**

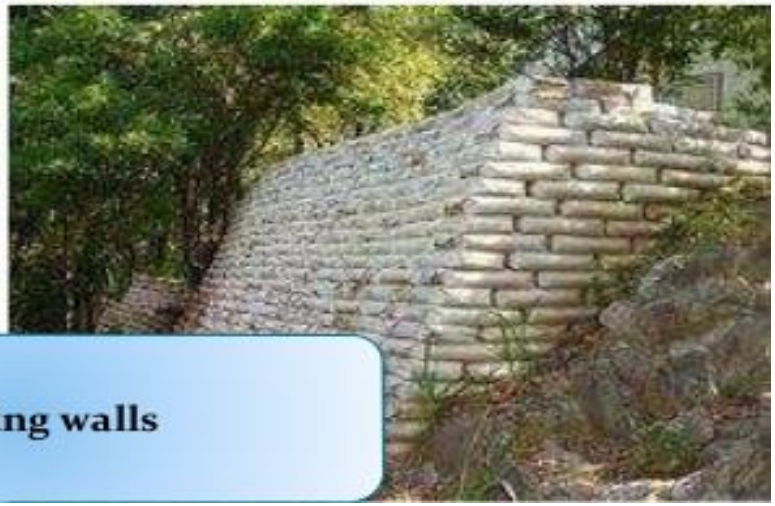
3. Build retaining walls

A. A retaining wall is a structure that **keeps soil, rock and water in place** so that it won't be washed away from the rain.

B. The retaining wall is to one of the purposes prevent soil is eroded by **wind, rain and flowing water,** but in most likely to be due to the wind and the rain.







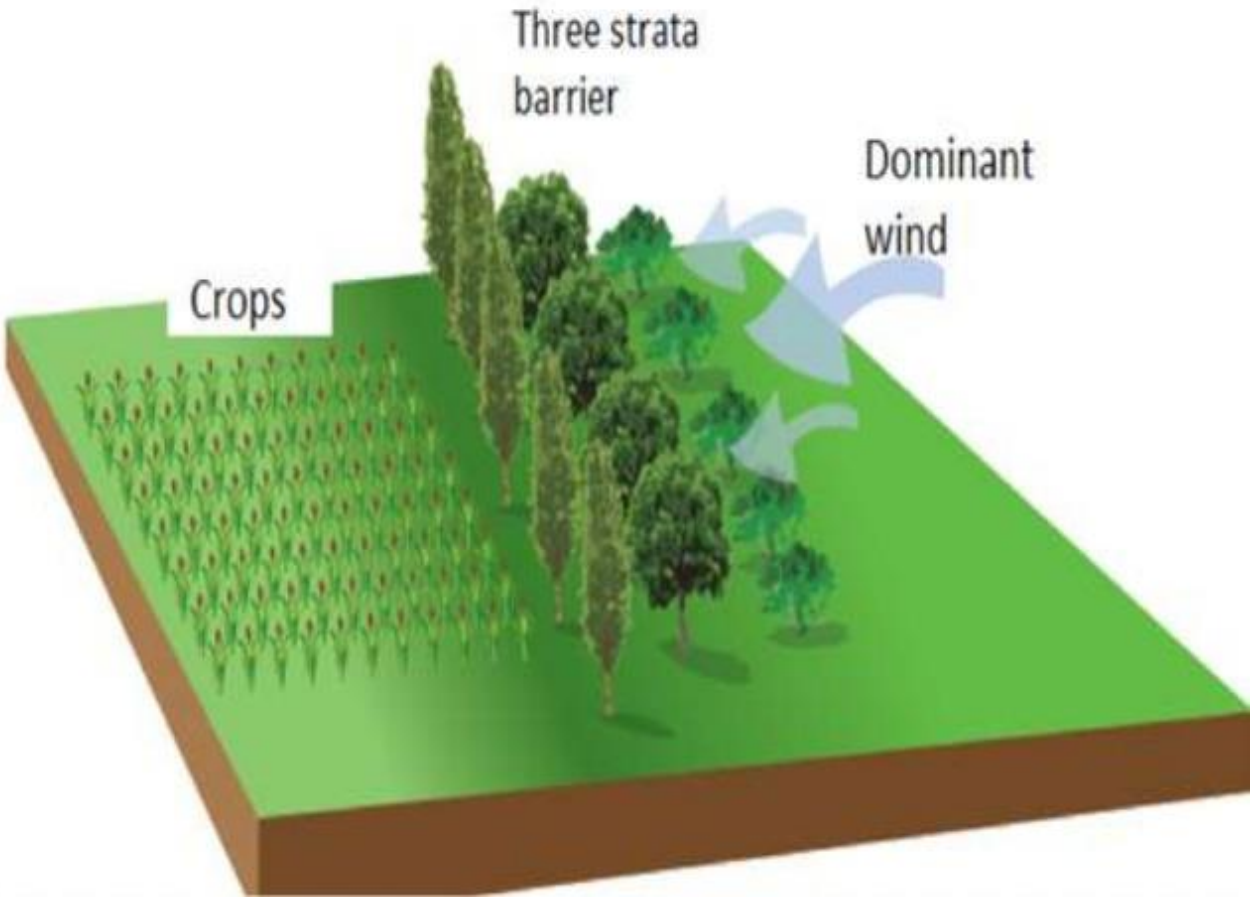
Retaining walls

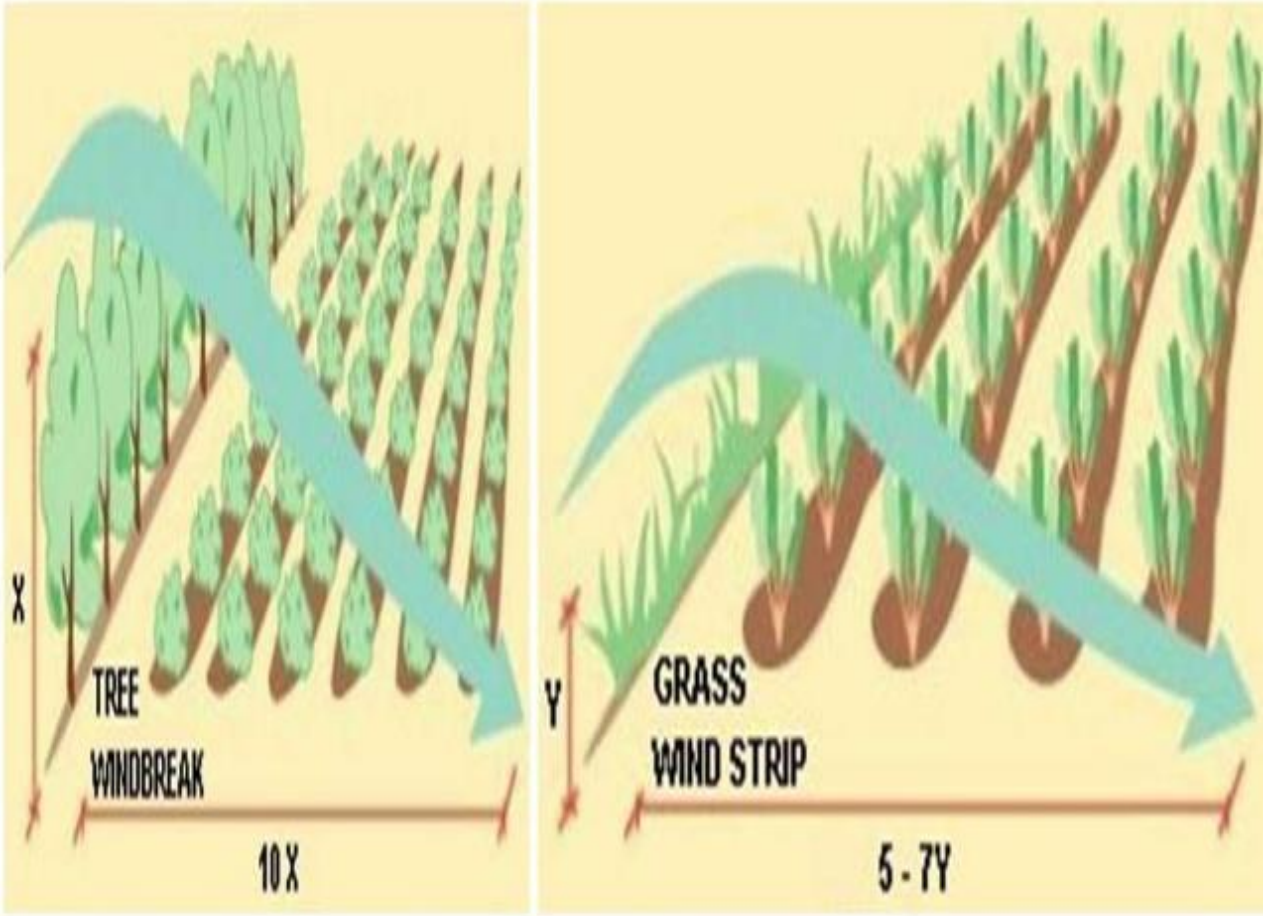
4. Wind Breakers

- Field windbreaks are **linear planting of trees/plant designed** to reduce wind speed in open fields, **preventing soil erosion** and protecting crops from **wind damage**.
- Field windbreaks are typically planted in **multiple rows perpendicular to prevailing winds.**

Planting trees along the boundary of cultivated lands. Trees are not only preventing soil erosion, it provides habitats for birds and supply wood as a fuel.

Wind Breakers




X
TREE
WINDBREAK
10 X
Y
GRASS
WIND STRIP
5 - 7Y

- Wind barriers reduce the **speed of wind** and **soil carrying ability** of the wind. **Tree windbreaks protect an area about 10 times their height**.

- **Grass wind barriers** are more flexible and can be pushed down by high winds, **reducing the protected distance to 5 to 7 times the barrier height**.

5. Agro forestry

- It involves planting crops in strips or alleys between rows of trees or shrubs.
- Even when the soil crop is harvested , the soil will not be eroded because trees and shrubs hold the soil particles.

Mulching

Conservation tillage

- Conservation tillage is **method of soil cultivation** that leaves of the previous year's **crop residue** (such as corn **stalks** or **wheat stubble**) on fields before and after planting the next crop to reduce **soil erosion and runoff**, as well as other benefits such as carbon store in soil.

Mulching

Terracing

It involves conversion of steep slopes into a series of terraces which run across the contour.

Terracing: - In hilly areas, the farming should be done only when the land is terraced properly because without terracing the run-off is increased and soil is easily eroded.

Desertification

1.It is a form of land degradation

2.Conversion of cultivated land into desert land is known as desertification.

Causes

1.Deforestation

Destroy of forest reduce the rain water and ground water and increase the soil erosion.

2.Over grazing

Destroy of Grass , changes the green land into dry land and increase the soil erosion leads to the desert formation.

3.Water management

Over utilization of ground water in the coastal area leads the salinity ,it is unfit for irrigation.

4.Mining and quarrying

It leads to the loss of vegetal cover leads to the desert formation.

5.Climate change

Failure of monsoon ,frequent drought leads to the desert.

6.Pollution

Excessive use of fertilizers ,pesticides and toxic water leads to the desertification

7. Single crop patterns

- Same type of crop patterns leads to the loss of soil fertility.

Harmful effects of desertification

1. Around 80% of cultivated land turned to desert. Loss of food grains . Around 600 million people are affected.
2. Loss of biodiversity.
3. Migration.
4. Illegal activities.

FOREST RESOURCES

i) It is a Renewable resources

ii) One-third on earth surface is forest

iii) It provides fuel, wood,Coal,Furniture....

Types of Forests

1. Evergreen forests

2. Deciduous forests

3. Coniferous forests

SILENT VALLEY IN KERALA

Uses of forest

1 . Commercial uses

2. Ecological uses

1 . Commercial uses

a) Wood fuel

b) Provides raw material for paper, pulp,timber industries

c) Provides gums ,resigns and dyes

d) Provides medicines and drugs

e) Provides honey , ivory , hides

f) Used for mining , grazing and dams

2. Ecological uses

a) Oxygen production during photosynthesis

b) Reducing global warming by reducing CO_2 gases

c) Soil conservation by roots of trees bind the soil tightly

d) Regulation of hydrological cycle

e) Pollution moderators

f) Wild life habitat

Over exploitation of forest

Due to Over populations , exploitation of forest takes place.

Causes:

1. Increasing agricultural production
2. Increasing industrial activities
3. Wood demand

DEFORESTATION

Definition:

The process of removal of forest resources due to many natural or man-made activities.

Causes of deforestation

1. Developmental projects
2. Mining operation
3. Raw material for industries
4. Fuel requirements
5. Shifting cultivation
6. Forest fires

1.Developmental projects

a) Through submergence of forest area under water

b)Destruction of forest area

Examples :Dams, Hydro electric power projects, Road constructions

2.Mining operation

It reduces the forest area

Example : Mica , Coal , Manganese , Lime stone

3.Raw material for industries

Wood is the raw material for so many purpose

Example : For making boxes , Furnitures , Ply wood, Pulp, Match boxes

4.Fuel requirements

Rural and tribal peoples use wood as fuel daily

5.Shifting cultivation

Mono specific tree plantation can lead to disappearance of number of plant and animal species

6. Forest fires

Due to forest fire thousands of forest area gets destructed

IMPACT OF DEFORESTATION ON THE ENVIRONMENT

1 . Global warming

2 . Loss of genetic diversity

3 . Soil erosion

4 . Loss of bio diversity

5. Loss of food grains

1. Global warming

a) Cutting and burning of forest increases the CO_2 in the atmosphere

b) Green house effect is increased

c) Rising sea level and depletion of ozone layer

2. Loss of genetic diversity

a) Forest is the greatest storehouse of genetic diversity
b) Provides new food and medicine for the entire world

3. Soil erosion

It causes landslides ,floods, drought

4. Loss of bio diversity

When plants destroyed , food for some animals becomes demand.

5. Loss of food grains

Due to soil erosion ,countries looses the food grains

Preventive measures of Deforestation

1. Migration of people from island to the main land should be banned
2. Tree plantation Programme have been started
3. Awareness Programme should be conducted
4. Strict implementation of law of forest conservation act

Case Studies

Deforestation in Himalaya region

Forests are destroyed

It leads to the loss of soil fertility and nutrients.

Disappearing tea Gardens in chhota Nagpur

Due to deforestation in hills of chhota Nagpur rain fall decreases and tea Gardens are destroyed.


DEFORESTATION IN HIMALAYA REGION

TIMBER EXTRACTION

To get wood fuel timber extraction is increasing day by day

Uses of Timber

1.Timber is raw material for various industries

2.Timber is used for development of Railways , Boat , Road construction

Effects

1.It causes deforestation

2.It leads to soil erosion

3.It leads to loss of tribal culture

4.it reduces thickness of forest

WATER RESOURCES

Types of water resources

1. Surface water
   a.Standing water bodies:lakes,reservoirs
   b.Flowing water bodies: Streams, rivers
2. Under ground water

1 . Surface water

The water stored on the surface of earth is called surface water.

a . Standing water bodies

Lakes

i) Oligotropic lakes

Deep, clear, deficient in nutrients

ii) Eutrophic lakes

More nutrients, more turbid

iii) Dystrophic lakes

Coloured, low pH, shallow

Reservoirs

Larger than lakes

Estuaries

Junction of river and sea water

b) Flowing water bodies

They originate from the precipitation point and flows in streams and rivers

2) Under ground water

Water found in the deep of the earth is called under ground water.

Types

1. Aquifer

A layer of highly permeable rock containing water

Example

Layers of sand and gravel

Types of aquifer

i) Un confined aquifers

water collects over clay or less permeable rock.

ii) Confined aquifers

water collects over impermeable rock.

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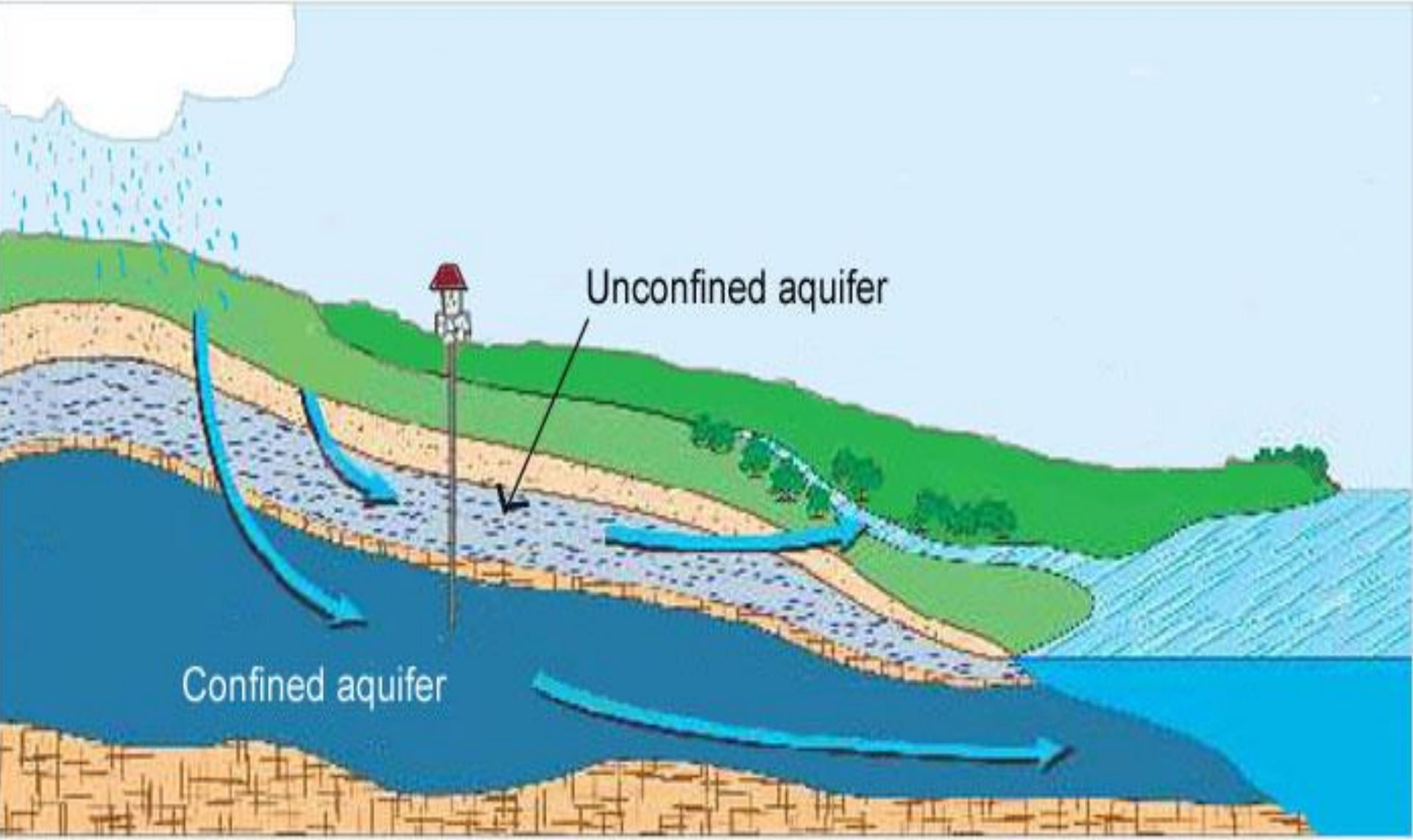

Unconfined aquifer
Confined aquifer

USES OF WATER

Consumptive use

Water is completely utilized and it is not reused

Example: Domestic, industries

Non-Consumptive use

Water is not completely utilized and it is reused

Example: Hydro power plant

Other important uses of water

1. Drinking, cooking, washing, bathing
2. Hotels, theatres, educational institutions, offices
3. Agricultural activities
4. Refineries, paper, pulp, iron, steel industries
5. Essential for living organisms
6. Diluting pollutants, moderating climate

Effects on over utilization of water

1. Decrease of Ground water
2. Ground water Subsidence
3. Lowering of water table
4. Intrusion of salt water
5. Earthquake and land slides
6. Pollution of water

1. Decrease of Ground water

Due to increased usage, the ground water level decreases

Reason:

Less rain fall

More buildings stops water intake

2. Ground water Subsidence

When the ground water withdrawal is more than its recharge rate ,the sediments in the aquifer get compacted .

Problems:

Structural damage in buildings

Fracture in pipes reversing the flow of canals and tidal flooding

3. Lowering of water table

Disturbing the equilibrium state of the reservoir by over utilization of ground water in arid and semi-arid area

4. Intrusion of salt water

In coastal area over exploitation of ground water leads to Intrusion of salt water from sea.

This water can not be used for drinking and agricultural purpose

5. Earthquake and land slides

Over exploitation of ground water leads to Earthquake and land slides

6. Pollution of water

Fertilizers pollute the ground water during over exploitation

BIG DAMS – BENEFITS AND PROBLEMS

1. Built across river
2. To store water,
3. Hydro electric power station
4. To control the flood

BENEFITS OF CONSTRUCTING DAMS

1. To Control flood
2. To divert water from river to channel
3. Drinking and agricultural purpose
4. To generate electricity
5. To develop the fishing navigation

PROBLEMS OF CONSTRUCTING DAMS

1. Upstream problems
2. Down stream problems

Upstream problems

1. Displacement of tribal people
2. Loss of forest
3. Landslide, sedimentation and siltation takes place
4. Spreading of disease
5. Can cause earth quake
6. Agricultural process may be affected

Down stream problems

1. Water logging and salinity produced by over irrigation
2. Reduced water flow in river
3. Salt water intrusion at river mouth
4. When dams collapse, micro organisms may be destroyed.

DAMS AND THEIR EFFECT ON TRIBAL PEOPLE AND FOREST

1.Dams are artificial structure

2.Built across the river

3.They are reservoir to store the water.

Effects of dams on forest

1.Thousands of hectares of forest are destroyed

2.Forests cleared for residential,office,store room roads construction

3.Hydro electric power projects destroys forest

4.Kills wild animals and aquatic life

5.Fertility of the land reduces

Effects of dams on Tribal people

1. Displacement of tribal people cannot tolerate bio diversity
2. Displacement affects the tribal people both mentally and physically
3. Tribal people are ill treated by modern society
4. Many of the people are not resettled recognized and compensated
5. Their culture is destroyed
6. Their body conditions will not suit with new area

Environmental effects (or) impacts of extracting and using Mineral Resources

Mining

It is the process of extraction of metals

Types of mining

i) Surface mining

Extraction of raw materials from surface deposit

ii) Underground mining

Extraction of raw materials from deep deposit of earth

a. Open-pit mining

Machines dig holes and remove the ores

E.g. Iron, copper, lime stone, marble, sand stone

b.Dredging

Chained buckets are used which scrap up the minerals from under water mineral deposit

C.Strip mining

The ore is stripped off by using bulldozers, stripping wheels

Steps involved in mining

1. Exploration-searching of minerals
2. Development
3. Exploitation
4. Ore processing
5. Purification of minerals

Effects of mining

1. Destroys trees ,pollute soil, water and air
2. Destroys natural habitat
3. Water logged area are formed which contaminates under ground water
4. Vibration leads to the earth quake
5. Sediments are transported by water erosion
6. It produces noise pollution
7. It reduces the shape and size of the forest area
8. It leads to the land slides

Environmental damage

i) Devestigation and defacing of land scape

Top soil and vegetation are removed from the mining area

ii) Ground water contamination

Some heavy metals and sulphuric acid leached in to ground water

iii) Surface water pollution

Radio active substance, Drainage and acidified water contaminates surface water

iv) Air pollution

During Roasting and Smelting of metals , enormous amount of Suspended particulate matter(SPM), SO_x, Arsenic Cadmium, Lead are evolved.

v) Subsidence of land

In mining area, cracks in building, bending of rail tracks takes place.

Effects of over exploitation of mineral resources

1. Rapid depletion of mineral deposits
2. Wastage of mineral deposits
3. Causes environmental pollution
4. It needs heavy energy requirement

Management of mineral resources

1. The efficient use and protection of mineral resources
2. Modernization of the mining industries
3. Search for new deposit
4. Re-use and Re cycling of the metals
5. Adopting eco friendly mining process

FOOD RESOURCES

1. It is an essential requirement for the human beings
2. The main components of food are Carbohydrates, Fats, Proteins, Minerals and vitamins

Types of Food supply

1.Crop lands

2. Rangelands

3. Ocean

1 . Crop lands

i.76% of the world food is crop

ii.It produces Grains

E.g. Rice, Wheat, Mice, Barley, Potato, Sugarcane…

2. Rangelands

i. It provides 17% of the world food

ii. It produces food mainly from livestock

E.g. Meat, Milk, Fruits…..

3. Ocean

It provides 75% of food

E.g. Fish, Prawn, Crab…

Major Food resources

1. More than thousands of edible animals and plants on earth
2. Only 15 plants and 8 terrestrial animals supply 90% of food

World food problems

1. The world population increases and cultivable land decreases .
2. Soil erosion, water logging, water pollution, salinity .
3. Urbanization occupies agricultural lands
4. Rice , wheat, corn and potato are common food for all countries, arises food problem
5. All human activities degrade the Primary productivity.

Nutrition

1. Carbohydrates, proteins and fats are called macro nutrients
2. Vitamins C, A,E and Minerals such as iron, Calcium and iodine are called micro nutrients
3. The minimum calorie required per day is 2,500 calories

Under nutrition

Less than 90% of the minimum calorie per day is called under nutrition

Effect

1. Mental Retardation
2. Measles
3. Diarrhea

Malnutrition

Deficiency or Lack of nutrition produces many diseases are called malnutrition.

Effect

Anemia- Iron

Blindness- Vitamin

Growth- Proteins

CHANGES CAUSED BY OVER GRAZING AND AGRICULTURE

Overgrazing

Definition

"Eating away the forest vegetation without giving it a chance to regenerate "

Impacts of over grazing

1.Land degradation

It leads to organically poor, dry, compacted soil which can not be used for further cultivation

2. Soil erosion

The cover of vegetation removed from the soil .Roots of plants is binder of soil. When it removed from soil produce soil erosion

3. Loss of useful species

Important plant species are destroyed .They can not be regenerated again in the same place.

Agriculture

- **Definition**

It is an industry of managing the growth of plants and animals for human use.

Types of agriculture

1. Traditional agriculture
2. Modern agriculture

1. Traditional agriculture

It involves……

A. Small plot
B. Simple tools
C. Surface water
D. Organic fertilizers
E. Mix of crops

Impact of Traditional agriculture

1. Deforestation

Cutting of trees for cultivation results in loss of forest cover

2. Soil erosion

Clearing of forest makes soil erosion

3. Loss of nutrients

Organic matters in the soil gets destroyed

Modern agriculture

It makes……

1. Use of hybrid seeds
2. Single crop variety
3. High tech equipments
4. Lot of fertilizers
5. Pesticides
6. Water

Effects (OR) Impacts of modern agriculture

Problems in using Fertilizers

A.Micro nutrient imbalance

All fertilizers contain Nitrogen, phosphorus and potassium

Excess fertilizers causes micro nutrient imbalance

B.Blue baby syndrome (or) Nitrate pollution

When nitrate concentration increases 25 mg/lit, causes health problem called Blue baby syndrome

C.Eutrophication

Over nourishment of water by N and P fertilizers are called eutrophication.


Pale or blue skin
Lethargic eyes
A.D.A.M.

Problems in using pesticides

i) First generation pesticides

Sulphur, Arsenic, Lead and Mercury

ii) Second generation pesticides

DDT- Dichloro diphenyl trichloro ethane

A . Death of non-target organisms

Many pesticides kill target and non target species which are useful to us.

B . Producing new pests

Some Pests generate highly resistant generations. They are immune to all types of Pesticides and are called **super pests**

C . Bio magnification

Non bio degradable pesticides in the food chain is called bio- magnification

D . Risk of cancer

Some fertilizers act as

1. Direct carcinogens
2. Indirect suppress the immune system

Desired qualities of an ideal pesticides

1. An ideal pesticide must kill only the target species
2. It must be a bio degradable
3. It should not produce new pests
4. It should not produce any toxic vapour
5. Excessive synthetic pesticide should not be used
6. Chlorinated and organophosphate fertilizers are hazardous. They should not be used

Water logging

Water stands for most of the year on the earth .

Problems in water logging

1. Pre – voids filled in the soil
2. Soil-air get depleted
3. Roots of the plants do not get adequate air
4. Mechanical strength of soil decreases

Cause of water logging

1. Excessive water supply
2. Heavy rain
3. Poor drainage

Remedy

1. Preventing excessive irrigation
2. Sub-surface technology
3. Bio-surface technology by eucalyptus tree

Salinity

The process of accumulation of salt is called salinity of the soil

Salinity is caused by Sodium chloride, Calcium chloride, Magnesium chloride, Sodium sulphate , Sodium bicarbonate and Sodium carbonates

Problems in salinity

1. Most of the water used for cultivation becomes salty
2. The soil become alkaline
3. Crop yield decreases

Remedy

1. The salt deposit is removed by flushing.
2. Use sub-surface drainage system.

ENERGY RESOURCES

Energy

The capacity to do work is called energy.

Renewable And Non- Renewable Energy resources

Renewable Energy resources

Natural resources which can be regenerated continuously.

E.g. Solar energy, wind energy, Hydro power, tidal energy

Merits of Renewable Energy resources

1. Unlimited supply
2. Provides energy security
3. Fits in to sustainable development concept
4. Decentralized energy production

Non- Renewable Energy resources

Natural resources, which can not be regenerated

E.g. Coal, Petroleum, Natural gas and Nuclear fuels…

Wood is Renewable Energy resources but coal is Non- Renewable Energy resources why?

- We can grow trees with in 10 – 20 years but coal takes Million of years to form.

RENEWABLE ENERGY RESOURCES

1. Solar energy
2. Wind energy
3. Tidal energy
4. Geo-thermal energy

SOLAR ENERGY

Energy getting from sun is called solar energy

Methods of harvesting solar energy

1. Solar cells

a) They are in close contact with each other.

b) Solar rays fall on top layer of p-type semiconductor.

c) The electrons from the valence band promoted to conduction band.

d) Potential difference between two layers created which causes flow of electrons.

Uses

1. Used in calculator
2. Electronic watches
3. Street lights
4. Water pumps
5. Radio and TV

SOLARCELL

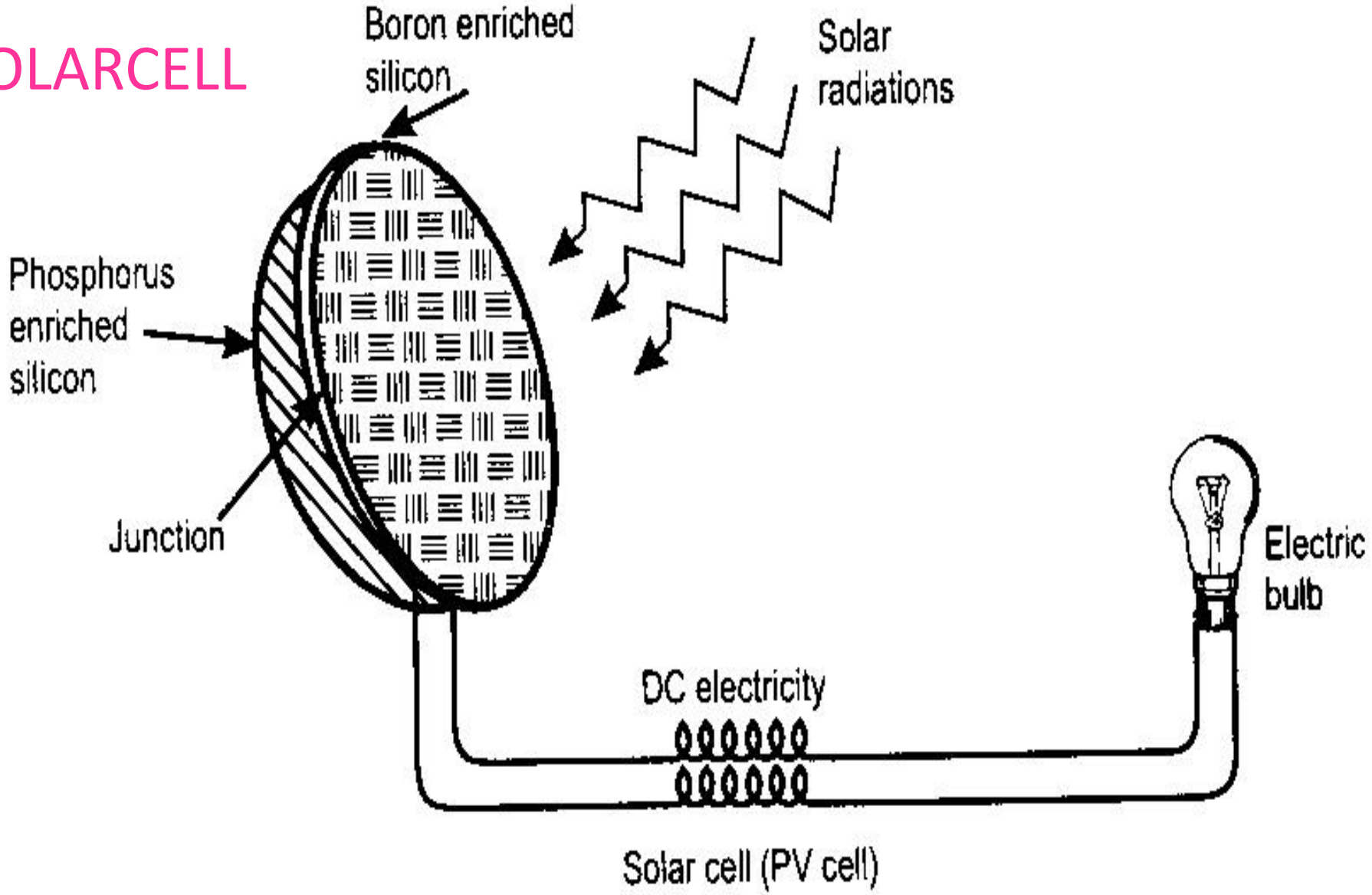


Fig. 2.4 Solar cell

Solar battery

When a large number of solar cells connected in a series it forms solar battery.

Solar heat collectors

It consists of stones and glass, which can absorb heat during the day time and release it slowly at night

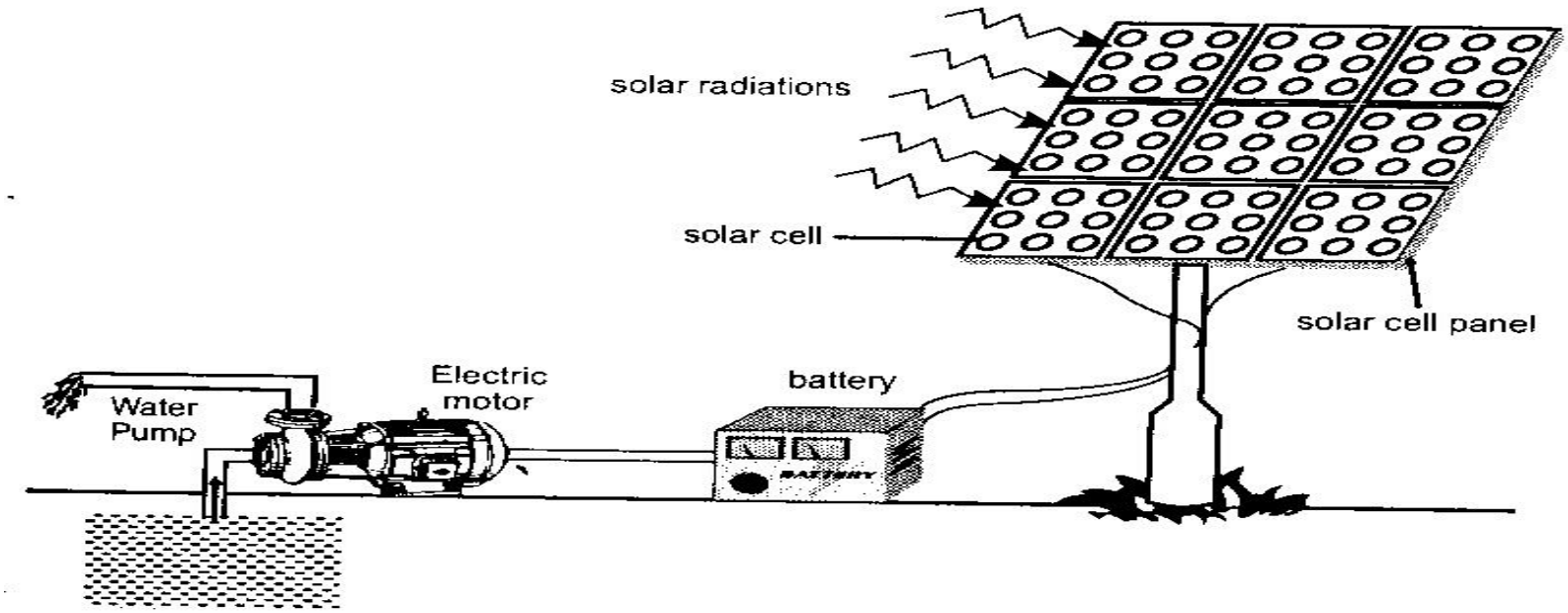
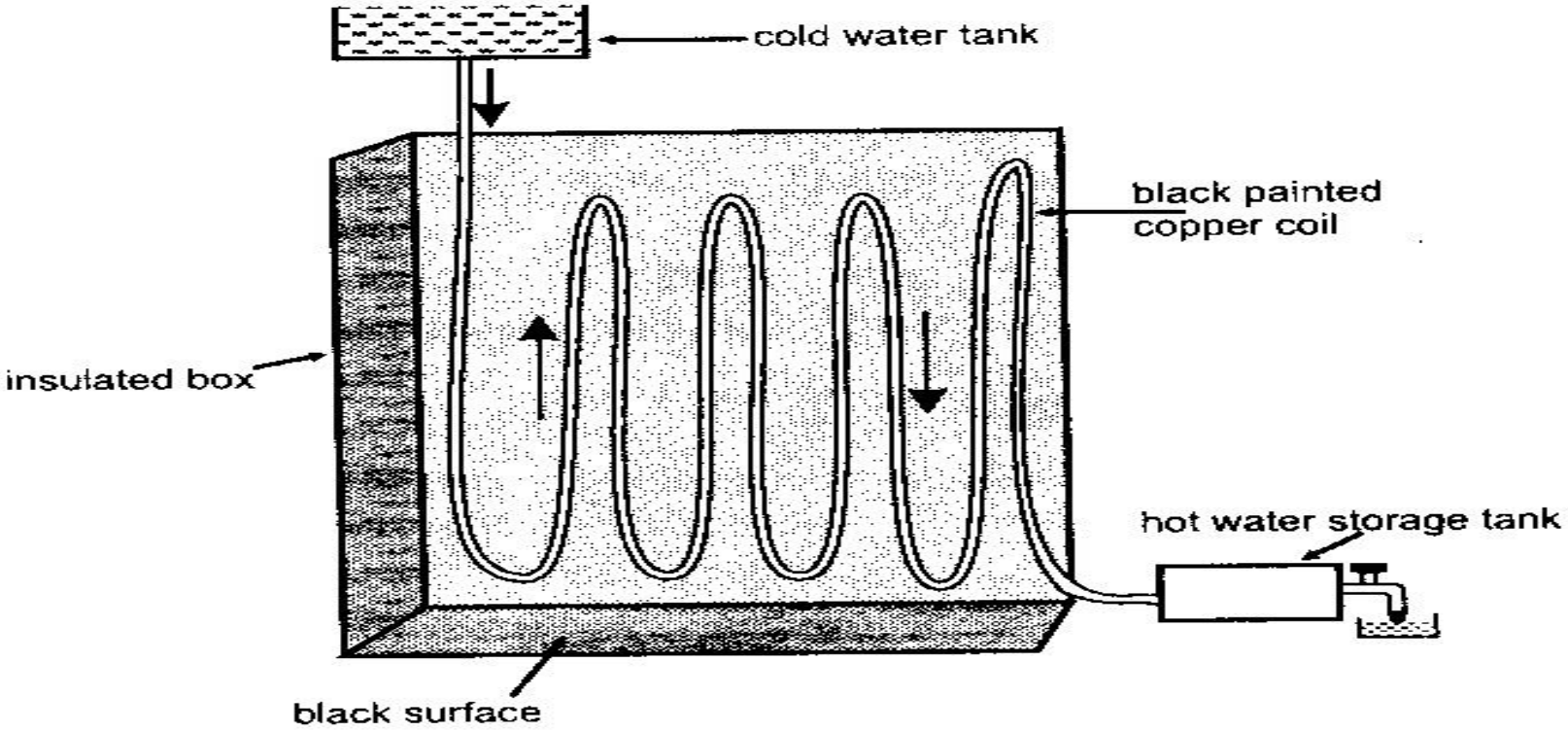
- 

Fig. 2.5 Solar pump run by solar cells (Battery)

Solar water heater

- It consists of an insulated box
- In side coated with black paint
- It consists glass lid to store heat
- In side black painted copper coil heats cold water
- Hot water stored in tank.



Wind energy

Moving air is called wind

Energy recovered from force of wind

1. Wind mills

The strike of wind on rotating blades with force.

The rotational motion of blades produces electricity.

2. Wind farms

The large number of wind mills joint together

Condition

The minimum speed for working of wind mills is 15 Km/hr.

Advantages

It does not cause any air pollution

It is very cheap.

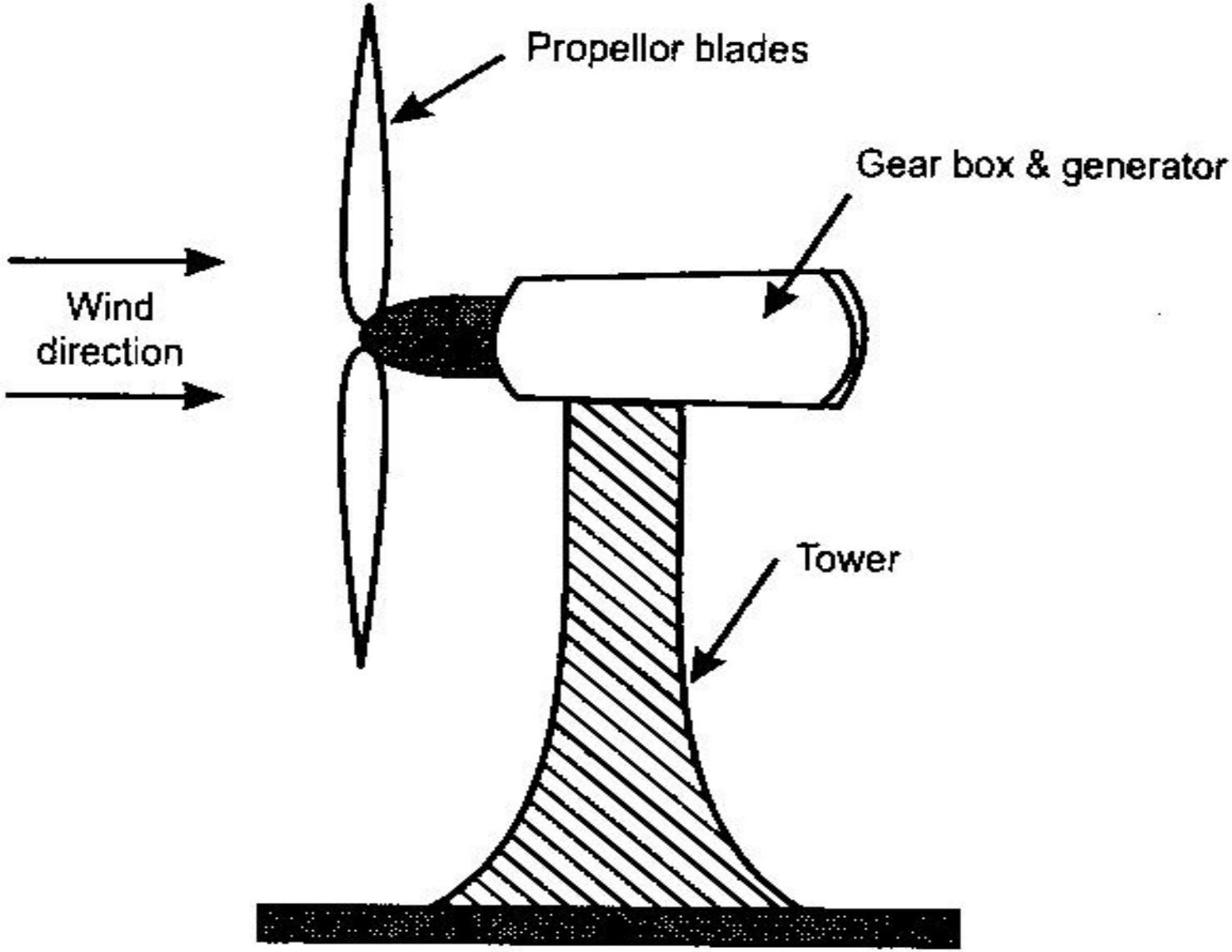


Fig. 2.7 Wind mill

Wind farms

Ocean energy

1. Tidal energy

Tides in ocean are produced by the gravitational forces of sun and moon.

High tide rotate the turbine in reservoir produce current

Low tides have low energy can not rotate the turbine.

2. Ocean thermal energy (OTE)

Temperature at surface of ocean=T1

Temperature at deep of the ocean=T2

OTE= T1-T2, is very high.

- Condition

T1-T2 should be minimum 20’C.

and again rotates the turbine.

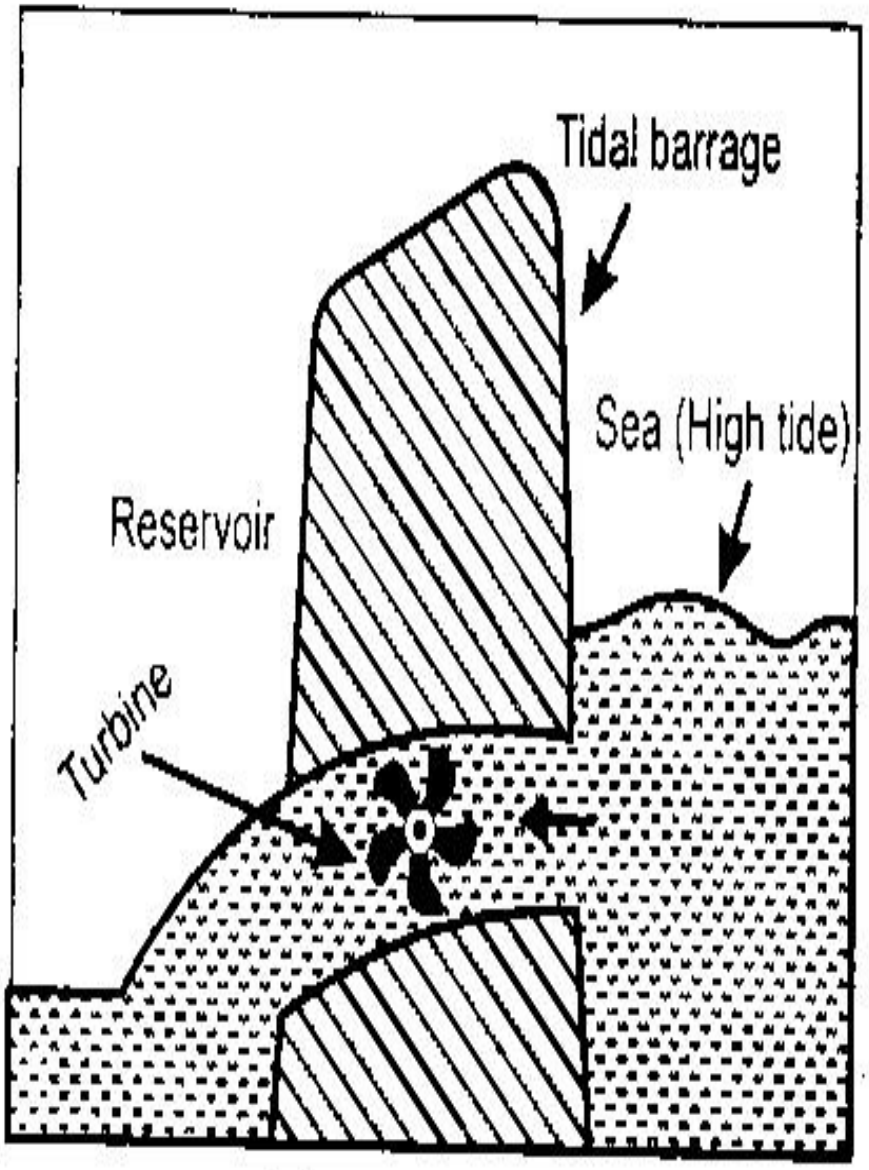


Fig. 2.8(a)

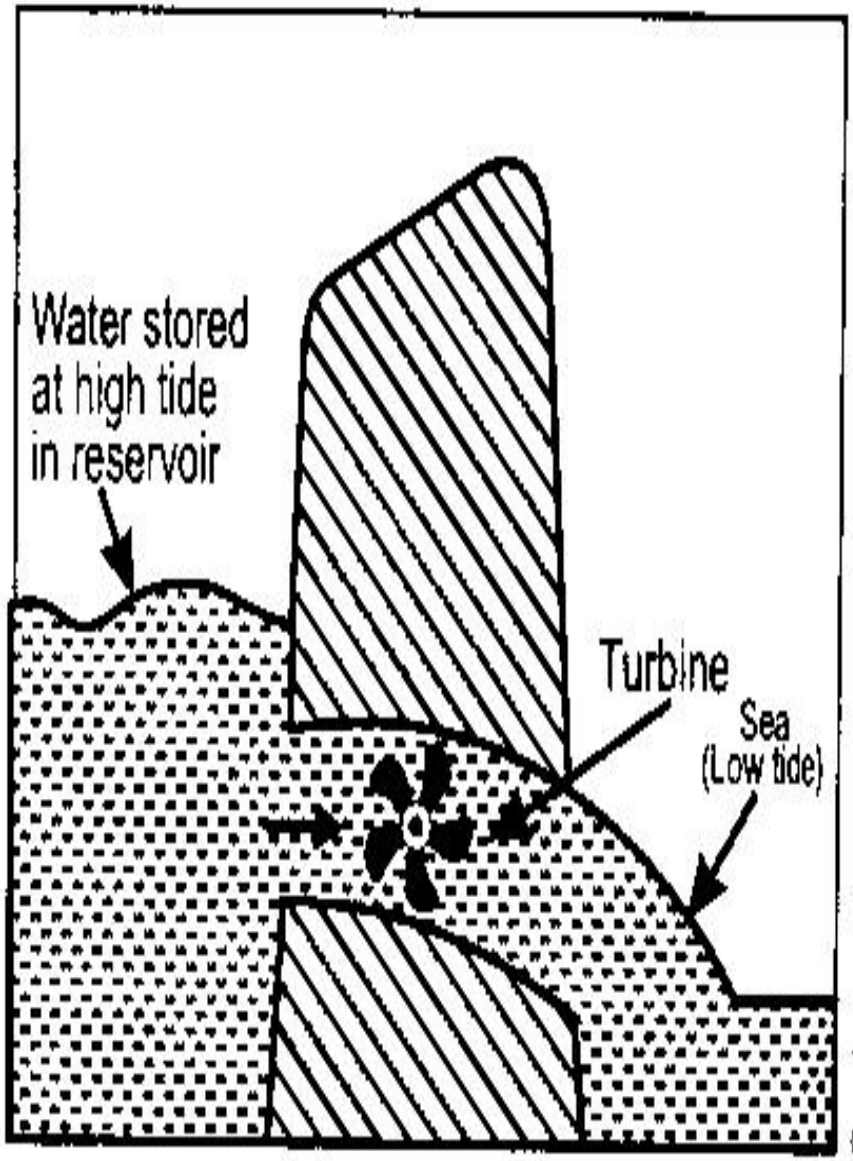


Fig. 2.8(b)

Geo thermal energy

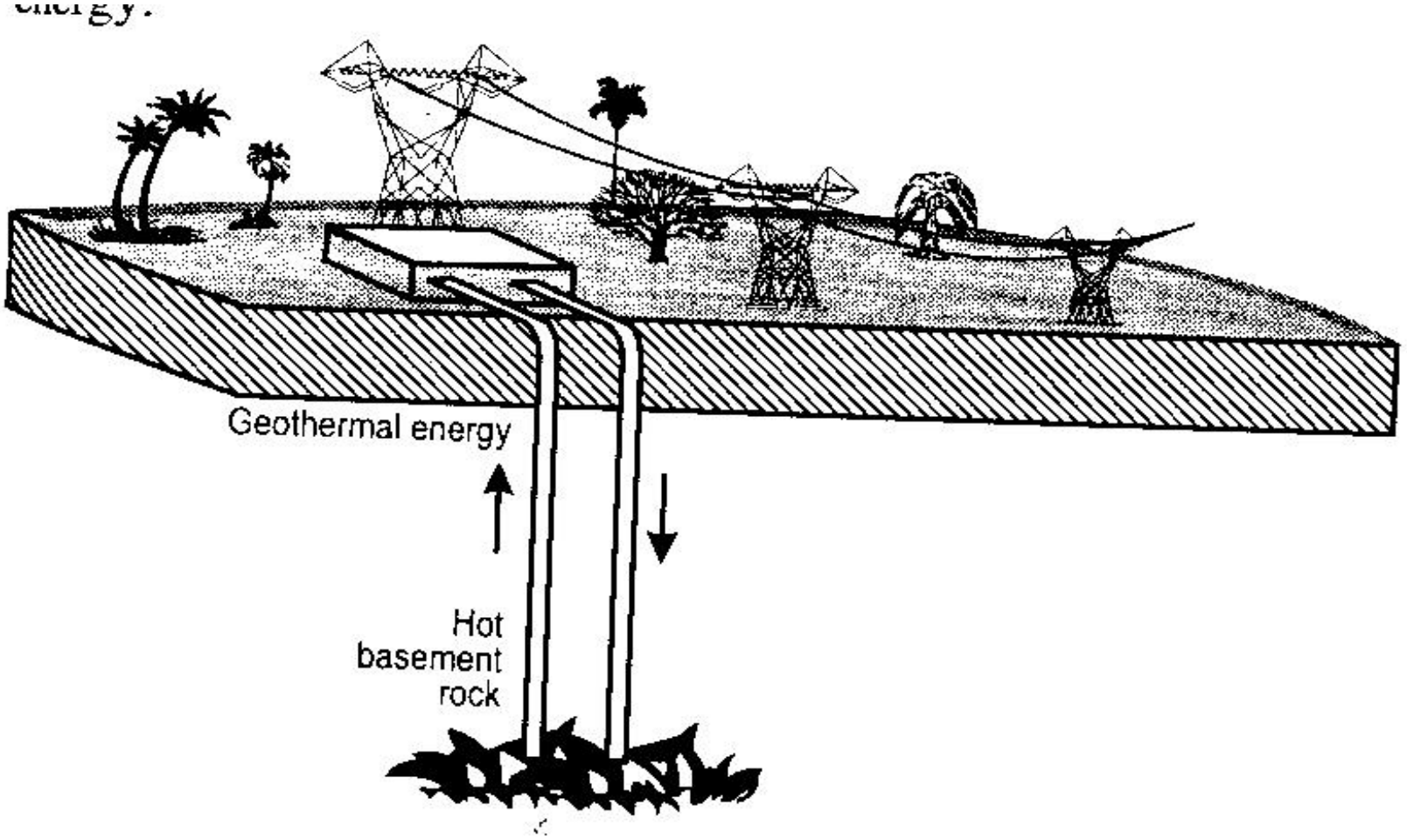


Fig. 2.9 Geo-thermal Energy

3. Geo thermal energy

When we move in to the earth, the temperature increases from 20-75’C.

The energy harnessed from the high temperature present in side the earth is called geo thermal energy.

Natural geysers

The hot waters or streams come out from the cracks of earth naturally

Artificial geysers

Artificially made holes emit hot water or steam by sending through pipe lines with very high pressure.

•

Bio mass energy

Bio mass is the organic matter obtained from plants and animals, used as source of energy

E.g. Wood Residues, Cow dung …

Bio gas

Mixture of methane, carbon di oxide, Hydrogen sulphide etc…

Major constituent is Methane 65%

It is obtained by anaerobic fermentation

Bio fuels

Fuels obtained by the fermentation of bio mass

Ethanol can be produced from sugar cane

Methanol can be obtained from sugar containing plants.

Mixture of Ethanol gasoline is called Gasohol.

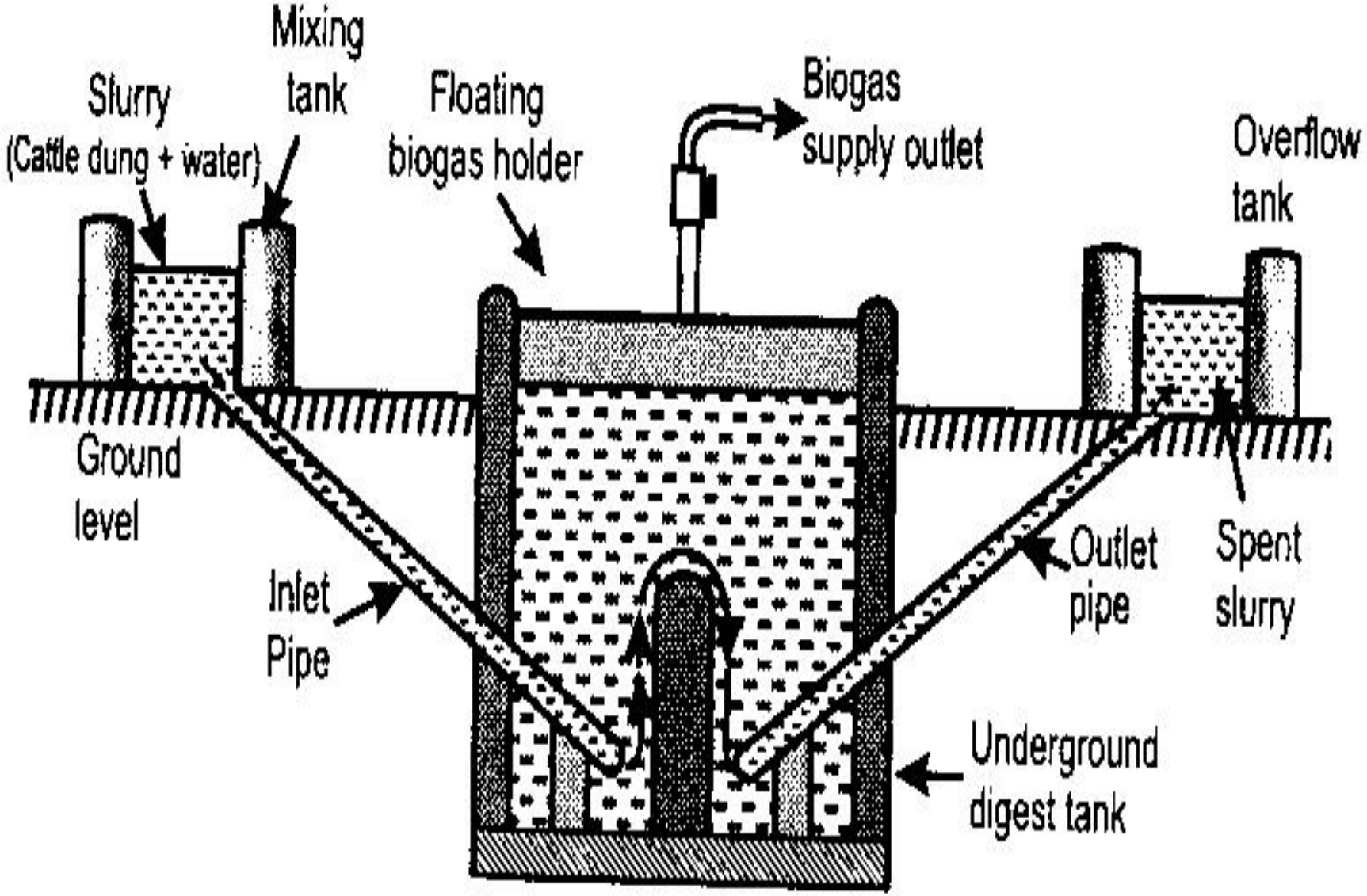


Fig. 2.10 Biogas Plant

Hydrogen Fuel

It is produced by thermal dissociation (or) photolysis (or) electrolysis of water.

$$2H_2 + O_2 \text{ ----------> } 2H_2O + 150KJ$$

Disadvantages

1. Highly inflammable, explosive
2. Safe handling
3. Difficult to store and transport

Non-Renewable energy sources

Coal

Coal is a solid fossil fuel

Various stages of coal

Wood------→Peat-------→Lignite-----→Bituminous coal-------→Anthracite

1. The carbon content of Anthracite is 90% and its calorific value is 8700 k.cal.
2. The carbon content of Bituminous coal is 80%
3. The carbon content of lignite is 70%
4. The carbon content of peat is 60%

Disadvantages

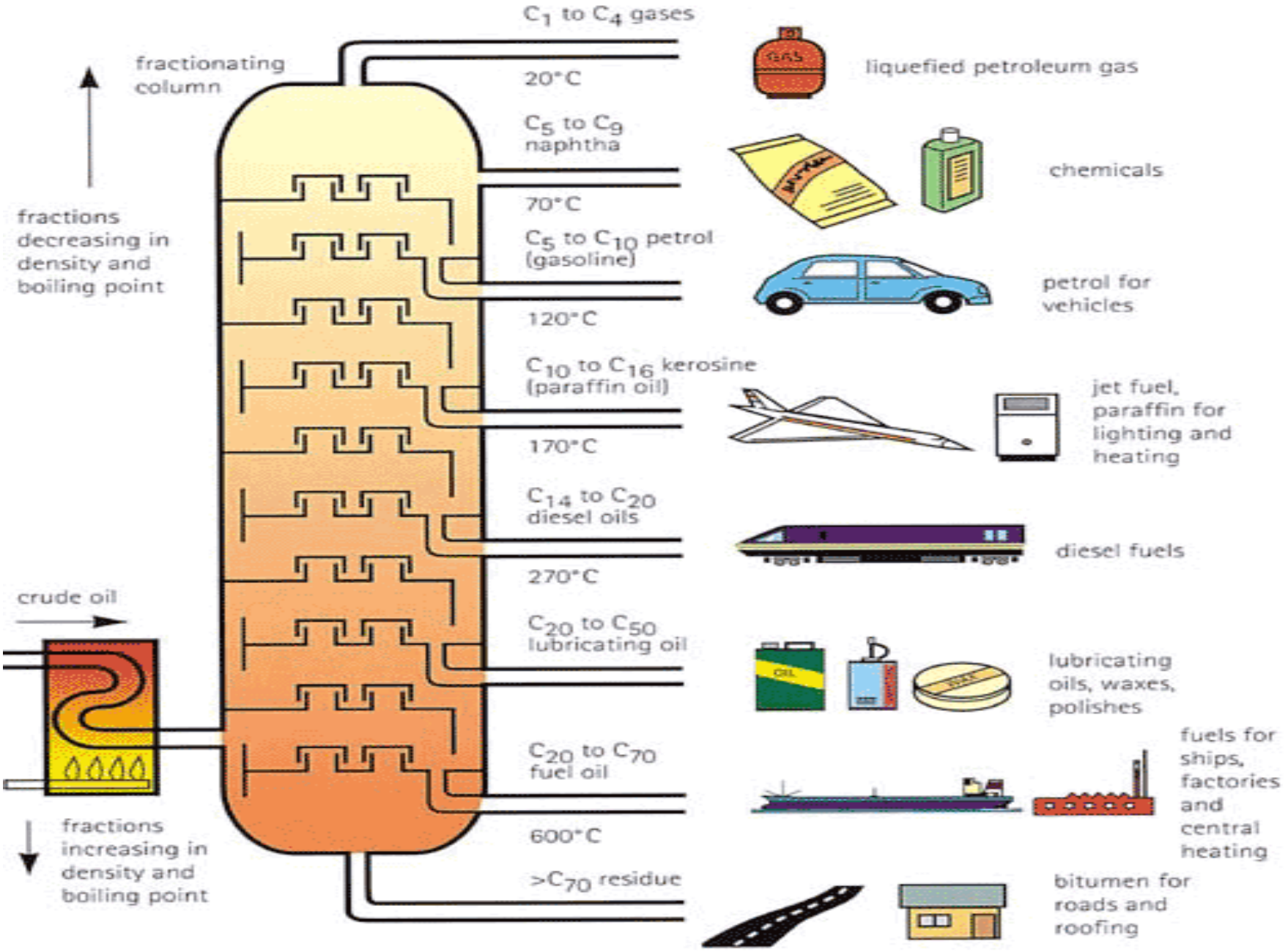
1. Coal producing CO_2 on burning produces toxic gases.

Petroleum

1. It is a thick liquid consisting of hundreds of combustible hydrocarbons.
2. It contains small amount of S, O, N.
3. It is formed by the decomposition of animals and plants at very high temperature and pressure for million of year

Fractional distillation

Separation of various hydrocarbons from crude petroleum oil.


C_1 to C_4 gases
fractionating column
20°C
C_5 to C_9 naphtha
70°C
C_5 to C_{10} petrol (gasoline)
120°C
C_{10} to C_{16} kerosine (paraffin oil)
170°C
C_{14} to C_{20} diesel oils
270°C
C_{20} to C_{50} lubricating oil
C_{20} to C_{70} fuel oil
600°C
>C_{70} residue
fractions decreasing in density and boiling point
crude oil
fractions increasing in density and boiling point
liquefied petroleum gas
chemicals
petrol for vehicles
jet fuel, paraffin for lighting and heating
diesel fuels
lubricating oils, waxes, polishes
fuels for ships, factories and central heating
bitumen for roads and roofing

LPG (Liquefied petroleum gas)

1. LPG is color less, odour less gas.
2. During bottling mercaptans are added.
3. It is a petroleum gas, can be converted in to liquid under high pressure.

Natural gas

It is a mixture of 50-90% methane and small amount hydro carbons.

Its calorific value ranges from 12000-14000 k.cal/m^3

1. Dry gas

Natural gas contains lower hydrocarbons like methane and ethane.

2. Wet gas

1. Natural gas contains higher hydrocarbons like Propane, butane along with methane.

Nuclear energy

Nuclear energy can be produced by

1. Nuclear fission
2. Nuclear fusion

1. **Nuclear fission**

   a. Heavier nucleus is split in to lighter nuclei

   b. On bombardment of fast moving neutrons

   c. Large amount energy is released

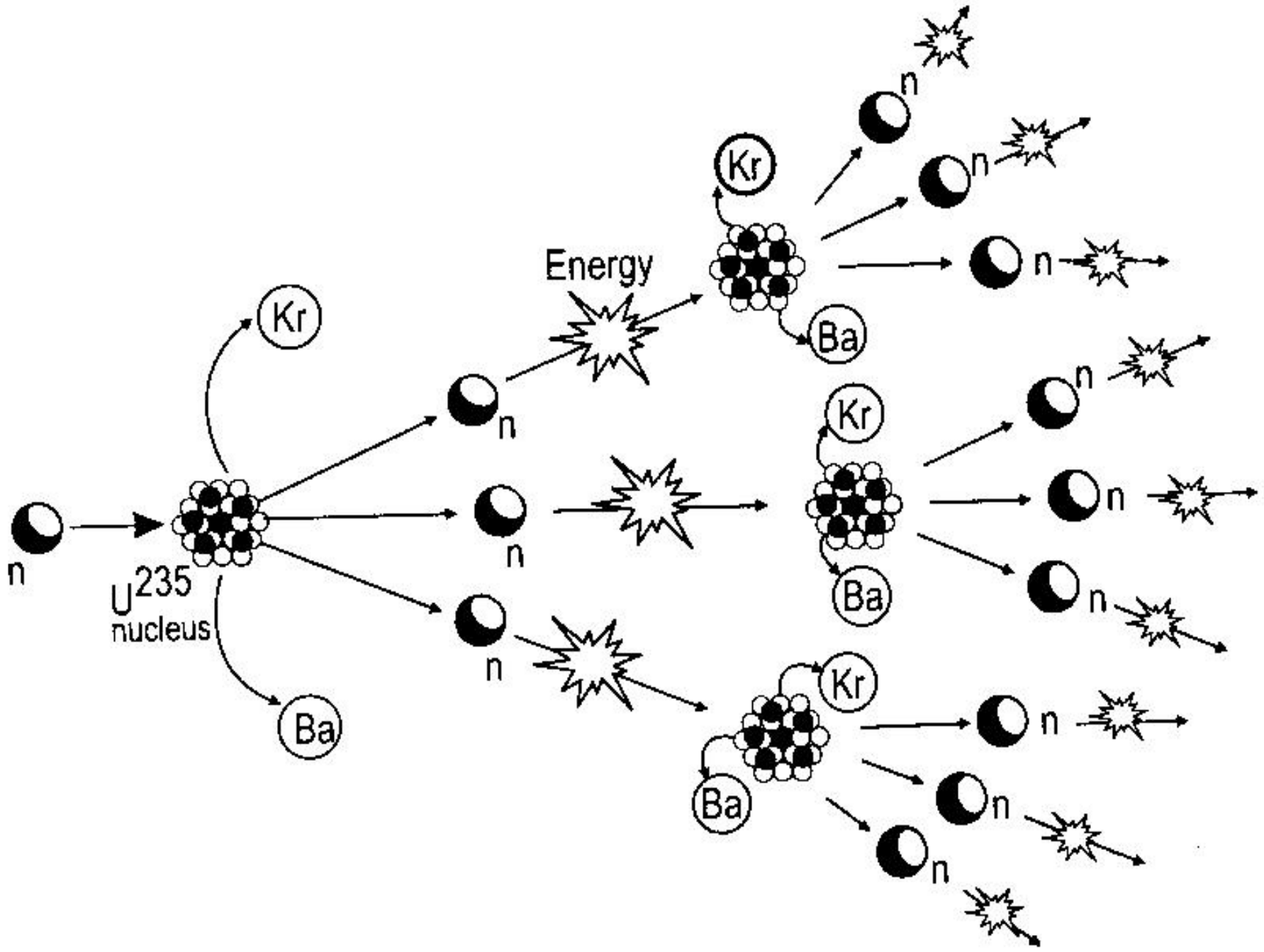
Example

Fission of U^{235}

$$U^{235}_{92} + n_0^1 \longrightarrow Ba^{139}_{56} + Kr^{94}_{36} + 3n^1_0 + \text{Energy}$$

Chain reaction

- Process of propagation of the reaction by multiplication in threes at each fission level


n
U235
nucleus
Kr
Ba
Energy
n
n
n
Kr
Ba
n
n
n
Kr
Ba
n
n
n
Kr
Ba
n
n
n

2. Nuclear fusion

1. Lighter nucleus combined together to form heavier nucleus.
2. Large amount of energy is released.

Example

Fusion of H_1^2

Two Hydrogen atoms fuse form helium at 1 billion ‘C.

Nuclear power in India

Tarapur-Maharastra

Ranapratap sagar- Rajasthan

Kalpakkam-Tamil Nadu

Narora-Up

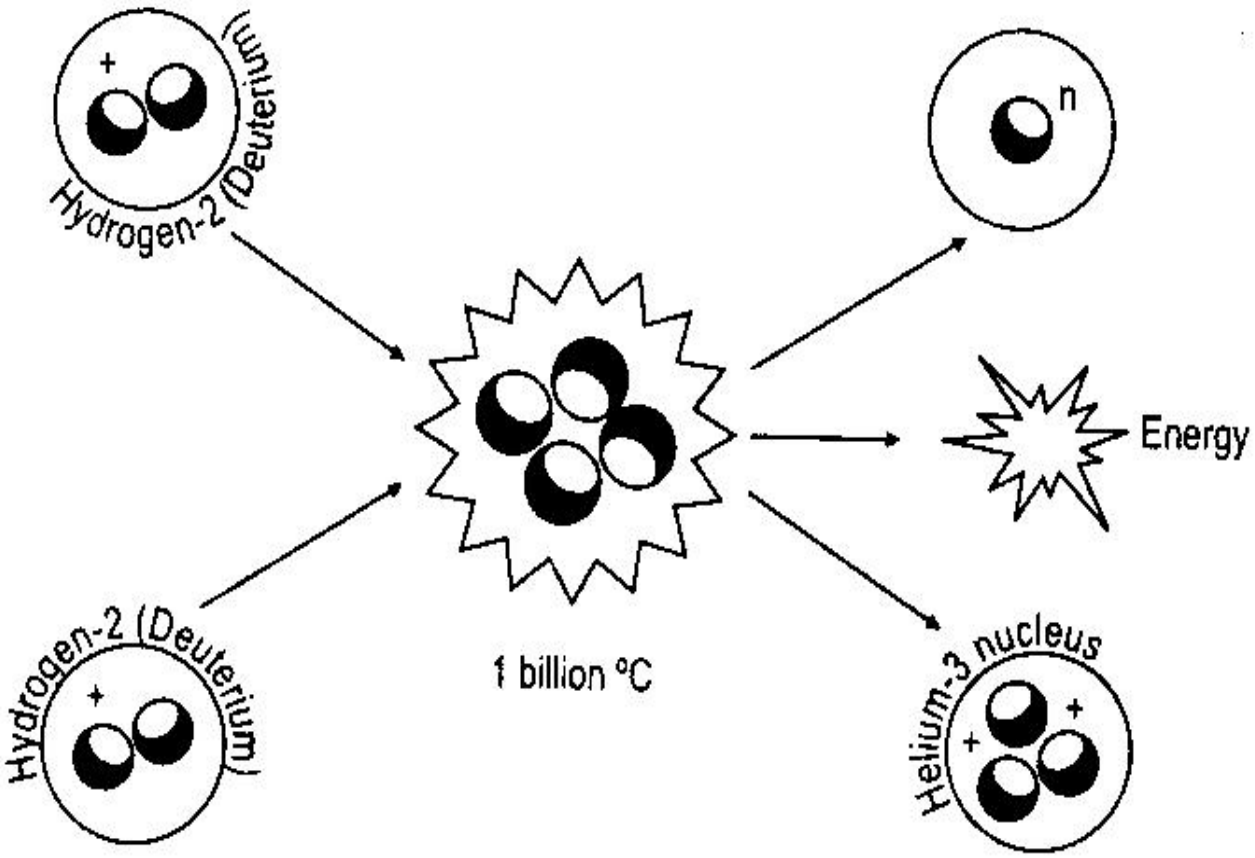


Fig. 2.13 Nuclear fusion reaction between two H-2 (Deuterium)

S.NO	COAL POWER	NUCLEAR POWER
1	Coal is called fossil fuel. It is formed from Buried animals and plants for over million of year	It is generated from fission and fusion
2	90% of worlds' total energy	11 % of the worlds' total energy
3	Small energy change in the combustion of coal	Many million times greater energy change
4	It is governed by temperature and pressure	Temperature and pressure have no effect
5	Similar products are obtained	New products are formed
6	No loss in total mass of coal	Loss of mass occurs
7	Atomic number of elements do not change	Atomic number of elements changes
8	Only change in electronic configuration and no change in nuclei	change in both electronic configuration and nuclei
9	During burning CO_2 produced ,increases green house effect	Radio active radiations are emitted. They are very dangerous

USES OF ALTERNATE ENERGY SOURCES (RENEWABLE)

Why alternate energy sources are required?

1. Fossil fuels and other sources are not free from Environmental implication.
2. Universally available energy sources are large scale utilization in future.
3. Hydro electric power generation is expected to upset the ecological balance.
4. Radioactive pollutants from atomic power plants are hazardous. the water in reactor Contains radio nuclides.
5. Radioactive waste can not be buried in land, produce soil pollution and can not dump in river, produce water pollution affect fish life
6. the burning of coal, petroleum produce smokes makes diseases to human and animals

There fore non conventional energy sources are needed.