

UNIT-3

ENVIRONMENTAL POLLUTION

POLLUTION

1. It is the contamination of the environment
2. Un wanted alteration of the surroundings
3. It decreases the quality of air , water and soil.
4. It affects the health of human, animals and plants

POLLUTANTS

The material which causes pollution

Table 1. Pollutants from different industries

Industrial sectors	Pollutant forms			
	Gas	Solid waste and soils	Water	Others
Iron and Steel	SO _x , NO _x , HC, CO, H ₂ S Toxic chemicals	Slag, wastes, sludge from effluent treatment	BOD, COD, oil, metals, acids, phenol, cyanide	Noise, particulate
Textiles and leather	SO _x , HC	Sludge (chromium) from effluent treatment	BOD, solids, sulfates and chromium, dyes	Odor, noise, particulate
Pulp and paper	SO _x , NO _x	sludge from effluent treatment	BOD, COD, solids, chlorinated organic compounds	Noise, odor, particulate
Petrochemicals, refineries	SO _x , NO _x , HC, CO, H ₂ S Toxic chemicals	Spent catalysts, tars, sludge	BOD, COD, oil, phenols and chromium	Noise, odor, particulate
Chemicals	Organic chemicals	Sludge from pollution treatment and process waste	COD, organic chemicals, heavy metals, solids and cyanide	Odor, toxic chemicals

Types of pollutants

Biodegradable pollutants

Non- Biodegradable pollutants

1. Biodegradable pollutants

They decompose rapidly by the natural process

2. Non- Biodegradable pollutants

They do not decompose rapidly by the natural process

Classification of Pollution

- Air pollution
- Water pollution
- Soil pollution
- Marine pollution
- Noise pollution
- Thermal pollution
- Nuclear hazards

Air pollution

Contamination of atmospheric air by dust, smoke and wastes .

Injurious to human health.



Composition of atmospheric air

Constituents	%
Nitrogen	78
Oxygen	21
Argon	< 1
CO ₂	0.037
Water vapour	Remaining
Ozone,He,NH ₃	Trace amount

Sources of air pollution

- 1. Natural sources**
- 2. Man made activities**

1. Natural sources

Examples

a) Volcanic eruption

b) Forest fires

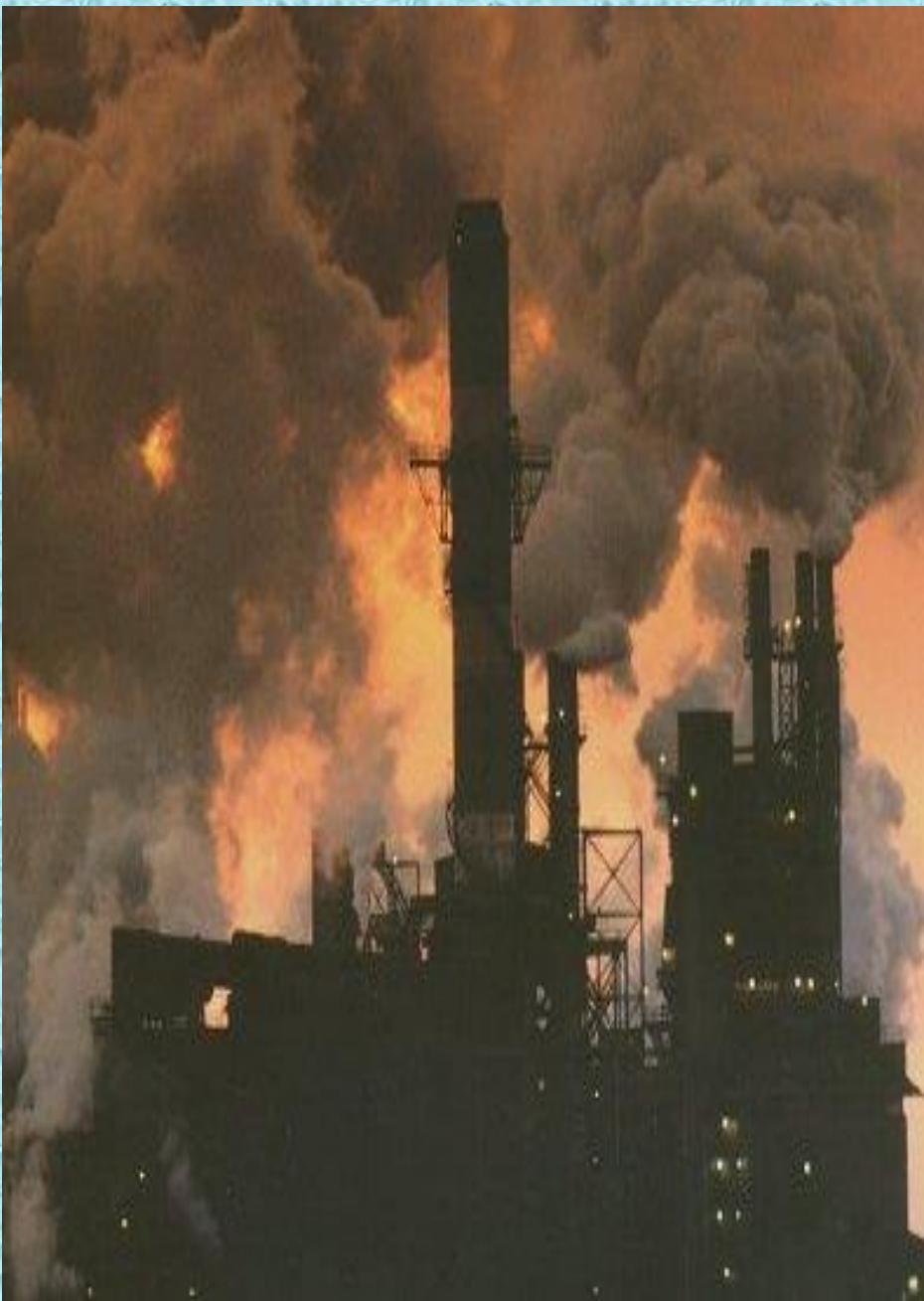
c) Biological decay

d) Radioactive materials

- These pollutions are caused by natural process

2. Man-made activities

- a) Thermal power plants**
- b) Vehicular emission**
- c) Fossil fuel burning**
- d) Agricultural activities**



Classification of air pollutants

- i) Primary pollutants**
- ii) Secondary pollutants**
- iii) Indoor air pollutants**

i) Primary pollutants

They are emitted directly in the atmosphere in harmful form

Example : CO, NO, SO₂

ii) Secondary pollutants

Some of the primary pollutants react with basic components of air to form new pollutants. They are called secondary pollutants

Example



iii) Indoor air pollutants

They are primary air pollutants

Example : Radon

Sources of indoor air pollutants

- a) Radon gas emitted by the tiles, concrete and bricks.
- b) It is also present in natural gas and ground water
- c) Fuel burning, cigarette smoking.



Common air pollutants

Sources and their effects

1. Carbon monoxide (CO)

Colourless, Odourless gas

Injurious to human and animal health

Cigarette smoking

About 77% comes from motor vehicles

Human sources

Incomplete combustion of fossil fuel

Power plants.

Cigarette smoking

About 77% comes from motor vehicles

Human health effects

Head ache , aneamia

At high levels it leads to coma and death

Environmental effects

It increases global temperature

Sulphur di oxide(SO₂)

Colorless and irritating gas

Formed from burning of coal and oil.

It is converted in to sulphuric acid in acid rain process.

Human sources

Power plants 88%

Industrial process 10%

Health effects

Breathing problems

Environmental effects

Reduce visibility

Sulphuric acid damage trees, plants, soil and aquatic life.

Ozone (O₃)

Highly reactive,
Irritating gas,
Unpleasant odour

It forms in the troposphere

It is a major component in the photo chemical smog.

Human sources

Nitrogen oxides

Volatile organic compounds

Environmental effect

Moderates the climate

- As a photo chemically very active compound, NO_2 absorbs the sunlight reaching the lower atmosphere at several magnitudes greater than all other gases.
- This overall reaction is by far the most important trigger of atmospheric radical chain reactions and in forming **photochemical smog**. “Photo smog” also contains a high share of toxic ozone.

Photo chemical smog

It is a brown smoke

It is formed by auto mobiles

It is formed due to the reaction between Nitrogen-oxides and hydrocarbons in the presence of sun light

Health effects

Breathing problems

Cough, Heart diseases

Eye, nose and throat irritation

Environmental effects

Ozone depletion

It reduces the visibility

It can damage plants and trees

Lead (Pb)

It is a solid, toxic metal

It can emit particulates

Human sources

Paint, smelters, storage batteries and leaded petrol.

Health effects

Damage brain and whole nervous system

Mental retardation

Digestive problems

Cancer in test animals

Environmental effects

Wild life destruction

Control measures

Source control

- I . Use only unleaded petrol
- ii. Use the fuels with low ash content and sulphur content
- iii .People should be encouraged to walk and drive cycle
- iV. Plantation of trees and plants in busy street absorb the carbon dioxide.
- v. Industries and waste disposal should be in the out of city range.
- Vi. Emission of carbon di oxide and hydrocarbons should be catalytically controlled.

Control measures in industrial centers

The emission rate should be within the limit allowed by the laws.

Air pollution control equipments should be designed Mandatory.

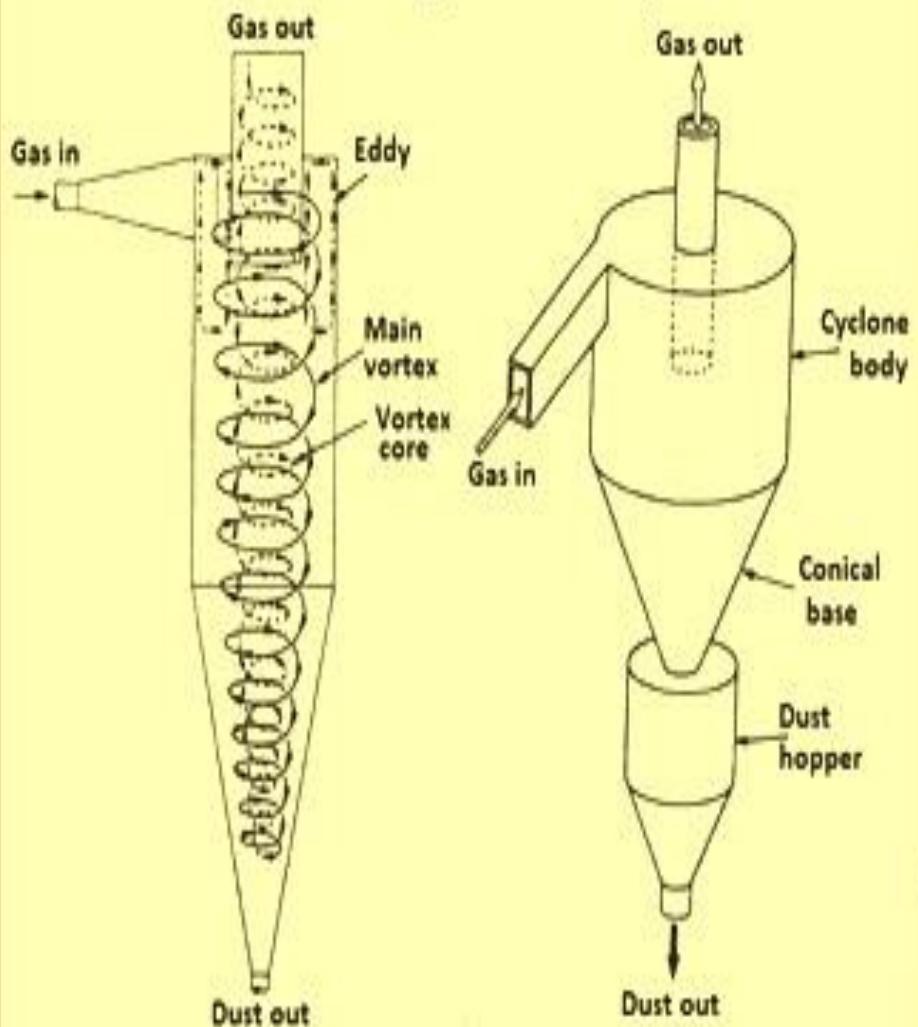
1. Sufficient supply of Oxygen to the combustion chambers
2. Sufficient supply of temperature to the combustion chambers
3. Eliminating the smoke consisting burnt ashes and dust

Equipments used to control air pollution

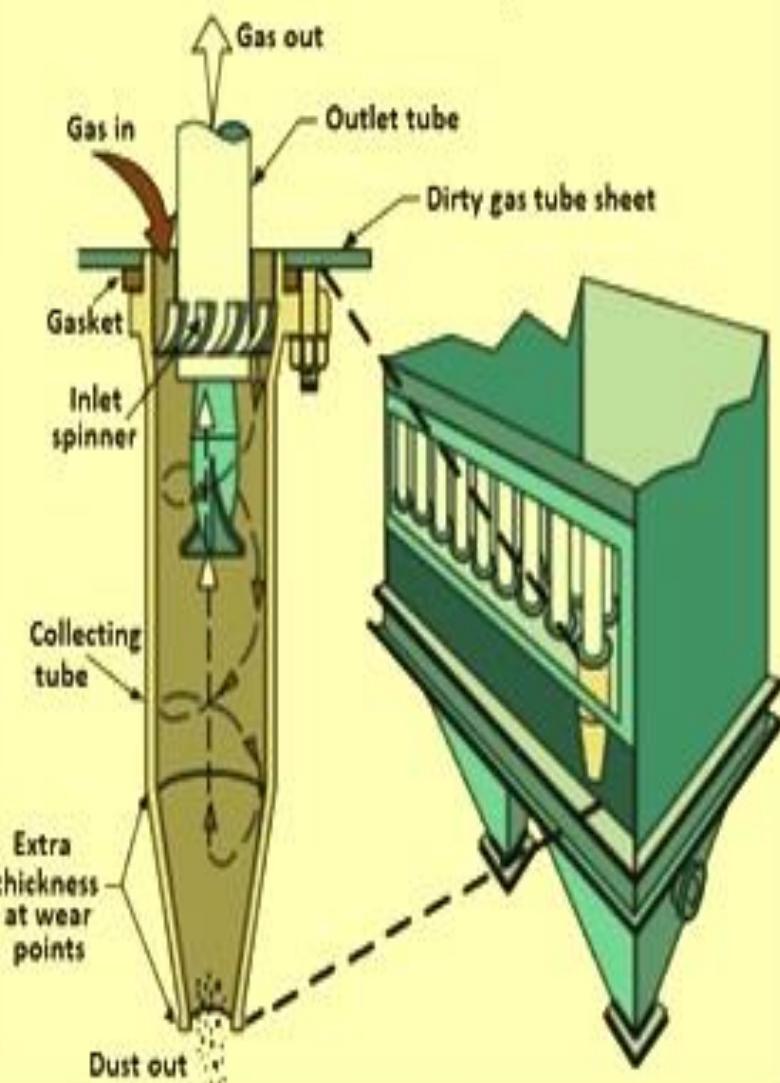
4. Use the mechanical devices
 - E.g. Scrubbers, Electrostatic precipitator, cyclone separator and bag house.

Cyclone devices

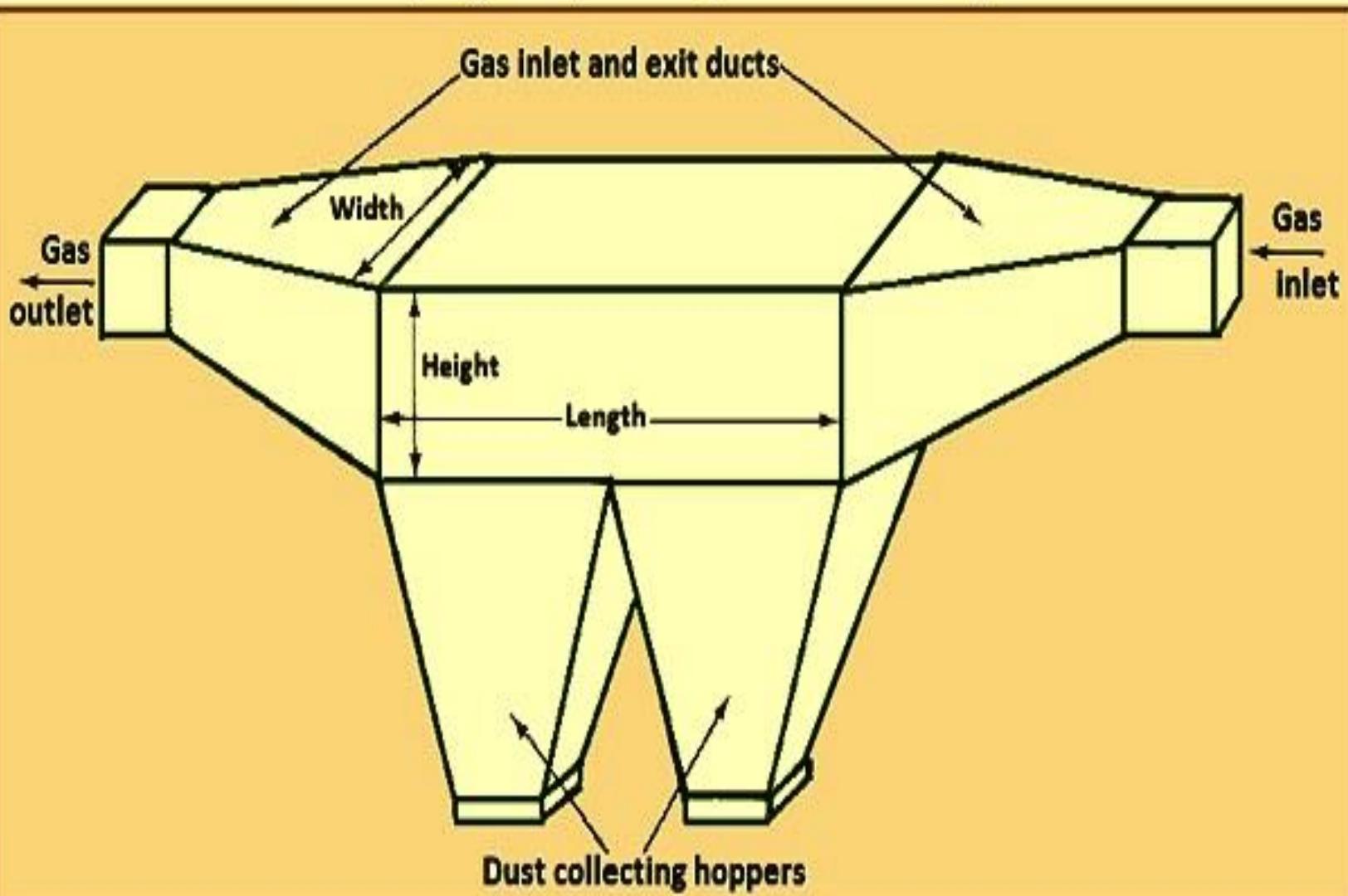
Cyclone showing vortex and eddy flows



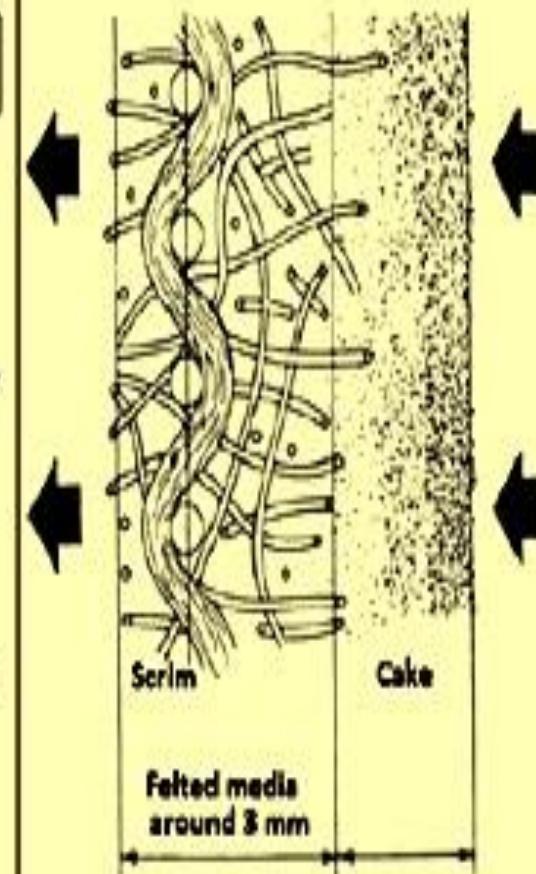
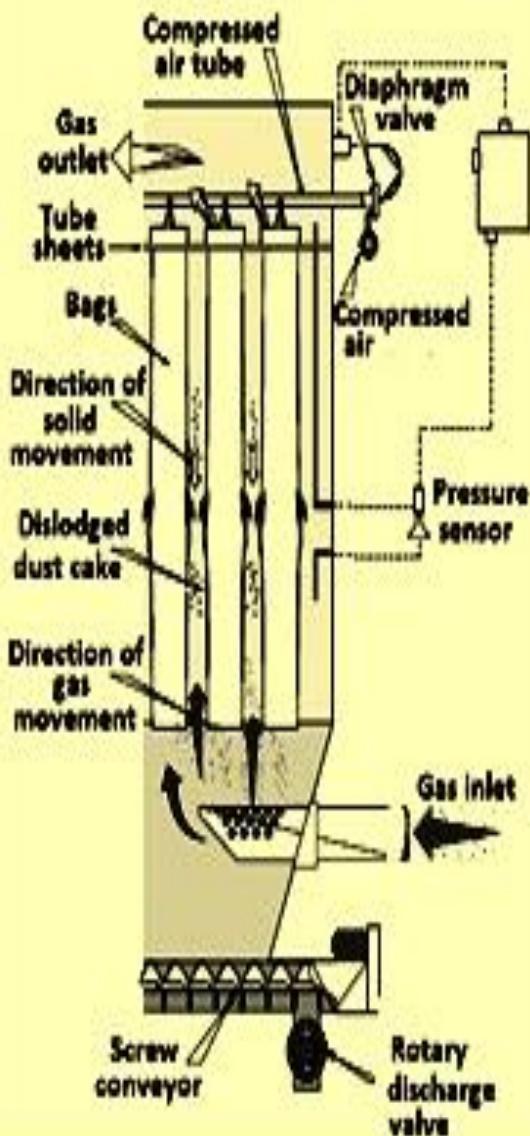
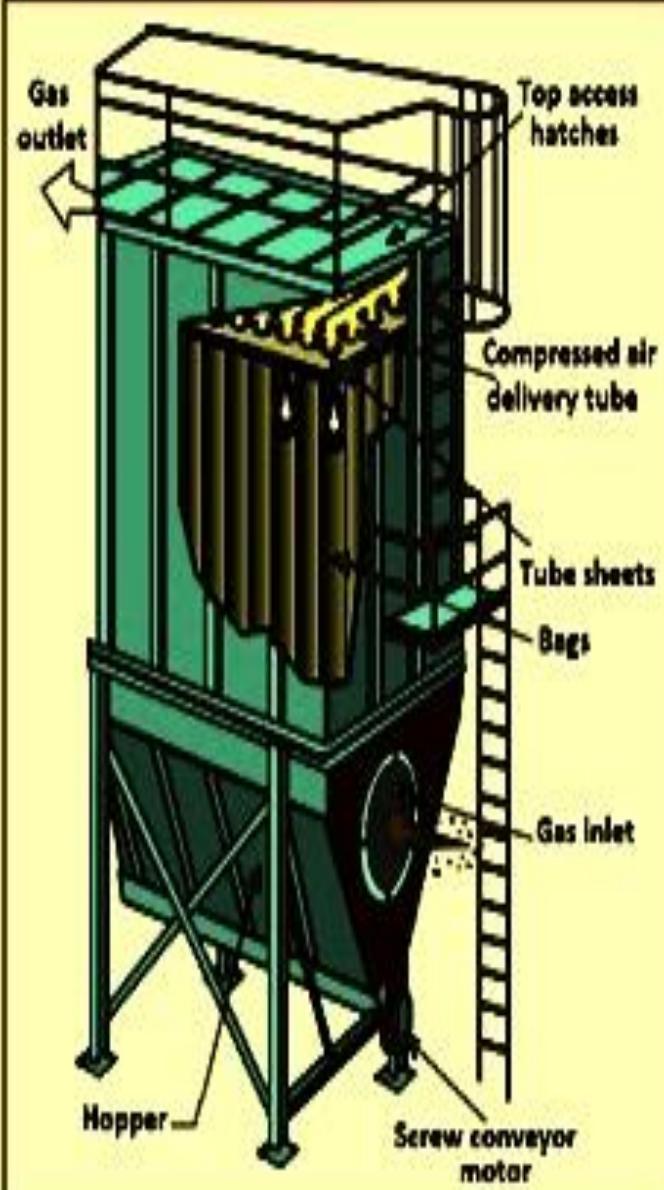
Small diameter multi-cyclone



A simple gravity settling chamber design



Pulse jet fabric bag house filter



Water pollution

- The alteration in the physical, chemical and biological characteristics of water
- This may cause harmful effects on humans and aquatic life.

Pollutants

- sewage
- Industrial wastes
- Oil and other wastes
- Fertilizers



Sources and effects of water pollution

1. Infectious agent – Source : Medical waste from hospitals and medical shop.

Example : Bacteria, viruses, protozoa and parasitic worms.

Human sources

Human and animal wastes

Effects

Variety of diseases

2. Oxygen demanding wastes

Example : Animal manure , Plant debris

Human sources

- Sewage
- Paper mills
- Food processing

Effects

- Depleting water of dissolved oxygen
- Fish and other aquatic life die

3. Inorganic chemicals

- Acids
- Lead, arsenic, selenium
- Sodium chloride and fluoride in soils

Human sources

Surface runoff, industrial effluents and household cleansers.

Effects

1. Fresh water contamination
2. Skin cancer and neck damage
3. Harm fish and other aquatic life
4. Lower crop yields
5. Corrosion of metals

4. Organic chemicals

Example : Oil, Gasoline, plastics, pesticides and Detergents.

Human sources

Industrial effluents, household cleansers and surface runoff

Effects

1. Damage the nervous system
2. Cause some cancer
3. Harm fish and wild life.

5. Plant nutrients

Example : Compound containing nitrate,
Phosphate, and Ammonium

Human sources

Sewage, manure, runoff fertilizers

Effects

Excessive growth of algae and aquatic plants

Deplete dissolved oxygen in water

Kill the fish

Lowering the oxygen carrying capacity of blood

Point and Non point sources of water pollution

1. Point sources

They are discharged pollutants in a place through pipes or ditches in to water bodies.

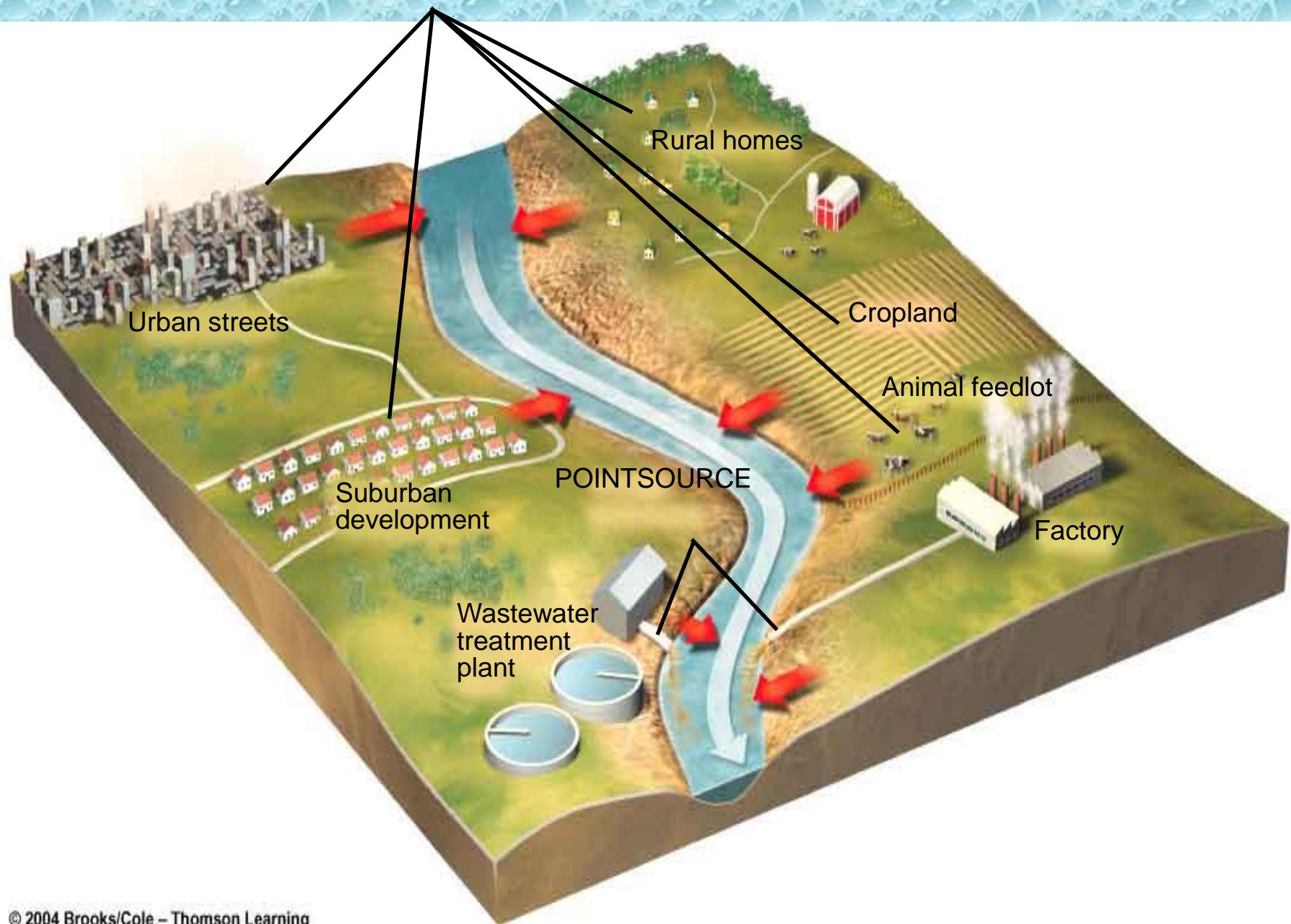
Example : Factories, sewage treatment plant

2. Non point sources

They are large land areas that pollute water by runoff, deposition from atmosphere.

Example : Acid deposition and runoff chemicals in to surface water from croplands and oil tankers.

NONPOINT SOURCES



Control measures of water pollution

1. Water pollution should be controlled by state or central government
2. Scientific methods should be followed for pollution control.
3. The industrial effluents should be recycled
4. Discharge of effluents in to water bodies should be stopped.
5. Deforestation should be stopped.
6. Plant more trees.

7. Domestic waste water may be used for gardening.
- 8 . Create Public awareness .
9. Laws and rules to protect the water should be framed.

Waste water or sewage treatment

1. To eliminate hardness of water
2. To eliminate the bad smell
3. To remove the solid wastes in the sewages
4. To kill and remove the disease producing micro organisms.

Treatment process

1. Preliminary treatment

Solids and suspended impurities are removed.

Here water is cleaned by bar and mesh screens.

2. Primary treatment or settling process

In organic and organic solids are removed.

To hurry up the settling, Alum and ferrous sulphate are added.

These chemicals form gelatinous precipitate, promote the settling.

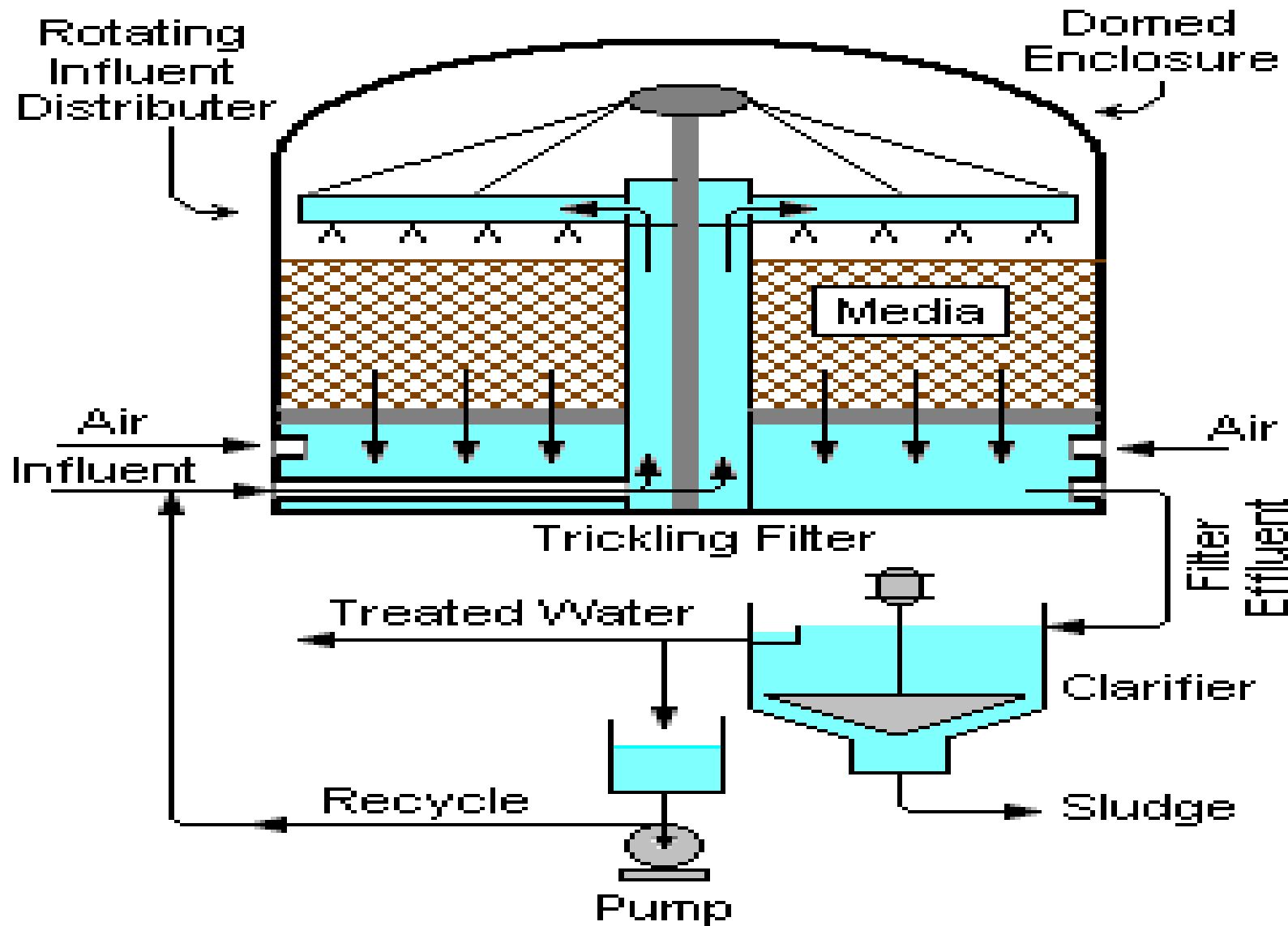
3. Secondary or biological treatment

Here trickling process or sludge process is used.

Bio degradable organic matters are removed.

90% of oxygen demanding wastes is also removed.

• Trickling filter process



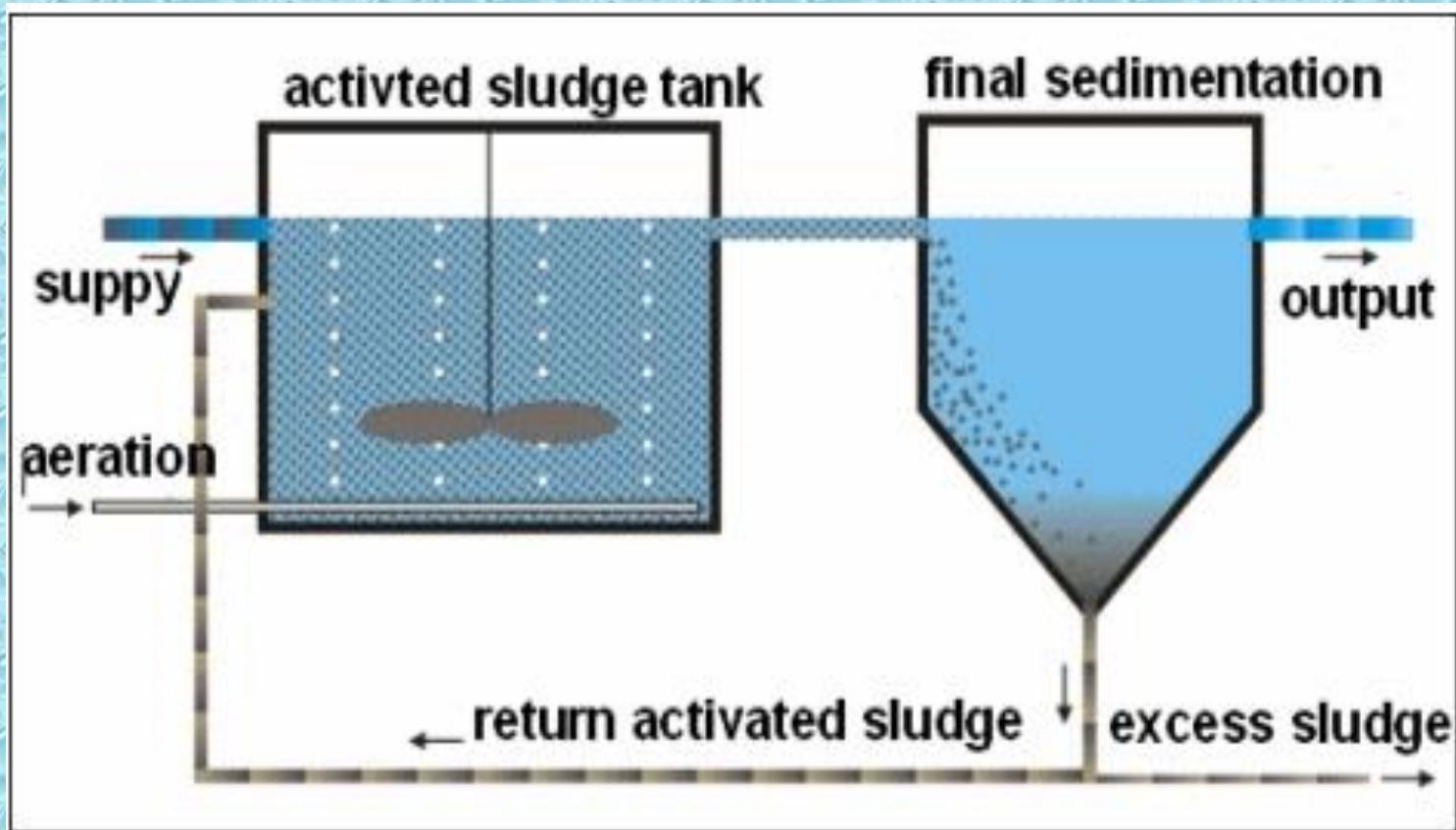
TRICKLING FILTER PROCESS

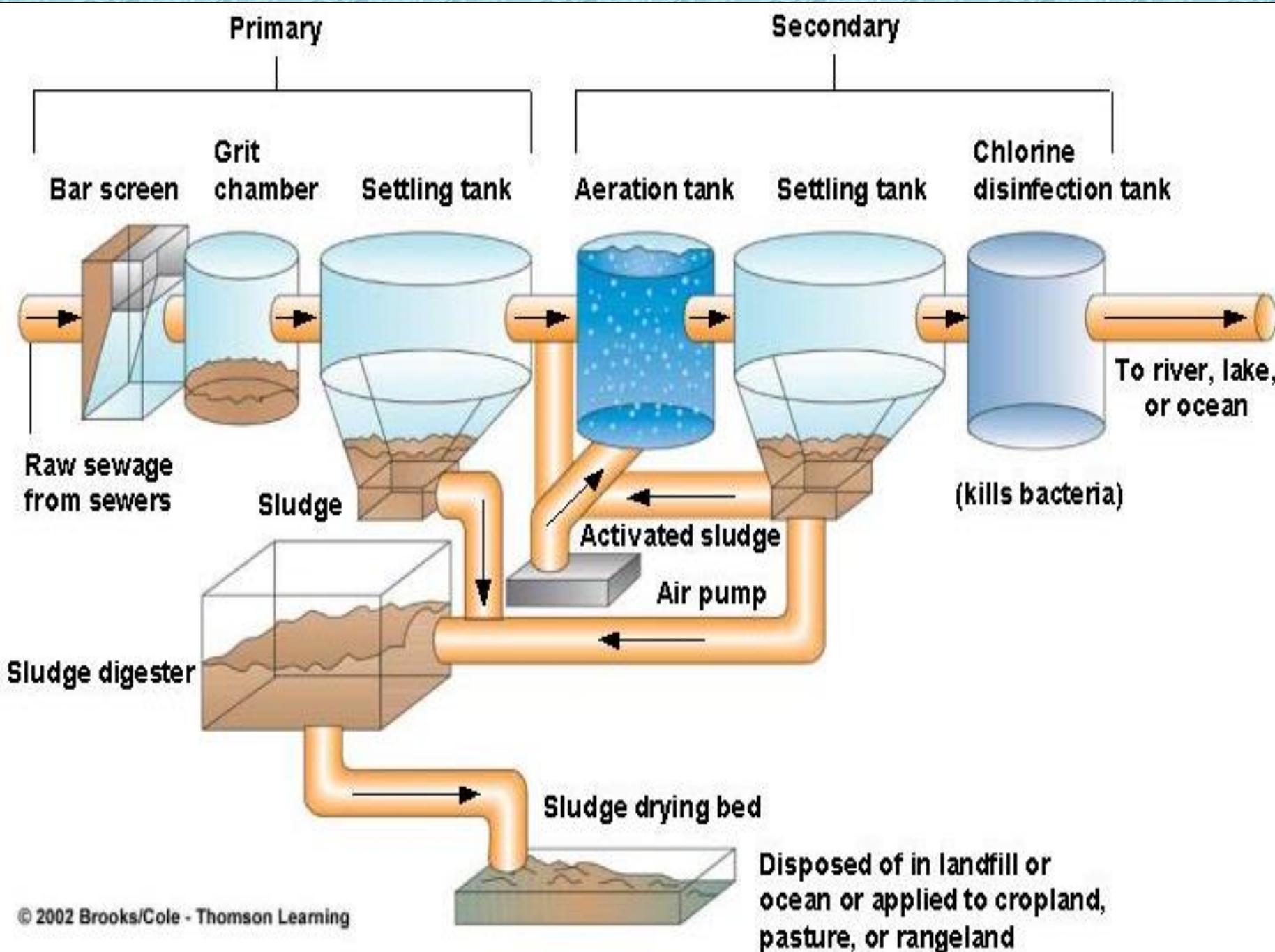
1. It is a circular tank.
2. Sewage is sprayed over crushed rocks
3. Slow rotating arm sprayer is used.
- 4 . When sewage moves downwards
microorganisms grow on rocks surface.
5. Food for the microorganisms is organic
matters in sewage.
6. After aerobic oxidation sewage goes to
settling tank
7. In settling tank sludge are removed.
8. By this process 85% of BOD removed.

Activated sludge process

1. Activated sludge is biologically activated sewage
2. Sewage from primary treatment mixed with activated sludge
3. It is aerated in aeration tank
4. Here oxidation of organic impurities takes place
5. Sludges settle down in the sedimentation tank.
6. This process removes 95% of BOD

Activated sludge tank





4. Tertiary treatment

- 1.BOD is removed by this treatment
2. The lime is added to the effluent in flocculation tank
3. Phosphates are removed.
4. Next effluent passed into ammonia tower; here ammonia is removed as gas.
5. Minute organic wastes are removed by charcoal adsorption
6. Finally the effluent is added with chlorine (Disinfectant).

5. Disposal of sludge

Wastes from the various steps of treatment
are disposed by

1. Dumping in to low lying area
2. Burning of sludge
3. Dumping in to the sea
4. Using it as low grade fertilizers.

ECOLOGICAL WASTE WATER TREATMENT



SOIL POLLUTION

Definition

The contamination of soil by human and natural activities, which may cause harmful effects to living things.

Composition of soil

Inorganic mineral-45%

Organic matter-5%

Soil water-25%

Soil air-25%

Types, effects and sources of soil pollution

- 1.Industrial wastes
- 2.Urban wastes
- 3.Agricultural practices
- 4.Radio active pollutants
- 5.Biological agents



1. Industrial wastes

Disposal of industrial wastes on land

Sources

- i) Pulp and paper mills
- ii) Chemical industries, oil refineries , Sugar factories, Tanneries
- iii) Coal, Mining industries,
- iv) Drugs, glass, cement and engineering industries

Effect

- i) Alter the chemical and biological activities of soil.
- ii) Hazardous chemicals enter in to the human and animal food chain.
- iii) Disturb the biological process of living organisms.



2.Urban wastes

Both commercial and domestic wastes

Form dry sludge of sewage

Constituents

Garbage and rubbish material

Plastics, glasses, fibers, rubbers, fuel
residues, abandoned vehicles

Industrial wastes

3. Agricultural practices

Modern agricultural process pollute the soil
through Fertilizers, pesticides, herbicides,

Farm wastes



4. Radio active pollutants

Radium, thorium, uranium and carbon -14 isotopes

Explosion of hydrogen weapons

Cosmic radiations

Nitrogen-15

Strontium-90, Iodine-129, Cesium-137 and isotopes of iron

Ruthenium-106, Iodine -131, Barium-140,

Control measures of soil pollution

Farm activities are increased for two reasons

- Population growth-to be controlled

- Urbanization (Decrease of farms)

Control of soil erosion

It is controlled by forestry and farm practices

Example

- Tree plantation on slopes

- Terracing and building diversion channel may be undertaken

- Reducing deforestation

Proper dumping of unwanted materials

Waste of human and animal form chronic problem

Open dumping method should be changed

Controlled tipping method should be followed

Production of natural fertilizers

Fertilizers and pesticides should not exceed the limit

Bio fertilizers should be preferred for chemical fertilizers

Example : Animal's dung are used for composting manure

Public awareness

Public awareness programs should be conducted
Problems of health hazards should be educated to
the people.

Recycling and reuse of wastes

The waste paper, plastics, glasses, petroleum
products and industrial effluents should be re used
and re cycled.

Ban on toxic chemicals

DDT, BHC pesticides should be banned

Improper disposal of radioactive wastes should
be banned

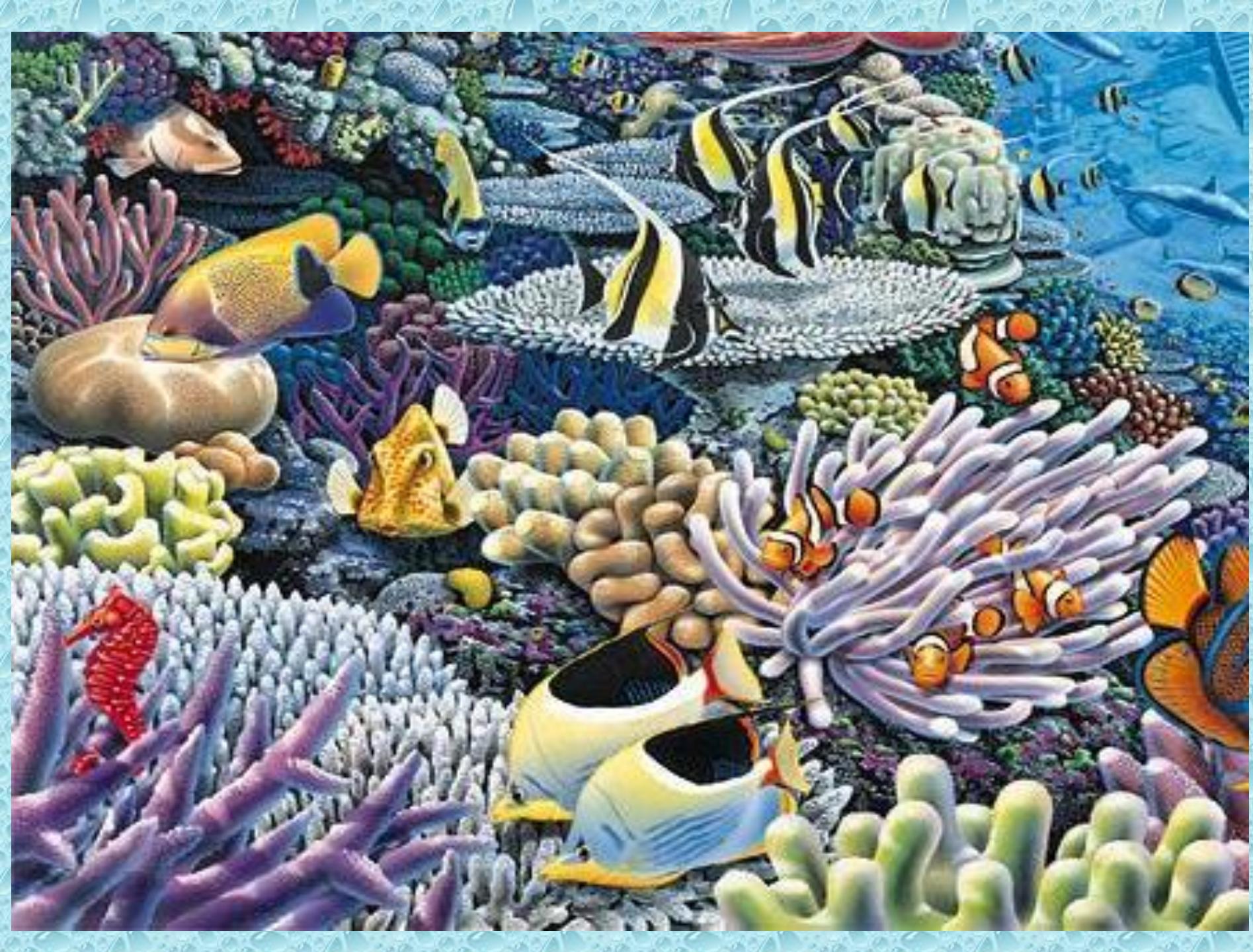
Nuclear explosion should be banned.

MARINE POLLUTION

Definition

Discharge of waste substances in to sea. It makes harmful to fishes and other living organisms.

It changes the physical, chemical and biological prosperities of sea water.



Coral reefs

Most of the people living nearer to the costal area
The coastal zone contains rich heritage, coral reefs,
wet lands and sea grass beds.

Benefits of coral reefs

1. Reefs support more than one million species
2. They provide feeding, breeding nursery areas to fish and shell fish
3. They offer medicines
4. They protect coastal lines from storms.
5. It is valued for 47000 US dollars
6. It is a great habitat for 2000 species

Sources of marine pollution

Dumping the wastes

Dumping the un treated wastes and sewage in to oceans

Rivers with wastes finally mingled with ocean

Agricultural discharges, fertilizers, pesticides, heavy metals are mixed into sea water.

Huge quantity of plastics is dumped into sea.

Effect

Many sea birds and animals get affect with gastro intestinal disorders.



Red tides

Oil pollution of Marine water

The huge damage on marine eco system by oil and petroleum products.

Example

- a) Cracks of oil tankers & Ship accidents allow the leakage of oils into sea water
- b) It reduces the oxygen level in the sea water.
- c) It deposits on the rocks and earth of sea and affects the habitats of sea animals.





Effects of marine pollution

1. The heavy metals and organic pollutants affect the egg shell and tissues.
2. About 50000 to 250000 birds killed every year by oil spill.
3. The rate of oxygen uptake by water reduced.
It inhibits photo synthesis and oxygen formation.
It inhibits the growth of plankton.
4. Many sea birds and animals get affect with gastro intestinal disorders.

Effects of marine pollution

5. Oil spilling in sea water causes abnormally low body temperature resulting in hypothermia. Nearly 150 rare species of bald eagles also became victims when they ingested oil during Exxon Valdez accident.
6. Hydrocarbons and benzpyrene in the oil accumulate in food chain- cause biomagnification and cancer.
7. Detergents used to clean up oil spill are also harmful to marine life.

Control measures of marine pollution

1. Plans for conserving marine bio diversity must be taken in to account of human needs
2. People should be educated marine eco system and its benefits
3. Local communities must be involved in protecting and managing their coastal area
4. Social and economic incentives must be offered for the conservation of marine eco system
5. The facts that all oceans are connected must be reflected in the policies
6. Government must manage their own waters while extending co-operation to the neighbours

Other control measures

The industrials should keep pollution control instruments

The urban growth near the coastal should be regulated

The needs of the fisher man should be fulfilled.

Methods of removal of oil

1. Physical methods

- a) Suction device is the simplest method
- b) Oil is absorbed by the suitable absorbing agents.
- c) Polyurethane foam is the best absorbent
- d) Chopped straw and saw dust are also the good absorbent

2. Chemical methods

- a) Dispersion
- b) Emulsification
- c) Using chemical additives

Protective measures

1. Municipal and industrial wastes should be treated
2. Coastal wastes should be analyzed periodically to know the pollution level
3. Recreational beaches should be maintained to keep hygienic and aesthetic value.



Noise Pollution

Definition

The unwanted and unpleasant sound that causes irritation to all living things is called noise pollution.

Types of noise

Industrial noise

Transport noise

Neighborhood noise

1. Industrial noise

1. Sound or noise pollution caused by machines
2. Mechanical saw and drilling produces noise
3. Factories produce enormous noise
4. It was observed by Oto-Rino Laryngology

2.Transport noise

- a) Road traffic noise
- b) Train traffic noise
- c) Motor, scooter, cars, motor cycles, buses and diesel vehicles produce noise
- d) Noise level is high in residential area
- e) Delhi, Kolkata and Mumbai produce 90 DB noise

3 . Neighbourhood Noise

- 1. Disturbance from household communities.
- 2. Musical instruments, TV, radio , telephones, transistors, loud speakers

Effects of noise pollution

- It affects human health, comfort and efficiency
- High blood pressure
- Mental stress
- Heart attack
- Birth defects
- Nervous break down

- Tension
- Increase the rate of heart beat
- It causes damages to kidney, brain and liver
- Loss of hearing, Pathological disorders
- It affects respiratory, cardio vascular system
- Blood is thickened by excess noise

Control measures

1. Source control

Design changes, limiting operational timing

Transmission path intervention

- Sound insulating enclosures,
- Provision of sound absorbing material
- Construction of sound barrier

Receptor control

- Provision of personal protection devices
- Protection of receiver by altering the work schedule
- Ear plug for operating noisy machinery

Oiling

- Proper oiling will reduce the noise from machines

Preventive measures

- Noise within limits should be followed for vehicles
- Ban horns near schools, hospitals,
- Reduce the traffic density
- Re designing buildings



Thermal pollution

Definition

- Addition of excess heat to water that makes it harmful to living things.

Sources of thermal pollution

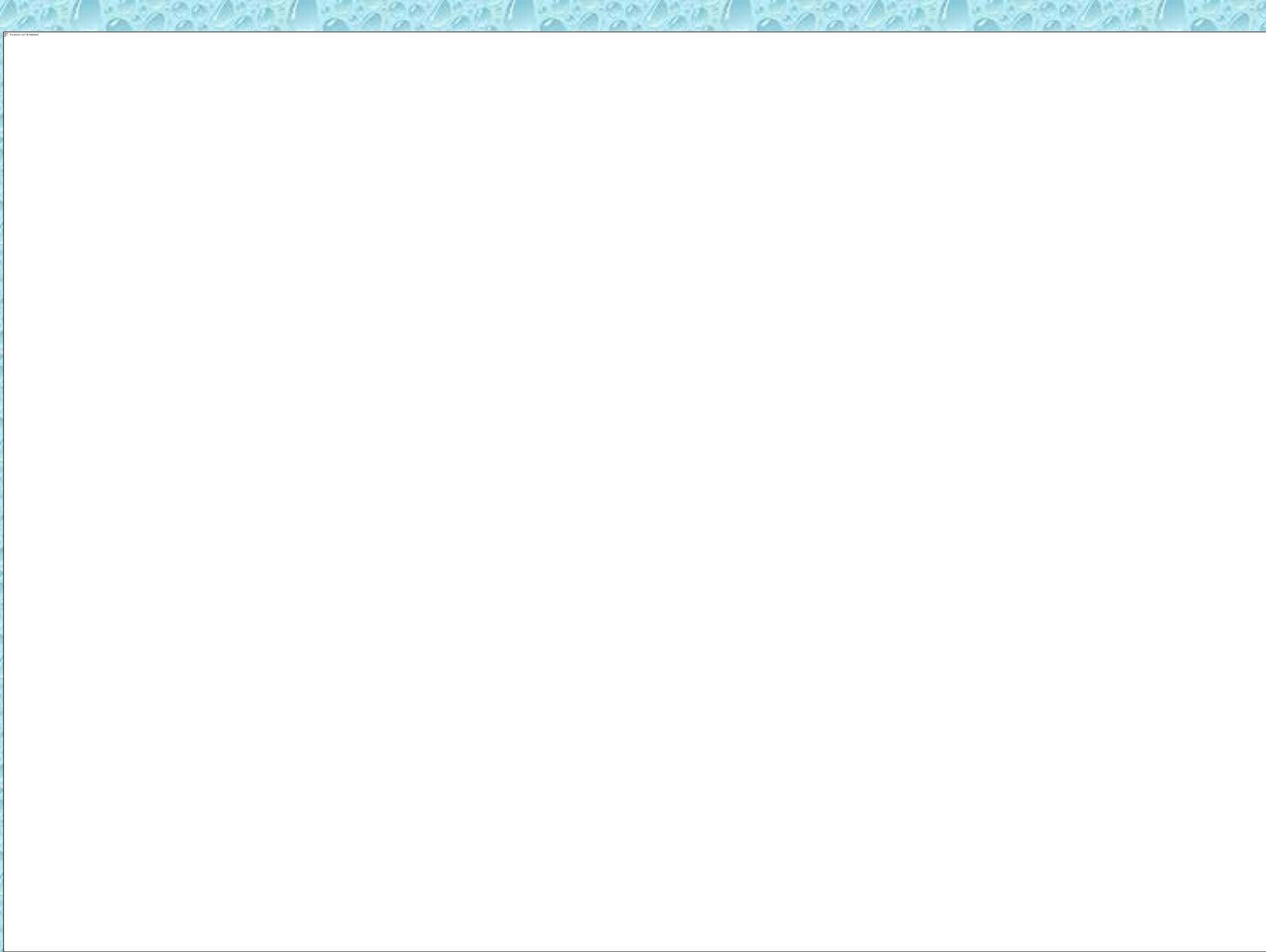
- 1. Thermal power plants
- 2. Coal-fired power plants
- 3. Industrial effluents
- 4. Domestic sewage
- 5. Hydro electric power



1. Thermal power plants

- Drainage from hospitals research institute
- Nuclear explosions and experiments
- Emissions from power and nuclear reactor and
- Heat effluents from power plants.
- Increases the temperature of the water bodies.





2. Coal-fired power plants

- Condensers in the thermal power plants are cooled with water from river and lakes; discharge the hot water back to them increasing the temperature of the water bodies.
- The heated effluents decrease the dissolved oxygen content in water.
- It kills the fishes and other micro organisms

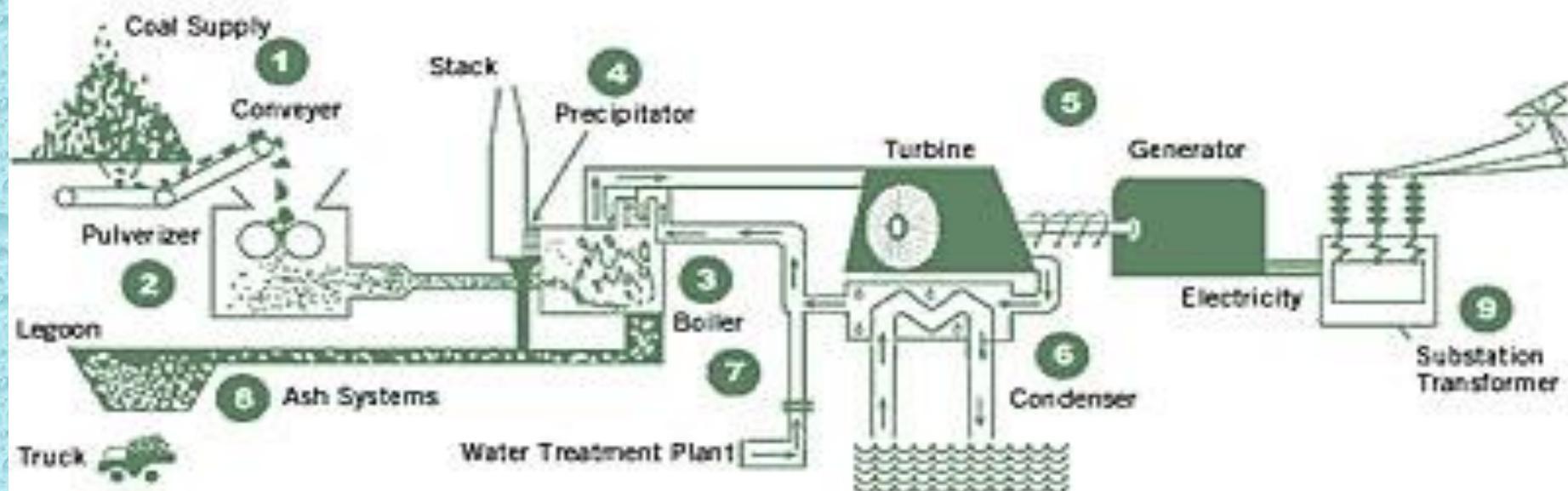
3. Industrial effluents

Electricity generating industries like

- Coal power plants
- Nuclear power plants
- Textile, paper and pulp industries
- Directly mix the hot effluents into water bodies
- It increases 10°C of temperature.



Components of a coal-fired thermal plant



Source: Canadian Clean Power Coalition

INDUSTRY EFFLUENTS



SCIENCEPHOTOGRAPHY



4.Domestic sewage

These are discharged in to river, lakes, and channels without treatment.

- The municipal sewage has high temperature
- The demand of oxygen increases.
- Water organisms will die.
- The offensive gases evolved

5.Hydroelectric power

- Negative thermal loading takes place in water.
- 8% more heat is given to the water bodies by nuclear power plants

Human activities

- Industries and power plants use water to cool are mixed with water bodies
- Cutting the trees and plants
- Soil erosion by construction
- Removal of stream side vegetation
- Poor farming practices

Effects of thermal pollution

a) Reduction in dissolved oxygen

- When temperature increases DO level decreases- solubility of gases will be decreased

b) Increase in toxicity

- When temperature increases toxic effect of Potassium cyanide and O-xylene increases

5.7.3 Effects of Thermal Pollution

- 1. Reduction in dissolved oxygen:** Concentration of dissolved oxygen (DO) decreases with increase in temperature of water.
- 2. Increase in Toxicity:** The rising temperature increases the toxicity of the poison present in water. A 10°C rise in temperature doubles the toxic effect of potassium cyanide, while a 80°C rise in temperature triples the toxic effects of O-xylene causing massive mortality of fish.
- 3. Interference with biological activities:** Temperature is considered to be of vital significance to physiology metabolism

C) Interference with biological activities

- It controls the respiratory, digestive, excretion systems.

d) Interference with reproduction

- Breeding and reproduction are affected by high temperature

e) Direct mortality

- Death occurs to fishes in high temperature

f) Food storage for fish

- Change in temperature alters the seasonal variation which affect the food storage system of fishes.

and biochemical process in controlling respiratory rates, digestion, excretion and overall development of aquatic organisms. The temperature changes totally disrupt the entire ecosystem.

4. Interference with reproduction: In fishes, several activities like nest building, spawning, hatching, migration and reproduction etc., depend on optimum temperature.

5. Direct mortality: Unutilized heat in water is responsible for direct mortality of aquatic organisms. The increase in temperature exhausts the micro-organisms and shortens their life span. Above a particular temperature, death occurs to fish due to failure in respiratory system, nervous system process.

6. Food storage for fish: Change in temperature alters the seasonal variation in the type and abundance of lower organisms. The fish may lack the right food at the right time.

Control measures of thermal pollution

- 1. Cooling towers
 - Cooling towers are designed to reduce the temperature of water
 - Cooling tower spread the heat from hot water to the surrounding by evaporation
 - There are two types
 - a) Wet cooling tower
 - b) Dry cooling tower

5.7.4 Control measures (or) management of thermal pollution

The following methods can be adopted to control the high temperature caused by thermal dischargers.

1. Cooling towers: The use of water from water systems for cooling purposes, with subsequent return to the water way after passage through the condenser, is termed as cooling process. To make it more effective, cooling towers are designed to control the temperature of water. Cooling towers transfer some of the heat from hot water to the surrounding atmosphere by the process of evaporation. Cooling tower is generally used to dissipate the recovered waste heat to eliminate the problems of the thermal pollution. Cooling tower are of two types.

(a) Wet Cooling tower: Hot water, coming out from the condensor (reactor) is allowed to spray over baffles. Cool air, with high velocity, is passed from sides, which takes away the heat and cools the water.

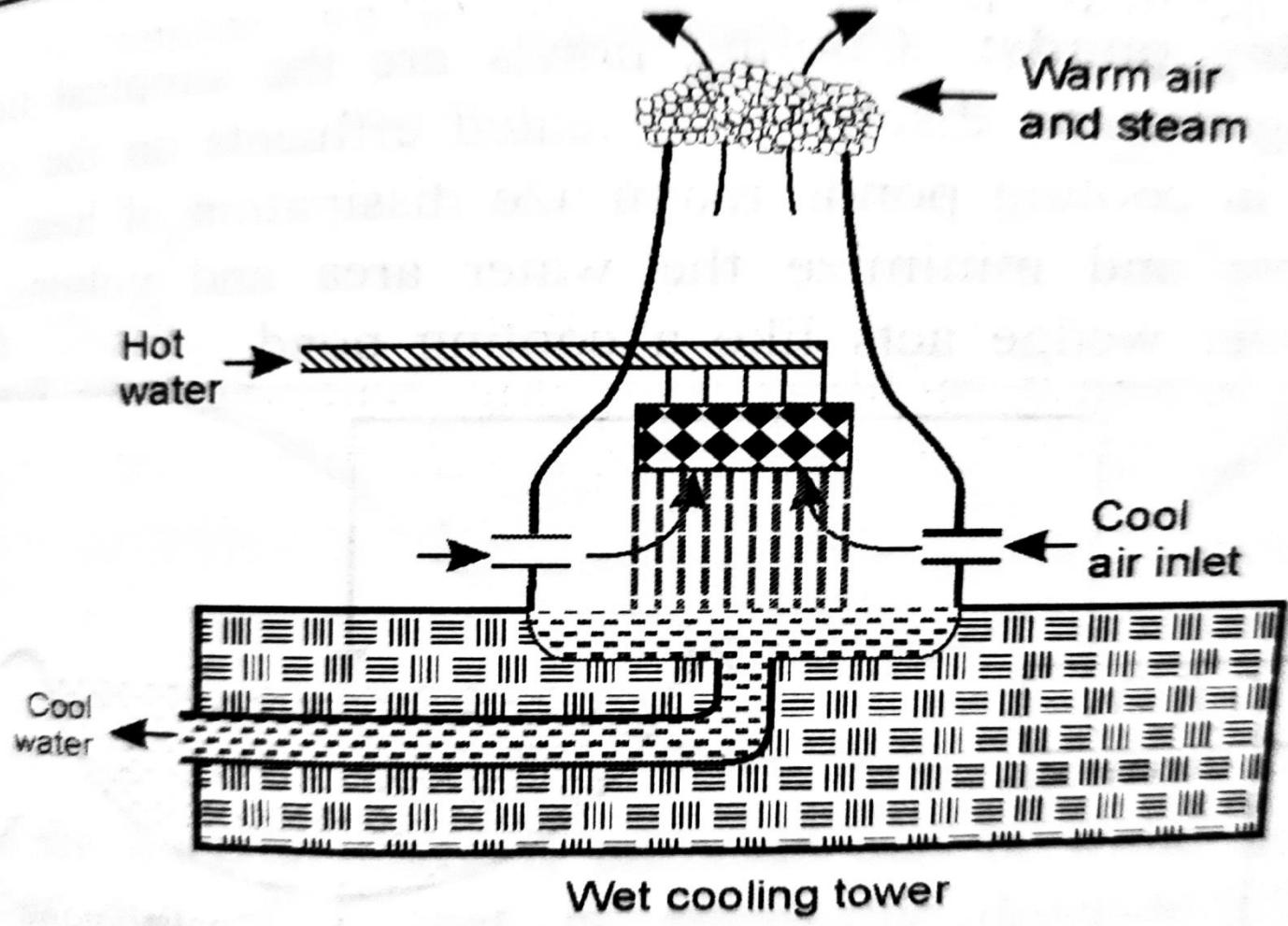
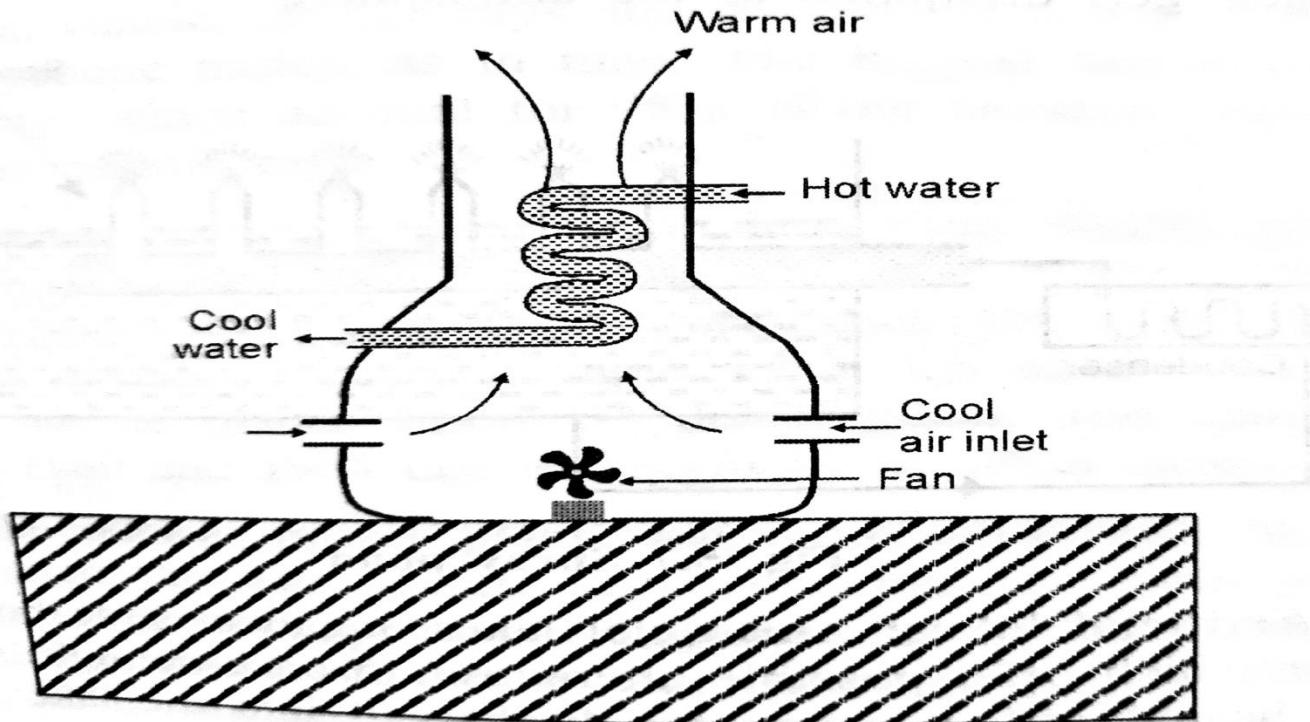


Fig. 5.4 Wet cooling tower

(b) **Dry Cooling tower:** Here the hot water is allowed to flow in a long spiral pipes. Cool air, with the help of fan, is passed over these hot pipes, which cools down the hot water. This cool water can be recycled.



Cooling ponds

- It is a simplest method of cooling the thermal discharges
- Heated effluents transferred to cooling pond
- Water surface dissipate the heat to atmosphere
- Water area minimized and volume reduced
- Water wedge acts like a cooling pond.

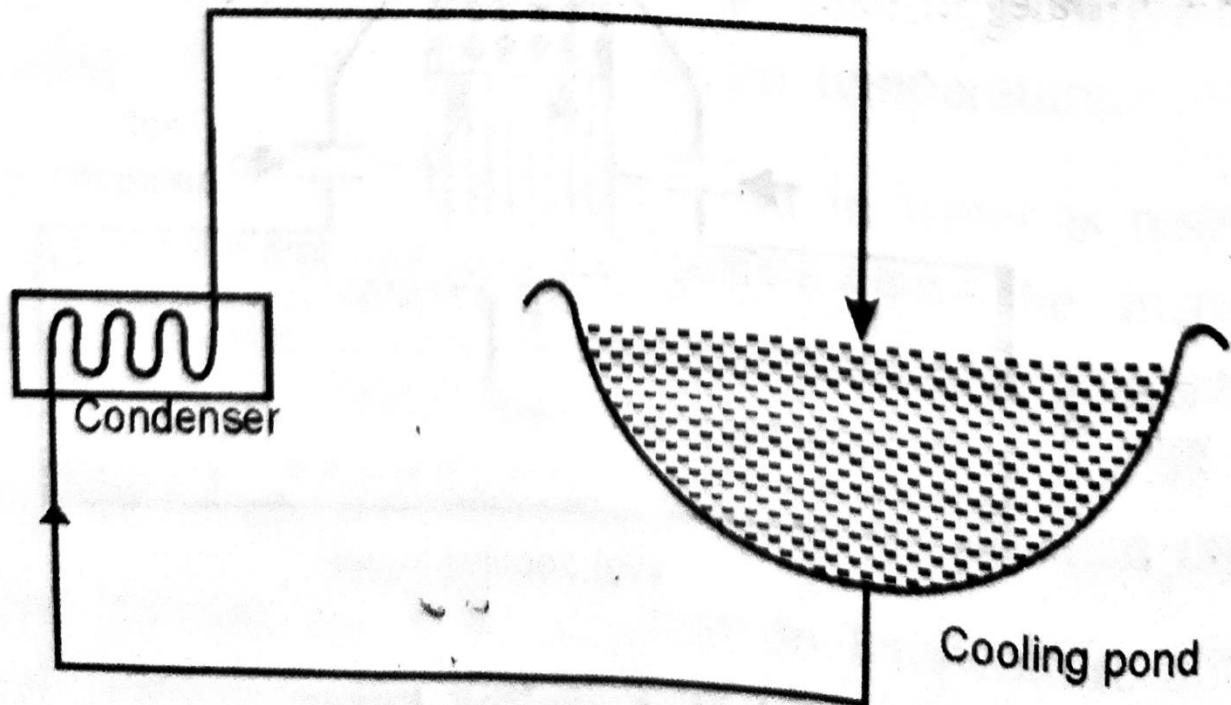
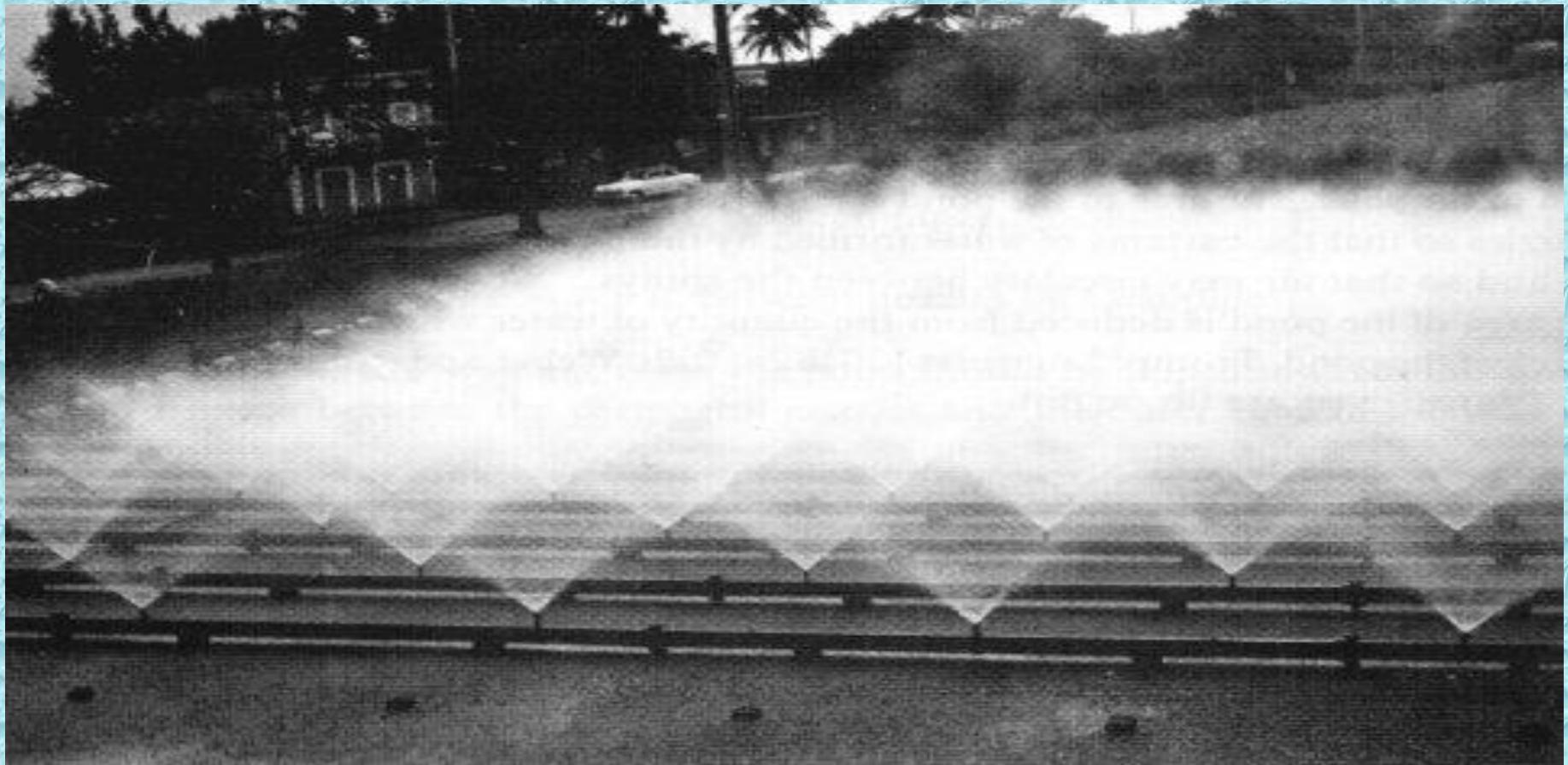


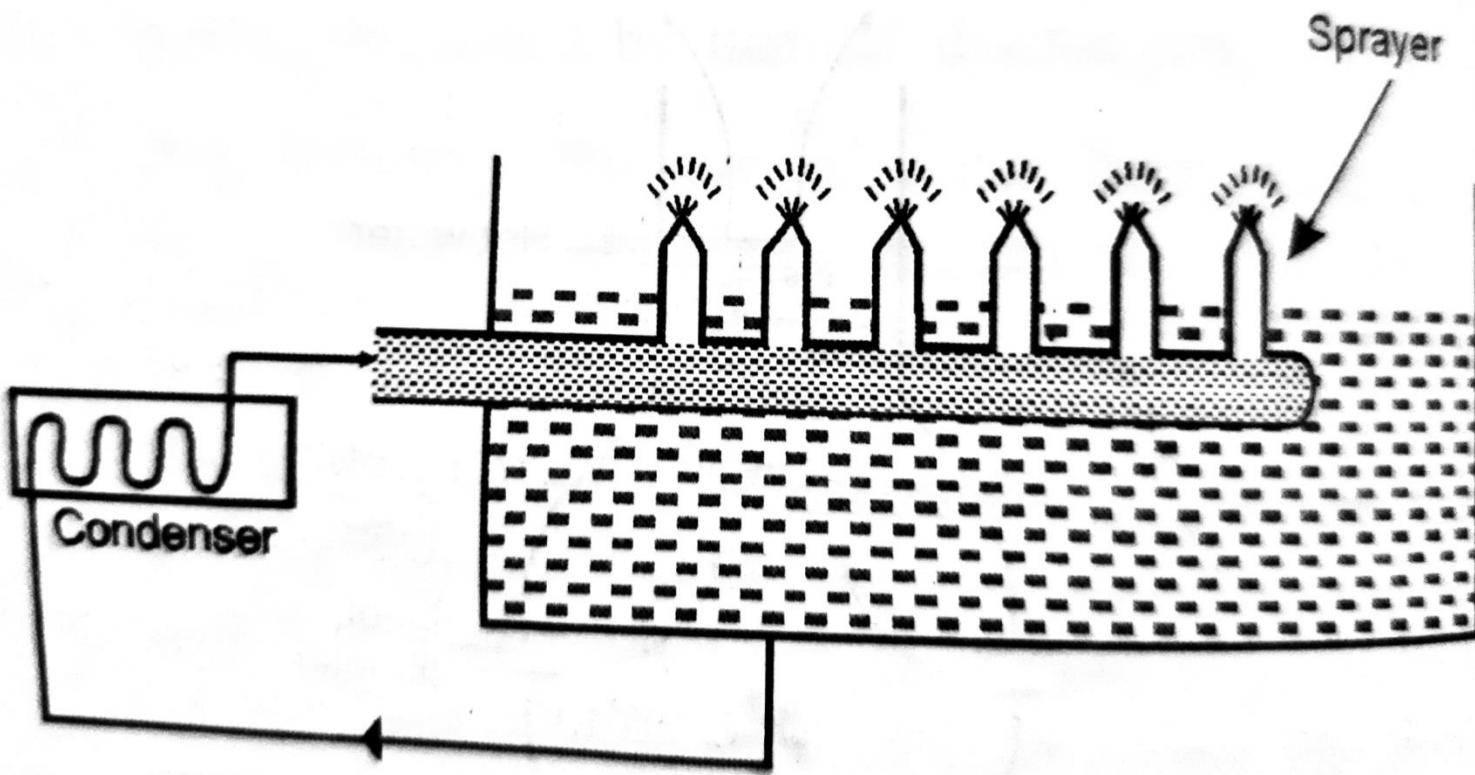
Fig. 5.6 Cooling pond

Spray ponds

- 1. The hot water is allowed to enter in sprayer
- 2. Water is sprayed as fine droplets through nozzles
- 3. Heat from the fine droplets dissipated to atmosphere



3. Spray ponds: The water coming out from condensers is allowed to pass into the ponds through sprayers. Here the water is sprayed through nozzles as fine droplets. Heat from the fine droplets gets dissipated to the atmosphere.



Artificial lakes

- These are man made bodies of water
- The heated effluents can be discharged into lake at one end and cooling water withdrawn from other end.
- The heat is dissipated through evaporation



NUCLEAR HAZARDS POLLUTION OR RADIO ACTIVE POLLUTION

- UV radiation, cosmic radiation, microwave radiation, X-rays, Nuclear radiations

Sources of Nuclear hazards

- 1. Natural hazards
- 2. Man-made sources

1. Natural sources

- a) Space, which emits cosmic radiations.
- b) Soil, rocks, air, water, food and
- c) radioactive radon-222.

2. Man-made sources

- a) Nuclear power plants
- b) Nuclear bombs
- c) Nuclear accidents
- d) X-rays
- e) Diagnostic kits

Effects of nuclear hazards

- Brain and central nervous system affected by delirium, Convulsions and death
- Loss of sight in eyes
- Vomiting, bleeding and mouth ulcers
- Blood vessel damage and red spot on skin
- Infection of intestinal wall
- Brain damage, mental retardation , stable pregnancy

- **Control measures of nuclear hazards**

1. Nuclear tests should not be in air
2. Nuclear tests should be in under ground
3. Nuclear reactor should be covered by closed cycle coolant
4. Production of radio isotopes should be minimized
5. Nuclear installation should be controlled

6. Fission reaction should be minimized
7. Radio isotopes may be used in the liquid or gas form instead of powder form
8. Nuclear mines formed with underground drainage
9. Disposal of radio active wastes should be very careful.
10. Usage of nuclear medicines should be minimized.

Solid waste management

- Population growth and urbanization brings enormous solid wastes
- 7.6million tones municipal solid wastes disposed daily in developed countries
- These are producing environmental pollution due to improper management

Types of solid wastes

- 1. Urban or municipal wastes
- 2. Industrial wastes
- 3. Hazardous waste



WASTE DIVERSION



LANDFILLING



TRANSFER



**INTEGRATED
SOLID WASTE
MANAGEMENT**



RECYCLING



COMPOSTING



SPECIAL WASTES



Sources of urban and industrial wastes

A.Domestic wastes

- Wastes from home
- Example : Food waste, cloth waste, paper waste, Glass bottles, polythene bags, waste metals.

B.Commercial wastes

- Wastes from markets, shops, hotels, offices and institutions.
- Example : Waste paper, packing covers, cans, Bottles and polythene bags

C. Construction waste

- Wastes from construction materials
- Example : Wood, concrete, debris

D. Biomedical waste

- Organic waste materials
- Example : Anatomical wastes, infectious wastes

Classifications of urban wastes

Biodegradable wastes

- The urban solid waste materials that can be degraded by micro organisms
- Example : Food, vegetables, tea leaves, egg shells, dry leaves, etc...

Non-bio degradable wastes

- The urban solid waste materials that can not be degraded by micro organisms
- Example : Polythene bags, scrap metals, glass bottles

Process of solid waste management



Steps involved in the solid waste management

1. Reduce, reuse and recycle

a. Reduce the usage of raw material

If the usage of raw material reduced, the generation of waste also gets reduced.

b. Reuse of waste materials

The containers, which are discarded after use, can be reused.

C .Recycling of material

Reprocessing of the discarded material into new useful product

Example : Reuse of waste plastics, cellulose, steel cans etc...

2. Discarding waste

- a. Land fill
- Solid wastes are filled with 80cm thickness
- It is covered by 20 cm thickness of earth fill.
- This will be done alternatively.
- Land fill structure is built either into the ground or on to the ground into which the waste is dumped.
- After 3 years 30 % of wastes volume reduced
- This place can be used for parks, road, and garden.
- This method is cheapest method

Advantages

- It is simple and economical
- Segregation is not required
- This areas can be used for other purposes
- Convert waste land into useful area
- Soil becomes fertile.

Disadvantages

- A large area is required
- When it is away from town, transportation cost is heavy.
- Improper management brings bad smell
- It produces mosquitoes
- Causes fire due to the formation of methane from wet land

Incineration

- It is a hygienic way of disposing solid waste
- Organic and hazardous containing wastes are managed by this method.
- It is expensive method.
- In this method combustible wastes such as rubbish, garbage etc are burnt in incinerator.
- Non combustible wastes such as glass, metals etc are separated before burning.
- First the wastes are dried. It is done by the pre heater

- Finally taken into the large furnace called incinerator. It can incinerate 100 -150 tonnes per hour.
- The burning temperature is 700 to 1000°C .
- The ashes left in the incinerator are disposed by land fill method.
- The heat produced in the incinerator is used for steam production.

Advantages

- The residue is only 20-25%
- Very small space enough
- They are located in town area
- Safest and hygienic method
- 300 tones can produce 3MW power.

Disadvantages

- Operating cost is very high
- Smoke formation, ash formation produce air pollution

Composting

- In this method organic wastes are converted into manure.
- This is a biological process
- Thickness of 1.5m layer of wastes are dumped in underground
- It is covered with 20 cm earth layer
- Some micro organisms or earth worms are introduced for quick decomposition. This will be done alternatively.
- Within 2-3 days biological decomposition starts.
- When decomposition starts ,it released 75°C heat
- This heat converts the wastes in to brown powder. It is known as **humus**.
- This powder contains nitrogen and phosphates.
- This can be used as fertilizers.

Advantages

- This method increases water retention and ion exchange capacity of soil
- Industrial solid wastes can be treated by this method.
- Reducing the cost of disposing wastes
- Recycling occurs

Disadvantages

- The non consumable has to be disposed separately
- No assured market for manures

Compulsory question

Explain the process of solid waste management with a flow charts and the three methods of disposal of the solid waste (incineration, landfill and composting). (OR)

In urban solid waste management, name the method to dispose the following material and explain in detail the method of solid waste disposal.

1)glass and porcelain bits 2) rubbish and garbage 3) food wastage and compostable waste.

Objectives for prevention of hazardous wastes

- 1 . Avoid hazardous wastes
- 2 . Manage the wastes in effective way
- 3 . Stop the hazardous wastes internationally
- 4 . Make strong international cooperation in hazardous management
- 5 . Minimizing the use of hazardous material



ILL-EFFECTS OF FIREWORKS





ILL-EFFECTS OF FIREWORKS

(i) The SPM (suspended particulate matter) levels rise to a large extent during Diwali.

- Causes throat, nose & eye related problems.
- Causes headaches & reduced mental activity
- Causes severe effects in people with heart, respiratory or nervous system disorders.
- Can aggravate problem for people suffering from cold, allergies or coughs and can also cause congestion of throat & chest.

(ii) Increase amount of noise has harmful effects on animals as well as humans. Standard decibel level for humans is 60 dB. Increase in the decibel level can lead to: Restlessness; Temporary or Permanent Hearing Loss; High Blood Pressure; Heart Attack; Sleep Disturbances



ILL-EFFECTS OF FIREWORKS

(iii) Fireworks can also cause health problems like:

**Chronic bronchitis; Common Cold ; Allergic Bronchitis;
Bronchial Asthma; Sinusitis; Chronic Obstructive;
Pulmonary Diseases (COPD); Emphysema; Pneumonia;
Laryngitis**

(iv) It results in smog which can reduce visibility thereby leading to accidents as well as is toxic if inhaled.

- It is said that one big firecracker like "1000 walas" and "hydrogen bombs" can produce up to 250 cc of smoke.**
- It can also cause water contamination and acid rains.**
- It results in air pollution that creates carcinogenic sulphur compounds and airborne arsenic effect.**



ILL-EFFECTS OF FIREWORKS

(v) Use of "rockets" near houses gives rise to many injuries each year. There is no law pertaining to the same.

(vi) Harmful effects of fireworks displays:

- Green light produced in fireworks displays comes from Barium that is radioactive and poisonous.
- Blue colour produced from copper compounds comes from dioxins linked to cancer.

Type	CLASS A	CLASS B	CLASS C	CLASS D	Electrical	CLASS F	Comments
	Combustible materials (e.g. paper & wood)	Flammable liquids (e.g. paint & petrol)	Flammable gases (e.g. butane and methane)	Flammable metals (e.g. lithium & potassium)	Electrical equipment (e.g. computers & generators)	Deep fat fryers (e.g. chip pans)	
Water	✓	✗	✗	✗	✗	✗	Do not use on liquid or electric fires
Foam	✓	✓	✗	✗	✗	✗	Not suited to domestic use
Dry Powder	✓	✓	✓	✓	✓	✗	Can be used safely up to 1000 volts
CO ₂	✗	✓	✗	✗	✓	✗	Safe on both high and low voltage
Wet Chemical	✓	✗	✗	✗	✗	✓	Use on extremely high temperatures



- cloth
- wood
- rubber
- paper
- plastics

- gasoline
- grease
- oil

electrical
fires

combustible
metals

kitchen
fires

Types of Fire

ROLE OF AN INDIVIDUAL IN PREVENTION OF POLLUTION

1. Plantation
2. Control the pollution
3. Use all energies and resources efficiently
4. Use recyclable products
5. Use CFC free refrigerators
6. Use natural gas than coal
7. Reduce deforestation

8. Use renewable resources
9. Use machines in ventilated areas
10. Increase the use of eco friendly products
11. Use rechargeable batteries
12. Use manures instead of fertilizers

CASE STUDIES

The Bhopal Gas tragedy

- The **Bhopal disaster** or **Bhopal gas tragedy** was an industrial disaster that took place at a Union Carbide pesticide plant in the Indian city of Bhopal, Madhya Pradesh. At midnight on 3 December 1984, the plant released 42 tones of toxic methyl isocyanate (MIC) gas, exposing more than 500,000 people to toxic gases. The first official immediate death toll was 2,259. A more generally accepted figure is that 8,000- 10,000 died within 72 hours, and it is estimated that 25,000 have since died from gas-related diseases.^[1]
- The Bhopal disaster is frequently cited as the world's worst industrial disaster. The International Medical Commission on Bhopal was established in 1993 to respond to the long term health effects of the disaster.





Gulf war marine pollution

- The Iraqi invasion of Kuwait leads to a serious damage to the marine environment. Burning of the oil fields, and massive oil slicks threatened marine life and had on going bad effects on the marine life not only in Kuwait but also near by areas.
- The oil fires Caused by Iraqi military attack on the natural resources lead to a serious destruction to the Marine environment and its creatures. Although the flames may be out, many environmental uncertainties remain today, visible and invisible, concerning land, ocean and, most importantly, underground water.



DISASTER MANAGEMENT

1. Natural disaster

2. Man-made disaster

1. Natural disaster

Disaster generated by the natural phenomena

Example : Cyclones, flood, landslides, earthquake

2. Man-made disaster

Resulting from man made hazards

Example : Accidents, pollution, fire

FLOOD IN JAPAN



Floods

Definition

When water flow exceeds, water carrying capacity of water bodies decreases. Then excess of water overflow on the surrounding and living area is called flood.

Causes of flood

- a) Heavy rainfall, rainfall during cyclone
- b) Sudden snow melt
- c) Lowering the water carrying capacity of channels
- d) Excess release of water from dams
- e) Construction work on earth reduces infiltration capacity of soil, speed up water flow
- f) Clearing of forest.



Effects of flood

- a) Heavy suffering to the people living in the low lying area
- b) Their houses and properties were destroyed
- c) Destroy the crops and live stock
- d) Economic loss and health diseases

Flood management

- a) Building walls prevent from flood
- b) Divert the flood direction into dry water bodies
- c) Construction of garden, parks and zoo in the plain
- d) River net working
- e) Pre and after flood information should be broadcasted

FLOOD IN JAPAN



CYCLONE

- Low depression formed on ocean and sea moves towards the land and destroys the living and non living things in land area.
- Their speed varies between 180-500 km/hr

Different names of cyclone

- Hurricane
- Typhoons
- Cyclones
- Willy Willies





BURMA CYCLONE



Effect

- Damage to human life, crops, roads, transport, communication, tanks, livestock.
- Slowdown the developmental activities

Cyclone management

- Forecasting the weather condition and intensity of cyclone
- Cyclone warning by radar system
- Every half an hour location of cyclone should be announced
- We should not stop the cyclone but minimize the damage
- Afforestation

Land slides

- The movement of earth materials like rock, stones, soil, and debris from higher region to lower region is called land slides.

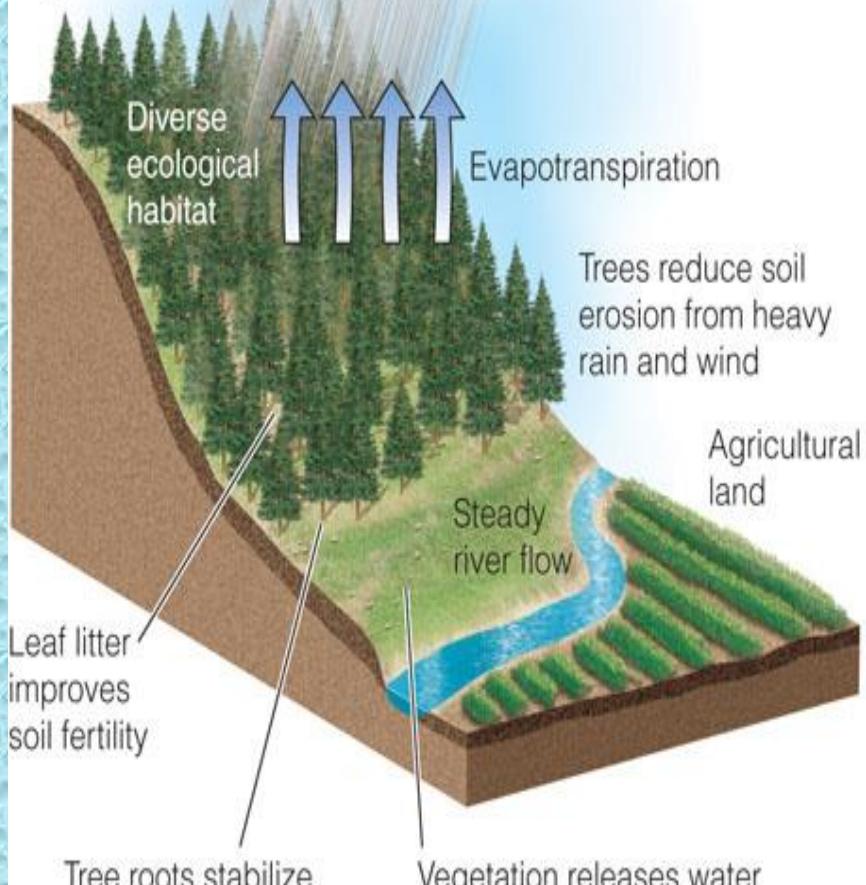
Causes of land slides

- Rain, forces on top materials, over weight on top material
- Transportation on the slope
- Earth quake, shocks, cyclone, and vibrations
- Water run off in rainy season and erosion in hill station
- Underground mining activities
- Road or house building on slope

Effects

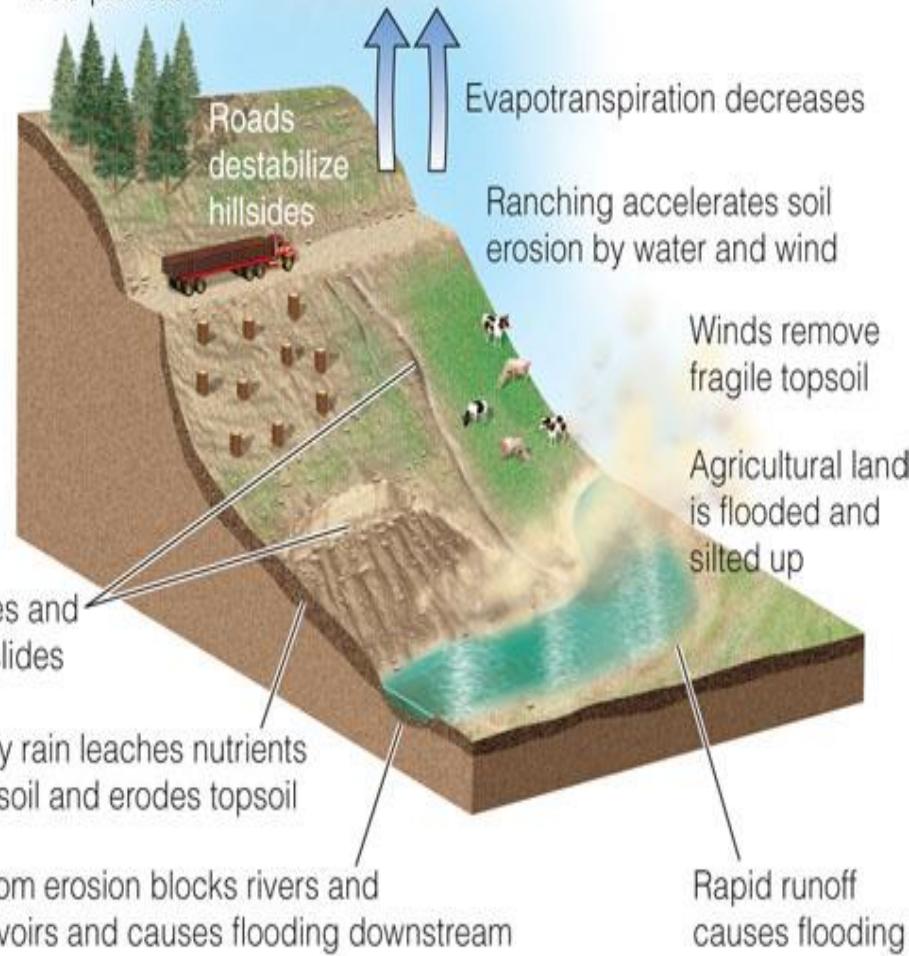
- Block the road and divert the passage
- Soil erosion
- Damage the livestock, crops, and houses

Oxygen released by vegetation



Forested Hillside

Tree plantation



After Deforestation

Land slides management

- Unloading the upper parts of the slope
- Improving the cultivation in the sloppy area
- Steepness of slope reduced by forming benches
- Concrete setup at the base of slope
- Soil stabilization using chemicals should be effective
- Drainage formation on the sloppy area



Earth quakes

Definition

- It is a sudden vibration on earth surface due to sudden release of enormous amount of energy stored in the rocks under the earth crust.

Causes

- Volcanic eruptions, hydrostatic power
- Under ground nuclear testing
- Decrease of under ground water level

JAPAN EARTHQUAKE







Earthquake management

- Constructing earth quake resistant buildings
- Wooden houses
- Seismologist must analyze the possibility of earthquake in land areas

Tsunami

- A very large ocean wave caused by an underwater earthquake or volcanic eruption.

Causes of tsunami

Seismic Activity

Sub marine Land slides







Effects of Tsunami

- Life loss
- Shelter loss
- Economic loss
- Diseases
- Marine pollution
- Land salinity
- Topography of earth changes
- Fisheries and fishing reduced

Tsunami management

1. Earthquakes under the sea are monitored by sensors
2. Sensors send information to floating buoys in surface.
3. The information sends to satellite
4. Warning sends to earth about danger
5. Finally GOVT should make the people alert





Case studies

Flood in Bangladesh-1974

- In 1984 Bangladesh suffered the worst monsoon flooding since 1974, the year of famine. The flood losses in production inevitably put severe strain on the food system. The strains were so severe as to be characterized as a ‘food crises’ - a situation in which government resorted to extraordinary measures. The seasonal losses in production for the first three crops of the calendar year 1984 were at least a million tonnes. As is now recognized this loss in production also resulted in a drastic reduction in employment for the rural landless, on a conservative estimate 25 million person days. These are circumstances which could have led to famine conditions.



1999 Orissa cyclone

- Super cyclonic storm ([IMD](#))
- Category 5 tropical cyclone ([SSHS](#))

Formed

- [October 25, 1999](#) (1999-10-25)

Dissipated

- [November 3, 1999](#) (1999-11-04)

Highest winds

- 240 km/h (150 mph) (3-minute sustained)
- 260 km/h (160 mph) (1-minute sustained)

Lowest pressure

- < 912 [hPa \(mbar\)](#)

Fatalities

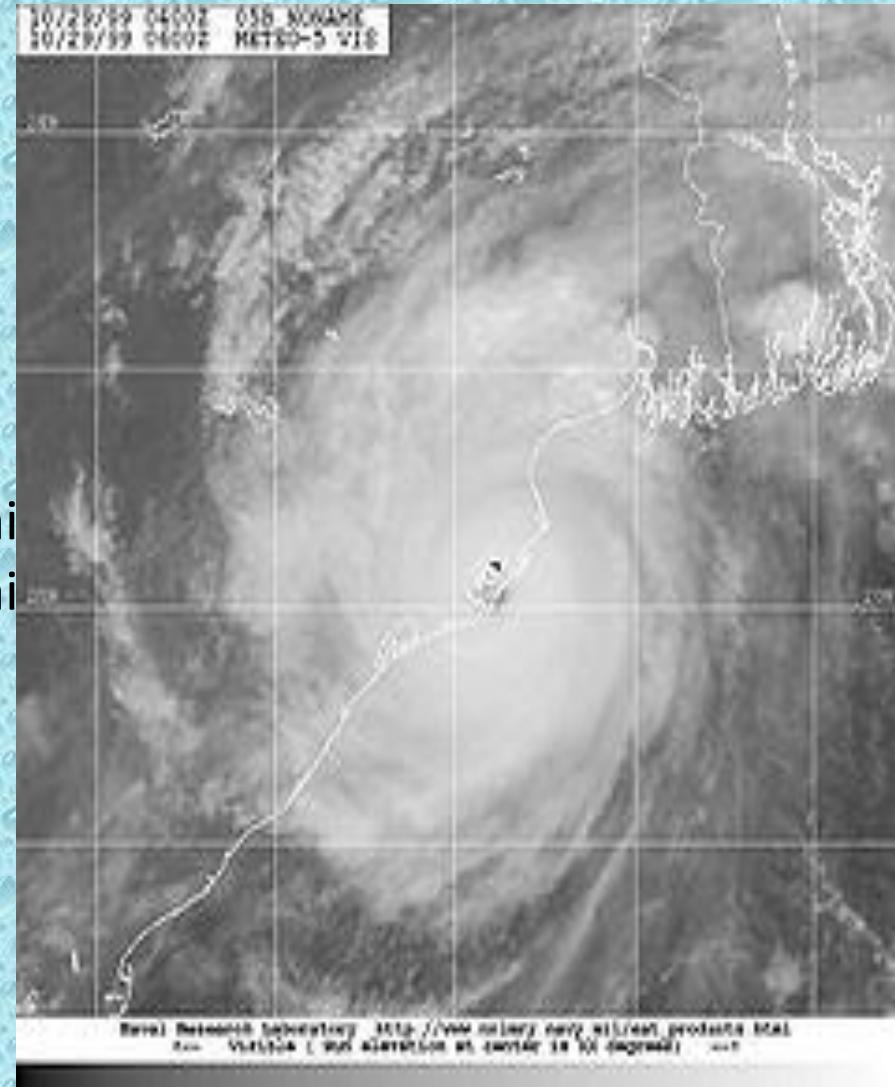
- 10,000+ direct

Damage

- \$4.5 billion (1999 [USD](#))
\$5.9 billion (2009 USD)

Areas affected

- [India](#), [Myanmar](#)



- 2016 Vardha
- Kaja -
- Thane -
- Okki –
- Mandous