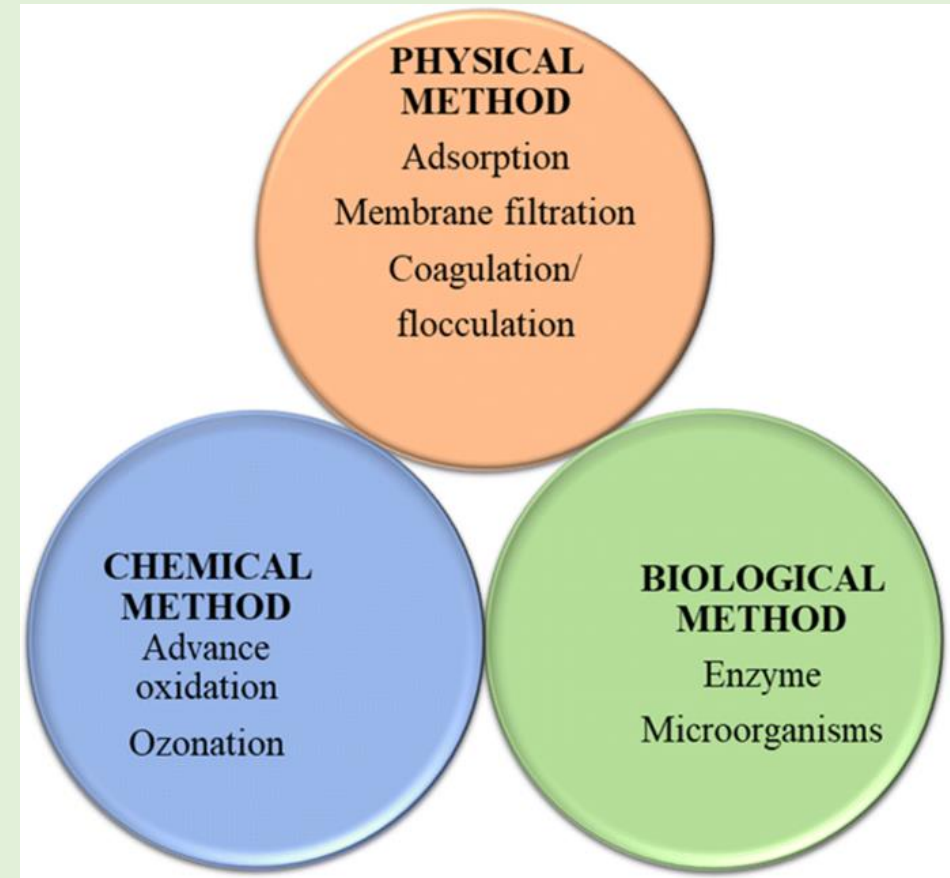


Water pollution control methods

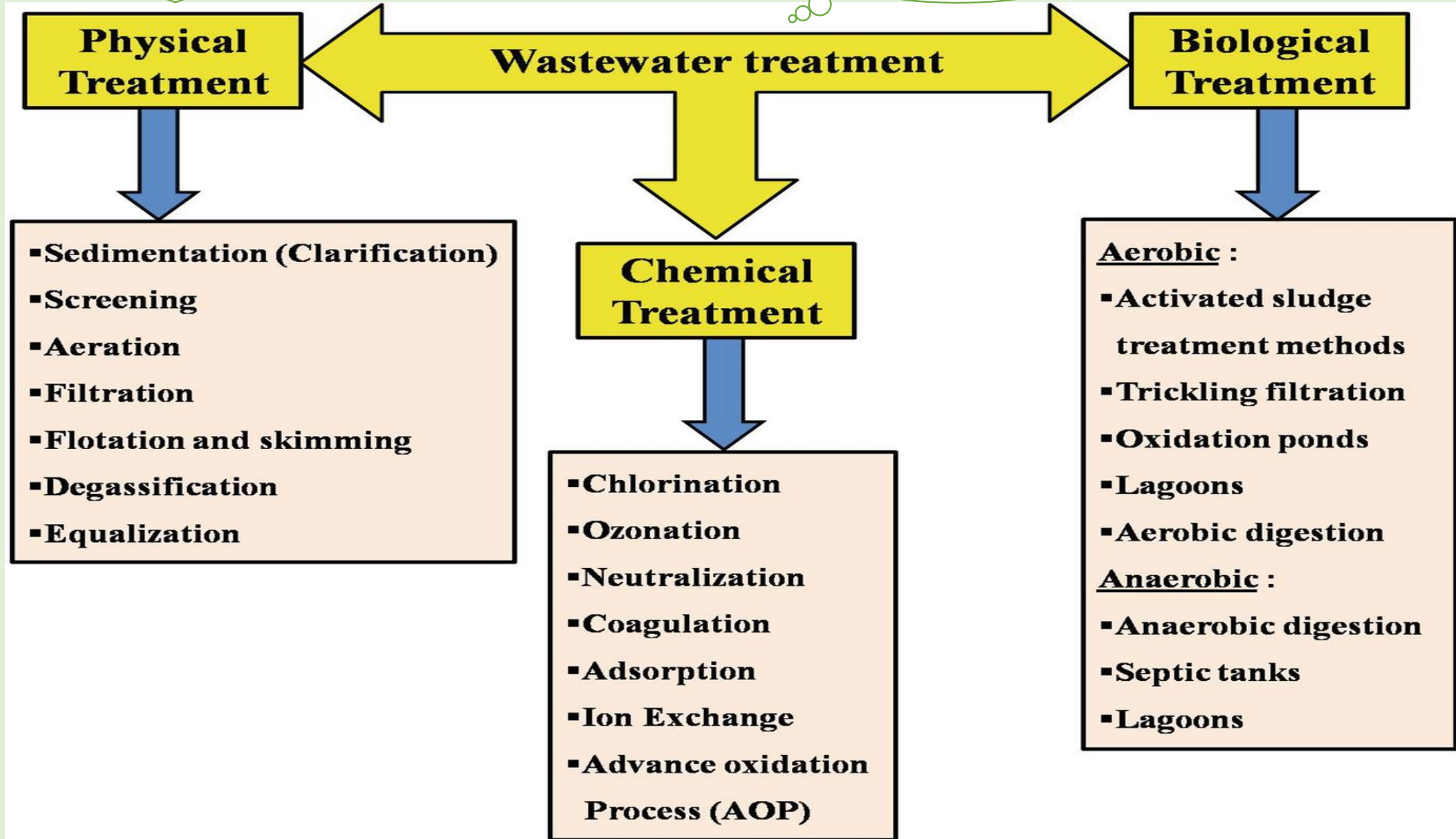
Environmental Pollution Control Approach

- **Water pollution control methods** can be subdivided into physical, chemical, and biological treatment systems. Most treatment systems use combinations of any of these three technologies.
- Physical treatment systems are processes which rely on physical forces to aid in the removal of pollutants.
- Physical processes which find frequent use in water pollution control include screening, filtration, sedimentation, and flotation.
- Screening and filtration are similar methods which are used to separate coarse solids from water.
- Suspended particles are also removed from water with the use of sedimentation processes.



Water pollution control methods

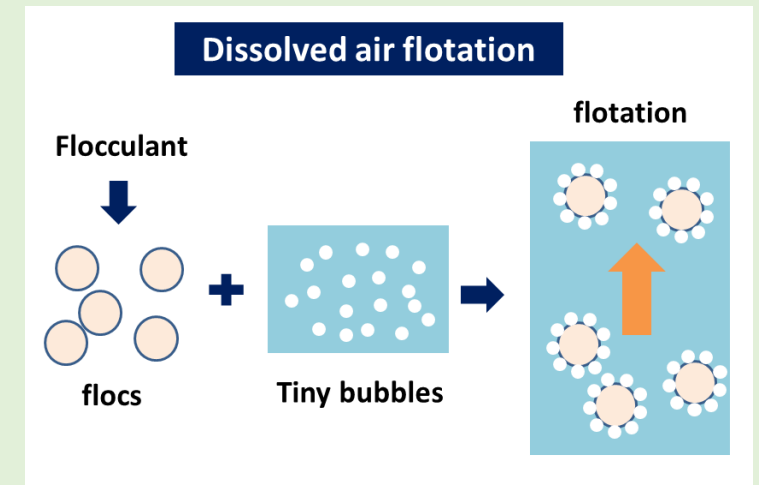
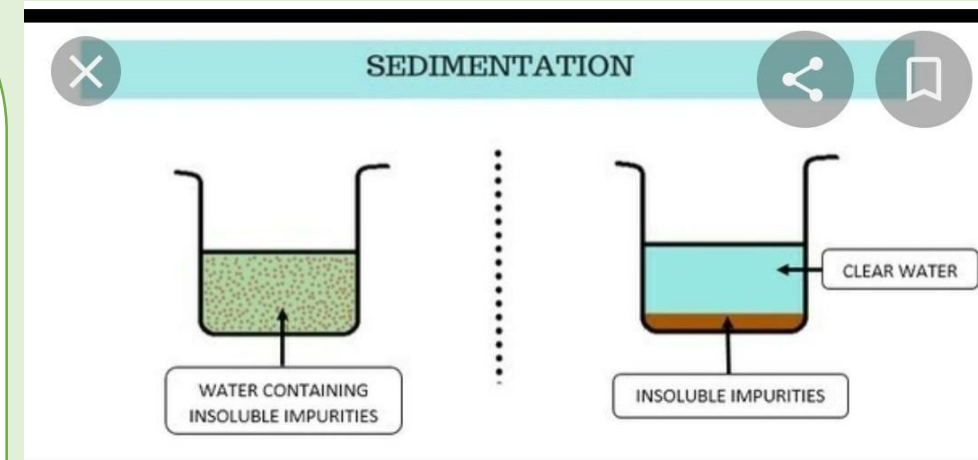
Environmental Pollution Control Approach



Water pollution control methods

Environmental Pollution Control Approach

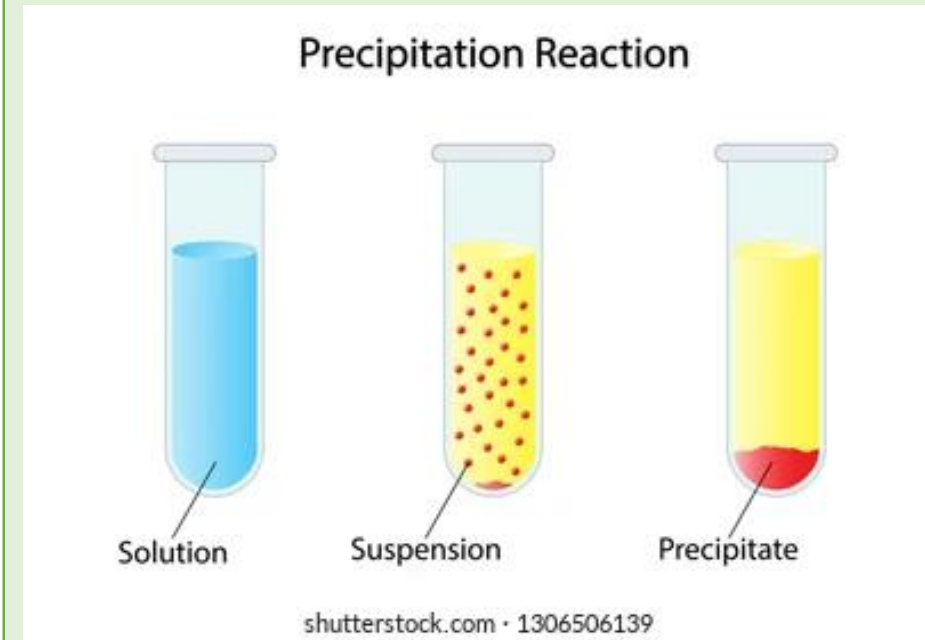
- Sedimentation devices utilize gravity to remove the heavier particles from the water stream. The wide array of sedimentation basins in use slow down the water velocity in the unit to allow time for the particles to drop to the bottom.
- Likewise, flotation uses differences in particle densities, which in this case are lower than water, to effect removal. Fine gas bubbles are often introduced to assist this process; they attach to the particulate matter, causing them to rise to the top of the unit where they are mechanically removed.



Water pollution control methods

Environmental Pollution Control Approach

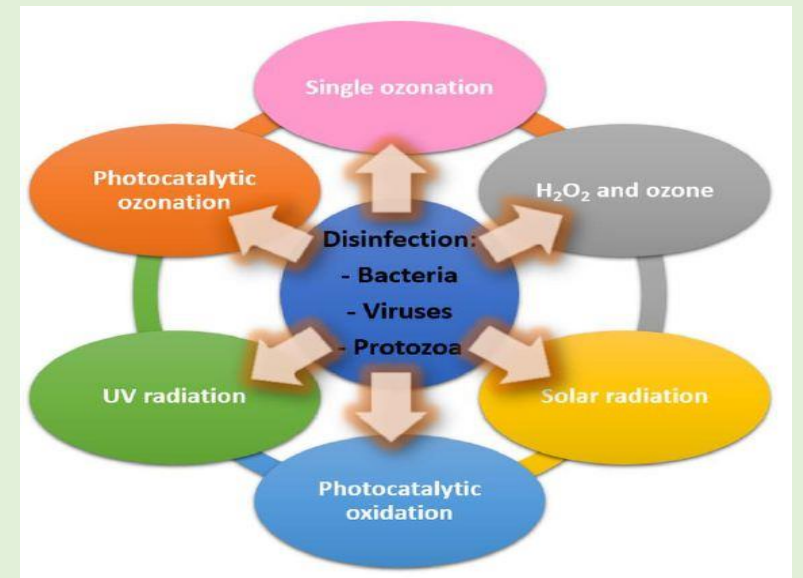
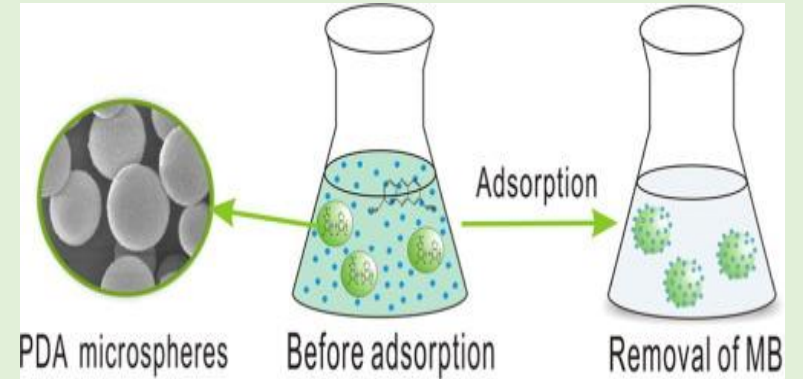
- **Chemical treatment** systems in water pollution control are those processes which utilize chemical reactions to remove water pollutants or to form other, less toxic, compounds.
 - Typical chemical treatment processes are chemical precipitation, adsorption, and disinfection reactions.
 - **Chemical precipitation** processes utilize the addition of chemicals to the water to bring about the precipitation of dissolved solids. The solid is then removed by a physical process such as sedimentation or filtration.
 - **Chemical precipitation** processes are often used for the removal of heavy metals and phosphorus from water streams.



Water pollution control methods

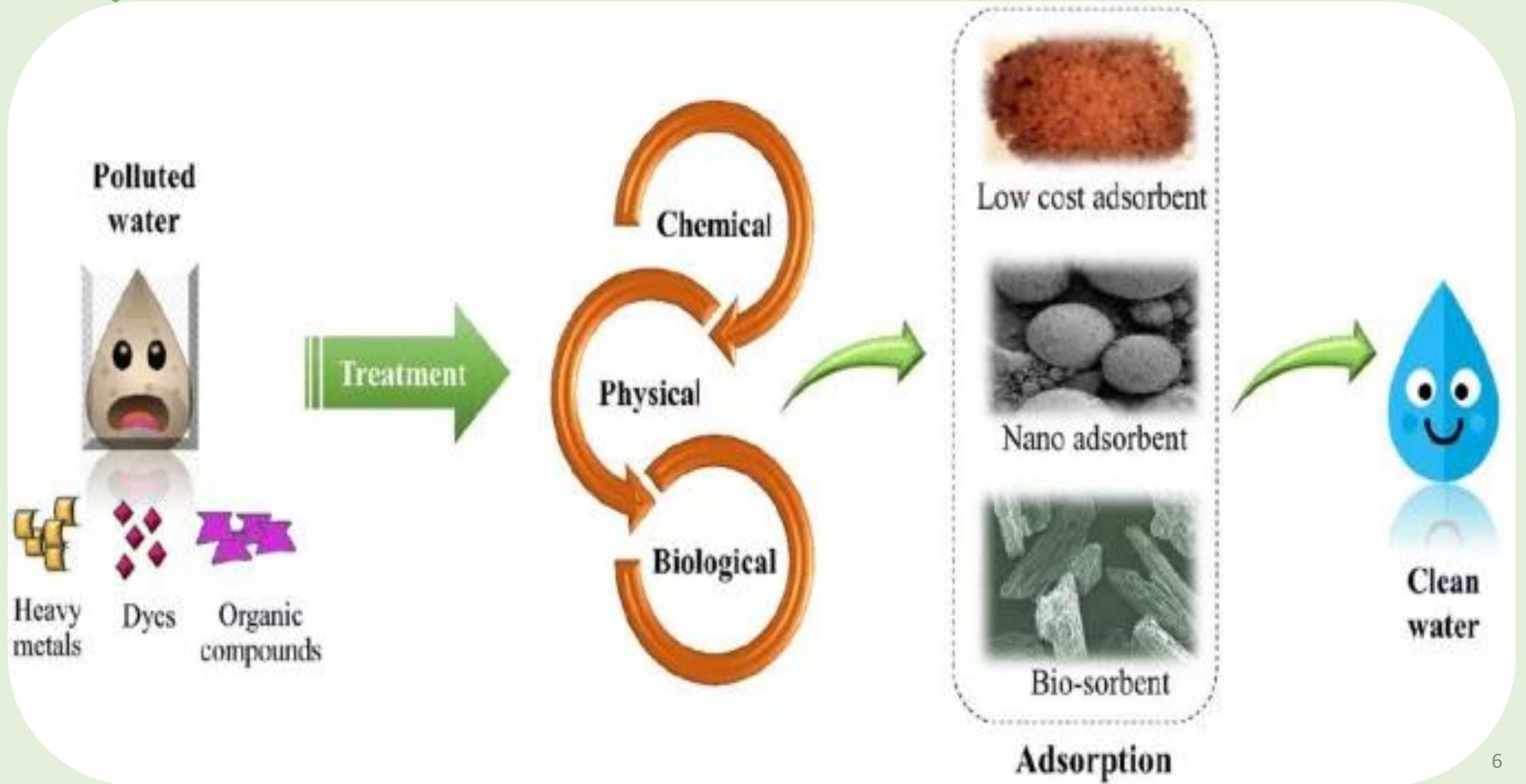
Environmental Pollution Control Approach

- **Adsorption processes** are used to separate soluble substances from the water stream. Activated carbon is the most widely used adsorbent. Water may be passed through beds of granulated activated carbon (GAC), or powdered activated carbon (PAC) may be added in order to facilitate the removal of dissolved pollutants.
- **Disinfection processes** selectively destroy disease-causing organisms such as bacteria and viruses. Typical disinfection agents include **chlorine**, **ozone**, and ultraviolet radiation.



Water pollution control methods

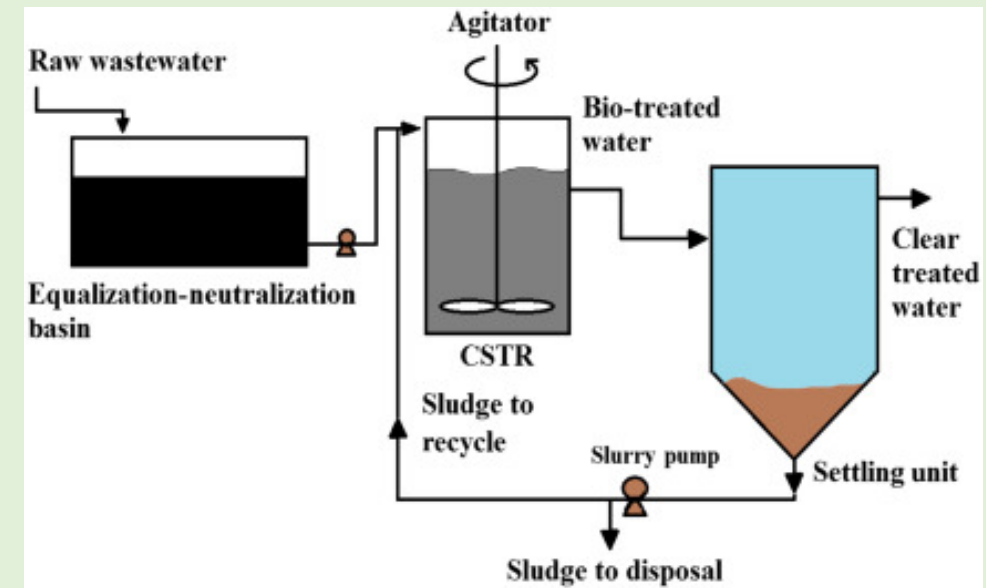
Environmental Pollution Control Approach



Water pollution control methods

Environmental Pollution Control Approach

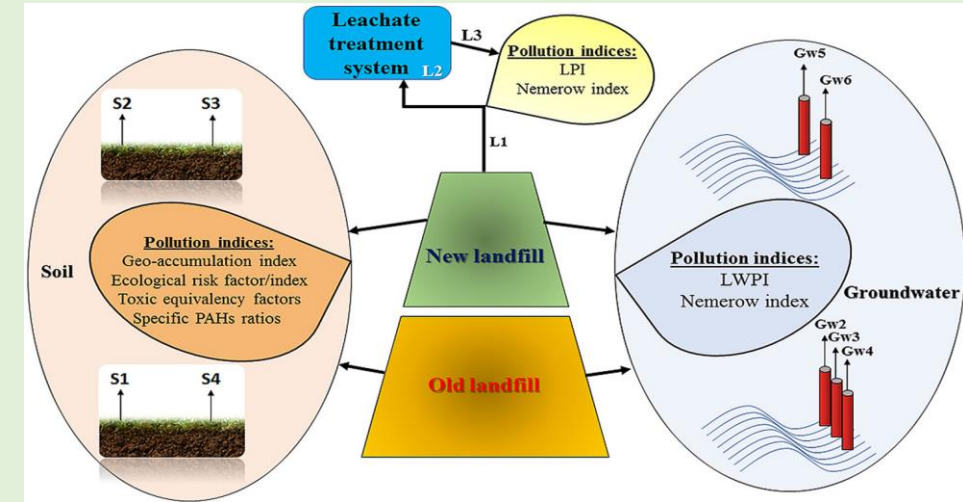
- **Biological water pollution control** methods utilize biological activity to remove pollutants from water streams, and used for the control of biodegradable organic chemicals, as well as nutrients such as nitrogen and phosphorus. In these systems, microorganisms consisting mainly of bacteria convert carbonaceous matter as well as cell tissue into gases.
- Two main groups of microorganisms used in biological treatment, aerobic and anaerobic microorganisms. Each requires unique environmental conditions to do its job. Both processes may be utilized whether the microorganisms **exist** in a suspension (suspended growth) or are attached to a surface (fixed film) processes.



Solid pollution control methods

Environmental Pollution Control Approach

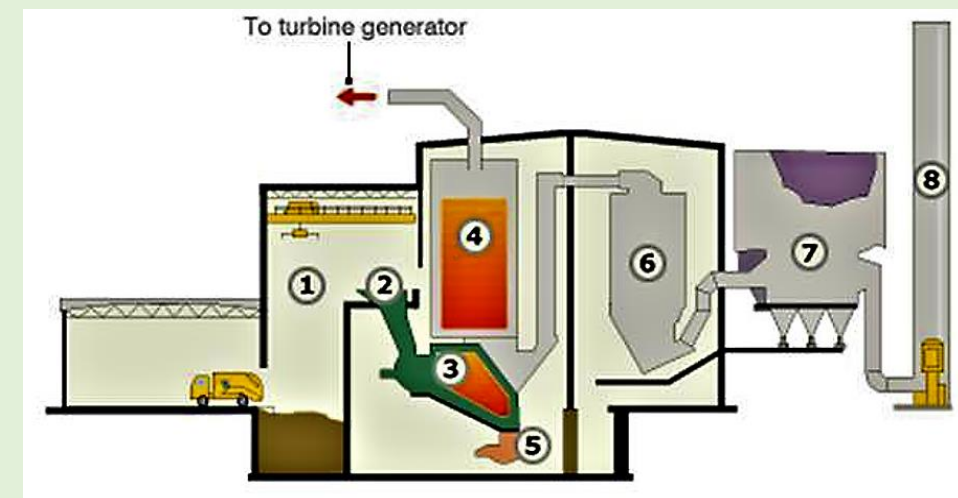
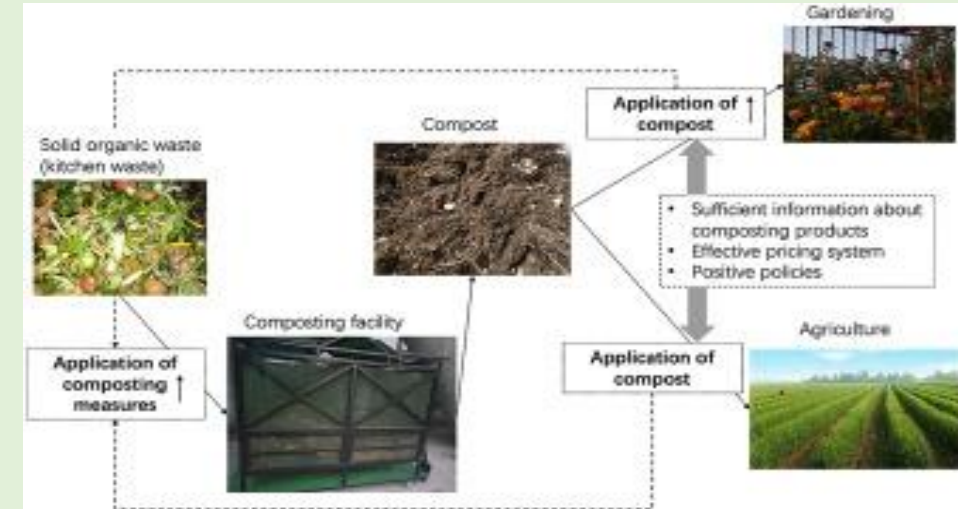
- **Solid pollution control** methods include landfilling, composting, and incineration.
- Sanitary landfills are operated by spreading the solid waste in compact layers which are separated by a thin layer of soil. Aerobic and anaerobic microorganisms help to break down the biodegradable substances in the landfill and produce CO_2 and CH_4 gases which is typically vented to the surface.
- Landfills also generate a strong wastewater called leachate which must be collected and treated to avoid groundwater contamination.



Solid pollution control methods

Environmental Pollution Control Approach

- **Composting** of solid wastes is the microbiological biodegradation of organic matter under either aerobic or anaerobic conditions.
- This process is most applicable for readily biodegradable solids such as sewage sludge, paper, food waste, and household garbage, including garden waste and organic matter.
- This process can be carried out in static pile, agitated beds, or a variety of reactors.
- **In an incineration** process, solids are burned in large furnaces thereby reducing the volume of solid wastes which enter landfills, as well as reducing the possibility of groundwater contamination.



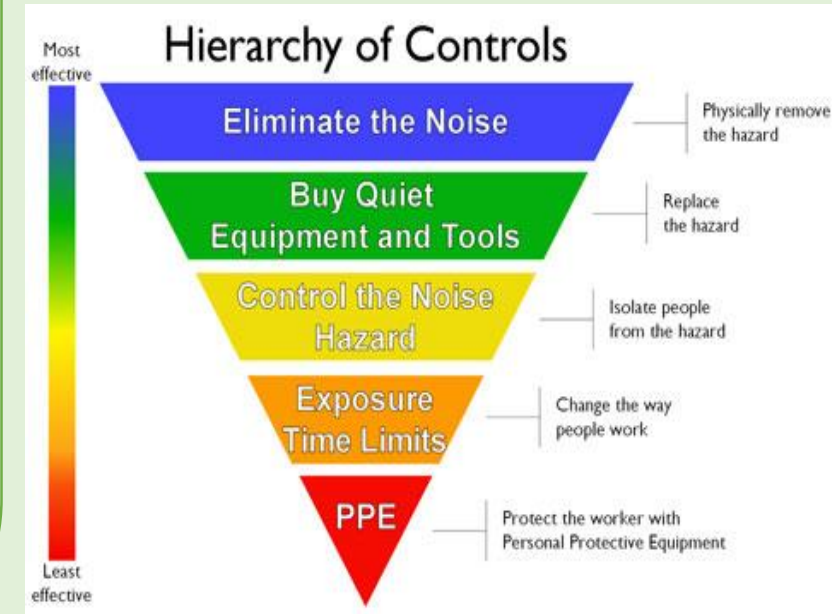
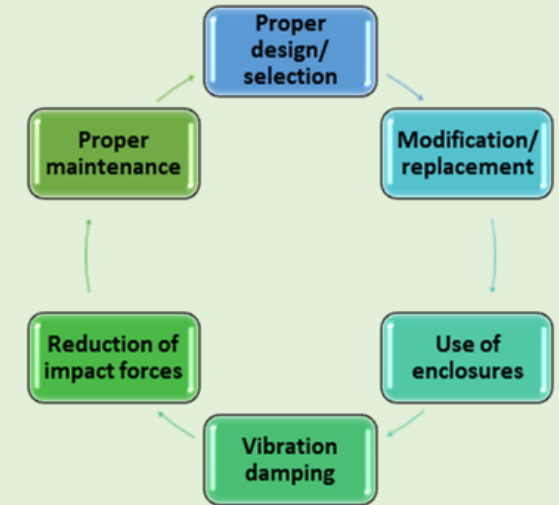
Noise control measures

Environmental Pollution Control Approach

(1) **Control at receiver's end:** For people working in noisy installations, ear-protection aids like ear-plugs, ear-muffs, noise helmets, headphones etc. must be provided to reduce occupational exposure.

(2) **Suppression of noise at source through:**

- (a) Designing, fabricating and using quieter machines to replace the noisy ones.
- (b) Proper lubrication and better maintenance of machines.
- (c) Installing noisy machines in sound proof chambers.
- (d) Covering noise-producing machine parts with sound-absorbing materials to check noise production.
- (e) Reducing the noise produced from a vibrating machine by vibration damping (rubber, neoprene, cork or plastic) beneath the machine.



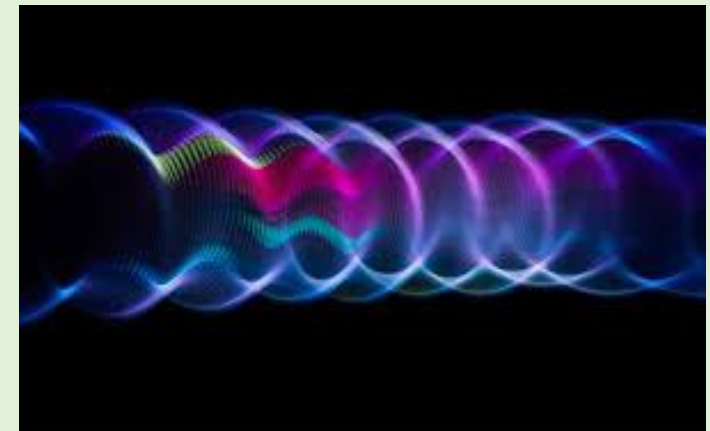
Noise control measures

Environmental Pollution Control Approach

(3) Acoustic Zoning: There should be silence zones near the residential areas, educational institutions and hospitals. Zoning of noisy industrial areas, bus terminals and railway stations, aerodromes etc. away from the residential areas i.e. increasing the distance between source and receiver.

(4) Sound Insulation at Construction Stages: Some of these measures could be:

- a) The space/cracks that get left between the door and the wall should be packed with sound absorbing material.
- (b) Sound insulation can be done by constructing windows with double or triple panes of glass and filling the gaps with sound absorbing materials.
- (c) Acoustical tiles, perforated plywood etc. can be fixed on walls, ceilings, floors etc. to reduce noise (especially for sound proof recording rooms etc.)



Noise control measures

Environmental Pollution Control Approach

- (5) **Planting of Trees:** Green muffler scheme involves planting green trees and shrubs along roads, hospitals, educational institutions etc. to reduce noise to a considerable extent. Trees like Ashoka, Neem, Tamarind.
- (6) **White noise:** It is a special type of sound signal which is used to mask background sounds. White noise helps to mask out sounds which might otherwise prevent one from either falling asleep or waking up whilst asleep.
- (7) **Legislative Measures:** Strict legislative measures need to be enforced to curb the menace of noise pollution.



Noise control measures

Environmental Pollution Control Approach

- Strict legislative measures need to be enforced to curb the menace of noise pollution.
- Noise standards (Table) should be strictly followed.
- Minimum use of loudspeakers and amplifiers especially near silence zones. Banning pressure horns in automobiles. Albeit, noise has been considered as pollutant under Air act and
- The noise pollution (regulation and control) rules (2000) have been framed under Environment protection act.

Table :Ambient air quality standards in respect of noise

Area Code	Category of Area/Zone	Limits in dB(A) Leq*	
		Day Time	Night Time
(A)	Industrial area	75	70
(B)	Commercial area	65	55
(C)	Residential area	55	45
(D)	Silence Zone	50	40

Source: CPCB

Thermal pollution control measures

Environmental Pollution Control Approach

Control of thermal pollution:

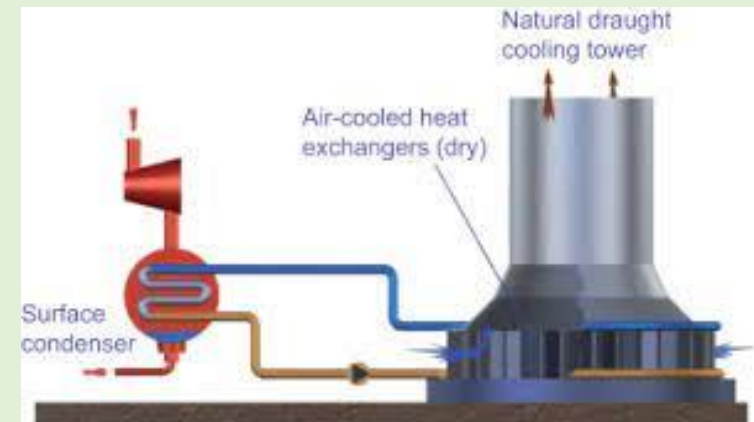
- Cooling ponds: Water from condensers is stored in ponds where natural evaporation cools the water which can then be discharged in nearby water vapour.
- Spray ponds: Here the water is sprayed through nozzles where fine droplets are formed.



Thermal pollution control measures

Environmental Pollution Control Approach

- Cooling towers:
- A) Wet cooling tower: Cool air entering from sides takes away the heat and cools the water. Large amount of water is lost through evaporation.
- B) Dry cooling tower: There is no water loss in this method but installation and operation cost of dry cooling tower is many times higher than wet cooling tower



Control of Nuclear Pollution

Environmental Pollution Control Approach

- Control of Nuclear Pollution
 - Siting of nuclear power plants should be carefully done.
 - Proper disposal of wastes from laboratory should be done
 - Uranium and Thorium mining and refineries must be carefully maintained.
 - In-door pollution should be minimized.



Efforts at international level for the protection of environment

- Stockholm conference, 1972
- Nairobi declaration 1982
- Vienna convention for the the protection of ozone layer, 1985
- Montreal protocol, 1987
- Rio declaration, 1992
- Convention of biological diversity, 1992
- United nations earth summit, 1997
- Kyoto protocol, 1997
- World summit on sustainable development

Methods for Protecting the environment

Preserve

- Protect area from damage by human activities.
- Example: natural parks

Conserve

- **Using ecosystem wisely: Organic farming instead of traditional**
- **4Rs (reduce, recovery, reuse, recycle)**

Restore

- **Repairing the damage done by human activities.**
- **Examples: planting trees to repair soil erosion.**

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