Disadvantages

- High energy cost is
- Difficult to dispose wastewater.
- More possibility of corrosion.
- Less efficient in collecting very small particles.

2.3 Water Pollution

2.3.1 Definition

Water pollution is defined as any physical, chemical or biological change in quality of water that has a harmful effect on living organisms or makes the water unsuitable for needs.

2.3.2 Sources of water pollution

Water pollution may be caused by many sources. But the two major sources of water pollution are:

1. Point sources and
2. Non-point sources.

1. Point sources

- Point sources discharge pollutants at a specific place through pipelines, sewer lines, or ditches into water bodies.
- Identification, monitoring and control of discharge from point source are easy.

- ❖ It is possible to treat the wastewater before entering in the environment.

Examples

- ➢ Factory outlets
- ➢ Power plants outlets
- ➢ Underground mines
- ➢ Oil wells
- ➢ Sewage treatment plants

2. Non-point sources

- ❖ Non-point sources discharge pollutants from large and scattered area.
- ❖ These sources have no specific location.
- ❖ Identification, monitoring and control of non-point source discharge is not that much easy.

Examples

- ➢ Urban streets
- ➢ Agricultural lands
- ➢ Soil erosion
- ➢ Discharge from municipal and industrial landfill sites
- ➢ Acid deposition from the atmosphere

2.3.3 Effects of Water pollution

1. Infectious agents present in the water causes many diseases. The different types of organisms causing water borne diseases are given in the Table(Table 2.6)

Table 2.6 Water Borne Diseases Vs Responsible Organisms

Water Borne Diseases	Responsible Organism
Typhoid, Paratyphoid, Diarrhoea, Cholera, Bacillary Dysentary	Bacteria
Amoebiasis, Giardiasis	Protozoa
Viral Hepatitis (Jaundice), Poliomyletitis	Viruses
Roundworm, hookworm , threadworm	Helminths

2. Change in color of water affects the usage of water and growth of plants and organisms in water.

3. The oxygen demanding wastes, such as animal manure and plant residues deplete the dissolved oxygen content of water which is harmful to the aquatic lives.

4. The inorganic substances present in water causes many damages to the water.

   (i) Makes the water unfit for drinking and other purposes.

   (ii) Corrosion of metals exposed to such waters.

(iii)Causes skin cancers, damages to spinal, CNS, liver and kidneys.

(iv)Reduces crop yield.

5. The presence of acids, alkalis and toxic substances affect the growth of aquatic plants and fishes.

6. The presence of oil and other lubricants affect the self purification of the stream or water body.

7. The presence of organic chemicals, such as detergents, pesticides, plastics, oil and gasoline present in the water damages the CNS and causes birth defects and genetic disorders. These chemicals are also harmful to the lives of aquatic organisms.

8. Enrichment of nutrients (Eutrophication) from surrounding waters affects the penetration of light through the water, causing damage to the characteristics of water and aquatic life.

9. Dumping of solid wastes results in the pollution of surface water as well as ground water.

10. Disposal of coolant water used in industries increase the temperature of the surface water. This affects the solubility of oxygen in water and aquatic ecosystem.

11. The application of more amount of artificial fertilizer in agricultural lands increase the nitrate concentration in the water.This causes *methemoglobinemia,* known as *blue baby.* It also decreases the oxygen carrying capacity of

the blood in the body.

12. Oil spills or leaks from underground storage tanks on land are affecting a large area in a very short time.

13. Oil spills at sea decrease the oxygen level in the water and cause harm to the marine planktons and other living organisms in the sea.

14. Run -off from farms, backyards and golf courses containing pesticides, such as DDT that contaminate the water.

15. Leach outs from landfill sites is another major contaminating source. It damages the ecosystems health and reproductivity of wildlife. Groundwater is susceptible to contamination, as pesticides are mobile in the soil.

16. Over exploitation of groundwater results in decline in water levels.

17. Presence of radioactive materials, such as iodine, radon, cesium , uranium and thorium, and its isotopes causes genetic disorders , birth defects and certain cancers.

18. The chlorinated organic pesticides like dieldrin, aldrin and DDT are hazardous mainly due to their concentration in the food chain. They have high stability, low vapour pressure and very low solubility in water. As a result of biological magnification (accumulation of concentration from one level to another level of food chain), these are harmful to the mammals in longer term effects.

19. The presences of sediments (soil and silt) cause the following damages:

    a) Fills lakes and reservoirs.

    b) Obstructs shipping channel.

    c) Clogs hydroelectric turbines.

    d) Affects photosynthesis of aquatic plants.

    e) Disturbs the aquatic food chain.

    f) Carries pesticides, bacteria and harmful substances to the receiving water body.

    g) Makes the water unsuitable for bathing, swimming, boating and other recreational uses .

2.3.4 Control of water pollution

Some of the control measures of water pollution are:

1. Farmers can reduce the running of fertilizers from their agricultural lands to the nearby water bodies and leaching into aquifers.
2. Over fertilization and improper application of pesticides can be avoided.
3. The usage of pesticide may be minimized and biological pests control may be encouraged.
4. Acid/Alkali/Organic/Toxic substances in industrial or municipal wastes should be treated properly.

5. Soil erosion can be minimized by reforesting critical and important water sheds.
6. The runoff and infiltration of manure from animal feedlots may be controlled by improving manure control and planting buffer zones.
7. Proper and complete treatment of sewage water from sewage treatment plants has to be carried out.
8. Proper treatment must be given to all the effluents from the industries.
9. The use of toxic chemicals and hazardous materials in industries should be reduced or eliminated.
10. Use of recycled materials can minimize the pollution. Because, the pollution during its production can be avoided by using the recycled materials.
11. By preventing ground water contamination.
12. By reusing treated water for irrigation purposes.
13. By reducing poverty and birth rates.

2.4 Soil Pollution

2.4.1 Introduction

Soil is one of our most fundamental and precious resources. Like clean air and water, life cannot survive without healthy soil. About 95% of our food comes from the land. Soil is the thin layer of organic and inorganic materials that covers the Earth's rocky surface. The organic portion of soil is derived from the decayed