3. Water Pollution

Water pollution is one of the most serious environmental problems. Water pollution is caused by a variety of human activities such as industrial, agricultural and domestic. Agricultural run off related to excess fertilizers and pesticides, industrial effluents with toxic substances and sewage water with human and animal wastes pollute our water thoroughly.

3.1 Water on earth occurs in three forms:

1. As a vapour we see it as clouds, mist and steam.
2. As a fluid we see water as rain, in streams, lakes, dams, wetlands and the seas.
3. As a solid we see water as ice in glaciers, hail, snow and frost.

Water is a combination of oxygen and hydrogen (H_2O), but as you get different types of animals and plants, you also get different types of water. The difference between the types of water depends on the substances that are dissolved or suspended in the water.

3.2 Types of Water

Ten Basic Types of Water:

1. **Hard Water:**

   This is saturated with calcium, iron, magnesium, and many other inorganic minerals. All water in lakes, rivers, on the ground, in deep wells, is classified as hard water. (Many city systems take water from rivers or lakes, or reservoirs supplied with mountain water; they erroneously call their supplies "soft water" but it is soft only in comparison with water which is harder.

2. **Boiled Water:**

   Boiling helps remove some of the germs, but concentrates the inorganic minerals. Boiling tap water does not make it cleaner. It makes it safer to drink because as others said, it kills the microorganisms in the water.

3. **Raw Water:**

This has not been boiled. Raw water may be hard (as calcium hardened water) or soft as rain water. Raw water describes any water that has not been treated to remove bacteria and other contaminants. Raw water contains millions of germs and viruses in every densely inhabited drop. Some of these viruses and bacteria may adversely affect the thyroid gland, the liver and other vital body organs.

Raw water comes from a variety of locations, including both surface and subsurface sources. Surface sources include ponds, lakes, and other water bodies. Subsurface water sources include springs and wells located underground, which often require drilling or pumping to access.

4. **Rain Water**

This has been condensed from the clouds. The first drop is distilled water. But when it falls as rain, it picks up germs, dust, smoke, minerals, strontium 90, lead and many other atmospheric chemicals. By the time rain water reaches the earth it is so saturated with dust and pollutants it may be yellowish in color. If we had no air pollution, we would have far less pollution in our drinking water.

5. **Snow Water**

This is frozen rain. Freezing does not eliminate any germs. All snowflakes have hardened mineral deposits. Melt the cleanest snow and you will find it saturated with dirt, inorganic minerals, germs and viruses.

6. **Filtered Water**

This water has passed through a fine strainer, called a filter. Some calcium and other solid substances are kept in the filter. Each pore of the finest filter is large enough for a million viruses to seep through in a few moments. A home filter usually only picks up suspended solids and is effective for the time, maybe only for hours, until it is filled up. Then it is ineffective even for removing suspended solids, and at the same time becomes a breeding ground for bacteria.

7. **Soft Water**

This water is soft in comparison with water which is harder. It may contain many trace minerals and chemicals, viruses and bacteria. It is not to be confused with "softened water." Soft water may be classified as water which is harder than distilled water.

8. **Reverse Osmosis**

This is a system of water purification which allows pre-filtered water to be forced through a semi- permeable membrane to separate impurities from our drinking water. However, this membrane allows only certain molecules to pass through providing the water pressure is exactly constant. The membrane also allows some iron and nitrate molecules to pass through.

9. **De-ionized Water: Deionization ("DI Water" or "Demineralization") Simple means the removal of ions**

Deionization removes minerals and ions, both cations (positively charged ions) and anions (negatively charged ions), through a chemical process. DI uses specially manufactured ion-exchange resins which exchange hydrogen ions and hydroxide ions for dissolved minerals, which are then recombined to form water (this leaves DI in an unbalanced condition and with an electrical charge.) DI does not significantly remove uncharged organic molecules, viruses or bacteria. Because deionized water is unbalanced, it goes after any dissolvable or absorbable ions on contact trying to return to a balanced state.

10. **Distilled Water**

Distillation purifies liquid by boiling it, capturing the steam and then condensing the vapors. The condensed vapors are then returned to their liquid state finishing the distillation process. Solids and other contaminants, salt being the most important, remain in the original container with just pure water being reduced to vapor. It takes approximately five gallons of water to create one gallon of distilled water.

3.3 Types of water uses:

1. **Municipal/public supply.**
2. **Domestic and commercial.**
3. **Industrial and mining.**
4. **Agricultural.**
5. **Thermoelectric power.**

- The average per capita (per person) use can vary greatly between communities for any number of reasons, including:

1. **Climate differences.**
2. **The mix of domestic, commercial, and industrial uses.**
3. **Household sizes.**
5. **Public uses.**
6. **Income brackets.**
7. **Age and condition of distribution system.**

1 . Municipal/ public supply:

Typical categories of residential water use include normal household uses such as:

1. Drinking and cooking.
2. Bathing.
3. Toilet flushing.
4. Washing clothes and dishes.
5. Watering lawns and gardens.
6. Maintaining swimming pools.
7. Washing cars.

2. Domestic/Commercial:

Domestic water use includes everyday uses that take place in residential homes, whereas commercial water uses are those which take place in office buildings, hotels, restaurants,

civilian and military institutions, public and private golf courses, and other nonindustrial commercial facilities.

3. Industrial and Mining:

Industrial water uses, estimated to be 8 percent of total freshwater use for all off stream categories, include cooling in factories and washing and rinsing in manufacturing processes. Some of the major water-use industries include mining, steel, paper and associated products, and chemicals and associated products. Water for both industrial and mining uses comes from public supplies, surface sources, and ground water.

4. Agricultural:

Agricultural water use can be divided between irrigation and livestock. Irrigation includes all water applied to farm or horticultural crops; livestock incorporates water used for livestock, dairies, feedlots, fish farms, and other farm needs.

5. Thermoelectric Power Generation:

This final category includes water used for the production of energy from fossil fuels, nuclear energy, or geothermal energy. Most water withdrawn for thermoelectric power production is used for condenser and reactor cooling. More than 99 percent of the water used for thermoelectric power production comes from self-supplied surface water, less than 0.2 percent from public supplies.

3.4 Sources of Water Pollution:

There are two main sources of water pollution: point sources and non-point sources.

(1) When pollutants are discharged from a specific location such as a drain pipe carrying industrial effluents discharged directly into a water body it represents **Point Source pollution. Point Sources** include factories, wastewater treatment facilities, septic systems, and other sources that are clearly discharging pollutants into water sources.