

### 1.3 WATER QUALITY ISSUES

- Contamination of both ground and surface waters caused by high levels of production and use of manure and chemical fertilizers is a serious problem, particularly in areas of intensive livestock or specialized crop production.
- Issues here include leaching of nutrients and pesticides, water extraction and drainage and flooding.
- Water quantity problems arise in regions where water consumption exceeds critical levels in relation to available water resources.

#### **Water quality as a global issue:**

- Agriculture, as the single largest user of freshwater on a global basis and as a major cause of degradation of surface and groundwater resources through erosion and chemical runoff, has cause to be concerned about the global implications of water quality. The associated agro food-processing industry is also a significant source of organic pollution in most countries
- Aquaculture is now recognised as a major problem in freshwater, estuarine and coastal environments, leading to eutrophication and ecosystem damage.

#### **The principal environmental and public health dimensions of the global freshwater quality problem are highlighted below:**

- Five million people die annually from water-borne diseases.
- Ecosystem dysfunction and loss of biodiversity.
- Contamination of marine ecosystems from land-based activities.
- Contamination of groundwater resources.
- Global contamination by persistent organic pollutants.

Experts predict that, because pollution can no longer be remedied by dilution (i.e. the flow regime is fully utilized) in many countries, freshwater quality will become the principal limitation for sustainable development in these countries early in the next century. This "crisis" is predicted to have the following global dimensions:

- Decline in sustainable food resources (e.g. freshwater and coastal fisheries) due to pollution.
- Cumulative effect of poor water resource management decisions because of inadequate water quality data in many countries.
- Many countries can no longer manage pollution by dilution, leading to higher levels of aquatic pollution.

**Agricultural impacts on water quality:**

Agricultural activity	Impacts	
	Surface water	Groundwater
Tillage/ploughing	<b>Sediment/turbidity:</b> sediments carry phosphorus and pesticides adsorbed to sediment particles; <b>siltation</b> of river beds and loss of habitat, spawning ground, etc.	
Fertilizing	Runoff of nutrients, especially phosphorus, leading to eutrophication causing taste and odour in public water supply, excess algae growth leading to deoxygenation of water and fish kills.	Leaching of nitrate to groundwater; excessive levels are a threat to public health.
Manure spreading	Carried out as a fertilizer activity; spreading on frozen ground results in high levels of contamination of receiving waters by pathogens, metals, phosphorus and nitrogen leading to eutrophication and potential contamination.	Contamination of ground-water, especially by nitrogen
Pesticides	Runoff of pesticides leads to contamination of surface water and biota; dysfunction of ecological system in surface waters by loss of top predators due to growth inhibition and reproductive failure;	Some pesticides may leach into groundwater causing human

	public health impacts from eating contaminated fish. Pesticides are carried as dust by wind over very long distances and contaminate aquatic systems 1000s of miles away (e.g. tropical/subtropical pesticides found in Arctic mammals).	health problems from contaminated wells.
Feedlots/animal corrals	Contamination of surface water with many pathogens (bacteria, viruses, etc.) leading to chronic public health problems. Also contamination by metals contained in urine and faeces.	Potential leaching of nitrogen, metals, etc. to groundwater.
Irrigation	Runoff of salts leading to salinization of surface waters; runoff of fertilizers and pesticides to surface waters with ecological damage, bioaccumulation in edible fish species, etc. High levels of trace elements such as selenium can occur with serious ecological damage and potential human health impacts.	Enrichment of groundwater with salts, nutrients (especially nitrate).
Clear cutting	Erosion of land, leading to high levels of turbidity in rivers, siltation of bottom habitat, etc. Disruption and change of hydrologic regime, often with loss of perennial streams; causes public health problems due to loss of potable water.	Disruption of hydrologic regime, often with increased surface runoff and decreased groundwater recharge; affects surface water by decreasing flow in dry periods

		and concentrating nutrients and contaminants in surface water.
Silviculture	Broad range of effects: pesticide runoff and contamination of surface water and fish; erosion and sedimentation problems.	

**Table 1.3.1 Agricultural impacts on water quality**

### Types of water pollution:

There are many types of water pollution because water comes from many sources. Here are a few types of water pollution:

#### 1. Nutrients Pollution

Some wastewater, fertilizers and sewage contain high levels of nutrients. If they end up in water bodies, they encourage algae and weed growth in the water. This will make the water undrinkable, and even clog filters. Too much algae will also use up all the oxygen in the water, and other water organisms in the water will die out of oxygen starvation.

#### 2. Surface water pollution

Surface water includes natural water found on the earth's surface, like rivers, lakes, lagoons and oceans. Hazardous substances coming into contact with this surface water, dissolving or mixing physically with the water can be called surface water pollution.

#### 3. Oxygen Depleting

Water bodies have micro-organisms. These include aerobic and anaerobic organisms. When too much biodegradable matter (things that easily decay) end up in

water, it encourages more microorganism growth, and they use up more oxygen in the water. If oxygen is depleted, aerobic organisms die, and anaerobic organisms grow more to produce harmful toxins such as ammonia and sulfides.

#### **4. Ground water pollution**

When humans apply pesticides and chemicals to soils, they are washed deep into the ground by rainwater. This gets to underground water, causing pollution underground. This means when we dig wells and bore holes to get water from underground, it needs to be checked for ground water pollution.

#### **5. Microbiological**

In many communities in the world, people drink untreated water (straight from a river or stream). Sometimes there is natural pollution caused by microorganisms like viruses, bacteria and protozoa. This natural pollution can cause fishes and other water life to die. They can also cause serious illness to humans who drink from such waters.

#### **6. Suspended Matter**

Some pollutants (substances, particles and chemicals) do not easily dissolve in water. This kind of material is called particulate matter. Some suspended pollutants later settle under the water body. This can harm and even kill aquatic organisms that live at the bottom of water bodies.

#### **7. Chemical Water Pollution**

Many industries and farmers work with chemicals that end up in water. This is common with Point-source Pollution. These include chemicals that are used to control weeds, insects and pests. Metals and solvents from industries can pollute water bodies. These are poisonous to many forms of aquatic life and may slow their development, make them infertile and kill them

#### **8. Oil Spillage**

Oil spills usually have only a localized effect on wildlife but can spread for miles. The oil can cause the death to many fish and get stuck to the feathers of seabirds causing them to lose their ability to fly.

**Effects of water pollution:**

Infectious diseases can be spread through contaminated water. Some of these water-borne diseases are Typhoid, Cholera, Paratyphoid Fever, Dysentery, Jaundice, Amoebiasis and Malaria.

**Chemicals** - in the water also have negative effects on our health.

**Pesticides** – can damage the nervous system and cause cancer because of the carbonates and organophosphates that they contain. Chlorides can cause reproductive and endocrinal damage.

**Nitrates** – are especially dangerous to babies that drink formula milk. It restricts the amount of oxygen in the brain and cause the “blue baby” syndrome.

**Lead** – can accumulate in the body and damage the central nervous system.

**Arsenic** – causes liver damage, skin cancer and vascular diseases

**Flourides** - in excessive amounts can make your teeth yellow and cause damage to the spinal cord.

**Petrochemicals** – even with very low exposure, can cause cancer.

**Water quality parameters:****➤ Physical properties:**

- ✚ Temperature
- ✚ Colour
- ✚ Odour
- ✚ Turbidity
- ✚ Electrical conductivity

**➤ Chemical properties:**

- ✚ pH of water
- ✚ Total Dissolved Solids(TDS)
- ✚ Major ions
- ✚ Minor or trace elements

+ Hardness

+ Salinity

+ Alkalinity

➤ **Biological properties:**

+ Dissolved Oxygen(DO)

+ Biochemical Oxygen Demand(BOD)

+ Chemical Oxygen Demand (COD)

**Causes of Water Pollution:**

Water pollution is caused due to several reasons. Here are the few major causes of water pollution:

➤ **Sewage And Waste Water:**

Sewage, garbage and liquid waste of households, agricultural lands and factories are discharged into lakes and rivers. These wastes contain harmful chemicals and toxins which make the water poisonous for aquatic animals and plants.

➤ **Dumping:**

Dumping of solid wastes and litters in water bodies causes huge problems. Litters include glass, plastic, aluminum, styrofoam etc. Different things take different amount of time to degrade in water. They affect aquatic plants and animals.

➤ **Industrial Waste:**

Industrial waste contains pollutants like asbestos, lead, mercury and petrochemicals which are extremely harmful to both people and environment. Industrial waste is discharged into lakes and rivers by using fresh water making the water contaminated.

➤ **Oil Pollution:**

Sea water gets polluted due to oil spilled from ships and tankers while traveling. The spilled oil does not dissolve in water and forms a thick sludge polluting the water.

➤ **Acid Rain:**

Acid rain is pollution of water caused by air pollution. When the acidic particles caused by air pollution in the atmosphere mix with water vapor, it results in acid rain.

➤ **Global Warming:**

Due to global warming, there is an increase in water temperature. This increase in temperature results in death of aquatic plants and animals. This also results in bleaching of coral reefs in water.

➤ **Eutrophication:**

Eutrophication is an increased level of nutrients in water bodies. This results in bloom of algae in water. It also depletes the oxygen in water, which negatively affects fish and other aquatic animal population.

**Treating polluted water :**

It is very important to prevent the polluting of water bodies and remove existing contaminants or reducing the concentration of these contaminants so as to make it fit for desired use. Following are some of the ways of treating polluted water:

➤ **Industrial Treatment:**

The raw sewage is needed to be treated correctly in a water treatment plant before it can be safely released into the environment. To reduce the amount and toxicity of waste, it is passed through a number of chambers and chemical processes in water treatment plant.

➤ **Denitrification:**

Conversion of nitrates in gas is called Denitrification. It is an ecological approach to prevent leaching of nitrates in soil. It stops ground water from getting contaminated.



➤ **Ozone Waste Water Treatment:**

Ozone waste water treatment method is becoming very popular. In this method, the pollutants in water are broken down by an ozone generator. Ozone oxidizes bacteria, molds, organic material and other pollutants in water.

➤ **Septic Tanks:**

Septic tanks are used to treat sewage at the place of location instead of treating it in any plant or sewage system. This system is used at the individual building level. The sewage is separated into solid and liquid components and treated separately.

