

**(Management Topic in Environmental Studies)**

**B. Tech 7<sup>TH</sup> Semester**

# **WATER POLLUTION (Part 1)**



**Department: Chemistry**  
**Subject: MTES(CHM2049)**

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# WATER POLLUTION

- ❑ Water pollution means undesirable changes in physical, chemical or biological properties of water that makes it unfit for use by human and other living beings.
- ❑ There are certain symptoms of water pollution: changed colour, offensive smell, bad taste, unchecked growth of aquatic weeds, oily material floating on surface, and death of fish and other aquatic organisms.



# Facts????

- Only about 3% surface water is fresh water
- One fifth of the world's population lacks the access of clean water
- Over 2.6 billion people do not have adequate toilets.
- More than 2 million children are killed by diarrheal diseases each year
- Demand of water will double in next 30 years

## Causes of Water Pollution?

- Water is uniquely vulnerable to pollution. Known as a “universal solvent,”
- Toxic substances from farms, towns, and factories readily dissolve into and mix with it, causing water pollution.



# Water pollutants: Types

**Organic pollutants:** Mainly derivatives of living beings, while some are synthetic. They include

- (a) Natural organic pollutants: faecal content, dead and decaying plant and animal,
- (b) Sewage and industrial effluents,
- (c) Synthetic organic chemicals (SOCs): Pesticide, herbicide, dioxin Polychlorinated biphenyl,
- (d) Microbiological pollutants: bacteria, virus, fungi, etc
- (e) Oils: marine pollution by spillage and leakage from ship carrying refinery oil .

**Inorganic pollutants:** example mineral acids, bases, salts, metals, heavy metals etc. They come from natural sources (rocks) as well as man made sources (industries).

Example  $\text{SO}_4$ ,  $\text{NO}_3$ ,  $\text{PO}_4$ , Cyanide, Fluoride, chloride etc, Heavy metal: Pb, Cr, Cd, Hg, As etc

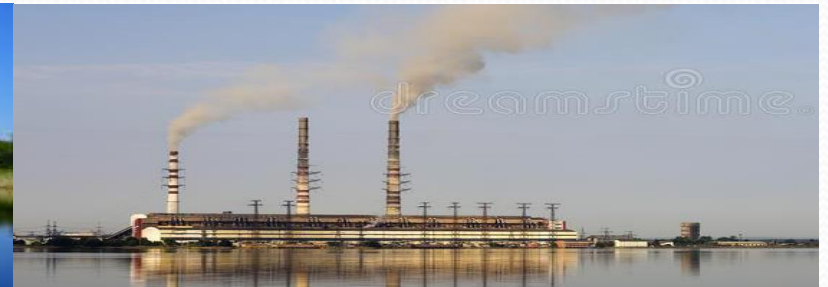


**Radioactive pollutants:** Released into water from natural sources (rocks) as well as man made sources (nuclear waste, weapons etc.) uranium , thorium etc

**Suspended solids and sediments:** These include insoluble impurities like soil, sand and other solid particles which either remain as suspension in water or form sediments.

## Sources of water pollution:

**Heat or thermal pollution:** Heated water from thermal power plants and industries. This increases temperature of water and decreases dissolved oxygen.



# Sources of water pollution

Major sources of water pollution include:

- **Nature** (death and decay of plants and animals): Faecal content increase BOD and COD level
- **Soil erosion** due to deforestation, overgrazing etc
- **Agricultural run-off**: Pesticide herbicide, fertilizer
- **Mining** (acid mine drainage),
- **Municipal sewage**,
- **Industrial effluents**: Petrol chemical, paper pulp, pharmaceutical, coke oven plant
- **Accidental spillage etc.:** during transport, storage and handling, Accident during ship carrying refinery oil



# Sources of water pollution

There are two types of sources of water pollution:

- ***Point sources:*** Sources whose location can be identified as single point. e.g., sewage and industrial effluent
- ***Non-point or diffused or area sources:*** Sources that are scattered over a large area or that can not be identified as single point. e.g., run-off from agricultural land, forests etc



# Effects of water pollution

**Physical effects:** It includes increased temperature, turbidity, conductivity, depletion of dissolved oxygen (DO), altered colour, oily surface etc. This results in reduced photosynthesis and loss of aquatic life.

**Oxidation effects:** It includes biological and chemical oxidation. As a result of this different impurities get oxidized (e.g., sulphides into sulphate, ammonia into nitrite and nitrates) at the cost of dissolved oxygen.

**Toxic chemical effects:** Causes fatal diseases or deaths of living beings. e.g., toxic metals like cadmium, mercury, chromium cause damage to liver, kidney and brain. Similarly pesticides, acids, dioxins cause damage and cause cancer.

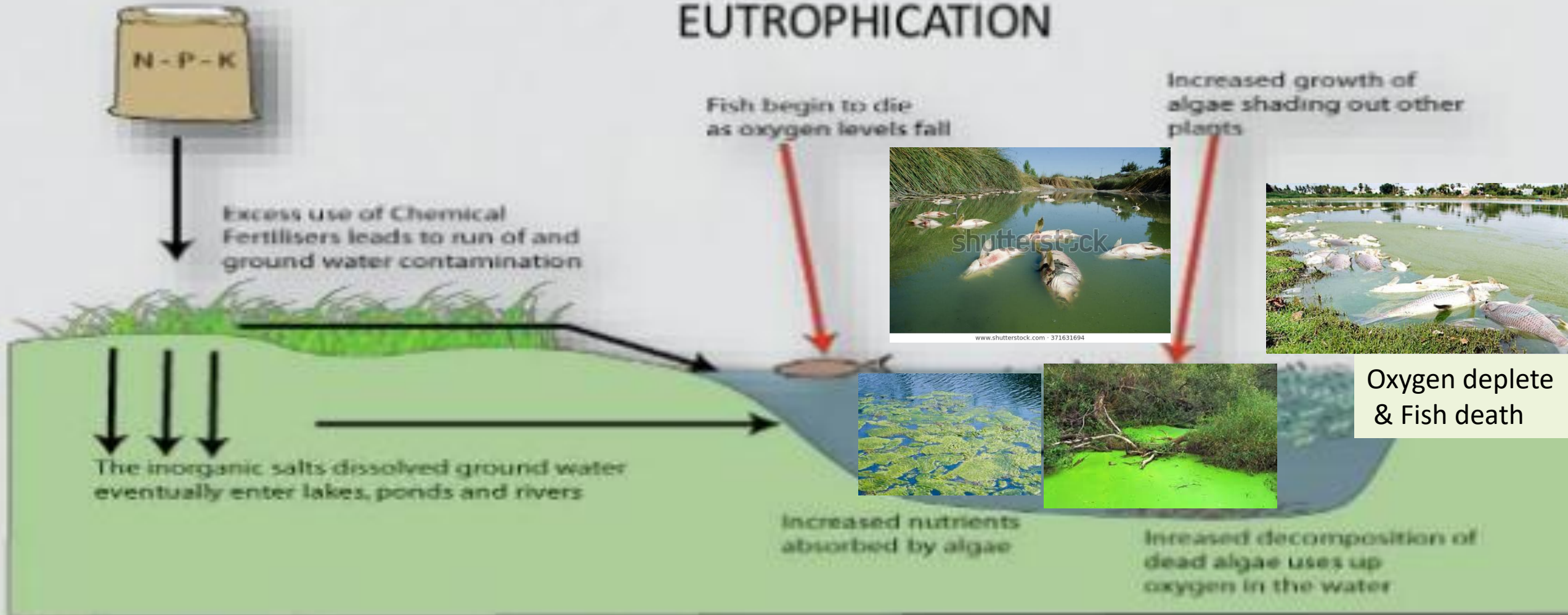
**Micro-organism effects:** Different micro-organisms (e.g., bacteria, virus) found in dirty water cause a number of water borne diseases e.g., cholera, typhoid, hepatitis, dysentery etc.



# Eutrophication

Fertilizers such as nitrates and phosphates are used to improve crop yield reach through irrigation, rainfall and drainage into rivers and ponds. They cause serious illness metheamoglobin.

## EUTROPHICATION



# Industrial Effluents

The industrial wastes and their effluents include poisonous materials like acids, alkalis, salts, phenols, cyanides, zinc, insecticides which makes water toxic and deoxygenated and eventually do not support aquatic life.

MERCURY- Minamata disease.

Neurological syndrome caused by severe mercury poisoning. Symptoms include ataxia, (loss of full control on body movement) numbness (Burning feeling) in the hands and feet, general muscle weakness, narrowing of the field of vision and damage to hearing and speech

OILS- Oil reduce rate of oxygen uptake by water, retards light intensity by 90%.

ITAI-ITAI Disease: (Cd) Osteomyeloma, severe bone pain renal dysfunction

BLACK FOOT DISEASE (Arsenic), ASBESTOSIS (Asbestos), BERYLLIOSIS (Beryllium), ITAI- ITAI disease (Cadmium).

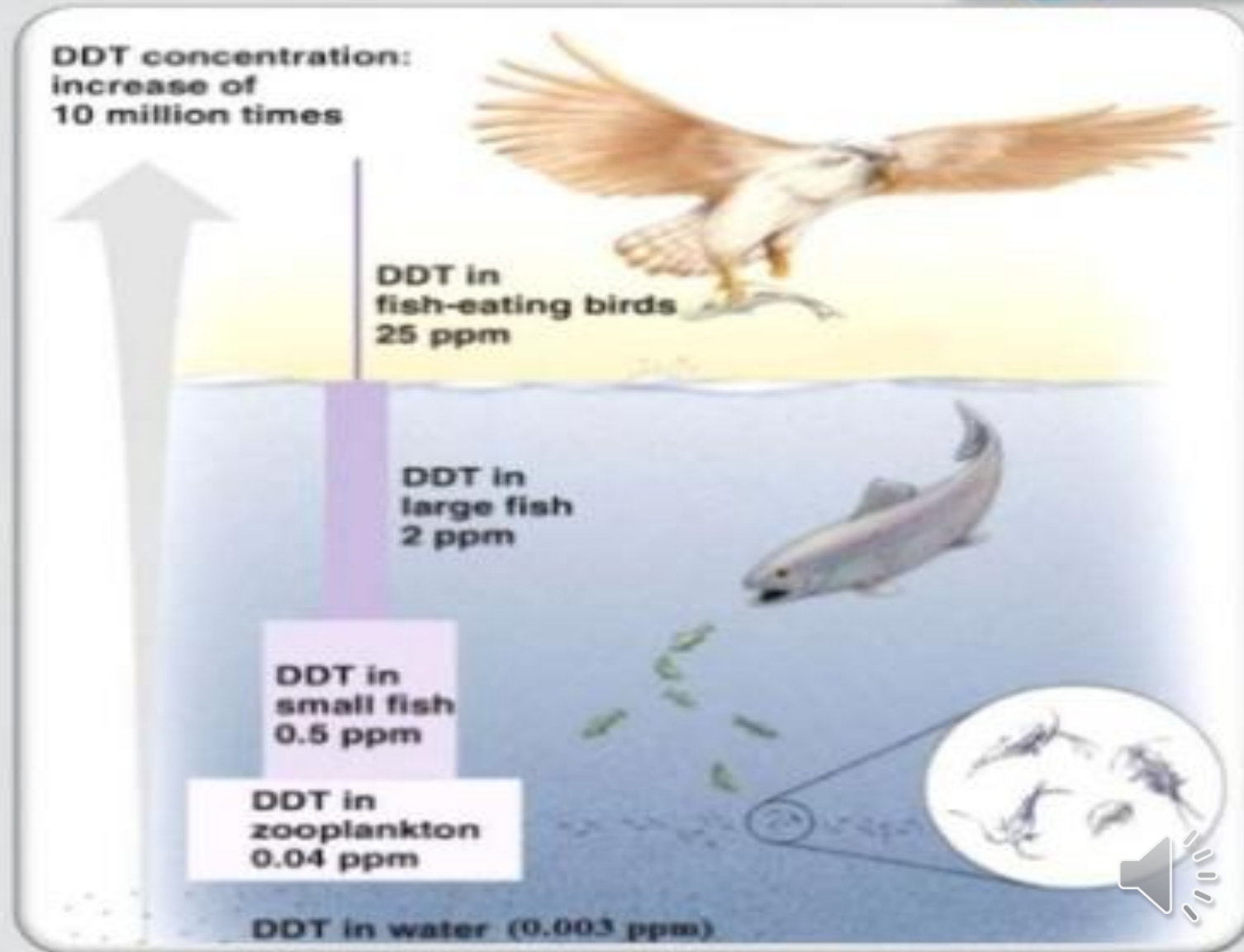


# Insecticide and Pesticides Biomagnification

They are biologically active chemicals are used for pest control. These include DDT (dichlorodiphenyltrichloroethane), aldrin etc.

Even Hg, Pb, Cd, As etc

Increased accumulation of these toxic substance in the food chain at high trophic level is called **BIOLOGICAL MAGNIFICATION**.



## Some common measures to control pollution

- ❑ Domestic and industrial waste waters should be discharged into rivers only after proper treatment through STPs and ETPs.
- ❑ Solid wastes must not be mixed with liquid wastes and should not be thrown into water bodies. They should be separately managed.
- ❑ Sources of drinking water should be protected from pollution. Polluting activities (e.g., industrial use, discharging effluents, bathing, washing, cattle rearing etc.) must be avoided in vicinity of source of drinking water.
- ❑ Water bodies should be regularly cleaned of aquatic weeds, plants and other crude impurities like polythene, metals, garbage etc. Special **breeds of fish, Gambusia fish which feed on mosquito eggs and bacteria, can be cultured in water** bodies.
- ❑ Afforestation must be done for reducing soil erosion and improving local soil hydrology. Use of agrochemicals need to be minimized.
- ❑ Public awareness regarding water pollution and its control measures should be created.





**THANK YOU**

