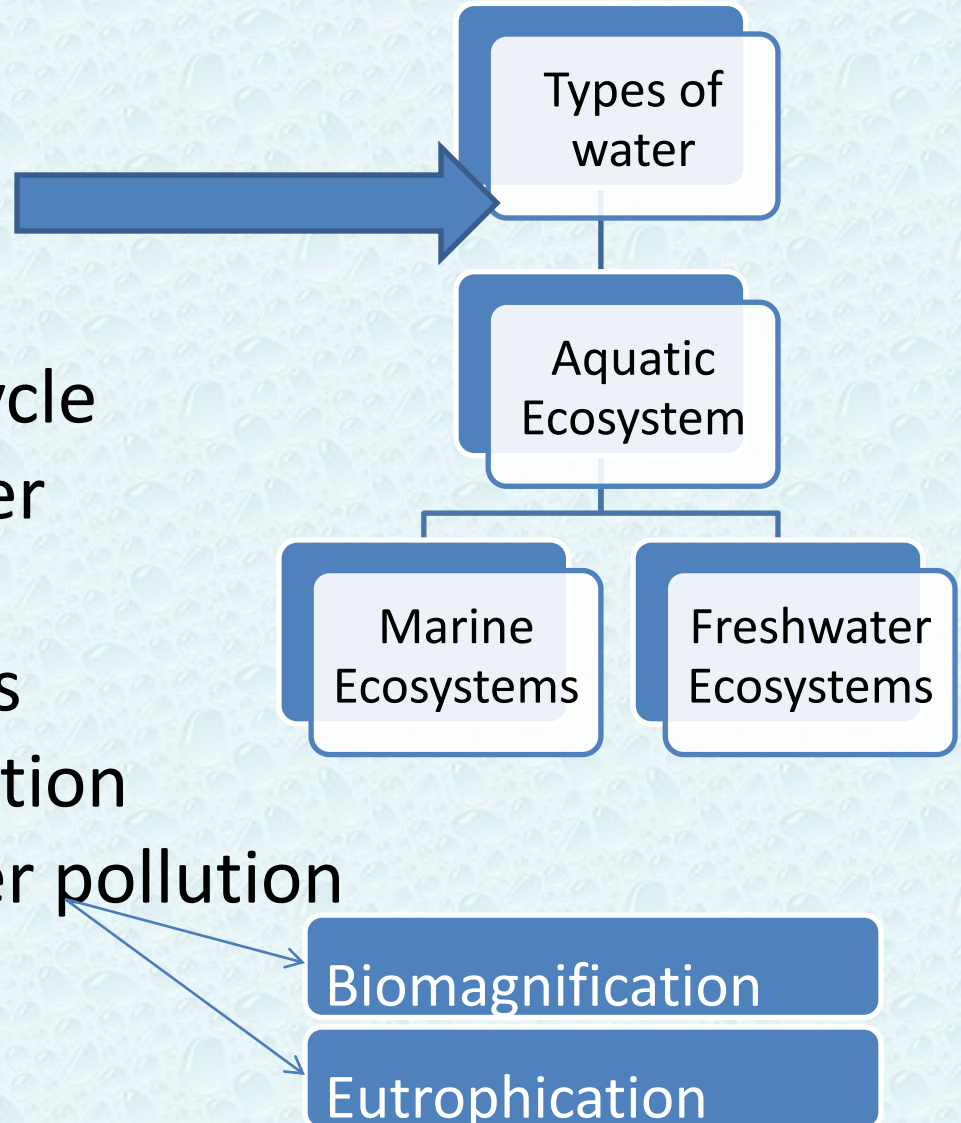


HYDROSPHERE

Dr. Shakha Sharda

Contents

- Introduction
- Distribution of water
- Water/Hydrological Cycle
- Major sources of water
- Water Pollution
- Major water pollutants
- Sources of water pollution
- Consequences of water pollution



Introduction

- The hydrosphere contains about 71% of the surface of the Earth and is the home for many plants and animals. 97.5% of the water on Earth is salt water present in oceans and seas.
- The oceans are salty due to weathering of rocks that adds to the mineral content of the water.
- 2.5% of water on Earth is fresh water (frozen and unfrozen).

Introduction

EARTH

29%
land

71%
water



Salt water
97.5%

Fresh
water
2.5%

69.4% of fresh water is frozen in form of glaciers and polar ice caps

unfrozen fresh water as:

- ★ groundwater 98.7%
- ★ lakes 0.96%
- ★ rivers 0.02%
- ★ atmosphere 0.12%
- ★ biological 0.01%
- ★ soil 0.16%

Types of water

- Sea/ marine/oceanic water

salt content is more than 3.5mg/l



- Brackish water

salt content is 0.5-3.5 mg/l



- Fresh water

salt content is less than 0.5mg/l



Aquatic Ecosystem

- Marine Ecosystems

- ❖ Oceans
- ❖ Intertidal zone
- ❖ Estuaries
- ❖ Coral reefs

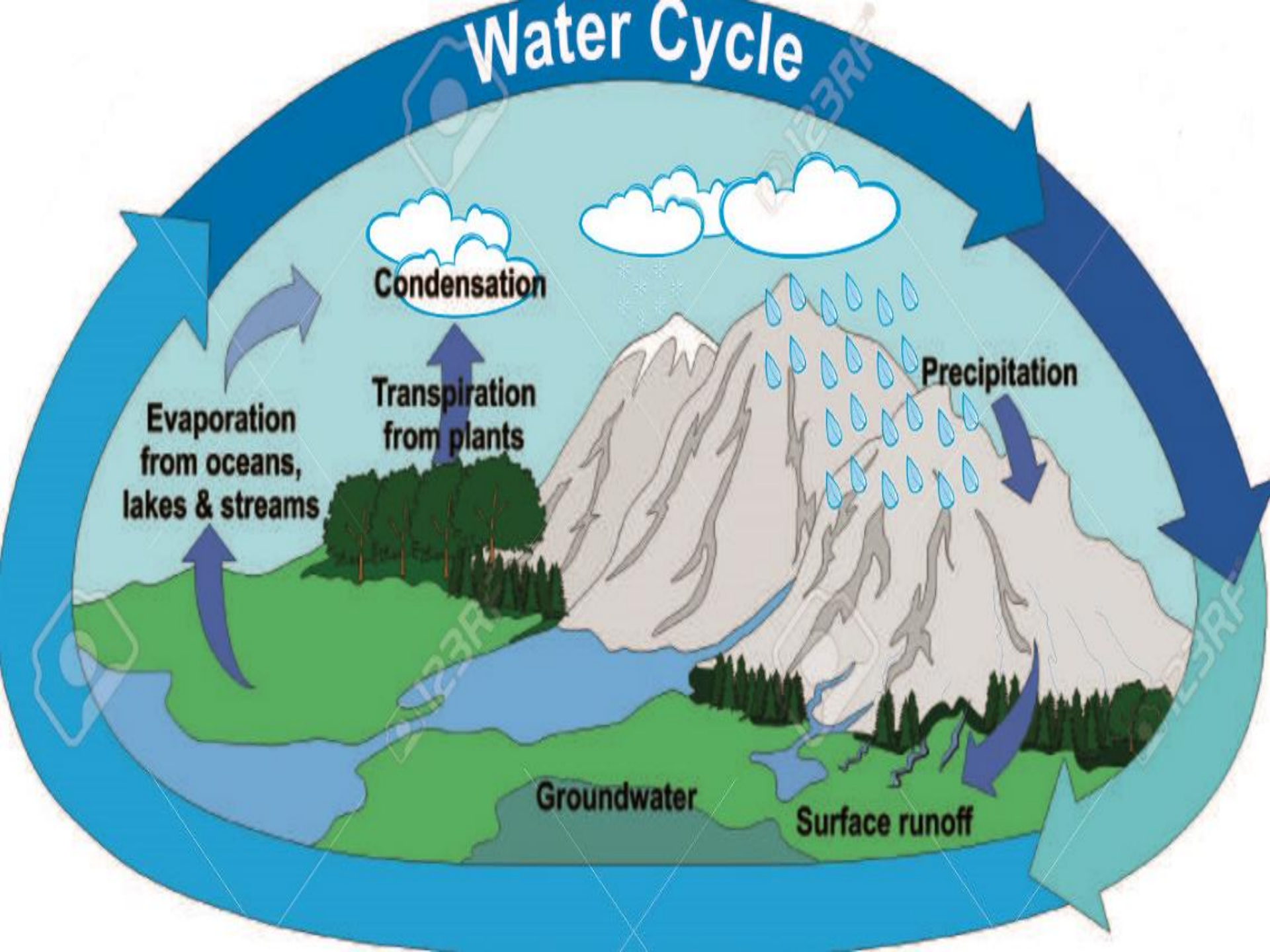


- Freshwater Ecosystems

- ❖ Streams/rivers (Lotic-flowing)
- ❖ Lakes, ponds and pools (Lentic-static)
- ❖ Wetlands



Water Cycle



Evaporation
from oceans,
lakes & streams

Condensation

Transpiration
from plants

Precipitation

Groundwater

Surface runoff

Major sources of water

- Precipitation: Rain, Snow, Hail and Sleet
(rain is the purest water in nature)
- Surface water: mainly depend upon rainfall
- Rivers
- Groundwater: infiltrates through the soil
- Frozen water: glaciers
- Sea/ Oceanic water



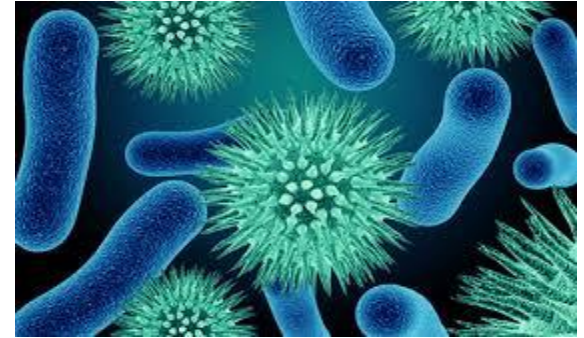
Water pollution



- Alteration in physical, chemical and biological properties of water due to the addition of excess of undesirable substances that make it harmful to man, animal and aquatic life.
- Water pollutants: is a physical or biotic component which adversely alters the environment by affecting growth rate of species, interfering with the food chain, health, comforts, amenities or property value of man.

Major water pollutants

- Pathogens
- Chemical pollutants



organic pollutants: detergents, VOC's, fuels

inorganic pollutants: industrial discharge

- Macroscopic pollutants

garbage, plastic pellets or shipwrecks



Sources of water pollution

- Surface water pollution: domestic wastes, industrial effluents, farm run-off, oil, radioactive, silt etc.
- Underground water pollution
- Marine water pollution



tion



Consequences of water pollution

- Algal blooming/Eutrophication
dead zone: Gulf of Mexico
 - Deoxygenation
 - Biomagnification/ Bioaccumulation/ Bioconcentration
DDT, BHC, Endrin, Mercury
- DDT: dichlorodiphenyltrichloroethane
BHC: benzenehexachloride
- DDT and BHC (chlorinated pesticides) are known as persistent organic pollutants (POPs) and are found in pesticides all over the world.
- Eutrophication (nitrates and phosphates): mostly seen in ponds and lakes



- Biomagnification is increase in the concentration of non-biodegradable toxic material at each successive trophic level of food chain.

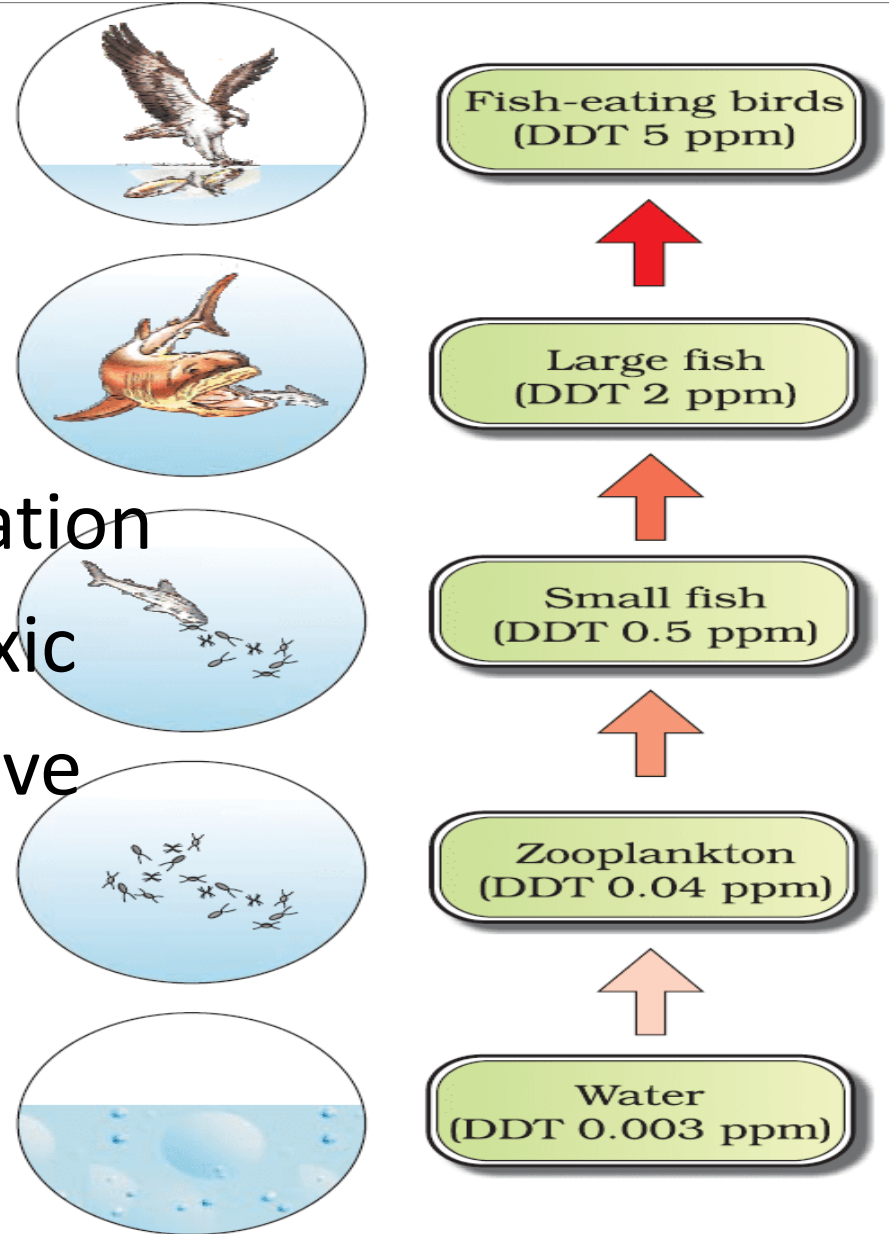
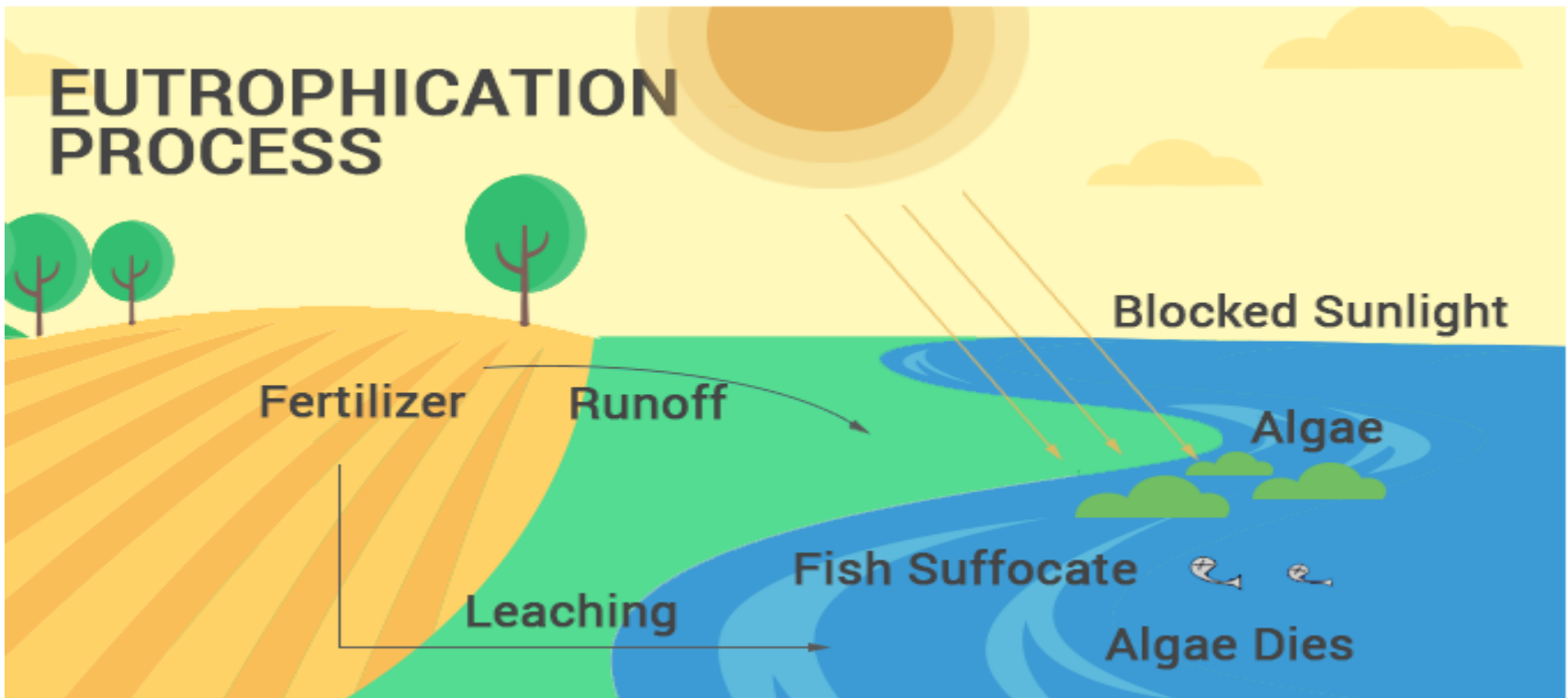


Figure- Biomagnification of DDT in an aquatic food chain

EUTROPHICATION

- In Greek, eutrophication means “well-nourished”. But eutrophication in the sense of water science, it’s more like an “over-nourished” water body.



Eutrophication occurs in 4 simple steps:

EXCESS
NUTRIENTS

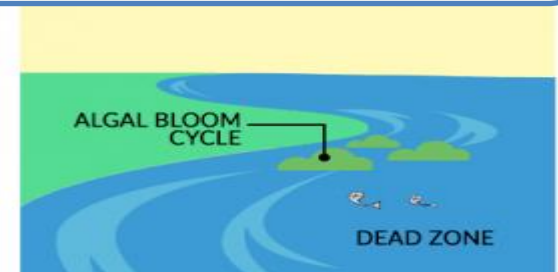
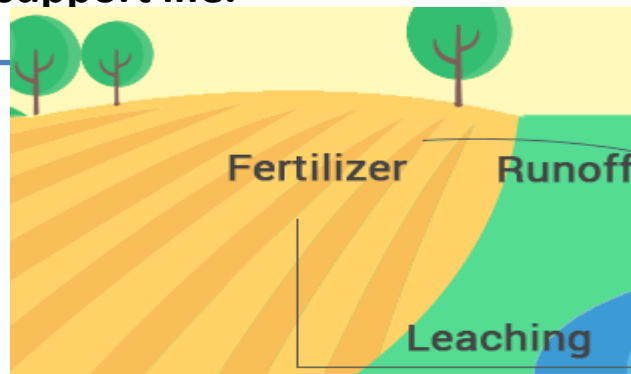
- farmers apply fertilizer to the soil. Then, excess nutrients run off from the field into the water.

ALGAE
BLOOM:

- the fertilizer rich in nitrate and phosphate spark the overgrowth of algae in water bodies.

OXYGEN
DEPLETION
DEAD ZONES

- algae formed, blocks sunlight from entering water and uses up oxygen. Eventually, water becomes oxygen-depleted.
- : Finally, water that is completely depleted of oxygen becomes a dead zone and can no longer support life.



NO WATER NO LIFE



*Thank
you*

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Contents

- Effects of water pollution due to:
 - industrial wastes
 - silt
 - thermal waste
 - radioactive waste
- Parameters to check the water pollution
- Prevention and control of water pollution
- Action taken by GOI (Government of India) :
 - GAP (Ganga Action Plan)
 - YAP (Yamuna Action plan)

Industrial Pollutants

- DDT : cerebral haemorrhage, hypertension, cancer
- Mercury : Minamata (Japan,1952); impaired speech, blurred vision, genetic diseases
- Lead : Anaemia, headache, paralysis, mutagenic diseases
- Cadmium: Itai-Itai (rheumatic pain), kidney damage, anaemia
- Arsenic : mental disturbance, blackening of nails, cirrhosis, ulcers, lung cancer
- Selenium : Fever, nervousness, vomiting, dental caries
- Chromium : Cancer, nephritis, gastrointestinal ulceration, liner damage



Pollution due to industrial wastes

- Nitrates : Blue-baby syndrome, Methaemoglobinom
- Fluoride : Mottled enamel, fluorosis
- Cyanide : thyroid damage
- Copper : anaemia, liver and
- Chlorine : High blood press
- Coliform bacteria : food con



Parameters to calculate water pollution

- DO (Dissolved Oxygen)

amount of oxygen dissolved in water; less the value of DO, more is the pollution.

8.0mg/l indicates pollution

below 4.0mg/l heavy pollution

BOD (Biological Oxygen Demand)

Amount of oxygen required by the microorganisms to decompose organic matter for 5 days at 20 degree Celsius.

high the value of BOD , high is the pollution

COD (Chemical Oxygen Demand)

amount of oxygen required by chemicals like potassium dichromate and potassium permanganate to decompose organic matter .

high the value of COD, high is the pollution



Water Analysis Kit



BOD Incubator

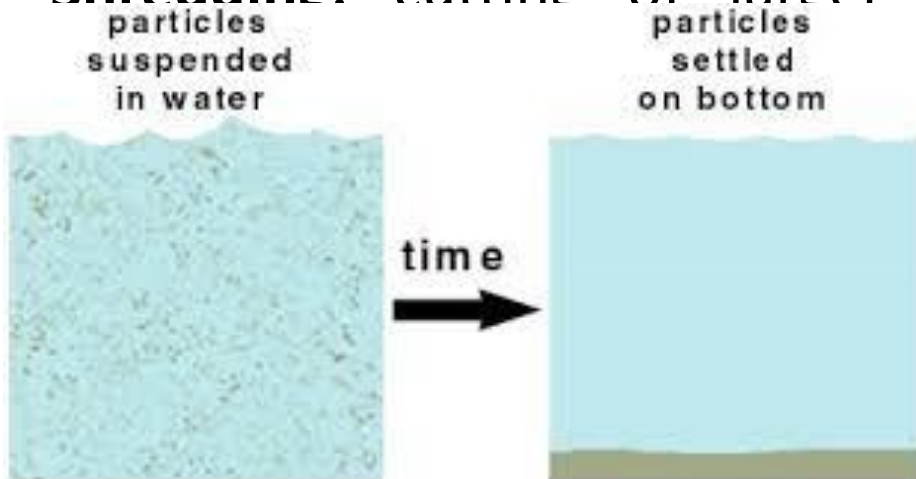


COD Analysis

Treatment of polluted water

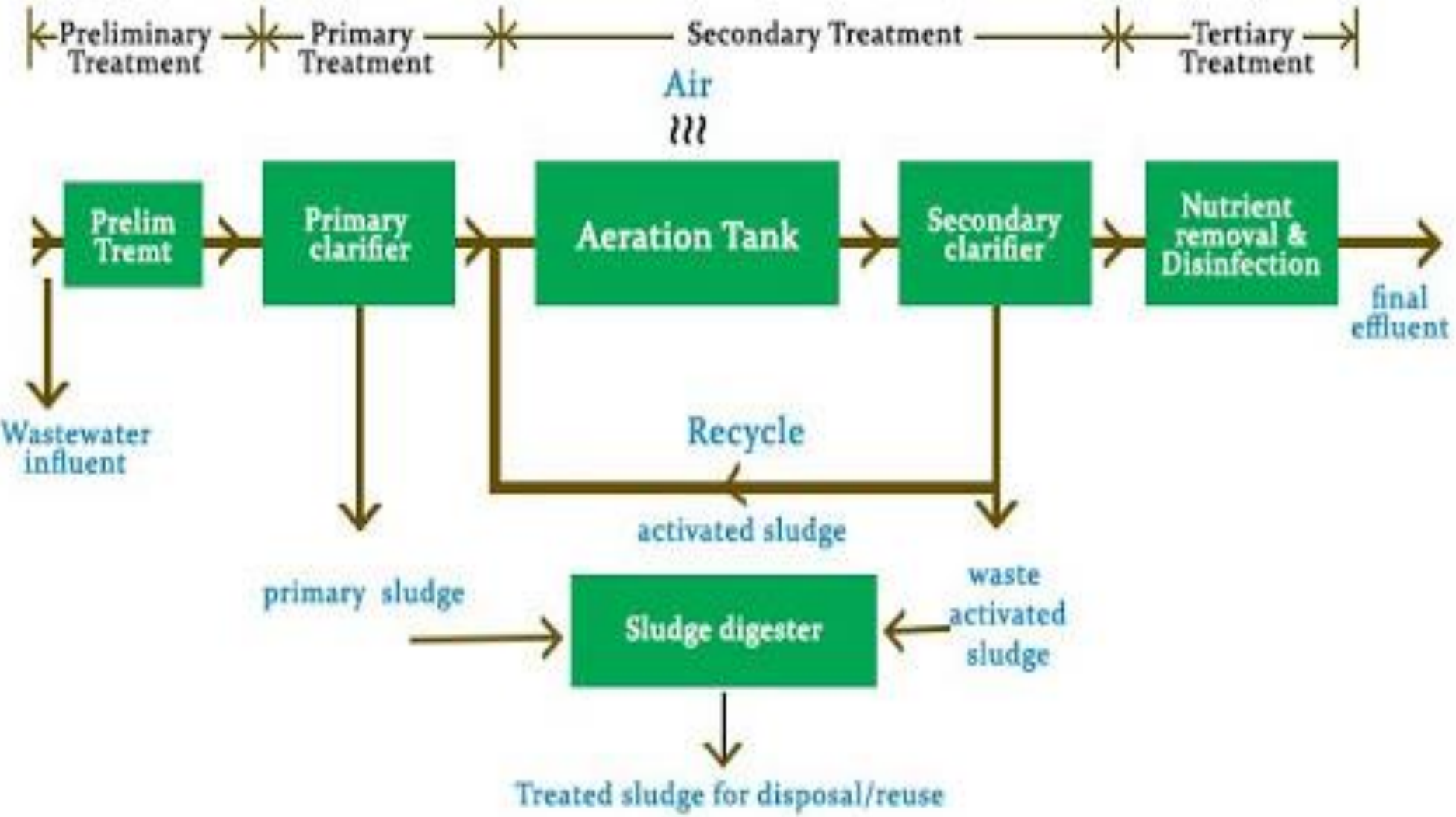
Physical/ Primary Treatment

1. **Screening and filtration:** stationary/moving screens to remove large pieces of organic matter
2. **Sedimentation:** settling down of insoluble or suspended material under the influence of gravity
3. **Floatation process:** to remove particles with densities lower than water
4. **Shredding:** cutting of larger pieces smaller ones by
nts by churning machines
- 5.



Secondary/ Biological Treatment

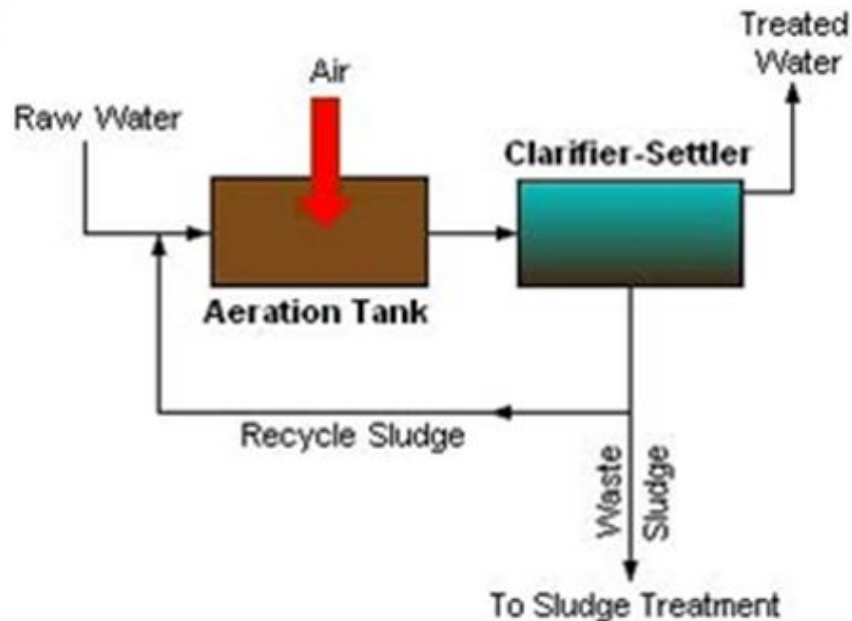
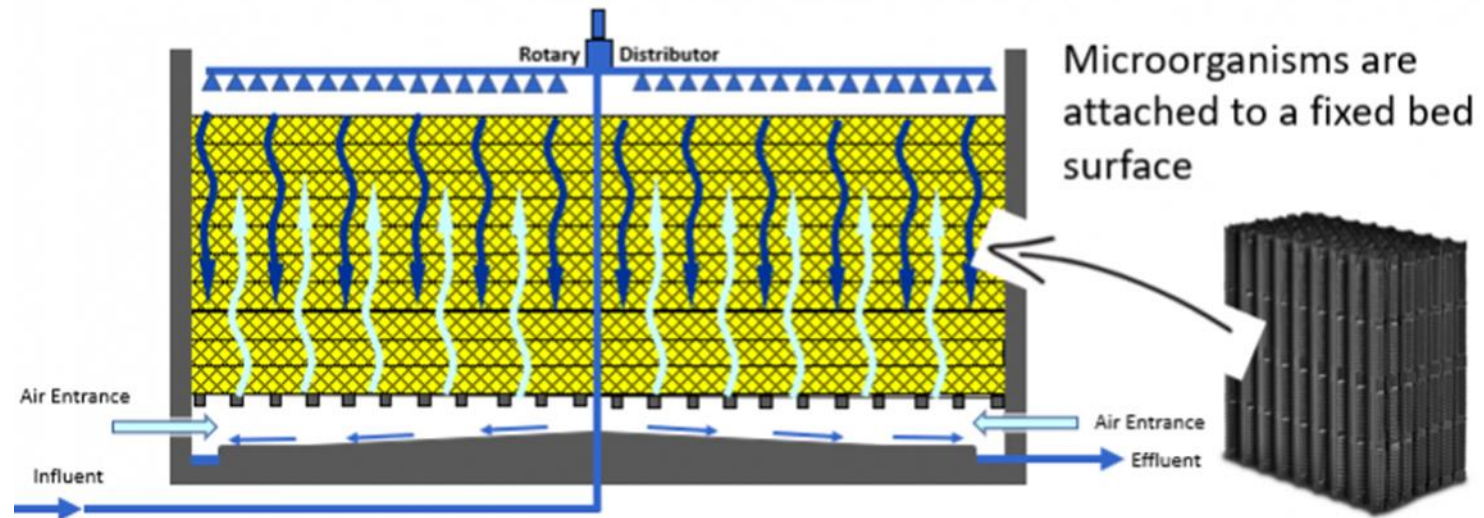
1. **Activated sludge process (ASP)**: waste water is passed through a series of 4 tanks where anaerobic and aerobic decomposition are carried out by sludge of algae and bacteria.
2. **Oxidation ponds**
3. **Trickling filters**: sewage is passed through a thick layer of gravel having sewage fungus or bacteria where the organic matter is completely decomposed.
4. **Septic tanks**



Activated Sludge Process (ASP)

Trickling filter function

Organic matter and/or ammonia removal



Tertiary/ Chemical Treatment

Chemical precipitation

Adsorption process

Disinfection

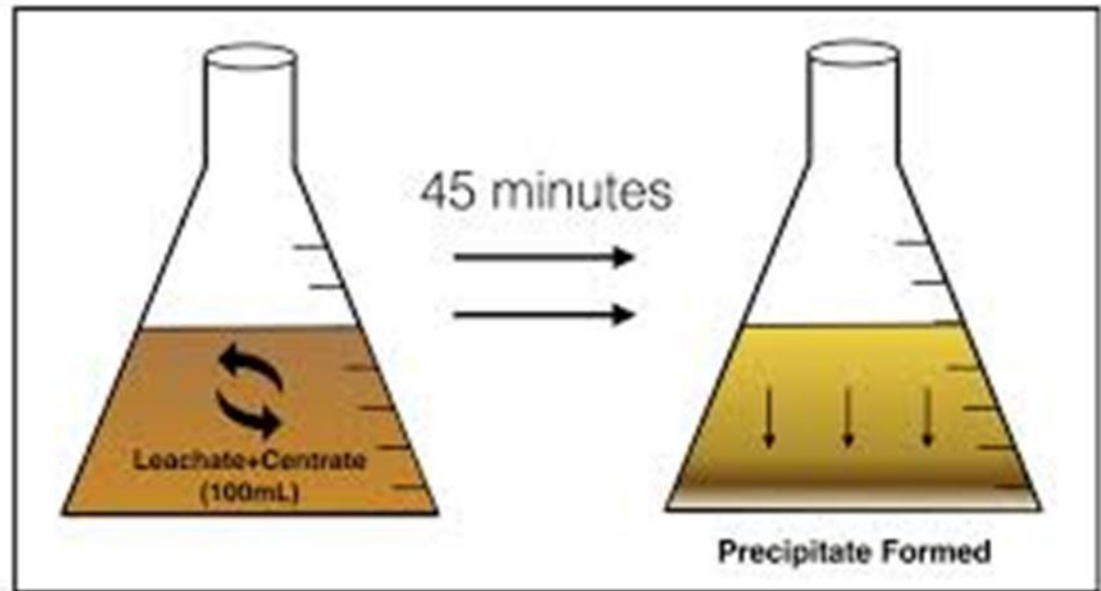


Image 1: Chemical Precipitation Process

Action taken by GOI

- Ganga action plan
started in 1985
- Yamuna action plan
started on 10th December, 1997
14 sewage plants in Delhi
proper treatment of Panipat cooperative sugar,
distillery and refineries
no effluents from NFL

River Ganga





Phases of the GAP

Phase – I



Phase – I, launched in June 1985 was the first attempt of Government to clean the river Ganga. To accomplish this task a total of 2061 projects of pollution abatement covering 25 towns in 3 states – UP, Bihar & West Bengal were sanctioned at a cost of Rs. 462 crores.

Phase – II



Since GAP Phase – I did not cover the pollution load of Ganga fully, GAP Phase – II was approved from 1993 on wards. It included the Gomti Action Plan, Yamuna Action Plan and Damodar Action Plan and Mahanada Action Plan

Permissible limits of drinking water

- Ph 6.5-8.5
- Hardness 300-600mg/l
- Alkalinity 200-600mg/l
- TDS 500-2000mg/l
- DO 5-6mg/l
- Nitrates 45-100mg/l
- Fluoride 1.0-1.5mg/l
- Chloride 250-1000mg/l
- BOD 2mg/l
- COD 250mg/l