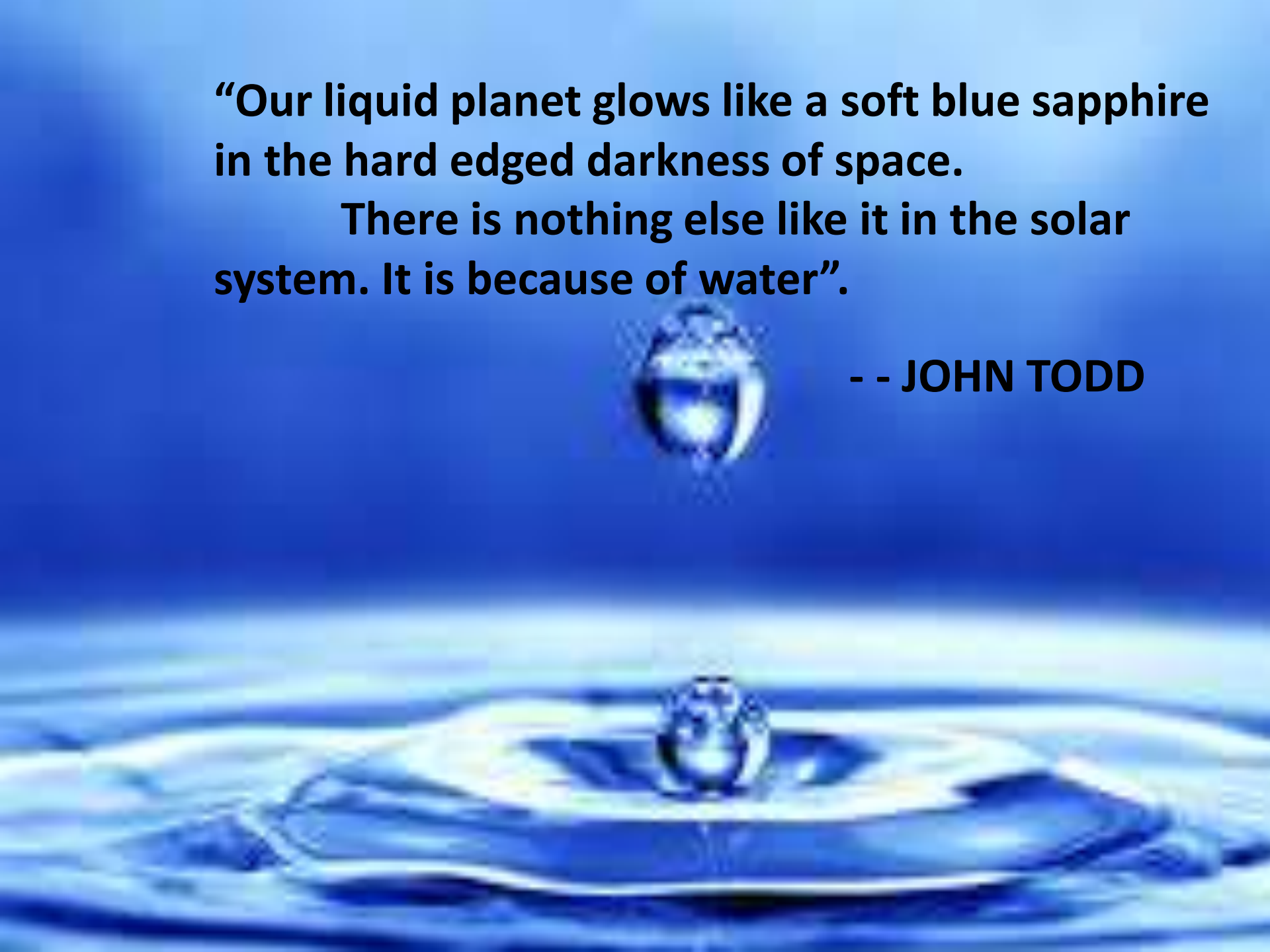
WATER POLLUTION

CAUSES
EFFECTS
CONTROL MEASURES


“Our liquid planet glows like a soft blue sapphire in the hard edged darkness of space.
There is nothing else like it in the solar system. It is because of water”.
- - JOHN TODD

DEFINITION & TYPES OF WATER POLLUTION:

- Water pollution may be defined as “the alteration in physical, chemical and biological characteristics of water which may cause harmful effects on humans and aquatic life.”
- Pollutant Types include:

1. Sewage
2. Industrial effluents and chemicals
3. Oil and other wastes.

Chemicals in air dissolve in rain water, fertilizers, pesticides and herbicides leached from land pollute water.

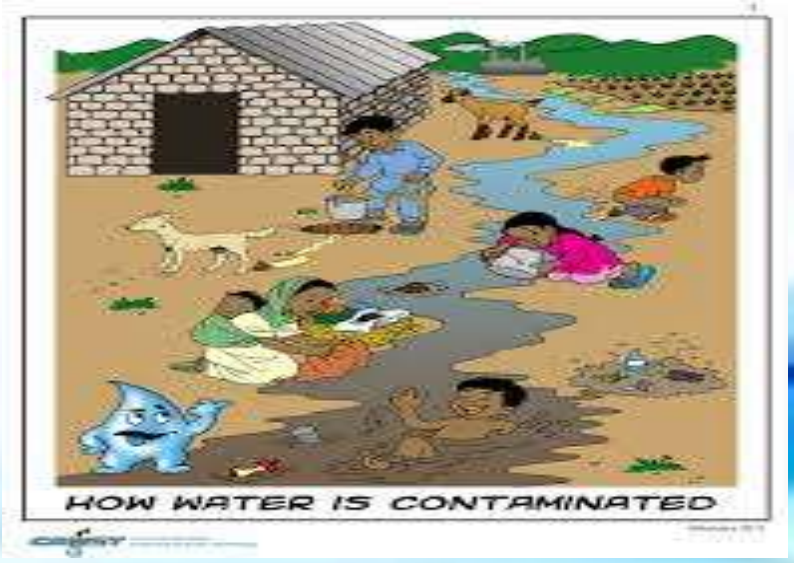
Causes of water pollution

- Industrial
- Home
- Agricultural

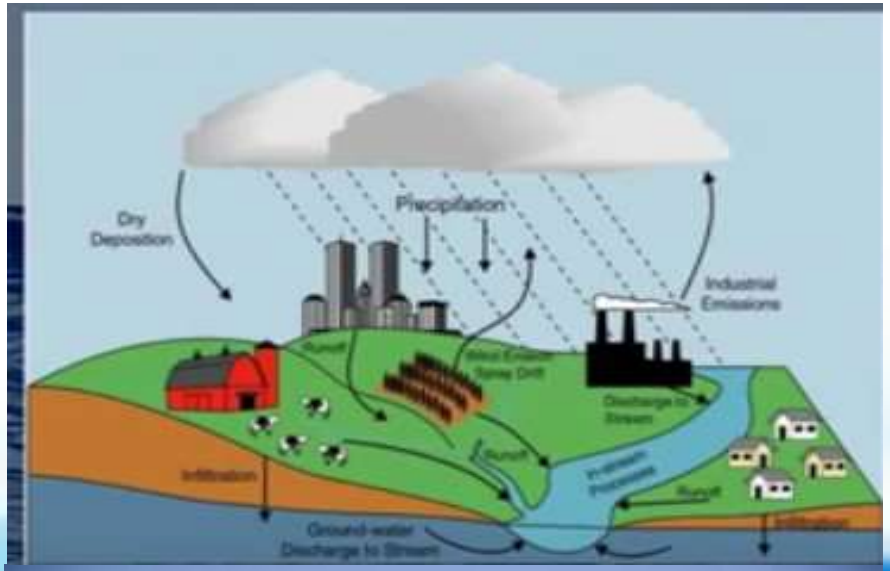
1.Sewage

- Sewage disposal affect peoples' immediate environment and leads to water-related illnesses such as Diarrhoea that kills 7,60,000 children under 5yr. Per annum.

- Sometimes sewage waste is pumped untreated into the sea / Rivers /water bodies.>



2.Industrial effluents & Chemical waste



- Detergents and many chemicals used in manufacturing units also pollute the surface and ground water.
- Another kind of toxic pollution comes from heavy metals, such as lead and cadmium and mercury.
- Chemicals released by smokestacks can enter the atmosphere and then fall back to earth as acid rain, entering seas, rivers, and lakes and causing water pollution. That called atmospheric deposition.

3. Oil & other waste

- Huge black oil slicks represent only a tiny fraction of all the pollution entering our oceans.
- Only 12 % of the oil that enters the oceans comes from **oil tanker accidents.**
- Over 70 percent of oil pollution at sea comes routine shipping and from the oil people pour down drains on land.

Radioactive waste

- At high enough concentration it can kill.
- In lower concentrations it can cause cancers and other illnesses.
- The biggest sources of radioactive pollution can be seen in places where factories reprocess waste fuel from nuclear power plants.

Causes of water pollution

CAUSES / SOURCES & Their EFFECTS

•Water pollution is any chemical, biological or physical change in water quality that has a harmful effect on living organisms or makes water unsuitable for desired uses.

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- **Infectious agents (Pathogens):**
- Ex: Bacteria, Viruses, Protozoa, and parasitic worms.
- Human sources
- Human and animal wastes

Effects: Variety of diseases (Diarrhea, Typhoid, viral infections etc).

Oxygen demanding wastes

- (Dissolved oxygen): This degradation consumes dissolved oxygen in water.
- Dissolved Oxygen (DO) is the amount of oxygen dissolved in a given quantity of water at a particular pressure and temperature.
- The saturated point of DO varies from 8 to 15 mg/L

Ex: Organic wastes such as animal manure and plant debris that can be decomposed by aerobic (oxygen-requiring) bacteria.

Oxygen demanding wastes

- Human sources:
  Sewage, Animal feedlots, paper mills and food processing facilities.

Effects:
Large populations of bacteria decomposing these wastes can degrade water quality by depleting water of dissolved oxygen. This causes fish and other forms of oxygen-consuming aquatic life to die

- Inorganic chemicals

Ex: Water soluble inorganic chemicals:

- Acids
- Compounds of toxic metals such as lead (Pb), arsenic (As) and selenium (Se)
- Salts such as NaCl in oceans and fluoride (F^{-})

Phosphates, nitrates of FERTILIZERS .

- Human sources:
- Surface runoff, industrial effluents and household cleansers.
- **Effects:** Inorganic chemicals can:
- Make freshwater unusable for drinking and irrigation
- Cause skin cancer and neck damage.
- Damage nervous system, liver and kidneys
- Harm fish and other aquatic life
- Lower crop yields
- Accelerate corrosion of metals exposed to such water

- **Organic chemicals :**
- Ex: Oil, Gasoline, Plastics, Pesticides, Cleaning solvents and Detergents.
- Human Sources: Industrial effluents, household cleansers and surface runoff from farms.
-
- **Effects**:
- Can threaten human health by causing nervous system damage and some cancers.
- Harm fish and wildlife.

Bioaccumulation / biomagnification

- Pesticides – the organic chemicals enter the water cycle through agriculture activities.
- .These pesticides can cause accumulation in the aquatic organisms body called Bioaccumulation and their concentration can be increased many fold called biomagnifications in the aquatic food chains.

- Ex: phyto planktons (0.01ppm) → Zoo planktons(1.0 ppm) → Herbivorous Fish(2.0 ppm) → large fish (20.0 ppm) → MAN (40.0 ppm).

• **Accumulation of DDT – Birds lay eggs with much thinner than normal leads to premature breaking of the eggs , kills chicks.** *Birds of Prey like Hawks, eagles fish eating birds also affected by DDT hence banned in India.*

- **Plant nutrients**
- Ex: Water soluble compounds containing nitrate, Phosphate and Ammonium ions.
- Human sources: Sewage, manure and runoff of agricultural and urban fertilizers.
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- **Effects:**
- Can cause excessive growth of algae and other aquatic plants, which die, decay, deplete dissolved oxygen in water thereby killing fish.
- Drinking water with excessive levels of nitrates lower the oxygen carrying capacity of the blood and can kill urban children and infants.

Sediment:

Ex: Soil, silt, etc.

Human Sources: Land erosion.

Effects:

- Causes cloudy water thereby reducing photosynthetic activity
- Disruption of aquatic food chain
- Carries pesticides, bacteria and other harmful substances.
- Settles and destroys feeding and spawning grounds of fish
- Clogs and fills lakes, artificial reservoirs, stream channels and harbors.

Radioactive materials:

Ex: Radioactive isotopes of:

- Iodine
- Radon
- Uranium
- Cesium and
- Thorium
- **Human sources**: Nuclear power plants, mining and processing of uranium and other ores, nuclear weapon production and natural sources.
- **Effects**: Genetic mutations, birth defects and certain cancers.

Heat (Thermal pollution)
Ex: Excessive heat of water due to contamination of water by industrial waste which is hot and boils the water.

Effects :

- **Low dissolved oxygen levels** thereby making aquatic organisms more vulnerable to disease, parasites and toxic chemicals.
- When a power plant starts or shuts down for repair, fish and other organisms adapted to a particular temperature range, can be killed by an abrupt ***temperature change*** **known as** ***thermal shock.***

Point and non-point sources of water pollution:

Point sources :

- These are pollutants that are discharged at specific locations through pipes, ditches or sewers into bodies of surface waters.
- **Ex:** Factories, sewage treatment plants, abandoned underground mines and oil tankers.

Non point sources :

- These pollutants cannot be traced to a single point of discharge.
- They are large land areas or air-sheds that pollute water by runoff, subsurface flow or deposition from the atmosphere.

Ex: Acid deposition, runoff of chemicals into surface water from croplands, logged forests, urban streets, lawns, golf courses and parking lots.

The state of INDIA'S RIVERS

- Most rivers in India, - worshipped and named after gods, goddesses or saints (Ganga, Yamuna, Sindhu, cauvery, Godavari, Krishna).
- Ironically, these rivers suffer from severe pollution due to :
  - –Industrialization(25%),
  - –Sewage, muncipal effluents - Urbanization
  - –excessive withdrawal of water(Ganga & Yamuna- through canals),
  - – Agriculture run off & various Religious and social practices.

The state of INDIA'S RIVERS

- In 1985, Indian Govt. had launched GAP- Ganga Action Plan- the largest ever river clean up action operation.
- Till now, hundreds of crores of money spent on it and deadly slow progress.
- In 1991, GAP Phase –II Intended to clean Tributeries of Gnaga- Yamuna, Gomti, and Damodar i.e YAP, GAP,DAP respetively.

- In 1995, NRCP –National river conservation plan was launched – to clean up all the rivers of India.
  - –772.08 Crores for such operation spent.
  - –Covering 18 rivers in 10 states, 46 towns.
  - –The cost is borne by Central Govt. & MoEF Ministry of Environment and Forests.
  - –Action : setting up sewage treatment plants, treating pollution load , electric crematoria , low cost sanitation facilities, river front development, afforestation and solid waste management.


THE MIGHTY
GANGA
BASIN
7,000 m
Thousands of megawatts worth of hydropower potential in the upper reaches
Haridwar
Area of the basin
860,000 km²
Millions congregate on the banks of the Ganga for religious and cultural activities
500 million people live in the Ganga basin in India
520 persons/km² Population density: highest among all basins in the world
50 major cities located on main stem, each with a population >50,000 people
25% India's water resources accounted for by the Ganga
>50% India's net irrigated area falls within the basin
2,500 km Total length from source to sea
Kanpur
Allahabad
Varanasi
Patna
The Ganga basin comprises 11 states and 17 major tributaries including Yamuna, Kosi and Chambal
Among top 10 most polluted rivers in the world
Kolkata
Sundarbans
Largest Mangrove forest
US$ 700 billion
GDP accounted for by the basin
200 million people
in the basin live below poverty line
The Ganga is home to
140 fish species
2 biosphere reserves
Nanda Devi and Sundarbans National Park
5 endangered species including Gangetic Dolphin and Royal Bengal Tiger

- **The NRCP faced failures due to :**
  - –Failed to allocate responsibility for running treatment facilities for long run and their cost.
  - –Power supply
  - –Agriculture run off water is not in action plan.
- In 2009, NGRBA – National Ganga River Basin Authority was formed.
  - –In its first meeting resolved to make Ganga pollution free by 2020.
  - –Total cost estimated = 15,000 Crores of Rupees.
  - –Initial assistance of $1 billion from world bank.
  - –NGRBA applies more holistic approach in planning, financing, monitoring, & coordinating authorities.

ONLY TIME WILL PROVE THE TRUE INTEGRITY OF THIS PLAN.

1 Indus (Up to border).
2a Ganga 2b Brahmaputra2b Barak andohers, 3 Godavari. 4 Krishna
5 Cauvery 6 Subernarekha7 Brahmani andBaitarni
8 Mahanadi 9 Pennar10 Mahi
11 Sabarmati12 Narmada
13 Tapi.
14 West flowing rivers South of Tapi.
15 East flowing rivers between Mahanadi and Godavari.
16 East flowing rivers between Godavari and Krishna.
17 East flowing rivers between Krishna and Pennar.
18 East flowing rivers between Pennar and Cauvery.
19 East flowing rivers South of Cauvery.
20 West flowing rivers of Kutch and Saurashtra including Luni.
21 Minor rivers draining into Bangladesh.
22 Minor rivers draining into Myanmar.
23 Area of North Ladakh not draining into Indus.
24 Drainage Area of Andaman & Nicobar Islands.
25 Drainage Area of Lakshadweep Islands

Control measures of water pollution

✓ Administration of water pollution control should be in the hands of state or central government.

✓ Scientific techniques should be adopted for environmental control of catchment areas of rivers, ponds or streams.

✓ Industrial plants should be based on recycling operations as it helps prevent disposal of wastes into natural waters but also extraction of products from waste.

✓ Plants, trees and forests control pollution as they act as natural air conditioners.

Control…

- ✓ Trees are capable of reducing sulphur dioxide and nitric oxide pollutants and hence more trees should be planted.
- ✓ No type of waste (treated, partially treated or untreated) should be discharged into any natural water body.
- ✓ Industries should develop closed loop water supply schemes and domestic sewage must be used for irrigation.
- ✓ Qualified and experienced people must be consulted from time to time for effective control of water pollution.

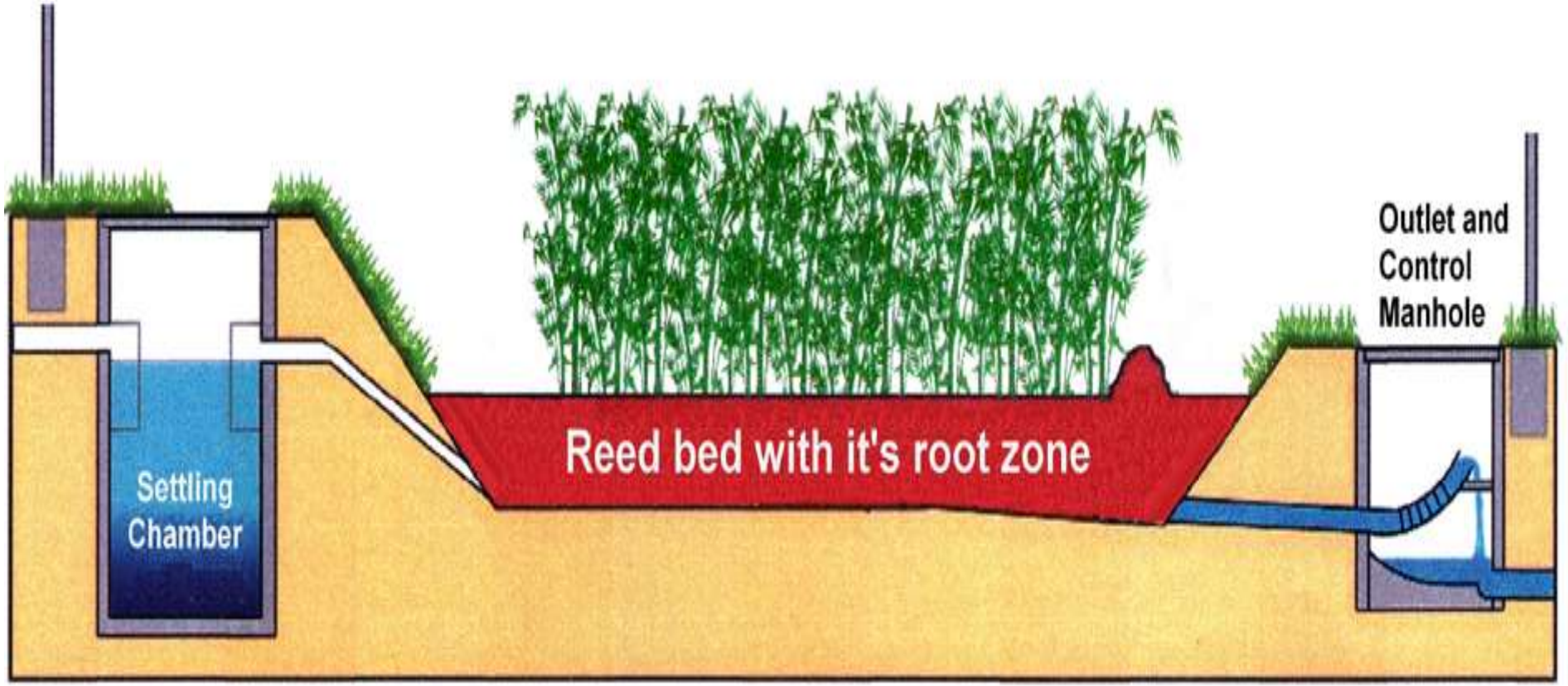
✓ Setting up effluent treatment plants to treat waste can reduce the pollution load in the recipient water.

✓ The treated effluents can be reused for gardening, cooling purposes etc.

✓ A new technology called **ROOT ZONE PROCESS** developed by THERMAX.

- –It involves running contaminated water through the root zones of specially designed reed beds.
- –The **reeds, which are wetland plants**, absorb the oxygen from the surrounding air through their stomatal opening
- –And makes it suitable to grow numerous bacteria and fungi, these oxidize impurities in the waste water, so the water finally comes out gets cleaned.

Root zone process



Control…

✓ Public awareness must be initiated regarding adverse effects of water pollution using the media.

✓ Laws, standards and practices should be established to prevent water pollution and these laws should be modified from time to time based on current requirements and technological advancements

✓ Basic and applied research in public health engineering should be encouraged.


LET THE
RIVER FLOW
Scroll down to continue

Thank you