



Water Pollution : Sources, Effects and Engineering control Strategies

What is water pollution?

Water pollution is the contamination of water bodies (e.g. lakes, rivers, oceans, aquifers and groundwater), very often by human activities.

It occurs when pollutants (particles, chemicals or substances that make water contaminated) are discharged directly or indirectly into water bodies without enough treatment to get rid of harmful compounds.



Types

Surface water pollution

> found on the exterior of the Earth's crust, oceans, rivers and lakes

Groundwater Pollution

> found in soil or under rock structure or aquifers

Sources of Water Pollution

There are various classifications of water pollution. The two chief sources of water pollution can be seen as **Point** and **Non-Point**.

TYPES OF WATER POLLUTION

POINT SOURCE

- pollution flowing from a single and identifiable source such as discharge pipe from a factory, roadway, or leaking underground storage tank

NON-POINT SOURCE

- pollution collected by rain falling over a larger watershed which is then carried by runoff to a nearby lake or stream, or by infiltration into the groundwater

1.Point source pollution

Point source pollution refers to contaminants that enter a waterway through a discrete conveyance, such as a pipe or ditch.

Examples-

- discharges from a sewage treatment plant, a factory,
- a city storm drain.

POINT SOURCE POLLUTION

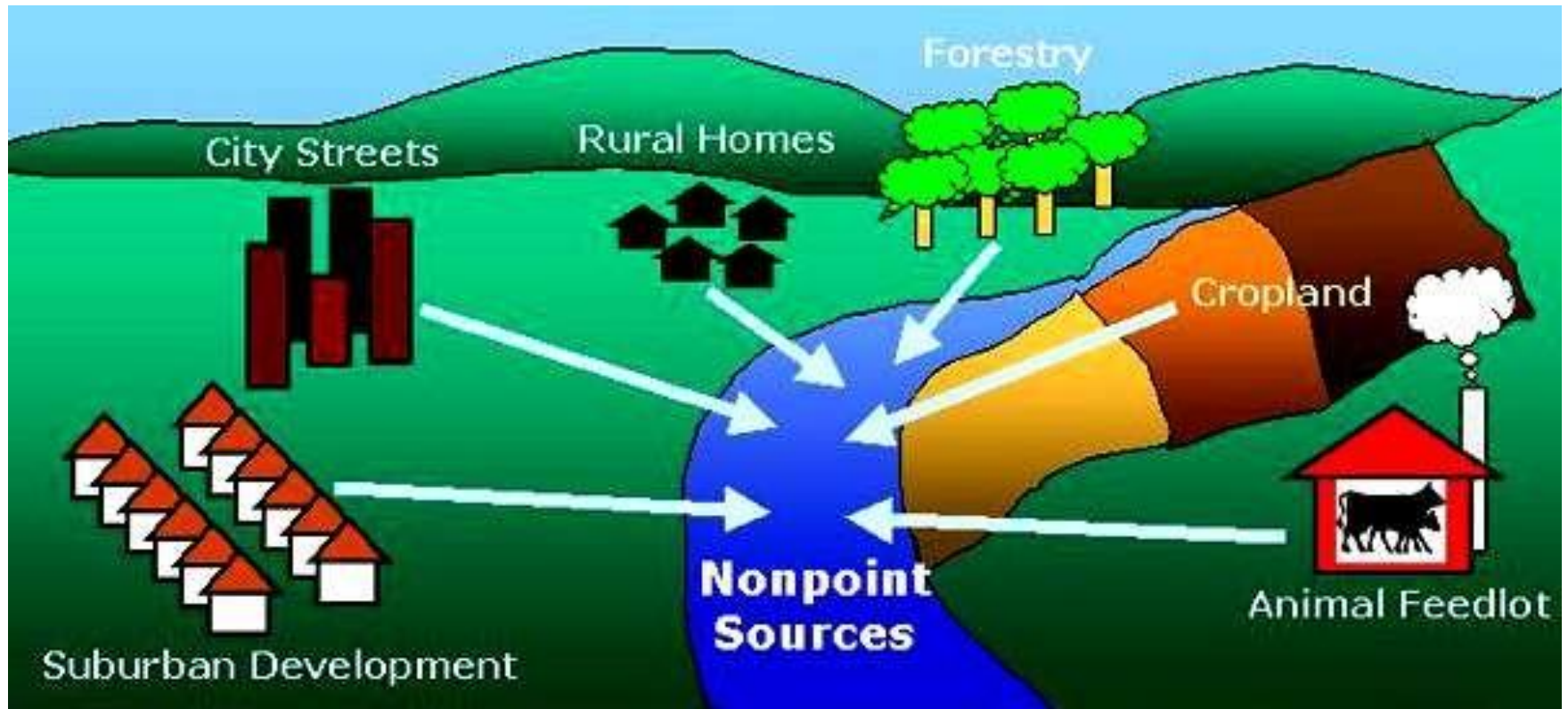


POINT SOURCE POLLUTION



- **Hazardous and toxic materials from manufacturing and industry discharged directly into the water - usually through a pipe or a leaky underground tank**
 - **Oil and gasoline**
 - **Solvents (toxic liquids)**
 - **Toxins and poisons**
 - **Heavy metals (arsenic, lead, mercury, etc.)**
 - **THERMAL POLLUTION - heated water causes the dissolved oxygen (DO) content in a body of water to decrease - can result in fish kills**

NON-POINT SOURCE POLLUTION



A HARDER PROBLEM TO SOLVE

2. Non-point source pollution

Non-point source (NPS) pollution refers to diffuse contamination that does not originate from a single discrete source.

NPS pollution is often accumulative effect of small amounts of contaminants gathered from a large area

- The leaching out of nitrogen compounds from agricultural land which has been fertilized is a typical example.

What are the 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.



Durban South Africa

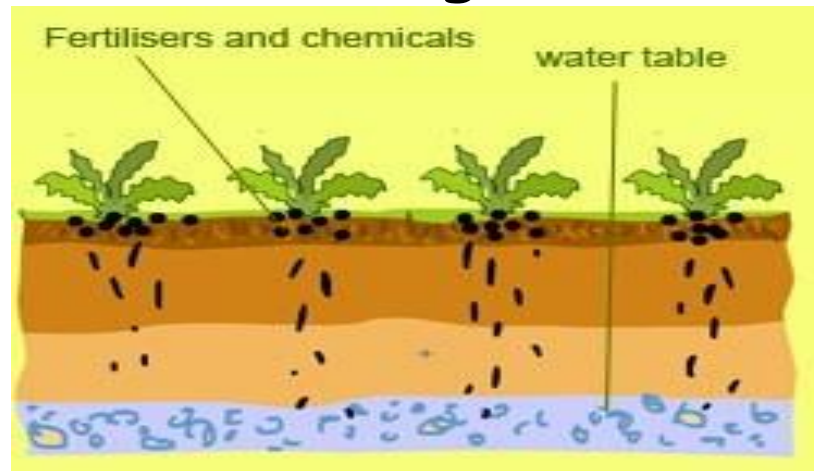
3. Oxygen Depleting

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 rain water. 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 micro-organisms 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 life that live at the floor of water bodies.



Marine Debris

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

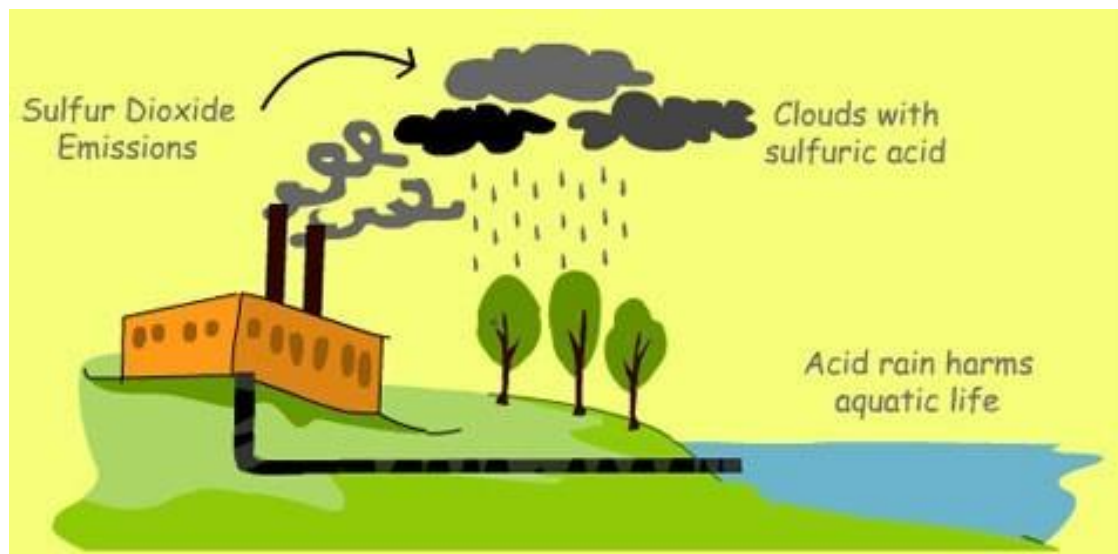
Oil spills usually have only a localized effect on wildlife but can spread for miles. The oil can cause the death to many fish and get stuck to the feathers of seabirds causing them to lose their ability to fly.



Industrial causes of water pollution

Industrial waste

Industries cause huge water pollution with their activities. These come mainly from:
Sulphur – This is a non-metallic substance that is harmful for marine life.



Oil Pollution by Oil Industries

Routine shipping, run-offs and dumping of oils on the ocean surfaces happen everyday. Oil spills cause major problems, and can be extremely harmful to local marine wildlife such as fish, birds and sea otters and other aquatic life. Because oil does not dissolve, it stays on the water surface and suffocates fish. Oil also gets caught in the feathers of sea birds, making it difficult for them to fly. Some animals die as a result.





Other causes of water pollution

Sewage and waste water

Sewage is the term used for wastewater that often contains feces, urine and laundry waste. The sewage and waste water that is produced by each household is chemically treated and released in to sea with fresh water. The sewage water carries harmful bacteria and chemicals that can cause serious health problems. Pathogens are known as a common water pollutant.

A pathogen is any organism that causes disease. Viruses, bacteria, fungi, and parasites are all examples of pathogens







Mining activities

Mining is the process of crushing the rock and extracting coal and other minerals from underground. These elements when extracted in the raw form contains harmful chemicals and can increase the amount of toxic elements when mixed up with water which may result in health problems.





Ocean and marine dumping

Again, think of the rubbish we all make each day. Paper waste, food waste, plastic, rubber, metallic and aluminum waste. In some countries, they are deposited into the sea. All these waste types take time to decompose.









Underground storage and tube leakages

Many liquid products (petroleum products) are stored in metal and steel tubes underground. Other sewage systems run in underground tubes. Overtime, they rust and begin to leak. If that happens, they contaminate the soils, and the liquids in them end up in many nearby water bodies.

Effects of Water Pollution

The effects of water pollution are varied and depend on what chemicals are dumped and in which locations.

Many water bodies near urban areas (cities and towns) are highly polluted. This is the result of both garbage dumped by individuals and dangerous chemicals legally or illegally dumped by manufacturing industries, health centers, schools and market places.

Death of aquatic (water) animals

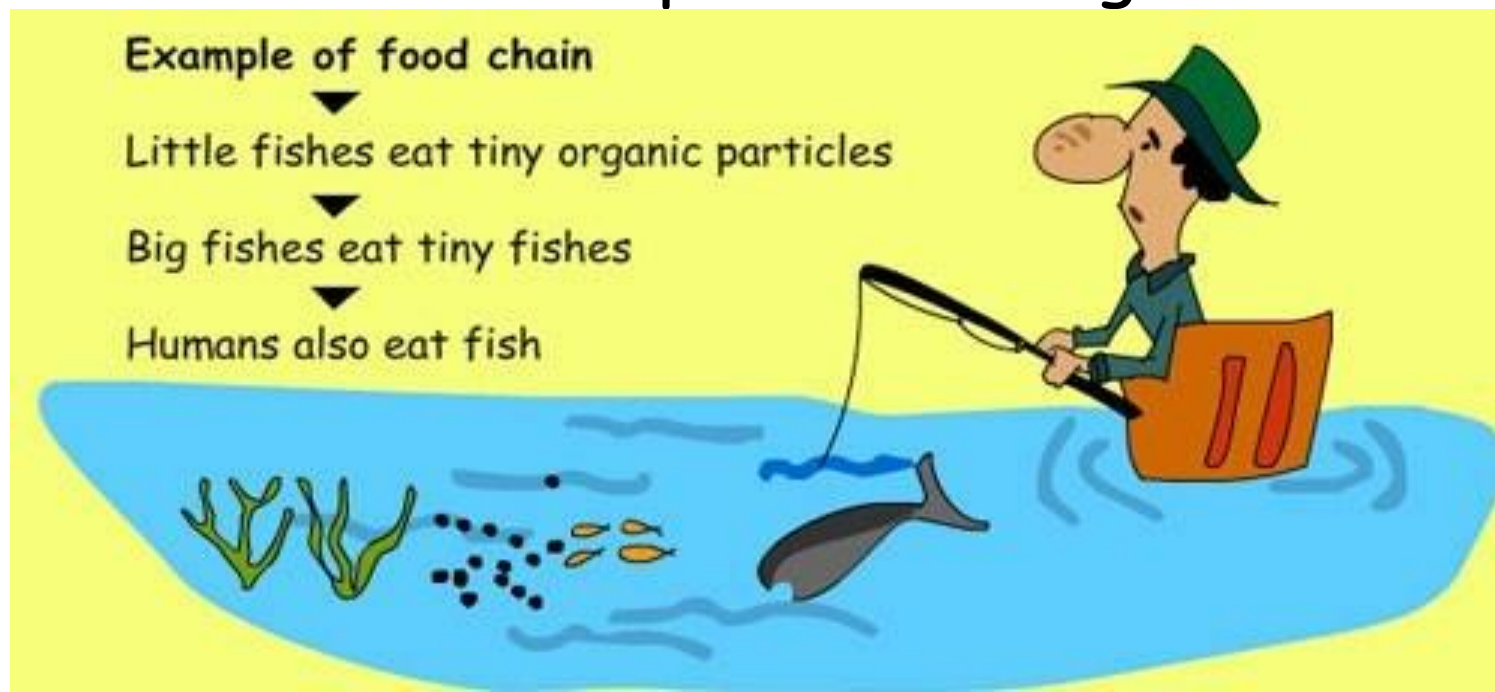
The main problem caused by water pollution is that it kills life that depends on these water bodies. Dead fish, crabs, birds and sea gulls, dolphins, and many other animals often wind up on beaches, killed by pollutants in their habitat (living environment).



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Disruption of food-chains

Pollution disrupts the natural food chain as well. Pollutants such as lead and cadmium are eaten by tiny animals. Later, these animals are consumed by fish and shellfish, and the food chain continues to be disrupted at all higher levels.



Diseases

Eventually, humans are affected by this process as well. People can get diseases such as hepatitis by eating seafood that has been poisoned. In many poor nations, there is always outbreak of cholera and diseases as a result of poor drinking water treatment from contaminated waters.

Destruction of ecosystems

Ecosystems (the interaction of living things in a place, depending on each other for life) can be severely changed or destroyed by water pollution. Many areas are now being affected by careless human pollution, and this pollution is coming back to hurt humans in many ways.



Prevention of Water Pollution

Dealing with water pollution is something that everyone (including governments and local councils) needs to get involved with.



Never throw rubbish away anyhow. Always look for the correct waste bin. If there is none around, please take it home and put it in your trash can. This includes places like the beach, riverside and water bodies.



Use water wisely. Do not keep the tap running when not in use. Also, you can reduce the amount of water you use in washing and bathing. If we all do this, we can significantly prevent water shortages and reduce the amount of dirty water that needs treatment.



Do not throw chemicals, oils, paints and medicines down the sink drain, or the toilet. In many cities, your local environment office can help with the disposal of medicines and chemicals. Check with your local authorities if there is a chemical disposal plan for local residents.



Buy more environmentally safe cleaning liquids for use at home and other public places. They are less dangerous to the environment.



If you use chemicals and pesticides for your gardens and farms, be mindful not to overuse pesticides and fertilizers. This will reduce runoffs of the chemical into nearby water sources. Start looking at options of composting and using organic manure instead.



If you live close to a water body, try to plant lots of trees and flowers around your home, so that when it rains, chemicals from your home does not easily drain into the water.



Liquid Waste (Sewage/Wastewater) Treatment

Wastewater (liquid waste) from flushing the toilet, bathing, washing sinks and general cleaning goes down the drain and into a pipe, which joins a larger sewer pipe under the road. The larger pipe also joins a major pipe that leads to the treatment center.

Pipes take water
to treatment
center

Screening
stage

Primary
treatment stage

Secondary
treatment stage

Final
treatment stage

Filtered
into river

