

An underwater photograph showing a large, clear plastic bottle floating in the water. The bottle is partially filled with a yellowish liquid. Surrounding the bottle are various pieces of debris, including a white plastic bag, a green plastic straw, and some brown leaves. The water is a deep blue-green color, and the scene is dimly lit, suggesting an underwater environment.

Water Pollution: Set the Scene

Class EE375

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Types of water pollutants



Surface Water Pollution



Oxygen Depleting Water Pollution



Microbiological water pollution



Nutrients and their Effect on Water



Groundwater Pollution

Health, environment and economic impacts of water pollution

Human health

Polluted water is the world's largest health risk, and continues to threaten both quality of life and public health. Associated with this are health service costs, loss life expectancy, and emergency health costs associated with major pollution events.



Ecosystem health

Damage to freshwater and marine ecosystems (e.g. fish kill, invertebrates, benthic fauna, flora, habitat degradation) and loss of ecosystem services, which may require investment in additional or different grey infrastructure alternatives to replicate these services.



Agricultural productivity

Exclusion of contaminated water for irrigation results in increasing water scarcity. Irrigation with contaminated water causes damage to, and reduced productivity of, pasture and crops, soil contamination, impacts to livestock health and production, and scouring of infrastructure.



Social values and tourism

Prohibition from recreational use (e.g. swimming, fishing, seafood gathering), beach closure, impacts on aesthetics, cultural and spiritual values. Losses in fishing, boating, rafting and swimming activities to other tourism activities or to other ventures with superior water quality.



Urban and domestic use

Increased water treatment and inspection costs, maintenance costs from scouring and premature ageing of infrastructure, increased wastewater treatment costs with implementation of more strict regulations. Emergency and clean-up costs from spills/accidents.



Property values

Waterfront property values can decline because of unsightly pollution and odour.

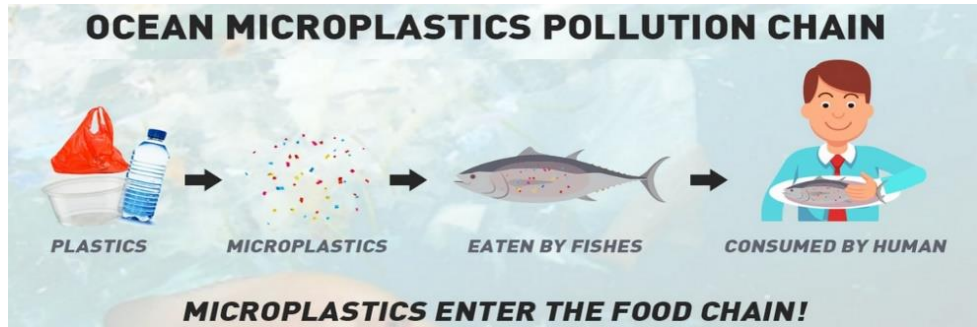


Commercial fisheries

Direct and indirect fish kill, contamination of shellfish.



Problems of water pollution



Impact on health and environment: Water pollution are harmful to the health of humans and animals after long term exposure and different forms of water pollutants have the following impacts:

- **Heavy metals from industrial processes and toxic industrial waste** can accumulate in nearby lakes and rivers. These are toxic to marine life such as fish and shellfish and aquatic animals, and subsequently to the humans who eat them. -> health effect such as immune suppression or acute poisoning.
- **Microbial pollutants from sewage** often result in infectious diseases that infect aquatic life and terrestrial life through drinking water -> cause diseases such as cholera and typhoid fever being the primary cause of infant mortality.
- **Organic matter and nutrients** causes an increase in aerobic algae and depletes oxygen from the water column. This causes the suffocation of fish and other aquatic organisms.
- **Suspended particles in freshwater** reduces the quality of drinking water for humans and the aquatic environment for marine life. Suspended particles can often reduce the amount of sunlight penetrating the water, disrupting the growth of photosynthetic plants and micro-organisms.

Impact on Economy: Water pollution can be damaging to the economy as it can be **expensive to treat and prevent contamination**. There are a number of water treatments to prevent pollution such as biological filters, chemical additives and sand filters. These simple techniques cost money to maintain, but prevention is much cheaper than cleaning up water pollution that has already occurred.

Causes of water pollution (1)



Eutrophication and Water Pollution

Eutrophication is when the environment becomes enriched with nutrients. This can be a problem in marine habitats such as lakes as it can cause algal blooms. Fertilisers are often used in farming, sometimes these fertilisers run-off into nearby water causing an...



Global Warming and Water Pollution

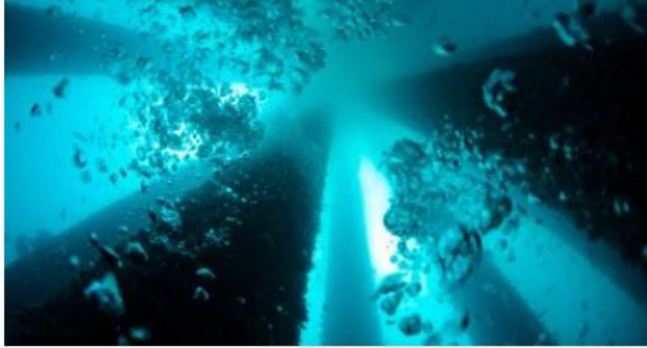
An increase in water temperature can result in the death of many aquatic organisms and disrupt many marine habitats. For example, a rise in water temperatures causes coral bleaching of reefs around the world. This is when the coral expels the microorganisms of which...



Atmospheric Water Pollution

Atmospheric deposition is the pollution of water caused by air pollution. In the atmosphere, water particles mix with carbon dioxide sulphur dioxide and nitrogen oxides, this forms a weak acid. Air pollution means that water vapour absorbs more of these gases...

Causes of water pollution (2)



Underground Storage Leakages

A tank or piping network that has at least 10 percent of its volume underground is known as an underground storage tank (UST). They often store substances such as petroleum, that are harmful to the surrounding environment should it become contaminated. Many UST's...



Oil Pollution in Water

Oceans are polluted by oil on a daily basis from oil spills, routine shipping, run-offs and dumping. Oil spills make up about 12% of the oil that enters the ocean. The rest come from shipping travel, drains and dumping. An oil spill from a tanker is a severe...



Nuclear Waste and Water Pollution

Nuclear waste is produced from industrial, medical and scientific processes that use radioactive material. Nuclear waste can have detrimental effects on marine habitats. Nuclear waste comes from a number of sources: Operations conducted by nuclear power...

Causes of water pollution (3)



Industrial Water and Water Pollution

Industry is a huge source of water pollution, it produces pollutants that are extremely harmful to people and the environment. Many industrial facilities use freshwater to carry away waste from the plant and into rivers, lakes and oceans. Pollutants from industrial...



Marine Dumping & Water Pollution

Dumping of litter in the sea can cause huge problems. Litter items such as 6-pack ring packaging can get caught in marine animals and may result in death. Different items take different lengths of time to degrade in water: Cardboard – Takes 2 weeks to degrade....



Sewage and Wastewater Pollution

Domestic households, industrial and agricultural practices produce wastewater that can cause pollution of many lakes and rivers. Sewage is the term used for wastewater that often contains faeces, urine and laundry waste. There are billions of people on Earth,...

How to prevent water pollution (1)

Water Pollution Prevention

Guidelines for end-users

People can prevent water pollution of nearby rivers and lakes as well as groundwater and drinking water by following some simple **guidelines** in everyday life.

- Conserve water by turning off the tap when running water is not necessary. This reduces the amount of contaminated water that needs treatment.
- Don't throw paints, oils or other forms of litter down the drain. Use environmentally household products, such as washing powder, household cleaning agents and toiletries.
- Take great care not to overuse pesticides and fertilisers. This will prevent runoffs of the material into nearby water sources.
- By having more plants - preventing fertiliser, pesticides and contaminated water from running off into nearby water sources.
- Don't throw litter into rivers, lakes or oceans.

How to prevent water pollution (2)

Water Pollution Prevention

Use laws and conventions to protect the world's oceans, rivers and lakes from unnecessary water pollution

- For example, there have been a number laws enforced to protect the surrounding ocean from marine dumping in Europe through several termination such as the dumping of industrial waste, sewage sludge, polluted materials, nuclear waste
- There are a number of directives given in the EU Environmental Legislation under water framework directive to achieve many objectives regarding health and environmental issues:

Examples of legislation directive:

- The **urban waste water directive** aims to protect surface inland waters and coastal waters from pollution by regulating the collection and treatment of urban waste water.
- The **nitrate from agricultural sources directive** aims to protect waters against pollution caused by nitrates, especially nitrates from agricultural sources such as fertilisers. This will enable marine and freshwaters to be protected from eutrophication.
- The **fish water directive and shell water directive** aims to protect waters from pollution that are primarily used for fishing.
- The **groundwater directive** aims to protect groundwater from dangerous pollutants by controlling the direct and indirect discharges of certain substances into the groundwater.
- The **bathing water directive** aims to keep good standards in the quality of bathing water in freshwater and coastal water areas.

How to prevent water pollution (3)

Water Pollution
Treated

- **Industrial water treatment:** Before raw sewage can be safely released back into the environment, it needs to be treated correctly in a water treatment plant in which sewage goes through a number of chambers and chemical processes to reduce the amount and toxicity of the waste.
- **Denitrification** is an ecological approach that can be used to prevent the leaching of nitrates in soil, this in turn stops any ground water from being contaminated with nutrients.
- **Septic tanks and sewage treatment:** Septic tanks treat sewage at the place where it is located, rather than transporting the waste through a treatment plant or sewage system. Septic tanks are usually used to treat sewage from an individual building.
- **Ozone wastewater treatment** is a method that is increasing in popularity. An ozone generator is used to break down pollutants in the water source. The generators convert oxygen into ozone by using ultraviolet radiation or by an electric discharge field. Ozone is a very reactive gas that can oxidise bacteria, moulds, organic material and other pollutants found in water. Ozone treatment can sometimes produce by-products such as bromate that can harm human health if they are not controlled.