



Asurafifi

*Inorganic Chemistry*

*Lecture 1*

*Pollution*

## Pollution

### Water pollution

Water pollution can come from a number of different sources. If the pollution comes from a single source, such as an oil spill, it is called point-source pollution. If the pollution comes from many sources, it is called non point-source pollution.

Most types of pollution affect the immediate area surrounding the source. Sometimes the pollution may affect the environment hundreds of miles away from the source, such as nuclear waste, this is called transboundary pollution.

### Industrial Waste

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 sources include:

Asbestos - This pollutant is a serious health hazard and carcinogenic. Asbestos fibers can be inhaled and cause illnesses such as asbestosis, mesothelioma, lung cancer, intestinal cancer and liver cancer.

Lead - This is a metallic element and can cause health and environmental problems. It is a non-biodegradable substance so is hard to clean up once the environment is contaminated. Lead is harmful to the health of many animals, including humans, as it can inhibit the action of bodily enzymes.

Mercury - This is a metallic element and can cause health and environmental problems. It is a non-biodegradable substance so is hard to clean up once the environment is contaminated. Mercury is also harmful to animal health as it can cause illness through mercury poisoning.

Nitrates - The increased use of fertilisers means that nitrates are more often being washed from the soil and into rivers and lakes. This can cause eutrophication, which can be very problematic to marine environments.

Phosphates - The increased use of fertilisers means that phosphates are more often being washed from the soil and into rivers and lakes. This can cause eutrophication, which can be very problematic to marine environments.

Sulphur - This is a non-metallic substance that is harmful for marine life.

Oils - Oil does not dissolve in water, instead it forms a thick layer on the water surface. This can stop marine plants receiving enough light for photosynthesis. It is also harmful for fish and marine birds.

Petrochemicals - This is formed from gas or petrol and can be toxic to marine life.

## *Oil Pollution*

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 problem because there is such a huge quantity of oil being spilt into one place.

Oil spills cause a very localised problem but can be catastrophic to local marine wildlife such as fish, birds and sea otters.

Oil cannot dissolve in water and forms a thick sludge in the water. This suffocates fish, gets caught in the feathers of marine birds stopping them from flying and blocks light from photosynthetic aquatic plants.

## *Sewage and Wastewater*

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 so treating sewage is a big priority.

Sewage disposal is a major problem in developing countries as many people in these areas don't have access to sanitary conditions and clean water.

Untreated sewage water in such areas can infect the environment and cause diseases such as diarrhoea.

Sewage in developed countries is carried away from the home quickly and hygienically through sewage pipes.

Sewage is treated in water treatment plants and the waste is often disposed into the sea.

Sewage is mainly biodegradable and most of it is broken down in the environment.

In developed countries, sewage often causes problems when people flush chemical and pharmaceutical substances down the toilet. When people are ill, sewage often carries harmful viruses and bacteria into the environment causing health problems.

## *Nuclear Waste*

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 stations produce radioactive waste. Nuclear-fuel reprocessing plants in northern Europe are the biggest sources of man-made nuclear waste in the surrounding ocean. Radioactive traces from these plants have been found as far away as Greenland.

Mining and refining of uranium and thorium are also causes of marine nuclear waste.

Waste is also produced in the nuclear fuel cycle which is used in many industrial, medical and scientific processes.

## *Dangers to Health*

Virtually all types of water pollution are harmful to the health of humans and animals. Water pollution may not damage our health immediately but can be harmful after long term exposure. Different forms of pollutants affect the health of animals in different ways:

Heavy metals from industrial processes can accumulate in nearby lakes and rivers. These are toxic to marine life such as fish and shellfish, and subsequently to the humans who eat them. Heavy metals can slow development; result in birth defects and some are carcinogenic.

Industrial waste often contains many toxic compounds that damage the health of aquatic animals and those who eat them. Some of the toxins in industrial waste may only have a mild effect whereas others can be fatal. They can cause immune suppression, reproductive failure or acute poisoning.

Microbial pollutants from sewage often result in infectious diseases that infect aquatic life and terrestrial life through drinking water. Microbial water pollution is a major problem in the developing world, with diseases such as cholera and typhoid fever being the primary cause of infant mortality.

Organic matter and nutrients cause an increase in aerobic algae and deplete oxygen from the water column. This causes the suffocation of fish and other aquatic organisms.

Sulfate particles from acid rain can cause harm to the health of marine life in the rivers and lakes it contaminates, and can result in mortality.

Suspended particles in freshwater reduce 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.