

Threats to the Hydrosphere

- Hydrosphere plays an extremely important role in the survival of life on Earth and that the unique properties of water allow various important chemical processes to take place which would otherwise not be possible.
- There are a number of factors that threaten our hydrosphere and most of these threats are because of human activities.
- We are going to focus on two of these issues: **overuse** and **pollution**.

i. Overuse of Water

- Only a very small percentage of the hydrosphere's water is available as freshwater. However, despite this, humans continue to use more and more water to the point where water consumption is fast approaching the amount of water that is available.
- Overuse of water is partly due to population growth, but also because of the increasing needs of industries as they expand and develop.

ii. Water Pollution

- Water pollution is a major problem and is mostly caused due to anthropogenic activities.
- Water pollution means that it is the addition of an excess of undesirable material(s) to water which are harmful to humans, animals, or aquatic life, or otherwise causes significant deviation from the normal activities of living communities in or near water bodies.

Markers of Water Pollution

Biomarkers of water pollution are organisms that live in or are closely associated with bodies of water and provide evidence of pollution either from accumulation of water pollutants or their metabolites or from effects on the organism due to pollutant exposure.

1. Fish are the most common bioindicators of water pollution, and fish lipid (fat) tissue is commonly analyzed for persistent organic water pollutants.

Fish have been widely documented as useful indicators of environmental water quality because of their differential sensitivity to pollution



2. An organism that has been described as “a worldwide sentinel species to assess and monitor environmental pollution in rivers, lakes, reservoirs, and estuaries” is the **osprey** (*Pandionhaliaetus*), a large raptor bird. Chemical and biochemical analyses of osprey feathers, eggs, blood, and organs along with observations of behavior, nesting habits, and populations have been used to assess water pollution.



Water Pollutants

- The greatest necessity of humans is the availability of drinking water and its quality.
- The available water is polluted by human activities, industrial and manufacturing process, discharge of municipal waste water in water bodies.

General Types of Water Pollutants	
Trace elements	Pesticides
Heavy metals	Detergents
Inorganic pollutants	Organic pollutants
Acidity, alkalinity	Sewage


EUTROPHICATION

Eutrophication is an enrichment of water by nutrient salts that causes structural changes to the ecosystem such as: increased production of algae and aquatic plants, depletion of fish species, general deterioration of water quality and other effects that reduce and preclude use.



Formation Mechanism

- Eutrophication is characterised by a significant increase of algae due to the greater availability of one or more growth factors necessary for photosynthesis, such as sunlight, carbon dioxide and nutrients.
- In deep water, a large amount of organic substance accumulates, represented by the algae having reached the end of their life cycle. To destroy all the dead algae, an excessive consumption of oxygen is required, in some cases almost total, by microorganisms. An anoxic environment is thus created on the lake bottom, with the growth of organisms capable of living in the absence of oxygen, responsible for the degradation of the biomass.

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- The microorganisms, decomposing the organic substance in the absence of oxygen, free compounds that are toxic, such as ammonia and hydrogen sulphide. The absence of oxygen reduces biodiversity causing, in certain cases, even the death of animal and plant species.
 - All this happens when the rate of degradation of the algae by microorganisms is greater than that of oxygen regeneration, which in summer is already present in low concentrations.

Structural Changes Caused by Eutrophication:

1. Use of fertilisers
2. Discharge of waste water into water bodies
3. Reduction of self purification capacity