**BLOG WORKSHEET**

**CHEMISTRY CLASS 10**

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**Eutrophication**([Greek](https://en.wikipedia.org/wiki/Greek_language): eutrophia (from eu "well" + trephein "nourish".); [German](https://en.wikipedia.org/wiki/German_language): Eutrophie), or more precisely hypertrophication, is the enrichment of a water body with nutrients, usually with an excess amount of nutrients. This process induces growth of plants and algae and, due to the biomass load, may result in oxygen depletion of the water body.[[1]](https://en.wikipedia.org/wiki/Eutrophication#cite_note-1) One example is the "bloom" or great increase of [phytoplankton](https://en.wikipedia.org/wiki/Phytoplankton)in a water body as a response to increased levels of nutrients. Eutrophication is almost always induced by the discharge of nitrate or phosphate-containing [detergents](https://en.wikipedia.org/wiki/Detergent), [fertilizers](https://en.wikipedia.org/wiki/Fertilizer), or [sewage](https://en.wikipedia.org/wiki/Sewage) into an aquatic system.

## **Mechanism of eutrophication**

Eutrophication arises from the oversupply of nutrients, which leads to overgrowth of plants and algae. After such organisms die, the bacterial degradation of their biomass consumes the oxygen in the water, thereby creating the state of [hypoxia](https://en.wikipedia.org/wiki/Hypoxia_(environmental)).

According to Ullmann's Encyclopedia, "the primary limiting factor for eutrophication is phosphate." The availability of phosphorus generally promotes excessive plant growth and decay, favouring simple algae and plankton over other more complicated plants, and causes a severe reduction in water quality. Phosphorus is a necessary nutrient for plants to live, and is the limiting factor for plant growth in many freshwater ecosystems. Phosphate adheres tightly to soil, so it is mainly transported by erosion. Once translocated to lakes, the extraction of phosphate into water is slow, hence the difficulty of reversing the effects of eutrophication.[[2]](https://en.wikipedia.org/wiki/Eutrophication#cite_note-Nasir-2) However, numerous literature report that nitrogen is the primary limiting nutrient for the accumulation of algal biomass.[[3]](https://en.wikipedia.org/wiki/Eutrophication#cite_note-3)

The sources of these excess phosphates are [phosphates in detergent](https://en.wikipedia.org/wiki/Phosphates_in_detergent), industrial/domestic run-offs, and fertilizers. With the phasing out of phosphate-containing detergents in the 1970s, industrial/domestic run-off and agriculture have emerged as the dominant contributors to eutrophication.[[4]](https://en.wikipedia.org/wiki/Eutrophication#cite_note-4)

### Cultural eutrophication[[edit](https://en.wikipedia.org/w/index.php?title=Eutrophication&action=edit&section=2)]

*Main article:*[*Cultural eutrophication*](https://en.wikipedia.org/wiki/Cultural_eutrophication)

Cultural eutrophication is the process that speeds up natural eutrophication because of human activity.[[5]](https://en.wikipedia.org/wiki/Eutrophication#cite_note-5) Due to clearing of land and building of towns and cities, [land runoff](https://en.wikipedia.org/wiki/Surface_runoff) is accelerated and more nutrients such as [phosphates](https://en.wikipedia.org/wiki/Phosphate) and [nitrate](https://en.wikipedia.org/wiki/Nitrate) are supplied to lakes and rivers, and then to coastal [estuaries](https://en.wikipedia.org/wiki/Estuary) and bays. Extra nutrients are also supplied by treatment plants, golf courses, fertilizers, farms, as well as untreated sewage in many countries.[[6]](https://en.wikipedia.org/wiki/Eutrophication#cite_note-6)

### Lakes and rivers[[edit](https://en.wikipedia.org/w/index.php?title=Eutrophication&action=edit&section=3)]

[](https://en.wikipedia.org/wiki/File:Orange_like_Autumn.jpg)

Eutrophication in a canal

When algae die, they decompose and the nutrients contained in that organic matter are converted into inorganic form by microorganisms. This decomposition process consumes oxygen, which reduces the concentration of dissolved oxygen. The depleted oxygen levels in turn may lead to [fish kills](https://en.wikipedia.org/wiki/Fish_kill) and a range of other effects reducing biodiversity. Nutrients may become concentrated in an anoxic zone and may only be made available again during autumn turn-over or in conditions of turbulent flow.

Enhanced growth of aquatic vegetation or [phytoplankton](https://en.wikipedia.org/wiki/Phytoplankton) and [algal blooms](https://en.wikipedia.org/wiki/Algal_bloom) disrupts normal functioning of the ecosystem, causing a variety of problems such as a lack of [oxygen](https://en.wikipedia.org/wiki/Oxygen) needed for fish and [shellfish](https://en.wikipedia.org/wiki/Shellfish) to survive. The water becomes cloudy, typically coloured a shade of green, yellow, brown, or red. Eutrophication also decreases the value of rivers, lakes and aesthetic enjoyment. Health problems can occur where [eutrophic](https://en.wikipedia.org/wiki/Eutrophic) conditions interfere with drinking [water treatment](https://en.wikipedia.org/wiki/Water_treatment).[[7]](https://en.wikipedia.org/wiki/Eutrophication#cite_note-Bartram_1999-7)

Human activities can accelerate the rate at which nutrients enter [ecosystems](https://en.wikipedia.org/wiki/Ecosystem). Runoff from [agriculture](https://en.wikipedia.org/wiki/Agriculture) and development, pollution from [septic systems](https://en.wikipedia.org/wiki/Septic_system) and [sewers](https://en.wikipedia.org/wiki/Sanitary_sewer), [sewage sludge](https://en.wikipedia.org/wiki/Sewage_sludge) spreading, and other human-related activities increase the flow of both inorganic nutrients and organic substances into ecosystems. Elevated levels of atmospheric compounds of [nitrogen](https://en.wikipedia.org/wiki/Nitrogen) can increase nitrogen availability. [Phosphorus](https://en.wikipedia.org/wiki/Phosphorus) is often regarded as the main culprit in cases of eutrophication in lakes subjected to "point source" pollution from sewage pipes. The concentration of algae and the trophic state of lakes correspond well to phosphorus levels in water. Studies conducted in the Experimental Lakes Area in Ontario have shown a relationship between the addition of phosphorus and the rate of eutrophication. Humankind has increased the rate of [phosphorus cycling](https://en.wikipedia.org/wiki/Phosphorus_cycle) on Earth by four times, mainly due to agricultural fertilizer production and application. Between 1950 and 1995, an estimated 600,000,000 [tonnes](https://en.wikipedia.org/wiki/Tonne) of phosphorus was applied to Earth's surface, primarily on croplands.[[8]](https://en.wikipedia.org/wiki/Eutrophication#cite_note-Carpenter,_S.R._1998-8) Policy changes to control point sources of phosphorus have resulted in rapid control of eutrophication.[[*citation needed*](https://en.wikipedia.org/wiki/Wikipedia:Citation_needed)]