

Overview and common understanding of eutrophication in European Commission and international policies

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ECRAN Multi-beneficiary Workshop, Sarajevo, 16-18 May 2016

Eutrophication

- Eutrophication is a process driven by the enrichment of water by nutrients, especially compounds of nitrogen and/or phosphorus, leading to: increased growth, primary production and biomass of algae; changes in the balance of organisms; and water quality degradation. The consequences of eutrophication are undesirable if they appreciably degrade ecosystem health and biodiversity and/or the sustainable provision of goods and services.

Eutrophication is a natural process!

But humans in their everyday activities can exacerbate the process through:

Point sources

- Sewage treatment plant discharges
- Storm sewer discharges
- Industrial discharges

Non-point sources

- Atmospheric deposition
- Agricultural runoff (fertilizer, soil erosion)
- Septic systems

Nutrients are natural

- Nitrogen in the Earth's atmosphere – 78%
- Nitrogen in the Earth's crust – 20 ppm
 - [P=1,000 ppm]
- Nitrogen in the human body – 4th most abundant element

Human Body (70 kg)

Oxygen: 43 kg
 Carbon: 16 kg
 Hydrogen: 7 kg
 Nitrogen: 2 kg
 Calcium: 1 kg
 Phosphorus
 Potassium
 Sulfur
 Sodium
 Chlorine

Impact of eutrophication

- **Primary impacts**

- Increased algal growth including shift in species composition to fast growing algae species (including toxic species) and a shift from long lived macroalgae to more nuisance species

- **Secondary impacts**

- Reduction in the depth distribution of macroalgae and sea grasses.

- Increased decomposition of organic matter (dead algae) can lead to oxygen deficiency in bottom waters.

- Lowered oxygen concentrations can impact the fish and benthic fauna , which either flee or die from the area.

- Shift in the biodiversity and ecosystem balance

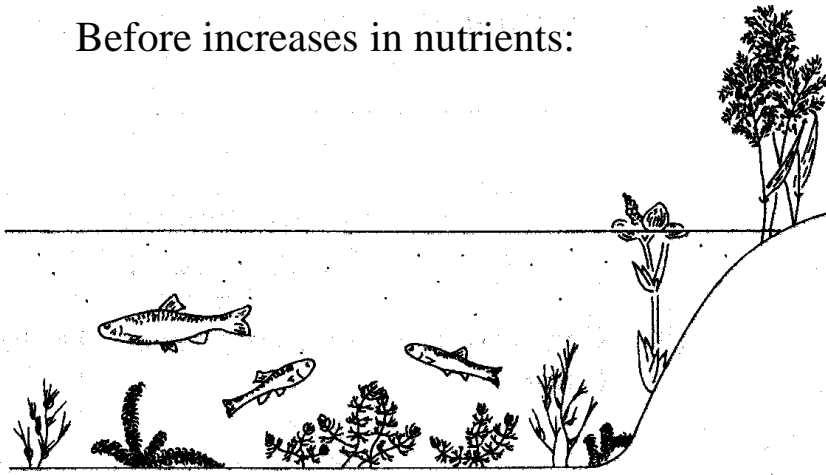
- Oxygen depletion can reduce fish and shellfish stocks and thereby have an economic impact on the fishery industry.

- Algal toxins from harmful algal blooms can cause shellfish poisoning in humans and be of danger to live stocks in coastal water

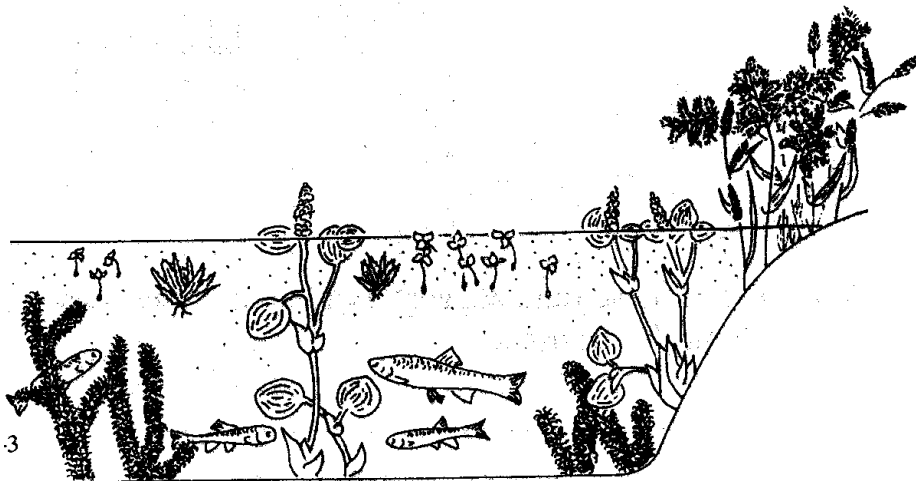
Eutrophication stages

- Addition of nutrients
- Growth of plants
- Death of plants
- Growth of bacteria
- Lack of oxygen
- Suffocation

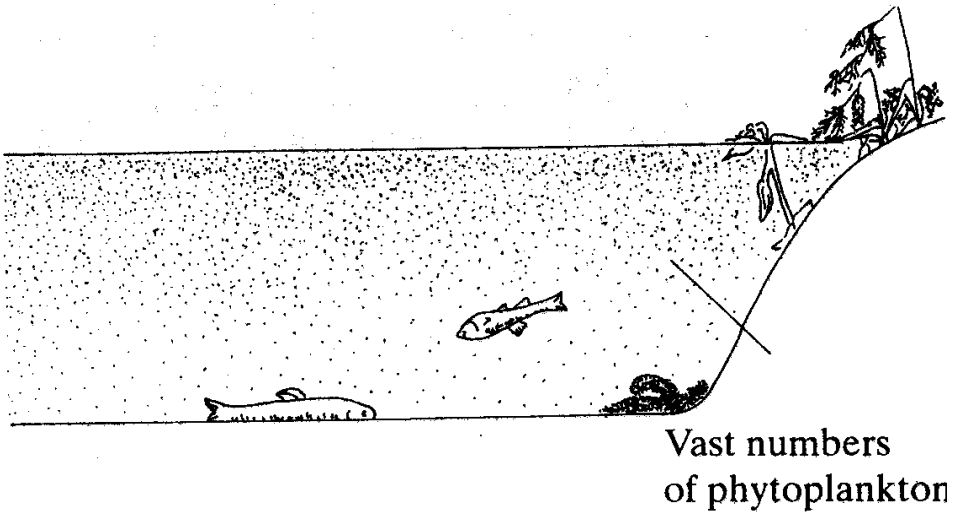
Before increases in nutrients:



Acceleration of eutrophication :



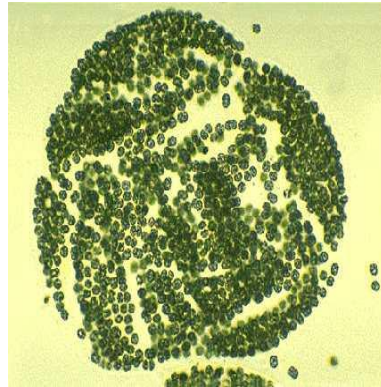
Results of eutrophication :



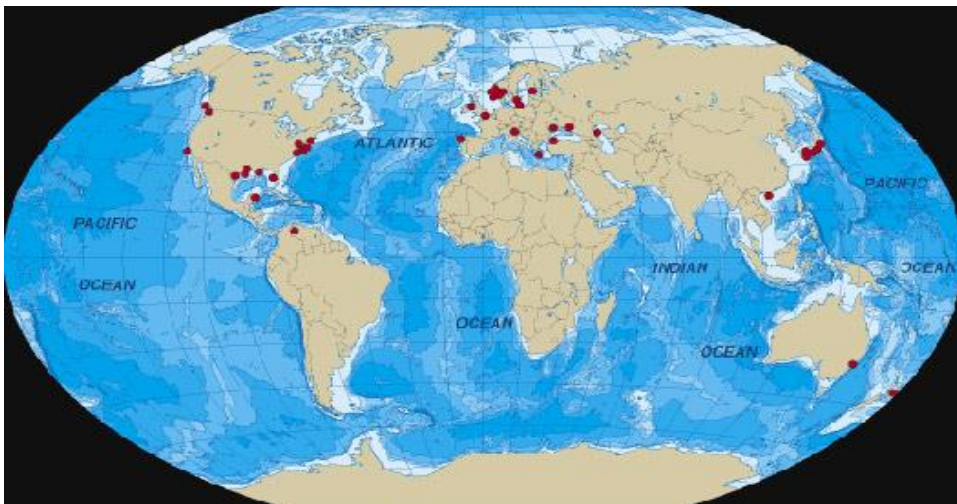


Microcystis

A toxic blue-green alga



Global Location of Dead Zones



Source: NASA http://daac.gsfc.nasa.gov/oceancolor/scifocus/oceanColor/dead_zones.shtml



EU Policy tackling source of eutrophication

- The Nitrate Directive (1991) aims to protect water quality across Europe by preventing nitrates from agricultural sources polluting ground and surface waters and by promoting the use of good farming practices.
- The Urban Waste Water Treatment Directive (1991) aims to protect the environment from the adverse effects of urban waste water discharges and discharges from certain industrial sectors.
- (2000) lays down a strategy to fight against the pollution of water, including adopting specific measures against pollution by individual pollutants or groups of pollutants presenting a significant risk to or via the aquatic environment.

Marine Strategy Framework Directive

- The Marine Directive requires the Members States to reduce the nitrogen and phosphorous loads to the marine environment and thereby to reduce eutrophication.
- Within the Descriptor 5: Eutrophication it is provided that “Human-induced eutrophication is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algae blooms and oxygen deficiency in bottom waters”

Global policy strategies to tackle eutrophication

- Implement research and monitoring programs to characterize the effects of eutrophication, collect water quality data, and inform adaptive management strategies.
- Raise awareness of eutrophication through public awareness campaigns, school environmental education programs, and targeted outreach and technical assistance for effective actions to reduce nutrient losses and eutrophication.
- Implement regulations to mitigate nutrient losses, such as standards, technology requirements, or pollution caps for various sectors.
- Create fiscal and economic incentives to encourage nutrient reducing actions using taxes and fees, subsidies, or environmental markets.
- Preserve and restore natural ecosystems that capture and cycle nutrients.
- Establish strong, and coordinated institutions to address eutrophication..
- Capitalize on environmental synergies when designing comprehensive policies to address eutrophication.

USA-EPA Policy to eutrophication

- Providing states with technical guidance and resources to help them develop water quality criteria for nitrogen and phosphorus as part of their water quality standards regulations for surface waters.
- Working with states to identify waters with nitrogen and phosphorus pollution and to develop Total Maximum Daily Loads to restore the waters by limiting allowable nutrient inputs.
- Awarding grants to states for operating nonpoint source management programs
- Administering a permit program that restricts the amount of nitrogen and phosphorus released to the environment from point sources.
- Providing funding for the construction and upgrading of municipal wastewater facilities and the implementation of nonpoint source pollution control and estuary protection projects.
- Working with its state and federal partners on the Mississippi River/Gulf of Mexico Watershed Nutrient to reduce hypoxia.
- Conducting and/or supporting research on nitrogen and phosphorus pollution-related topics.
- Working to reduce nitrogen oxides emissions through emission standards and the Nox trading program and the acid rain program
- Helping states reduce air pollution and attain clean air standards and manage interstate air pollution from power plants

Conclusions on the eutrophication approach

- Eutrophication is a global problem and tackling the issue is a priority for all regions
- Effects of eutrophication will have a big impact on the water quality, environment and social and economic activities
- Diffuse pollution from agriculture, untreated waste water and some industrial activities are the main source of water eutrophication
- Tackling the diffuse and point sources of nutrient discharges is a priority around the world
- European Union has developed targeted policies toward the reduction of nutrient pollution in inland and marine waters