Eutrophication and designation of sensitive areas or nitrate vulnerable zones

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EUTROPHICATION

- Eutrophication is the accumulation of nutrients in aquatic ecosystems.
- It alters the dynamics of a number of plant, animal and bacterial populations; thus, bringing about changes in community structure.
- It is a form of water pollution and like all other forms of pollution is the result of human activities influencing ecological cycles.

Nutrient discharge from human agglomerations

- Represent an important input to the water nutrient pollution, particularly in the rural area
- Untreated or partially treated waste water discharges affects the rivers, lakes and coastal waters
- Lack of wastewater collection affects mainly the ground waters which many times are discharges within the surface water
- The local industries quite often are discharging waste water within the public sewerage increasing the nutrient concentrations

Eutrophication and sensitive areas in UWWTD

- "eutrophication" means the enrichment of water by nutrients, especially compounds of nitrogen and/or phosphorus, causing an accelerated growth of algae and higher forms of plant life to produce an undesirable disturbance to the balance of organisms present in the water and to the quality of the water concerned;
- Directive requires Member States to designate Sensitive Areas, in conformity with the criteria of Annex II.

Definition of sensitive areas

- (a) natural freshwater lakes, other freshwater bodies, estuaries and coastal waters which are found to be eutrophic or which in the near future may become eutrophic if protective action is not taken.
- (b) surface freshwaters intended for the abstraction of drinking water which could contain more than the concentration of nitrate laid down under the relevant provisions of Council Directive 75/440/EEC of 16 June 1975 concerning the quality required of surface water intended for the abstraction of drinking water in the Member States (') if action is not taken ;
- (c) areas where further treatment than that prescribed in Article 4 of this Directive is necessary to fulfil Council Directives.

Criteria for fresh waters, estuaries and coastal waters

- The following elements might be taken into account when considering which nutrient should be reduced by further treatment :

(i) lakes and streams reaching lakes/reservoirs/closed bays which are found to have a poor water exchange, whereby accumulation may take place. In these areas, the removal of phosphorus should be included unless it can be demonstrated that the removal will have no effect on the level of eutrophication. Where discharges from large agglomerations are made, the removal of nitrogen may also be considered ;

(ii) (ii) estuaries, bays and other coastal waters which are found to have a poor water exchange, or which receive large quantities of nutrients. Discharges from small agglomerations are usually of minor importance in those areas, but for large agglomerations, the removal of phosphorus and/or nitrogen should be included unless it can be demonstrated that the removal will have no effect on the level of eutrophication ;

Status of sensitive areas within EU at 2012

- 12 EU Member States have decided to apply Article 5(8) of the Directive and apply more stringent treatment over the whole territory: AT, CZ, DE, DK, EE, FI, LT, LU, LV, NL, PL and RO
- 7 EU Member States (CZ, DK, EE, FI, LV, LT, LU and RO) apply Article 5(8) and Article 5(2,3). All apply Article 5(8) with sensitivity for N and P with the exception of FI, which applies the Directive with sensitivity for P only (and for some subregions, if this is necessary due to the local situation, sensitivity for N is applied).
- AT, DE, NL and PL apply Article 5(8) and Article 5(4)
- BE, SK and SE apply Article 5(2,3) and have identified all their water bodies as sensitive areas

Diffuse pollution with nutrients

- Is coming mainly from agricultural sources
- Use of fertilizers and manure from livestock for crops is the main source of diffuse pollution
- Quite difficult to assess and monitored
- In rural areas diffuse pollution is complemented by the pollution coming from human agglomerations without sewerage
- Very sensitive to geomorphological features and climate characteristics of the area

EU Nitrate Directive

- The Nitrate Directive issued in 1991.
- Objectives are to reduce water pollution caused or induced by nitrates from agricultural sources and to prevent such pollution.
- Member states must identify Nitrate Vulnerable Zones (NZVs) on the basis of monitoring requirements results.
- Action Programmes with mandatory measures on agricultural practices must be implemented in NVZs. Maximum amounts of animal manure that can be applied to land yearly (210 kg N/ha until mid-December 2002 when the amount will be reduced to 170 kg N/ha).
- Monitoring of water quality according to specific requirements.
- Codes of Good Agricultural Practice (CGAP) must be elaborated and are mandatory in the NVZs and voluntary outside.

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Nitrate Vulnerable Zones

- A nitrate vulnerable zone is a conservation designation for areas of land that drain into nitrate polluted waters, or waters which could become polluted by nitrates.
- The NVZs covered large areas of land that had been identified as exceeding or being at risk of exceeding 50 mg NO_3/l.
- NVZs have rules on fertilizer application involving not fertilizing at certain times of the year (during the winter when runoff is greatest and uptake by plants at a minimum), reducing the amount of fertilizer used, and changing the times when animal waste is applied to the land (waste must be held in tanks over the period when it cannot be applied)..

Method of designation Nitrate Vulnerable Zones

Overlapping three layers information:

- Layer 1: Soil transmission properties for nitrates below root front depth (leaching) and by surface runoff
- Layer 2: Groundwater
- Layer 3: Nitrogen balance NUTS level (import from local farmyard+livestock manure; export by crop yields)

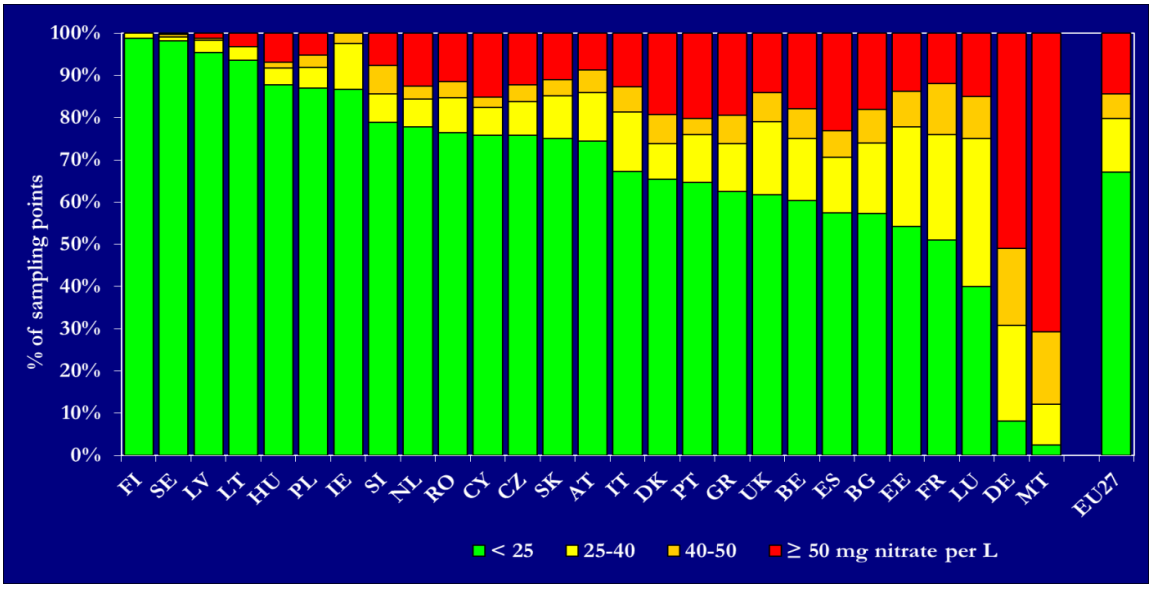
Nitrate Vulnerable Zones in EU 2012

- Action programmes are applying on about 1 952 086.5 km^2 in the year 2012, corresponding to about 46.7% of the total EU land area
- States which apply the Action programmes on entire territory are:Austria, Denmark, Finland, Germany, Ireland, Lithuania, Luxembourg, Malta, the Netherlands, Slovenia, the Region of Flanders, Northern Ireland, Romania, Belgium-Wallonia, Spain Sweden and the United Kingdom

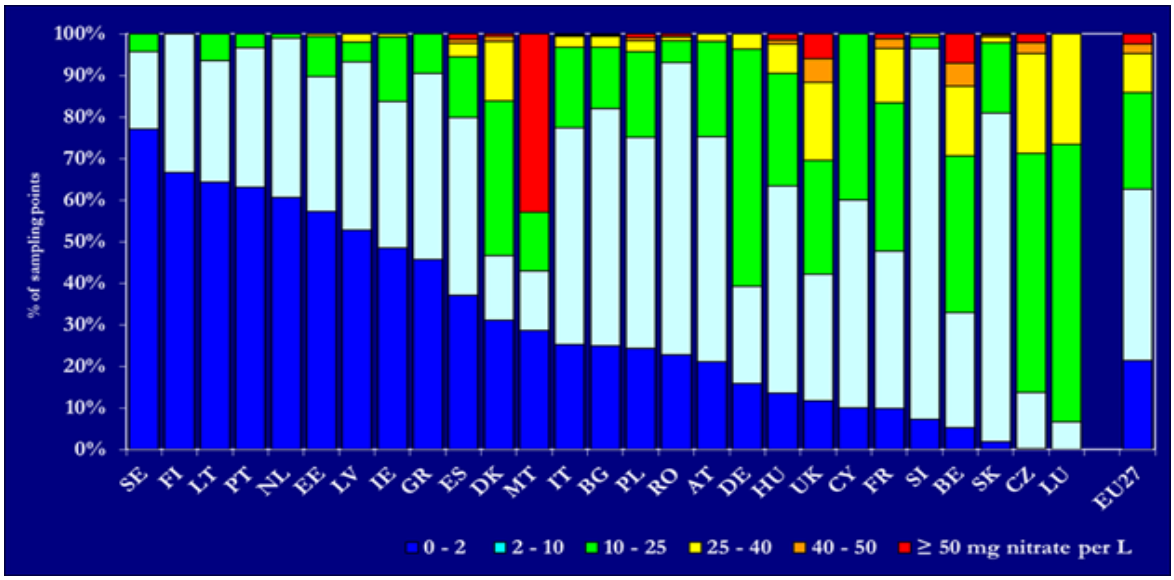
Evolution of the nitrate pollution from agriculture

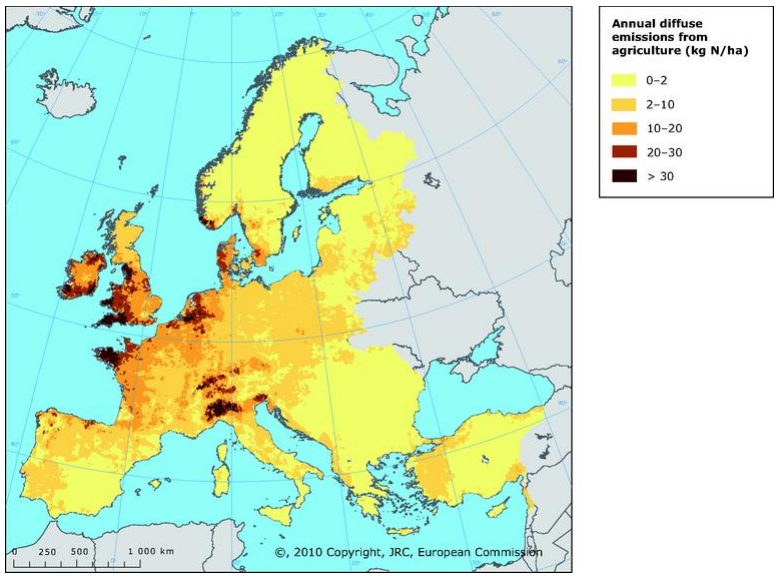
- The pressure from agriculture has decreased, although not uniformly, in the period 2008–2011 compared to 2004–2007 regarding the numbers animals.
- Consumption of chemical fertilizers has decreased, continuing its long-term trend.
- Monitoring of water quality has improved, with an increase in the total number of monitoring stations for groundwater and surface water
- Fresh surface water quality has improved regarding nitrate concentrations.
- Transitional, coastal and marine waters in many parts of Europe remains eutrophic (Baltic Sea, Black Sea, parts of the North Sea and Mediterranean coastline

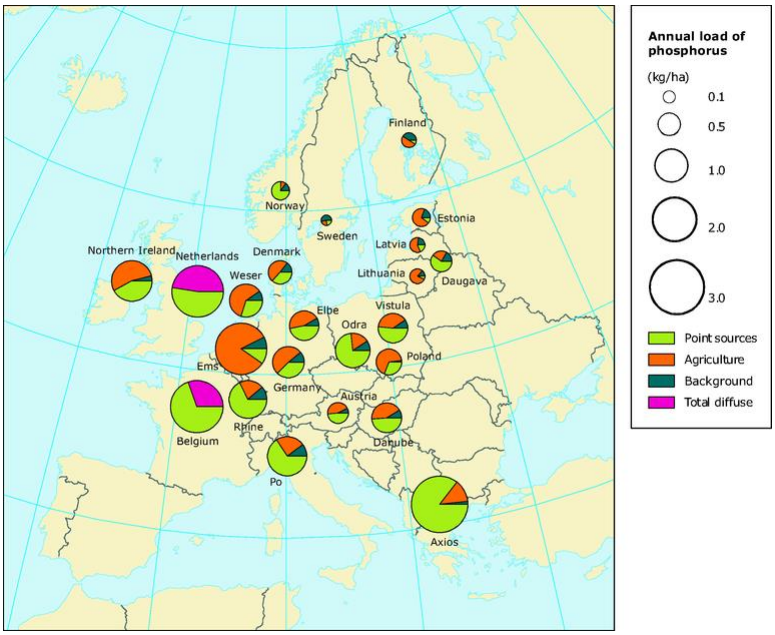
Annual average nitrate concentration in groundwater



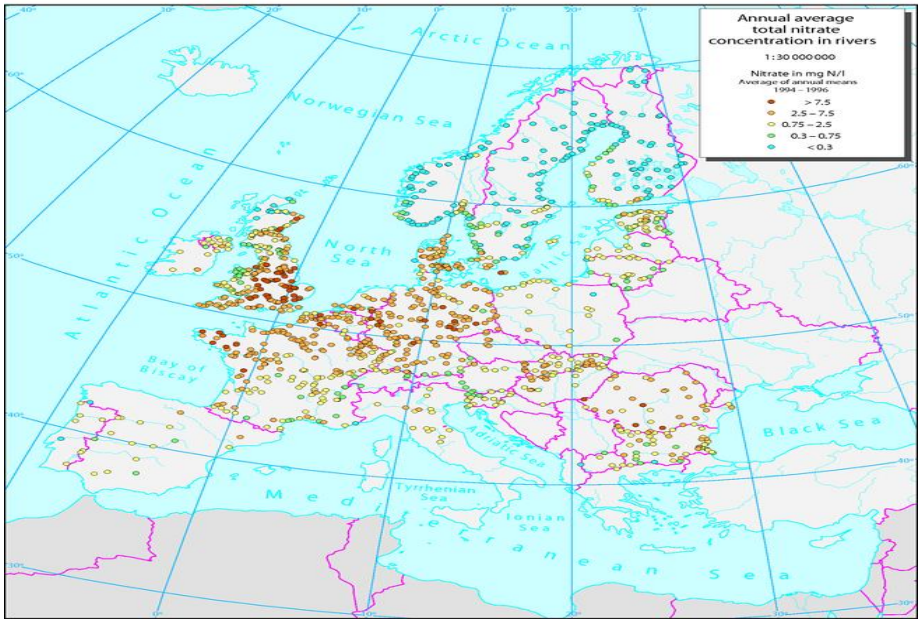
Annual average nitrate concentration in surface water







9.8 Annual average total nitrate concentration in rivers



Map 9.4 Nitrate concentration (mg NO_3/l) in groundwater – frequency distribution at a country level.