

Cross-country comparisons

Freshwater quality — nutrients in rivers



Nutrient enrichment of Europe's freshwaters is a concern, with pollution from agriculture a cause of poor water quality.

Average nitrate concentrations in European rivers reduced by over 20% between 1992 and 2012, whilst orthophosphate concentrations more than halved.

Enhanced integration of water policy objectives into other policy areas, especially agriculture, is essential to ensure that a sufficient quantity of good quality water is available for people's needs and the environment.

Setting the scene

Europe's freshwaters are affected by a range of pressures, including water pollution, water scarcity, floods, and modifications to water bodies that affect morphology and water flow. Nutrient enrichment of freshwaters is widespread. The main sources of nitrogen and phosphorus include point source emissions from urban wastewater treatment plants and industry, and diffuse emissions from agricultural production.

Eutrophication, resulting from excessive inputs of nitrogen and phosphorus to water bodies, results in changes in species' abundance and diversity, as well as problematic algal blooms that result in lower oxygen levels and turbid waters. Excessive nutrient concentrations in rivers can also promote eutrophication in receiving coastal waters. These ecological changes can cause a loss of biodiversity and have negative impacts on the use of water for human consumption and other purposes. This has implications for the provision of ecosystem services such as drinking water, fisheries, and recreation opportunities, and can be costly to remediate.

The SOER 2015 briefing on freshwater quality provides an overview of the status, trends and prospects at a European level. This SOER 2015 cross-country comparison focuses on nutrients, specifically nitrates and orthophosphates in rivers.

About the indicator

The EEA indicator 'nutrients in freshwaters' provides information on annual average nutrient concentrations in groundwater, rivers and lakes. The data presented here are annual average nitrate (or total oxidised nitrogen) and orthophosphate (or total phosphorus) concentrations. Data are collected annually through the Water Information System for Europe — State of Environment (WISE-SoE) collection process, and are sub-samples of national data. More detailed and extensive national data sets are available but this dataset has been assembled for the purpose of providing comparable indicators on a Europe-wide scale.

The indicator only uses complete time series in the assessment. This ensures that the aggregated data series are consistent, i.e. they include the same stations throughout the time series. In this way, assessments are based on actual changes in concentrations and not changes in the number of stations.

The data sets include almost all EEA member and cooperating countries but the time coverage varies amongst countries. See [1] for full details on data handling, methodology, and quality assurance procedures. A 21-year time series (1992–2012) is presented for those countries for which it is available. A 13-year time series (2000–2012) is used for the assessment of change over time, as it is available for the largest number of countries. Finally, those countries with incomplete datasets are included in the figures, but not in any assessment of change over time, as a sufficient time series is needed to assess change due to the inter-annual variability in nutrient concentrations related to factors such as weather and river flow levels.

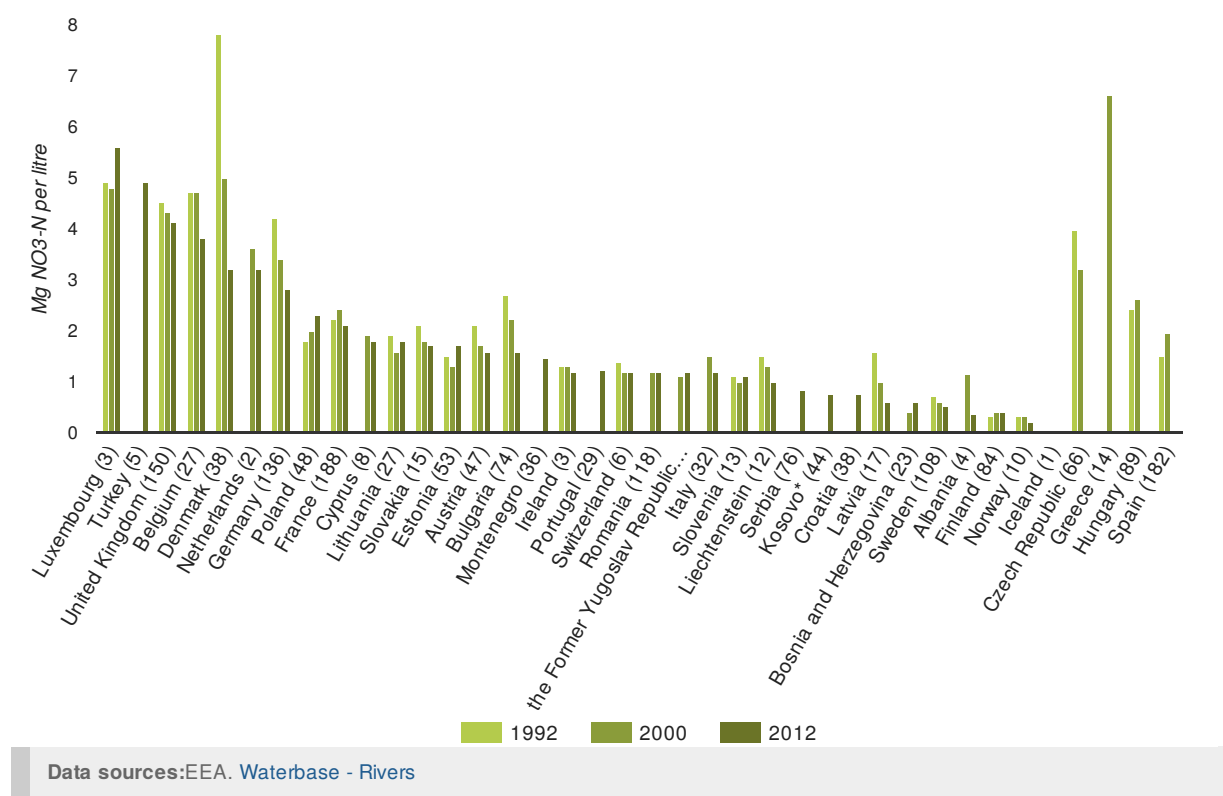
Policies, targets and progress

The main aim of European water policy is to ensure that a sufficient quantity of good quality water is available for people's needs and the environment. The quality of surface waters with respect to eutrophication and nutrient concentrations is an objective of a range of European policies, namely the Water Framework Directive, Nitrates Directive, Urban Waste Water Treatment Directive, Integrated Pollution Prevention and Control Directive, and the Drinking Water Directive, as well as national policies.

There has been a significant reduction in the levels of nutrients in European freshwaters over the past two decades. This is predominantly due to improvements in wastewater treatment and to reduction in point discharges of nutrients and organic pollution to freshwater bodies resulting from implementation of the Urban Waste Water Treatment Directive. The reduction in nutrient levels are also the result of progress in some regions in reducing nitrate pollution from agriculture under the Nitrates Directive.^[1] However, diffuse pollution from agriculture remains a significant pressure in more than 40% of Europe's water bodies in rivers and coastal waters, and in one third of the water bodies in lakes and transitional waters.^[2]

River-draining land subject to intense agricultural production and/or with high population densities (and hence significant input from wastewater treatment plants) tend to have the highest nitrate and phosphorus concentrations. Rivers in more sparsely populated countries of northern Europe and mountainous regions generally have significantly lower average river nitrate concentrations (Figure 1). Reductions in nitrate concentration in rivers are related to changes in how both agriculture and wastewater treatment are managed.

Figure 1: Average concentration of nitrate-nitrogen in rivers in 38 European countries (1992, 2000 and 2012)



Note: Please see reference [3] for additional information

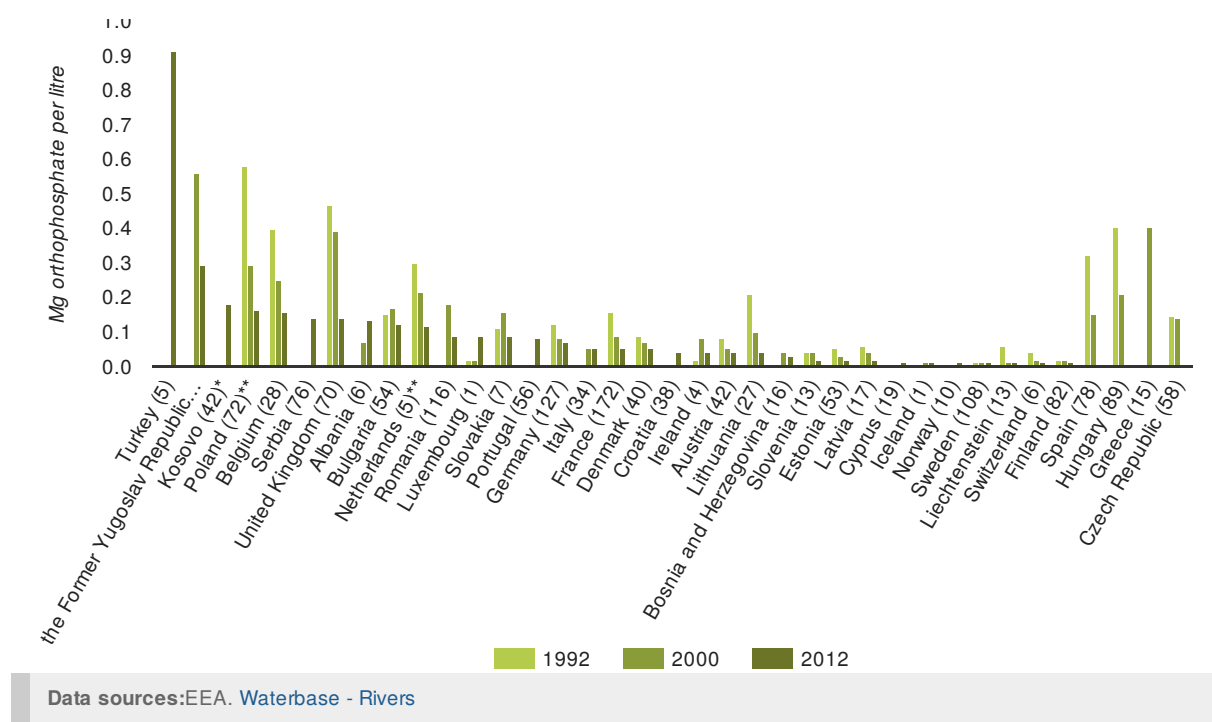
The average nitrate concentration in European rivers has reduced steadily over the period 1992 to 2012, a reduction of 0.5 mg NO₃-N/l, or 0.03 mg NO₃-N/l (0.8%) per year. Overall, there has been a decrease at 44% of stations and an increase at 13%. The countries with the highest proportion of stations with significant decreasing trends are Denmark and Germany. Denmark and Germany also had the largest annual decrease, along with Bulgaria and Latvia. The EEA also publishes interactive maps of the annual mean concentrations of nitrates.^[4]

In 2012, the countries with the highest nitrate concentrations in rivers were Luxembourg, Turkey, the United Kingdom, Belgium and Denmark (Figure 1). Downwards trends in nitrate concentrations in rivers have been recorded in the United Kingdom, Belgium and Denmark, with no significant trend recorded in Luxembourg. Belgium has reported improved compliance with the Urban Waste Water Treatment Directive during this period, as well as reductions in the application of both manure and mineral fertilisers in the Wallonia region.^[5] In Denmark, the reduction in nitrate levels may be related to the effective implementation of the national action programme under the Nitrates Directive and high compliance levels.^[5]

With regards to phosphate, average concentrations in European rivers have decreased markedly over the last two decades, falling by more than half, a rate of 2.1% per year. In 2012, the countries with the highest orthophosphate concentrations in rivers were Turkey, the former Yugoslav Republic of Macedonia, Kosovo under UNSCR 1244/99, Poland and Belgium (Figure 2).

There has been a reduction in orthophosphate concentrations at 52% of river stations while there has been an increase at only 9%. The countries showing the strongest decreasing trends were Austria, Belgium, Denmark, France, Germany, Latvia, Liechtenstein, Lithuania, Switzerland and the United Kingdom. The reduction in phosphorus concentrations in rivers reflects both improvement in wastewater treatment and reductions in phosphorus in detergents.

Figure 2: Average concentration of orthophosphate in rivers in 37 European countries (1992, 2000 and 2012)



Note: Please see reference [6] for additional information

Prospects

Despite the progress outlined above, nutrient enrichment of Europe's freshwaters remains a concern. Reductions reflect improvements in wastewater treatment. However, diffuse pollution from agriculture in particular remains a major cause of poor water quality currently observed in parts of Europe.

European and national policies are in place to promote a continued reduction in nutrient emissions from both point and diffuse sources. There are now high levels of compliance with the Urban Waste Water Treatment Directive in many countries, but further progress is needed in others. However, significant challenges remain in ensuring compliance with Nitrates Directive action programmes, with a particular focus on compliance with the limits on application rates for manures and fertilisers.^[5] The rate of reduction in river nitrate concentrations reflects the continued significance of agricultural nitrogen emissions. Further reduction in nutrient levels will be required to meet the objectives of the Water Framework Directive of achieving good status for water bodies.

However, the integration of water policy objectives into other policy areas needs to be enhanced if the objective of ensuring a sufficient quantity of good quality water is available for people's needs and the environment is to be achieved. Of key importance is the **Common Agricultural Policy (CAP)** and the recent reforms for the period 2013 to 2020, which contain a number of elements that could greatly improve the interaction between agriculture and water policy. In particular, improved **water management**, including fertiliser management, is explicitly identified as a priority for rural development.

Diffuse pollution from agriculture is expected to remain an important contributor to river nutrient levels. Mineral fertilisers represent a significant cost for farmers, implying that techniques to reduce the nitrogen demand of crops and losses to the environment are important in reducing direct costs on farmers as well as in improving water quality.

SOER 2015 cross-country comparisons analyse selected environmental issues across a number of EEA countries. They are part of the EEA's report SOER 2015, addressing the state of, trends in and prospects for the environment in Europe. The EEA's task is to provide timely, targeted, relevant and reliable information on Europe's environment.

For **references**, see www.eea.europa.eu/soer or scan the QR code.

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