Europe's water:
An indicator-based assessment
Summary

European Environment Agency

Cover: EEA
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Foreword

Progress is being made in improving the quality and quantity of Europe's water resources, particularly in the European Union. Much of this improvement has been made through measures aimed at reducing the pressures on Europe's water from households and industry, often introduced through European policy initiatives. However, many of Europe's groundwater bodies, rivers, lakes, estuaries, and coastal and marine waters are still significantly impacted by human activities. For example, pollutant concentrations remain above, and water levels below, natural or sustainable levels. In many parts of Europe this leads to a degradation of aquatic ecosystems and dependent terrestrial ecosystems such as wetlands, and to drinking and bathing water that sometimes fail human health standards.

The EU water framework directive represents a major advance in European policy with the concepts of ecological status and water management at the river basin level being included in a legislative framework for the first time. Ecological status must include an assessment of the biological communities, habitat and hydrological characteristics of water bodies as well as the traditional physico-chemical determinands. For the first time, measures will have to be targeted at maintaining sustainable water levels and flows and at maintaining and restoring riparian habitats.

The success of the water framework directive in achieving its objectives will be dependent on proper implementation by countries. The European Commission is therefore developing a common implementation strategy for the new directive with EU Member States and accession countries.

The achievement of good ecological status for surface waters and good groundwater status will require measures aimed at the agricultural sector in particular. Agriculture has a significant, and in many areas the most significant, impact on Europe's waters. This is reflected, for example, in the continued high concentrations of nitrates and pesticides in surface and groundwaters and in the over-abstraction of water resources for irrigation. It is now recognised that environmental protection needs to be integrated into sectoral policies and legislation (such as the common agriculture policy).

Another area of concern is the lack of appropriate and adequate information on the effects of many chemical substances on aquatic life and human health. Thousands of chemicals are being produced in, and used by, modern society. Many end up in the aquatic environment. Most have not had formal risk assessments, as progress has been very slow in assessing existing chemicals, which is required by legislation. In particular, there is a growing awareness of the issue of chemicals with endocrine mimicking effects.

The EU will incorporate the 10 acceding countries in 2004. Water quality in the acceding countries is often different from that in current 15 EU Member States, reflecting differences in the socio-economic structures and development of the regions. For example, there is less polluting agriculture but poorer wastewater treatment in the acceding countries than in EU Member States. Industry and agriculture has generally been in decline in the acceding countries during the transition to market-oriented economies. Agricultural practices are not so intensive in these countries as in current EU Member States. If acceding countries aim to achieve EU levels of agricultural production then, potentially, water quality and quantity will deteriorate, e.g. nitrate concentrations in surface and groundwaters will increase, as will the nitrate load on Europe's seas. It is, therefore, essential that the development of the economies of acceding countries within the EU is accompanied by the appropriate development and implementation of measures that safeguard the future quality and quantity of water in these countries.

It is my hope that this report provides an overview of the current issues affecting Europe's water and some insights into how it can be better protected and restored in future.

Gordon McInnes
Interim Executive Director

Introduction

This summary presents the main findings and key messages from a report *Europe's water — an indicator-based assessment* (EEA, 2003), which assesses the quality and quantity of Europe's water. Its geographical scope is the European Union, EFTA and EU accession and candidate countries. Four water issues — ecological quality, nutrients and organic pollution of water, hazardous substances and water quantity — were assessed on the basis of the EEA draft core set of water indicators, and were selected for their representativeness and policy relevance.

Using these indicators, the report seeks to answer a number of questions that have been formulated to assess whether the broad objectives and targets of EU water policy are being achieved and to indicate where policy gaps may occur.

These objectives are set out in such documents as the European Community's sustainable development strategy, common fisheries and common agricultural policies, sixth environment action programme and the forthcoming marine thematic strategy. Relevant EU legislation includes the water framework directive and directives on: integrated pollution prevention and control (IPPC), dangerous substances in water, urban waste water treatment, nitrates, bathing water and drinking water.

Main findings and key messages

☺	**positive development in state or decreased pressure**
😐	**no clear development in state or pressure**
☹	**negative development in state or increased pressure**
○	**important finding (bad)**
◉	**important finding (good)**

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The EEA is developing a core set of water indicators to help streamlining of European water reporting and to make it more policy relevant.	23

Ecological quality

The EU water framework directive, which came into force at the end of 2000, will fundamentally change how water is monitored, assessed and managed in many European countries. Two of the key concepts it introduces to legislation are 'ecological status' and 'water management at the river basin level'.

Ecological status is an expression of the quality of the structure and functioning of aquatic ecosystems. Three groups of quality elements (biological, hydromorphological and physico-chemical) have been identified in the water framework directive as necessary to classify the ecological status of a particular water body. Member States are required to achieve good surface water and groundwater status by 2015, which means the status achieved by a surface water body when both its ecological and its chemical status are at least good. For groundwater, chemical quality and quantitative status should be good. The rates of abstraction from our water resources have to be sustainable over the long term.

At present it is not possible to obtain a full overview of the ecological status of Europe's waters since there are many significant shortfalls and gaps in countries' information, monitoring and assessment systems (Figure 1). However, the Commission and Member States are working together under a common implementation strategy to fill these gaps and to gain a common understanding of what is required under the water framework directive.

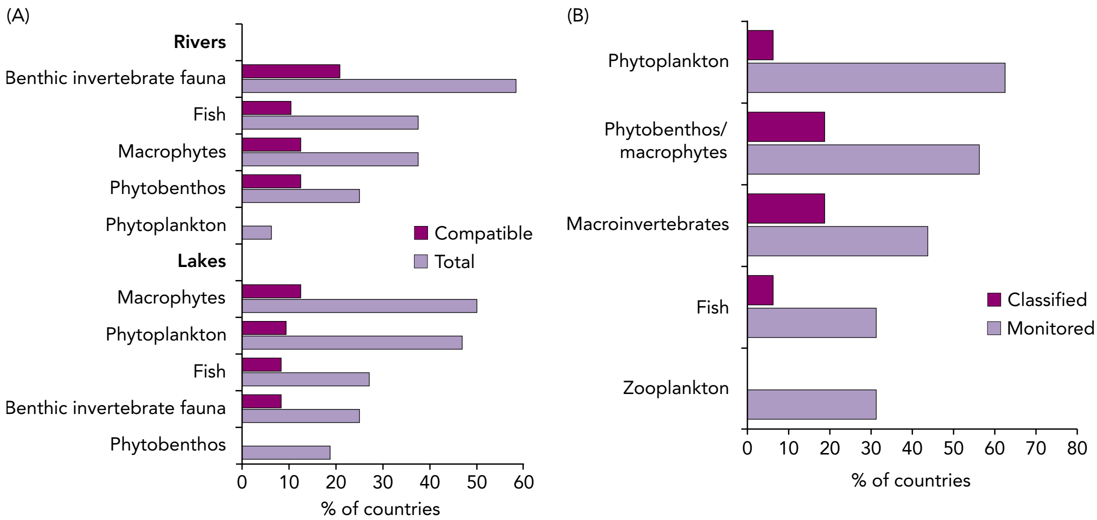
Good ecological status of a water body requires that there is enough water of good quality in the water body to allow the naturally occurring species to live and reproduce.

Photo: Bent Lauge Madsen

> There is a large gap between what is required by the water framework directive in terms of monitoring and classification of ecological status, and what is currently undertaken by countries.

Many European countries have river classification schemes designed to give an indication of river water quality. Physico-chemical quality elements (such as pH, dissolved oxygen and ammonium) are most frequently used in these schemes but there are also many examples where biological quality elements (e.g. benthic invertebrates) are used. Although the countries have different schemes they give a general indication of river water quality, particularly whether, according to a country's scheme, there has been an improvement or not. Based on country results, the majority of river classification schemes show an improvement in quality in recent years (Figure 2).

Figure 1 **A) Biological quality elements in river and lake classification systems and compatibility with the water framework directive, and B) the biological quality elements monitored and categorised in transitional and coastal waters in EU (and Norway)**

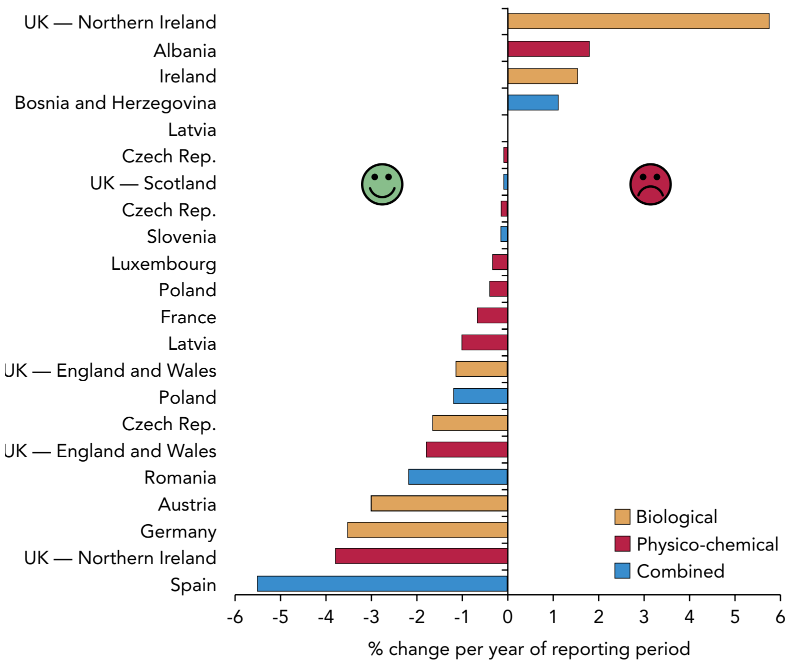


Source A: Compiled by ETC/WTR from contributions to the Common implementation strategy working group 2.3 (REFCOND). Information from 16 countries.

Source B: Compiled by ETC/WTR from contributions to the Common implementation strategy working groups 2.4 (coast) and 2.7 (monitoring). Information from 14 countries with a coastline.

Note that the monitoring of zooplankton is not required by the water framework directive.

Figure 2 **Rate of change in river category between less than good and good**



Sources: Compiled by ETC/WTR from national reports and questionnaire returns from national regional centres.

The water framework directive will introduce ecological status classification schemes that will integrate the effects of chemical pollution and the effects of changes in habitat quality. Ecological quality integrates all pressures and shows the overall status of the ecosystem.

River water quality in Europe is improving in most countries

Some countries have also developed national classification schemes for their lakes. These are generally based on nutrients (mainly phosphorus) and on chlorophyll-a concentrations.

There have been many improvements in the quality and quantity of Europe's water as a result of controlling and managing the pressures (e.g. discharges and abstractions) that arise from households and industry. In the future, new focus and emphasis will have to be given to effective measures to reduce the impacts arising from agriculture if further improvements are to be obtained, particularly in the achievement of good water status. Agriculture activity is significant in terms of: pollution of water by nitrates, phosphorus, pesticides and pathogens; habitat degradation; and over-abstraction of water for irrigation (to be explained in subsequent sections).

Changes to the structures of water bodies as well as water abstractions and other physical changes such as damming and channelisation will also have to be addressed.

> The impact of agriculture on Europe's water resources will have to be reduced if good surface water status and good groundwater status are to be achieved. This will require the integration of environmental and agricultural policies at European level.

Effective measures will require integration of environmental policies, such as the water framework directive and nitrates directive, with the common agricultural policy. However, the implementation of the nitrates directive across Europe has been extremely poor generally, with all but two countries (Denmark and Sweden) having infringement proceedings brought against them at some stage since the directive came into force in 1991. Nitrate surpluses in agricultural soils are still high in EU countries (around 50–100 kg N per hectare of agricultural area) and remained nearly constant between 1990 and 1995.

> There is a large nitrogen surplus in the agricultural soils of EU countries that can potentially pollute both surface and groundwaters.

There is a long tradition in Europe of investigating the pollution status of water bodies. In particular, chemical water quality has been investigated based on monitoring and assessment of organic matter and nutrients. For water quantity the focus has been on monitoring and assessment of water availability, water abstraction and its impacts and water uses. Thus there is a relatively large amount of information on some of these aspects. The following assessment makes use of indicators on nutrients and organic pollution, hazardous substances and water quantity.

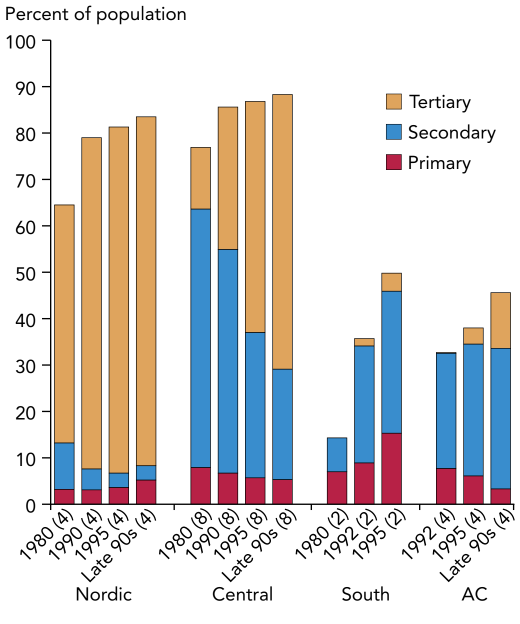
Nutrients and organic pollution

The relevant policy objectives in terms of nutrients and organic pollution of water are: to prevent further deterioration of water quality; to reduce current pollution; and to achieve levels of water quality that safeguard both human health either through drinking water or recreational bathing, and also aquatic ecosystems. Relevant EU directives for the achievement of these objectives are the water framework directive, and the IPPC, bathing water, drinking water, nitrate and urban waste water treatment directives.

Figure 3 **Wastewater treatment in Europe between 1980s and late 1990s**

Notes: Only countries with data from all periods are included, the number of countries in parentheses. Nordic: Iceland, Norway, Sweden, Finland. Central EEA: Austria, Ireland, United Kingdom, Luxembourg, Netherlands, Germany, Denmark Switzerland. Southern: Greece and Spain. AC: Bulgaria, Estonia, Hungary and Poland

Sources: EEA – ETC/WTR based on Member States data reported to OECD / Eurostat Joint Questionnaire 2000.



There has been a marked improvement in the level of treatment and proportion of the population connected to treatment plants in western countries since the 1980s (Figure 3). In the north and central western countries most of the population is now connected to wastewater treatment plants, many to tertiary plants (removal of nutrients). In southern western Europe, Belgium, Ireland and central and eastern EU accession countries, currently only around half of the population is connected to wastewater treatment plants, with 30–40 % of the population connected to secondary (removal of organic matter) or tertiary treatment plants. However, many large cities still discharge their wastewater almost untreated (e.g. Brussels, Milan and Bucharest).

Wastewater treatment in all parts of Europe has improved significantly since the 1980s.

However the percentage of population connected to wastewater treatment is relatively low in Belgium, Ireland, southern Europe and in the accession countries.

In many western European countries point source discharge of organic matter is now only 10–20 % of the highest discharges that occurred in the 1980s. In the central and eastern EU accession countries, the organic matter discharged from point sources decreased dramatically during the 1990s. This was partly due to the economic recession in the first half of the 1990s and the consequent decline in highly-polluting heavy industry, but also due to construction of wastewater treatment plants. Although economies have since improved and industrial output has increased, there has been a shift towards less-polluting industries and former pollution levels have not been reached again.

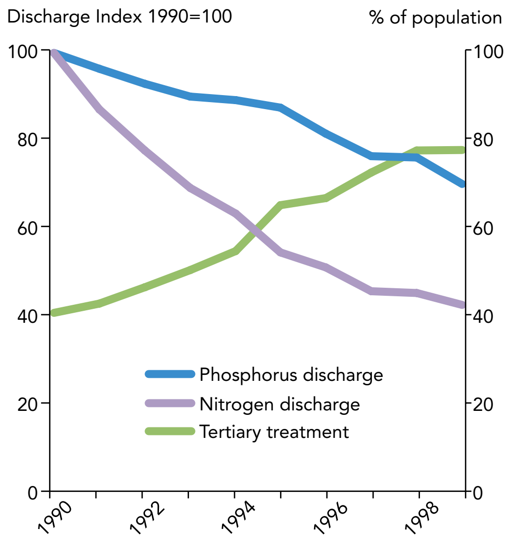
In several countries in north-western Europe there was a marked increase in the percentage of population connected to tertiary wastewater treatment during the 1990s with increased production of sewage sludge. In the countries included in Figure 4 the percentage of population connected to tertiary treatment increased from 40 % to 80 %. In the same period the discharge of nitrogen and phosphorus from wastewater treatment decreased by 30 % and 60 % respectively, reflecting that nearly all the tertiary treatment plants have phosphorus removal while only some of the plants, in particular the large plants, have nitrogen removal.

The quality of Europe's rivers and lakes has improved markedly during the 1990s as a result of the reduction in loads of organic matter and phosphorus arising largely from wastewater treatment and industry.

Reduction in point source discharges is reflected in significantly improved river conditions. During the 1990s the biochemical oxygen demand (BOD) levels improved by around 20–30 % in both EU and accession country rivers. The reduction in ammonium concentrations in the 1990s was even greater than BOD, with a 40 % decrease in EU rivers and a nearly 60 % decrease in accession countries' rivers.

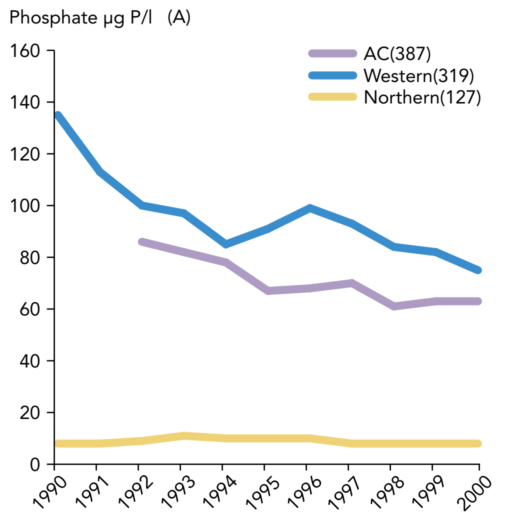
Phosphorus concentrations in EU and accession country rivers generally declined by 30–40 % during the 1990s (Figure 5A). In particular, the countries with average concentrations higher than 200 µg P/l in the beginning of the 1990s, indicating high pollution by point sources, had a marked decrease in phosphorus concentration. These decreases reflect both the general improvement in wastewater treatment during this period and recession in accession countries.

Nutrient discharges and wastewater treatment in selected western European countries — Figure 4

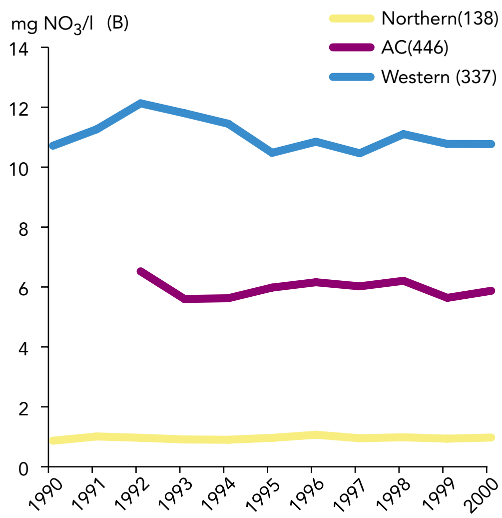


Note: N and P discharges: Denmark, Finland, the Netherlands, Norway (no data on nitrogen) and Sweden.

Phosphate (A) and nitrate (B) in European rivers — Figure 5

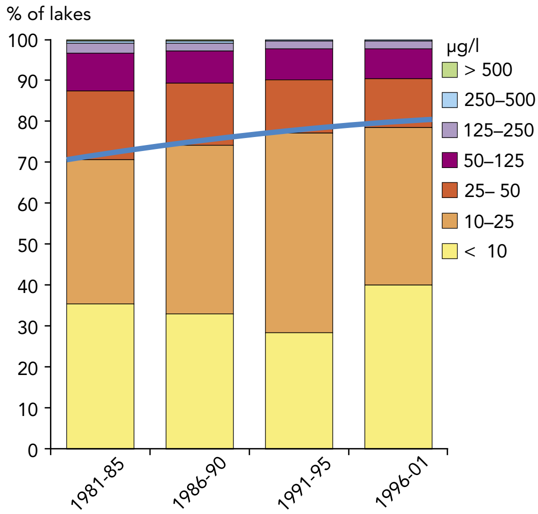


Note: Data collected by Eurowaternet: Western: Denmark, Germany, France and the UK, Northern: Finland and Sweden and AC: Slovenia, Poland, Latvia, Lithuania, Hungary, Estonia and Bulgaria. Number of stations in brackets



Note: Data collected by Eurowaternet: Western: Denmark, Germany, France and the UK, Northern: Finland and Sweden and AC: Slovenia, Poland, Latvia, Lithuania, Hungary, Estonia and Bulgaria. Number of stations in brackets

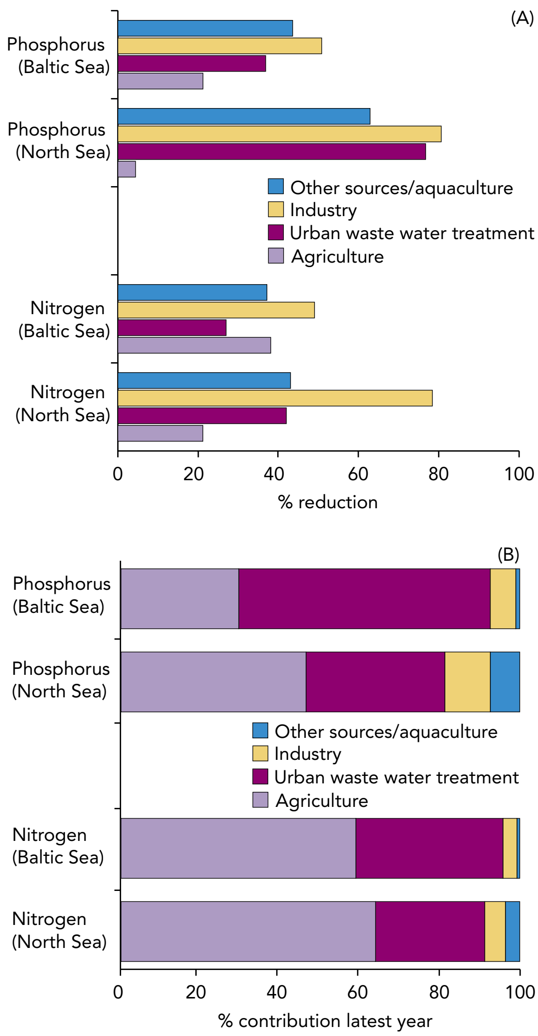
Figure 6 **Average summer concentration of phosphorus in lakes**



Note: Based on 369 lakes from Austria (5), Denmark (11), Germany (5), Finland (203), France (1), Ireland (6) and Sweden (138). Numbers of lakes in brackets.

Source: Eurowaternet-Lakes, 2001.

Figure 7 **A) Reduction of loads of nitrogen and phosphorus into the North and Baltic Seas since 1985, and B) sectoral contribution to nitrogen and phosphorus loads in the North and Baltic Seas.**



Note: Urban wastewater treatment (UWWT). Percentage reductions between 1985 and 2000 for North Sea and late 1980s and 1995 for Baltic Sea. Latest year: North Sea 2000, Baltic Sea 1995.

Sources: North Sea Progress Report 2002; Helcom 2002.

In contrast to phosphorus, no clear trends for nitrates in rivers are evident although concentrations are lower in the accession and northern countries due to the lower intensity of agriculture (Figure 5B). A few countries, Latvia, Germany and Denmark, had indication of lower river nitrate concentrations in the late 1990s. Overall, current concentrations of phosphorus and nitrate are still significantly above what might be considered natural or 'background' levels.

> Nitrate concentrations in rivers have remained relatively stable throughout the 1990s and are highest in those western European countries where agriculture is most intensive.

The reduction in point source loads has also been reflected in an improvement in lake water quality. In the past 20 years, the proportion of lakes and reservoirs with low phosphorus concentrations (< 25 µg P/l) increased from 75 % to 82 % of 369 lakes with long time series (Figure 6). This indicates that eutrophication in European lakes is decreasing. However, diffuse pollution, particularly from agriculture, continues to be a problem.

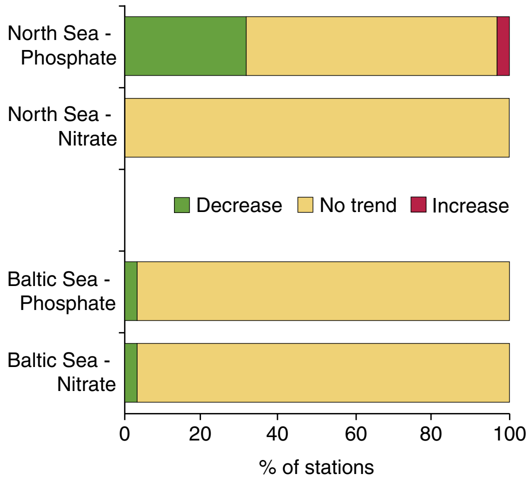
There have also been associated decreases in riverine and direct discharges of nutrients to the North and Baltic Seas (Figure 7) though this reduction is not always reflected in reductions in marine water concentrations of nutrients (Figure 8). This is because there is a complex relationship between riverine and direct discharges of nitrogen and phosphorus and the concentration of nutrients in coastal waters, estuaries, fjords and lagoons, which in turn affect their biological state. Data for the Black Sea and Mediterranean Seas are much less comprehensive than for the Baltic and North Seas and do not allow an assessment of trends in loads.

Loads of both phosphorus and nitrogen from all quantified sources to the North Sea and Baltic Sea have decreased since the 1980s.

Nutrient concentrations in Europe's seas have generally remained stable over recent years, though a few stations in the Baltic, Black and North Seas have demonstrated a slight decrease in nitrate and phosphate concentrations.

A smaller number of stations in the Baltic and North Seas showed an increase in phosphate concentrations.

Nitrate and phosphate concentrations in North and Baltic Seas — Figure 8



Notes: Trend analyses are based on a time series 1985–2000 with each monitoring station having at least three years data in the period 1995–2000. Number of stations in brackets.
Baltic Sea data from: Denmark, Finland, Germany, Latvia, Lithuania, Poland, Sweden.
North Sea data from: Belgium, Denmark, Germany, the Netherlands, Norway, Sweden, UK.

Source: OSPAR, Helcom, ICES, BSC and EEA member countries compiled by ETC Water.

Individual countries have reported reductions of nitrate and phosphorus concentrations at locations in their coastal waters. For example, there has been a decrease in nitrogen and phosphorus concentrations since 1991 in Dutch coastal waters, which is in line with the reductions in nitrate and phosphorus loads of the River Rhine.

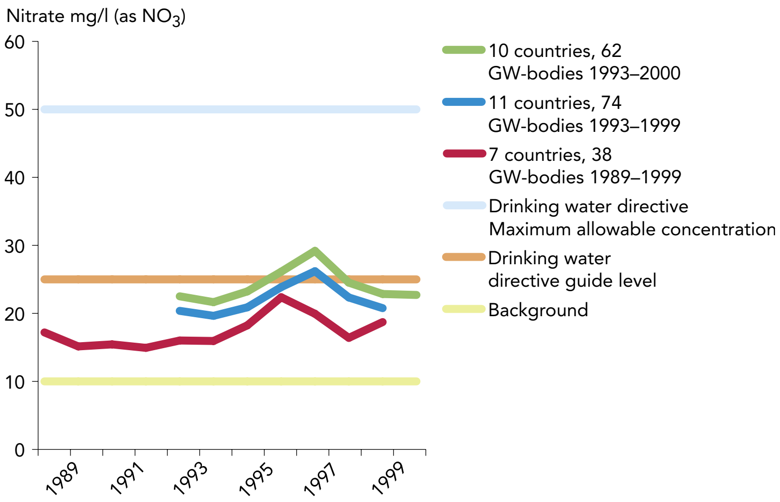
Europe's groundwater is polluted in several ways. Some of the most serious problems are pollution by nitrate and pesticides. Nitrate is a significant problem in parts of Europe, in particular, in regions with intensive livestock production. In general, there is no improvement in the nitrate situation in European groundwater during the 1990s (Figure 9). Nitrate drinking water limit values are exceeded in around one-third of the groundwater bodies for which information is currently available.

There is no evidence of a decrease (or increase) in levels of nitrate in Europe's groundwater.

Excessive nutrient concentrations in water bodies can lead to the adverse effects of eutrophication. In severe cases microscopic algae in the water occur in enormous amounts. When dying and sinking to the bottom, they decompose and use up the oxygen in the water, leading to a change in the composition of the bottom community from a heterogenous community to a layer of white sulphur bacteria. This results in the escape or death of fish and bottom dwelling animals.

Photos: Helen Munk Sørensen and Peter Bondo Christensen

Figure 9 **Average nitrate concentration in European groundwater bodies**



Notes: The figure compares three time series containing different numbers of groundwater bodies, time spans and countries. 1993 to 1999 time series: Austria, Belgium, Bulgaria, Denmark, Estonia, Spain, Hungary, Lithuania, Latvia, the Netherlands, Slovenia, Slovak Republic. 1993 to 2000 time series: Austria, Belgium, Bulgaria, Denmark, Estonia, Lithuania, Latvia, the Netherlands, Slovenia, Slovak Republic. 1989–1999 time series: Bulgaria, Denmark, Estonia, Hungary, Lithuania, the Netherlands, Slovak Republic.

Source: Eurowaternet-Groundwater, 2002

In many EEA countries drinking water is contaminated by nitrate. For example, over 3 % of drinking water samples taken in France, Germany, and Spain exceeded nitrate standards set in EU legislation. The significance of these exceedances has, however, not been quantified, as there is no complementary information on the duration and level of exceedance, or on the number of people exposed. In accession countries, shallow wells in central and southern Poland are known to be contaminated and in Bulgaria it is estimated that, in the early 1990s, up to 80 % of the population was exposed to nitrate concentrations greater than 50 mg/l.

Nitrate in drinking water is a common problem across Europe, particularly from shallow wells.

Sewage and animal waste are sources of contamination of drinking water and recreational waters by pathogens and other microbiological organisms. The bathing water directive (76/160/EEC) was designed to protect the public from accidental and chronic pollution which could cause illness from recreational water use. It lists a number of parameters to be monitored but the focus has been on bacteriological quality.

The quality of designated bathing waters (coastal and inland) has improved in Europe throughout the 1990s.

Despite this improvement, 10 % of Europe's coastal and 28 % of inland bathing waters do not meet (non-mandatory) guide values

Hazardous substances

The relevant policy objectives are: to reduce or eliminate pollution by hazardous substances in all waters; to phase out emissions, losses and discharges of the most hazardous substances; and to achieve levels that protect human health and aquatic ecosystems. A number of EU directives aim at achieving these broad objectives, including the dangerous substances directive, drinking water directive, IPPC directive and the water framework directive.

Many thousands of chemicals are in every day use. They are an integral part of today's society. Some will end up in the aquatic environment either by use or from production process. Many of these substances are potentially harmful to aquatic organisms and to humans through drinking water or by exposure during recreational activities. The presence of endocrine disrupting substances is one emerging issue and sexual disruption of aquatic animals is being reported by several European countries.

There have been several successes in reducing the pollution from relatively few hazardous substances that have been stringently regulated at a European level since the 1970s. However, there are still many other substances for which adequate regulation or information is not available. For example, there is a lack of appropriate and adequate information on the effects of many chemical substances on aquatic life and human health. Of equal concern is the lack of comparable and relevant information at a European level on the presence and concentrations of chemical substances in Europe's waters.

The water framework directive will require Member States to assess the chemical status of groundwater and surface water, and the ecological status of surface waters. This will include the regulation at European level of 33 priority list substances (or groups of substances) and any other pollutant that occurs in significant quantities in river basins. Once fully implemented, the directive should significantly improve the amount and quality of information on hazardous substances in Europe's waters.

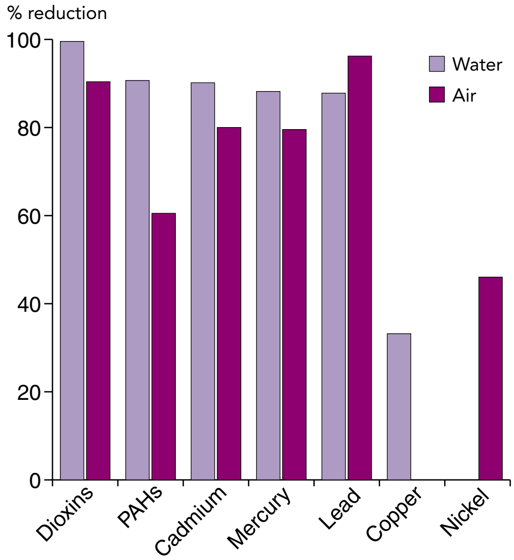
The International Sea Conventions have objectives on reducing the emissions of hazardous substances and their pollution. For example, countries discharging to the North Sea set a target of a 50–70 % reduction in releases (discharges, emissions and losses) to water and air of several hazardous substances between 1985 and 1995. Reduction of discharges to the North Sea, the North East Atlantic and the Baltic of hazardous substances such as heavy metals, dioxins and polyaromatic hydrocarbons (PAHs) has been significant.

- There have been significant reductions in the discharges/releases to water and of emissions to air of hazardous substances such as heavy metals, dioxins and polyaromatic hydrocarbons from most North Sea countries and to the North East Atlantic since the mid 1980s (Figure 10).
- The loads of many hazardous substances to the Baltic Sea have been reduced by at least 50 % since the late 1980s.
- There is very limited information on the loads entering the Mediterranean and Black Seas, and none on how these have changed over recent years.

Figure 10 **Reductions in discharges and emissions of some hazardous substances to water and air from North Sea countries between 1985 and 1999**

Discharges to water based on:
Dioxins: Netherlands, Norway
PAH (Polyaromatic hydrocarbons): Belgium, Netherlands, Norway
Mercury: Denmark, Germany, Norway, Netherlands, Sweden
Cadmium: Denmark, Germany, Norway, Netherlands, Sweden
Lead: Denmark, Norway, the Netherlands, Sweden
Copper: Germany, Norway, the Netherlands, Sweden
Emissions to air based on:
Dioxins: the Netherlands, Norway, Sweden
PAH: Belgium, the Netherlands, Norway, Sweden
Mercury: Belgium, Norway, the Netherlands, Sweden
Cadmium: Norway, the Netherlands, Sweden
Lead: Norway, the Netherlands, Sweden
Nickel: Denmark, Norway, the Netherlands, Sweden

Source: Progress report to 5th North Sea Conference 2002.



Reductions in discharges to water and emissions to air of heavy metals, dioxins and polyaromatic hydrocarbons were achieved in particular from industrial activities and waste disposal (including municipal wastewater). These reflect the introduction of cleaner technologies and more efficient wastewater treatment. There have also been very significant reductions in lead and PAH releases to air from the transport sector. The former reduction reflects the increasing use of unleaded petrol.

However, while discharges of oil from refineries and offshore installations have decreased, major accidental oil spills still occur within Europe's seas. Considering the increase in oil production and consumption and net import to the EU, the risk of oil spills is also increasing. A more rapid introduction of double hulls for tankers will help to reduce this risk.

Pollution of rivers by heavy metals and a few other heavily regulated chemicals is decreasing.

For the many other substances that are present in Europe's water no assessment of changes can be made, due to a lack of data.

Alongside the reduction in emissions and loads of some hazardous substances, the concentrations of cadmium and mercury have decreased in rivers in the EU since the late 1970s. This reflects the success of measures to eliminate pollution of these two List I substances under the dangerous substances directive (Figure 11). This directive also requires a reduction in the pollution by List II substances. List II metals include zinc, copper, nickel, chromium and lead. Data from the Rhine and Elbe indicate that the concentrations of some of these metals have also been reduced since the late 1980s.

Oil pollution from refineries and illegal discharges is a problem in Europe's Seas. Also of major concern are the catastrophic accidental oil spills that still occur at irregular intervals.

Photo: Beredskabscenter, Sydsjælland

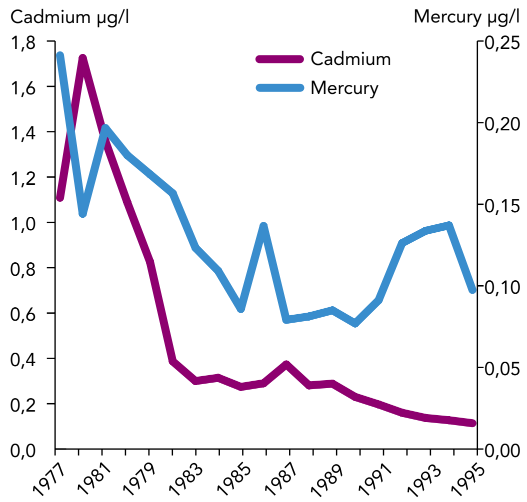
The drinking water directive aims to ensure that water intended for human consumption is safe. In addition to monitoring for microbiological and physico-chemical parameters, a number of toxic substances are also monitored, such as pesticides, polyaromatic hydrocarbons, cyanide compounds, and heavy metals. This is because the raw supply may be contaminated, e.g. with pesticides from agricultural land, which have leached into ground water or from contamination within the distribution system, e.g. lead from piping.

> Pesticide and metal contamination of drinking water supplies has been identified as a problem in many European countries.

Hazardous substances may also affect human health through consumption of contaminated marine organisms. They may have deleterious effects on the marine ecosystem function as well. Table 1 summarises main trends for cadmium, mercury and lead concentrations in mussels in the North East Atlantic and Mediterranean Sea; for lindane in Mediterranean mussels; and for DDT and polychlorinated biphenyls (PCBs) in mussels from the North East Atlantic. In fish, there was less evidence of decreasing concentrations and, in the case of PCBs in cod liver in the North East Atlantic, there was evidence of an increase in concentrations since 1990.

> There is some evidence that the reduction in loads to water of some hazardous substances is leading to decreases in the concentrations of these substances in marine organisms in some of Europe's seas.
>
> Contaminant concentrations above limits for human consumption are still found in mussels and fish, mainly from estuaries of major rivers, near industrial point discharges and in harbours.

Concentration of cadmium and mercury at river stations — Figure 11



Note: In less polluted areas in, e.g., Nordic countries concentrations of cadmium are only 10 % and mercury only 1 % of these values. Average of country annual average concentrations. Cadmium data from Belgium, Germany, Ireland, Luxembourg, the Netherlands, UK. Mercury data from Belgium, France, Germany, Ireland, the Netherlands, UK

Source: EU Member State returns under the Exchange of Information Decision.

Summary of trends in concentrations in biota in Baltic Sea, the North East Atlantic Ocean, and Mediterranean sea — Table 1

	Baltic Herring	NE Atlantic Cod	NE Atlantic Mussels	Mediterranean Mussels
Cadmium	no trend	no trend	inconsistent but decreasing trend	inconsistent but decreasing trend
Mercury	no trend	no trend	inconsistent but decreasing trend	inconsistent but decreasing trend
Lead	no trend	inconsistent but decreasing trend	inconsistent but decreasing trend	inconsistent but decreasing trend
DDT	inconsistent but decreasing trend	no trend	inconsistent but decreasing trend	ni
PCBs	inconsistent but decreasing trend	upward trend	inconsistent but decreasing trend	ni
Lindane	ni	ni	ni	inconsistent but decreasing trend

inconsistent but decreasing trend;

no trend;

upward trend;

ni = no information

Muscle analysed in herring; liver analysed in cod except for mercury where muscle data was used.

Source: complied by ETC/WTR from OSPAR, Helcom and EEA Mediterranean member countries

Water quantity

The relevant policy objectives for water quantity are to ensure and promote sustainable water abstraction and use of surface and ground waters. The water framework directive includes the amount of water in a water body as an element for assessing the ecological status of surface and ground waters. The directive also obliges Member States to use pricing for water-related services as an effective tool for promoting water conservation. This would allow the environmental costs of water supply to be reflected in the price of water. National, regional and local authorities need to introduce measures to improve the efficiency of water use and to encourage changes in agricultural practices necessary to protect water resources (and quality).

Precipitation is the source of all freshwater resources. However, it is unevenly distributed in Europe, being highest in the western part and in regions with mountains. Annual average run-off from rain varies from over 3 000 mm in western Norway to less than 25 mm in southern and central Spain, and is about 100 mm over large areas of eastern Europe.

Climate changes are affecting precipitation patterns in Europe. In parts of northern countries there has been an increase of more than 9 % in the annual precipitation per decade between 1946 and 1999. Decreasing trends in precipitation have been observed in parts of southern and central Europe. Most climate models project increasing precipitation rates for central and northern Europe and decreasing rates for southern Europe. The increasing rates are mainly due to more precipitation during the winter months, while southern Europe will experience more summer droughts.

In absolute terms, the total renewable freshwater resource in Europe is around 3 500 km^3/year. Twelve countries have less than 4 000 m^3/capita/year while the northern countries and Bulgaria have the highest water resources per capita. Inflows from transboundary watersheds can provide a significant percentage of freshwater resources in countries.

The total water abstraction in Europe is about 353 km^3/year, which means that 10 % of Europe's total freshwater resources is abstracted. The water exploitation index (WEI) in a country is the average annual total abstraction of freshwater divided by the long-term average freshwater resources. It gives an indication of how the total water demand puts pressure on the water resource. The WEI identifies those countries that have high demand in relation to their resources and therefore are prone to suffer problems of water stress. It should be underlined that it is an indicator of the average water stress in a country and thus can hide considerable regional differences within a country.

Eighteen percent of Europe's population live in countries that are water stressed.

A total of 20 countries (50 % of Europe's population) can be considered as non-stressed (Figure 12), lying mainly in central and northern Europe. Nine countries can be considered as having low water stress (32 % of Europe's population). These include Romania, Belgium and Denmark and southern countries (Greece, Turkey and Portugal). Finally, there are four countries (Cyprus, Malta, Italy and Spain), which are considered to be water stressed (18 % of population in the study region). Water stressed countries can face the problem of groundwater over-abstractions and consequent water table depletion and salt-water intrusion in coastal aquifers.

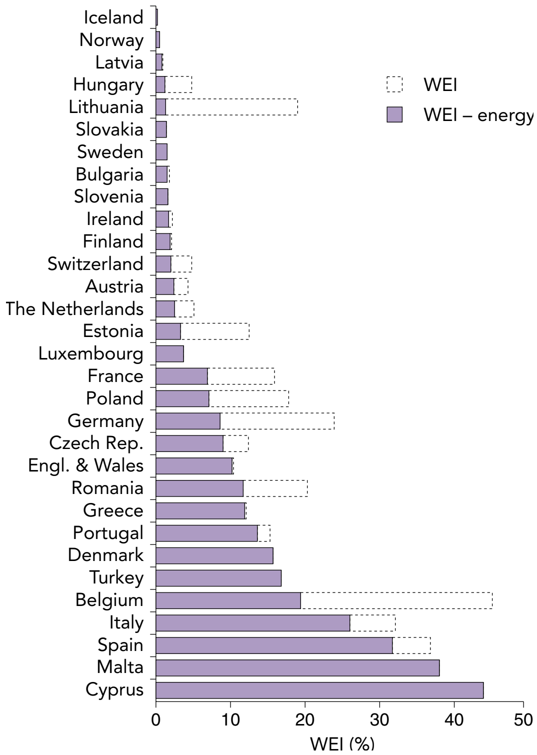
On average, 33 % of total European water abstraction in countries is used for agriculture, 16 % for urban use, 11 % for industry (excluding cooling), and 40 % for energy production (Figure 13). The southern accession countries and southern EU countries use the largest percentages of abstracted water for agriculture (75 %, and 50 %, respectively), primarily for irrigation. Western central and western accession countries are the largest users of water for energy production (primarily cooling water) (57 %), followed by urban use.

Over the last decade there were decreases in water abstracted for agriculture, industry and urban use in central accession and western central countries, and in water used for energy production in western southern and western central countries.

There was an increase in agricultural water use in western southern countries.

Total water abstraction has decreased over the last decade in western central Europe and in the central accession countries, while in western Europe it has been relatively stable. The decrease of agricultural and industrial activities in central accession countries during the transition process led to decreases of about 70 % in water abstracted for agricultural and industrial uses in most of the countries (Figure 14). In central accession countries there was a 30 % decrease in abstractions for public water supply (urban use).

Water exploitation index (WEI) across Europe — Figure 12



Notes:
Solid bar:
WEI without water abstraction for energy cooling.

Dotted bar:
WEI based on total water abstraction.

Source:
Eurostat, New Cronos database.

WEI less than 10 %
— non-stressed

WEI between 10 and 20 %
— low stress

WEI greater than 20 %
— stressed

Without access to water for irrigation agricultural production would be severely reduced in many European countries. In south-western Europe there has been an increasing trend in water abstraction for agriculture. Over-abstraction of water can lead to adverse ecological effects in water bodies and wetlands.

Photo: Chris Steenmans

Figure 13 **Sectoral use of water**

Notes: Southern accession countries (AC): Malta, Cyprus, Turkey. Western southern: France, Greece, Italy, Portugal, Spain. Nordic: Iceland, Finland, Norway, Sweden. Central accession countries (AC): Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Republic, Slovenia. Western Central: Austria, Belgium, Denmark, Germany, the Netherlands, UK.
Source: Eurostat, New Cronos database

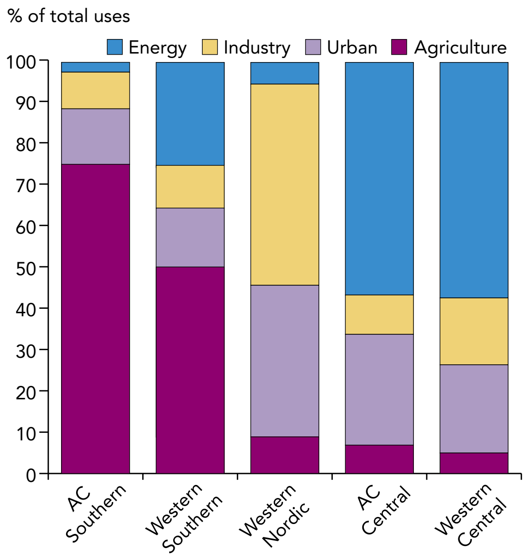


Figure 14 **Agricultural use of water in three regions of Europe**

Notes: Western southern: France, Greece, Italy, Portugal, Spain. Western central: Austria, Belgium, Denmark, France, Germany, the Netherlands, UK. Central accession countries: Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Republic, Slovenia. Nordic: Iceland, Finland, Sweden and Norway: insufficient data for trend assessment.
Source: Eurostat, New Cronos database

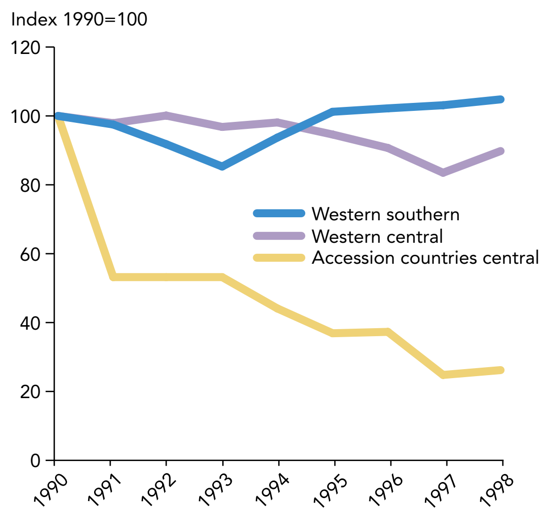
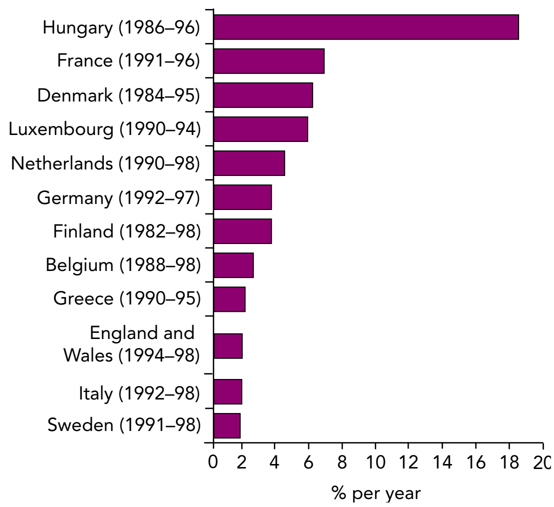


Figure 15 **Domestic water use price: average increases in selected European countries**

Source: OECD, 2001



Large areas of the Mediterranean coastline in Italy, Spain and Turkey have been reported to be affected by saltwater intrusion. The main cause is groundwater over-abstraction for public water supply and in some areas abstractions for tourism and irrigation.

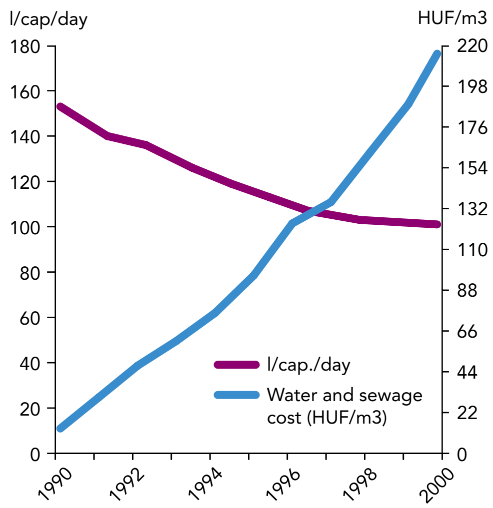
Over-abstraction of water remains a major concern in parts of Europe, such as the coast and islands of the Mediterranean. Over-abstraction leads to groundwater depletion, loss of habitats and deteriorating water quality. In the case of groundwater, over-abstraction can also lead to the intrusion of saltwater into aquifers, making the water unsuitable for most purposes. In nine of 11 countries where coastal over-exploitation was reported to exist, saltwater intrusion is the consequence.

- Measures to control demand for water, such as water pricing, and technologies that improve water use efficiency are contributing to reductions in water demand.
- Agriculture, which is still widely subsidised, pays much lower prices for water than the other main sectors, particularly in southern Europe.
- In some countries losses of water by leakage from water distribution systems can still be significant, exceeding 40 % of supply.

There has been a general trend towards higher water prices in real terms for the domestic sector throughout Europe in the 1990s (Figure 15). In many accession countries, water prices were heavily subsidised before 1990 but there was a marked increase in prices during transition, resulting in lower water use. In Hungary, for example, water prices increased 15-fold after subsidies were removed, which led to a reduction in water use during the 1990s of about 50 % (Figure 16).

Losses of water in the distribution network can reach high percentages of the initial volume. Problems with leakage are not only related to the efficiency of the network but also to water quality (contamination of drinking water if the pressure in the distribution network is too low).

Household water use and price of water in Hungary Figure 16



Source: Hungarian Central Statistical Office, 2001.

Information

The main objective of the EEA is to provide timely, targeted, relevant and reliable information to policy-making agents and the public. In relation to water, the EEA provides European information on current trends in water quantity and water quality, on how pressures are changing, and on the effectiveness of policies.

The EEA is developing indicators, in a top-down approach, to answer specific policy questions. This approach is not yet always feasible as, in some cases, the appropriate datasets and dataflows are not available or developed at a European level. However, as this summary shows, comparable data flows are improving as a result of the implementation of Eurowaternet, the EEA information network for water.

Eurowaternet is built upon existing monitoring activities in the countries and is designed to give a representative assessment of water types and variations in human pressures within a country and across Europe. The data are transferred on an annual basis from the countries to Waterbase. In early 2003, Waterbase had information on more than 3 600 river stations in 28 countries, more than 1 100 lake stations in 21 countries and quality data for more than 600 groundwater bodies in 22 countries. Eurowaternet is currently being extended to cover water quantity as well as transitional, coastal and marine waters.

- Over the past eight years, implementation of Eurowaternet has led to marked improvements in information about Europe's water.
- Eurowaternet is based on existing country monitoring and will in the future be adapted to meet the reporting needs of the water framework directive.
- The EEA is developing a core set of water indicators to help streamlining of European water reporting and to make it more policy relevant.

Eurowaternet's continued development alongside the operational implementation by countries of the water framework directive and other major policy drivers will ensure that the quality of the indicators improves over time. The harmonisation and development of common policy relevant data flows and data needs for a number of users and policy-makers will be a major contribution towards the goal of streamlining reporting on water.

European Environment Agency

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