EEA Signals 2004

A European Environment Agency update on selected issues

European Environment Agency

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Foreword

EEA Signals are annual reports covering a broad range of topics. They are typically built around 20–30 pages of indicator-based assessment written in non-technical language for a broad audience with graphics to support the text. They are translated into all EEA languages.

The key messages in this year's report highlight the need to make further progress in managing the environmental impacts of agriculture, transport and energy. This can be achieved by further increasing the use of market-based instruments to manage demand and internalise external costs (e.g. for transport), by switching more extensively to positive subsidies (e.g. for agriculture) and by promoting innovation (e.g. for renewable energies). Similar instruments can also help deal with unsustainable trends in waste generation. The spin-off benefits for the environment and human health will be multi-dimensional across issues such as climate change, air pollution, biodiversity and water quality.

The major events in Europe's environment during 2003 were weather- and climate-related. The hot summer claimed possibly as many as 35 000 lives, mainly in southern Europe. Ozone pollution levels were especially high, while unusually low water flows were recorded in the Danube, Rhine and other major rivers, in sharp contrast with the heavy flooding the summer before. The summer 2003 forest fires claimed lives and cost some EUR 925 million in Portugal alone. It is estimated that in Europe around three quarters of economic losses caused by catastrophic events result from weather- and climate-related events. A very conservative estimate of the annual average bill is about EUR 10 billion and rising. These figures suggest that managing Europe's natural resources is increasingly important for ensuring the viability of Europe's economic and social capital.

In general, environmental data are improving but they remain inadequate to meet the task of monitoring changes. For example, water quality data need to become more statistically representative at catchment level, while air quality monitoring for small particles ($PM_{2.5}$) needs strengthening in urban areas. Waste data are very patchy and generally suffer from definitional problems although packaging waste is relatively well documented. Climate change impacts data, as presented here on temperature, glaciers and flowering season length, are robust and scientifically collected over long time scales. The timeliness of all data needs to be improved.

The European Environment Agency is working to improve data by ensuring there is complete coverage over time for all member countries and that data delivered are as accurate as possible. Work continues to improve indicator methodologies, focusing primarily on the EEA core set of indicators (www.eea.eu.int/coreset). The set will be reviewed regularly and gradually expanded to cover issues not well addressed at present, such as resource use, health and chemicals. In addition, to meet the needs of citizens and policy-makers across Europe most effectively, the EEA will continue to develop more integrated indicators that combine the environmental, economic and social dimensions as well as the territorial dimension.

Professor Jacqueline McGlade
Executive Director

Europe in 2004: An environmental perspective

Europe's environment should be considered in the context of socio-economic agendas, such as the Lisbon process and sustainable development, that also have a strong global dimension. In March 2000 the Lisbon European Council set a new strategic goal ([1]) for Europe. This was subsequently complemented in Gothenburg in June 2001 with a strategy for sustainable development, the addition of the environmental dimension to the Lisbon objectives and the establishment of a new approach to policy making ([2]).

The main barriers to progress in environmental protection and sustainability are the complex, inter-sectoral, inter-disciplinary and international nature of both the problems and the solutions. These barriers are underpinned by shortcomings in institutional structures, non-implementation of commitments already made (see European Council conclusions, 25–26 March 2004) and lack of information on and understanding of possible 'win-win-win' solutions for achieving sustainable outcomes. Such solutions embrace competitiveness and innovation, social cohesion, territorial cohesion and the protection and maintenance of scarce natural resources and valuable ecosystems.

The European Union is the second largest economy behind the United States, with a vast array of assets and a lead part to play in global governance. The Lisbon economic agenda aims to deliver higher growth and more and better jobs, but progress towards its objectives is mixed. Economic growth (in terms of gross domestic product) in the 15 older EU Member States was 27 % between 1990 and 2002, compared with 41 % in the United States. Employment growth in these Member States has also lagged behind the United States since 1990, but labour productivity has been more closely aligned.

Competitiveness and innovation are defining conditions for growth to deliver sustainable outcomes for Europe's economy, society and environment. Europe's competitiveness is being driven by a handful of countries and 'super-regions', according to the 2004 European Competitiveness Index (*The European Competitiveness Index 2004*, Robert Huggins Associates, http://www.hugginsassociates.com). In the future, ambitious regions in the new EU Member States are expected to overtake the least competitive among the older Member States. At country level Denmark and Luxembourg head the competitiveness league among the older Member States, while Uusimaa in Finland and Stockholm head the regional index and are also the only regions in the European Union to feature in the 2002 world competitiveness index. Norway and Switzerland also perform well. The extent of knowledge creation and the utilisation of human capital distinguish the competitive performers from the less competitive. Many of these countries and regions also perform relatively well on environmental issues, indicating that economic and environmental goals can be achieved together. Reducing regional disparities, the main goal of the European Union's cohesion policy, is expected to further enhance 'better' growth (see European Commission 3rd Cohesion Report, February 2004).

Better growth also means improved resource productivity. There was a slight increase per capita in the use of materials in the European Union economy between 1980 and 2000. Over the same period, Europe's gross domestic

product grew much more strongly (by 56 %), indicating that there has been a relative decoupling of resource use from economic growth, driven in part by technological innovation. Europe leads on environmental technology innovations, for example on more sustainable manufacturing materials and processes, renewable energies and waste treatment practices. Research is key to maintaining progress. The coherence and targeting of research resources could be improved and much more can be done to exploit fully the potential of what already exists by dealing with institutional and political barriers to progress. There is also a lot to be achieved by promoting the use of venture capital in embryo niche markets.

Social changes in Europe are being driven by enlargement, demographic changes and globalisation. These in turn are influencing consumption patterns and spatial planning decisions, with transport in particular playing an increasingly pivotal role in the economy and people's lives. Wealth per capita differs substantially between the west and east of the European Union. The now enlarged Union has 20 % more population and 25 % more territory. Around three-quarters of the population live on only 15 % of the land area ([3]) and present trends of urban agglomeration in the industrial regions of northern France, Germany, the Netherlands and Belgium are expected to continue into the future. The pressures on urban agglomerations across Europe are expected to increase further as people seek to improve their living standards by moving to where the employment opportunities are greatest. These trends will increase pressure on existing urban infrastructure and services but will also create opportunities for building more sustainable cities that accommodate economic, social and environmental aspirations.

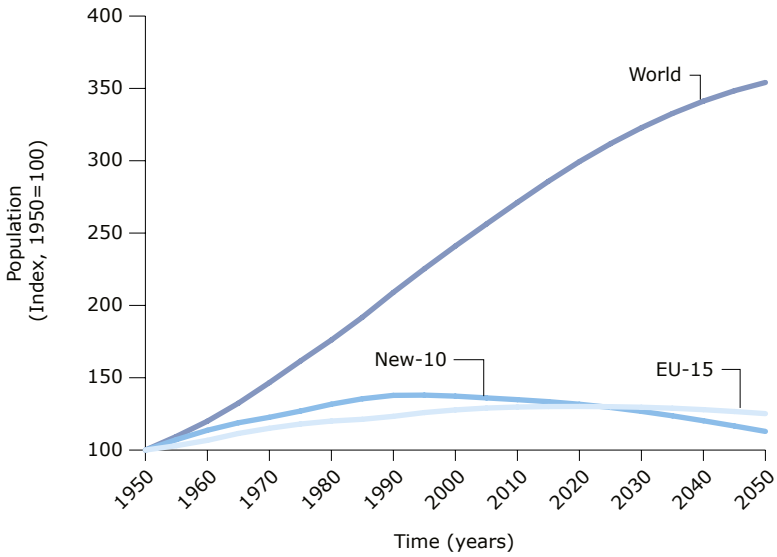
In this evolving context, Europe's population is expected to increase until about 2020, after which it will stabilise and then decline. However the working-age population (those aged 15–64) is expected to start falling a few years earlier, from 2010, with consequences for sustaining employment and innovation. In parallel, there will be a marked increase in older persons (aged 65 and over). The consumption demand patterns of older people tend to shift towards services such as social and leisure activities, including tourism, with consequent environmental impacts. So, for example, the explosive increase in air travel, which is the fastest growing source of greenhouse gas emissions, reflects in part these changes in demography.

While Europe's population stabilises and ages, the number of households will increase at a more rapid rate. In the European Union the number grew by 11 % between 1990 and 2000 ([4]) and is expected to continue rising. The majority of new households will be small, reflecting social and lifestyle changes such as increasing numbers of single and divorced people. Smaller households tend to be less efficient, requiring more resources per capita ([5]) than larger households. The trend towards smaller households also increases the pressure on land and acts as a factor driving the expansion of built-up areas. Over 80 % of Europeans ([6]) are expected to live in urban areas by 2020.

Europe's rural population, in turn, is declining and this long-observed trend is expected to continue ([7]). Rural depopulation often results in the abandonment of farmland, a trend that is of particular threat to areas of high nature conservation value ([8]). Semi-natural and extensively farmed areas are very vulnerable to changes in land management such as the cessation of grazing and mowing, which contribute to the maintenance of high biological diversity in these areas.

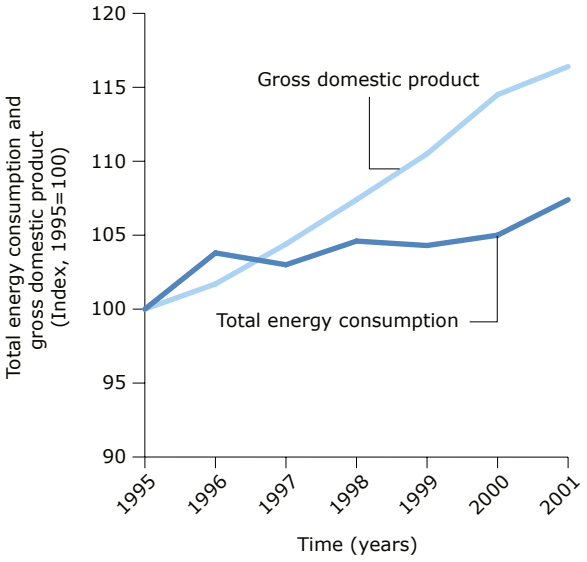
Population growth

Europe's population is growing more slowly and ageing. The New-10 (9) countries will follow this trend; their population is expected to decline more rapidly than the EU-15 after 2025. Many countries are expected to have declining populations by 2020. Exceptions are the UK, France and the Netherlands (with expected rises of 4–5 %) and Ireland where an increase of 12 % is forecast. Tourism and leisure activities are expected to increase as older people enjoy more years of active, healthy life for longer after retirement. Currently air travel, where tourism is a key driver, is showing the fastest increase of all modes of passenger transport.



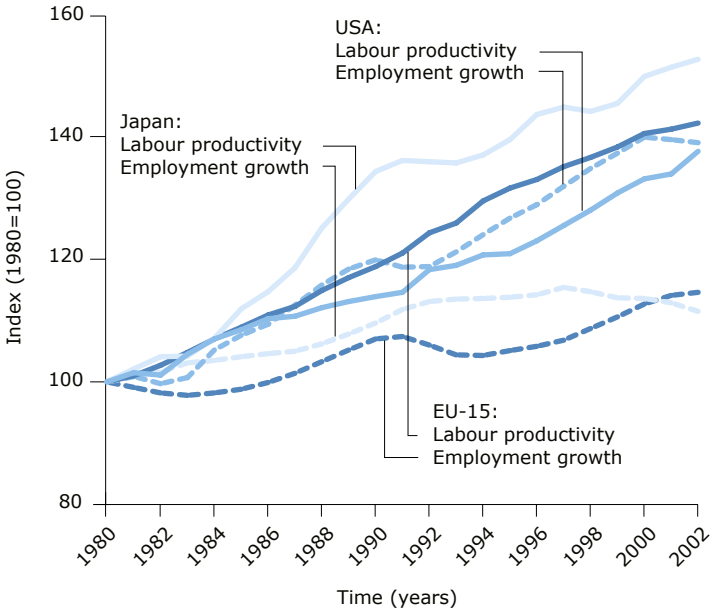
Energy consumption and gross domestic product

Energy consumption is rising, but more slowly than gross domestic product (GDP). Between 1995 and 2001, energy consumption rose by 7 % while GDP increased by 16 %. The continued potential for saving energy is widely recognised. In the energy supply sector the opportunities for improvement focus in the short term on further switching to more efficient natural gas-powered production, and in the longer term on increasing use of combined heat and power and decentralising electricity generation.



Employment trends in Europe, Japan and the US

Over the last 20 years, the rate of employment growth in the US has been almost three times greater than in the EU-15 and nearly four times that of Japan. Between 1999 and 2002, the rate of growth was greatest in the EU-15 (at 3.5 %), compared with the US (1 %) and Japan (– 2 %). Labour productivity in EU-15 has been rising consistently faster than employment growth, a trend echoed by the Japanese economy. In the US, however, labour productivity and employment growth are closely coupled.



These farming practices are often also the most marginal and are therefore economically vulnerable to rising prices and greater competition.

The management of Europe's environment and its natural capital are important to ensure the long-term viability of its economic and social capital. So, for example, demographic and socio-economic trends are playing a role in increasing society's exposure to weather- and climate-related damage through factors such as housing developments in areas vulnerable to flooding and other risks. It is estimated that in Europe around three-quarters of economic losses caused by catastrophic events are weather- or climate-related. A very conservative estimate of the average annual bill is about EUR 10 billion and rising.

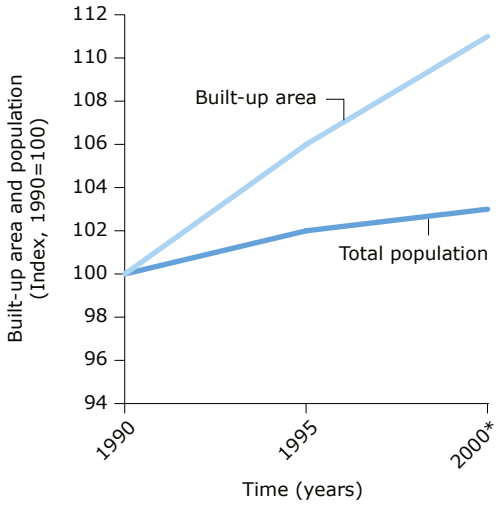
Energy consumption is still increasing, a major concern in the context of climate impacts. In particular the domestic sector's demand for electricity and transport are rising in line with increasing wealth and the growing number of smaller households. End-of-pipe technology has reduced air pollutant emissions from power generation, but as the possibilities are narrowing for some key low-carbon technologies, such as large-scale hydro-electric power, other options need to be explored. These could include reducing demand by implementing energy efficiency measures, for which there is huge potential; reducing the barriers to, and improving the incentives for, the uptake of renewable technologies; rethinking options for transport; and increasing funding for research into alternative technologies.

Trends in waste generation, a proxy for resource use intensity, are unsustainable. Treatment and disposal options are diminishing as quantities increase and concerns about their potential impacts grow. Decisions on the location of incinerators have become very controversial in many countries. Landfill options are often limited by space as well as by fears of soil and groundwater contamination and their impacts on human health. The current policy tools for dealing with waste are inadequate and need to be complemented by approaches that promote smarter resource use by changing production and consumption patterns and through innovation.

Subsequent chapters provide further insight into these and other issues relevant to the environment and in particular the main sectoral activities that have most impact — agriculture, transport and energy.

Built-up land area

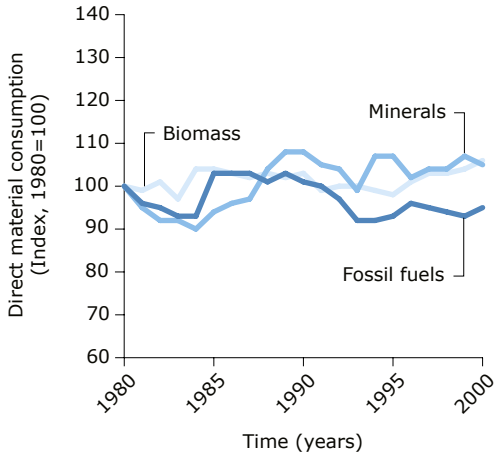
Built-up areas are spreading across Europe and increasing much faster than the population. Most new areas have been created at the expense of agricultural land, but are also encroaching on forested land. Further expansion is likely to be caused by factors such as decreasing household size, which increases the number of households; growing demand for roads; and the depopulation of rural areas, leading to an influx of people into already built-up urban areas. Built-up areas have a heavy impact on soil function: where the topsoil is taken off during construction, removing the built surface would not restore the soil to a useful resource. This has implications for soil as a resource for future generations.



* Data for 2000 or latest available year

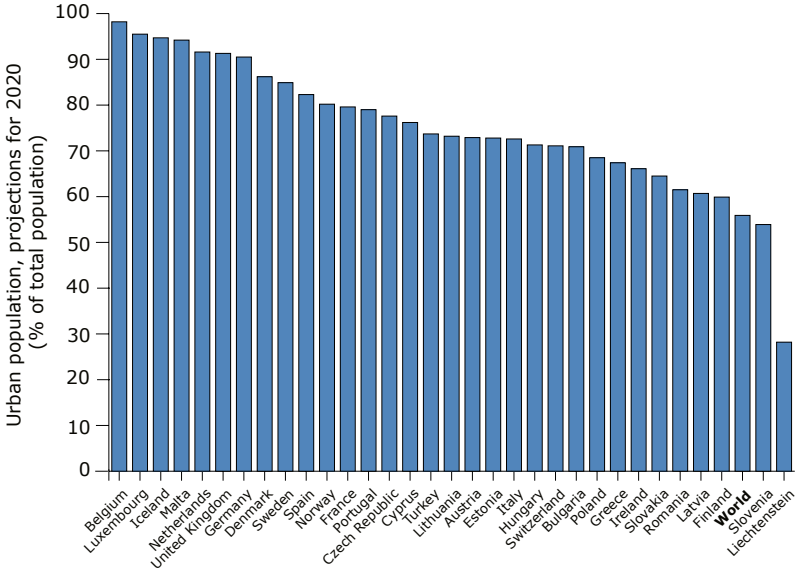
Direct material consumption

Direct material consumption (DMC) is a measure of the materials used by the economy. It is an indicator of how successfully the EU-15 is moving towards its aim of decoupling use of resources from economic growth. DMC increased slightly compared with early 1980 levels, to around six billion tonnes in 2000. It remained more or less constant at around 16 tonnes per capita during the second half of the 1990s. Non-renewable materials dominate DMC: their share was fairly constant at around 75 % between 1980 and 2000. Of these, construction minerals make up the largest share, accounting for more than 40 %.



Urban population

The urban population is increasing. It is forecast that 80 % of Europeans will be living in urban areas by 2020, and in seven countries the proportion will be 90 % or more. The pressures of extensive urban development (urban sprawl) are closely coupled with issues of transport and consumption. Urban sprawl can also lead to economic segregation, seen in areas of inner-city dereliction and extensive peripheral estates, often with sub-standard housing. Urban expansion can also place pressure on inner city and urban green areas, which may be vulnerable to fragmentation and conversion unless adequately protected by planning guidelines.



Agriculture: Impacting biodiversity

The new Member States contain considerable areas of semi-natural habitats and associated species of conservation interest, but many of these areas are threatened by intensification ([10]) or land abandonment. Current rural development spending in Member States is not sufficiently targeted at biodiversity-rich areas.

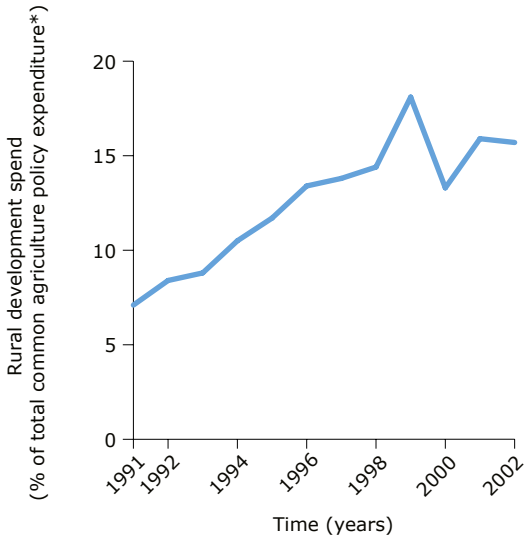
Europe's countryside has been shaped by agriculture over centuries and much of Europe's biodiversity depends in some way on farmland. European agriculture is still very diverse, ranging from intensively farmed monocultures that put heavy pressure on the environment to extensively farmed semi-natural areas creating much less pressure. Protecting valuable farmland is important for halting the loss of biodiversity. However, by 2003 the sites designated by Member States under the birds and habitats directives ([11]) covered less than one third of farmland areas with high nature value.

The common agricultural policy accounts for about 50 % of the total European Union budget and influences how farmers manage their land and livestock. Past subsidies encouraged intensive agricultural production by paying per tonne of wheat or per head of livestock produced. Since the early 1990s, however, income support payments have taken over and more rural development measures have been introduced, including important measures for the environment such as agri-environment schemes and support for less favoured areas. These help to fund the protection of high nature value farmlands, underpinning the activities of the LIFE (Nature) programme. Increased support for these farmland areas is needed as declining prices for agricultural produce are driving many farmers either to increase production efficiency, leading to intensification and specialisation of farms, or to stop farming. Both these trends have negative environmental consequences, especially on biodiversity.

The share of rural development measures in the common agricultural policy budget has increased since 1990 and accounted for 13 % (equivalent to EUR 53 per hectare) in 2000–2002. Under their accession agreement the proportion of rural development spending in the ten new Member States is much higher than for the older Member States, at around half of total spending (equivalent to EUR 45 per hectare) between 2004 and 2006 ([12]). In absolute terms, however, the level of rural development spending is similar. As well as taking a higher share of the total agricultural budget it is important that rural development expenditure, and in particular the agri-environment schemes, is properly targeted at areas of high biodiversity.

Rural development spending

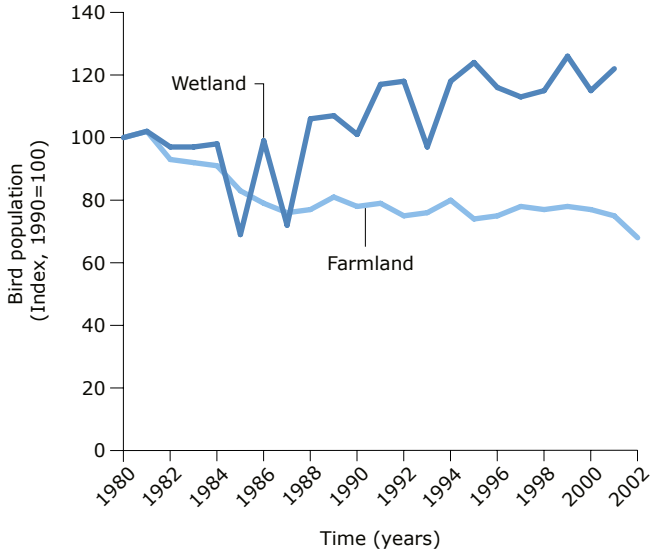
The share of the rural development budget in total common agricultural policy (CAP) spending has risen slowly since 1991: for EU-15 it averaged 9 % (EUR 22 per hectare) between 1991 and 1993, rising to 13 % (EUR 53 per hectare) in 2000–2002. Some 30–40 % of rural development funding is used for agri-environment schemes but levels of spending vary widely between countries. Spain and Greece, for example, spent around EUR 4 per hectare on agri-environmental schemes in 2000–2002 while in Finland and Austria the figure was around EUR 80 per hectare. More than 70 % of farming area in Finland and Austria is covered by agri- environment schemes but only about 5 % in Spain and Greece.



* European Agricultural Guarantee and Guidance Fund including Member State cofinancing

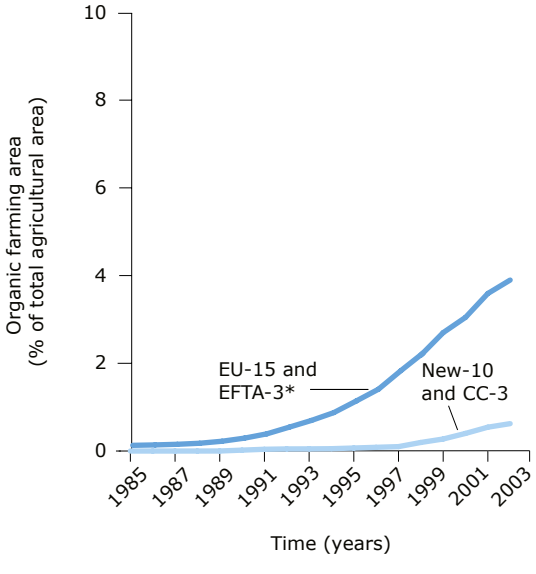
Bird populations

Farmland bird populations have fallen substantially in recent decades. These data start in 1980 but it is probable that rapid decline also occurred in the 1970s. Farmland bird populations have not fallen as much in the New-10 and CC-3 as in the EU-15, largely because of the lower intensity of farming in central and eastern Europe. Wetland birds are migratory: their numbers often fluctuate in line with temperature, with fewer arriving in cold years. Wetland birds are also affected by hunting and eutrophication of wetlands.



Organic farming area

Organic farming does not use chemical fertilisers and pesticides. It relies instead on animal manure, crop rotation and appropriate soil cultivation practices for building up soil fertility and combating pests and plant diseases. Organic agriculture has lower yields than conventional farming systems but reduces the risk of nitrate pollution of water and generally promotes more wildlife. The share of organic land remains far below 1 % in most of the New-10 and the CC-3 due to little or no state support and low consumer demand for organic products. Across the EEA-31 as a whole, however, organic farming area increased by around four fifths between 1997 and 2000, to 4.4 million hectares from 2.4 million.



* EFTA-4 without Switzerland

Water pollution: Managing nitrate

Diffuse pollution from agricultural land is still the main source of nitrate in water. Nitrates continue to damage the environment, contributing to eutrophication in coastal and marine waters and pollution of drinking water, especially where groundwaters have become contaminated. Member States' success in tackling nitrate pollution has been mixed.

Nitrate pollution is caused mainly by agriculture. Unless fertiliser and manure are absorbed by crops or removed during harvesting, excess nitrate can be washed into groundwater as well as surface water bodies ([13]). Measures to reduce nitrate pollution can be effective however. The greatest improvements have occurred in Denmark, which began a national nitrogen management programme in the late 1980s. This combines advice to farmers with the allocation of an annual nitrogen 'budget' to each farm, enforced through regular field checks.

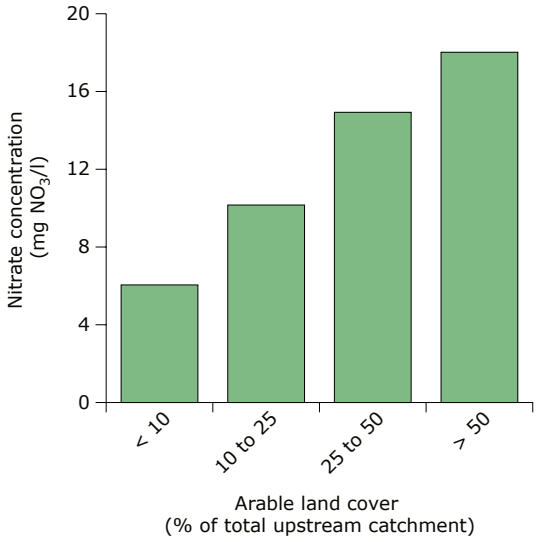
Substantial time lags can occur before changes in agricultural practices are reflected in groundwater quality, depending on the soil type and the specific hydrogeological conditions of the groundwater body and overlying substrate. As groundwater ranges in age from decades to millennia (although groundwater used for drinking water is on average 40 years old), current practices are in effect leaving a legacy of groundwater pollution for coming generations. Around one third of groundwater bodies ([14]) now exceed nitrate guideline values.

The cost of nitrate reduction lies in the range of EUR 50-150 per hectare per year ([15]), but this is estimated to be 5 to 10 times cheaper than removing nitrate from polluted water. A 2002 study ([16]) estimates that denitrification of UK drinking water costs £19 million a year and projects the total UK cost of achieving the European Union nitrate standard for potable water ([17]) at £199 million over the next 20 years ([18]). Consumers, rather than the polluters (i.e. farmers), pay almost all of the bill.

Agricultural practices are currently less intensive in the ten new EU Member States than in the 15 older ones. However, if farming becomes more intensive in the new Member States, as predicted, nitrate concentrations in surface and ground waters could increase. Good implementation of the European Union nitrates directive, supported by additional measures as necessary, will be essential to avoid creating an extensive, long-lived and costly pollution problem in these countries over the coming years.

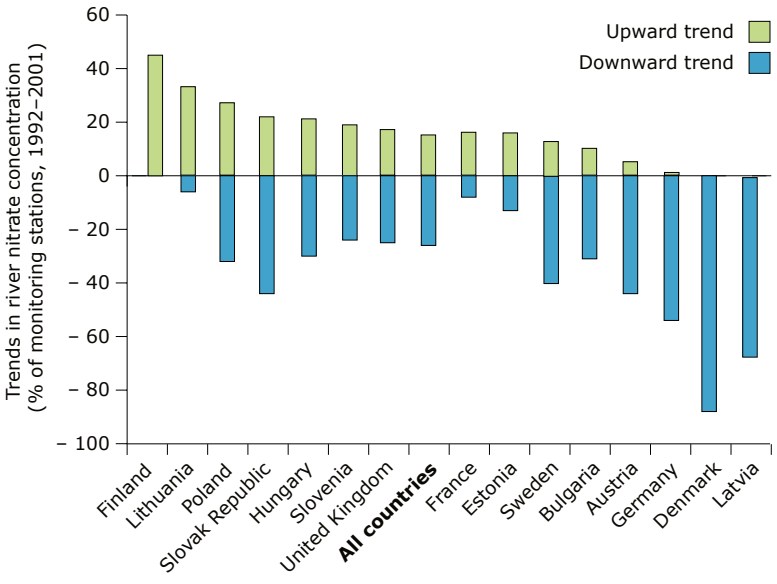
Arable land in upstream catchments

Nitrate concentrations in rivers are linked to the proportion of arable land in the upstream catchment: highest levels occur where large amounts of nitrogenous fertilisers and animal manure are used. In 2001, nitrate levels in rivers where arable land covers more than 50 % of the upstream catchment area were three times higher than in catchments with arable land cover of less than 10 %. Member States are required to designate nitrate vulnerable zones and implement programmes of measures to reach the EU nitrates directive's objective of reducing water pollution caused or induced by nitrates from agricultural sources.



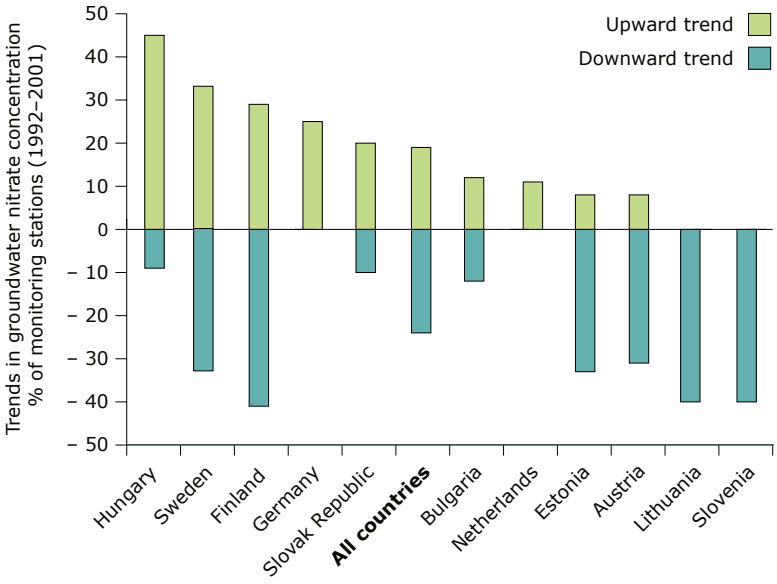
Nitrate concentrations in rivers

Nitrate pollution in rivers is higher in the EU-15 than in the New-10 (but lowest of all in the Nordic countries). This reflects differences in agricultural intensity and practices. In 2000/2001, rivers in 14 European countries (out of 24 with available information) exceeded the EU drinking water directive's guide concentration for nitrate; five also exceeded the maximum allowable concentration. In general nitrate concentrations in rivers are declining: 25 % of monitoring stations on Europe's rivers recorded a decrease between 1992 and 2001. However, around 15 % of river monitoring stations showed an increasing trend in nitrate concentrations over the same period.



Nitrate concentrations in groundwater

Nitrate pollution of groundwater appears stable at the European level. However, when the data are broken down by country, 24 % (out of 142) individual groundwater bodies show decreasing nitrate concentrations while in 19 % concentrations are increasing. The most marked rises are in Hungary, Sweden, Finland and Germany. Increases may either reflect the time-lag between changes in agricultural practices and their effects on groundwater quality or show a need for additional measures.



Nature: Maximising the value of protected areas

Designating sites to protect threatened species and habitats has long been a core element of biological diversity policy but conflicting pressures on available land are now making it more difficult to establish new sites. The future of nature protection lies in integrating biodiversity considerations into sectoral and environmental policies and maximising the utility of existing protected sites. More needs to be done to protect marine biodiversity.

Since the 1970s, the number of national sites has increased substantially as countries have progressively implemented national laws on nature protection. International and European Union instruments have also made it compulsory for countries to designate sites for protection ([19]).

As a result there are now nearly 600 different categories of protection and more than 42 000 individual protected sites in the European Environment Agency's 31 member countries. By the end of 2003, sites designated as special protection areas under the birds directive or proposed as sites of Community interest under the habitats directive covered around 15 % of the territory of the European Union.

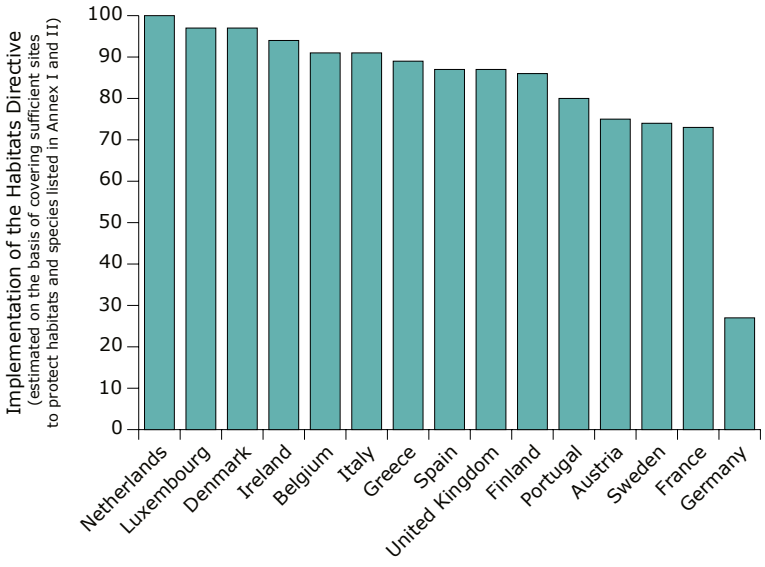
Additionally, marine protected areas have been created in all of the regional seas and on the coasts of many European countries. However, there remain substantial gaps in the protection of marine and coastal areas. Marine areas should be protected according to the richness of their biodiversity, but this protection may conflict with other uses including shipping or fishing. Agreeing on an appropriate level of protection and then enforcing it is therefore often difficult.

Protected areas cannot be sustained in isolation from the communities and economic activities in and around them ([20]). To maximise their value, protected areas need to be integrated into wider landscape uses and be connected to other areas of similar qualities. Connecting sites ensures that species have the possibility to survive by moving in response to disturbances and climate change. The Natura 2000 network can play a role in achieving such integration.

There is now less scope for designating new sites as protecting biodiversity competes with growing and conflicting pressures on available land. Policies will increasingly have to deal with this by maximising the value of areas already protected and by integrating biodiversity concerns into sectoral policies (e.g. agri-environmental measures or sustainable forestry policies) as well as into other environmental policies.

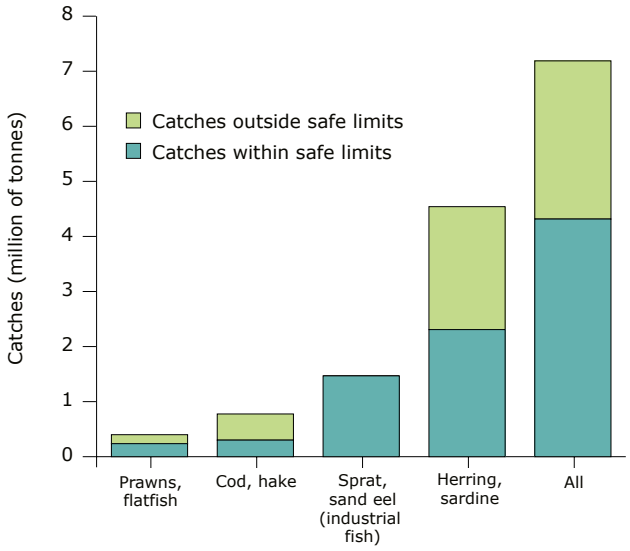
Implementation of the habitats directive

As of November 2003, more than 80 % of the habitats and species listed in the EU habitats directive were sufficiently ([21]) covered by sites proposed by the Member States. Generally progress is now good: the Netherlands, for example, has reached 100 % sufficiency. Germany reached only 27 % sufficiency by November 2003, but draft proposals have since been received which, if officially confirmed, are expected to double the number of sites and increase the sufficiency level. The indicator charts progress in proposing terrestrial sites for the protection of the targeted habitats and species of the directive.



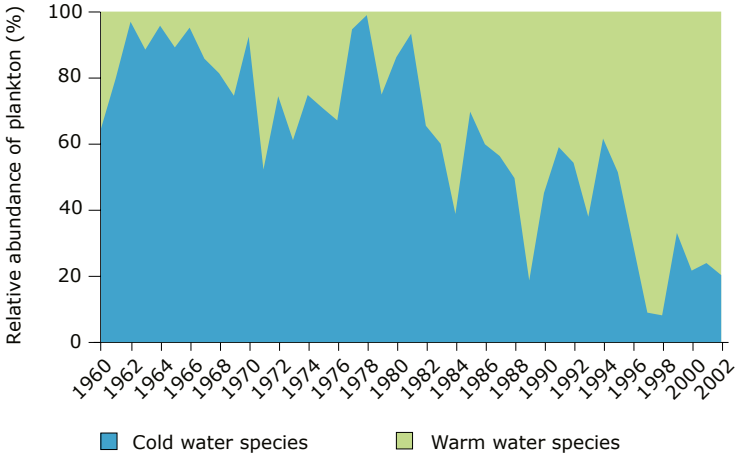
Fish catches above safe limits

Overall 60 % of European fish catches exceed safe limits, i.e. levels above which the biomass removed by fishing is no longer replaced by population growth. Catches of open sea fish account for almost two thirds of all catches; about half of these catches are outside safe limits. Industrial fishing catches account for another 20 % of the total. Fish play an integral role within the wider marine environment, which is experiencing pressures from shipping, pollution, coastal eutrophication and climate change. The continuation of present trends of over-fishing will therefore probably lead to substantial changes across the entire marine ecosystem.



Zooplankton abundance

The past decade has seen a marked change in the relative abundance of zooplankton in the North Sea. The warm-water copepod *Calanus helgolandicus* has become more than twice as abundant as the cold-water species *Calanus finmarchicus*. These data are illustrative of a general trend for zooplankton populations to shift northwards in response to changing climatic conditions. The composition of the marine ecosystem has been changing since the mid 1980s in the North Sea, a trend that directly affects fish populations and consequently fisheries. Projections show that global warming will increasingly change the composition of the ecosystems in the oceans and cause a shift by warm-water species towards higher latitudes.



Data on two species of Copepod found in the Central North Sea
warm water: *Calanus helgolandicus*
and cold water: *Calanus finmarchicus*

Packaging waste: Still increasing

Prevention has long been the highest priority of European Union waste policy: only where the production of waste is unavoidable should recycling and reuse of waste be encouraged. Yet Europe has made little progress in preventing packaging waste. While many countries have met the targets for recycling set under the 1994 packaging waste directive, the amount of packaging waste is still increasing.

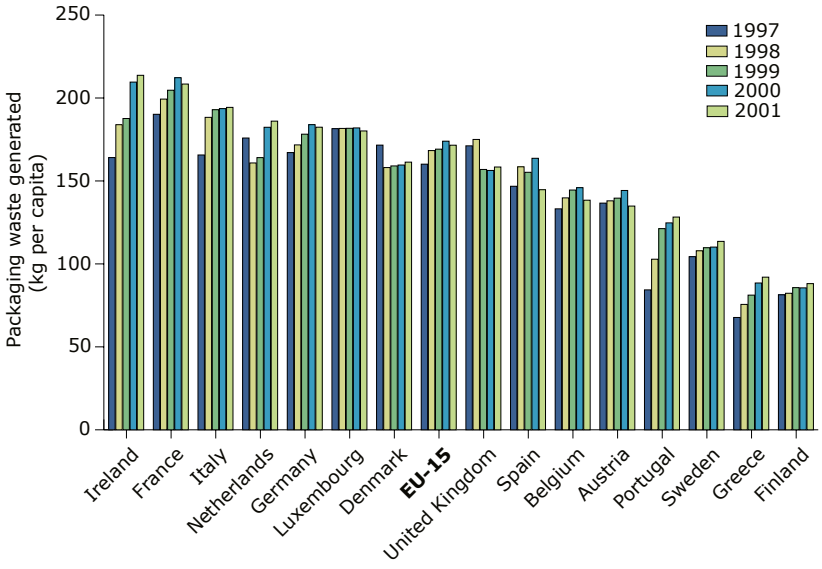
Data suggest overall volumes of waste are continuing to grow in Europe. Total waste is made up of several waste streams. The largest is construction and demolition waste, but packaging waste is the best documented in terms of quantities produced and treated. The generation of packaging waste is closely coupled to economic growth and consumption patterns. From 1997 to 2001 the amount of packaging waste increased in 10 of the 15 older EU Member States, and by 7 % in the then European Union as a whole. Preliminary projections suggest that volumes of packaging waste are likely to continue rising substantially in the future ([22]). Some of this increase is attributable to the proportionately higher generation of packaging waste from small households, but also to the growth of the internal market and the consequently greater need to transport packaged goods. With rising emphasis on health and food safety, the amount of food packaging has also been increasing.

The European Union Packaging Waste Directive (94/62/EC) addresses the elements of packaging waste management in a general way while placing emphasis on recycling and recovery by setting quantitative targets for both. An initial analysis ([23]) suggests that for some countries (e.g. Italy and Ireland) the directive has had a positive impact on the implementation of packaging waste management systems. For certain countries with high recycling and recovery rates (e.g. Denmark and Austria) ([24]), however, the legislation has had little influence since their waste management systems were in place before it entered into force. In general, countries that have implemented a mix of instruments have been most effective in meeting their objectives and targets. The directive was amended in January 2004 but as it contains no waste prevention targets it can have only an indirect effect on the prevention of packaging waste.

The soundness of recycling as a strategy for smarter resource use has recently been questioned ([25]), but recycling is in most cases better for the environment than either energy recovery or disposal. As the cost of recycling rises with the percentage of material recycled however, a comparison of the costs (including external costs) of alternative options is likely to limit the scope for raising recycling targets continually. Generating less waste in the first place must remain the foremost objective.

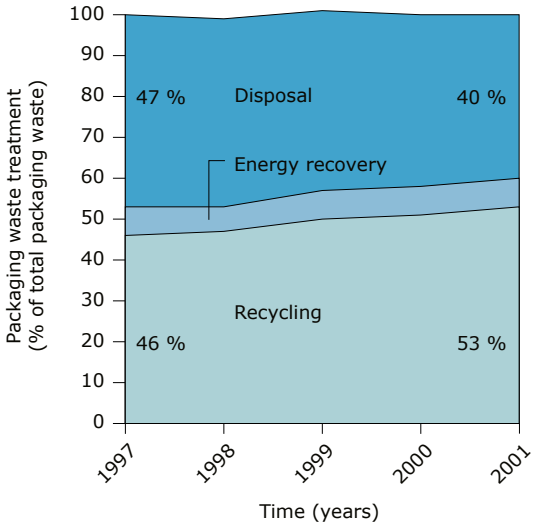
Packaging waste generation

Between 1997 and 2001 total packaging waste increased by 7 % in the EU-15. Over the year 2000–2001 the overall amount dipped slightly, mainly due to a 12 % decrease in Spain, but it is too early to tell whether this signals a change in the upward trend. Packaging waste quantities vary substantially between countries, most likely due to different calculation methodologies. In particular some countries report only on the four key materials for which Member States are required to provide data — plastic, glass, metal and paper. Others report on all packaging including wood, which substantially increases the total weight recorded.



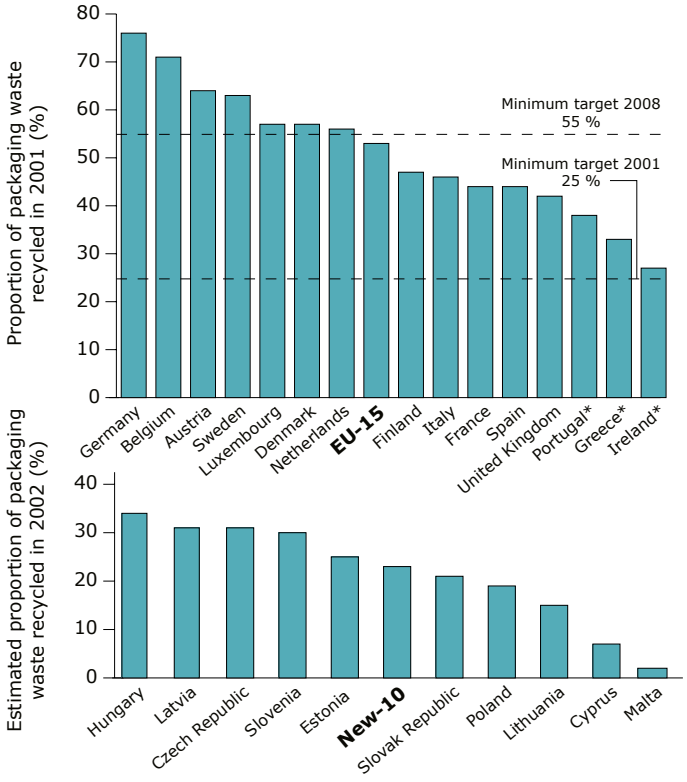
Packaging waste treatment

An increasing proportion of packaging waste is recovered. The main forms of recovery are recycling and incineration to produce energy. The use of incineration is high in some countries e.g. Denmark and the Netherlands, while in others, e.g. Germany and Austria, more recycling is used. The revised directive, adopted in January 2004, will effectively restrict the scope for incineration and other recovery methods except recycling. In some countries this will require substantial changes to the collection and sorting of wastes. The directive's targets are to be met by the end of 2008.



Proportion of packaging waste recycled

All Member States met the target of recycling at least 25 % of all packaging waste by 2001 (Greece, Ireland and Portugal were given lower targets and longer timeframes). The revised directive raises the target for recycling to at least 55 % of all packaging wastes. Several countries, in particular the New-10, are still a long way from meeting this. Some, including Estonia, Cyprus, Lithuania, Malta, Poland and Slovakia, but also Ireland, will need to more than double the proportion they recycled in 2002. The New-10 have been given several extra years to meet the recycling target.



* Extension of deadline and lower targets

Sustainable energy: A long way to go

Total energy consumption continues to increase rapidly, making it difficult for Europe to reach its objectives on climate change. If exploited more fully, energy efficiency and renewable energy sources could make a major contribution to a more sustainable energy system. Achieving this will require deep changes throughout the economy.

Total energy consumption in the 25 Member States has been rising since the mid-1990s and this trend is expected to continue. Burning fossil fuels, the main source of greenhouse gas emissions, is predicted to remain the largest energy source in Europe for the next 30 years. Despite some growth in absolute terms renewable energy is not expected to raise its share significantly, while the contribution of nuclear power is projected to decline as a result of moratoria and phase-out policies in several countries. The transition to sustainable energy will require substantial increases in energy savings, energy efficiency and renewable energy production across all sectors.

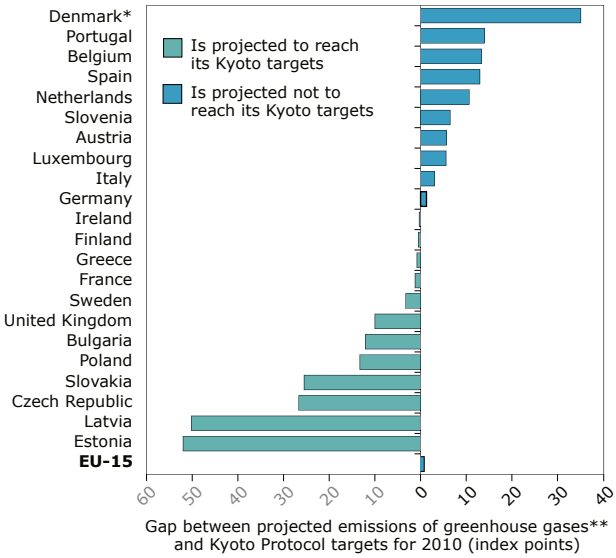
Substantial growth in renewable energy is needed to meet European and national targets for 2010 and will require further support. Creating favourable conditions for renewables is a key requirement for increasing their market share. A portfolio of diverse policy measures is needed, including setting policy targets beyond 2010 to provide long-term investment security; implementing support schemes; and getting the prices right by fully including external costs in energy prices (e.g. by removing environmentally harmful subsidies).

Increased support for renewables will drive innovation and new technologies. The recently proposed energy services directive ([26]) is another step in the right direction. It aims to lower energy consumption by setting mandatory targets for Member States to save 1 % per year of energy supplied between 2006 and 2012 ([27]) ([28]). However, because energy efficiency improvements achieved since 1991 can be counted towards this target, there is a risk Member States that have shown greatest progress will not feel obliged to make substantial additional efforts even if they still have usable energy efficiency potential.

It is estimated that the potential exists today to improve energy efficiency in cost-effective ways by at least 20 % in the 15 older EU Member States and by even more in the ten new ones. This potential needs to be realised to move Europe further towards a sustainable energy future.

Projected progress towards Kyoto Protocol targets

The projections show that with existing and planned domestic policies many Member States will not meet their agreed targets and the EU-15 will not reach its overall target (– 8 %). All the New-10, including Slovenia, now project that existing domestic policies and measures will be sufficient to meet their targets. The sector with the largest projected increase in EU-15 emissions is transport. The European climate change programme has identified a number of EU-wide policies and measures ([29]) that, if fully implemented, should be sufficient to achieve the EU target. Member States can also use other instruments under the Kyoto Protocol to reach their targets ([30]).

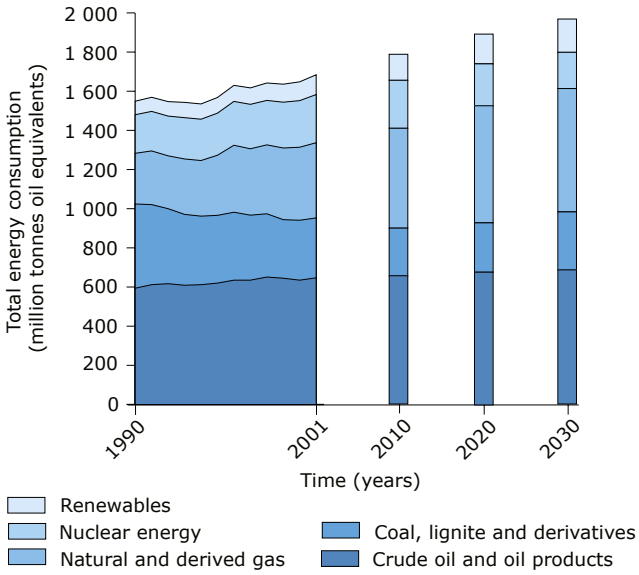


* Denmark adjusts emission data for the year 1990 for electricity trade. In this indicator however unadjusted data are presented for Denmark.

** All countries should provide updated projections in 2004 to the European Commission

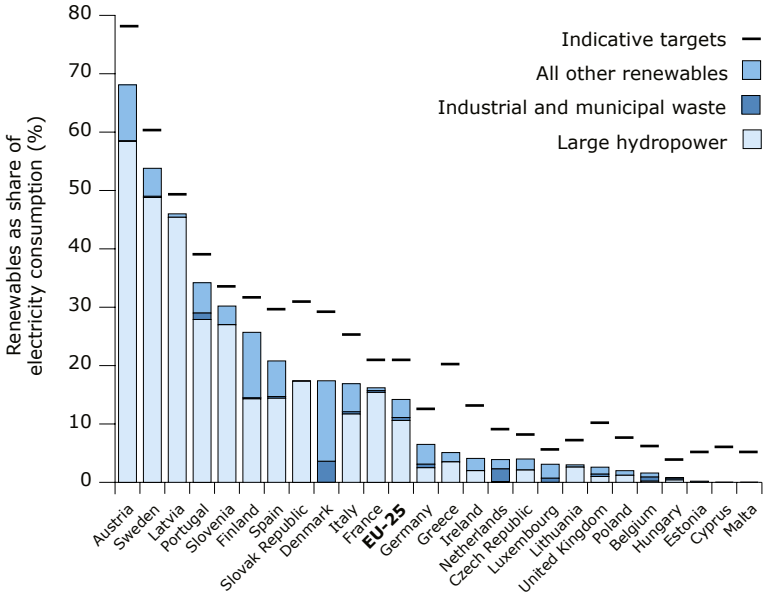
Total energy consumption by fuel type

Total energy consumption in the EU-25 has been rising since the mid-1990s and this trend is projected to continue. Fossil fuels currently dominate the fuel mix with an 80 % share; this proportion is expected to increase slightly over the next 30 years. Despite some growth in absolute terms, renewable energy is not expected to raise its share significantly, while the contribution of nuclear power is projected to decline.



Renewable energy sources as a share of electricity consumption

The share of renewable electricity in EU-25 gross electricity consumption grew from 12 % in 1990 to 14 % in 2001. A substantial further increase is needed to meet the EU indicative target of 21 % by 2010. Large-scale hydropower schemes provide most of the electricity currently produced from renewable sources (about 85 %), but they will not contribute to future increases due to environmental considerations and a lack of available sites. Future growth in renewable electricity needs to come from other renewable energy sources, such as wind, biomass, solar and small-scale hydropower.



Transport: Full-cost pricing needed

Demand for transport, especially road transport, is growing rapidly. This increase has implications across many areas, including energy consumption, climate change and human health. Decoupling transport demand from economic growth has been a key aim of EU transport policy for several years but has yet to show results.

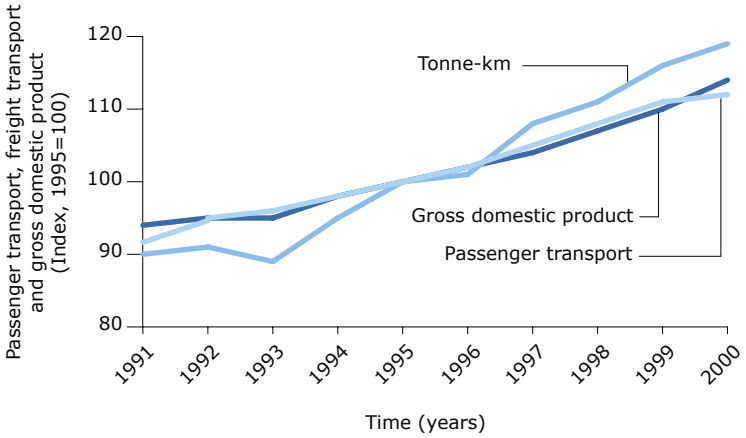
Freight volumes are growing faster than the economy (at around 3 % a year compared with 2 %, for the 15 older EU Member States) ([31]). This largely reflects the pan-European production and consumption patterns that are accompanying the expansion of the EU internal market. Passenger transport is increasing at the same rate as the economy. Air transport is growing by 6–9 % per year in both the old and new EU Member States. At the same time the market shares of modes such as rail and buses are increasing only marginally, if at all.

Options for managing the environmental impacts of transport include adjusting prices to account fully for its external costs and promoting innovation through improved regulation and financial incentives. Adjusting policy so that the market share taken by each transport mode reflects its environmental impacts would mean establishing a closer link between the prices paid by users and the total internal and external costs of transport. Prices are an important factor for steering demand in a market economy, and in the case of transport both the level and the structure of user prices are relevant. Regulations to deal with issues such as air pollution (e.g. particulates) and noise, together with investment incentives, can drive innovation towards cleaner, safer and quieter transport. This would in turn help reduce external costs.

There is clear agreement that transport prices do not fully cover the external costs caused by transport activities, although consensus is lacking on the exact figure to be paid. Contrary to intentions, variable charges for road freight were actually reduced between 1998 and 2001. The most important variable element is taxation on fuel, but fuel prices have remained within the same price range for more than 20 years. Implementing full-cost pricing could help reduce environmental impacts in the same way as regulating air pollutants has led to substantial decreases in the regulated emissions.

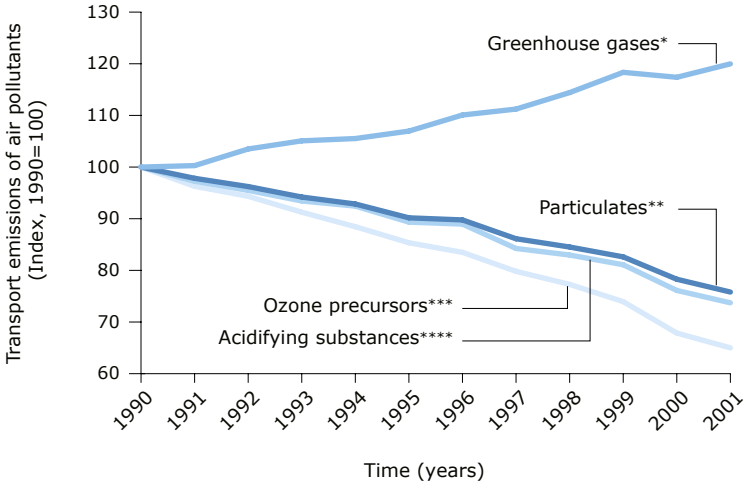
Transport growth and gross domestic product

There has been no success in decoupling transport demand from economic growth, either for freight or passenger transport. At around 3 % a year, freight transport is increasing faster than gross domestic product (GDP), which is growing at around 2 % annually. Passenger transport is increasing at the same rate as GDP. The reasons are complex but largely linked to socio-economic factors such as the expansion of the EU internal market, which is driving the rise in freight transport. For passenger transport, the reasons include increased car use for commuting, leisure and tourism.



Transport emissions of air pollutants

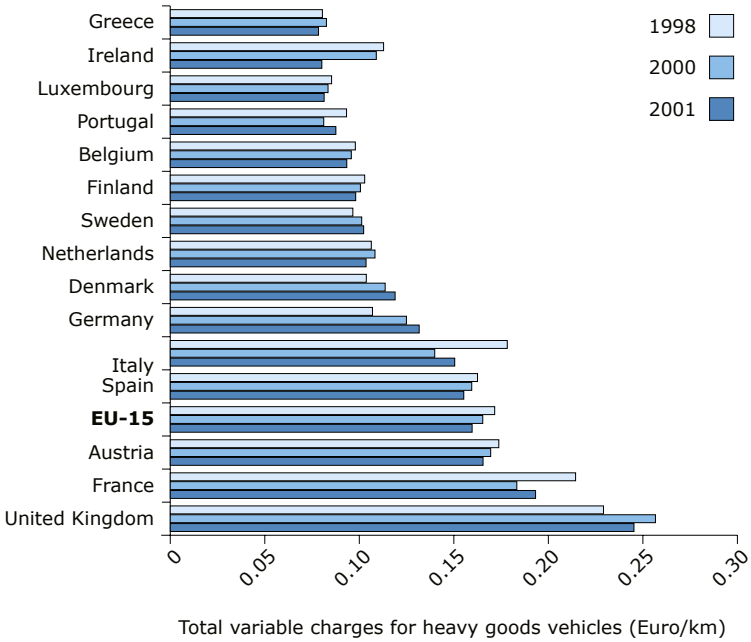
Carbon dioxide emissions continue to rise as transport demand outstrips improvements in energy-related emissions. Reductions for particulates (24 %), carbon monoxide (46 %), nitrogen oxides (24 %), volatile organic compounds (47 %) and lead (100 %) come partly from innovations in exhaust gas treatment technology and partly from changes in fuel composition. Further improvements will take place as even stricter regulations come into force in the coming years and as older vehicles are replaced with newer ones. Sulphur dioxide is a different case: large reductions in road transport emissions (61 %) have been offset by a similar increase in emissions from international maritime transport. Thus in effect the exposure of people to sulphur dioxide has been reduced but not the overall emissions.



* O, CO_2, N_2O, CH_4 (95% CO_2)
** PM_{10}
*** NO_X, NMVOCs
**** SO_X, NO_X, NH_3

Progress with distance-related charges for heavy goods vehicles on highways

The value of variable charges for goods transport on roads decreased in many EU Member States between 1998 and 2001. In overall terms, variable charges in EU-15 fell by 7 % in this period. This is partly a result of the protests in September 2000 by freight transport companies, farmers and fishermen against rising fuel prices. The diesel tax is still the most important instrument in value terms. In addition several EU countries, e.g. Germany, Austria and the UK, plan to introduce distance-based charges. These will help to reduce road transport's net external costs to the environment.



Air pollution: Damaging health in cities

High concentrations of ground-level ozone and fine particulates are causing human health problems in cities. Despite reductions in emissions, much of Europe's urban population remains exposed to concentrations of these pollutants exceeding the levels set to protect human health. Further action is needed to bring down pollution, especially as limits and targets may be tightened in response to growing evidence of health impacts at concentrations below the current values.

The air pollutants ground-level ozone and fine particulates are linked through their shared precursors ([32]), namely nitrogen oxides (NO_x) and non-methane volatile organic compounds (NMVOCs). When inhaled, both ozone and particulates have adverse effects on human health. These include aggravation of respiratory conditions such as asthma (from short-term exposure) and respiratory and cardiovascular illness as well as premature mortality (from long-term exposure) ([33]). Their effect is likely to be additive, at least in the short term ([34]).

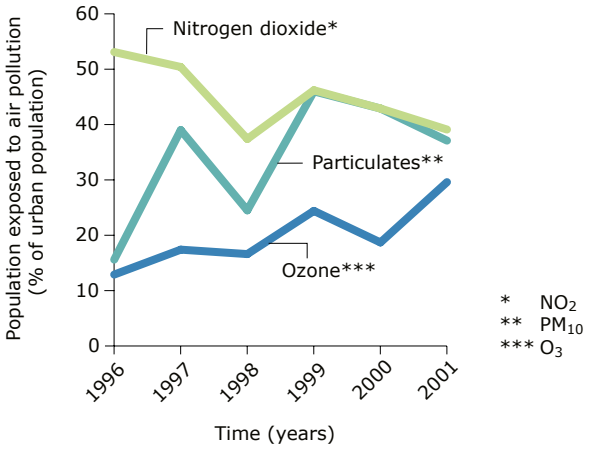
These health impacts are caused by high concentrations that occur mainly in the urban areas of central, eastern and southern Europe. For particulates, high levels occur over the whole year, while ozone is mainly a problem during the summer months. Ozone levels were especially high during the summer heatwave of 2003. Some people are more vulnerable to high concentrations of ozone and fine particulates than others. The worst effects are generally seen in children, asthmatics and the elderly, as well as those exercising outdoors.

Despite recent reductions in emissions of both ozone precursors and fine particulates (by 30 % and 36 % respectively from 1990 to 2001), it is estimated that up to 45 % of Europe's urban population remains exposed to particulate concentrations exceeding limit values and up to 30 % to ozone concentrations above target levels for protecting human health. The emission cuts achieved so far have been mainly due to the introduction of catalysts on new cars and to the implementation of the EU solvents directive, which has led to lower emissions from industrial processes.

There is now growing evidence of adverse health effects from concentrations of fine particulates and ozone at levels below the values currently set to protect health. Discussions are under way within the framework of the EU Clean Air for Europe process ([35]) that may lead to present limits being reconsidered and eventually tightened. Proposals under discussion include setting long-term reduction targets for 2020 for both air quality concentrations and pollutant emissions. Technology measures, demand management options and economic instruments are also being considered.

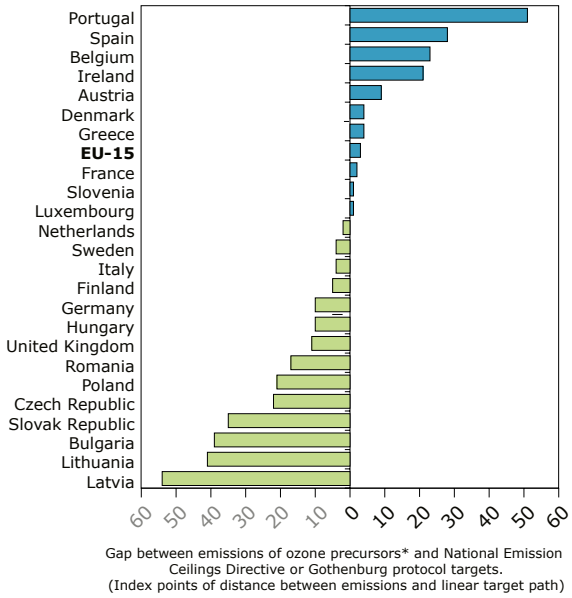
Urban population exposure to pollution levels above EU limit values

The European air quality information system Airbase includes data for particulates (PM_{10}, the fraction of particles with a diameter of 10 μm or less), ozone and nitrogen dioxide. Between 1996 and 2001, 25–45 % of the urban population was exposed to particulate concentrations in excess of the EU limit value and 20–30 % to ozone concentrations above the EU target value for ozone. The urban population for which exposure estimates can be made increased from 51 to 103 million people over the same period. Data reliability has therefore increased substantially, but data between 1996 and 2001 make it difficult to draw firm conclusions on exposure trends for either ozone or particulates.



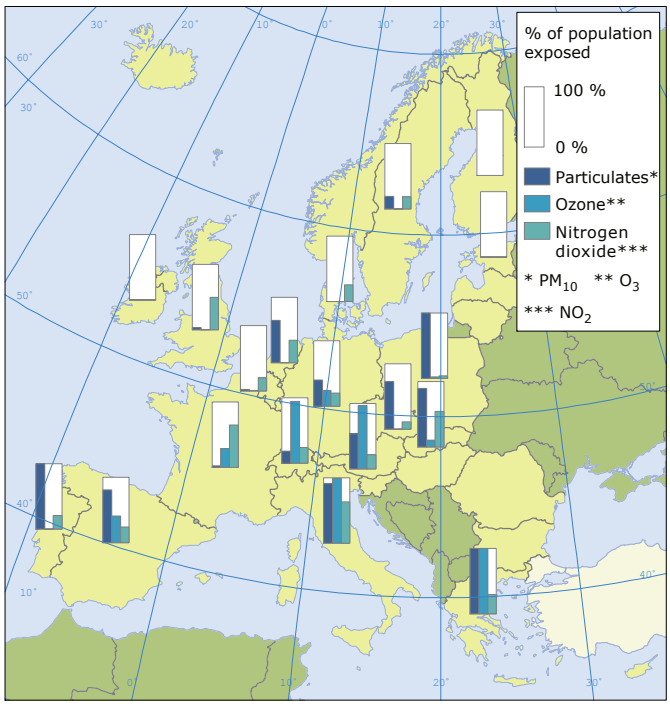
Ozone precursor emissions

Between 1990 and 2001 emissions of ground-level ozone precursors decreased by 30 % in the EU-15 and by 43 % in the New-10. Road transport is the dominant source of ozone precursors (39 % of total emissions). Other key sources are energy use (combustion) and use of solvents in industry and households. The reduction in emissions is mainly due to the introduction of catalysts on new cars (cutting emissions of nitrogen oxides) and the implementation of the EU solvents directive (limiting emissions of non-methane volatile organic compounds from industrial processes). Several countries are not on track to meet their targets, making substantial emission reductions necessary. Emissions of ozone precursors have increased in Cyprus and Turkey and fallen in Estonia, but as these countries have no targets they are not shown.



Urban population exposure: geographical variations

The exposure of urban populations to pollutant concentrations above limit and target values is strongly influenced by climatic conditions and is not evenly distributed throughout Europe. Ozone limits are exceeded mainly in central and southern European countries; for particulates (PM_{10}), exceedances occur mainly in parts of Europe with a dry or continental climate. PM_{10} is less often a problem in wet, maritime countries as precipitation is the most effective way of removing aerosol particles from the air. Concentrations of nitrogen dioxide (NO_2) exceeding the annual limit value are recorded almost exclusively at urban monitoring stations, especially those near heavy road traffic.



Climate change: Growing evidence of impacts

The climate is projected to continue changing, globally and in Europe, over the next 100 years. Evidence is growing of climate change's impacts on human and ecosystem health as well as economic viability. Substantial reductions in emissions of greenhouse gases will be required to ensure that Europe meets its short-term emission targets. Adaptation measures to manage the negative impacts of climate change also need to be put into place.

Combating climate change is a key environmental priority for the European Union. The average temperature in Europe has increased by 0.95 °C over the past 100 years and is projected to rise by as much as a further 6.3 °C by 2100. This contrasts with the European Union's indicative target of limiting the long-term global temperature increase to 2 °C. Sea levels are also rising (by up to 0.2 m over the past century) and are projected to increase further. Impacts on glaciers can be seen too, as all of Europe's glacial regions except one are in retreat ([36]).

The consequences of climate change include economic losses resulting from weather and climate-related events such as floods, storms and droughts. In Europe these losses have increased substantially over the past 20 years to an average of EUR 10 billion in the 1990s. The number of disastrous weather and climate-related events in Europe per year doubled over the 1990s compared with the previous decade, while non-climatic events such as earthquakes remained constant. Four of the five years with the largest economic losses have occurred since 1997.

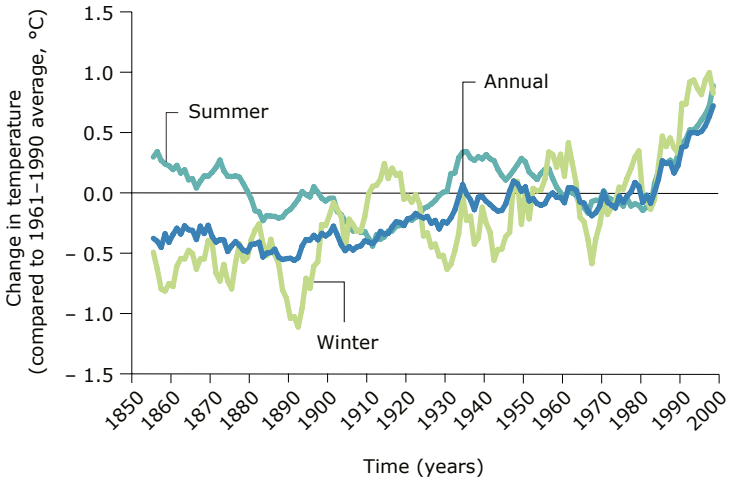
Other impacts include an increase of about ten days in the average growing season in Europe over the past 20 years. However, projections indicate that this positive development may in some areas be counteracted by an increased risk of water shortage, which would harm vegetation. These changes in growing season length may require adaptation measures and changes in agriculture and nature protection strategies.

The Kyoto Protocol has set a target of reducing greenhouse gas emissions from industrialised countries to 5 % below 1990 levels by the period 2008–2012. A recent study confirms previous estimates that to mitigate climate change in the longer term much larger global emission reductions would be needed ([37]). Several European Union Member States have set indicative targets for substantially cutting their emissions. For example, the United Kingdom and Germany have reduction targets of 60 % and 30 % (from 1990 levels), to be met by 2050 and 2030 respectively.

Even if Europe and other regions substantially reduced their emissions of greenhouse gases over the next few decades the climate system is expected to continue changing over the coming centuries. This is due to the long time delay before emission reduction policies have an effect on greenhouse gas concentrations and, in turn, on the climate. Therefore, in addition to reducing emissions, adaptation to climate change is increasingly needed, not only in developing countries, which are the most vulnerable, but also in Europe.

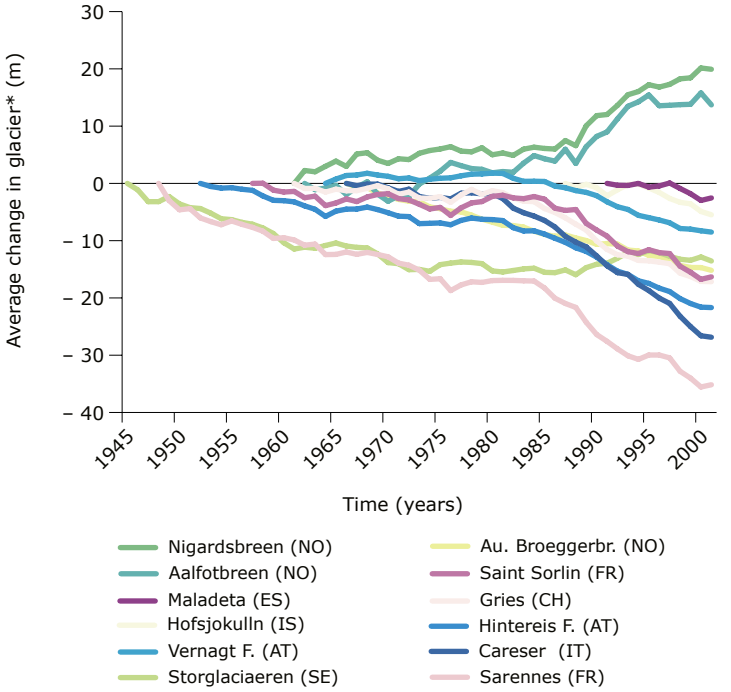
Observed temperature trend in Europe

Global average temperature has increased by 0.7 (± 0.2) °C over the past 100 years. The 1990s were the warmest decade in the observational record, and 1998, 2002 and 2003 the hottest years. Europe has warmed more than the global average, with a 0.95 °C increase since 1900. The EU target of limiting the global temperature rise to no more than 2.0 °C above pre-industrial levels is likely to be exceeded around 2050. Impacts of climate change are often not determined by the annual average temperature but by seasonal temperature. For example, the start and end of a growing season are determined by spring and autumn temperatures, while changes in winter temperature are important for species' survival rate in winter.



Average change in European glaciers

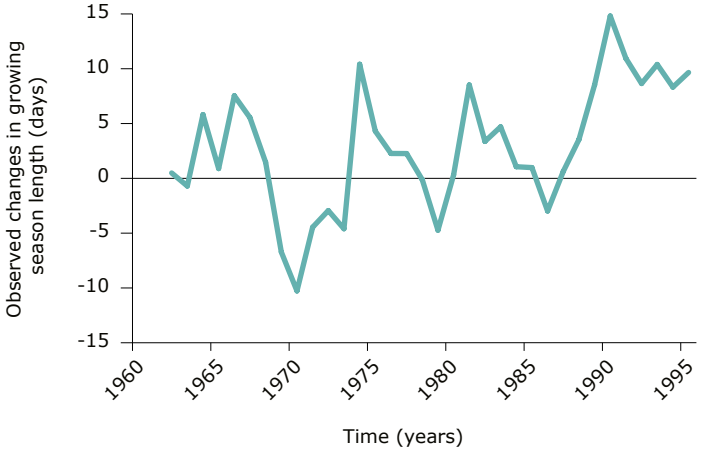
Glaciers in all European glacial regions except for Norway are in retreat, consistent with the global trend. Norwegian coastal glaciers are expanding due to increased snowfall in winter. From 1850 to 1970, glaciers in the European Alps lost approximately one third of their area and one half of their mass. Since 1980, another 20–30 % of the remaining ice has been lost. Current glacier retreat is now reaching levels exceeding those of the last 10 000 years. It is very likely that glacier retreat will continue. By 2050 about 75 % of the glaciers in the Swiss Alps are likely to disappear. The extent of Arctic sea ice is also decreasing by about 0.3 % per annum, a trend that has been recorded for the past 25 years ([38]).



* Specific net mass balance (cumulative): i.e. the net change is glacial volume expressed as the equivalent amount of liquid water averaged over the surface of the glacier (m/year).

Observed changes in growing season length

The average annual growing season in most areas of Europe has increased by about 10 days over the past 20 years and will further lengthen in the future. Green biomass (needles and leaves) of vegetation increased by 12 %, an indicator of enhanced plant growth. These positive effects of rising temperature on plant growth may be offset by an increased risk of water shortage that would harm vegetation. Some crops and trees need low temperatures in winter to trigger bud bursting in spring. These species can no longer grow in areas where winter temperatures are becoming too high. This dataset does not cover France, Italy, Spain or Portugal.



Data sources

Chapter	Indicator name in EEA Signals 2004	Information sources
Europe in 2004: An environmental perspective	Population growth	United Nations Secretariat, Population Division of the Department of Economic and Social Affairs
	Energy consumption and gross domestic product	Eurostat
	Employment trends in Europe, Japan and the US	Annual macroeconomic database (Ameco), DG ECFIN, European Commission.
	Built up land area	EEA, Corine Land Cover Eurostat
	Direct material consumption	Eurostat
	Urban population	United Nations Secretariat, Population Division of the Department of Economic and Social Affairs
Agriculture: Impacting biodiversity	Rural development spending	European Commission
	Bird populations	European Bird Census Council (EBCC); Wetlands international, international waterbird census
	Organic farming area	Welsh Institute of Rural Affairs
Water pollution: Managing nitrate	Arable land in upstream catchments	European Environment Agency (Eurowaternet)
	Nitrate concentrations in rivers	European Environment Agency (Eurowaternet)
	Nitrate concentrations in groundwater	European Environment Agency (Eurowaternet)
Nature: Maximising the value of protected areas	Implementation of the habitats directive	Council of Europe UNEP/WCMC (World Conservation Monitoring Centre) EEA, CDDA (EEA collection of original data) DG Environment (Habitats and Birds Directives)
	Fish catches outside safe limits	DG Fisheries, European Commission
	Zooplankton abundance	M. Edwards; Sir Alister Hardy Foundation for Ocean Science
Packaging waste: Still increasing	Packaging waste generation	DG Environment
	Packaging waste treatment	DG Environment
	Proportion of packaging waste recycled	DG Environment
Sustainable energy: A long way to go	Projected progress towards Kyoto Protocol targets	UNFCCC DG Environment (EU GHG Monitoring Mechanism)
	Total energy consumption by fuel type	Eurostat, European Commission PRIMES projections
	Renewable energy sources as a share of electricity consumption	Eurostat, National Technical University of Athens for projections
Transport: Full cost pricing needed	Transport growth and gross domestic product	Eurostat, DG TREN, UNECE, European Conference of Ministers of Transport (ECMT)
	Transport emissions of air pollutants	European Environment Agency, UNFCCC/EMEP
	Progress with distance related charges for heavy goods vehicles on highways	DG TREN, European Conference of Ministers of Transport

Chapter	Indicator name in EEA Signals 2004	Information sources
Air pollution: Damaging health in cities	Urban population exposure to pollution levels above EU limits	DG Environment (Exchange of Information Decision), Airbase Eurostat
	Ozone precursor emissions	UNECE/CLRTAP/EMEP UNFCCC DG Environment (EU Monitoring Mechanism, NEC Directive) Eurostat
	Urban population exposure: geographical variations	DG Environment (Exchange of Information Decision), Airbase, Eurostat
Climate change: Growing evidence of impacts	Observed temperature trend in Europe	Climate Research Unit, University of East Anglia, Norwich, UK
	Average change in European glaciers	Frauenfelder, 2003 (World Glacier Monitoring Service)
	Observed changes in growing season length	Menzel, 2002

Data quality

Chapter	Indicator name	Link to the Core set of indicators (yes/no)/(Name)	Coverage of countries	Latest data	Data quality
Europe in 2004: An environmental perspective	Population growth	no	EEA-31	2000 projection to 2050	★★★
	Energy consumption and gross domestic product	yes Total energy consumption	EU-25	2000	★★★
	Comparison of employment growth and labour productivity of Europe, Japan and America	no	EU-15	2002	★★★
	Built up land area	yes Land take	19 countries	2000 (or latest available data)	★★
	Direct material consumption	no	EU-15	2000	★★
	Urban population	no	EEA-31	2020 (forecast)	★★★
Agriculture: Impacting biodiversity	Rural development spending	no	EU-15	2002	★★★
	Bird populations	yes Species diversity	EU-15	2002	★★
	Organic farming area	yes Area under organic farming	EEA-31	2002	★★★
Water pollution: Managing nitrate	Arable land in upstream catchments	yes Nutrients in freshwater	12 countries	2001	★★
	Nitrate concentrations in rivers	yes Nutrients in freshwater	24 countries	2001	★★
	Nitrate concentrations in groundwater	yes Nutrients in freshwater	24 countries	2001	★★
Nature: Maximising the value of protected areas	Implementation of the habitats directive	yes Designated areas	EU-15	2003	★★
	Fish catches outside safe limits	yes Status of marine fish stocks	EU-15		★★
	Zooplankton abundance	no	Not applicable	2002	★★★
Packaging waste: Still increasing	Packaging waste generation	yes Generation and recycling of packaging waste	EU-15	2001	★★
	Packaging waste treatment	yes Generation and recycling of packaging waste	EU-15	2001	★★
	Proportion of packaging waste recycled	yes Generation and recycling of packaging waste	EU-25	2001 (2002 for New-10)	★★
Sustainable energy: A long way to go	Projected progress towards Kyoto Protocol targets	yes Projections of greenhouse gas emissions and removals and policies and measures	22 countries	2001 projection to 2010	★★★
	Total energy consumption by fuel type*	yes Total energy consumption	EU-25	2001 projection to 2030	★★★
	Renewable energy sources as a share of electricity consumption*	yes Renewable electricity	EU-25	2001	★★★

Chapter	Indicator name	Link to the Core set of indicators (yes/no)/(Name)		Coverage of countries	Latest data	Data quality
Transport: Full cost pricing needed	Transport growth and gross domestic product	yes	Passenger transport demand, Freight transport demand	EU-15	2000	★★
	Transport emissions of air pollutants	yes	Greenhouse gas emissions and removals, Emissions of acidifying substances, Emissions of ozone precursors, Emissions of primary particulates and secondary particulate precursors	EEA-31	2001	★★
	Progress with distance related charges for heavy goods vehicles on highways	yes	Passenger transport demand, Freight transport demand	EU-15	2001	★★
Air pollution: Damaging health in cities	Urban population exposure to air pollutants above limit values: Map of variation between countries	yes	Exceedences of air quality limit values in urban areas	EEA-31	2001	★★
	ozone precursors	yes	Emissions of ozone precursors	EU-25	2001	★★
	Urban population exposure to air pollutants above limit values: Map of variation between countries	yes	Exceedance of air quality limit values in urban area	18 countries	2001	★★
Climate change: Growing evidence of impacts	Observed temperature trend in Europe	yes	Global and European temperature	EEA-31	1999 (data available for 2003 but averaged over 5 years)	★★★
	Average change in European glaciers	no		Selected countries	2001	★★★
	Observed changes in growing season length	no		Selected countries	1995	★★★

Stars: ★★★=high, ★★=medium and ★=low quality

Further reading

All the data used in this report can be found in the associated excel file 'Data for Signals 2004' downloadable from the EEA Signals 2004 directory at http://reports.eea.eu.int/

The thematic factsheets can be downloaded from http://themes.eea.eu.int/indicators/

Definitions of terms can be found in the EEA multilingual environmental glossary at http://glossary.eea.eu.int/EEAGlossary/

EEA reports

EEA (1999); *Environment in the European Union at the turn of the century*; Environmental assessment report No 2

EEA (2002); *Environmental signals 2002 — Benchmarking the millennium;* Environmental assessment report No 9

EEA (2002); *TERM 2002 — Paving the way for EU enlargement* — Indicators of transport and environment integration; Environmental issue report No 32

EEA (2002); *Greenhouse gas emission trends and projections in Europe;* Environmental issue report No 33

EEA (2003); *Europe's environment: the third assessment;* Environmental assessment report No 10

EEA (2003); *Air pollution by ozone*; Topic report No 3/2003

EEA (2003); *Europe's water: An indicator-based assessment;* Topic report No 1/2003

EEA (2004a); *Air pollution in Europe 1990–2000*; Topic report No 4/2003

EEA (2004b); *Arctic environment: European perspectives, why should Europe care?;* Environmental issue report No 38

EEA (2004c); *Agriculture and the environment in the accession countries — Implications of applying the EU common agricultural policy*; Environmental issue report No 37

EEA (2004d); *Exploring the ancillary benefits of the Kyoto Protocol for air pollution in Europe;* Technical report No 93

EEA (2004e); *An inventory of biodiversity indicators in Europe 2002;* Technical report No 92

EEA (2004f); *Climate change impacts in Europe: Today and in the future*; EEA, (in press)

EEA (2004g); *EEA strategy 2004–2008*

EEA (2004h); *Greenhouse gas emission trends and projections in Europe,* Environmental issue report No 36 (in press)

EEA / UNEP (2004i); *High nature value farmland;* EEA report 1/2004

EEA (2004j); *Mapping the impacts of recent natural disasters and technological accidents in Europe*; Environmental issue report No 35

General European Commission References

European Commission (2001); *Environment 2010: Our future, our choice,* The sixth environment action programme; COM (2001) 31 final

European Commission (2001b); A *sustainable Europe for a better world: A European Union Strategy for sustainable development;* COM (2001) 264 final

European Commission (2002); *The Lisbon strategy — making change happen*; COM (2002) 14 final

Notes

([1]) To become the most competitive and dynamic knowledge based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion. European Commission (2002b).

([2]) Knowledge-based decision making; more stakeholder involvement; more development of framework legislation; more ex-post analyses on effects and effectiveness; more ex-ante (sustainability) impact assessment.

([3]) EEA (1999); *Environment in the European Union at the turn of the century*; p. 72.

([4]) EEA (2004) p. 24; Background report for the EEA state of the environment and outlook report in 2005: Consumption and the environment in Europe, trends and futures, EEA.

([5]) For example, economies of scale mean that a two-person household will use 20 % less energy than two single-person households. Consequently, most scenarios show no significant reductions over the next 30 years in the contribution made by households to CO_2 emissions. A two-person household is also likely to use 300 litres of water per day, while a single-person household is expected to use about 210 litres per day.

([6]) EU-25.

([7]) UN data: http://www.unhabitat.org/habrdd/trends/europe.html

([8]) UNEP/EEA (2004i); *High nature value farmland.*

([9]) The ten new Member States of the European Union following enlargement are referred to in graphics throughout this report as the New-10; the 15 older Member States are referred to as EU-15; the enlarged European Union is referred to as EU-25. The candidate countries — Romania, Bulgaria and Turkey — are referred to as CC-3. The member countries of the European Environment Agency are referred to as EEA-31.

([10]) The term 'agricultural intensification' stands for a variety of processes, including mechanisation, higher use of fertilisers and pesticides per hectare, increased livestock numbers per hectare, and less diversity of crops per farm.

([11]) Directives 79/409/EEC and 92/43/EEC.

([12]) EEA (2004c); *Agriculture and the environment in the accession countries: Implications of applying the EU common agricultural policy.* Copenhagen.

([13]) The underlying geology however also plays a key role in determining the extent of groundwater pollution.

([14]) Strictly speaking this refers to the groundwater bodies for which data are available. Data are available for most groundwater bodies used for drinking water but not necessarily for deeper, older groundwaters that are less frequently used for drinking water. It is likely that the latter will also become contaminated as nitrate pollution seeps downwards.

([15]) *Implementation of Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources. Synthesis from 2000 Member States reports.* European Commission, Luxembourg, 2002.

([16]) Pretty, *et al.,* Essex University (2002); cited in EEA (2003), *Development of storylines for the integrated environmental assessment of water,* third draft.

([17]) (…) The drinking water directive standards apply to treated water at the consumer's tap, not in the water body.

([18]) This total value does not include policy response costs i.e. the costs incurred from responding to the eutrophication through monitoring and treatment [in EEA (2003); *Development of storylines for the integrated environmental assessment of water,* third draft].

([19]) E.g. Ramsar Convention on Wetlands, EU birds and habitats directives and the Natura 2000 network.

([20]) Durban Action Plan, September 2003.

([21]) Please note that 'sufficient' in this context is determined by a political process involving evaluation at biogeographical region seminars.

([22]) EEA (2003); Preliminary results from macro-econometric modelling (baseline projection); Background study undertaken for the 2005 EEA state of the environment and outlook report.

([23]) ETC/WMF (2003); *Evaluation analysis of the implementation of packaging waste policies in five EU countries,* interim report.

([24]) Study countries: Denmark, Austria, Ireland, Italy and United Kingdom.

([25]) Dr Caroline Jackson MEP at the ASSURRE (Association for the sustainable use and recovery of resources in Europe) Conference on 'Smarter resource use — from strategy to delivery', Brussels, 6 November 2003.

([26]) COM(2003)739 final.

([27]) Calculated based on average energy consumption for the most recent five calendar-year period previous to the implementation of the directive.

([28]) The proposal also requires Member States to put in place regulatory frameworks to address barriers to the development and implementation of energy efficiency policies.

([29]) Including: the EU greenhouse gas emissions trading scheme, starting in 2005; promotion of electricity from renewable energy; promotion of combined heat and power (CHP); improvements in the energy performance of buildings and energy efficiency in large industrial installations; promotion of the use of energy efficient appliances; and reducing the average carbon dioxide emissions of new passenger cars.

([30]) These instruments are joint implementation with industrialised countries in eastern Europe; the clean development mechanism with developing countries; and carbon 'sinks' (forests and soils). Some countries have already started to allocate and spend substantial financial resources on such projects.

([31]) See TERM report (2002) *Paving the way for EU enlargement;* and associated fact sheets.

([32]) Precursors are chemical substances that give rise to other substances.

([33]) HEI (2003); *Revised Analyses of Time-Series Studies of Air Pollution and Health.* Health Effects Institute (HEI). May 2003. http://www.healtheffects.org/Pubs/TimeSeries.pdf; US EPA, (2003); Web site (PM_{10} brochure) of the United States Environmental Protection Agency (US EPA). http://www.epa.gov/air/aqtrnd97/brochure/pm10.html; WHO (2003); *Health Aspects of Air Pollution with Particulate Matter, Ozone and Nitrogen Dioxide.* Report on a World Health Organisation (WHO) Working Group. Bonn, Germany. 13–15 January 2003.

([34]) http://www.euro.who.int/document/e79097.pdf

([35]) CAFÉ (2003); working group on particulate matter. Draft second position paper on particulate matter, August 2003.

([36]) EEA (2004f); *Climate change impacts in Europe: Today and in the future* (in press).

([37]) WGBU (2003) has proposed reducing global CO_2 emissions from fossil fuels by 45–60 % from 1990 levels by 2050. [WGBU (2003); *World in transition: Towards sustainable energy systems,* German Advisory Council on Global Change, Berlin].

([38]) Climate change impacts in the arctic, and information on arctic sea ice from EEA (2004b).

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