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Towards a green economy in Europe

EU environmental policy targets and objectives 2010–2050

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European Environment Agency
Kongens Nytorv 6
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Tel.: +45 33 36 71 00
Fax: +45 33 36 71 99
Web: eea.europa.eu
Enquiries: eea.europa.eu/enquiries

Contents

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1 Moving towards a green economy in Europe

Global economic crisis, soaring commodity prices and growing awareness of humanity's impact on the environment have pushed the 'green economy' concept into mainstream policy debate in recent years. In large part, this reflects a recognition that the prevailing model of economic growth — founded on ever-increasing consumption of resources and emission of pollutants — simply cannot be sustained in a world of finite resources and ecosystem capacity.

1.1 The green economy — a vision for development

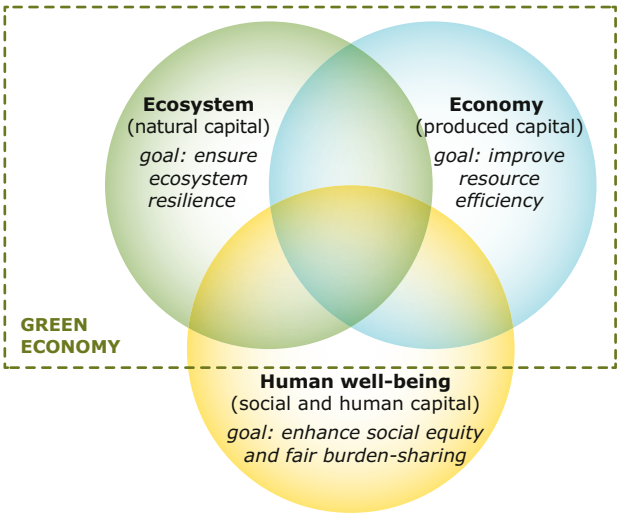
Changing the way that society manages the interaction of the environmental and economic domains requires actions across all sectors. The green economy concept can play a valuable role in this context by providing a coherent vision to guide policy and planning. A 'green' economy can be understood as one in which environmental, economic and social policies and innovations enable society to use resources efficiently — enhancing human well-being in an inclusive manner, while maintaining the natural systems that sustain us (EEA, 2012b).

Essentially, the green economy concept comprises a twin challenge. First, we need to focus on the economy, finding ways to increase prosperity without increasing resource use and environmental impacts. Put simply, we need to become more resource efficient.

By itself, however, resource efficiency will not guarantee steady or declining resource use. After all, we could become more efficient but still put excessive demands on the environment. For that reason, to achieve sustainability we also need to focus on ecosystem resilience — the status, trends and limits of natural systems.

While addressing the twin challenge of boosting resource efficiency and maintaining ecosystem resilience, there is a clear need to integrate a third focus: human well-being. This aspect is important because the benefits we derive from the environment and the harms that we suffer due its degradation are not always reflected in market prices and therefore require separate consideration. Equally important, there is a need to ensure an equitable distribution of the benefits and costs of economic restructuring.

Figure 1.1 The green economy



Source: EEA, 2012b.

1.2 From vision to reality

Evidently, the abstract conception of the green economy outlined above provides little guidance to decision-makers. Policymaking and planning require a clear understanding of where we stand today and how we are progressing. As set out in the 'Bellagio principles on assessing sustainable development' (IISD, 1997), that means translating the strategic vision into concrete and measurable goals, targets and indicators, supported with appropriate communication, participation, continuing assessment and institutional capacity.

In Europe today, many of these elements are to be found in environmental and economic policy. The EU has established policy goals extending as far

ahead as 2050 in a few areas, along with numerous others across a much wider range of policy fields as part of its Europe 2020 strategy. In many cases, these goals are accompanied by relevant targets and indicators to track implementation.

With its *Environmental indicator report 2012*, the EEA undertook its first analysis of Europe's progress in greening the economy, using six key indicators to assess resource efficiency and a further six addressing ecosystem resilience (EEA, 2012b). The findings, summarised in Table 1.1, indicate a mixed performance, although they appear to suggest that Europe has made more progress in improving resource efficiency than preserving ecosystem resilience.

Table 1.1 Summary of progress towards environmental targets and objectives

Selected 'state' indicators (related to ecosystem resilience)

Environmental issue	EU-27 target or objective	EU-27 on track?	EU-27 and EEA-32 10-year trend?
Focus: loss of biodiversity			
Conservation status (safeguard EU's most important habitats/ species)	To achieve favourable conservation status, set up Natura 2000 network	☐	→
Focus: climate change			
Global mean temperature change	To limit increases to below 2 °C globally	☒ [a]	(↗)
Focus: air quality			
Air quality in urban areas (particulate matter and ozone)	To attain levels of air quality that do not give rise to negative health impacts	☒	→
Focus: marine environment			
Biodiversity loss (marine species and habitats)	To reverse negative species abundance trends	☒	(↘)
Focus: water stress			
Water stress (water exploitation)	To achieve good quantitative status of water bodies	☐ [b]	→ [c]
Focus: material resource use			
Ecological footprint (footprint versus biocapacity)	N.A.	N.A.	→

Note: [a] The ambition is to limit global mean temperature increase to below 2 °C above pre-industrial levels. This depends critically also on greenhouse gas emissions originating outside Europe.

[b] The targets set out in the Water Framework Directive have to be reached by 2015. First assessments by member states show that a large percentage of water bodies will not reach good ecological and chemical status.

[c] Note that the trend regarding water abstractions in Europe is decreasing. This does not necessarily translate in a decrease in water stress, however, as water availability may continue to be low in regions with water stress due to variations in seasonal water demand and climatic factors.

Table 1.1 Summary of progress towards environmental targets and objectives (cont.)

Selected 'pressure' indicators (related to resource efficiency)

Environmental issue	EU-27 target or objective	EU-27 on track?	EU-27 and EEA-32 10-year trend?
Focus: nitrogen emissions			
Transboundary air pollution (NO_x, NMVOC, SO_2, NH_3)	To limit emissions of acidifying, and eutrophying pollutants	☐	↘
Focus: carbon emissions			
Greenhouse gas emissions	To reduce greenhouse gas emissions by 20 % by 2020	☑	↘
Focus: air pollution			
Air pollution	To limit emissions of ozone precursor pollutants	☐	↘
Focus: maritime use			
Maritime transport emissions	To reduce greenhouse gas emissions	☐	→
Focus: water use			
Water use	N.A.	N.A.	↘
Focus: material resource			
Decoupling and recycling (decouple resource use from economic growth)	To decouple resource use from economic growth; to move to a recycling society	☐	↗

Legend		
Positive developments	**Neutral developments**	**Negative developments**
↘ – Decreasing trend	**→ – Stable**	**(↘) – Decreasing trend**
↗ – Increasing trend		**(↗) – Increasing trend**
☑ – EU on track (some countries may not meet target)	**☐ – Mixed progress** (but overall problem remains)	**☒ – EU not on track** (some countries may meet target)

Source: EEA, 2012b.

1.3 Report aims, structure and limitations

The present report aims to build on the EEA's *Environmental indicator report 2012*, providing a more detailed overview of the key objectives and targets in EU environmental policy and legislation for the period 2010–2050. It focuses on selected environmental and resource policy areas, specifically:

- energy;
- greenhouse gas (GHG) emissions and ozone-depleting substances;
- air quality and air pollution;
- transport sector emissions of greenhouse gases and air pollutants;
- waste;
- water;
- sustainable consumption and production (SCP);
- chemicals;
- biodiversity and land use.

The review is based on a broad analysis of the EU legislation in force and the main political and strategic documents of the last decade. The most important sources include the European Commission's 'Summaries of EU legislation' (EC, 2012c), the websites of the Commission's directorates-general (for environment, mobility and transport, energy, climate action, etc.) and EEA reports.

For three of the policy areas — energy, air pollution and waste — the review of targets and objectives is complemented with a brief assessment of the trends of key indicators and the distance to associated EU targets and objectives.

Binding targets and non-binding objectives

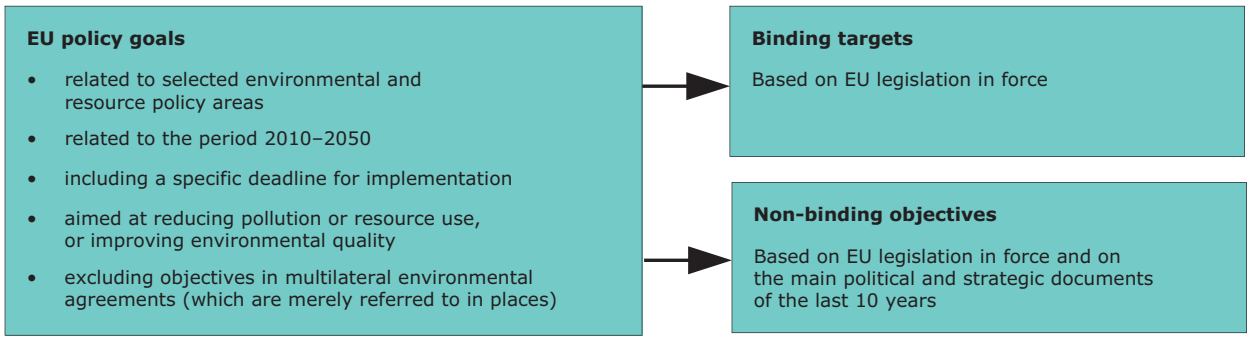
In order to develop a broad picture of the policy framework, the report analyses both binding targets and non-binding objectives. For the purposes of this report, these are defined as follows:

- Targets are binding goals established by EU legislation (regulations, directives and decisions) and international legislation that Member States and the EU are required to achieve.
- All other goals are classified as non-binding objectives. This broad category includes goals set out in Commission communications, environmental action programmes and European Council Presidency conclusions, as well as those incorporated into EU legislation (including indicative targets, target values or targets subject to subsequent confirmation). Non-binding objectives are, therefore, quite heterogeneous and can vary greatly in their stringency and political strength.

Where targets or objectives are set by legislation, this report only includes those that are set for a future date, i.e. after the date of entry into force or of transposition (where necessary).

Targets and objectives are intimately connected, as the former are normally conceived as mechanisms for achieving the latter. Figure 1.2 summarises the distinctions between objectives and targets used in this report.

Figure 1.2 Objectives and targets addressed in this report

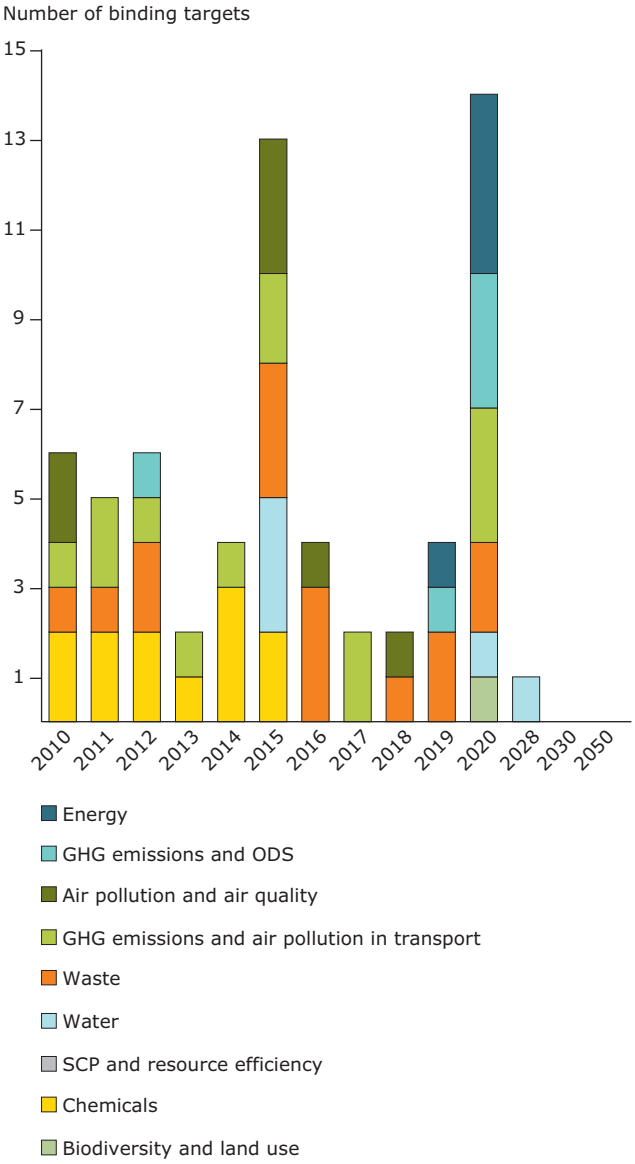


Chapter 2 sets out the EU's targets and objectives in the nine policy areas listed above for the period 2010–2050. While the earliest of these targets and objectives are now in the past, they are included here to provide an indication of how the goals are developing from where we stand today.

The nine policy areas addressed are closely related, lacking strict boundaries. Some objectives concern more than one policy area so assigning them to a single area involves a certain degree of subjective judgment. For example, volatile organic compounds emission limit values have been included in 'air quality and air pollution' but are also relevant for 'chemicals'.

A total of 63 legally binding targets and 68 non-binding objectives have been identified across the nine environmental policy areas (Figures 1.3 and 1.4). While the distribution of targets across sectors is partly determined by the categorisation used in this report, it is interesting to note that many of the binding targets are set for 2015 and 2020 in the areas of energy, air pollution, transport emissions and waste. The great majority of non-binding objectives are set for 2020, with SCP and resource efficiency playing a larger role, along with biodiversity and land use.

Figure 1.3 Binding targets in EU environmental policies, by sector and year



Limits of this study

This report aims to provide a broad overview of the policy targets set out in EU environmental legislation, accompanied with references to enable the interested reader to locate more detailed information. While it aims to be as precise and complete as possible, the overview does not claim to be exhaustive. For example:

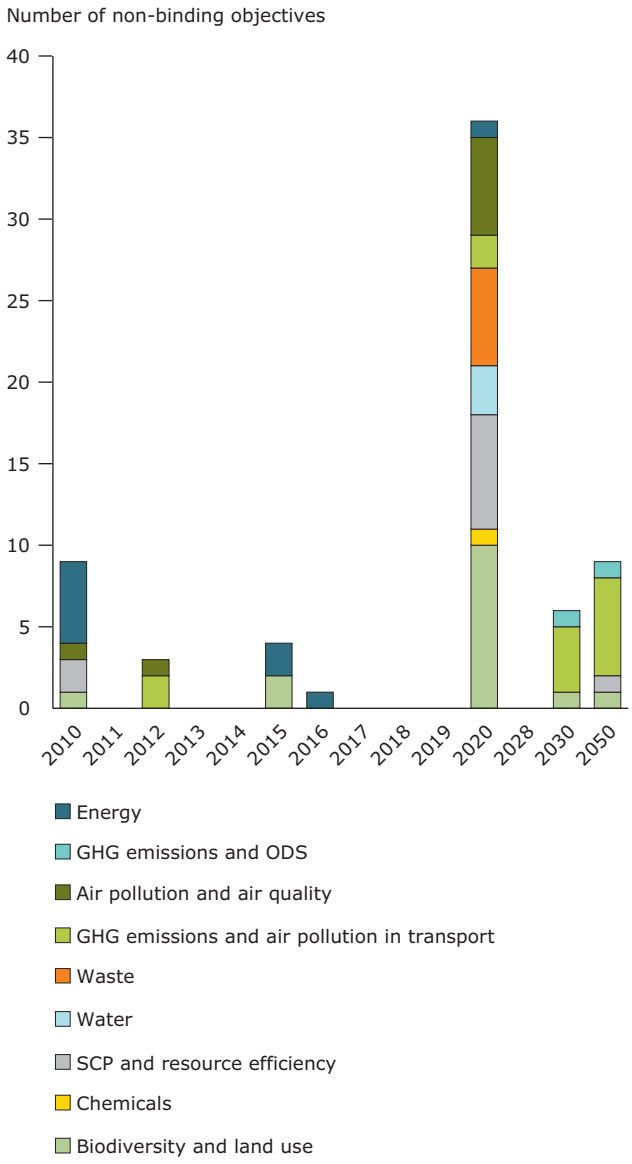
- The EU's environmental objectives and targets are being supplemented and adjusted continually. The cut-off date for the present study was autumn 2012, although in areas where there have been particularly important recent developments these have been included in a text box or footnote.

- Environmental protection is an issue that transcends policy boundaries, meaning that significant environment-related objectives and targets can also be found in other areas of EU legislation, for example agriculture, fisheries and industry.

- Most of the objectives and targets set out in this report are directly aimed at reducing pollution and resource use, and improving environmental quality. Objectives concerning other 'indirect' measures, such as collecting information and data, registration or classification procedures, monitoring, or establishing programmes and plans (which all play an important role in EU environmental policy and legislation) are outside the scope of this study.

- Apart from the EU greenhouse gas (GHG) emission reduction target under the Kyoto Protocol, this report does not present in detail the objectives and targets in multilateral environmental agreements to which the

Figure 1.4 Non-binding objectives in EU environmental policies, by sector and year



EU or its Member States are party, or those established by related protocols and decisions of the executive organs of those agreements, except where they have been integrated into EU policy. Sections 2.1–2.9 do, however, include summaries of the most significant multilateral environmental agreements adopted since 1970 that completely or partially cover the EU-27 and have been ratified by the EU or at least two EU Member States ([1]).

More detailed information on environmental policy at the EU level can be found at DG Environment (EC, 2012c), the IEEP Manual of European Environmental Policy (IEEP, 2010) and Nilsson et al. (2012).

([1]) Restrictions on its competences and powers mean that the EU cannot sign and ratify all multilateral environmental agreements. For example, the EU cannot participate in the work of the International Maritime Organization or conclude maritime conventions elaborated thereunder.

2 EU environmental policy targets and objectives

2.1 Energy

In the energy policy area the EU has established objectives and targets for energy efficiency and renewable energy sources (RES) via its '20-20-20' targets. Adopted by the European Council in March 2007 (EC, 2007), the 20-20-20 targets comprise three key measures:

- a 20 % reduction in total EU greenhouse gas emissions (including both energy and non-energy related sources) from 1990 levels (addressed in Section 2.2 of this report);
- a 20 % increase in energy efficiency by 2020;
- increasing the share of EU energy consumption produced from renewable resources to 20 %.

The greenhouse gas and renewable energy targets were translated into legislation through the Climate and Energy Package in 2009 (EU, 2009h), while the energy efficiency objective was translated by the Energy Efficiency Plan (EC, 2011c) into a 20 % reduction in consumption of primary energy compared to energy consumption projections for that year.

As set out below, these three measures are complemented by a range of supporting legislation.

Energy efficiency

The 20 % energy reduction objective entails a saving of 368 million tonnes of oil equivalent (Mtoe) of primary energy (gross inland consumption minus non-energy uses) by 2020, compared to projected consumption in that year of 1 842 Mtoe.

An energy efficiency objective is not directly set out in the climate and energy package but rather through the EU Energy Efficiency Plan (EC, 2011c) and Directive 2012/27/EU (EU, 2012b), known as the 'Energy Efficiency Directive' ([2]). The latter introduces several measures to ensure that the EU achieves its objective on energy efficiency in 2020. While these have not been fully translated into binding measures, some legislative steps have already been taken that contribute towards that objective, for example:

- Directive 2010/31/EU requires that, by the beginning of 2019, new buildings occupied and owned by public authorities be 'nearly zero-energy' buildings and that, by 2020, all new buildings be 'nearly zero-energy' buildings (EU, 2010a).
- Directive 2006/32/EC sets an overall national indicative energy savings objective of 9 % of the annual average final energy consumption by 2016 (EU, 2006a) ([3]).
- Directive 2012/27/EU provides that Member States must set indicative national energy efficiency targets by 2013; the public sector shall renovate 3 % of the buildings owned and occupied by the central government annually from 2014; Member States will prepare long-term national strategies for building renovation; and large companies shall be subject to energy audits. As a binding measure, Member States shall establish energy efficiency obligation schemes that ensure that energy distributors and retail energy sales companies operating in each Member State achieve a cumulative end-use energy savings target by 31 December 2020 ([4]).

([2]) Directive 2012/27/EU repeals most of the provisions of Directive 2006/32/EC from 5 June 2014.
([3]) The annual average consumption for each Member State is calculated based on annual final inland energy consumption of all energy users within the scope of this Directive for the most recent five-year period previous to the implementation of this Directive for which official data are available. This final energy consumption is the amount of energy distributed or sold to final customers during the five-year period, not adjusted for degree days, structural changes or production changes.
([4]) The target shall be at least equivalent to achieving new savings each year in the period 2014–2020 of 1.5 % of energy sales (by volume) to final customers of all energy distributors and/or retail energy sales companies, relative to the average during the recent three years immediately prior to 1 January 2013.

Table 2.1 Timeline for energy objectives and targets (2010–2050)

Sub-sectors and objectives	Sources	Deadline for implementation
		2010 2011 2012 2013 2014 2015 2016 2017 2019 2020 2030 2050
Energy efficiency		
Overall national indicative energy saving target of 9 % of average annual final energy consumption	Directive 2006/32/EC	⇒ 2016
Reduce consumption of primary energy by 20 % compared to energy consumption projections for 2020	Energy efficiency action plan '20-20-20' targets Europe 2020 strategy Directive 2012/27/EU	⇒ 2020
All new buildings occupied and owned by public authorities are 'nearly zero-energy' buildings	Directive 2010/31/EU	⇒ 2019
All new buildings are 'nearly zero-energy' buildings	Directive 2010/31/EU	⇒ 2020
Cumulative end-use energy savings target for energy distributors/energy sales companies	Directive 2012/27/EU	⇒ 2020
Renewable energy		
Increase renewable energy to 12 % of total energy consumption	Decision 1600/2002/EC 2006 review of the EU SDS	⇒ '10
Increase biomass use by over 50 % compared to 2003	Biomass Action Plan	⇒ '10
Increase renewable energy to 15 % of total energy consumption	2006 review of the EU SDS	⇒ 2015
Increase the share of energy from renewable sources to at least 10 % of the final consumption of energy in transport	Directive 2009/28/EC	⇒ 2020
Increase renewable energy to at least 20 % of final energy consumption	Directive 2009/28/EC	⇒ 2020
Increase renewable energy to 10 % of the overall EU transport energy consumption	Directive 2009/28/EC	⇒ 2020
Electricity from RES		
Increase electricity from RES to 21 % of total electricity consumption	2006 review of the EU SDS Directive 2001/77/EC	⇒ '10
Deliver 22 % of the electricity production from renewable energies	Decision 1600/2002/EC	⇒ '10
Biofuels		
Increase biofuels to 5.75 % of all petrol and diesel for transport purposes placed on the market by 31 December 2010	Directive 2003/30/EC	⇒ '10
Increase biofuels to 8 % of all petrol and diesel for transport purposes placed on the market	2006 review of the EU SDS	⇒ 2015

Note: Non-binding objectives (including national indicative targets, target values and targets to be confirmed, set by EU legislation) are presented in blue; binding targets are in red. Some of the non-binding objectives are repealed by later directives, implying that the deadlines for implementation are no longer valid.

Renewable energy

Under the 20-20-20 targets, Directive 2009/28/EC establishes binding renewable energy targets for the EU-27, building on two earlier commitments:

- electricity produced from renewable energy sources (RES) should reach a 21 % indicative share of total electricity consumption by 2010, according to Directive 2001/77/EC (EU, 2001b);
- bioenergy use should increase by at least 50 % in 2010 compared to 2003 (from 69 Mtoe to 150 Mtoe), according to the Biomass Action Plan (EC, 2005a).

In terms of binding commitments, Directive 2009/28/EC requires the EU-27 as a whole to achieve the 20 % target for renewable energy in final energy consumption. National binding targets for the share of renewable energy in final energy consumption were established during the legislative process. It further requires that renewable energy should meet 10 % of EU transport sector energy needs by 2020 ([5]).

The binding renewable energy target appears demanding as renewable energy accounted for just 12.5 % of EU final energy consumption in 2010.

International commitments

At the international level, the EU and its 27 Member States have ratified the Energy Charter Treaty and the Energy Charter Protocol on Energy Efficiency and Related Environmental Aspects (PEEREA). Both entered into force in 1998. PEEREA requires parties to formulate clear policy aims for improving energy efficiency and reducing the energy cycle's negative environmental impact.

In addition, binding energy efficiency targets for ships were recently adopted in the context of MARPOL 73/78 ([6]), to which all EU-27 Member States are party (IMO, 1978).

The Energy Protocol to the Alpine Convention, ratified by the EU along with Austria, Germany, France and Slovenia, promotes energy saving and rational use of energy in Alpine states in order to establish sustainable development in the energy sector.

Box 2.1 Is the EU on track towards its energy consumption objective?

The EU's 20-20-20 strategy includes, as a non-binding objective, a requirement that the EU-27 shall cut primary energy consumption by 20 % compared to the 'business as usual' level estimated on the basis of 2007 information. That implied target primary energy consumption of 1 474 Mtoe in 2020, down from the 'business as usual' level of 1 842 Mtoe in 2020. In 2010 primary energy consumption stood at 1 647 Mtoe.

Figure 2.1 presents the past trend in EU energy consumption (based on historic data for 1990–2010) and progress towards the 2020 target. Alongside the target (designated with a red square), Figure 2.1 also includes three additional data points:

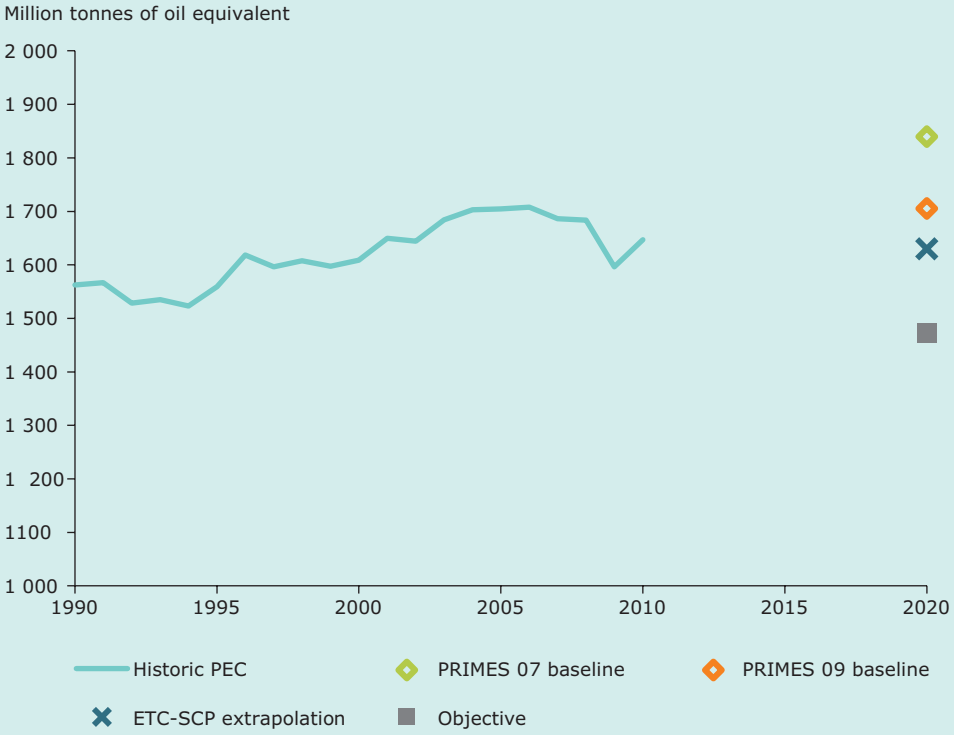
- Projected primary energy consumption in 2020, as set out in the European Commission's report, *Energy trends to 2030 — update 2007*. The forecast, which is based on the PRIMES partial equilibrium model, served as the 'business as usual' projection that underpinned the 20 % target.
- Projected primary energy consumption in 2020, as set out in the European Commission's report, *Energy trends to 2030 — update 2009*. The modelling undertaken for that report (using PRIMES) reflected the initial impact of the economic crisis.
- An extrapolation performed by the European Topic Centre on Sustainable Consumption and Production (ETC/SCP) on the basis of historic emission data since the last statistically significant structural break in the trend. Clearly, such extrapolations do not take existing knowledge of future abatement pathways or agreed policies and measures into account. As such, it merely provides an indication of the potential change if recent past trends were to continue to 2020.

([5]) Blending of biofuels is expected be the main contributor to achieving this goal. In the light of concerns regarding the potential environmental impacts of employing 'first generation' biofuels in this context, the Commission has proposed limiting their contribution to no more than 5 % of total EU transport sector energy consumption (EC, 2012a).

([6]) The main energy efficiency targets (reduction in energy consumption calculated from a baseline representing the average efficiency for ships built between 1999 and 2009) to be applied to most new ships are as follows: 10 % by 2015, 20 % by 2020 and 30 % by 2025 (Energy Efficiency Design Index, Resolution MEPC 203/62, 15 July 2011).

Box 2.1 Is the EU on track towards its energy consumption objective? (cont.)

Figure 2.1 Primary energy consumption and the 2020 objective



As Figure 2.1 illustrates, sustaining the trend of recent years would imply a substantial gap between projected consumption in 2020 and the 20 % reduction target. Whereas the 1474 Mtoe target for 2020 implies that consumption must be a little below the level in the mid-1990s, the trend since then has been slightly upwards.

The projections based on PRIMES modelling likewise foresee a further increase in energy consumption up to 2020, although it is worth noting that the most recent PRIMES projections publicly available at the time of publication are from the 2009 baseline. While the initial impact of the financial and economic crisis is apparent in the significant downward revision of the 2009 baseline relative to the 2007 figure, the next baseline projection (PRIMES 2013) is expected to be lower still due to further deterioration of the economic outlook and the adoption of additional national and EU measures to mitigate energy consumption.

Although the economic crisis has not caused a statistically significant shift in the overall primary energy consumption trend (according to the methodology set out above), it has clearly provided some downwards impetus in the last couple of years. Whether this lower level of primary energy consumption can be sustained as economic recovery occurs remains to be seen. In spite of the huge potential for energy saving and efficiency from already existing technologies, energy efficiency is generally a difficult policy to implement due to the variety of sectors involved (including industry, housing and transport) and because it calls for behavioural change by consumers.

For these reasons, it appears likely that achieving the 2020 objectives will require stronger policy implementation and possibly additional policy impulses. At present, however, the EU target on energy consumption is not legally binding.

2.2 Greenhouse gas emissions and ozone-depleting substances

Greenhouse gases

Europe plans substantial cuts in greenhouse gas (GHG) emissions in coming decades. As detailed below, the EU has a binding target of reducing emissions by 20 % in 2020 compared to 1990. At the 2009 European Council EU leaders endorsed the objective of an 80–95 % reduction of Europe's GHG by 2050 compared to 1990 levels and called on all developed countries as a group to achieve an emission reduction of a similar degree (European Council, 2009). In addition, the Commission stated the need to reduce GHG emissions by 40 % in the EU by 2030 so that the EU is on track to reach 80–95 % GHG reduction by 2050 (EC, 2013b).

The 2050 objective is consistent with the level of reductions that the Intergovernmental Panel on Climate Change (IPCC) views as necessary from developed countries as a whole in order to prevent an increase in the global mean temperature of more than 2 °C. Taking into account the contributions from developing countries according to their responsibilities and respective capabilities, this will enable a global emissions reduction of 50 % by 2050.

The 20 % GHG target for 2020 is part of the '20-20-20' targets agreed by the European Council in March 2007 (EC, 2007). The EU has also offered to increase its emissions reduction to 30 % by 2020, on the condition that other developed countries commit themselves to comparable emission reductions and economically more advanced developing countries commit to contribute adequately according to their responsibilities and respective capabilities.

In 2009 the EU adopted Decision 406/2009/EC, known as the 'Effort Sharing Decision' (EU, 2009a), as part of the its climate and energy package aimed at achieving a 20 % cut in GHG emissions by 2020 compared to 1990. It requires that sectors not covered by the EU Emissions Trading System (ETS), excluding land use, land-use change and forestry (LULUCF), must achieve a cut of 10 % compared to 2005 levels by 2020. The latter target, together with the emissions reductions delivered under the ETS ([7]), will deliver the 20 % emission reduction goal relative to 1990 levels by 2020, in accordance with the EU's 20-20-20 targets approved by the European Council in March 2007 (EC, 2007).

With its 'Roadmap for moving to a competitive low-carbon economy in 2050' (EC, 2011b), the European Commission looks beyond the 2020 targets and sets out a plan to meet the objective, endorsed by the European Council in October 2009, of reducing GHG emissions by 80–95 % by 2050, compared to 1990.

The Roadmap (EC, 2011b) states that the EU should prepare for an 80 % reduction of domestic emissions (not offsetting through the international carbon market) by 2050, compared to 1990. It also indicates that a cost-effective and gradual transition would require a 40 % reduction of domestic GHG emissions (compared to 1990 levels) by 2030.

At the global level, GHG emissions are addressed by the United Nations Framework Convention on Climate Change (UN, 1992) and its Kyoto Protocol, which have been ratified by the EU and all its Member States. Pursuant to the Kyoto Protocol (UN, 1997b), the EU-15 is obliged to cut its GHG emissions by 8 % compared to base year levels in the first commitment period 2008–2012 .

For the second period, the EU has taken on an emissions reduction commitment in line with its domestic target of cutting GHG emissions by 20 % of 1990 levels by 2020, but has left the door open to stepping up this reduction to 30 % if the conditions are right. The reduction commitment will be fulfilled jointly by the EU and its Member States, as well as Iceland. The targets of all countries participating in the second period will be revisited by 2014 with a view to considering raising the level of ambition.

Ozone-depleting substances

According to Regulation 1005/2009/EC on substances that deplete the ozone layer (EU, 2009e), hydrochlorofluorocarbons (HCFCs) must be phased out and EU countries must not produce them after 31 December 2019.

At the global level ozone-depleting substances are regulated by the Vienna Convention on the Protection of the Ozone Layer (UN, 1985) and its Montreal Protocol (UN, 1987), which has been amended several times. These agreements have been ratified both by the EU and all its Member States and are generally considered to be among the most successful multilateral environmental agreements.

([7]) Phase III of the EU ETS (2013–2020) will deliver an overall GHG emissions reduction of 21 % compared to the 2005 levels (EU, 2009d).

Other relevant measures for reducing emissions of GHGs and ozone-depleting substances are presented in Sections 2.1 and 2.4 of this report (on energy and transport emissions). They also feature in other policy areas not covered by the present analysis, such as agriculture.

Box 2.2 Climate change adaptation and resilience

Alongside the development and implementation of targets to mitigate climate change, important complementary policy processes focus on climate change adaptation. While these processes have generated few concrete objectives so far, EU policy is developing rapidly in this area.

In April 2009 the European Commission adopted a White Paper (EC, 2009) setting out a framework to reduce the EU's vulnerability to climate change impacts. Since 2009 a range of initiatives have been taken to integrate and mainstream adaptation into EU sectoral policies, including those addressing human health.

In April 2013, the European Commission published its 'EU Strategy on adaptation to climate change' (EC, 2013a), which has the following objectives:

1. Promoting Member State action by:
    - encouraging all Member States to adopt comprehensive adaptation strategies;
    - providing LIFE funding to support capacity-building and to step up adaptation action in Europe;
    - introducing adaptation into the Covenant of Mayors framework.
2. Ensuring better informed decision-making by:
    - bridging the knowledge gap;
    - further developing Climate-ADAPT ([8]) as the 'one-stop shop' for adaptation information in Europe.
3. Climate-proofing EU action by promoting adaptation in key vulnerable sectors through:
    - facilitating the climate-proofing of the Common Agricultural Policy (CAP), the Cohesion Policy and the Common Fisheries Policy (CFP);
    - ensuring more resilient infrastructure;
    - promoting insurance and other financial products for resilient investment and business decisions.

The EEA has supported the development of EU and national adaptation policy by co-developing the Climate-ADAPT platform and publishing a range of assessment reports in 2012 and 2013 on climate change impacts, vulnerability and adaptation in Europe (EEA, 2012a, 2012c, 2013a).

By mid-2013, 16 EEA member countries have developed national adaptation strategies. Some of them already have action plans in place. Further information is available on the country pages of Climate-ADAPT and in the EEA report *Adaptation in Europe* (EEA, 2013a).

The strategy is complemented by certain other EU measures such as the 'Europe 2020 Strategy for smart, sustainable and inclusive growth' (EC, 2010c), which requires Europeans to strengthen their economies' resilience to climate risk and their capacity for disaster prevention and response.

Looking ahead, the proposed amendment to the EU regulation on a mechanism for monitoring and reporting greenhouse gas emissions includes an article requiring Member States to report on their national adaptation planning and strategies every four years (in line with UNFCCC reporting), outlining both achievements and objectives.

([8]) The Climate-ADAPT platform is accessible at: http://climate-adapt.eea.europa.eu.

Table 2.2 Timeline for objectives and targets for emissions of GHGs and ozone-depleting substances (2010–2050)

Objectives	Sources	Deadline for implementation
EU-15 shall cut its aggregate GHG emissions by 8 % compared to 1990 levels (2008–2012)	Kyoto Protocol, ratified by the EU in 2002	⇒ 2012
Stop producing HCFCs	Regulation 1005/2009/EC	⇒ 2019
Reduce GHG emissions by 20 % compared to 1990 levels	'20-20-20' targets Europe 2020 strategy	⇒ 2020
Reduce GHG emissions by 21 % below the 2005 level in sectors falling under the EU Emissions Trading System (EU ETS)	Directive 2009/29/EC	⇒ 2020
Reduce GHG emissions by approximately 10 % compared to 2005 levels in sectors not covered by ETS, excluding LULUCF (Member States have binding national targets)	Decision 406/2009/EC	⇒ 2020
Reduce GHG emissions by 40 % compared to 1990 levels	Roadmap for a low carbon economy Green paper on 2030 framework	⇒ 2030
Reduce GHG emissions by 80 % compared to 1990 levels	Resource efficient Europe flagship initiative Roadmap for a low carbon economy Council Conclusion October 2009	⇒2050

Note: Non-binding objectives (including national indicative targets, target values and targets to be confirmed, set by EU legislation) are in blue; binding targets are in red.

2.3 Air pollution and air quality

In the areas of air pollution and air quality, the EU's Sixth Environment Action Programme (6EAP) (EU, 2002a) set the long-term goal of achieving levels of air quality that do not give rise to significant negative impacts on, and risks to, human health and the environment. In pursuance of that goal, the EU has established several non-binding objectives targeting significant improvements by 2020:

- The Thematic Strategy on Air Pollution (EC, 2005b) includes long-term objectives for 2020 (a 47 % reduction in loss of life expectancy as a result of exposure to particulate matter; a 10 % reduction in acute mortalities from exposure to ozone; a 74 % reduction in excess acid deposition in forest areas and a 39 % reduction in surface freshwater areas; and a 43 % reduction in areas or ecosystems exposed to eutrophication).These entail the following emissions reductions: sulphur dioxide should decrease by 82 %, nitrogen oxides by 60 %, volatile organic compounds by 51 %, ammonia by 27 % and primary $PM_{2.5}$ by 59 %, compared to the year 2000 ([9]).

- Directive 2004/107/EC (EU, 2004a) sets out target values ([10]) related to concentrations in ambient air of arsenic, cadmium, nickel and benzo(a)pyrene, which Member States were required to meet by 310160December 2012.

- Directive 2008/50/EC on ambient air quality (EU, 2008c) sets an indicative limit value for $PM_{2.5}$ (to be confirmed at review in 2013) and an exposure reduction target to be reached by 2020, while target values were established for 2010 for both $PM_{2.5}$ and ozone.

In terms of binding targets, Directive 2001/81/EC (EU, 2001c) set national emission ceilings for four atmospheric pollutants responsible for acidification, eutrophication and ground-level ozone pollution (sulphur dioxide, nitrogen oxides, non-methane volatile organic compounds and ammonia) to be met by Member States by 2010 and in all years thereafter ([11]).

From January 2010, Directive 2004/42/EC (EU, 2004c) limits emissions of volatile organic compounds (VOCs) from organic solvents in decorative paints and varnishes and vehicle refinishing products. VOC emission limit values (ELVs) were introduced for existing installations carrying out certain activities by Directive 1999/13/EC (EU, 1999a) and for paints and varnishes first set by Directive 2004/42/EC, with effect from 2007. Directive 2010/75/EU on industrial emissions requires Member States to apply ELVs for certain VOCs and halogenated VOCs as well as other important air pollutants (EU, 2010b).

Directive 2008/50/EC provides that Member States must comply with a limit value and an exposure concentration obligation related to $PM_{2.5}$ from 2015.

Integrated Prevention and Pollution Control requirements (set by Directive 2008/1/EC), as clarified and strengthened by Directive 2010/75/EU (Annex II), shall be extended to new activities covered by Annex I of the latter (e.g. additional poultry installations, smaller combustion units, wood preservation activities, certain waste management activities) by 2015. Directive 2010/75/EU (Annexes V and VI) also defines stricter ELVs for existing large combustion plants and existing combustion plants, which co-incinerate waste to be applied from 2016 (Directive 2001/80/EC provided for a first set of ELVs that existing large combustion plants had to comply with since the beginning of 2008).

Directive 2009/126/EC aims to ensure that harmful petrol vapour displaced from the fuel tank of a motor vehicle during refuelling at a service station is recovered. It therefore imposes upon operators of existing service stations whose throughput exceeds 3 000 m^3 per year, an obligation to install

([9]) The purpose of the emission ceilings is broadly to meet the following interim environmental objectives: the areas with critical loads of acid depositions will be reduced by at least 50 % compared with 1990; ground-level ozone loads above the critical level for human health will be reduced by two-thirds compared with the 1990 situation (an absolute limit is also set and the guide value set by the World Health Organization may not be exceeded on more than 20 days a year); ground-level ozone loads above the critical level for crops and semi-natural vegetation will be reduced by one-third compared with 1990 (an absolute limit is also set).

([10]) A 'target value' constitutes a concentration in the ambient air set with the aim of avoiding, preventing, or reducing harmful effects on human health and the environment as a whole, to be attained where possible over a given period.

([11]) The emission ceilings for SO_2, NO_x, VOC and NH_3 to be achieved by 2010 at EU-27 level via implementation of national emission ceilings were as follows: SO_2 = 8 297 kilotonnes; NO_x = 9 003 kilotonnes; VOC = 8 848 kilotonnes; NH_3 = 4 294 kilotonnes (Directive 2001/81/EC).

a Stage II Petrol Vapour Recovery (PVR) system by 2018 ([12]).

Other relevant objectives concern GHG and ozone-depleting substances (addressed in Section 2.2), the transport sector (Section 2.4) and persistent organic pollutants (POPs) (Section 2.8).

At the international level, the most important multilateral environmental agreement related to this policy area is the Convention on Long-Range Transboundary Air Pollution (to which the EU and all EU-27 countries are parties as well as the US, Canada and a number of countries from eastern Europe, the Caucasus and central Asia) and its protocols (UNECE, 1979). It should be noted that not all EU Member States have ratified all the protocols under the Convention. Key instruments are as follows:

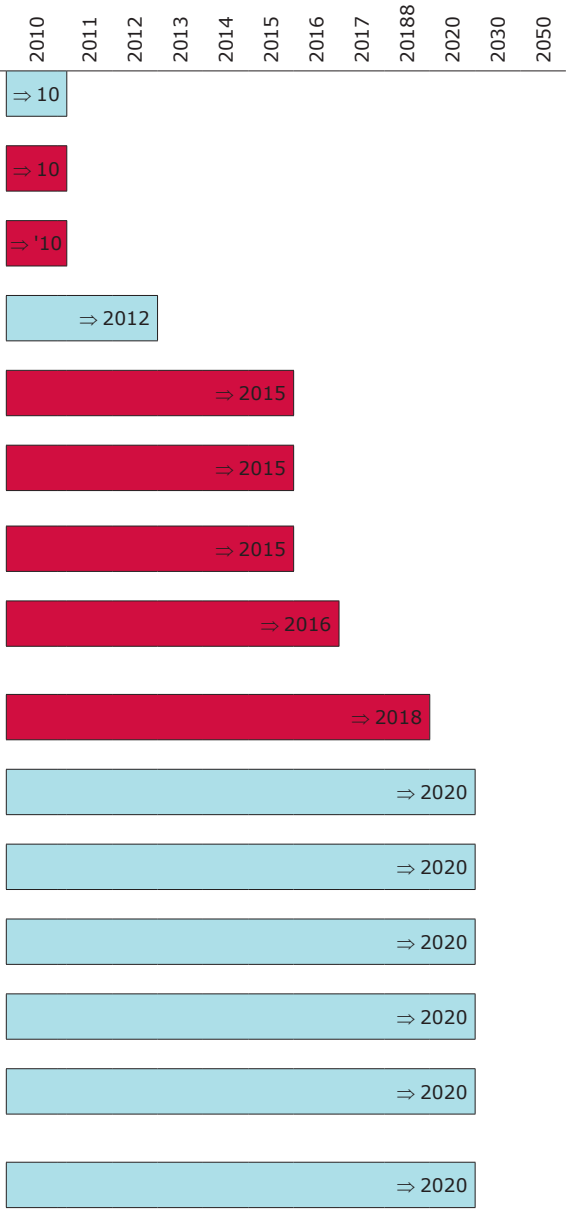
- The 1999 Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-Level Ozone (known as the Multi-Effect Protocol) set emission ceilings for 2010 for four pollutants: sulphur, NO_x, VOCs and ammonia. It requires that Europe's sulphur emissions be cut by at least 63 %, nitrogen oxides emissions by 41 %, VOC emissions by 40 % and ammonia emissions by 17 % compared to 1990 levels. The Protocol was amended in 2012, establishing new national emission reduction commitments for 2020, including commitments for fine particulate matter ($PM_{2.5}$) and measures designed to reduce emissions of black carbon. As a result, the EU as a whole is required to cut its 2020 emissions sulphur dioxide by 59 % relative to emissions in 2005. It must cut nitrogen dioxide emissions by 42 %, ammonia emissions by 6 %, volatile organic compound emissions by 28 % and $PM_{2.5}$ emissions by 22 %.
- The 1985 Helsinki Protocol on the Reduction of Sulphur Emissions or their Transboundary Fluxes by at least 30 %. This was followed by the 1994 Oslo Protocol on Further Reduction of Sulphur Emissions, which established differentiated emission reduction obligations for parties to the Protocol.
- The 1988 Sofia Protocol concerning the Control of Emissions of Nitrogen Oxides or their Transboundary Fluxes, which required its parties to freeze emissions of nitrogen oxides or their transboundary fluxes, taking 1987 as the general reference year.
- The 1991 Geneva Protocol concerning the Control of Emissions of Volatile Organic Compounds or their Transboundary Fluxes, which specifies three options for emission reduction targets that must be chosen upon signature or ratification ([13]). Unlike the four protocols cited immediately above, the EU has signed but not ratified the Geneva Protocol.
- The 1998 Aarhus Protocol on Heavy Metals, which requires Parties to reduce their emissions of cadmium, lead and mercury below their levels in 1990 (or an alternative year between 1985 and 1995). In 2012 the Protocol was amended to include more stringent controls on heavy metals emissions.
- The 1998 Aarhus Protocol on Persistent Organic Pollutants (POPs), which aims to eliminate discharges, emissions and losses of 16 substances identified as POPs (11 pesticides, two industrial chemicals and three by-products/contaminants). The Protocol banned the production and use of some products, and scheduled others for elimination at a later stage. In 2009 the Protocol was amended to include a further seven substances.

([12]) According to the Directive,'Existing service station' means a service station that is built or for which an individual planning permission, construction licence or operating licence is granted before 1 January 2012.
'Throughput' means the total annual quantity of petrol unloaded from mobile containers into a service station.
'Stage II petrol vapour recovery system' means equipment that recovers the petrol vapour displaced from the fuel tank of a motor vehicle during refuelling at a service station and transfers that petrol vapour to a storage tank at the service station or back to the petrol dispenser for resale.

([13]) The options are as follows:
(i) 30 % reduction in emissions of volatile organic compounds (VOCs) by 1999 using a year between 1984 and 1990 as a basis. This option has been chosen by Austria, Belgium, Estonia, Finland, France, Germany, Netherlands, Portugal, Spain, Sweden and the United Kingdom with 1988 as base year, by Denmark with 1985, by Liechtenstein, Switzerland and the United States with 1984, and by Czech Republic, Italy, Luxembourg, Monaco and Slovakia with 1990.
(ii) The same reduction as for (i) within a Tropospheric Ozone Management Area (TOMA) specified in Annex I to the Protocol and ensuring that by 1999 total national emissions do not exceed 1988 levels. Annex I specifies TOMAs in Norway (base year 1989) and Canada (base year 1988).
(iii) Finally, where emissions in 1988 did not exceed certain specified levels, Parties may opt for a stabilisation at that level of emission by 1999. This has been chosen by Bulgaria, Greece and Hungary.

Table 2.3 Timeline for objectives and targets for air pollution and air quality (2010–2050)

Objectives	Sources	Deadline for implementation
$PM_{2.5}$ and ozone target values	Directive 2008/50/EC	⇒ 10
National emission ceilings for SO_2, NO_X, VOCs, NH_3 (*)	Directive 2001/81/EC	⇒ 10
Second set of VOCs limit values for paints and varnishes	Directive 2004/42/EC	⇒ '10
Target values for concentrations of As, Cd, Hg, Ni, benzo(a)pyrene in air	Directive 2004/107/EC	⇒ 2012
New $PM_{2.5}$ limit value and exposure concentration obligation	Directive 2008/50/EC	⇒ 2015
Extension of IPPC requirements to new activities	Directive 2010/75/EU	⇒ 2015
New emissions limit value for selected VOCs and halogenated VOCs	Directive 2010/75/EU	⇒ 2015
New emission limit value for existing large combustion plants and for combustion plants thatco-incinerate waste	Directive 2010/75/EU	⇒ 2016
Service stations with a throughput > 3 000 m^3 mustinstall Stage II PVR technology	Directive 2009/126/EC	⇒ 2018
47 % reduction in loss of life expectancy as a result of exposure to particulate matter	Thematic Strategy on Air Pollution	⇒ 2020
10 % reduction in acute mortalities from exposure to ozone	Thematic Strategy on Air Pollution	⇒ 2020
Reduction in excess acid deposition of 74 % and 39 % in forest areas and surface freshwater areas respectively	Thematic Strategy on Air Pollution	⇒ 2020
43 % reduction in areas or ecosystems exposed to eutrophication	Thematic Strategy on Air Pollution	⇒ 2020
Emissions reductions:– 82 % of SO_2, – 60 % of NO_X, – 51 % of VOCs, – 27 % of NH_3, – 59 % of primary $PM_{2.5}$ compared to the year 2000	Thematic Strategy on Air Pollution	⇒ 2020
$PM_{2.5}$ indicative limit value and exposure reduction target	Directive 2008/50/EC	⇒ 2020



Note: Non-binding objectives (including national indicative targets, target values and targets to be confirmed, set by EU legislation) are in blue; binding targets are in red.

* These emission ceiling are valid for 2010 and all years thereafter. A proposal for a revised National Emissions Ceilings Directive (NECD) is expected in autumn 2013 which may propose new ceilings for 2020 and beyond.

Box 2.3 Is the EU on track towards its air pollutant objectives?

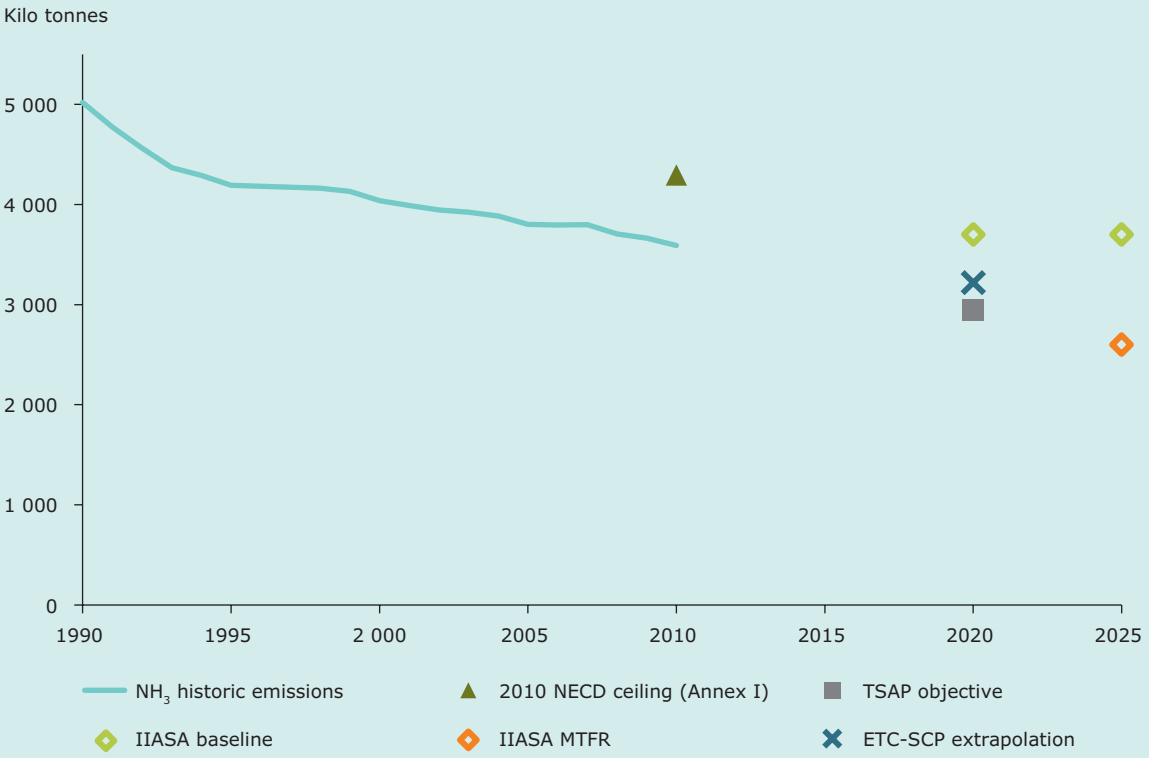
The Thematic Strategy on Air Pollution (EC, 2005b) establishes emissions reduction objectives for a series of air pollutants: sulphur dioxide (82 % compared to the year 2000), nitrogen oxides (60 %), volatile organic compounds (51 %), ammonia (27 %) and primary $PM_{2.5}$ (59 %). The thematic strategy is currently under review as part of the European Commission's review of EU air policy. As part of the review, a proposal for a revised National Emission Ceilings Directive is expected in autumn 2013, which may include future emission reduction commitments for 2020 and beyond.

The figures below present the historic trends for emissions of NH_3, NMVOC, NO_x, $PM_{2.5}$ and SO_x. Alongside the existing 2020 objectives, the figures include six additional data points:

- For 2010, the EU-27 emission ceilings for NO_x, NMVOC, SO_2 and NH_3 as defined in the National Emission Ceilings Directive Annex I and Annex II (if available). See EEA (2013b) for further information.
- IIASA's projected 'baseline' emissions in 2020 and 2025, based on the PRIMES/GAINS models (Amann, 2013).
- IIASA's projected 'maximum technically feasible reductions (MTFR)' for 2025 (Amann, 2013).
- An extrapolation performed by the European Topic Centre on Sustainable Consumption and Production (ETC/SCP) on the basis of historic emission data since the last statistically significant structural break in the trend. Clearly, such extrapolations do not take existing knowledge of future abatement pathways or agreed policies and measures into account. As such, it merely provides an indication of the potential change in emissions if recent past trends were to continue to 2020.

As the figures illustrate, the EU-27 has generally made good progress towards its 2010 emissions targets. Only in the case of $PM_{2.5}$ is there an obvious need to accelerate abatement efforts significantly. IIASA's modeling likewise suggests that achieving the targets is technically feasible for all the pollutants except $PM_{2.5}$, although in all cases it will require an improvement on the baseline projections.

Figure 2.2a EU-27 air pollutant emission trends and the Thematic Strategy on Air Pollution (TSAP) objectives for 2020 — ammonia (NH_3)



Box 2.3 Is the EU on track towards its air pollutant objectives? (cont.)

Figure 2.2b EU-27 air pollutant emission trends and the Thematic Strategy on Air Pollution (TSAP) objectives for 2020 — non-methane volatile organic compounds (NMVOC)

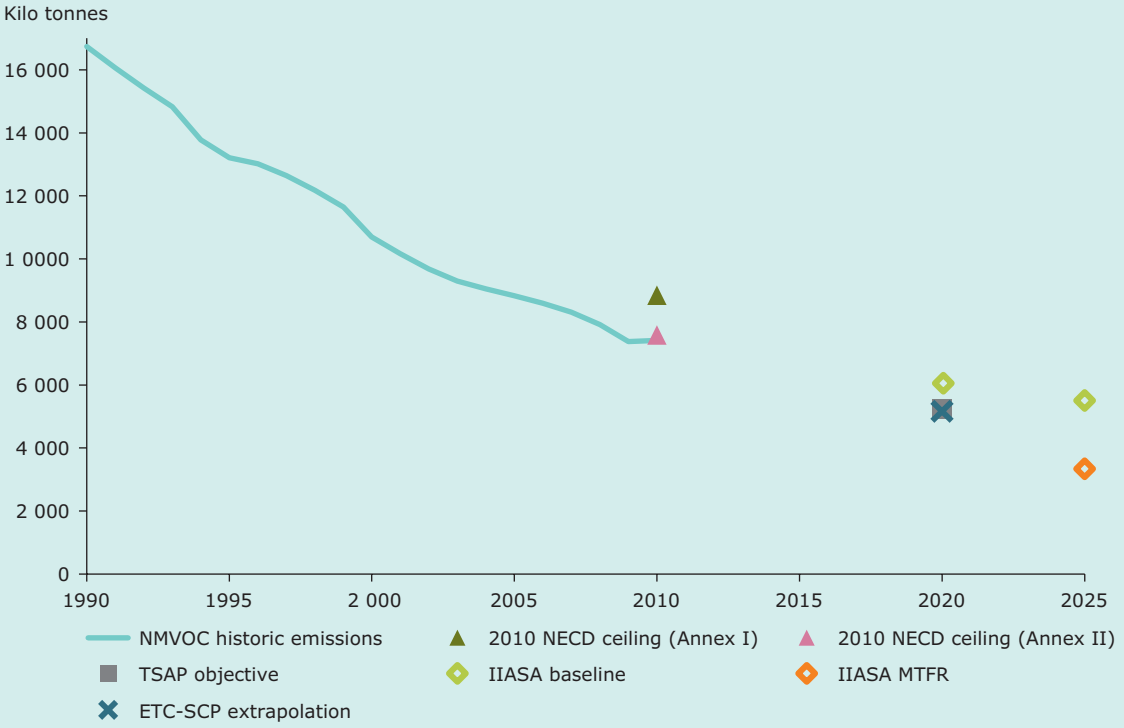
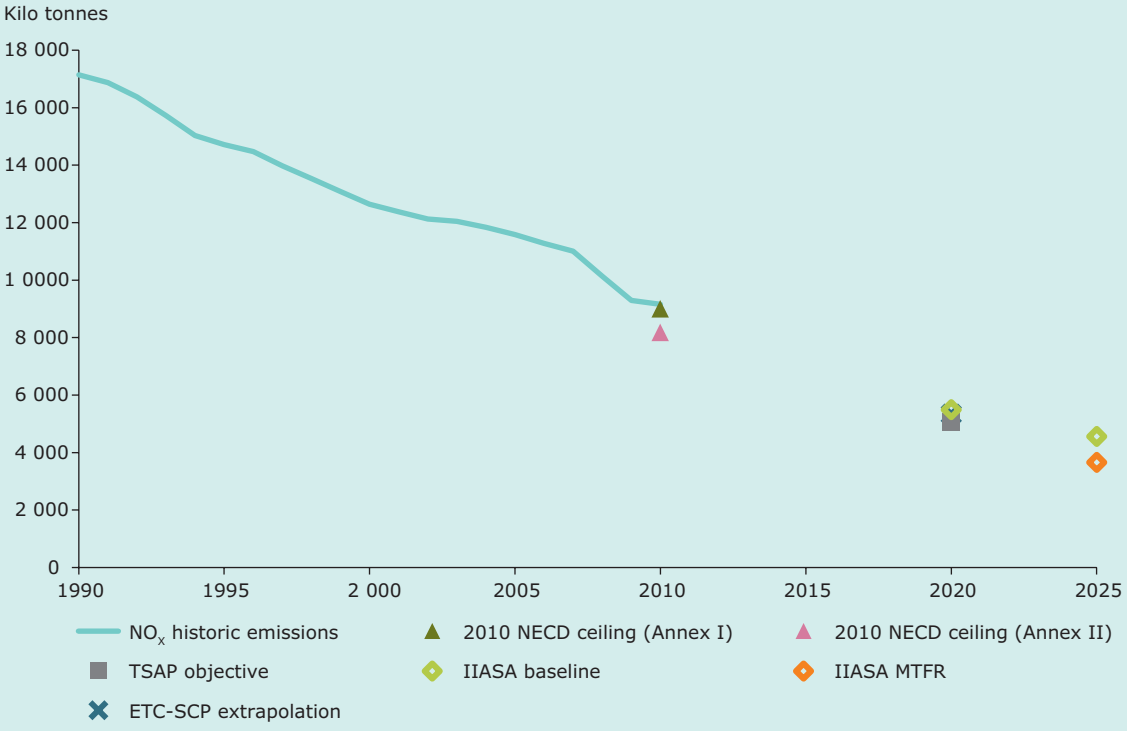


Figure 2.2c EU-27 air pollutant emission trends and the Thematic Strategy on Air Pollution (TSAP) objectives for 2020 — nitrogen oxides (NO_x)



Box 2.3 Is the EU on track towards its air pollutant objectives?

Figure 2.2d EU-27 air pollutant emission trends and the Thematic Strategy on Air Pollution (TSAP) objectives for 2020 — fine particulate matter ($PM_{2.5}$)

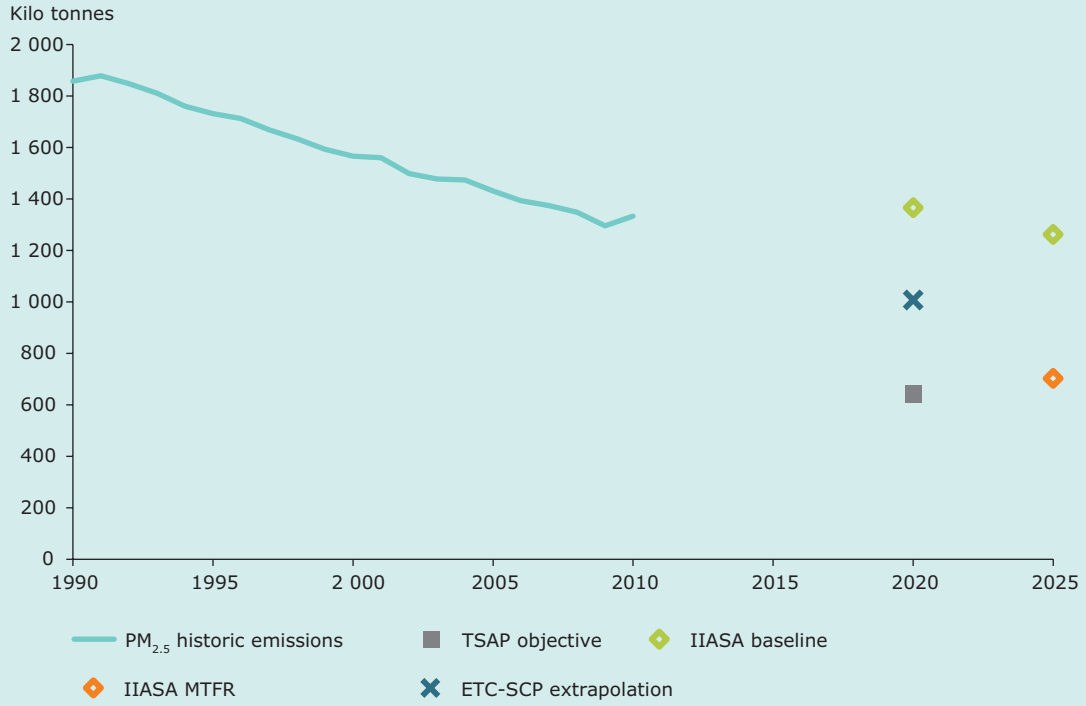
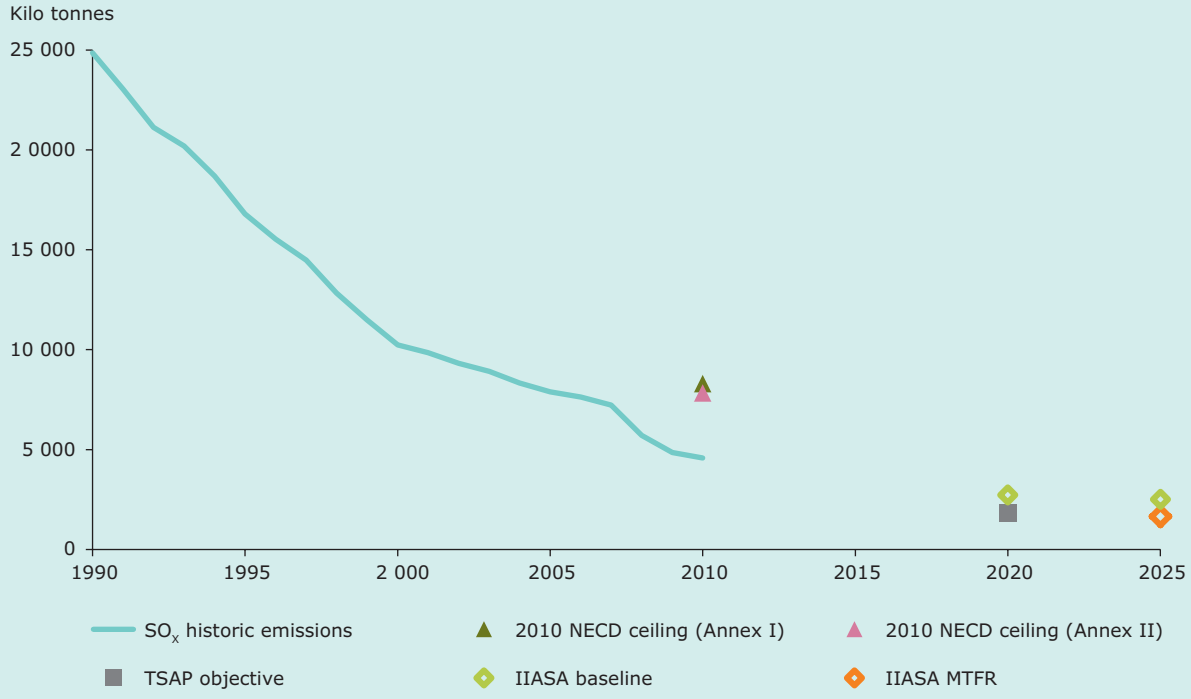


Figure 2.2e EU-27 air pollutant emission trends and the Thematic Strategy on Air Pollution (TSAP) objectives for 2020 — sulphur oxides (SO_x)



2.4 Transport emissions of greenhouse gases and air pollutants

The transport sector is subject to an extensive set of indicative and binding targets related both to GHG emissions and air pollutants.

With regard to GHG emissions, non-binding EU objectives aim for a strong reduction in CO_2 emissions from cars and light commercial vehicles. The 2006 review of the EU Sustainable Development Strategy (EC, 2006c) foresaw an emission limit of 120 g CO_2/km as the fleet average for new cars by 2012. Looking ahead, the European strategy on clean and energy efficient vehicles (EC, 2010b) provides for a limit of 95 g CO_2/km for passenger cars and Regulation 510/2011/EU (EU, 2011b) sets a limit of 147 g CO_2/km for new light commercial vehicles by 2020. In addition, the Roadmap to a Resource Efficient Europe (EC, 2011a) targets an average 1 % yearly reduction in transport GHG emissions starting from 2012.

The Roadmap to a Single European Transport Area (EC, 2011f) establishes a range of transport emission goals. Cities should halve the use of conventionally fuelled cars by 2030 and completely phase them out by 2050. Member States should shift 30 % of road freight over 300 km to rail or water by 2030, rising to 50 % by 2050, and should shift the majority of medium-distance passenger transport to rail by 2050. They should also cut transport CO_2 emissions to 60 % below 1990 levels by 2050 (a 20 % cut in 2030 compared to 2008 levels is set as intermediate goal). Additionally, major urban centres should achieve essentially CO_2-free logistics by 2030.

Demanding non-binding objectives are also in place for GHG emissions from shipping and air transport. The Roadmap to a Single European Transport Area, in particular, includes calls for airlines to increase their use of sustainable low-carbon sustainable fuels to 40 % by 2050, and for shipping to cut its carbon emissions from bunker fuels by 40 % in 2050 compared to 2005 levels.

In terms of binding targets, Directive 1999/32/EC (EU, 1999c) limits the sulphur content of marine fuels used by ships at berth in an EU port and inland waterway vessels to 0.1 % by mass from 1 January 2010, in order to improve air quality around ports and inland waterways. Driven by standards developed at the International Maritime Organisation (IMO), Directive 2012/33/EU reduces the maximum sulphur content of marine fuels from the current 3.5 % to 0.5 % by January 2020. In some very fragile ecosystems, the maximum sulphur content will be reduced to 0.1 % in 2015.

Directive 2006/40/EC on emissions from air-conditioning systems in motor vehicles (EU, 2006b) requires that Member States phase out of mobile air conditioning systems that use fluorinated greenhouse gases (hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride) with a global warming potential (GWP) higher than 150 ([14]). This requirement applies from 1 January 2011 for new types of vehicles and from 1 January 2017 for all new vehicles.

With regard to CO_2 emissions from vehicles, Member States face targets relating to fleet average emissions from different classes of vehicles. Regulation 443/2009/EC (EU, 2009f) sets a 130 g CO_2/km limit for new passenger cars by 2015 (with the target phased in from 2012) and a 95 g CO_2/km limit by 2020. Regulation 510/2011/EU (EU, 2011b) sets a 175 g CO_2/km limit for new light commercial vehicles by 2017 – with the target phased in from 2014 and 147 g CO_2/km limit by 2020. Based on Directive 98/70/EC on the quality of petrol and diesel fuels (EU, 1998a), by 2020 Member States shall require suppliers to reduce lifecycle GHG emissions per unit of energy from fuel and energy supplied by at least 6 % compared with a fuel baseline standard.

Other relevant binding targets on pollutant emissions include the Euro standards. Regulation 595/2009/EC (EU, 2009g) provides that the Euro VI standard applies from 2012 for new types of heavy vehicles (lorries and buses) and from 2013 for all new heavy vehicles. Regulation 715/2007/EC (EU, 2007b) requires that the Euro 6 standard be applied from September 2014 for approving light vehicles (under 3.5 tonnes), and from September 2015 for the registration and sale of new types of cars. The Euro 6 standard for light-duty vehicles will mainly reduce the emissions of nitrogen oxides from diesel cars (from the Euro 5 limit of 180 mg/km down to 80 mg/km). For heavy-duty diesel vehicles the Euro VI standard entails a reduction of 80 % in nitrogen oxides and 66 % in particulate matter emissions, compared to the Euro V limits (the emission requirements for hydrocarbons have also been stiffened).

([14]) 'Global warming potential' means the climatic warming potential of a fluorinated greenhouse gas relative to that of carbon dioxide. The global warming potential (GWP) is calculated in terms of the 100-year warming potential of one kilogram of a gas relative to one kilogram of CO_2.

At the international and global levels, multilateral environmental agreements related to GHG emissions, ozone-depleting substances and air pollution (see Sections 2.2 and 2.3) are also relevant for transport. The 1997 Protocol to MARPOL 73/78, which has been ratified by most EU-27 Member States, concerns the prevention of air pollution from ships. The Transport Protocol to the Alpine Convention, ratified by Austria, Germany, France and Slovenia, aims to reduce the harmful effects of intra-alpine transport, including by transferring an increasing amount of transport, especially freight transport, to the railways; increasing the efficiency of transport systems; and optimising the use of existing infrastructures.

Table 2.4 Timeline for objectives and targets for GHG emissions and air pollution in transport (2010–2050)

Sub-sectors and objectives	Sources	Deadline for implementation
GHG emissions		
Phase out of mobile air conditioning systems designed to use F-gases with global warming potential > 150 for new types of vehicles	Directive 2006/40/EC	⇒ 2011
Limit fleet average CO_2 emissions for new cars to 120 g/km	2006 review of the EU SDS	⇒ 2012
Reduce average transport GHG emissions by 1 % annually	Roadmap to a Resource Efficient Europe	⇒ 2012
Limit fleet average CO_2 emissions from new cars to 130 g/km (2012–2015)	Regulation 443/2009/EC	⇒ 2015
Phase out mobile air conditioning systems designed to use F-gases with global warming potential > 150 for new vehicles	Directive 2006/40/EC	⇒ 2017
Limit fleet average CO_2 emissions from new light commercial vehicles to 175 g/km (2014–2017).	Regulation 510/2011/EU	⇒ 2017
Reduce maximum sulphur content of marine fuels from 3.5 % to 0.5 %	Directive 2012/33/EC	⇒ 2020
Limit fleet average CO_2 emissions from new light commercial vehicles to 147 g/km	Regulation 510/2011/EU	⇒ 2020
Limit fleet average CO_2 emissions from new cars to 95 g/km	European strategy on clean and energy efficient vehicles	⇒ 2020
Limit average emissions for the new car fleet to 95 g CO_2/km.	Regulation 443/2009/EC	⇒ 2020
Reduce life cycle GHG emissions per unit of energy from fuel and energy supplied by at least 6 % compared to a fuel baseline standard	Directive 98/70/EC	⇒ 2020
Reduce CO_2 emissions from the transport sector by 20 % compared to 2008 levels	Roadmap to a Single European Transport Area	⇒ 2030
Reduce conventionally fuelled cars in cities by 50 %	Roadmap to a Single European Transport Area	⇒ 2030
Major urban centers achieve essentially CO_2-free city logistics	Roadmap to a Single European Transport Area	⇒ 2030

Table 2.4 Timeline for objectives and targets for GHG emissions and air pollution in transport (2010–2050) (cont.)

Sub-sectors and objectives	Sources	Deadline for implementation
Shift 30 % of road freight over 300 km to rail/waterborne transport	Roadmap to a Single European Transport Area	⇒ 2030
Reduce CO_2 emissions from the transport sector by 60 % compared to 1990 levels	Roadmap to a Single European Transport Area	⇒ 2050
Completely phase out conventionally fuelled cars in cities	Roadmap to a Single European Transport Area	⇒ 2050
Shift 50 % of road freight over 300 km to rail/waterborne transport	Roadmap to a Single European Transport Area	⇒ 2050
Shift the majority of long- and medium-distance passenger road transport to rail	Roadmap to a Single European Transport Area	⇒ 2050
Airlines increase their use of low carbon fuels by 40 %	Roadmap to a Single European Transport Area	⇒ 2050
Reduce carbon emissions from shipping by 40 % compared to 2005 levels	Roadmap to a Single European Transport Area	⇒ 2050
Air pollution		
Marine fuels with a sulphur content of over 0.1 % by mass are prohibited	Directive 1999/32/EC	⇒ '10
Euro 5 standard for registration and sale of new types of cars	Regulation 715/2007/EC	⇒ 2011
Euro VI standard for new types of heavy vehicles	Regulation 595/2009/EC	⇒ 2012
Euro VI standard for all new heavy vehicles	Regulation 595/2009/EC	⇒ 2013
Euro 6 standard for approval of light vehicles	Regulation 715/2007/EC	⇒ 2014
Euro 6 standard for registration and sale of new types of cars	Regulation 715/2007/EC	⇒ 2015

Note: Non-binding objectives (including national indicative targets, target values and targets to be confirmed, set by EU legislation) are in blue; binding targets are in red.

2.5 Waste

In strategic terms, EU waste policy aims to ensure that by 2020 waste is managed as a resource; waste generated per capita is in absolute decline; re-use and recycling of waste are economically attractive options for public and private actors; more materials are recycled according to high quality standards; energy recovery is limited to non-recyclable materials; landfilling is virtually eliminated; and illegal shipments are eradicated (Roadmap to a Resource Efficient Europe).

Collection, recycling and recovery targets to be reached between 2011 and 2020 have been introduced by binding legislation for various waste streams. Directive 2006/66/EC (EU, 2006c) addresses batteries, Directive 2008/98/EC (EU, 2008e) addresses non-hazardous construction and demolition waste, as well as paper, plastic, glass and metal from households, and Directive 2000/53/EC (EU, 2000a) addresses end-of-life vehicles. Similar targets were previously established for the period 2001–2008 for other waste streams. For example Directive 2002/96/EC (EU, 2002c) addresses waste electrical and electronic equipment and was followed recently by Directive 2012/19/EU (EU, 2012a). Similarly, Directive 94/62/EC (EU, 1994), as amended by Directive 2004/12/EC (EU, 2004b), addresses packaging waste. Directive 1999/31/EC (EU, 1999b), known as the Landfill Directive, sets other compulsory targets concerning biodegradable municipal waste (BMW). It provides that Member States shall ensure, through national strategies, that the disposal of BMW is progressively reduced to 35 % of the total amount (by weight) of BMW produced in 1995 by 2016, with a preliminary target of 75 % by 2006 and an intermediate target of 50 % by 2009.

With regard to hazardous substances, Directive 96/59/EC (EU, 1996) provides that equipment with polychlorinated biphenyls (PCBs) volumes higher than 5 dm^3 be decontaminated or disposed of by 2010. Directive 2011/65/EU (EU, 2011a), which repeals Directive 2002/95/EC (EU, 2002b) with effect from 2013, prohibits heavy metals in all new electrical and electronic equipment (EEE) by 2019.

At the international level, the Basel Convention, ratified by the EU and all EU-27 countries, addresses transboundary movements of hazardous wastes and their disposal. The Convention is implemented within the EU through Regulation (EC) No1013/2006, known as the Waste Shipments Regulation (EU, 2006e), which also gives effect to the OECD system for the control of transfrontier movements of wastes destined for recovery operations (OECD Decision C/92/39 final, as amended by OECD Decision C/2001/107 final).

Some multilateral environmental agreements concerning marine pollution address waste-related problems: the Dumping Protocol to the Convention for the Protection of the Mediterranean Sea against Pollution (ratified by the EU and seven EU-27 countries), the Hazardous Waste Protocol to the Convention for the Protection of the Mediterranean Sea against Pollution (ratified by Malta), the Dumping Protocol to the Convention on the Protection of the Black Sea against Pollution (ratified by Bulgaria and Romania), Annex V to MARPOL 73/78 on the Prevention of Pollution by Garbage from Ships (ratified by all EU-27 countries) and the Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matters (ratified by most EU Member States).

The International Maritime Organization (IMO) has also promoted the conclusion of the International Convention for the Safe and Environmentally Sound Recycling of Ships, which has been signed by several countries but not yet ratified by any ([15]).

([15]) The Council of the European Union, in its Conclusions on an EU Strategy for better ship dismantling of 21 October 2009 (ENVI, 2009) strongly encouraged 'EU Member States to ratify the Hong Kong Convention as a matter of priority so as to facilitate its entry into force as early as possible and to generate a real and effective change on the ground'. The Convention can be ratified only by IMO Member States (not by the EU).

Table 2.5 Timeline for waste sector objectives and targets (2010–2050)

Sub-sectors and objectives	Sources	Deadline for implementation
		2010 2011 2012 2013 2014 2015 2016 2018 2019 2020 2030
General		
Waste is managed as a resource	Roadmap to a Resource Efficient Europe	⇒ 2020
Achieve an absolute decline of waste generated per capita	Roadmap to a Resource Efficient Europe	⇒ 2020
Ensure high quality recycling	Roadmap to a Resource Efficient Europe	⇒ 2020
Limit energy recovery to non-recyclable materials	Roadmap to a Resource Efficient Europe	⇒ 2020
Virtually eliminate landfilling	Roadmap to a Resource Efficient Europe	⇒ 2020
Eradicate illegal shipments of waste	Roadmap to a Resource Efficient Europe	⇒ 2020
Reuse, recycling and recovery targets		
Recycling targets for batteries (by average weight): – 65 % of lead acid batteries, – 75 % of nickel cadmium batteries – 50 % of other batteries	Directive 2006/66/EC	⇒ 2011
WEEE, with reference to Annex I categories: – cat. 1 or 10: 80 % recovery and 75 % recycling – cat. 3 or 4: 75 % recovery and 65 % recycling – cat. 2, 5, 6, 7, 8 or 9: 70 % recovery and 50 % recycling Gas discharge lamps: 80 % recycling (*)	Directive 2012/19/EU	⇒ 2012
Targets for end-of-life vehicles (by average weight per vehicle per year): reuse and recovery: 95 % reuse and recycling: 85 %	Directive 2000/53/EC	⇒ 2015
WEEE, with reference to Annex I categories: – cat. 1 or 10: 85 % recovery and 80 % recycling – cat. 3 or 4: 80 % recovery and 70 % recycling – cat. 2, 5, 6, 7, 8 or 9: 75 % recovery and 55 % recycling Gas discharge lamps: 80 % recycling	Directive 2012/19/EU	⇒ 2015
WEEE, with reference to Annex IIII categories: – cat. 1 or 4: 85 % recovery and 80 % reuse and recycling – cat. 2: 80 % recovery and 70 % reuse and recycling – cat. 5 or 6: 75 % recovery and 55 % reuse and recycling – cat. 3: 80 % recycling	Directive 2012/19/EU	⇒ 2018
Recycling and reuse of 70 % by weight of non-hazardous construction and demolition waste	Directive 2008/98/EC	⇒ 2020

Table 2.5 Timeline for waste sector objectives and targets (2010–2050) (cont.)

Sub-sectors and objectives	Sources	Deadline for implementation
		2010 2011 2012 2013 2014 2015 2016 2018 2019 2020 2030
Recycling and reuse of 50 % by weight of paper, plastic, glass and metal from households	Directive 2008/98/EC	⇒ 2020
Collection and disposal		
Decontamination or disposal of equipment with PBC volumes > 5 dm3	Directive 96/59/EC	⇒ '10
Collection target for batteries: 25 %	Directive 2006/66/EC	⇒ 2012
Separate collection for glass, plastic, metal, paper	Directive 2008/98/EC	⇒ 2015
Collection target for batteries: 45 %	Directive 2006/66/EC	⇒ 2016
Disposal of biodegradable municipal waste: reduction to 35 % of total 1995 biodegradable municipal waste	Directive 1999/31/EC	⇒ 2016
Collection target for WEEE: 45 % of the average weight of EEE placed on the market in the three preceding years in the Member State concerned	Directive 2012/19/EU	⇒ 2016
Collection target for WEEE: – 65 % of the average weight of EEE placed on the market in the Member State in the three preceding years or – 85 % of WEEE generated in the Member State.	Directive 2012/19/EU	⇒ 2019
Product making		
No heavy metals (Pb, Hg, Cd, hexavalent Cr, PBB and PBDE) in new electrical and electronic equipment	Directive 2011/65/EU	⇒ 2019

Note: Non-binding objectives (including national indicative targets, target values and targets to be confirmed, set by EU legislation) in blue, binding targets in red.

* These targets, established by Annex V to Directive 2012/19/EU, are applicable from 13 August 2012 until 14 August 2015, i.e. before the date of transposition of the Directive (14 February 2014). Although they do not meet the selection criteria set out in Chapter 1, they are included in Table 2.5 to provide a complete picture of the new WEEE targets, as the table contains all the other targets established by Annex V.

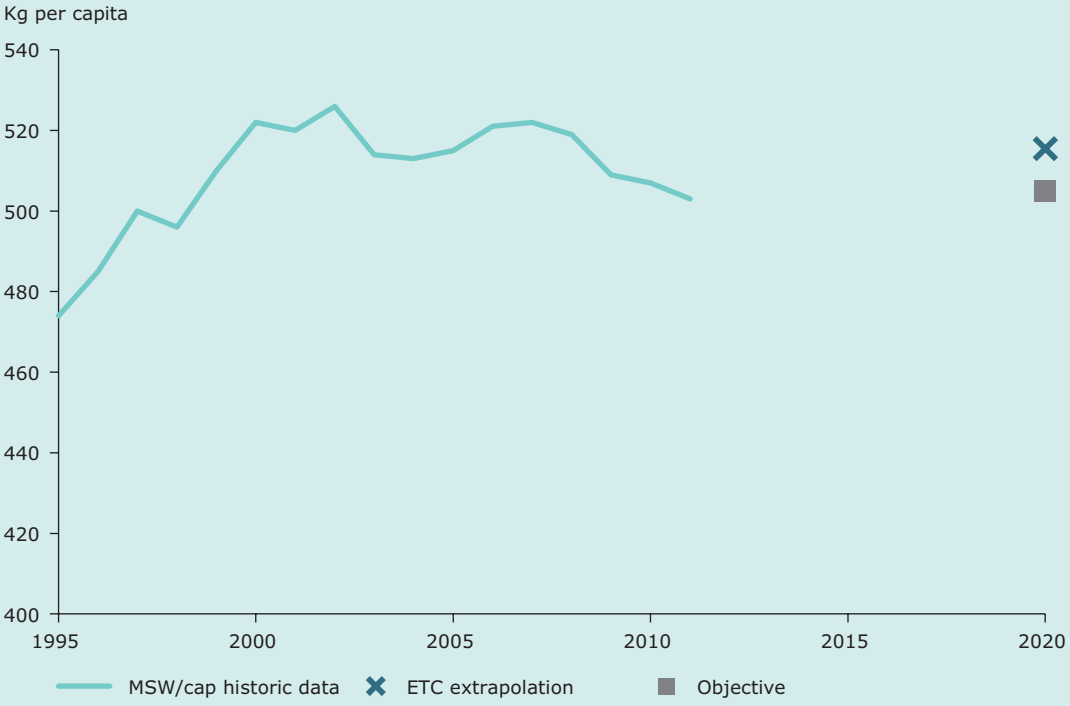
Box 2.4 Is the EU on track to achieve its waste objectives?

As noted above, two of the EU-27's core non-binding objectives for waste specify that waste generated per capita should be in absolute decline and that landfilling of waste should be near zero by 2020. To illustrate progress towards those targets, Figure 2.3 and Figure 2.4 present the historic emissions trends along with extrapolations of the data since the last structural break in the trend (if any has occurred), using the methodology set out in Box 2.1.

As shown in Figure 2.3, the recent trend in MSW generation has fluctuated at slightly over 500 kg per capita. Extrapolation of the trend since the last structural break suggests that output will increase marginally from 505 kg/cap in 2011 to 515 kg/cap in 2020, implying that the EU would narrowly miss its 2020 target. The trend is certainly ambiguous, however, with the decline in waste generation since 2007 giving some cause for encouragement.

In general, waste policies of the 1990s and 2000s affected waste management but not waste generation. While the establishment of national waste prevention plans under the Waste Framework Directive offers some means of encouraging waste prevention, the absence of legally minding measures arguably weakens European efforts in this area.

Figure 2.3 EU-27 MSW generation per capita



Note: Actual data 1995–2008; projected data 2009–2020 based on autoregressive model AR(1) on the differences.

Source: Eurostat and ETC/SCP.

Box 2.4 Is the EU on track to achieve its waste objectives? (cont.)

As for the objective on 'near-zero landfill' in 2020, an extrapolation of the trend since the last structural break points to a decline from 179 kg per capita in 2011 to 114 kg per capita in 2020 (Figure 2.4). This is obviously not very near to zero.

Figure 2.4 EU-27 MSW landfilled and the objective of 'near zero landfill' in 2020

Note: Actual data 1995–2008; projected data 2009–2020 based on autoregressive model AR(1) on the differences.

Source: Authors, elaborating on Eurostat data.

Achieving the target for near-zero landfill appears to require a radical change in waste management, particularly in the EU-12. While the extrapolation of recent trends presented in Figure 2.4 must, of course, be regarded with considerable caution because it does not reflect planned policy initiatives and other relevant factors, realising the necessary acceleration in diversion of waste away from landfill clearly looks very demanding.

The EU's progress towards the landfill target appears to resemble progress towards the EU's objective that Member States should recycle 50 % of municipal solid waste by 2020. As a recent EEA report observes: 'While five countries have already achieved the target and another six will achieve it if they continue to improve their recycling rate at the same pace as in the period 2001–2010, the majority of countries will need to make an extraordinary effort in order to achieve the target of 50 % recycling by 2020.'

2.6 Water

The 'Roadmap to a Resource Efficient Europe'(EC, 2011a) specified a series of non-binding objectives for water to be achieved by 2020. Specifically, water abstraction should stay below 20 % of available renewable water resources; the impacts of droughts and floods should be minimised, with adapted crops, increased water retention in soils and efficient irrigation; and alternative water supply options should only relied upon when all cheaper savings opportunities have been taken.

In the medium term, management of water resources is affected by three important sets of binding environmental targets, as set out below.

Water Framework Directive targets

The first set of targets are set by the Water Framework Directive (EU, 2000b), which requires that all surface and groundwater bodies achieve 'good status' by 2015. The Directive defines 'good status' as 'good ecological status' plus 'good chemical status' with reference to surface waters; and as 'good chemical status 'plus 'good quantitative status' with reference to groundwater.

In particular, 'good chemical status' for surface waters entails meeting all environmental quality standards for chemicals set at EU level. The existing list of 33 priority substances (set out in Annex X to the Water Framework Directive) was established by Decision 2455/2001/EC (EU, 2001a) and amended by Directive 2008/105/EC (EU, 2008b). The Commission has recently adopted a proposal for a new revision of the list, COM/2011/876/final (EC, 2012b).

Directive 2008/105/EC also introduced environmental quality standards for all the 33 priority substances and for eight other pollutants that were already regulated under existing EU legislation (listed in Directive 76/464/EEC (EU, 1976b) and Annex IX of the Water Framework Directive).Thirteen of the 33 priority substances have been classified as hazardous (metals, organic pollutants, pesticides, etc.). The WFD requires the Commission to propose controls for the cessation or phase-out of emissions, discharges and losses of such substances and a time limit of 20 years is set out to achieve the cessation or phase-out, from the date of adoption of the controls. As a consequence, the 13 hazardous priority hazardous substances must be completely eliminated by 2028 at the latest.

With reference to water pollution, Article 10 of the Water Framework Directive specifies a combined approach for addressing point and diffuse sources, based in part on the requirements set out in three pieces of supporting legislation:

- Directive 2008/1/EC on integrated prevention and pollution control (IPPC) (EU, 2008a). Directive 2010/75/EU (EU, 2010b) extends the IPPC requirements to new activities (e.g. additional poultry installations, smaller combustion units, wood preservation activities, certain waste management activities) by 2015.

- Directive 91/271 concerning urban waste-water treatment (EU, 1991), which introduced binding targets for collecting and treating urban waste-water for the period 2000–2005.

- Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources.

Bathing Water Directive targets

The second set of targets is shaped by the Directive 2006/7/EC, known as the new Bathing Water Directive (EU, 2006d), which will repeal the original Bathing Water Directive (Directive 76/160/EEC (EU, 1976a)) by 2014. It requires Member States to ensure that, by the end of the 2015 bathing season, all bathing waters are at least 'sufficient', based on clear bacteriological quality standards. In order to monitor and assess the quality of bathing waters and to classify them, two main parameters are defined, instead of nineteen in the previous Directive, relating to intestinal *enterococci* and *escherichiacoli*.

Marine Strategy Framework Directive targets

The third set of targets is set by Directive 2008/56/EC, known as the Marine Strategy Framework Directive (EU, 2008d). It requires that 'good environmental status' be maintained or reached in the marine environment by 2020. Each Member State must develop a marine strategy by 2012 that contains a detailed assessment of the state of the environment and define 'good environmental status' at the regional level, as well as establishing clear environmental targets and monitoring programmes. The Commission established criteria to be used by the Member States to assess environmental status by its decision of 1 September 2010 on criteria and methodological standards on good environmental status of marine waters (EC, 2010a).

International obligations

At the international level, general instruments addressing the protection of transboundary freshwaters include the Convention on the Protection and Use of Transboundary Watercourses and International Lakes (UNECE, 1992), which has been ratified by the EU and most EU-27 countries, and the Convention on the Law of the Non-Navigational Uses of International Watercourses (UN, 1997a), which has been ratified by about ten EU Member States and is not yet in force.

Many other conventions cover international river basins totally or partially located within the EU (Danube, Oder, Elbe, Rhine, Maas, and Scheldt).

With reference to marine waters, other general instruments include the United Nations Convention on the Law of the Sea (ratified by all EU-27 countries and formally confirmed by the EU), as well as several IMO conventions: MARPOL 73/78 (ratified by all EU-27 countries), the International Convention on Oil Pollution Preparedness, Response and Co-operation (ratified by most EU Member States), the International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea (ratified by a few EU Member States and not yet in force), and the International Convention on Civil Liability for Bunker Oil Pollution Damage (ratified by most EU Member States). Other multilateral environmental agreements and protocols concern pollution by dumping of waste, marine biodiversity and fisheries.

Relevant regional seas conventions include the Convention for the Protection of the Mediterranean Sea against Pollution (and related Protocols), the Convention on the Protection of the Marine Environment of the Baltic Sea Area (HELCOM), the Convention for the Protection of the Marine Environment of the North Sea Atlantic (OSPAR), the Convention on the Protection of the Black Sea against Pollution, the Agreement for Cooperation in dealing with Pollution of the North Sea by Oil and other Harmful Substances, and the Cooperation Agreement for the Protection of the Coasts and Waters of the North-East Atlantic Against Pollution (not yet in force).

Box 2.5 Recent developments — the Water Blueprint

In November 2012 the Europe Commission launched its 'Blueprint to safeguard Europe's water' — a long-term strategy to ensure that sufficient good quality water is available to meet the needs of people, the economy and the environment.

The 'Blueprint' sets out a three-tier strategic approach to achieving the Water Framework Directive's objective of good water status by 2015, concentrating on:

- better implementation of existing water legislation, for example by restoring wetlands and floodplains, and improving incentives via metering and better water pricing;
- integration of water policy objectives into other policies such as agriculture, fisheries, renewable energy, transport and cohesion and structural funds;
- filling gaps in the current framework, particular as regards water quantity and efficiency.

The Water Blueprint's time horizon is closely related to the EU's 2020 Strategy and, in particular, to the 2011 Resource Efficiency Roadmap, of which the Blueprint is the water milestone. However, the analysis underpinning the Blueprint covers a longer time span, up to 2050, and is expected to drive EU water policy over the long term.

Table 2.6 Timeline for water objectives and targets (2010–2050)

Objectives	Sources	Deadline for implementation
All surface and groundwater bodies in river basins achieve 'good status'	Directive 2000/60/EC	⇒ 2015
Bathing waters achieve a classification of at least 'sufficient'	Directive 2006/7/EC	⇒ 2015
Extension of IPPC requirements to new activities	Directive 2010/75/EU	⇒ 2015
Keep water abstraction below 20% of available renewable water resources	Roadmap to a Resource Efficient Europe (COM(2011)571 final)	⇒ 2020
Alternative water supply options are only relied upon when all cheaper savings opportunities have been taken	Roadmap to a Resource Efficient Europe (COM(2011)571 final)	⇒ 2020
The impacts of droughts and floods are minimised	Roadmap to a Resource Efficient Europe (COM(2011)571 final)	⇒ 2020
'Good environmental status' is achieved or maintained in the marine environment	Directive 2008/56/EC	⇒ 2020
Priority hazardous substances under Directive 2008/105/EC are completely eliminated from surface waters	Directive 2008/105/EC	⇒ 2028

2010 2011 2012 2013 2014 2015 2016 2017 2019 2020 2028 2050

Note: Non-binding objectives (including national indicative targets, target values and targets to be confirmed, set by EU legislation) are in blue; binding targets are in red.

2.7 Sustainable consumption and production

The non-binding objectives related to sustainable consumption and production (SCP) are mainly set out in the 'Roadmap to a Resource Efficient Europe'(EC, 2011a). The objectives to be reached by 2020 include the following:

- environmentally harmful subsidies are to be phased out and the share of environmental taxes in public revenues should increase substantially;
- incentives for healthier and more sustainable food production and consumption should be widespread and drive a 20 % reduction in the food chain's resource inputs and halve the disposal of edible food waste in the EU;
- citizens and public authorities should have the right incentives to choose the most resource efficient products and services, through appropriate price signals and clear environmental information;
- market and policy incentives should be in place to reward business investments in efficiency, and all companies should be able to measure and benchmark their lifecycle resource efficiency;
- economic growth and wellbeing should be decoupled from resource inputs;
- ambitious resource efficiency targets and robust should be in place, alongside timely indicators guiding public and private decision-makers in the transformation of the economy towards greater resource efficiency.

Moreover, as a very general strategic goal, by 2050, the EU economy should grow in a way that respects resource constraints and planetary boundaries, thus contributing to global economic transformation. It should be competitive, inclusive and provide a high standard of living with much lower environmental impacts. All resources should be sustainably managed, from raw materials to energy, water, air, land and soil.

Two objectives set for 2010 pertain to green public procurement (GPP). The 2006 review of the EU Sustainable Development Strategy (EC, 2006c) required that by 2010 the EU should achieve an average level of GPP equal to the level of the best performing Member States at the time of the review. The Commission's communication on procurement for a better environment (EC, 2008) provides that Member States should have made 50 % of all tendering procedures green, where 'green' means 'compliant with endorsed common core GPP criteria'.

At the international level, some of the multilateral environmental agreements already mentioned with reference to energy (Section 2.1) and GHG emissions and ozone-depleting substances (Section 2.2), also play a role in fostering sustainable consumption and production and resource efficiency. Examples include the Energy Charter Protocol on Energy Efficiency and Related Environmental Aspects, the Energy Protocol to the Alpine Convention, the energy efficiency targets for ships under MARPOL 73/78, and the Kyoto Protocol.

Table 2.7 Timeline for SCP and resource efficiency objectives (2010–2050)

Objectives	Sources	Deadline for implementation
Achieve an EU average level of GPP equal to the one of the best performing Member States	2006 review of the EU SDS	⇒ '10
50% of all tendering procedures should be green	Communication on procurement for a better environment	⇒ '10
Phase out environmentally harmful subsidies and substantially increase the share of environmental taxes	Roadmap to a Resource Efficient Europe	⇒ 2020
Food chain resource inputs should be cut by 20 %	Roadmap to a Resource Efficient Europe	⇒ 2020
Disposal of edible food waste should be halved	Roadmap to a Resource Efficient Europe	⇒ 2020
Price signals and environmental information should be in place to incentivise citizens and public authorities to choose the most resource efficient products and services	Roadmap to a Resource Efficient Europe	⇒ 2020
Market and policy incentives that reward business investments in efficiency are in place	Roadmap to a Resource Efficient Europe	⇒ 2020
Resource efficiency targets and indicators guide public and private decision-makers	Roadmap to a Resource Efficient Europe	⇒ 2020
Economic growth and wellbeing is decoupled from resource inputs	Roadmap to a Resource Efficient Europe	⇒ 2020
Economy grows respecting resource constraints	Roadmap to a Resource Efficient Europe	⇒ 2050

2010 2011 2012 2013 2014 2015 2016 2017 2019 2020 2030 2050

Note: Non-binding objectives (including national indicative targets, target values and targets to be confirmed, set by EU legislation) are in blue; binding targets are in red.

2.8 Chemicals

At a strategic level, the June 2006 Review of the EU Sustainable Development Strategy (EC, 2006c) requires that by 2020 chemicals, including pesticides, are produced, handled and used in ways that do not pose significant threats to human health and the environment.

To this end, the rapid adoption of Regulation 1907/2006/EC on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) (EU, 2006f) was considered a milestone. This horizontal chemical legislation was endorsed in 2006 and entered into force in 2007. In particular, it provides for the following compulsory measures:

- Producers and importers are required to submit a registration to the European Chemicals Agency (ECHA) for each chemical substance produced in or imported into the EU market in quantities of 1 tonne or more annually per company, with deadlines from 2010 to 2018, depending on the type of substance and the quantities manufactured or imported ([16]). This information is then evaluated by ECHA and the Member States to examine the quality of the registration dossiers and the testing proposals and to clarify if a given substance constitutes a risk to human health or the environment.

- Chemical substances identified as 'substances of very high concern'(SVHC) and included in the authorisation list (Annex XIV), cannot be placed on the market or used after a given date (the socalled 'sunset date'), unless an authorisation is granted for their specific use or their use is exempted from authorisation. Annex XIV, at present, lists 14 SVHCs, with sunset dates ranging from 2014 to 2015.

- Binding 'restrictions' (Annex XVII) can be decided to limit or ban the manufacture, sale or use of a chemical substance that poses an unacceptable risk to health or the environment. Several such binding restrictions are to be applied between 2010 and 2015.

Other compulsory objectives have been adopted for mercury, biocides and pesticides:

- Regulation 1102/2008/EC (EU, 2008f) has banned the export of metallic mercury and certain mercury compounds and mixtures originating from the EU since 15 March 2011.

- Regulation 1451/2007/EC (EU, 2007a) and Directive 98/8/EC (EU, 1998b) provide that more than one hundred active substances contained in several biocidal product types ([17]) must be phased out between 2010 and 2013, with most of the deadlines set for 2011.

- Directive 98/8/EC further provides that biocidal products containing active substances not included in Annex I that were on the market in the EU on 14 May 2000 ('existing active substances') shall not be placed on the market after 14 May 2014.

- Directive 2009/128/EC (EU, 2009b) sets outgeneral principles of integrated pest management in its Annex III to be implemented by all professional users by 1 January 2014.

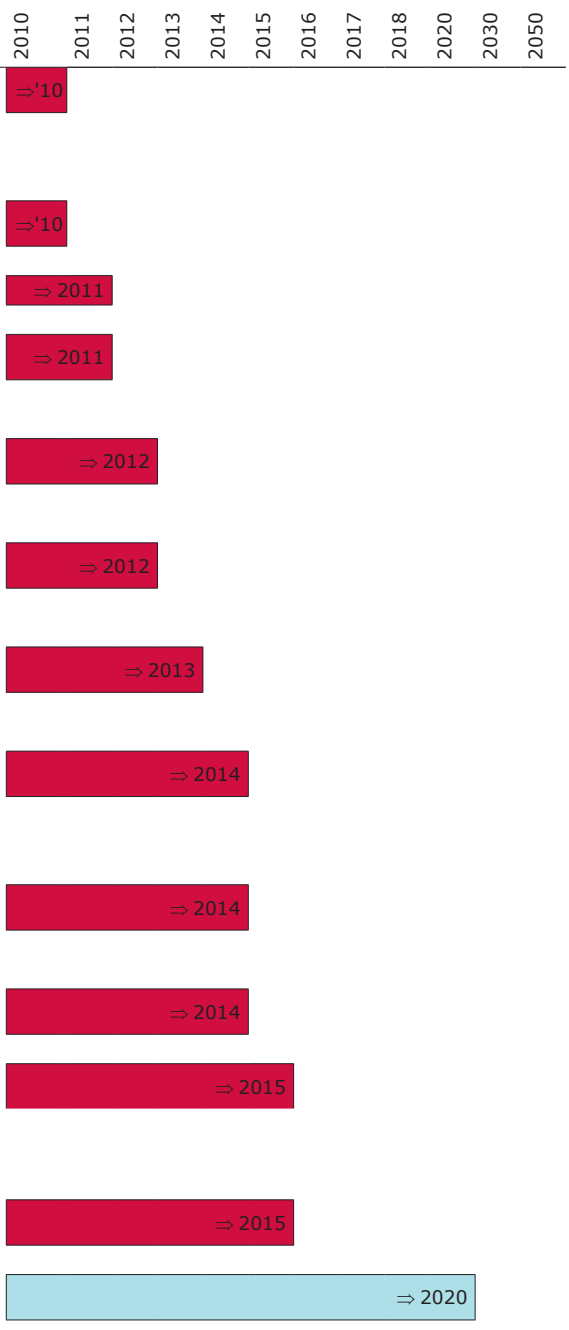
Objectives concerning volatile organic compounds are included in Section 2.3 on air pollution and air quality, while objectives related to chemical substances (such as heavy metals or PCBs) are included in the Section 2.5 on waste and Section 2.6 on water.

At the international level, relevant multilateral environmental agreements are the Convention on Long-range Transboundary Air Pollution (UNECE, 1979) (and its protocols on heavy metals and persistent organic pollutants), the Stockholm Convention on Persistent Organic Pollutants, the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade and the Convention on Transboundary Effects of Industrial Accidents to which the EU and most EU Member States are parties. Several EU Member States are also parties to the International Convention on the Control of Harmful Anti-Fouling Systems on Ships.

([16]) As noted in Chapter 1, the selection criteria for this review mean that the registration procedure and its deadlines are not covered.
([17]) According to EU legislation, 'biocidal products' are active substances and preparations containing substances or micro-organisms, including a virus or a fungus, having general or specific action on or against harmful organisms.

Table 2.8 Timeline for the objectives and targets for chemicals (2010–2050)

Objectives	Sources	Deadline for implementation
REACH restrictions concerning tri-substituted organostannic compounds, PHAs, DEGME, DEGBE, MDI, cyclohexane and ammonium nitrate	Regulation 1907/2006/EC and amendments	⇒'10
Phase out of several active substances contained in selected biocidal product types (*)	Regulation 1451/2007/EC Directive 98/8/EC	⇒'10
Ban on the export of metallic mercury	Regulation 1102/2008/EC	⇒ 2011
Phase out of several active substances contained in selected biocidal product types (*)	Regulation 1451/2007/EC Directive 98/8/EC	⇒ 2011
REACH restrictions concerning DOT compounds, Cd, dichloromethane (final deadline), acrylamide	Regulation 1907/2006/EC and amendments	⇒ 2012
Phase out of several active substances contained in selected biocidal product types (*)	Regulation 1451/2007/EC and Directive 98/8/EC	⇒ 2012
Phase out of several active substances contained in selected biocidal product types(*)	Regulation 1451/2007/EC and Directive 98/8/EC	⇒ 2013
Biocidal products containing 'existing active substances'(on the market in the EU on 14 May 2000) not included in Annex I shall no longer be placed on the market	Directive 98/8/EC	⇒ 2014
General principles of integrated pest management are implemented by all professional users	Directive 2009/128/EC	⇒ 2014
'Sunset date'for the following SVHCs: 5-ter-butyl-2,4,6-trinito-m-xylene and MDA	Regulation 1907/2006/EC and amendments	⇒ 2014
'Sunset date'for the following SVHCs: HBCDD, DEHP, BBP, DBP, DIBP, diarsenic trioxide, diarsenicpentaoxide, lead chromate, lead sulfochromate yellow, lead chromate molbydatesulphate red, TCEP and 2,4-DNT	Regulation 1907/2006/EC and amendments	⇒ 2015
REACH restrictions concerning DBT compounds (final deadline)	Regulation 1907/2006/EC	⇒ 2015
Ensure that chemicals are produced and used without threats to humans and the environment	June 2006 review of the EU SDS	⇒ 2020



Note: Non-binding objectives (including national indicative targets, target values and targets to be confirmed, set by EU legislation) are in blue; binding targets are in red.

(*) The complete list of active substances and the related dates by which products containing these active substances shall no longer be placed on the market for the relevant product-types is available at: http://ec.europa.eu/environment/biocides/pdf/list_dates_product_2.pdf.

2.9 Biodiversity

Historically, the development of EU targets and objectives on biodiversity has been intimately linked to global target setting. In June 2001, EU Heads of State meeting in Gothenburg, Sweden, decided that 'biodiversity decline should be halted with the aim of reaching this objective by 2010'. In 2002, the EU adopted its Sixth Environment Action Programme (EU, 2002a), setting out environmental priorities for the next decade. It included a commitment to protect and restore the structure and functioning of natural systems and halt the loss of biodiversity both in the European Union and on a global scale by 2010.

Also in 2002, the parties to the Convention on Biological Diversity (including the EU and all its Member States) committed 'to achieve by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional and national level'. Later that year the World Summit on Sustainable Development held in Johannesburg likewise called for 'the achievement by 2010 of a significant reduction in the current rate of loss of biological diversity'. Subsequently, in 2006, the EU adopted a Biodiversity Action Plan setting out a range of actions to achieve its 2010 target.

During the same period, the EU also established two important objectives to be achieved by 2015, which again corresponded to commitments by the EU and its Member States in the World Summit for Sustainable Development's Johannesburg Plan of Implementation (2002), specifically:

- keeping fishing within maximum sustainable yields (Review of the EU Sustainable Development Strategy, June 2006 (EC, 2006c) and Target 4 of the EU Biodiversity Strategy to 2020 (EC, 2011e), as replicated in the Roadmap to a Resource Efficient Europe (EC, 2011a));

- improving management and avoid overexploitation of renewable natural resources such as fisheries, biodiversity, water, air, soil and atmosphere, and restoring degraded marine ecosystems (Review of the EU Sustainable Development Strategy, June 2006).

The interaction between global and EU targets has persisted in more recent times. In March 2010, the EU agreed a new headline target: 'To halt the loss of biodiversity and the degradation of ecosystem services in the EU by 2020, restore them in so far as feasible, while stepping up the EU contribution to averting global biodiversity loss'.

In October 2010, the Parties to the Convention on Biological Diversity adopted Decision X/2, establishing the so-called 'Aichi Biodiversity Targets' which comprise 20 objectives, most to be achieved by 2020. The 20 objectives are linked to five 'strategic goals':

- Strategic Goal A: Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society (targets 1–4)

- Strategic Goal B: Reduce the direct pressures on biodiversity and promote sustainable use (targets 5–10)

- Strategic Goal C: To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity (targets 11–13)

- Strategic Goal D: Enhance the benefits to all from biodiversity and ecosystem services (targets 14–16)

- Strategic Goal E: Enhance implementation through participatory planning, knowledge management and capacity-building (targets 17–20).

The Aichi Biodiversity Targets informed the development of the EU's 2011 biodiversity strategy, which provides the umbrella for activities and targets in the Habitats Directive (EU, 1992), the Birds Directive (EU, 2009c), the Marine Strategy Framework Directive (EU, 2008d) and the Water Framework Directive (EU, 2000b). The strategy sets out the following key objectives to be achieved by 2020:

- halting the deterioration in the status of all species and habitats covered by EU nature legislation and improving their status in a significant and measurable way, so that, compared to current assessments: 100 % more habitat assessments and 50 % more species assessments under the Habitats Directive show an improved conservation status; and 50 % more species assessments under the Birds Directive show a secure or improved status (Target 1 of the EU Biodiversity Strategy to 2020);

- maintaining and enhancing ecosystems and their services by establishing green infrastructure and restoring at least 15 % of degraded ecosystems (Target 2 of the EU Biodiversity Strategy to 2020);

- maximising the areas under agriculture across grasslands, arable land and permanent crops that are covered by biodiversity-related

measures under the Common Agricultural Policy so as to ensure the conservation of biodiversity and bring about measurable improvement in the conservation status of species and habitats that depend on or are affected by agriculture and in the provision of ecosystem services as compared to the EU 2010 Baseline, thus contributing to more sustainable management (Target 3 of the EU Biodiversity Strategy to 2020);

- in line with sustainable forest management, ensuring that forest management plans or equivalent instruments are in place for all publicly owned forests and for forests holdings above a certain size that receive funding under EU rural development policy so as to bring about a measurable improvement in the conservation status of species and habitats that depend on or are affected by forestry and in the provision of related ecosystem services as compared to the EU 2010 Baseline (Target 3 of the EU Biodiversity Strategy to 2020);

- achieving, through fisheries management, a population age and size distribution indicative of a healthy stock with no significant adverse impacts on other stocks, species and ecosystems, in support of achieving the Marine Strategy Framework Directive requirement of 'good environmental status by 2020 (Target 4 of the EU Biodiversity Strategy to 2020);

- identifying and prioritising invasive alien species and their pathways, controlling or eradicating priority species and managing pathways to prevent the introduction and establishment of new invasive alien species (Target 5 of the EU Biodiversity Strategy to 2020);

- stepping up the EU efforts to averting global biodiversity loss (Target 6 of the EU Biodiversity Strategy to 2020).

The EU's only binding target on biodiversity to date concerns maintaining biodiversity in the marine environment which, according to Directive 2008/56/EC (the Marine Strategy Framework Directive (EU, 2008d)), shall be achieved by 2020 as a part of the broader objective of ensuring 'good environmental statu' in the marine environment by the same date.

In addition to the international agreements already cited, several other multilateral environmental agreements have been adopted concerning biodiversity and land use. The address:

- the protection and conservation of animals, including wild animals (e.g. the Convention on the Conservation of Migratory Species of Wild Animals), domesticated animals (e.g. the European Convention for the Protection of Animals Kept for Farming Purposes or the European Convention for the Protection of Pet Animals), fish stocks (e.g. the United Nations Fish Stocks Agreement);

- the protection of landscape and natural heritage (e.g. the European Landscape Convention and the Convention Concerning the Protection of the World Cultural and Natural Heritage);

- the conservation of plants and plant genetic resources (e.g. the International Treaty on Plant Genetic Resources for Food and Agriculture);

- the protection of specific habitats (e.g. the Convention on Wetlands of International Importance Especially as Waterfowl Habitat);

- biodiversity and land use-related problems at a regional or local level (river basins conventions, regional seas conventions, mountains conventions, etc.).

Box 2.6 Challenges monitoring progress to biodiversity targets

Tracking progress towards biodiversity targets poses particular challenges. The diversity and complexity of issues that must be assessed and the significant fluctuations in data resulting from short-term changes in environmental conditions necessitate a lengthy timeframe for assessment.

The Nature Directives (Habitats and Birds), for example, follow a six-year reporting cycle. The last review was completed in 2009 and the next is currently under way and should deliver results at the end of 2014. Clearly, these factors influence the capacity to monitor progress to targets and use assessment data to inform policy implementation.

Box 2.7 Land use targets and objectives — latest developments

Alongside biodiversity goals, the EU has established various targets and objectives addressing the related theme of land use. For example, the EU aims to halt global forest cover loss by 2030 (2008 Communication on deforestation (EC, 2006a)). By 2050, the EU should halt net land take for housing, industry, roads and recreational purposes (Roadmap to a Resource Efficient Europe).

With respect to land degradation, the UNCCD Secretariat launched the target of Zero Net Land Degradation in the run-up to Rio+20 (UNCCD, 2012). The concept refers to the achievement of land degradation neutrality, whereby land degradation is either avoided or offset by land restoration. Promoting the ZNLD target would secure the currently available productive land for the use of present and future generations. UNCCD promotes achieving the following targets for sustainable land use for all and by all (addressing agriculture, forestry, energy and urbanisation):

- Target 1: Zero net land degradation by 2030
- Target 2: Zero net forest degradation by 2030
- Target 3: Drought policies and drought preparedness implemented in all drought-prone regions/countries by 2020.

Subsequently, the Rio+20 Summit outcome called for a land degradation neutral world in the context of sustainable development, to which the European Union subscribed (UN, 2012). This intention is reiterated in the Commission's proposal for a general Union Environment Action Programme to 2020 'Living well, within the limits of our planet' (EC, 2012b). Under Priority objective 1 'To protect, conserve and enhance the EU's natural capital', it provides that 'The EU and Member States should reflect on how best to make such a commitment operational within their respective competencies as well as to address soil quality issues within a binding legal framework (referring to the proposed Soil Framework Directive (EC, 2006b)). Targets will also be set for sustainable land use and soil.' In order to reach this objective, the programme shall ensure that by 2020:

- land is managed sustainably in the EU, soil is adequately protected and the remediation of contaminated sites is well underway; requiring:
- increasing efforts to reduce soil erosion and increase soil organic matter, to remediate contaminated sites and to enhance the integration of land use aspects into coordinated decision-making involving all relevant levels of government, supported by the adoption of targets on soil and on land as a resource, and land planning objectives.

Table 2.9 Timeline for the objectives and targets for biodiversity and land use (2010–2050)

Objectives	Sources	Deadline for implementation
Halt the loss of biodiversity	Sixth Environment Action Programme	⇒ '10
Fishing within MSY	Marine Strategy Framework Directive Roadmap to a resource efficient Europe EU biodiversity strategy to 2020	⇒ 2015
Improve management and avoid overexploitation of renewable natural resources	2006 review of the EU Sustainable Development Strategy	⇒ 2015
Halt the loss of biodiversity and the degradation of ecosystem services	EU Biodiversity Strategy Roadmap to a resource efficient Europe	⇒ 2020
Reduce soil erosion and the rate of land take, increase soil organic matter	Roadmap to a resource efficient Europe	⇒ 2020
Natural capital and ecosystem services are properly valued	EU Biodiversity Strategy Roadmap to a resource efficient Europe	⇒ 2020
EU policies take into account their direct and indirect impact on land use	Habitats Directive Roadmap to a resource efficient Europe	⇒ 2020
Target 1: Achieve a significant and measurable improvement in the status of species and habitats covered by EU nature legislation	EU biodiversity strategy to 2020	⇒ 2020
Target 2: Better protection/restoration of ecosystems and their services and greater use of green infrastructure	EU biodiversity strategy to 2020	⇒ 2020
Target 3: More sustainable agriculture and forestry	EU biodiversity strategy to 2020	⇒ 2020
Target 4: Better management of EU fish stocks	EU biodiversity strategy to 2020	⇒ 2020
Target 5: Tighter controls of invasive alien species	EU biodiversity strategy to 2020	⇒ 2020
Target 6: Greater EU contribution to averting global biodiversity loss	EU biodiversity strategy to 2020	⇒ 2020

Table 2.9 Timeline for the objectives and targets for biodiversity and land use (2010–2050) (cont.)

Objectives	Sources	Deadline for implementation
Biodiversity in the marine environment is maintained	Directive 2008/56/EC	⇒ 2020
Halt global forest cover loss	2008 Communication on deforestation	⇒ 2030
No net land take	Roadmap to a resource efficient Europe	⇒ 2050

2010 2011 2012 2013 2014 2015 2016 2017 2018 2020 2030 2050

Note: Non-binding objectives (including national indicative targets, target values and targets to be confirmed, set by EU legislation) are in blue; binding targets are in red.

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European Environment Agency
Kongens Nytorv 6
1050 Copenhagen K
Denmark

Tel.: +45 33 36 71 00
Fax: +45 33 36 71 99

Web: eea.europa.eu
Enquiries: eea.europa.eu/enquiries

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