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Trends and projections in Europe 2014

Tracking progress towards Europe's climate and energy targets for 2020

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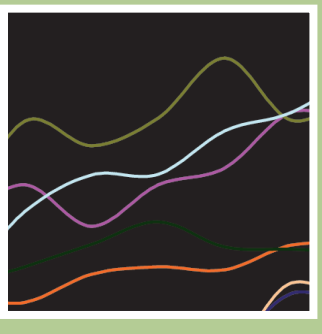

European Environment Agency

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Executive summary

Reporting the latest progress towards climate and energy targets in Europe

This 2014 edition of the annual European Environment Agency (EEA) 'Trends and projections' report provides an updated assessment of the progress of the European Union (EU) and European countries towards achieving their climate mitigation and energy targets.

The report also supports and complements the annual report from the European Commission to the European Parliament and the Council on progress towards meeting the Kyoto and EU 2020 objectives, as required under Article 21 of the EU Monitoring Mechanism Regulation (MMR) (EU, 2013d).

In June 2014, the EEA published final complete data on annual greenhouse gas (GHG) emissions during the Kyoto Protocol's first commitment period (2008 through 2012) in the EU ([1]). An updated assessment of progress achieved towards Kyoto targets based on these data are published alongside this report ([2]).

In July 2014, Member States reported approximated estimates of 2013 GHG emissions ([3]). These preliminary estimates — before final data on 2013 GHG emissions is officially published in June 2015 — provide the basis for a first assessment of progress of the EU Member States towards their annual targets for the period from 2013 to 2020, under the 2009 Effort Sharing Decision (ESD). The ESD caps those emissions not covered by the EU Emissions Trading System (ETS).

The assessments presented in this report are based on the latest year for which data are available. While data pertaining to GHG emissions are available up until the year 2013, in addition to GHG projections until 2030, energy-related data cover historic trends until 2012.

* * *

The EU is on track to meet its '20-20-20' targets

The EU's '20-20-20' targets, endorsed by the European Council in 2007 and implemented through the 2009 climate and energy package and the 2012 Energy Efficiency Directive (EED) (EU, 2012), focus on:

- a 20 % reduction of the EU's GHG emissions compared to 1990;
- a 20 % share of renewable energy sources (RES) in the EU's gross final energy consumption;
- a 20 % saving of the EU's primary energy consumption compared to projections.

These targets form part of the Europe 2020 growth strategy, alongside targets relating to employment, education, research and innovation, and social inclusion and poverty reduction.

The EU is making good progress towards these climate and energy targets: the EU's energy consumption decreased faster between 2005 and 2012 than required to achieve the 2020 energy efficiency target, the 2012 share of renewable energy sources (RES) was above interim target levels, and 2013 levels of GHG emissions were already very close to the 20 % reduction target, seven years ahead of the 2020 deadline.

([1]) See EEA Technical report No 9/2014, *Annual European Community greenhouse gas inventory 1990–2012 and inventory report 2013* (EEA, 2014a).
([2]) See EEA Technical report No 18/2014, *Progress towards 2008–2012 Kyoto targets in Europe* (EEA, 2014h).
([3]) See EEA Technical report No 16/2014, *Approximated EU GHG inventory: early estimates for 2013* (EEA, 2014b).

2013 GHG emissions are already 19 % below 1990 levels and with further reductions projected, the EU will most likely over-achieve its 20 % reduction target for 2020

According to preliminary estimates of 2013 GHG emissions, total EU GHG emissions decreased by 1.8 % between 2012 and 2013. GHG emission levels were therefore 19 % below 1990 levels in 2013 ([4]). Based on Member State projections taking into account policies and measures adopted by 2012 (the 'with existing measures' projection scenario), total EU GHG emissions are expected to decrease to a level of 21 % below 1990 emissions by 2020. If the additional measures planned by Member States are fully implemented (the 'with additional measures' projection scenario), the overall reduction could reach 24 % compared to 1990 in 2020. In fact, GHG levels in the EU in 2013 were lower than anticipated in both these GHG projection scenarios between 2010 and 2020. Furthermore, several policy developments, expected to bring further GHG reductions, took place at EU level after the preparation by Member States of their GHG emission projections: adoption of the Energy Efficiency Directive (EED), binding emission targets for new car and van fleets, and a new regulation on fluorinated gases. If the projected level of effort is sustained by Member States until 2020, the EU could actually achieve an emissions reduction greater than the projected 24 %.

Large emission reductions took place in the sectors covered by the EU ETS; however, this system is undergoing necessary reforms to address its surplus of emission allowances

The EU ETS is a 'cap and trade' system covering about 12 000 industrial installations across the EU. It entered its third trading period in 2013. ETS emissions in 2013 remained below the cap set as in previous years. Compared to 2005 levels, the overall reduction of 19 % places the ETS sectors close to their 21 % overall reduction target for 2020. The effects of the economic recession since 2008, as well as large entitlements for the use of emission reduction credits coming from outside the ETS, have contributed to a low demand for allowances. This has led to the build-up of a substantial allowance surplus, with corresponding effects on the price of CO_2.

According to Member State projections, verified emissions will continue decreasing considerably and therefore remain below the cap. In order to address the imbalance of supply and demand, an amendment of the EU ETS Auctioning Regulation was adopted to postpone ('backload') the auctioning of 900 million allowances from the years 2014 to 2016, to the years 2019 and 2020. The European Commission has proposed structural measures to address the surplus.

Renewables are growing as planned, but further progress depends upon appropriate investment and a transformation of the energy market to facilitate more penetration by renewables

The EU is on track to achieve its 20 % target for renewables for 2020. In 2012, the 14.1 % share of RES in gross final energy consumption in the EU was higher than the 13.0 % target for 2012, which results from Member State National Renewable Energy Action Plans (NREAPs). However, the indicative renewable energy trajectory outlined in the RED becomes increasingly steeper towards 2020. Most Member States need to increase their support to renewable energy by 2020 in order to reach their legally binding national targets.

Energy consumption has been decreasing since 2005; full implementation and enforcement of national energy efficiency policies is necessary to keep the EU on track to meet its 2020 energy efficiency target

The EU is on track to meet its energy efficiency target. Between 2005 and 2012, its primary energy consumption and its final energy consumption ([5]) decreased faster than would be necessary to meet its 2020 target. In conjunction with the implementation of energy efficiency policies, the economic crisis played an important part in this outcome ([6]). As economic growth gradually picks up again across Europe, further efforts will be required to implement fully and enforce energy efficiency policies at the national level, in order to ensure that the 2020 target is met.

([4]) Unless stated otherwise, the focus lies on the climate and energy package scope (i.e. including projected emissions from international aviation in total GHG emissions).

([5]) Primary energy consumption is the total energy demand of a country or region (which has not been subjected to any conversion or transformation process). Final energy consumption is the energy supplied to the final consumer (after any conversion or transformation).

([6]) The penetration of renewables also led to a reduction of 3.2 % in primary energy consumption, through the replacement of less efficient fossil fuel plants.

* * *

Achievements at national level remain mixed, but the overall situation improved compared to the last year of reporting, in particular for renewables

Nine Member States (Croatia, Cyprus, Czech Republic, Denmark, Greece, Hungary, Romania, Slovakia and the United Kingdom) are on track to meet targets for all three climate and energy policy objectives. Last year's 'Trends and projections' report showed that no Member State underperformed with respect to all three policy objectives. This year's report draws a similar conclusion.

Noticeable progress has been achieved compared to last year, particularly in the deployment of renewable energy, where six more Member States are now on track to achieve their RES targets. Three Member States (Estonia, France and Germany) saw their performance deteriorate in progress towards energy efficiency targets, as well as ESD targets (in the case of Germany). Belgium and Germany are the two Member States considered not to be on track with respect to two policy objectives (GHG emission reductions and energy efficiency improvement).

Three Member States could miss their 2013 target under the ESD

Under the ESD, Member States must meet annual individual GHG targets during the period 2013 to 2020 for emissions not covered by the EU ETS ('ESD emissions'). The first annual ESD compliance cycle will begin in 2015, when Member States report official GHG emission data for the year 2013.

Provisional 2013 emission estimates indicate that ESD emissions in Germany, Luxembourg and Poland were above their respective ESD targets. Besides these three Member States, Austria, Belgium, Finland, Ireland and Spain are not considered either to be on track to meet their targets, because their projected GHG emissions do not indicate that they will achieve their 2020 targets through domestic policies and measures (either existing or additional). These Member States will therefore have to design and implement new measures or use flexibility mechanisms to achieve their ESD targets ([7]).

Projected GHG emissions for 2020 indicate that half of the Member States are considered to be on track towards their ESD targets. In these countries, ESD emissions were below the respective 2013 ESD targets, and the 2020 ESD target are expected to be met under the current policies and measures already in place. Six other Member States (Bulgaria, Italy, Latvia, Lithuania, the Netherlands and Slovenia) are partly on track towards their targets, because they will not achieve their 2020 ESD targets through domestic reductions alone without implementing the measures that were still at the planning stage in 2012.

Among all the additional measures reported by Member States, those aimed at improving energy efficiency in the residential and services sectors are expected to deliver key contributions towards further emission reductions by 2020. By contrast, the expected emission reductions in the transport sector — the main source of emissions not covered by the EU ETS — remain limited. Likewise, the agriculture sector is not currently expected to contribute to significant emission reductions in the future.

Three further Member States show insufficient progress on renewables

In 2012, 22 Member States (all except France, Ireland, Malta, the Netherlands, Portugal and Spain) plus Iceland and Norway were considered to be on track towards meeting their RES targets. The RES share of these countries met or exceeded both their indicative RED target for 2011 to 2012, and their expected 2012 NREAP target. The share of renewables was actually higher than the 2020 targets in Bulgaria, Estonia, Iceland and Sweden. Austria, the Czech Republic, Latvia, Luxembourg and the United Kingdom made good progress towards their RES targets in 2012, compared to 2011.

In Ireland, Portugal and Spain, the RES shares had reached or exceeded their indicative RED target for 2011 to 2012, but not their expected 2012 NREAP target for 2012. In France, Malta and the Netherlands, the shares of RES in 2012 remained below both the indicative RED targets for 2011 to 2012 and below the expected 2012 NREAP targets.

([7]) Luxembourg submitted its approximated GHG inventory for 2013 too late for inclusion in this report. According to these estimates, Luxembourg would actually achieve its 2013 ESD target. For Austria and Finland, national projections indicate achievement of the 2020 targets; however, projections adjusted by EEA indicate that the targets will be missed by a small margin.

Eleven Member States need to step up efforts on energy consumption

Concerning energy efficiency, Member States defined their own non-binding targets for energy consumption for 2020 under the Energy Efficiency Directive (EED). Seventeen Member States (the Czech Republic, Croatia, Cyprus, Denmark, Finland, Greece, Hungary, Ireland, Italy, Latvia, Luxembourg, Portugal, Romania, Slovakia, Slovenia, Spain and the United Kingdom) are considered to be on track towards their 2020 energy efficiency targets. These countries have so far succeeded in reducing or limiting their primary energy consumption and final energy consumption below a linear target path between 2005 levels and the 2020 targets.

Austria, Bulgaria, France, Lithuania, Malta, the Netherlands and Poland are only partly on track to meet their energy consumption targets, because they are only on track towards either their primary or their final energy consumption target. Belgium, Estonia, Germany and Sweden are not considered to be on track towards either of these targets. All these Member States need to enhance the reduction or limitation of their energy consumption through better implementation and enforcement of their energy efficiency policies in order to achieve their 2020 targets. Compared to the situation observed in 2011, the assessment results based on 2012 energy consumption levels show an improvement in the situation of Finland, Malta, Poland and Slovenia, while the situation deteriorated in Estonia, France and Germany.

* * *

Policies and measures have had a key role in the progress achieved so far; while the economic recession partly contributed to this outcome, it may well impede future progress

Policies and measures implemented to reduce GHG emissions, improve energy efficiency and stimulate the growth of renewable energy are having an impact. Clearly, however, the economic recession has played an important role by affecting economic activity and thereby energy demand. This, in turn, drove GHG emissions down and boosted (statistically) the share of renewables in final energy consumption. At the same time, the recession risks inhibiting future progress: it resulted in a surplus in the EU ETS that needs to be adequately addressed; it reduced investment in renewables; and, overall, it risks sending the misleading signal that climate and energy targets might be achieved with a reduced level of policy effort.

Targets for 2030 keep the EU on track towards its long term objectives on climate change and energy sustainability

EU leaders have endorsed the objective of reducing Europe's GHG emissions by between 80 % and 95 % by 2050, compared to 1990 levels. This objective corresponds to the necessary reductions that, according to the Intergovernmental Panel on Climate Change (IPCC), developed countries should collectively achieve.

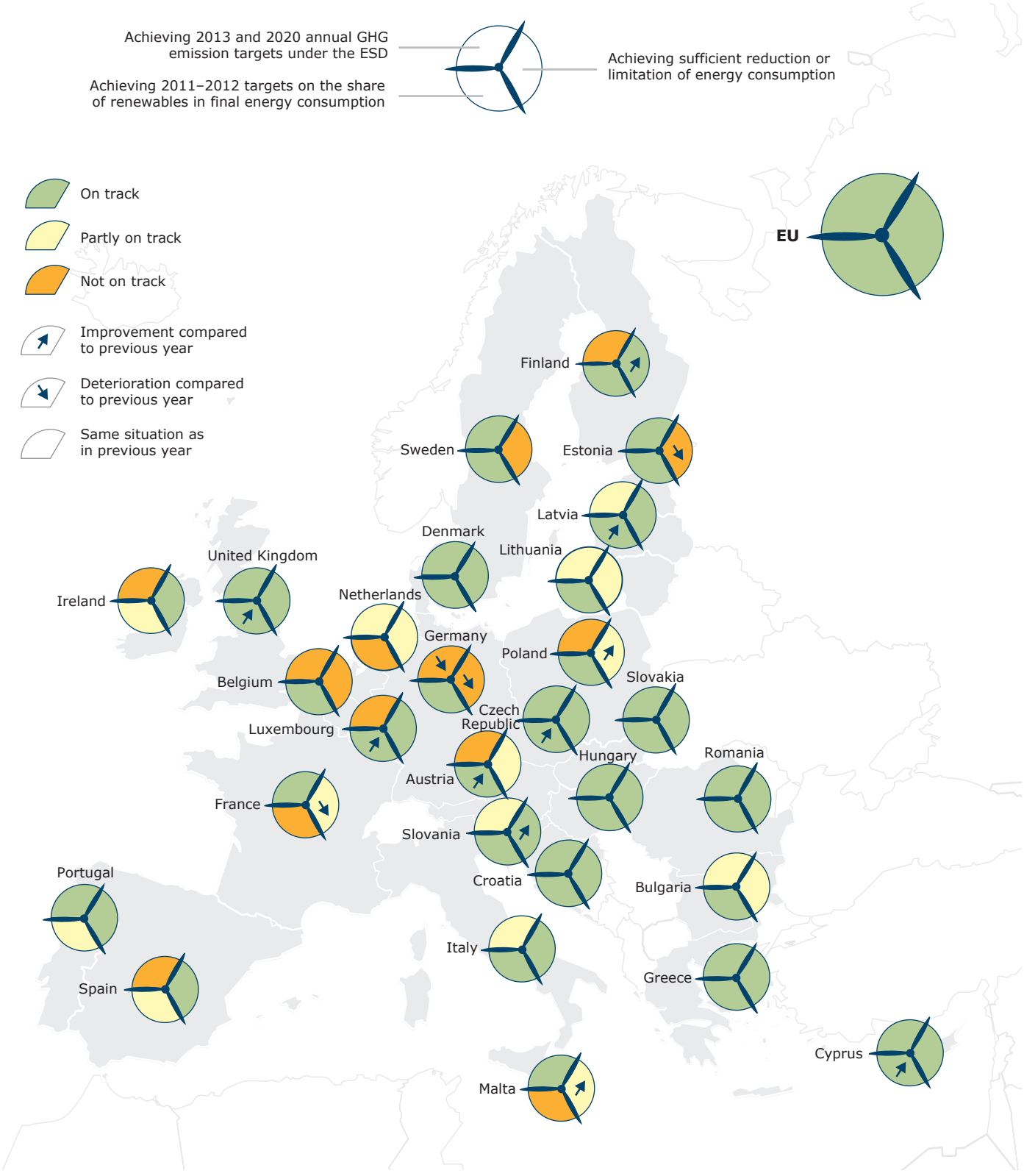
In October 2014, the European Council adopted a new set of climate and energy targets for 2030:

- a binding target of an at least 40 % domestic reduction in GHG emissions, compared to 1990, to be met collectively by a 43 % reduction in the ETS sectors and a 30 % reduction in the non-ETS sectors, compared to 2005, respectively;
- a target, binding at EU level, of at least 27 % for the share of renewable energy consumption;
- an indicative target at EU level of at least 27 % for improving energy efficiency compared to projections of future energy consumption, based on the current criteria.

Projections from Member States indicate a limited decrease in emissions until 2030. These anticipated reductions between 2020 and 2030 are still largely insufficient when compared to the 40 % reduction target and the even steeper reduction needed beyond 2030, if the EU is to remain on a trajectory towards a low-carbon and resource-efficient economy. Further policies need to be planned to ensure the 40 % target is reached. In its 2030 framework for climate and energy policies published in January 2014, the European Commission proposed changes to strengthen the EU ETS. Member States will have to pay particular attention to their emissions under the ESD, especially in sectors that have showed no, or limited, projected reductions such as the transport and agriculture sectors.

The EU's energy sector will also need to undergo a rapid decarbonisation, with the share of renewables reaching between 55 % and 75 % by 2050 (up to 73 % in transport and 86 % in power generation), according to the European Commission. Overhauling the energy system will also require the modernisation of power grids, the development of cost-effective load balancing and energy storage options, implementation of demand response and energy efficiency improvements across all sectors,

Figure 0.1 Progress of Member States towards 2020 climate and energy targets



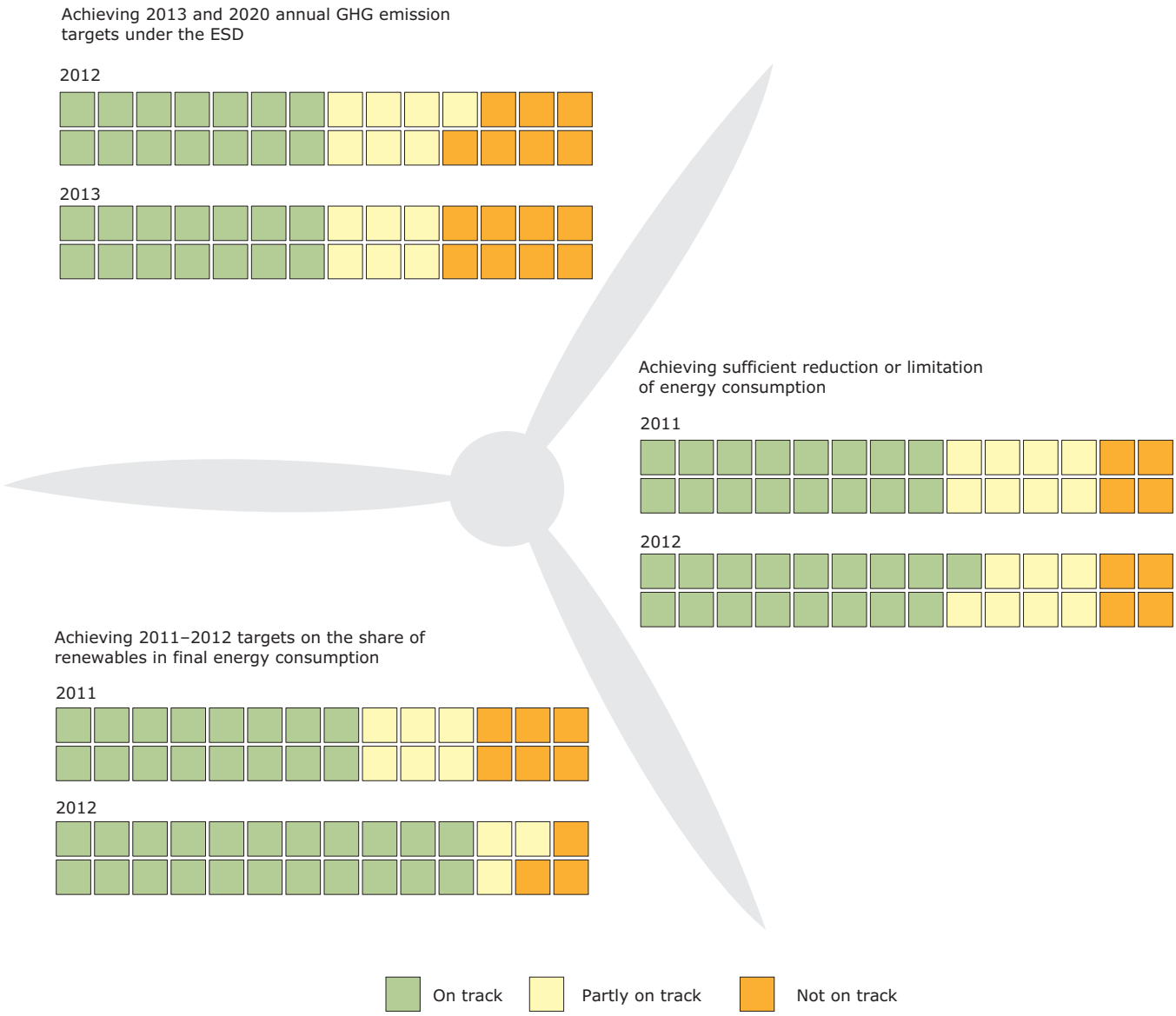
Source: EEA.

along with the deployment of carbon capture and storage (CCS) at the majority of the remaining fossil fuel plants.

Synergies clearly exist in pursuing climate and energy objectives together; improved information on policies and measures, and further analysis would help optimise the policy mix needed to achieve further cost-effective emissions reductions

Progressing towards several climate and energy targets at the same time presents a number of co-benefits. For example, the significant deployment of renewable energy between 2005 and 2012 resulted in GHG emission savings and, to a certain extent, a reduction in primary energy consumption through the replacement of less efficient fossil fuel plants. At the same time, the detail of policy interactions, in particular with the EU ETS, and the estimated effects of policies and measures could benefit from further empirical analysis in order to optimise the policy mix. In this respect, the new reporting requirements on policies and measures and GHG-related data, adopted in the EU in 2013, could help expanding the knowledge base to support such analysis.

Figure 0.2 Evolution of progress towards climate and energy targets, 2011–2013



Source: EEA.

1 Introduction

This 2014 edition of the annual European Environment Agency (EEA) 'Trends and projections' report assesses the progress of 33 European countries and the European Union (EU) in achieving their climate mitigation and energy policy objectives. These objectives include international commitments under the United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol, as well as EU domestic policy targets consistent with the '20-20-20' objectives of achieving, by 2020, a 20 % reduction of GHG emissions (compared to 1990 levels), a 20 % share of renewables in energy consumption, and a 20 % saving of the Union's primary energy consumption (compared to projections).

The report focuses on meeting the 2020 objectives, both at EU and national level. The report also presents, albeit more succinctly, some analysis of the progress achieved at EU level towards longer-term policy objectives, where such objectives have been set and relevant data are available.

The geographical scope of this assessment includes the 33 EEA member countries ([8]) in the following contexts: the EU as a whole (EU-28), its 28 individual Member States and the other EEA member countries ([9]).

The report structure is based on the three policy objectives for 2020 related to greenhouse gas (GHG) emissions, renewable energy and energy efficiency. **Chapter 2** presents the main relevant climate and energy targets applicable to the EU, its Member States and the other EEA member countries. **Chapter 3** provides detailed information on the main features of the EU Emissions Trading System (EU ETS): coverage, caps, allocation principles and observed trends. **Chapter 4** assesses current and projected progress towards GHG emission targets. This multiple-level analysis covers overall EU progress towards its 20 % reduction objective by 2020, progress within the EU ETS towards EU-wide emission caps and also individual Member States' progress towards annual national targets set under the Effort Sharing Decision (ESD) (Decision No 406/2009/EC of the European Parliament and of the Council of 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020) (EU, 2009a). Such targets concern only those GHG emissions not covered by the EU ETS. **Chapter 5** tracks current and projected progress towards renewable energy targets under the Renewable Energy Directive (RED) (Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC) (EU, 2009b). **Chapter 6** analyses progress made in the EU towards reducing energy consumption and achieving energy efficiency objectives for 2020 and national targets set by Member States under the Energy Efficiency Directive (EED) (Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC) (EU, 2012b). Finally, **Chapter 7** synthesises the results from previous chapters, and discusses potential interactions between the targets (and progress made in meeting these).

The report uses a two-fold approach for assessing progress towards 2020 climate and energy targets, as explained below.

([8]) The EEA member countries are Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

([9]) Turkey has no target under the Kyoto Protocol, nor for renewables and energy efficiency under the RED and EED respectively, and therefore is not covered in this assessment.

- The assessment of **current** progress is based on a comparison between the latest historic trends and the relevant levels for comparison, such as interim targets, indicative trajectories or relevant target paths (e.g. annual GHG emission targets for 2013 to 2020 under the ETS and the ESD, indicative trajectories for the development of renewable energy, or for the reduction or limitation of energy consumption).

- An assessment of **projected** progress is presented for GHG emissions, based on a comparison between projected values for 2020 reported by Member States and the relevant targets. In the case of renewable energy and energy efficiency complete projections across all countries are not available.

The report also supports and complements the annual report of the European Commission to the European Parliament and the Council on the progress of the EU and its Member States towards set targets, as required by Article 21 of the Monitoring Mechanism Regulation (MMR).

2 Climate and energy targets and policies in the EU

Key messages

- The EU, its Member States and EEA member countries have committed to limiting or reducing their GHG emissions under the UNFCCC and the Kyoto Protocol. The first commitment period under the Kyoto Protocol ran from 2008 until 2012; the second, 8-year commitment period runs from 2013 through 2020. In this context, the EU is committed to cutting its emissions by 2020 by at least 20 % compared to 1990 levels (or 30 % subject to the conclusion of a comprehensive international climate change agreement). The EU is also committed to increasing, to 20 %, the share of renewable energy in EU's gross final energy consumption (with a minimum 10 % share in the transport sector) under the Renewable Energy Directive (RED), and to saving 20 % of the EU's energy consumption through increased energy efficiency. The three '20-20-20' targets form part of the EU's 10-year growth strategy Europe 2020, alongside targets pertaining to employment, education, research and innovation, and social inclusion and poverty reduction.

- To meet the 2020 GHG target, subtargets were set for emissions covered by the EU ETS (which are governed by a single EU-wide cap), and for other emissions not covered by the EU ETS (where differentiated binding targets have been set for each Member State and for each year of the period between 2013 and 2020, under the ESD). The RED also sets differentiated binding targets for each Member State for 2020, and provides indicative trajectories for the period from 2011 to 2020. Concerning energy efficiency, Member States defined their own non-binding targets for energy consumption for 2020 under the Energy Efficiency Directive (EED). These targets take various forms, and some of them may be subject to revision in future years.

- EU leaders have endorsed the objective of reducing Europe's GHG emissions by between 80 % and 95 % by 2050, compared to 1990 levels, in the context of necessary reductions to be collectively achieved by developed countries, according to the Intergovernmental Panel on Climate Change (IPCC). To ensure that the EU is on a cost-effective track towards meeting this long-term objective, EU leaders agreed, in October 2014, on a 2030 climate and energy policy framework for the EU. They endorsed a binding EU target of an at least 40 % domestic reduction in GHG emissions by 2030 compared to 1990. They also set a target, binding at EU level, of at least 27 % for the share of renewable energy consumed in the EU in 2030, as well as an indicative target at EU level of at least 27 % for improving energy efficiency in 2030 compared to projections of future energy consumption based on the current criteria.

2.1 International commitments of EU and EEA countries under the UNFCCC and the Kyoto Protocol

In 1992, countries across the globe adopted the UNFCCC to cooperatively consider options for limiting average global temperature increases and the resulting climate change. Under the UNFCCC, developed country Parties (Annex I Parties) ([10]) are specifically obliged to commit to adopting national policies and to take corresponding measures for mitigation of climate change.

([10]) A Party is a state (or regional economic integration organization such as the EU) that agrees to be bound by a treaty and for which the treaty has entered into force. Annex I Parties are those listed in Annex I to the UNFCCC. See further details in Acronyms, units and terms on page 98.

In 2010, the EU submitted a pledge to reduce its GHG emissions by 2020 by 20 % compared to 1990 levels, in order to contribute to achieving the ultimate objective of the UNFCCC: 'to stabilise GHG concentrations at a level that would prevent dangerous anthropogenic (human-induced) interference with the climate system' (UNFCCC, 2014a), or, in other words, to limit the global temperature increase to less than 2 °C compared to temperature levels before industrialisation (UNFCCC, 2011b). The EU is also committed to raising this target to a 30 % emission reduction by 2020 compared with 1990 levels, provided that other developed countries also commit to achieving comparable emission reductions, and that developing countries contribute adequately, according to their responsibilities and respective capabilities. This offer was reiterated in the submission to the UNFCCC by the EU-28 and Iceland on 30 April 2014 (EU, 2014b).

A number of other Annex I and non-Annex I country Parties also submitted targets to the UNFCCC. These objectives under the convention are not legally binding, as they are laid down in a COP decision ([11]) and not under a protocol with the specific intention to create binding obligations for Parties. Moreover, not all targets are defined with the same level of clarity in terms of included sectors and gases. Overall, achieving these targets would not be sufficient to reach the collective emission reductions needed to achieve the 2 °C goal (UNEP, 2013). In the subsequent process of clarifying the underlying assumptions, conditions and methodologies of the targets in order to render them comparable and transparent, the EU has set internal rules under its climate and energy package — these also underpin the implementation of the target under the convention, and are more ambitious than current rules under the Kyoto Protocol, e.g. by including international aviation and adding an annual compliance cycle for emissions under the ESD or higher quality standards for international emission credits under the ETS.

The first international legally binding agreement specifying mitigation obligations of Annex I Parties which have signed the agreement is the Kyoto Protocol. It was signed in 1997 and entered into force in 2005 (for more information on the first commitment period that ran from 2008 to 2012, see Annex 3.2). There are currently 192 Parties to the Kyoto Protocol to the UNFCCC.

The EU has also committed to a new target under the Kyoto Protocol. At the 2012 Conference of the Parties (COP18/CMP.8) in Doha (Qatar), amendments to the Kyoto Protocol to establish the second commitment period from 2013 to 2020 were adopted ([12]). The set of amendments includes new quantified emission limitation and reduction commitments (QELRCs) for Annex I Parties intending to take part in the second commitment period. The Doha Amendments' entry into force is subject to acceptance by at least three fourths of the Parties to the Kyoto Protocol ([13]).

Overall, the Doha Amendment sets an emission reduction objective of 18 % below 1990 levels for all Parties to the Kyoto Protocol for the second commitment period (see Table 2.1). The EU, its 28 Member States and Iceland agreed to a joint QELRC under the Kyoto Protocol's second commitment period, corresponding to a 20 % reduction to be achieved during the 2013–2020 period compared to the base year. The EU, its Member States and Iceland also declared that they intended to fulfil this commitment jointly, under

Table 2.1 Emission reduction commitments by EU and EEA countries for the Kyoto Protocol's second commitment period, 2013–2020

Party	QELRCs submitted by Parties (2013–2020)
	% reduction compared to base-year emissions
EU-28	– 20.0 %
Iceland	– 20.0 %
Liechtenstein	– 16.0 %
Norway	– 16.0 %
Switzerland	– 15.8 %

Source: UNFCCC, 2012b.

([11]) A decision taken by the Conference of the Parties (COP), which is the ultimate decision-making body of the UNFCCC. The COP meets every year to review the implementation of the UNFCCC.
([12]) See decision 1/CMP.8.
([13]) As of 30 September 2014, 18 countries have ratified the Doha Amendment. Decisions on the implementation of the reporting format (standard electronic format (SEF)) for the second commitment period, on the implementation of Article 3.7ter of the Doha amendment, on the carry-over, from one commitment period to the next, of Kyoto units resulting from target over-achievement and rules on reporting for Parties without commitments for the second commitment period are still pending under the UNFCCC.

Article 4 of the Kyoto Protocol. Liechtenstein, Norway and Switzerland are the three other EEA member countries which also agreed on QELRCs for the second commitment period. Despite having targets under the first commitment period, Canada, Japan, New Zealand and the Russian Federation did not submit targets for the second commitment period. Overall, emissions by countries with targets for the second commitment period only make up 14 % to 15 % of global emissions (EC, 2013f).

To secure the chances to stay below 2 °C, the international community has decided to work towards an international climate agreement for the period after 2020, which should be applicable to all. The negotiation on this new global agreement is expected to be concluded in 2015 in Paris (France).

2.2 Domestic commitments of the EU and its Member States

In the context of its commitments and the negotiations at international level, the EU has adopted domestic targets and legislation to achieve these targets and fulfil its international commitments.

In 2002, the 15 pre-2004 Member States (EU-15) agreed to differentiated emission limitation or reduction targets for each, under an EU accord known as the Burden-Sharing Agreement (EU, 2002). These targets determined the contribution of each Member State to reaching the overall 8 % reduction target of the EU-15 under the first commitment period of the Kyoto Protocol.

In March 2007, the European Council committed the EU to becoming a highly energy-efficient, low-carbon economy, by achieving three climate and energy objectives by 2020:

- reducing its GHG emissions by 20 % from 1990 levels;
- raising to 20 % the share of renewable energy sources (RES) in EU's gross final energy consumption (see Section 2.4);
- improving EU's energy efficiency by 20 % (see Section 2.5).

To achieve these domestic commitments, in 2009 the EU adopted the climate and energy package ([14]), legally binding legislation related to the GHG and renewable energy targets. The package introduced a clear approach to achieving the 20 % reduction of total GHG emissions from 1990 levels, which is equivalent to a 14 % reduction compared to 2005 levels. This 14 % reduction objective is divided between two sub-targets, equivalent to a split of the reduction effort between ETS and non-ETS sectors of two thirds vs one third (EU, 2009c).

These two sub-targets are:

- a 21 % reduction target compared to 2005 for emissions covered by the EU ETS (including domestic and international aviation);
- a 10 % reduction target compared to 2005 for the remaining non-ETS emissions, shared between the 28 Member States through differentiated national GHG targets included in the ESD.

The climate and energy package also included directives on fuel quality (EU, 2009d), carbon capture and storage (CCS) technologies (EU, 2009e) and a regulation on CO_2 emissions from cars (EU, 2009f).

Under the revised EU ETS Directive (Directive 2009/29/EC of the European Parliament and of the Council amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community), one single EU ETS cap covers the EU Member States and the three participating non-EU Member States (Norway, Iceland and Liechtenstein), i.e. there are no further differentiated caps by country. The sectors covered under the EU ETS contribute the largest share of emission reductions for meeting the EU's 2020 GHG target (see Chapter 4). For allowances allocated to the EU ETS sectors, annual caps have been set for the period from 2013 to 2020; these decrease by 1.74 % annually, starting from the average level of allowances issued by Member States for the second trading period (2008–2012). The annual caps imply interim targets for emission reductions in sectors covered by the EU ETS for each year until 2020. For further details on the EU ETS in the 2013–2020 period, see Chapter 3.

While the EU ETS target is to be achieved by the EU as a whole, the ESD target was divided into national targets to be achieved individually by each Member State. The ESD sets binding annual

([14]) See http://ec.europa.eu/clima/policies/package/index_en.htm for more details.

targets — Annual Emission Allocations (AEAs) — for GHG emissions not covered by the EU ETS for all Member States for the period from 2013 to 2020. The ESD covers emissions from all sources outside the EU ETS, except for emissions from international maritime, domestic and international aviation (which were included in the EU ETS from 1 January 2012) and emissions and removals from land use, land-use change and forestry (LULUCF). It thus includes a diverse range of small-scale emitters in a wide range of sectors: transport (cars, trucks), buildings (in particular heating), services, small industrial installations, agriculture and waste. Such sources currently account for about 60 % of total GHG emissions in the EU.

At EU level, the ESD will deliver an emission reduction of 9.3 % in 2020, compared with 2005 levels, from those sectors covered by the decision.

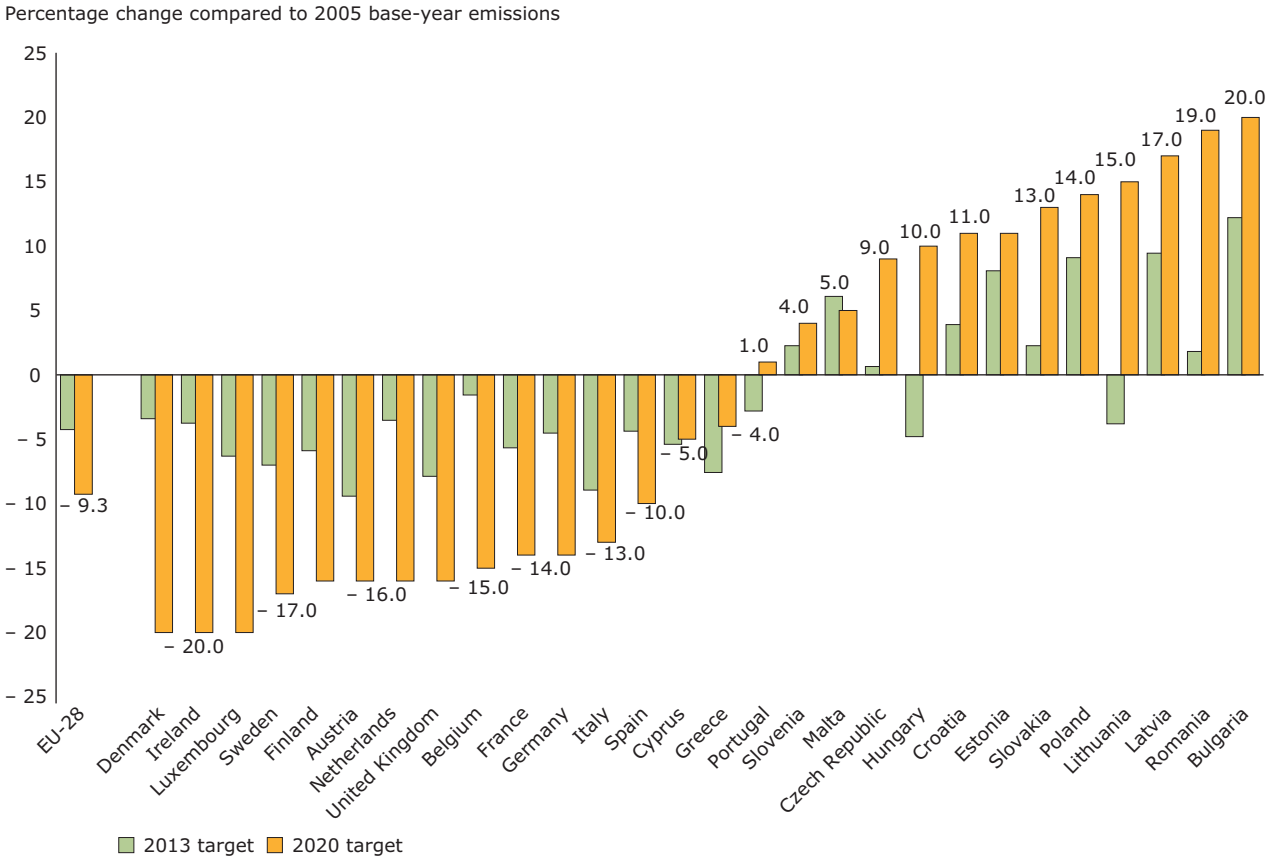
At country level, 2020 targets under the ESD range from – 20 % to + 20 %, compared to 2005 levels. Up to certain limitations, the ESD allows Member States to make use of flexibility provisions for meeting their annual targets: carry-over of over-achievements to subsequent years within each Member State, and transfers of AEAs between Member States (see Annex 3.1).

2.3 Methodological issues on coverage of GHG emission targets

Differences between international and domestic EU commitments for GHG emissions

The scope of existing EU legislation implementing its domestic 20 % commitment is different from that of its Kyoto target for the second commitment

Figure 2.1 National 2013 and 2020 GHG emission limits under the ESD, relative to 2005 emissions levels



Note: The 2013 targets are based on ESD values for **relative** 2020 targets, Commission Decisions for absolute 2020 and 2013 targets. To express the 2013 targets in relative terms, absolute values are compared with 2005 base-year emissions, calculated on the basis of relative and absolute 2020 targets.

The absolute 2020 and 2013 targets used for the calculations are consistent with the IPCC's AR4 global warming values and take into account the change in the scope of the ETS from the second to the third period (2013–2020).

Source: EC, 2013a and 2013e; EU, 2009a.

period. For this reason, the total allowed emissions or the 'emissions budget' under the climate and energy package cannot be directly compared to the corresponding QELRC. Several main differences in terms of emissions included and methodologies to determine the emissions between the climate and energy package and the second commitment period need to be highlighted (see also EU, 2012a):

- International aviation: emissions from international aviation are not accounted for under the Kyoto Protocol. However, these emissions are covered by the EU's overall 20 % reduction target for 2020 and the legislation adopted under the climate and energy package to achieve this target (as aviation in EU Member States is included in the EU ETS).

- LULUCF: emissions and removals from LULUCF were accounted for under the Kyoto Protocol's first commitment period. They will also be considered during the second commitment period according to the relevant decisions made in the UNFCCC negotiations in Durban (South Africa) (UNFCCC, 2012a). However, the LULUCF sector in the EU is not included in the 20 % target under the climate and energy package.

- The use of units from flexible mechanisms is restricted under the Kyoto Protocol, to the extent that such use is supplemental to domestic action. This condition is not further specified. Under EU domestic legislation, the use of units from flexible mechanisms is capped in the EU ETS (up to 50 % of the required reduction below 2005 levels can be achieved through the use of carbon credits between 2008 and 2020, under the ETS). In the sectors covered by the ESD, the annual use of carbon credits is limited to up to 3 % of each Member State's ESD emissions in 2005, with a limited number of Member States being permitted to use an additional 1 % from projects in least developed countries or small island developing states, subject to conditions.

- Nitrogen trifluoride (NF_3): the scope of the gases covered by the Kyoto Protocol ([15]) was extended for the second commitment period, in order to include the additional gas NF_3 ([16]). However, this gas is not included in the climate and energy package. The impact of NF_3 on aggregate EU emissions is assumed to be negligible.

- Base years: the Kyoto Protocol provides a certain degree of flexibility — Parties may set a base year other than 1990 for fluorinated gases. Economies in transition also have some flexibility for the base year for other gases. The domestic EU 2020 target uses 1990 as the base year against which emission levels are compared for the overall emission reduction target.

- Global warming potential (GWP): the GWP allows the calculation of GHG impacts of non-CO_2 gas emissions in a common metric (CO_2-equivalent). Base-year emissions and absolute GHG emission targets under the first commitment period of the Kyoto Protocol were established on the basis of GWPs from the IPCC's *Second Assessment Report: Climate Change 1995* (SAR). For the Kyoto Protocol's second commitment period, absolute targets will be based on GWPs from the IPCC's *Fourth Assessment Report: Climate Change 2007* (AR4). For the years from 2013 onwards, ETS information is consistent with the GWPs from the AR4. The absolute national emission limits for the period from 2013 to 2020, published by the Commission in 2013, were provided in both sets of GWPs, from the second and the fourth assessment reports (EC, 2013a and 2013e).

Emissions from aviation

While GHG emissions from domestic and international aviation have been partly included in the EU's target under the UNFCCC since 2012 as part of the EU ETS, only emissions from domestic aviation are included in its targets under the Kyoto Protocol. Domestic aviation from the EU Member States amounts to less than 0.5 % of total GHG emissions without LULUCF, whereas international aviation of EU-28 Member States totals about 3 %.

In principle, the EU ETS covers all flights arriving at, and departing from, airports in all EU Member States, Norway, Iceland and Liechtenstein and closely related territories. However, since 2012, flights to and from aerodromes from other countries have not been included in the EU ETS. This exclusion, first resulting from the 'stop the clock' decision (EU, 2013a) was made in order to facilitate negotiation of a global agreement on aviation emissions in autumn 2013 by the General Assembly of the International Civil Aviation Organisation

([15]) Carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs). All these gases are also covered by the ESD.
([16]) NF_3 is predominantly used in the high-volume production of liquid-crystal displays and silicon-based thin-film solar cells.

(ICAO). At its 38th meeting in autumn 2013, the ICAO decided on a roadmap for the development of a global market-based mechanism to tackle aviation emissions. By 2016, the body will decide on a mechanism to be implemented by 2020.

The EU decided to continue with a reduced scope in the period from 2013 to 2016 (EU, 2014c). Only flights between aerodromes located in countries in the European Economic Area are included. Flights to and from outermost regions, as per Article 349 of the Treaty on the Functioning of the European Union (TFEU), are covered only if they occur in the same outermost region.

More than 1 200 aviation operators are currently included in the EU ETS. The cap for aviation in the EU ETS is based on average historic emissions in this sector between 2004 and 2006 (221.4 million t CO_2 for all participating countries) ([17]). The cap for the 2013–2020 period equals 95 % of baseline emissions (EU, 2008). Whereas aircraft operators may use aviation allowances as well as EU allowances (EUAs) from the stationary sectors, stationary installations are not permitted to use aviation allowances for compliance. In addition, some international credits can be used by aircraft operators: up to 14 % of their verified emissions in 2012, and from 2013 onwards, each aircraft operator is entitled to use international credits up to a maximum of 1.5 % of its verified emissions during the period from 2013 to 2020, without prejudice to any residual entitlement from 2012 (EU, 2014c).

LULUCF activities under the Kyoto Protocol

In addition to policies and measures targeting sources of GHG emissions, countries can use policies and measures to protect their existing terrestrial carbon stocks (e.g. by reducing deforestation) and to further enhance terrestrial carbon stocks (e.g. by increasing the area or carbon density of forests).

The following LULUCF activities are included under the Kyoto Protocol.

- Afforestation, reforestation and deforestation (ARD) since 1990 (mandatory activities covered by Article 3.3 of the Kyoto Protocol), for land that has been subject to direct, human-induced conversion from a non-forest to a forest state, or vice versa.
- Forest management (FM), cropland management (CM), grazing-land management (GM) and revegetation (RV). Although CM, GM and RV are voluntary, since the second commitment period, FM has been a mandatory activity under Article 3.4 of the Kyoto Protocol). These activities pertain to land that has not undergone conversion since 1990, but is otherwise subject to a specific land activity. Parties account for net emissions or removals for each activity during the commitment period by issuing removal units (RMUs) in the case of net GHG removals from LULUCF activities, or cancelling Kyoto units in the case of LULUCF activities being a net source of GHG emissions. LULUCF activities can therefore be used to compensate for emissions from other sources if removals are higher than emissions from this sector. In the first commitment period, the number of RMUs that could be issued by each Party under FM was capped (UNFCCC, 2006). For the second commitment period, FM activities will be accounted against a 'FM reference level', i.e. a country-specific level of business-as-usual emissions or removals. RMUs will be issued only if FM removals are higher, or emissions are lower, than the agreed FM reference level. Otherwise, Kyoto units will be cancelled.

RMUs can be accounted for at the end of a commitment period or annually. According to Decision 13/CMP.1, Parties must indicate the frequency of accounting with their initial reports. For each activity under Article 3.3 and Article 3.4, Parties have elected to account for emissions or removals either annually during the commitment period or once only at the end of this period. The decision on frequency determines when Parties may issue RMUs or cancel other units in the case of emissions from Article 3.3 and Article 3.4 activities.

For the second commitment period, new accounting rules apply for the accounting of emissions and removals in the LULUCF sector. In particular, additional activities for wetland management can be chosen to be accounted on a voluntary basis. Guidelines for these new rules were developed by the IPCC and adopted by the UNFCCC. Subsequently, the rules were almost entirely transferred into EU law in form of the EU LULUCF Decision 529/2013/EU (EU, 2013c).

LULUCF emissions and removals are not included in the EU domestic 2020 target under the climate

([17]) The annual average of CO_2 emissions in the years 2004, 2005 and 2006 forms the baseline for historical aviation emissions, based on data from the European Organisation for the Safety of Air Navigation (EUROCONTROL) and actual fuel consumption information provided by aircraft operators.

and energy package. The EU has adopted a LULUCF Decision (Decision No 529/2013/EU of the European Parliament and of the Council on accounting rules on greenhouse gas emissions and removals resulting from activities relating to land use, land-use change and forestry and on information concerning actions relating to those activities) (EU, 2013c). This legislation harmonises EU LULUCF reporting with Kyoto Protocol requirements but also goes beyond these requirements; under EU rules, Member States have to report also on agricultural activities (CM, GM), irrespective of whether these activities are elected or not under the KP.

Table 2.2 Overview of EU climate and energy targets

	International commitments			Unilateral EU commitments		
	Kyoto Protocol		UNFCCC	Climate and energy package		Proposed framework on climate and energy policies
				EU ETS	ESD	
Target year or period	First commitment period (2008–2012)	Second commitment period (2013–2020)	2020	2013–2020	2013–2020	2030
Emission reduction target	– 8 %	– 20 %	– 20 %	– 21 % compared to 2005 for ETS emissions	Annual targets for Member States. In 2020, – 9 % compared to 2005 for ESD emissions	– 40 %
Other targets			Conditional target of – 30 % if other Parties take on adequate commitments	RED: 20 % share of renewable energy of gross final energy consumption; EED: increase energy efficiency by 20 %		At least 27 % share of renewable energy consumption; at least 27 % increase in energy efficiency
Base year	1990 Kyoto Protocol Flexibility rules for F-gases and economies in transition	1990, but subject to flexibility rules. 1995 or 2000 may be used as base year for F-gases or NF_3	1990	1990 for overall emission reduction target; 2005 for renewable energy and energy efficiency target, as well as for targets broken down into ETS and non-ETS emissions		1990 for emission reduction target; further rules to be determined
LULUCF	Included ARD and other activities if elected	Included ARD and forest management, other activities if elected (new accounting rules)	Excluded	Excluded		Included (according to proposal by Commission) without specifying means
Aviation	Domestic aviation included. International aviation excluded	Domestic aviation included. International aviation excluded	Domestic aviation included. International aviation partly included	Domestic and international (partly) aviation included in EU ETS	Aviation generally excluded, some domestic aviation included (very small operators)	Not specified, yet expectation of market mechanisms for aviation under ICAO

Table 2.2 Overview of EU climate and energy targets (cont.)

	International commitments			Unilateral EU commitments		
	Kyoto Protocol		UNFCCC	Climate and energy package		Proposed framework on climate and energy policies
				EU ETS	ESD	
Use of market mechanisms	International emission trading, CDM and JI, no cap (but supplementarity)	International emission trading, CDM and JI, no cap (but supplementarity)	Possible, but capped under EU ETS and ESD	EUA transfers and limited CDM use, following RICE	Possible under ESD, capped by EU internal legislation	To be determined. In ETS no additional use of international credits. Increased use of international credits if a conditional target is set. No use mentioned in ESD
Carry-over of units	Not applicable	Possibly subject to specific carry-over rules (2.5 % of CERs and ERUs, no RMUs, AAUs to PPSR account)	Carry-over of surplus AAUs is not possible, (but carry-over is possible under EU ETS)	Surplus EU allowances under EU ETS can be banked into subsequent ETS trading period	Unused part of annual quantity may be carried over to subsequent year until 2020 and transferred to another MS	ETS: yes ESD: to be determined
Gases covered	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6,	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, NF_3	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, NF_3 not included		No information at this stage
Sectors included	Energy, IPPU, agriculture, waste	Energy, IPPU, agriculture, waste	Energy, IPPU, agriculture, waste, aviation	Power and heat generation, energy-intensive industry sectors, aviation	Transport (except aviation), buildings, non-ETS industry, agriculture (except forestry) and waste	Under discussion
GWPs used	IPCC SAR	IPCC FAR	IPCC SAR Inventory data (including historical data) will be switched to IPCC FAR from 2015 onwards	IPCC FAR		Calculations in current proposal carried out on basis of FAR
Member States included	15	28 + Iceland	28	28		28

Source: EC, 2007 and 2013g; EU, 2009a, 2009b, 2009c, 2012b and 2014b; UNFCCC, 1998, 2012b, 2012c and 2013b.

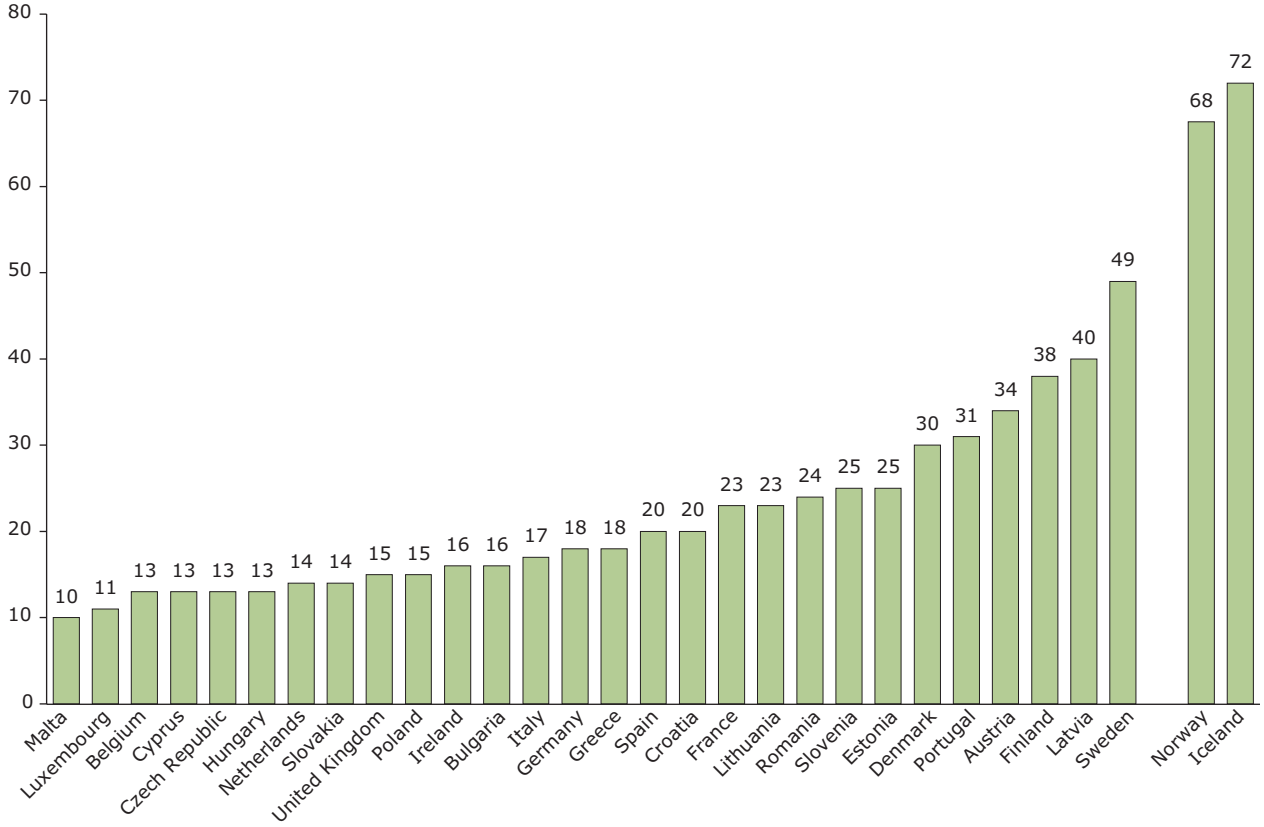
2.4 Renewable energy targets

In order to meet its target of raising the share of RES to 20 % in its gross final energy consumption by 2020, the EU adopted the RED (EU, 2009b), as part of the climate and energy package.

The RED includes legally binding national renewable energy targets for 2020 consistent with a 20 % EU-wide RES share in gross final energy consumption by 2020, and a 10 % RES share in transport by the same year (EU, 2009b). The RED also sets for each Member State an indicative

Figure 2.2 National targets for renewable energies for 2020

Share of RES in gross final energy consumption (%)



Note: The targets for Iceland and Norway, which are not EU Member States, were agreed and included in the annex of the European Economic Area Agreement. For simplicity, this report refers to these as being RED targets.

Source: EU, 2009b.

Box 2.1 Definitions related to energy consumption

Primary energy consumption
Gross inland consumption, excluding non-energy uses. Gross inland consumption is the total energy demand of a country or region. It represents the quantity of energy necessary to satisfy inland consumption of the geographical entity under consideration.

Final energy consumption
All energy supplied to the final user (industry, transport, households, services and agriculture) for all energy uses. It excludes deliveries to the energy transformation sector (e.g. fossil fuels delivered to power plants to produce electricity) and the energy industries themselves, as well as network losses.

Gross final energy consumption
All energy delivered for energy purposes to final consumers (industry, transport, households, services, agriculture, forestry and fisheries), including the consumption of electricity and heat by the energy branch for electricity and heat production and including losses of electricity and heat in distribution and transmission.

The gross final consumption of energy from renewable sources is calculated as the sum of:
(a) gross final consumption of electricity from renewable energy sources;
(b) gross final consumption of energy from renewable sources for heating and cooling; and
(c) final consumption of energy from renewable sources in transport.

trajectory for the period from 2011 until 2018, intended to ensure that each Member State achieves its 2020 target. An interim indicative RED target for the EU can be derived from the minimum indicative trajectories of the Member States in the run-up to 2020 (RED, Annex I Part B).

Under the RED, Member States had to submit National Renewable Energy Action Plans (NREAPs) in 2010 (EC, 2013i). These plans outline the pathways foreseen by Member States (i.e. the expected trajectories) to reach their legally binding national renewable energy targets in 2020. In 2011 (and every two years thereafter), Member States had to report on national progress towards the interim RED and expected NREAP targets. The NREAPs adopted by Member States in 2010 outline expected trajectories for the share of RES in gross final energy consumption towards the legally binding national 2020 RES targets.

2.5 Energy efficiency targets

In 2007, European heads of state and government stressed the need to increase energy efficiency so as to achieve a 20 % energy savings target for 2020 with regard to primary energy consumption, and agreed on binding targets for GHG emission reductions and renewable energy (European Council, 2007). The reduction of primary energy consumption by 20 % by 2020 is a non-binding objective in the EU.

The climate and energy package does not address the energy efficiency target directly, although the CO_2 performance standards for cars and vans (Regulation EU No 333/2014 and Regulation EC No 443/2009), the revised EU ETS directive and the ESD all contribute to fostering energy efficiency. Since the adoption of the package, the EU energy efficiency policy framework has evolved in line with the priorities identified in the Action Plan for Energy Efficiency 2006 (EC, 2006a). The Energy Efficiency Action Plan was reviewed in 2011, following revisions of several pieces of legislation:

- the Ecodesign Directive (Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products) (EU, 2009g);
- the Energy Labelling Directive (Directive 2010/30/EU of the European Parliament and of the Council of 19 May 2010 on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products) (EU, 2010a);
- the Energy Performance of Buildings Directive (EPBD) (Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings) (EU, 2010b).

One of the key developments in the energy efficiency policy framework was the adoption of the EED in 2012 (EU, 2012b). The EED establishes a common framework of measures for the promotion of energy efficiency within the Union and aims to help remove barriers and overcome market failures that impede efficiency in the supply and use of energy. The EED stipulates that primary energy consumption in the EU-28 should not exceed 1 483 Mtoe in 2020, and that final energy consumption in EU-28 should not exceed 1 086 Mtoe by the same year. These absolute targets were established using the European Commission's 2007 baseline scenario, based on the Price-driven and Agent-based Simulation of Markets Energy System Models (PRIMES) (EC, 2008 and 2011d). Implementing the EED was expected to lead to a 15 % reduction in primary energy consumption compared to the 2007 baseline scenario, with an additional 2 % reduction, expected to come from the transport sector (Groenenberg, 2012).

Under the EED, Member States had to set indicative national targets and implement a set of mandatory requirements, one of the most significant being the establishment of an energy efficiency obligation scheme, or the implementation of alternative measures.

Member States adopted different base years against which the progress towards national energy efficiency targets will be measured. Member States also chose different approaches when setting the national target. Ten Member States (Austria, Belgium, Cyprus, Denmark, Hungary, Ireland, Italy, Latvia, Malta and Poland) chose to focus the target on primary energy consumption, while 12 others (Croatia, Estonia, Finland, France, Greece, Lithuania, Luxembourg, Netherlands, Spain, Slovakia, Slovenia and the United Kingdom) chose to focus their national target on final energy consumption and two (Bulgaria and Sweden) on primary energy intensity. Each national target reflects the specific situation of the Member State which adopted it. As a consequence, ambition levels vary greatly. When comparing all targets to 2005 levels, sixteen Member States have aimed for reduction of final as well as primary energy consumption; for six Member States, targets show an increase in final as well as primary energy consumption (including

Malta which has a 24 % reduction target in primary energy consumption, alongside a + 40 % target for final energy consumption, compared to 2005); five other Member States have placed a cap on the potential increase of either primary or final energy consumption over the period. Croatia has only adopted one very generous target on final energy consumption (+ 46 % compared to 2005).

In some Member States, the targets may still be subject to change in the upcoming years. This is due to the fact that some countries are currently holding nationwide debates on the future of their energy systems. Depending on the outcome of these debates, energy efficiency targets might be modified. These updates can be reported in the triennial National Energy Efficiency Action Plans (NEEAPs) to be submitted by Member States under the EED. Cyprus, Malta, Spain and Sweden updated their energy efficiency targets compared to the data used in the 2013 report (EEA, 2013).

Figure 2.3 represents the national targets set by each Member State under the EED compared to 2005 levels for primary and final energy consumption. The year 2005 is used here to serve as a common reference, although the EED does not explicitly refer to this year as a common base year.

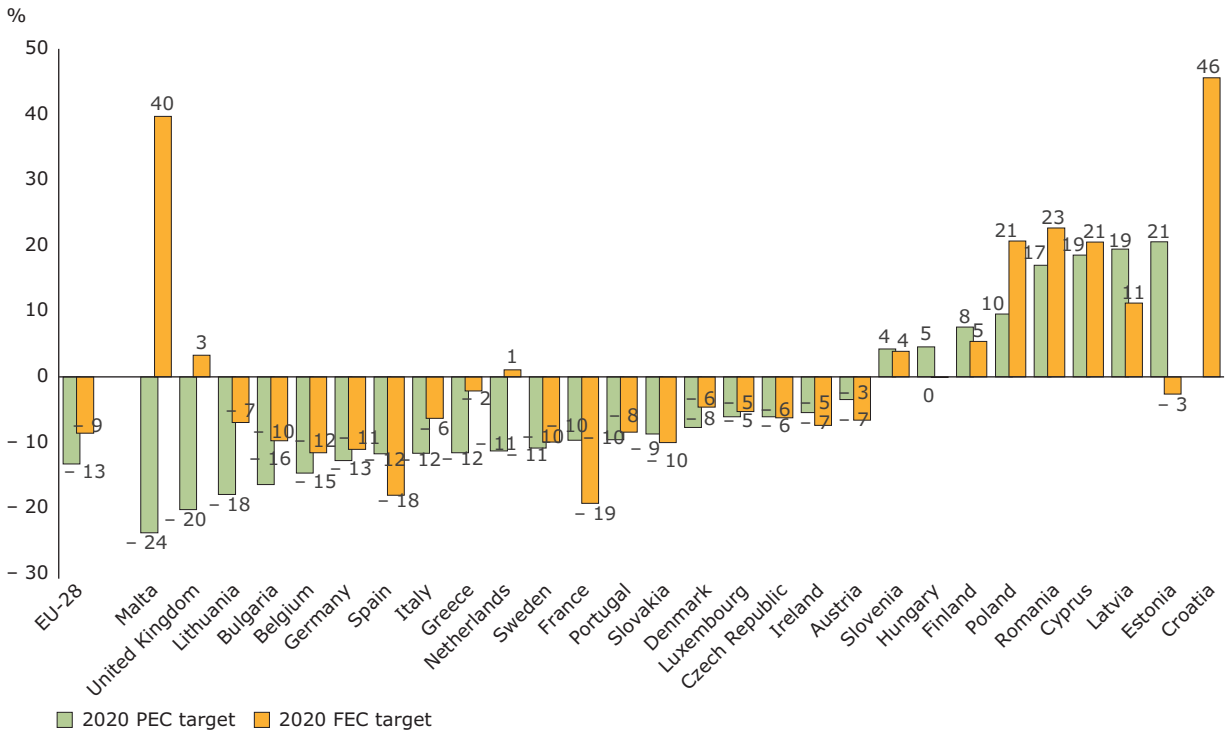
2.6 Outlook towards post-2020 targets

The EU has also articulated a long-term goal for 2050 of reducing Europe's greenhouse-gas emissions by 80 % to 95 % compared to 1990 levels. To ensure that the EU is on the cost-effective track towards meeting this long-term objective, EU leaders agreed, in October 2014, on the 2030 climate and energy policy framework for the EU and adopted a 2030 policy framework aims to make the EU's economy and energy system more competitive, secure and sustainable (European Council, 2014).

The adopted framework includes the following targets:

- a binding target of an at least 40 % domestic reduction in GHG emissions, compared to 1990;

Figure 2.3 National indicative primary and final energy consumption targets



Note: The national targets for 2020 reported by Member States under the EED were first calculated in absolute terms, and then compared with 2005 levels.

Source: Reported targets under Article 3 of EED in 2013, including updates of Cyprus, Malta, Spain and Sweden in NEEAP 2014 ([18]); Eurostat, 2014.

([18]) See http://ec.europa.eu/energy/efficiency/eed/neep_en.htm.

- a target, binding at EU level, of at least 27 % for the share of renewable energy consumption;

- an indicative target at EU level of at least 27 % for improving energy efficiency compared to projections of future energy consumption, based on the current criteria.

The 40 % domestic reduction target for GHG emissions will ensure that the EU is on the cost-effective track towards meeting its objective of cutting emissions by at least 80 % by 2050. This target will be delivered collectively, with a 43 % reduction in the ETS sectors and a 30 % reduction in the non-ETS sectors by 2030 compared to 2005, respectively. All Member States will participate in this effort, balancing considerations of fairness and solidarity. In the EU ETS, the annual factor to reduce the cap on the maximum permitted emissions will be changed from 1.74 % to 2.2 % from 2021 onwards. In the non-ETS sectors, the methodology to set the national reduction targets, with all the elements as applied in the ESD for 2020, will be continued until 2030, with efforts distributed on the basis of relative GDP per capita. All Member States will contribute to the overall EU reduction in 2030 with the targets spanning from 0 % to – 40 % compared to 2005.

The target of at least 27 % for the share of renewable energy consumed in the EU is binding at EU level but, with no fixed targets for the individual Member States. This target is intended to provide flexibility for Member States to set their own more ambitious national objectives for increased renewable energy and supporting them, in line with the state aid guidelines, as well as taking into account their degree of integration in the internal energy market.

The indicative target at the EU level of at least 27 % is set for improving energy efficiency in 2030 (compared to projections of future energy consumption based on the current criteria). The target will be reviewed by 2020, having in mind an EU level of 30 %. The Commission will propose priority sectors in which significant energy-efficiency gains can be reaped, and ways to address them at EU level, with the EU and the Member States focusing their regulatory and financial efforts on these sectors.

Neither the renewable energy target nor the energy efficiency target will be translated into nationally binding targets. Individual Member States are free to set their own higher national targets.

The adoption of these targets follows the publication, by the European Commission, of several communications outlining the main possible elements of a policy framework for climate and energy in the period from 2020 to 2030 (EC, 2014a). These elements are briefly described below.

- In January 2014, the European Commission presented a climate and energy policy framework for 2030 (EC, 2014a), in which it proposed a 40 % reduction target for GHG emissions and a 27 % target for the RES share in EU energy consumption, to be achieved by 2030. The communication was accompanied by an extensive impact assessment and a report on energy prices and costs which examines the key drivers of prices and costs, and compares EU prices with those of its main trading partners (EC, 2014b).

- On 28 May 2014, the European Commission published an EU energy security strategy (EC, 2014g) in which increasing energy efficiency and meeting the proposed 2030 climate and energy targets represent one of the five key areas of focus in the medium and long term.

- On 23 July 2014, the Commission published an Energy Efficiency Communication (EC, 2014h), in which the Commission proposed a target at EU level of 30 % energy savings by 2030. Concerning the 2020 target, no new measures were considered but Member States should step up their current efforts to ensure collective delivery of the 20 % target. The Commission will complement these efforts with appropriate guidance and dissemination of best practice to ensure full exploitation of the available Union funds.

Concerning LULUCF, no final decision has been taken yet on how to include this sector into the 2030 greenhouse gas mitigation framework. The Commission has been invited to examine the best means of encouraging the sustainable intensification of food production, while optimising the sector's contribution to GHG mitigation and sequestration, including through afforestation.

3 The EU Emissions Trading System (ETS)

Key messages

- The EU ETS is one of the key climate policy instruments in the EU. It was introduced to help participating countries reach their emissions reduction targets under the Kyoto Protocol as well as the internal EU targets for 2020 and beyond, through cost-efficient emission reductions at point sources across the EU. In 2013, the EU ETS entered its third trading period (2013–2020); it has a wider scope than the first (2005–2007) and second (2008–2012) trading periods, as additional countries, gases and sectors have entered the scheme. The third trading period is governed by a new set of rules: the cap is set at EU level, with a linear reduction factor, rather than national allocation plans (NAPs) drawn up by participating countries. Auctioning has become the default method for allocation, with about half of the allowances being auctioned; however, there remains a substantial share of free allocation until 2020.

- EU ETS emissions decreased by 19 % between 2005 and 2013, with particularly large decreases in the cement clinker and lime sector. Emissions from combustion installations, which represent more than 70 % of all ETS emissions and are dominated by electricity generation, have been reduced mainly due to the expansion of renewable energies. In the cement, iron and refinery sectors, emission reductions were to a large extent driven by reduced production due to the economic crisis.

- The EU ETS entered its third trading period with a cumulated surplus of nearly 1.8 billion allowances carried over from the second trading period. The effects of the mostly unpredicted economic recession since 2008, as well as large entitlements for the use of emission reduction credits coming from outside the ETS (under the clean development mechanism (CDM) and joint implementation (JI)), contributed to low demand for allowances and thus the build-up of such large surplus of allowances, with corresponding effects on the carbon price signal. In 2013, verified emissions were 4 % lower than in 2012. Coupled with a continued use of external emission reduction credits, this led to an increase in the surplus, to 2 billion allowances. As a result, prices have also remained at low levels at the beginning of the third trading period.

- In order to address the imbalance of supply and demand, an amendment of the Auctioning Regulation was adopted to postpone ('backload') the auctioning of 900 million allowances from the early years of the third trading period to the end of that trading period. Furthermore, the European Commission has proposed changes to strengthen the EU ETS, such as a legislative proposal to establish a market stability reserve mechanism.

- To contribute cost-effectively to the adopted 40 % reduction target by 2030, compared to 1990, EU ETS emissions will have to be reduced by 43 % compared to 2005, and the annual factor to reduce the cap on the maximum permitted emissions will be changed from 1.74 % to 2.2 % from 2021 onwards.

3.1 Introduction

The EU ETS is one of the key climate policy instruments implemented in the EU to achieve its emission reductions objectives in a cost-effective manner. It was established by the Emissions Trading Directive (EU, 2003) and entered into force on 1 January 2005. The EU ETS was conceived in the context of international mitigation commitments under the Kyoto Protocol; it was aimed at helping Member States reach their individual Kyoto targets.

The EU ETS is an economic instrument which created a carbon price for installations in the energy and industrial sectors across the EU. Setting up an EU-wide carbon market, the EU sought to trigger emission reductions where they could be achieved at least cost. Furthermore, by allocating to operators allowances linked to Kyoto units and making them legally responsible for achieving emission reduction objectives, governments shared part of their commitment to achieve their Kyoto targets with ETS operators.

As part of the climate and energy package adopted in 2009, the original Emissions Trading Directive was revised (EU, 2009c), in order to help the EU achieve its commitment to cut its GHG emissions by 20 % compared to 1990 levels by 2020 and to contribute to emissions reductions after 2020.

The EU ETS is based on a 'cap and trade' approach, whereby a total limit (cap) on CO_2 emissions — in the form of a quantity of emission allowances — is set for the regulated entities. By the end of April each year an amount equivalent to the emissions from the previous year must be surrendered by operators of stationary installations and aircraft operators liable under the scheme. Operators holding more allowances than required to cover their verified emissions may either sell allowances to other operators or keep them for use in future years and trading periods (this is known as 'banking'). Operators holding less allowances than they need to cover their emissions, can either buy from other operators willing to sell allowances, participate in allowance auctions, surrender international credits, borrow a limited number of allowances from the next year or carry out emissions reductions to meet their obligation.

The first trading period of the EU ETS (2005–2007) was designed as a pilot period of 'learning by doing'. It was followed by a second trading period (2008 to 2012) corresponding to the first commitment period under the Kyoto Protocol. In 2013, the EU ETS entered its third trading period, which will run until 2020.

During the first and second trading periods, most emission allowances were allocated for free by governments under national allocation plans (NAPs), which had to be reviewed by the European Commission, and not many allowances were auctioned. In the third trading period, the amount of freely allocated allowances has decreased considerably, and about 50 % of all allowances are auctioned.

3.2 Coverage of the EU ETS

Participating countries

The EU ETS began with the EU-25 in 2005; the number of countries covered has since reached 31. Bulgaria and Romania entered the EU ETS in 2007. Norway, Iceland and Liechtenstein joined in 2008 (only stationary installations from Iceland have participated since 2013), and Croatia joined the EU and the EU ETS in 2013.

Sectors

The EU ETS covers more than 12 000 stationary installations in the energy and most industrial sectors, as well as about 1 300 aircraft operators. In the two first trading periods (2005–2007 and 2008–2012), the ETS covered CO_2 emissions from electricity generators and other combustion plants, oil refineries, coke ovens, iron and steel plants and factories making cement, glass, lime, bricks, ceramics, pulp, paper and board. Some participating countries (Austria, Italy, Latvia, the Netherlands, Norway and the United Kingdom) included (mainly N_2O-emitting) installations during the second trading period ('opt-ins' ([19])).

Since 2013, the scheme has covered additional sectors and gases (EU, 2009c) ([20]):

- capture, transport and geological storage of GHG emissions;
- CO_2 emissions from the petrochemicals, ammonia and aluminium production;

([19]) See http://ec.europa.eu/clima/policies/ets/pre2013/nap/documentation_en.htm.
([20]) From 2013 onwards, some countries have excluded small installations (emitting less than 25 000 tonnes CO_2 per year) from the scheme, as per Article 27 of the Emissions Trading Directive.

- nitrous oxide (N_2O) emissions from the production of nitric, adipic and glyoxylic acid;
- CO_2 emissions from non-ferrous metal production/processing;
- perfluorcarbon (PFC) emissions from aluminium production.

In total, all installations covered by the EU ETS emitted 1 908 Mt CO_2-eq. in 2013, which represents about 40 % of total GHG emissions. The share of non-CO_2 gases is less than 1 % ([21]).

Table 3.1 details verified emissions for each of the new activity codes that were introduced in 2013 in order to account for the new sectors included in the scheme. For the purpose of this analysis these are summarised into five composite sectors as shown in the table. Verified emissions are shown for the start year of each of the three trading periods. The combustion sector is by far the largest source of emissions, accounting for 71 % of 2013 verified emissions, followed by the cement and lime sector and the refineries sector with 7.4 % each, and the iron, steel and coke sector at 7.1 %.

Of the activities that entered the EU ETS in 2013, those emitting the most emissions were related to the production of chemicals (bulk organic chemicals: 16 Mt CO_2-eq., ammonia: 14 Mt CO_2-eq. and, hydrogen and synthesis gas: 8 Mt CO_2-eq.). The second group of sectors that entered the EU ETS in 2013 is related to non-ferrous metals (primary aluminium: 7 Mt CO_2-eq. and other non-ferrous metals: 5 Mt). The activities for which N_2O is included in the EU ETS are the production of nitric acid and adipic acid. These activities emitted 2 Mt CO_2-eq. in 2013 ([22]).

The aviation sector has been included in the EU ETS since 1 January 2012 (EU, 2008). In principle, the EU ETS should cover all flights arriving at, and departing from, airports in all EU Member States, Norway, Iceland and Liechtenstein and closely related territories. However, since 2012, flights to and from aerodromes from other countries have not been included in the EU ETS. This exclusion, first resulting from the 'Stop the clock' decision (EU, 2013a) was taken in order to facilitate negotiation of a global agreement to address aviation emissions in the forum of the International Civil Aviation Organisation (ICAO). The ICAO assembly agreed in 2013 on a roadmap for developing a global market-based mechanism (MBM) which aims to finalise the design of the global MBM in 2016 with implementation from 2020. The EU has decided to continue with a reduced scope in the 2013–2016 period (EU, 2014c). Reporting of emissions for 2013, as well as surrendering of allowances for flights included in EU ETS, is deferred until the compliance deadlines of 2015, where 2014 emissions will be reported and allowances surrendered. Due to the lack of consistent data for the aviation sector, the following analyses only include stationary installations covered by the EU ETS.

([21]) One single number for total greenhouse gas emissions per year (in tonnes of CO_2-eq.) is reported for each installation included in the European Union Transaction Log (EUTL). No further information on emissions per greenhouse gas is available. The EUTL therefore does not allow quantifying the amount of non-CO_2 greenhouse gas emissions emitted by installations covered by the EU ETS. It is, however, possible to estimate non CO_2-emissions covered by the EU ETS on an aggregated level, based on the emissions reported for the relevant industrial sectors in national greenhouse gas inventories. In 2012, N_2O emissions from nitric acid production (2.B.2) in the EU were equal to 9 Mt CO_2-eq., N_2O emissions from adipic acid production (2.B.3) were equal to 0.5 Mt CO_2-eq. and PFC emissions from aluminium production were likewise equal to 0.5 Mt CO_2-eq. (EEA, 2014d).

([22]) Thus, N_2O emissions reported under the EU ETS for 2013 are considerably lower than emissions reported in the inventory in 2012 (the latest year with inventory data). It is likely that the price signal in the EU ETS has triggered further abatement of N_2O emissions from 2012 to 2013. On the other hand, some N_2O-emitting installations might be part of a bigger installation with a different activity code. In 2015, inventory data for 2013 will be available that will allow for a comparison of inventory and EU ETS data.

Table 3.1 Activities and sectors covered under the EU ETS

Sectors	Activities	Verified emissions (Mt)			Share of 2013 emissions (%)
		2005	2008	2013	
Combustion	20 Combustion of fuels	1 473	1 524	1 346	70.6 %
Refineries	21 Refining of mineral oil	154	157	142	7.4 %
Iron steel and coke	22 Production of coke	19	21	23	1.2 %
	23 Metal ore roasting or sintering	7	4	3	0.2 %
	24 Production of pig iron or steel	114	120	101	5.3 %
	25 Production or processing of ferrous metals	0	1	8	0.4 %
Cement clinker and lime	29 Production of cement clinker	166	177	129	6.8 %
	30 Production of lime or calcination of dolomite/magnesite	12	14	13	0.7 %
Other	26 Production of primary aluminium	0	0	7	0.4 %
	27 Production of secondary aluminium	0	0	1	0.0 %
	28 Production or processing of non-ferrous metals	0	0	5	0.3 %
	31 Manufacture of glass	20	23	19	1.0 %
	32 Manufacture of ceramics	15	14	14	0.7 %
	33 Manufacture of mineral wool	0	0	0	0.0 %
	34 Production or processing of gypsum or plasterboard	0	0	1	0.1 %
	35 Production of pulp	3	3	3	0.1 %
	36 Production of paper or cardboard	27	29	25	1.3 %
	37 Production of carbon black	0	0	0	0.0 %
	38 Production of nitric acid	0	0	2	0.1 %
	39 Production of adipic acid	0	0	0	0.0 %
	40 Production of glyoxal and glyoxylic acid	0	0	0	0.0 %
	41 Production of ammonia	1	1	14	0.8 %
	42 Production of bulk chemicals	2	8	16	0.8 %
	43 Production of hydrogen and synthesis gas	0	0	8	0.4 %
	44 Production of soda ash and sodium bicarbonate	1	1	3	0.1 %
	45 Capture of greenhouse gases under Directive 2009/31/EC	0	0	0	0.0 %
	46 Transport of greenhouse gases under Directive 2009/31/EC	0	0	0	0.0 %
	47 Storage of greenhouse gases under Directive 2009/31/EC	0	0	0	0.0 %
	99 Other activity opted-in under Art 24	0	23	25	1.3 %
	All activities	**2 014**	**2 120**	**1 908**	**100.0 %**

Notes: New activity codes and definitions were introduced in 2013 in order to account for the new sectors included in the scheme, but also to define activities already covered more specifically. All new installations entering the scheme are automatically assigned a new activity code. However, not all installations that were already part of the scheme before the start of the third trading period have changed to the new activity codes; they have retained the old codes instead. In this table, old codes have been merged with new ones. Please see the EEA's ETS data viewer manual for details of the mapping from old to new sector codes.

Source: EEA, 2014e.

3.3 Emissions cap and allocation principles

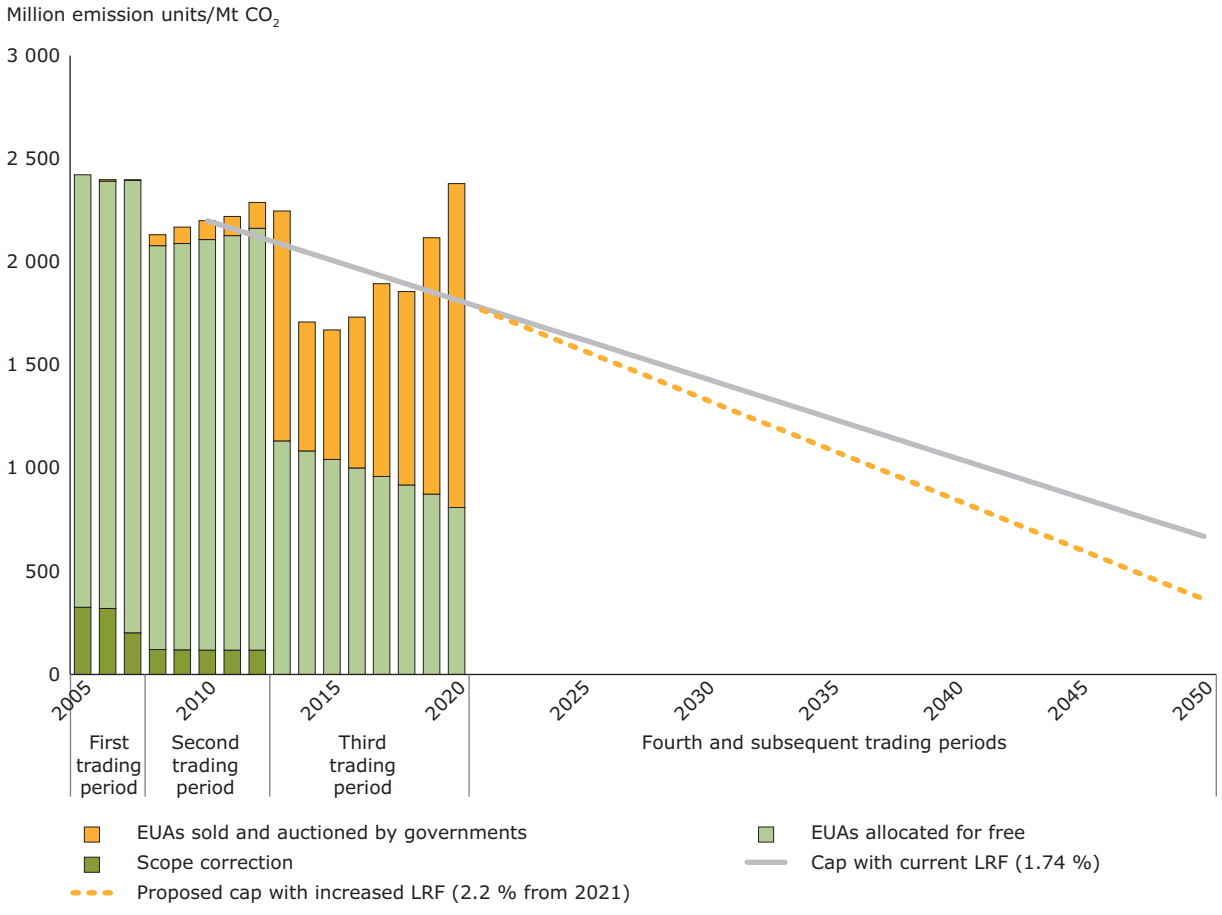
Overall ETS cap

The emissions target of the EU ETS — the cap — is the total amount of allowances which are available to the regulated entities, through either free allocation or auctions. In addition, until 2020, operators can use a certain amount of international credits. This use increases the overall emission cap (see 'Permitted use of international emission credits' below for more information).

In the first and second trading periods, national emission caps were determined by all participating countries in their NAPs. These NAPs had to be reviewed and accepted by the European Commission, which had published guidance documentation on how to set up the NAPs (EC, 2005). The review process of the national emission caps by the European Commission is documented in a communication (EC, 2006b). In essence, the NAPs were checked against gross domestic product (GDP) growth and reduced carbon intensity taken from the PRIMES 2005 modelling for the second trading period. The individual caps of EU Member States as a total formed the EU-wide cap.

From the third trading period onwards, an EU ETS-wide cap governs the supply of allowances under the EU ETS. The cap level is based on the expected contribution of the EU ETS towards achieving the EU's 20 % emissions reduction target for 2020 compared to 1990, which amounts to a 21 % reduction compared to 2005 levels in the ETS sectors. From 2013 onwards, the cap is decreased by applying a linear reduction factor of 1.74 % to the average 2008–2012 cap. The linear reduction factor is also applied to the cap adjustment made in order to incorporate emissions from new sectors and gases from 2013 onwards (EU, 2009c). In the long term,

Figure 3.1 EU ETS caps up to 2020 and policy proposals up to 2050



Note: The data presented do not include the aviation sector.

Source: EEA, 2014e and 2014f; EC, 2013d.

the current linear reduction factor of the ETS cap by 1.74 % per year would lead to an emissions reduction in the EU ETS sectors of around 71 % compared to 2005 levels in 2050 (for all countries participating in the EU ETS). An increased linear reduction factor would deliver more emission reductions.

To contribute cost-effectively to the adopted 40 % reduction target by 2030, compared to 1990, EU ETS emissions will have to be reduced by 43 % compared to 2005, and the annual factor to reduce the cap on the maximum permitted emissions will be changed from 1.74 % to 2.2 % from 2021 onwards. Applying a linear reduction factor of 2.2 % from 2021 until 2050 would lead to emission reductions in the EU ETS sectors of 84 % below 2005 levels in 2050 (for all countries participating in the EU ETS).

Free allocation

During the first trading period, almost all allowances were allocated for free (less than 1 % was auctioned or sold). The allocation level for individual installations was mainly based on historical emissions. The rules for allocation of allowances to individual installations in the first and second trading periods was determined in the NAPs (EU, 2003).

In the second trading period, 95 % of emission allowances were allocated for free. In many countries (e.g. Denmark, Germany or the United Kingdom), benchmarks were used to allocate allowances to electricity generators, while allocation was still largely based on historical emissions for industrial sectors. As a result, free allocation (relative to emissions) tended to be higher for industrial sectors compared to combustion installations (a large part of which generate electricity).

From 2013 onwards, the EU ETS moved to a more auctioning-based allocation process, with a large number of permits still allocated free of charge. Most of these free allowances are allocated to industrial sectors, although certain combustion installations also receive free allocation (installations producing electricity generally only receive free allocation for heat production). Furthermore, some installations in the electricity generation sector continue to receive free allocation in the third trading period, as is permitted for 10 of the Member States which have joined the EU since 2004, under Article 10c of the EU ETS Directive (EU, 2009c) ([23]). The total maximum number of allowances that can be allocated for free by Member States (indicated in Table 3.2) under these rules was published in two decisions of the European Commission. A condition for the free allocation under Article 10c is that investments are made to modernise electricity generation. If investments are not implemented as planned, the amount of free allocation is reduced and the allowances auctioned instead (EU, 2011b).

Table 3.2 Maximum free allocation for electricity generators under Article 10c of the EU ETS Directive

Country	2013	2014	2015	2016	2017	2018	2019	2020	Total 2013–2020
					Million EUAs				
Bulgaria	13.5	11.6	9.7	7.7	5.8	3.9	1.9	0.0	54.2
Cyprus	2.5	2.2	1.9	1.6	1.3	0.9	0.6	0.0	11.0
Czech Republic	26.9	23.1	19.2	15.4	11.5	7.7	3.8	0.0	107.7
Estonia	5.3	4.5	3.8	3.0	2.3	1.5	0.8	0.0	21.2
Hungary	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.0
Lithuania	0.6	0.5	0.5	0.4	0.4	0.3	0.2	0.0	2.9
Poland	77.8	72.3	66.7	60.0	52.2	43.4	32.2	0.0	404.7
Romania	17.9	15.3	12.8	10.2	7.7	5.1	2.6	0.0	71.4
Total	**151.6**	**129.5**	**114.5**	**98.4**	**81.1**	**62.7**	**42.1**	**0.0**	**679.9**

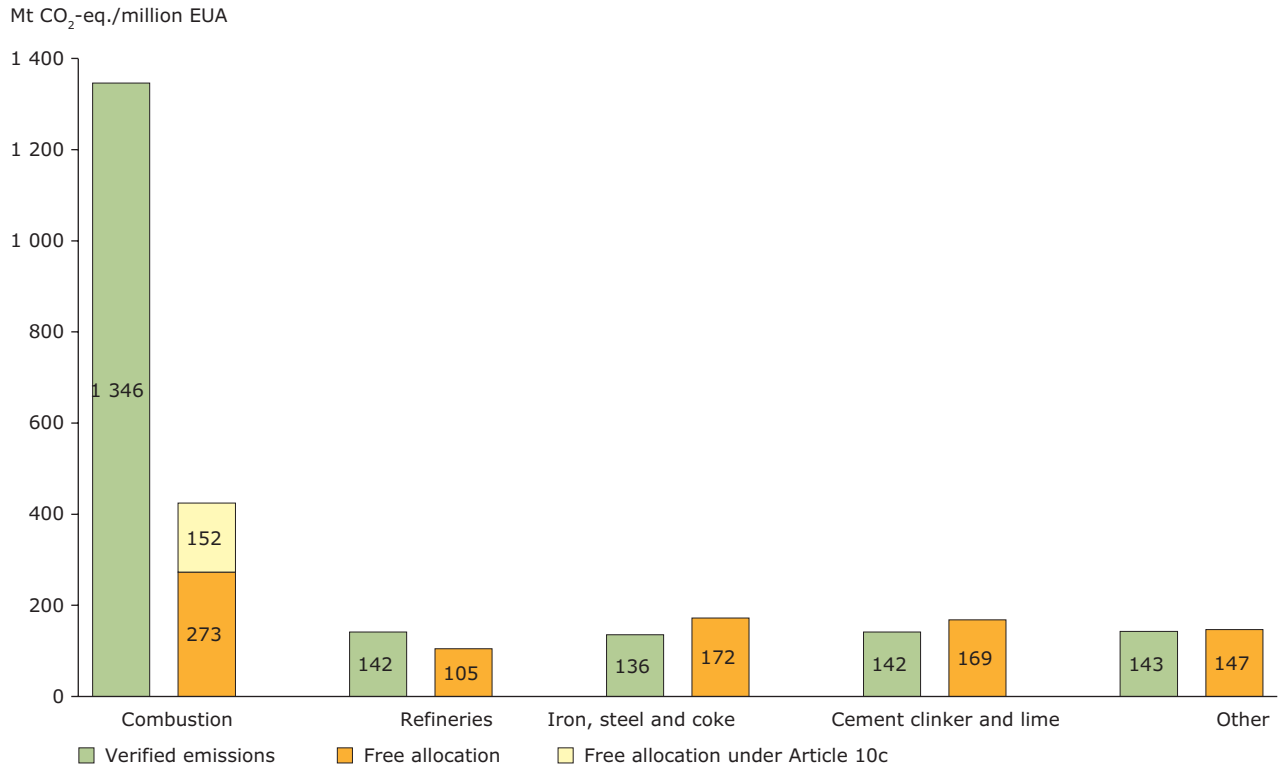
Source: EC, 2012a and 2012b.

([23]) Under Article 10c, paragraph 1, Member States are permitted to allocate free allowances to electricity generation: a) when the national electricity network is not connected to the Union for the Co-ordination of Transmission of Electricity (UCTE); b) when the national electricity network is only connected to the UCTE through a line with a capacity of less than 400 MW; c) when the GDP per capita of the Member State does not exceed 50 % of the average and more than 30 % of electricity is produced from a single fossil fuel.

Free allocation to individual installations in the third trading period is based on harmonised allocation rules, including allocation based on EU ETS-wide benchmarks and historical production levels from the years from 2005 to 2008 or from 2009 to 2010. Benchmarks are largely product based and correspond to the average performance of the 10 % most efficient installations in each sector in the EU in the years 2007–2008. On the basis of these harmonised allocation rules, governments submitted preliminary calculations (so-called national implementation measures (NIMs)) of the number of free allowances to be allocated to each installation in their jurisdiction to the European Commission. As the preliminary allocation through the NIMs exceeded the maximum amount of allowances laid down in the ETS Directive (EC, 2013d) , a cross-sectoral correction factor of 5.73 % in 2013 (rising to 17.56 % in 2020) is applied to non-electricity generators, in order to comply with these rules. When also taking this correction factor into account, the final allocations to installations in each country were calculated, inscribed in the national allocation tables (NATs) and published on the European Union Transaction Log (EUTL).

Figure 3.2 shows the verified emissions and free allocation for the five largest emitting sectors in 2013 ([24]). Combustion installations (essentially related to the production of electricity and heat) received about 30 % of their verified emissions in free allocation. This includes a maximum free allocation of 152 million EUAs allocated to power generators in eight of the Member States which have joined the EU since 2004 (Bulgaria, Cyprus, the Czech Republic, Estonia, Hungary, Lithuania, Poland and Romania), under Article 10c of the revised ETS Directive. The refineries sector received free allocation equivalent to about 80 % of the verified emissions in this sector. The sectors of iron, steel and coke were freely allocated more permits than their total verified emissions in 2013 ([25]). The same applies to the composite 'other' sector. Finally, the sector for cement clinker and lime

Figure 3.2 Free allocation and verified emissions in 2013



Note: For free allocation under Article 10c, the maximum amount that can be allocated for free by the relevant Member States is shown: 152 million EUAs. A status table is available (EC, 2014j).

Source: EEA, 2014e; EC, 2014j.

([24]) See Table 3.1 for the (simplified) sector classification used.
([25]) The operators of blast furnaces in this sector are allocated allowances for both their own emissions and the emissions of the blast furnace gas used in (external) power stations that are classified under emissions trading sector 'Combustion'. If this is taken into account, free allocation and verified emissions in this sector are more even.

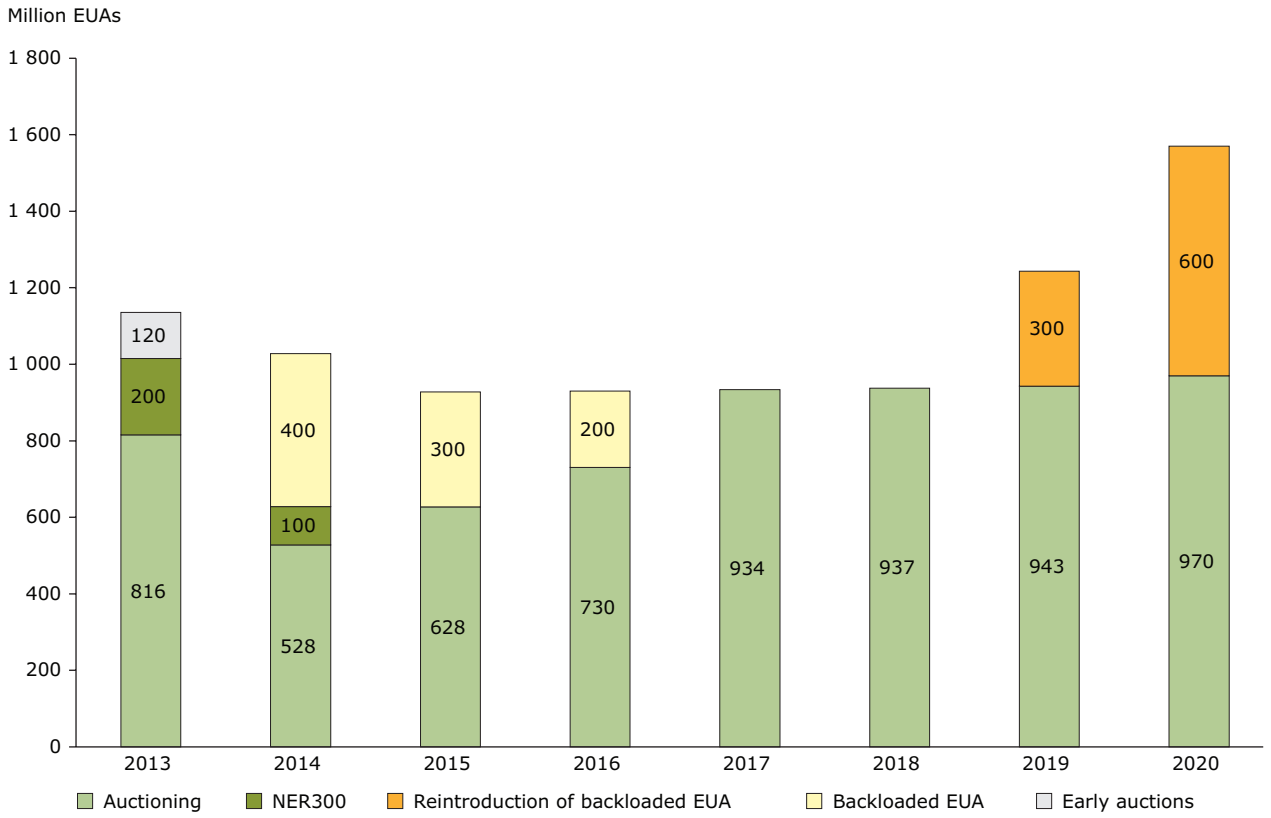
received more permits allocated for free than were needed to cover their 2013 verified emissions. This is also due to the reduced production in this sector.

Auctioning and sales

From the third trading period onwards, a much larger share of allowances was auctioned (45 % in 2013, rising to 55 % in 2020). The EU jointly auctions allowances for all Member States, except three which have opted out of this common auctioning platform: Germany, Poland and the United Kingdom. The European Energy Exchange (EEX) ([26]) carries out EU-wide auctions, German auctions and Polish auctions ([27]). The Intercontinental Exchange (ICE) ([28]) carries out auctions for the United Kingdom.

Figure 3.4 shows the total auctioning amount from 2013 to 2020. Each year, between 0.9 and 1 billion EUAs are to be auctioned ([29]). This auctioning profile was modified in 2014, due to the adoption of a decision to 'backload' allowances. Through this mechanism, the auctioning quantities are reduced by 400 million EUAs, 300 million EUAs and 200 million EUAs in the years 2014 through 2016, respectively. These backloaded amounts are then to be reintroduced in 2019 and 2020 (300 million EUAs and 600 million EUAs, respectively) (EC, 2014d). Figure 3.3 also includes sales of some 300 million EUAs that have been taken from the new entrants reserve (NER300) (EIB, 2014) ([30]). These EUAs were sold in order to generate financial support for CCS and for innovative renewable energy projects.

Figure 3.3 Planning for allowance auctioning, 2013–2020



Note: Values for 2013 and 2014 are based on auctioning calendars of EEX and ICE. Values for the years 2015 to 2020 were derived by subtracting free allocation and the NER from the cap. Data are preliminary and will improve over time.

Source: EC, 2013d; EEA, 2014e; EEX, 2014; EIB, 2014; ICE, 2014.

([26]) See www.eex.com.
([27]) Poland also intended to appoint an opt-out auction platform, but is using the common auction platform (EEX) in the meantime.
([28]) See www.theice.com.
([29]) In 2012, 'early auctions' of third trading period EUAs were held. The volumes of these auctions were added to 2013 auctioning volumes as these EUAs pertain to the third trading period (EEA, 2014f).
([30]) A first tranche of 200 million EUAs was already sold by October 2012. However, they are attributed to the auctions and sales in 2013, as it was only possible to use these allowances from 2013 onwards. A second tranche of 100 million EUAs was sold between November 2013 and April 2014. The second tranche is attributed to the year 2014.

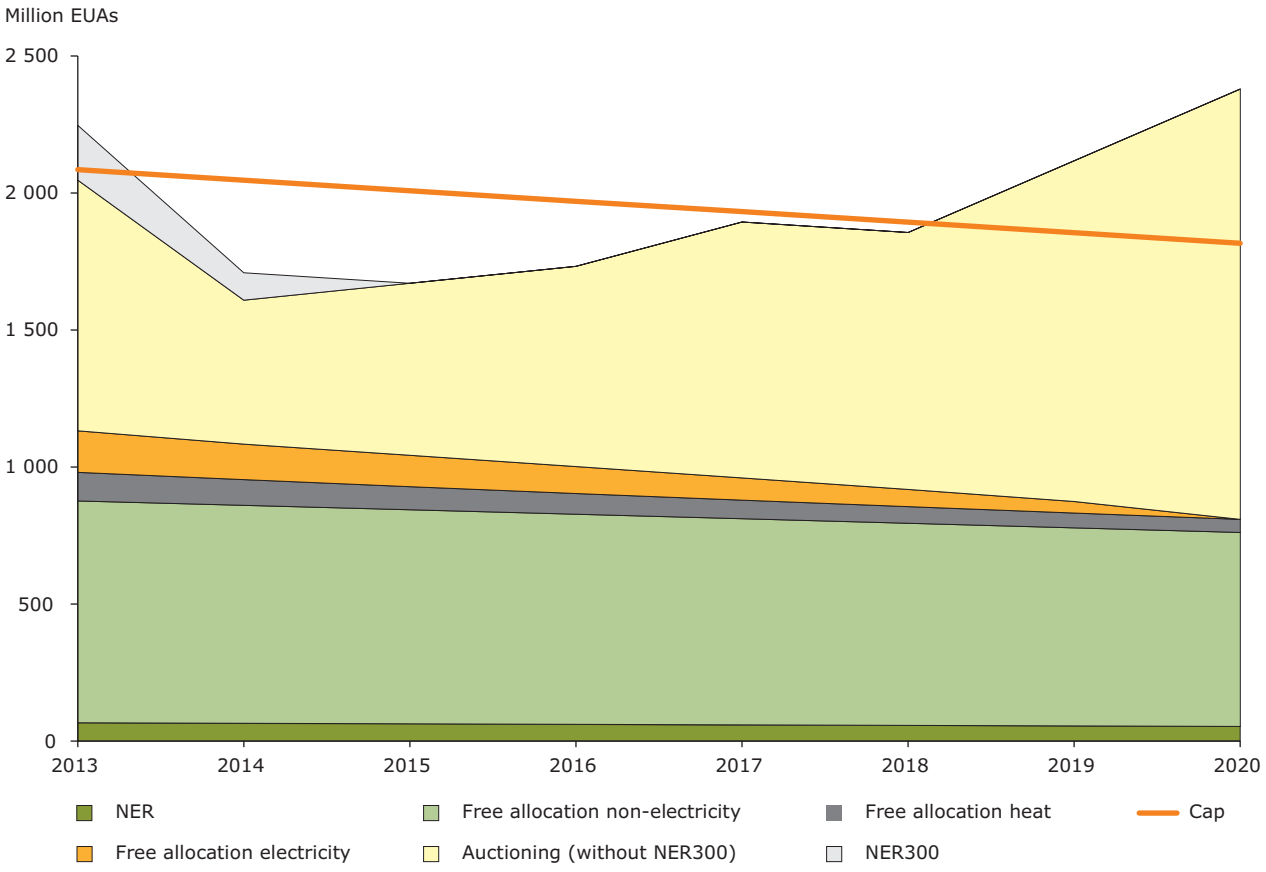
Summary of auctions and free allocation

On average, about 50 % of the overall cap will be auctioned in the period from 2013 to 2020 (see Figure 3.4). The remaining 50 % will be allocated for free, which means operators do not have to pay in order to receive these allocations.

There are several types of free allocation.

- The largest share of allowances allocated for free goes to non-electricity generators (mainly industrial activities) through 2020 (EC, 2013d), representing, on average, about 78 % of free allocation during the third trading period.
- In general, electricity generators only receive free allocation for heat produced (EC, 2013d). Free allocation decreases over time, from 80 % of the benchmark in 2013 to 30 % in 2020. The share of heat production in total free allocation amounts to about 8 % during the third trading period.
- The transitional free allocation for power generators in eight Member States to help modernise production will decline to zero by 2020. The share of this transitional free allocation in total free allocation is on average equal to about 9 % during the third trading period.
- Furthermore, for new entrants, there will be maximum free allocation of about 480 million EUAs that have been placed into the NER ([31]). Any allowances remaining in the NER at the end of the period will be auctioned. The share of free allocation to new entrants in total free allocation is about 6 %.

Figure 3.4 Planned supply of allowances, 2013–2020



Note: NER: new entrants reserve; NER300: sales of some 300 million EUAs that have been taken from the new entrants reserve.

Source: EC, 2013d; EIB, 2014; Table 3.2.

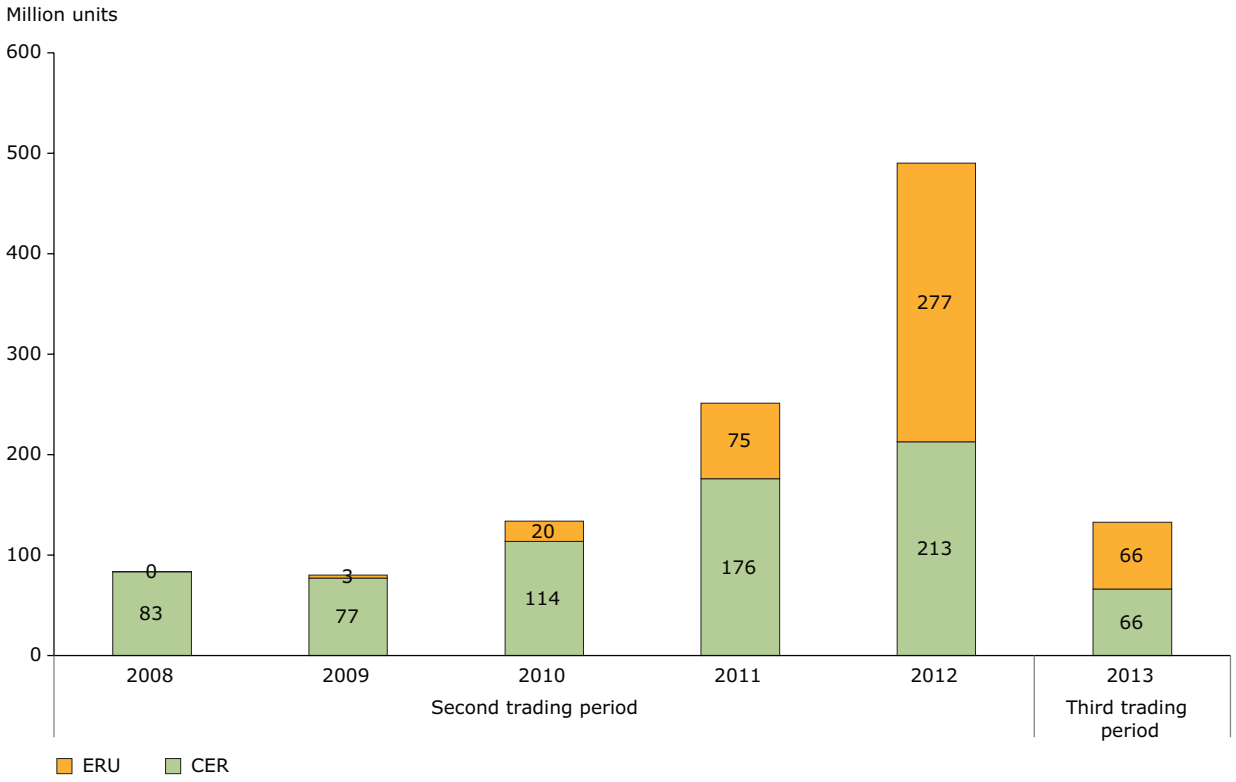
([31]) The overall size of the NER is 780 million EUAs (5 % of the cap in the period from 2013 to 2020). In order to generate financial support for CCS and innovative renewable energy projects, 300 million EUAs are taken out of this reserve and auctioned (NER300, see 'Auctioning and sales' above).

Permitted use of international emission credits

In addition to the allowances allocated — freely or through auctioning — operators have the possibility to use a limited number of eligible international credits to cover their emissions. This effectively increases the overall emissions cap. Both the quantity and quality of credits eligible for use in the EU ETS are regulated. No international credits were allowed during the first trading period. In the second trading period, international credits (certified emission reductions (CERs) from the CDM emission reduction units (ERUs) from JI) were directly surrendered by operators to cover emissions. In the third trading period, eligible credits are exchanged for allowances subject to a quantitative limit determined in accordance with the Regulation on international credit entitlements (RICE) (EC, 2013g) ([32]). In the first compliance cycle of the third trading period, 0.13 billion international credits were exchanged for allowances ([33]). This is considerably less than in 2012, where 0.5 billion international credits were surrendered (Figure 3.5). The large number of credits surrendered in 2012 is also due to the fact that certain industrial gas project types were excluded from the EU ETS for the third and subsequent trading periods (EC, 2011c).

Overall, operators used a total of 1.2 billion international credits from CDM and JI projects from 2008 to 2013. In accordance with Article 2(1) of the RICE Regulation (EC, 2013g), each Member State must determine the quantity of CERs or ERUs that each of its operators can use in the period from 2008 to 2020. The total amount of international credits that can be used by operators in the period from 2008 to 2020 is estimated between 1.5 and 1.6 billion (Öko-Institut, 2012). As some entitlements are expressed as a percentage of verified emissions, the overall maximum amount will only be fully known at the end of the third trading period.

Figure 3.5 Use of Kyoto credits (CERs and ERUs), 2008–2013



Note: CER: certified emission reduction, generated through the clean development mechanism; ERU: emission reduction unit, generated through joint implementation.

Source: EC, 2014f; EEA, 2014e.

([32]) Since 2013, credits have not been able to be directly surrendered for ETS compliance, but must be first exchanged for allowances instead. In the following analysis, all offsets surrendered by 30 April 2014 are attributed to the year 2013.
([33]) By 30 April 2014, operators had exchanged 66 million CERs and 66 million ERUs for EUAs (EC, 2014f).

3.4 Emission trends in the EU ETS by sectors

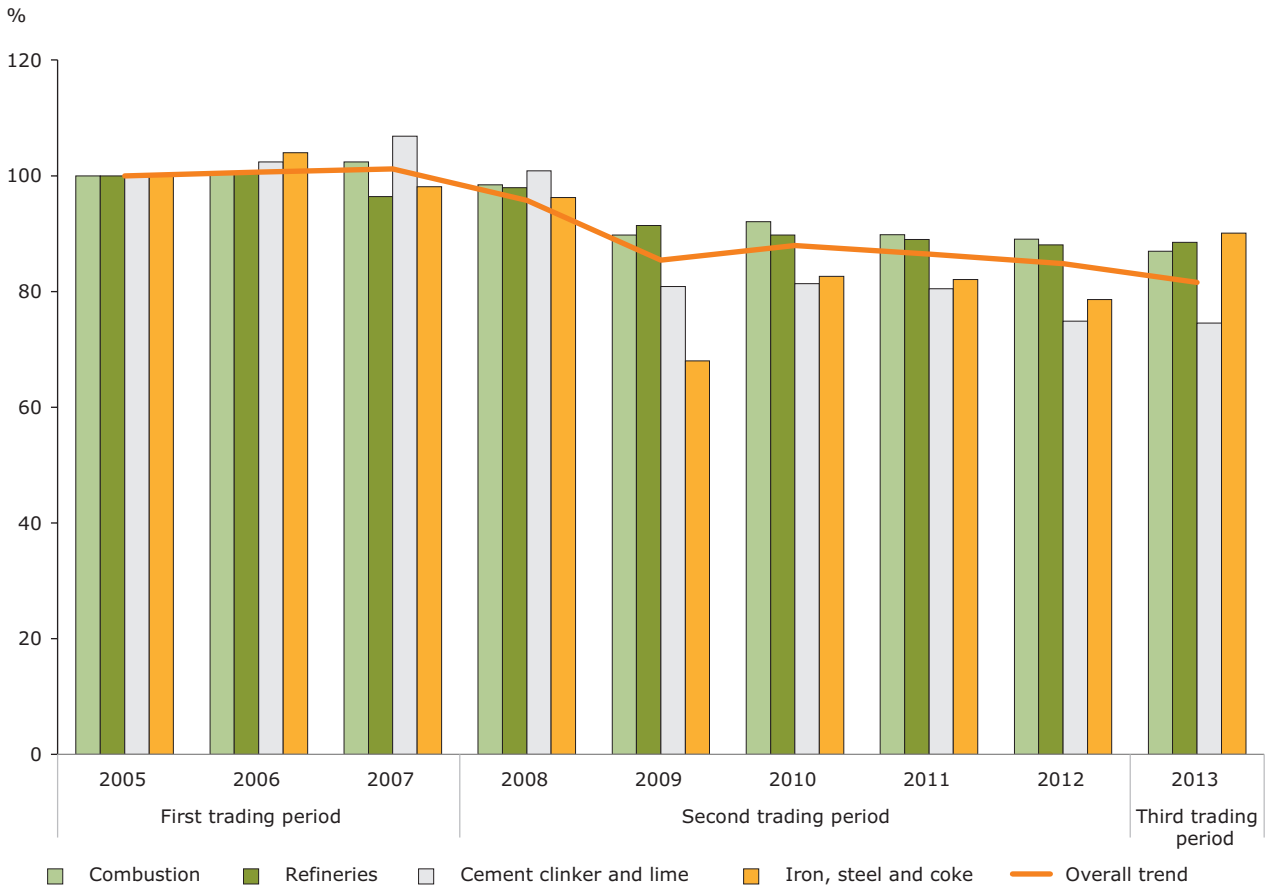
Figure 3.6 displays scope-corrected verified emissions trends for individual sectors between 2005 and 2013.

Applying scope correction to verified emissions makes them comparable across years (see EEA, 2014f for the methodology and data sources used). The overall scope-corrected emissions trend indicates a decrease of emissions to 19 % below 2005 levels by 2013 within the EU ([34]), with particularly large decreases in the cement clinker and lime sector.

At sectoral level, different trends are observed between 2005 and 2013:

- In 2009, emissions from the sector for iron, steel and coke had decreased by 30 % compared to 2005 levels, due in part to the economic recession. From 2010 onwards, emissions recovered to about 80 % of 2005 levels. In 2013, emissions from this sector increased due to the additional installations falling under the scope of the EU ETS.
- In the sector cement clinker and lime production, emissions were 20 % below 2005 levels in 2009. In contrast to iron and steel production, emissions in this sector continue to fall. In 2013, verified emissions were 25 % below 2005 levels.
- Emissions from refineries show a steadily decreasing trend. The effect of the economic

Figure 3.6 Emission trends by EU ETS sector



Notes: The emission trend takes into account a scope correction (EEA, 2014f). The sectoral disaggregation takes the following into account: for Bulgaria and Romania, it was assumed that the sectoral disaggregation in 2005 and 2006 was equal to the one in 2007; for Norway and Liechtenstein, it was assumed that the sectoral disaggregation in 2005 to 2007 matched the one of 2008. It was further assumed that the change in scope from all other countries can be assigned to the sector of combustion installations.

Source: EEA, 2014e and 2014f.

([34]) The decrease is equal to – 18 % for the whole ETS, when covered installations from Iceland, Liechtenstein and Norway are accounted for.

recession in 2009 had less impact on refineries than on other sectors. In 2013, emissions from refineries were 12 % below 2005 levels.

- Emissions from combustion installations also show a declining trend. In 2013, emissions from combustion installations were 13 % below 2005 levels. Emissions from combustion installations are dominated by electricity generation. Emissions from electricity generation have mainly been reduced by the expansion of renewable energies. In general terms, power plants with higher marginal costs (e.g. oil and natural gas-fired power plants) have reduced emissions more than plants with lower marginal costs (e.g. coal-fired power plants) (Berghmans and Alberola, 2013; EEA, 2013).

In the cement, iron and refinery sectors, verified emissions closely reflect production trends, illustrating the fact that emission reductions in these industrial sectors were driven by reduced production rather than by efficiency improvements (EEA, 2014h).

3.5 Supply and demand balance of EU allowances

The balance between supply and demand of EU allowances is determined by the level of the ETS cap, the number of allowances banked into the current trading period, the level of verified emissions and how intensively operators use international credits on top of EU allowances, to comply with their obligation.

- The quantity of available emission allowances between 2005 and 2012 were set in the NAPs, and are determined by the linear reduction factor from 2013 onwards. In the third trading period, about half of the allowances available is allocated for free, while the other half is auctioned.

- The trends of verified emissions in the EU ETS specify the demand for emission allowances by the regulated entities.

- The operators are also entitled to use a limited amount of eligible international credits from CDM and JI (CERs and ERUs, respectively) in addition to EU emission allowances.

Figure 3.7 illustrates the supply and demand balance in the EU ETS between 2005 and 2013.

During each year of the first trading period (2005–2007), verified emissions were below the total quantity of EU allowances allocated by governments. Since banking was not possible between the first and the second trading periods, all unused allowances by the end of the trading period had no value for the future. The EUA price initially reached levels between EUR 20 and EUR 25. However, the first publication of 2005 verified emissions, in April 2006, made clear that there was a surplus of allowances which would remain until the end of the first trading period. Consequently, the EUA price dropped abruptly and remained close to levels of almost zero until the end of 2007 (Figure 3.8).

During the second trading period (2008–2012), total emissions were below the number of allocated allowances. 2008 was the only year where demand exceeded the supply of allowances. The additional use of CERs and ERUs contributed to an accumulating surplus of allowances over the years 2009 to 2012. During the second trading period, the EUA price first reached levels of between EUR 25 and EUR 30, but decreased to around EUR 7 by the end of the period. Meanwhile, CER prices were traded at less than EUR 1 by the end of the second trading period.

In 2013, verified emissions remained lower than the number of allocated allowances (both free and auctioned). Additionally, operators continued to surrender significant amounts of CERs and ERUs. In 2013, the price of EUAs stabilised at around EUR 5, while CER prices remained very low, at levels around EUR 0.4.

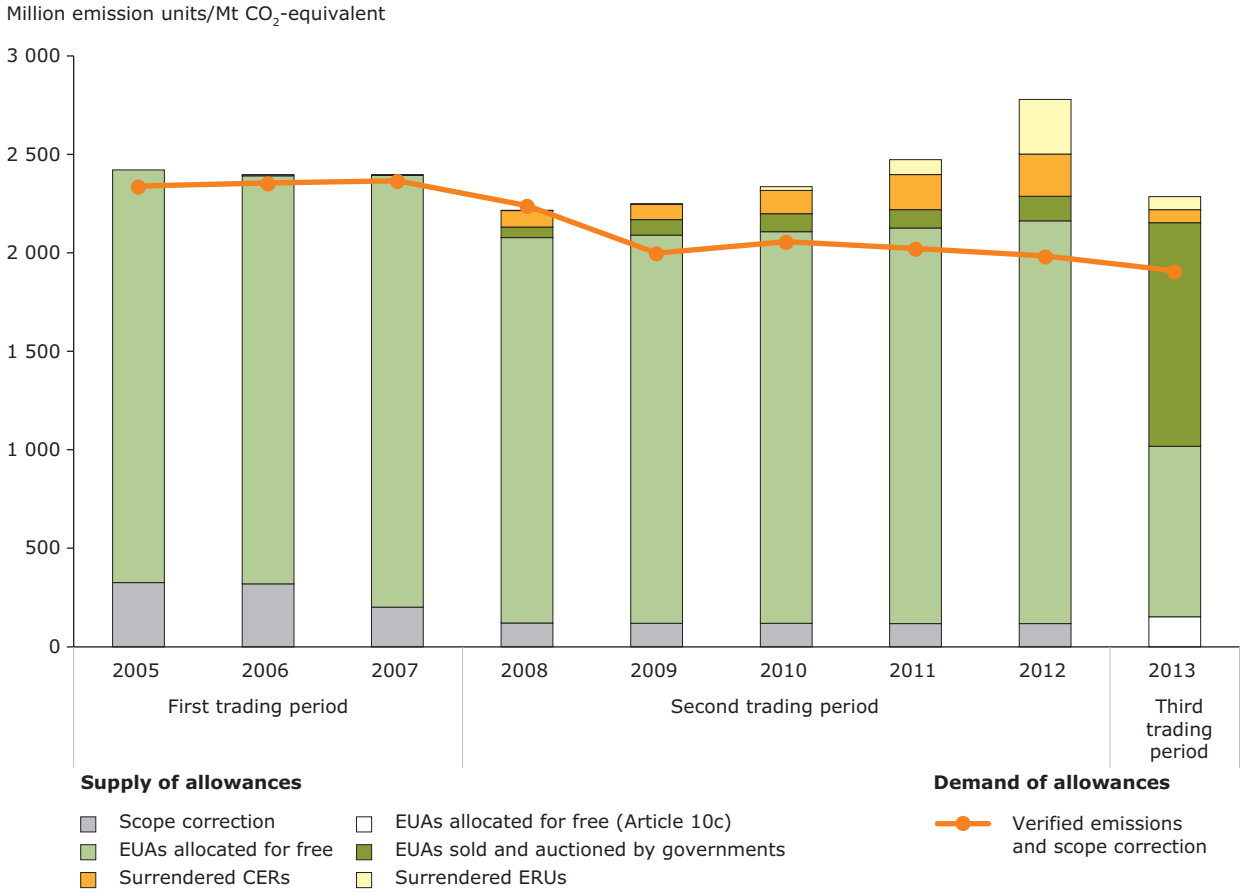
According to Member States projections reported in 2013, ETS emissions are expected to decrease by 2020. See further analysis in Section 4.2. In its 2013 Reference Scenario, the European Commission also expects ETS emissions to decrease by 2020 (EC, 2014c). According to the impact assessment accompanying the Commission communication *A policy framework for climate and energy in the period from 2020 to 2030*, a surplus of 'more than 2.5 billion EUAs' could accumulate by 2020 (EC, 2014b).

In the short term, in order to address the existing imbalance of supply and demand, an amendment of the Auctioning Regulation was adopted, in order to postpone ('backload') the auctioning of 900 million allowances from the early years of the third trading period of the EU ETS to the end of the trading period. As 'backloading' is only a temporary measure, the Commission has proposed structural changes to the EU ETS, by introducing a legislative proposal to establish a market stability reserve. As a contribution to the 40 % GHG reduction target in 2030, the linear reduction factor will be increased

from 1.74 % (currently) to 2.2 % per year from 2021, in order to reduce ETS emissions by 43 % compared to 2005 by 2030.

The introduction of a market stability reserve starting in 2021 would put allowances into a reserve when the surplus is larger than 833 million allowances and release them back into the market when the surplus falls below 400 million allowances, or when a price threshold ([35]) is reached. By way of this mechanism, the Commission's goal is to 'guarantee a more balanced market, with a carbon price more strongly driven by mid- and long-term emission reductions and with stable expectations encouraging low-carbon investments' (EC, 2014b).

Figure 3.7 Supply and demand balance for stationary installations in the EU ETS, 2005–2013

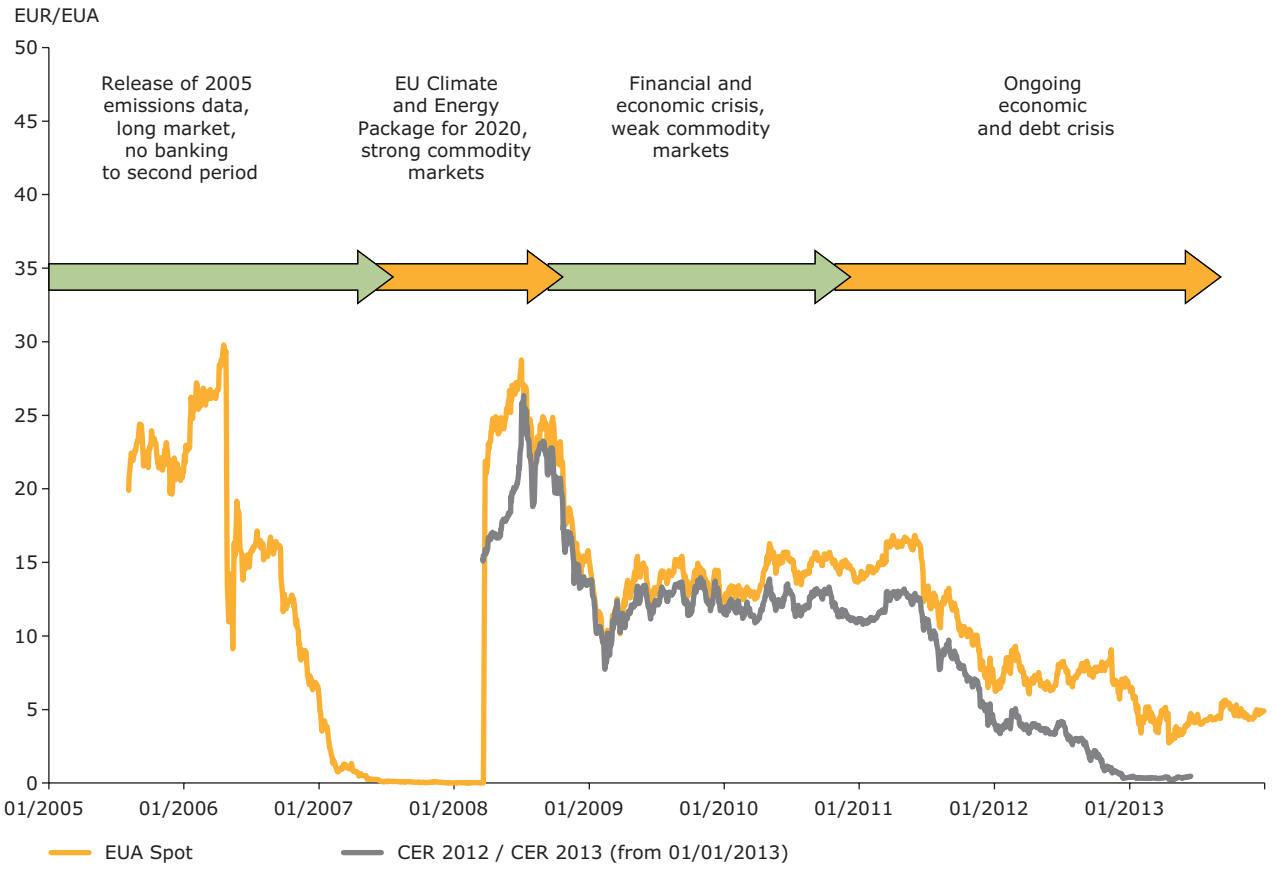


Note: Free allocation under Article 10c is not recorded in the EUTL and displayed in white (2013).

Source: EEA, 2014e and 2014f; Table 3.2.

([35]) In relation to price increase, as set out in Article 29a of the ETS Directive, a release of allowances is triggered in case the average price in a six-month period was at least three times the average price during the preceding two years.

Figure 3.8 Price trends for EUAs and CERs, 2005–2013



Source: EEX, 2014; ICE, 2014.

4 Progress towards 2020 targets for greenhouse gas (GHG) emissions

Key messages

- The EU is on track to meet its target of reducing its GHG emissions by 20 %, by 2020. Total EU GHG emissions decreased by 1.8 % between 2012 and 2013, based on approximated GHG emission data reported by all EU Member States. When considering the scope of the EU's climate and energy package, EU GHG emissions were 19 % below 1990 levels in 2013, very close to its 20 % reduction target seven years ahead of 2020. Based on Member State projections taking into account policies and measures adopted until 2012, total EU GHG emissions are expected to decrease to a level of 21 % below 1990 emissions by 2020. If the additional measures planned by Member States were fully implemented, the overall reduction could reach 24 % compared to 1990 in 2020 ([36]). GHG levels in the EU in 2013 were lower than anticipated in these GHG projection scenarios between 2010 and 2020. Furthermore, several policy developments took place at EU level after the submissions of GHG emission projections by Member States in 2013: adoption of the Energy Efficiency Directive (EED), binding emission targets for new car and van fleets, a new regulation on fluorinated gases, and further implementation of the ecodesign legislation for boilers and water heaters. If the level of effort projected by Member States is sustained until 2020, the EU could actually achieve an emissions reduction greater than the projected 24 %.

- In the EU ETS, 2013 emissions remained below the cap as in previous years. Compared to 2005 levels, the overall reduction of 19 % places the ETS sectors close to their 21 % overall reduction target for 2020. According to Member State projections, verified emissions could continue decreasing considerably and therefore remain below the cap. The European Commission estimates a potential surplus of more than 2.5 billion EUAs by 2020 under current ETS arrangements, and has therefore proposed structural measures to address the surplus.

- Eight Member States are not considered to be on track to meet their targets: for Germany, Luxembourg and Poland, it is estimated that ESD emissions in 2013 were already above their ESD target (although Luxembourg's own estimates, submitted too late for consideration in this assessment, indicate that Luxembourg would actually achieve its 2013 ESD target). Germany is the only Member State which saw its situation deteriorate in 2013 compared to 2012, when ESD emission levels were still below the 2013 ESD target. For Austria, Belgium, Finland, Ireland, Luxembourg and Spain, implementing additional measures is not expected to be sufficient for them to achieve their 2020 targets (for Austria and Finland, national projections indicate lower ESD emissions than the 2020 targets, while projections adjusted by EEA indicate slightly higher emissions). All these Member States will have to implement additional measures or use flexibility mechanisms to comply with the ESD. Among such additional measures, those aimed at improving energy efficiency in the residential and services sectors are expected to deliver key contributions towards further emission reductions by 2020. By contrast, the expected reductions in the transport sector — the main source of ESD emissions — remain limited. Likewise, no significant reductions are projected in the agriculture sector.

([36]) Unless stated otherwise, the focus lies on the climate and energy package scope (i.e. including projected emissions from international aviation in total GHG emissions).

Key messages (cont.)

- Beyond 2020, projections from Member States indicate a limited decrease in emissions until 2030. These anticipated reductions between 2020 and 2030 are still largely insufficient when compared to the 40 % reduction target adopted in October 2014, and the even steeper reduction needed beyond 2030, if the EU is to remain on a trajectory towards a low-carbon and resource-efficient economy. Further policies are to be planned to ensure the 40 % target is reached.

4.1 Overall progress towards the EU's 2020 GHG target

Historic trends

In 2012, total EU GHG emissions (excluding LULUCF and international aviation) decreased by 1.3 % compared to 2011. This decrease was largely due to emission reductions in the transport and industry sectors, and also to a growing proportion of energy from renewable sources. Italy alone accounted for 45 % of the total EU net reduction in emissions in 2012, largely due to lower emissions from transport and industry. The second largest reduction, in Poland, was mainly due to a substantial decrease in solid fuel consumption. In contrast to their overall decreasing emission trend since 1990, Germany and the United Kingdom saw rising emissions in 2012 because of increased use of solid fuels. Overall, 2012 GHG emissions were 19.2 % below 1990 levels (for total emissions excluding international aviation and LULUCF) (see Table 4.1).

Approximated estimates of greenhouse gas (GHG) emissions for the year 2013, reported in 2014 ([37]), indicate a further 1.8 % decrease in emissions, compared to 2012 (EEA, 2014g). The winter in Europe was generally warmer in 2013 than it was in 2012, which led to lower heating demand and lower emissions from the residential and commercial sectors. In addition, electricity production from renewable sources increased considerably.

The 20 % reduction target for 2020 implemented through the EU's climate and energy package includes emissions from international aviation (covered by the EU ETS). When this extended scope is considered, the decrease of GHG emissions between 2011 and 2012 was also 1.3 % (corresponding to a 17.9 % decrease below 1990 levels). Based on the approximate GHG inventories from Member States, the 2013 reduction could place the EU 19.3 % below its 1990 levels. The EU is therefore very close to its 20 % reduction target, 7 years ahead of 2020 (see Figure 4.1).

Compared to 2012, 2013 emissions under the EU ETS (stationary installations) were cut by 3.9 %; in sectors covered by the ESD, emissions remained stable compared to 2012 (when comparable scopes across the years are considered).

Table 4.1 Main GHG emission trends and projections in the EU

	Total GHG emissions, excluding international aviation (scope: UNFCCC, Kyoto Protocol)	Total GHG emissions, including international aviation (scope: climate and energy package)
2011–2012	– 1.3 %	– 1.3 %
1990–2012	– 19.2 %	– 17.9 %
2012–2013	– 1.8 %	– 1.8 %
1990–2013	– 20.7 %	– 19.3 %
1990–2020 WEM	– 22 %	– 21 %
1990–2020 WAM	– 26 %	– 24 %

Source: EEA, 2014a, 2014c, 2014d and 2014g.

([37]) The official submission of 2013 data to the UNFCCC will occur in 2015.

Projected trends

Based on the projections reported by Member States, EU GHG emissions in 2020 could be lower than 1990 levels by a difference of 1 183 Mt CO_2-eq. in the scenario 'with existing measures' (WEM), which considers the effects of all adopted and implemented measures at the time projections are prepared ([38]). This represents a level 21 % below 1990 emissions.

When the impacts of additional policies and measures — those which Member States reported that they were planning — are taken into account, GHG emission projections show that GHG emissions could be reduced by approximately 1 389 Mt CO_2-eq. in 2020, which is equivalent to – 24 % compared to 1990 levels.

GHG levels in the EU in 2013 were lower than anticipated in both GHG projection scenarios between 2010 and 2020. If the projected level of effort is sustained until 2020, the EU could actually achieve an emissions reduction greater than the projected 24 % (see Figure 4.1).

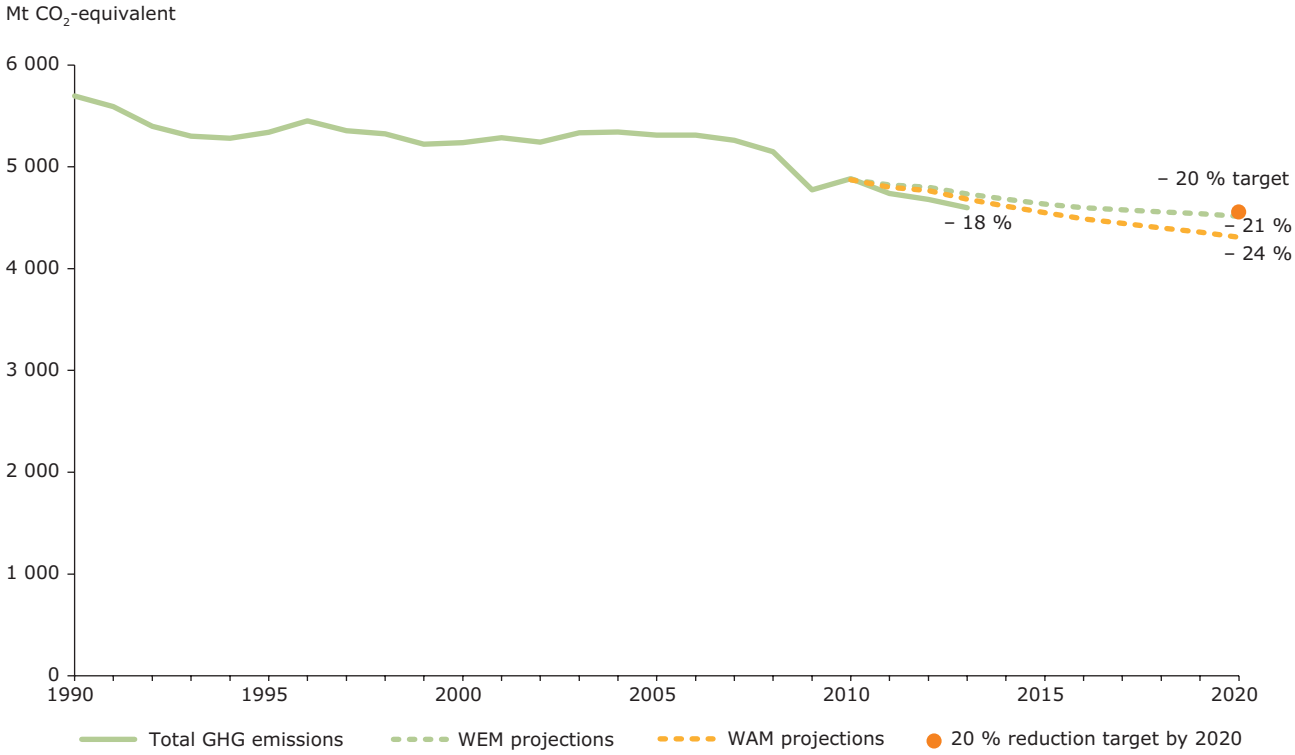
The EU is therefore well on track to meet its 2020 target on GHG emissions.

When considering only emissions covered by the Kyoto Protocol (i.e. excluding international aviation), GHG emissions in 2020 are projected to be 22 % WEM and 26 % below 1990 levels with additional measures (WAM).

Sectoral trends

From 1990 to 2013, all sectors reduced GHG emissions, except the transport sector, where GHG emission increased by 14 % (see Figure 4.2). In 2013, the transport sector represented 20 % of total GHG emissions and accounted for 33 % of GHG emissions covered by the ESD.

Figure 4.1 EU GHG emission trends and projections

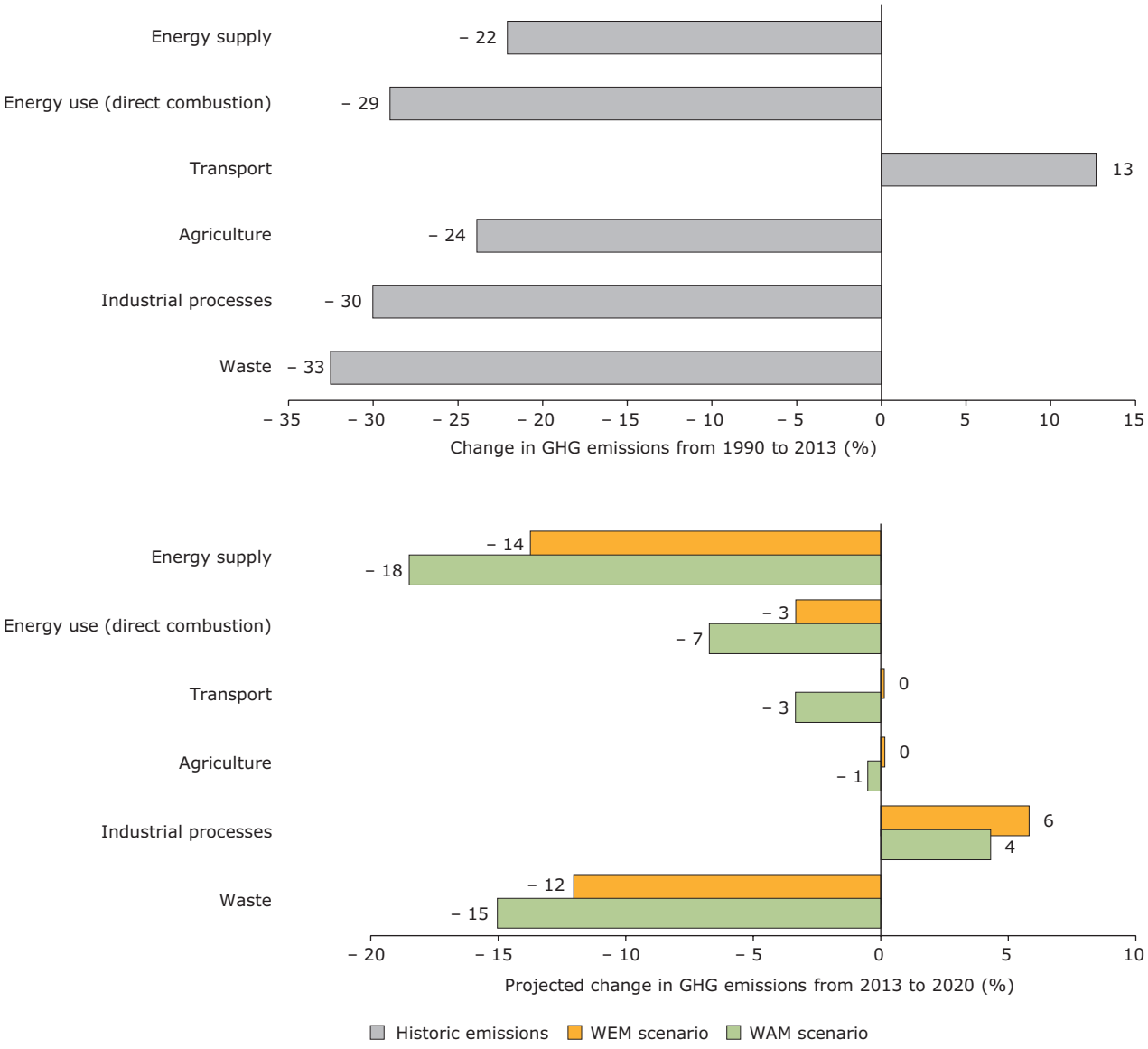


Note: The scope of emissions presented in this figure includes emissions from international aviation (which are covered by the EU climate and energy package but not by the Kyoto Protocol) and excludes emissions and removals from the LULUCF sector (carbon sinks).

Source: EEA, 2014a, 2014c, 2014d and 2014g.

([38]) Based on an aggregation of the projections submitted to the European Commission by 21 Member States in 2013 and 7 Member States in 2014, and considering the scope of the climate and energy package (i.e. including projections for international aviation in total GHG emissions).

Figure 4.2 Emission changes by sector, 1990–2013 (top) and projected changes under the 'with existing measures' scenario, 2013–2020 (bottom)



Note: Top: the figure is based on historic values, including 2013 approximated GHG emission inventories as reported by Member States. Bottom: the figure is based on GHG projections in the WEM scenario. Both 2013 and 2020 values belong to the same data set, and 2013 values are different than 2013 approximated GHG emissions.

The sector definitions used are the following. Energy supply: IPCC sectors 1.A.1+1.B; Energy use (direct combustion): IPCC sectors 1.A.2+1.A.4+1.A.5; Transport: IPCC sector 1.A.3; Agriculture: IPCC sector 4; Industrial processes: IPCC sector 2; Waste: IPCC sector 6.

Source: EEA, 2014a, 2014c, 2014d and 2014g.

The projected emission changes at sector level between 2013 and 2020 show that the projected pace of future GHG emission reduction is slower than recent changes indicate. The largest projected decreases in GHG emissions are observed in the energy supply and waste sectors, while almost no progress is projected for the agriculture and transport sector.

In the following sections, progress under the EU ETS sector and under the ESD is analysed in detail.

4.2 Progress towards 2013–2020 EU ETS targets

While Chapter 3 presents a state-of-play in the EU ETS up until 2013, this section provides additional analysis on the projected developments in the EU ETS until 2020.

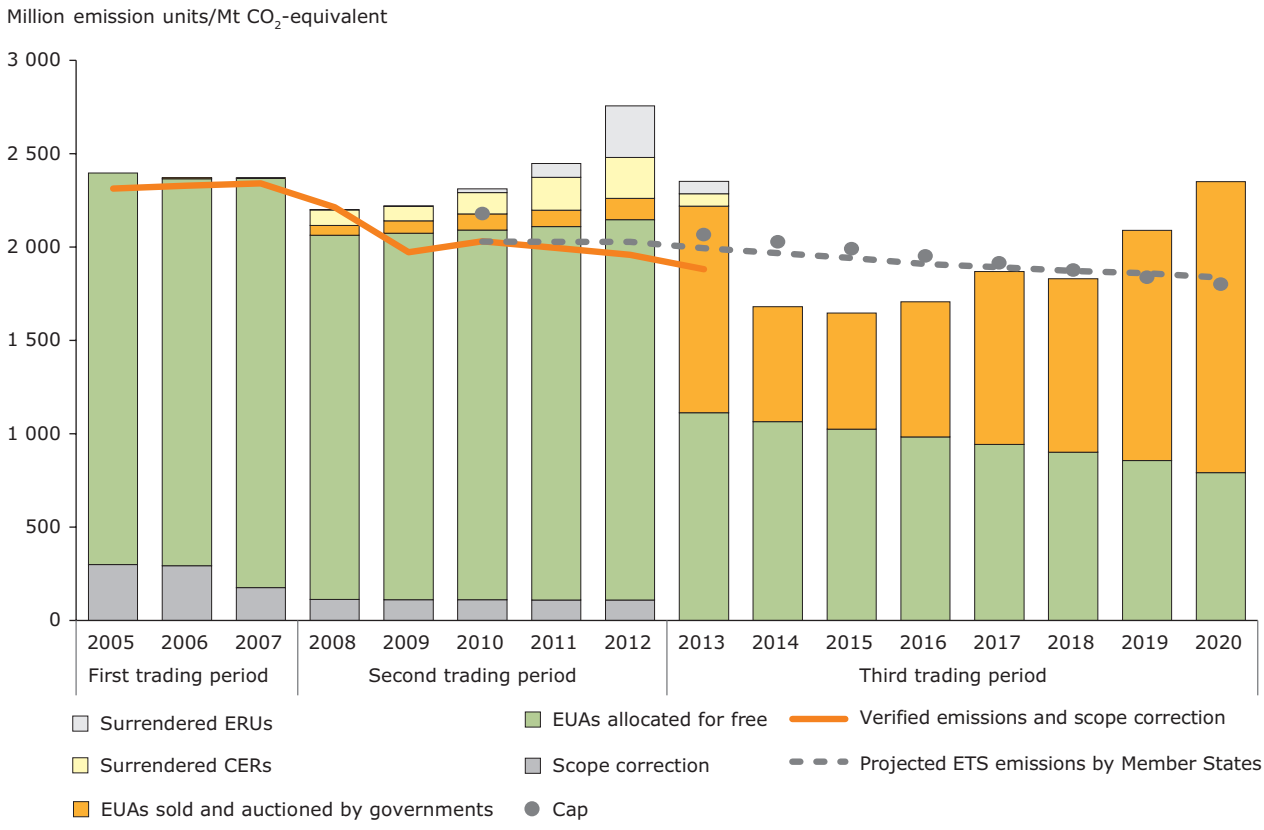
In order to meet the EU 20 % reduction objective for total emissions in 2020 compared to 1990, the EU climate and energy package determined that the contribution of the EU ETS should be a 21 % reduction compared to 2005 levels. Since 2013, the ETS has been governed by an EU ETS-wide cap with a linear reduction factor of – 1.74 % per year (see Section 3.3).

During the first two trading periods (2005 through 2008 and 2008 through 2012), verified emissions covered by the EU ETS were lower than the cap in every single year except in 2005 and 2008 ([39]) (Figure 4.3). When the use of CERs and ERUs submitted by operators between 2008 and 2012 is taken into account, this results in a cumulated surplus of allowances of 1.8 billion EUAs by the end of the second trading period (EEA, 2013).

In 2013, the first year of the third trading period, verified emissions remained below their cap. Verified emissions decreased by 4 % compared to verified emissions in the year 2012 (based on a comparison of 2013 data with corrected 2012 data to account for the change in ETS scope between 2012 and 2013 ([40])). Compared to 2005 verified emissions (scope-corrected), the reduction achieved in 2013 was about 19 %, which means that the target of a 21 % reduction is close to being achieved.

According to projections submitted by Member States, GHG emissions in the EU ETS are projected to decrease by 8 % between 2013 and 2020 (stationary installations only). This corresponds to an annual average decrease of 1.2 % per year (see Figure 4.3) under existing policies and

Figure 4.3 Stationary EU ETS emissions, cap and available credits, 2005–2020



Source: EEA, 2014e and 2014f; Table 3.2.

([39]) As in Chapter 3 on ETS, this section focuses on stationary installations included under the EU ETS, due to the 'stop the clock' decision and the lack of available data for aviation.
([40]) See EEA, 2014f for an explanation of scope correction.

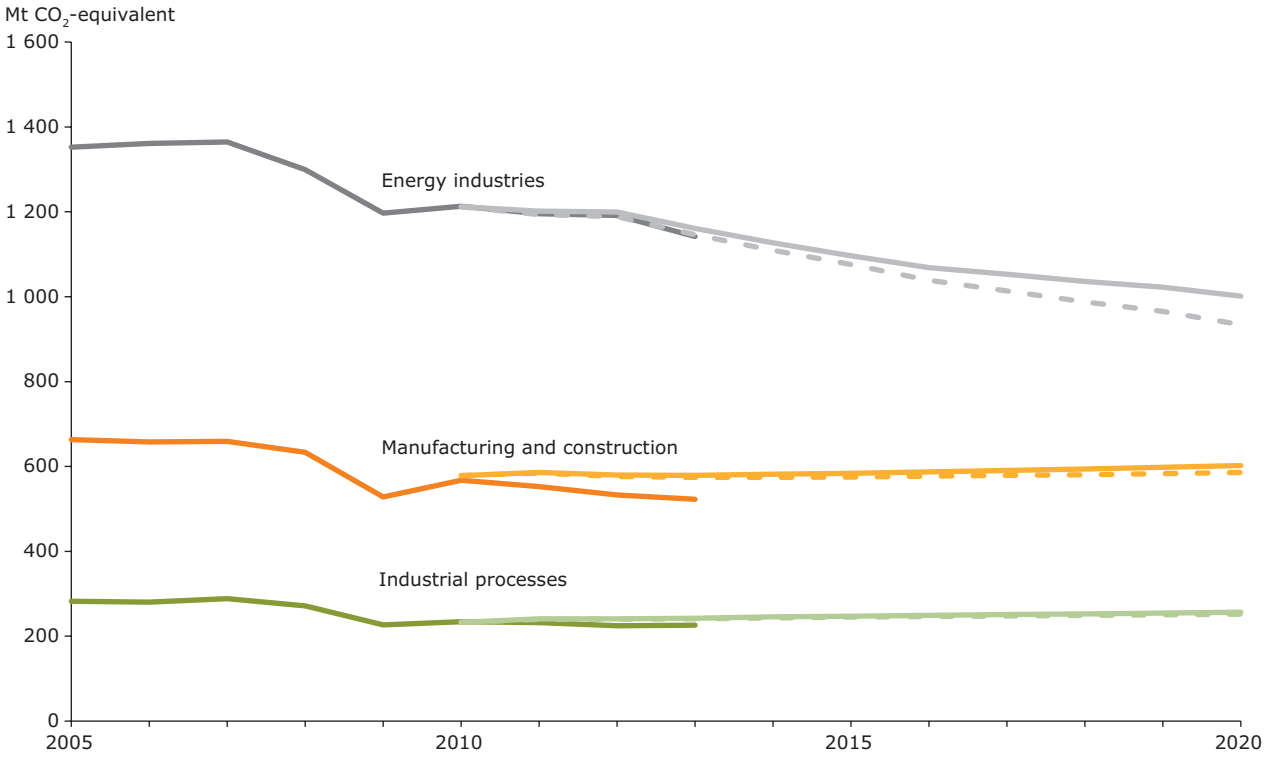
measures. ETS emissions would remain below the decreasing linear cap, but would converge towards the 2020 target of – 21 % compared to 2005. However, a surplus of allowances would remain — as noted in Section 3.5, the European Commission notes that 'with full implementation of current policies, the surplus in the ETS is projected to further increase to over 2.5 billion allowances by 2020' (EC, 2014b).

Mapping ETS emissions against the source categories used by countries to report their national GHG inventories using IPCC guidelines (i.e. the common reporting format (CRF)) shows that the sector of energy industries (e.g. electricity production and refineries), which represents the largest share of EU ETS emissions, is expected to deliver the most significant cuts in GHG emissions, both in absolute and in relative terms (an annual average decrease of 2 % per year between 2013 and 2020). Emissions from industrial processes and combustion emissions from the manufacturing and construction sector are actually projected to increase during this period, under the existing measures in place (see Figure 4.4).

4.3 Progress towards 2013–2020 ESD targets

In order to meet the EU's 20 % reduction objective for total emissions in 2020 compared to 1990, the EU climate and energy package determined that the contribution of the sectors not covered by the EU ETS should be an approximate 10 % reduction, compared to 2005 levels. This overall contribution at EU level was further split into national contributions, resulting in individual targets at national levels set under the ESD. Starting in 2013 and every year until 2020, Member States must achieve annual compliance by keeping their emissions below their annual target, under the ESD. Each annual target is expressed as an emission budget of AEAs. Member States may make use of certain options for flexibility in order to achieve their targets (see Annex 3.1).

Figure 4.4 Sectoral trends and projections in the EU ETS, 2005–2020



Note: Solid lines represent historic GHG emissions up to 2013, and projections WEM from 2010 onwards. Dashed lines represent projections WAM. The projected trends were calibrated to the 2010 year of the latest inventory data, which is the base year for the projections for most Member States.

GHG emissions at EU level were assigned to ETS sectors under the following hypothesis: 70 % of the GHG emissions projected for the industrial processes sector and 80 % of projected GHG emissions of the energy industries are assigned to the ETS sector.

Source: EEA, 2014a, 2014c, 2014d and 2014g.

For details on methodology for tracking current and projected progress to ESD targets, see Annex 2.

EU progress

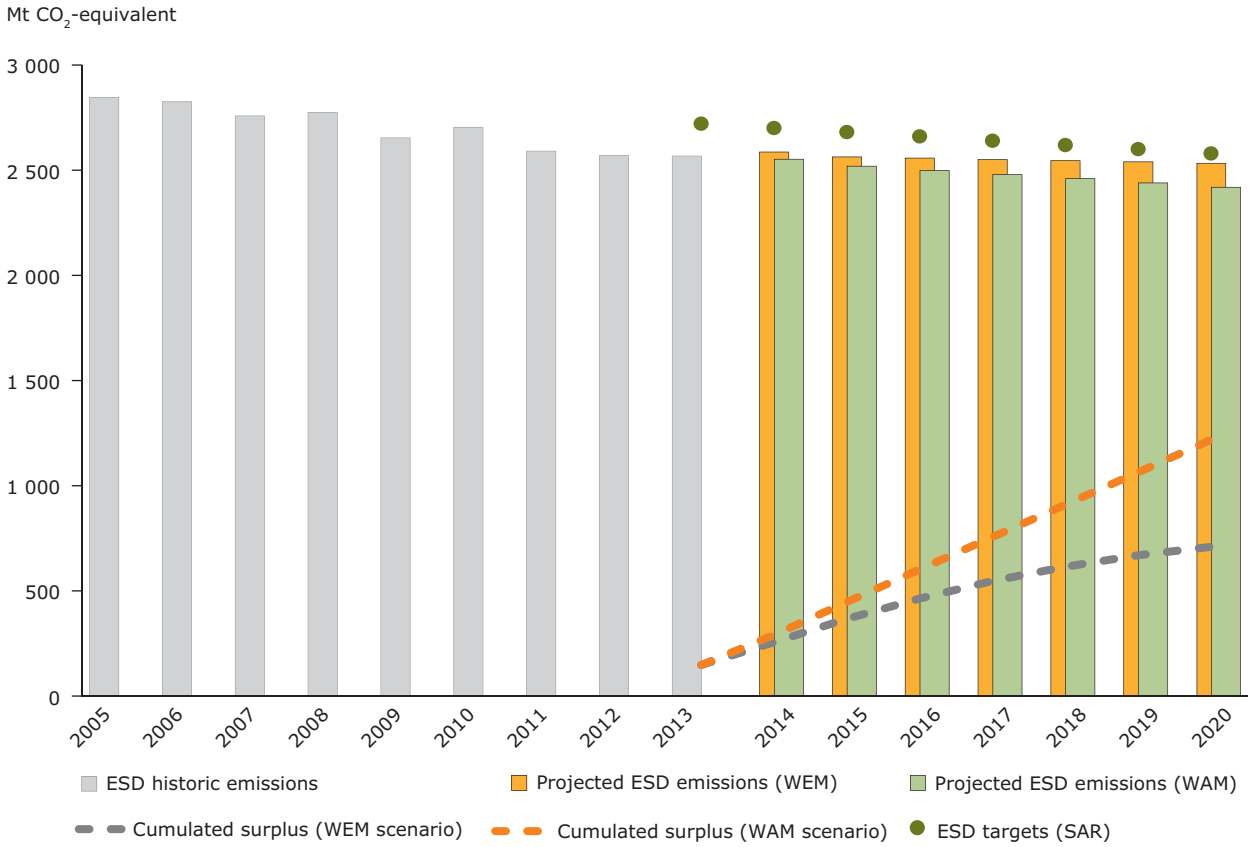
The EU does not have annual targets under the ESD as such; however, such EU targets can be calculated by summing the targets of each individual Member State.

Based on approximated GHG inventories submitted in 2014 by Member States, 2013 ESD emissions in the EU were equal to 2 646 Mt CO_2-eq. This level was 5 % below the sum of the national 2013 ESD targets for all Member States.

When considering the projected progress of the EU, projections by Member States show that total ESD emissions are expected to remain lower than ESD targets until 2020. Taking into account all existing measures implemented in Member States (WEM scenario), the GHG emissions covered by the ESD are projected to decrease by 79 Mt CO_2-eq. between 2013 and 2020. If Member States were also to implement additional measures (WAM scenario), it is envisaged that GHG emissions in the ESD sector would decrease by 167 Mt CO_2-eq. between 2013 and 2020 (see Figure 4.5).

Under the WEM scenario, the gap between emissions and AEAs is expected to decrease during the period from 2013 to 2020: the annual AEA surplus would decline, from 103 Mt CO_2-eq. in 2013 (149 Mt CO_2-eq. according to proxy data for 2013) to 40 Mt CO_2-eq. in 2020. Conversely, the implementation of additional measures would lead to an increase of the annual AEA surplus until 2015, up to 156 Mt CO_2-eq. This surplus would then remain stable until 2020.

Figure 4.5 EU GHG emission trends and projections in the ESD sectors



Note: The figure shows how GHG emissions covered by the ESD have evolved to 2013 (grey bars), and how their development is projected to 2020 under the WEM scenario (orange bars) and under the WAM scenario (green bars). The dots above bars represent the sum of the 28 individual Member States' ESD targets. The dashed lines highlight the development of the AEA surplus in the two scenarios, which is the difference between projected GHG emissions covered by the ESD and aggregated ESD targets at EU level.

The 2013 data are based on approximated GHG inventories.

Source: EC, 2013a and 2013e; EEA, 2014a, 2014c, 2014d and 2014g; EU, 2009a.

Overall, the cumulative surplus under the ESD at EU level for the whole period from 2013 to 2020 could range approximately from 700 Mt CO_2-eq. (WEM scenario) to 1 200 Mt CO_2-eq. (WAM scenario) (see Figure 4.5).

This overall result at EU level hides different performances at Member State level. Progress at national level is further assessed below.

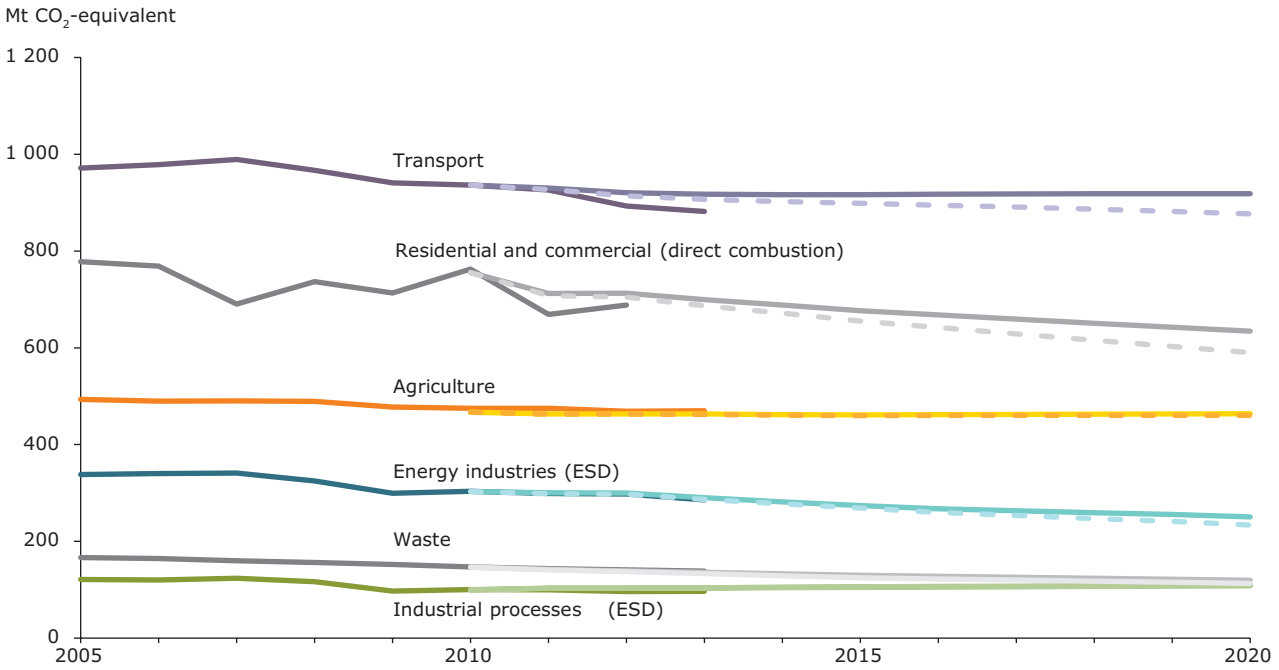
EU GHG emission trends and projections in the ESD sectors

By definition, sectors covered by the ESD are those not covered by the EU ETS. Furthermore, emissions from LULUCF and from international maritime transport are not covered under the ESD either (while emissions from intra-EEA flights are covered by the EU ETS). The sectors covered by the ESD are essentially transport (without domestic aviation), energy use mostly in households and services (except electricity consumption, for which emissions are allocated to electricity producers, thereby falling under the EU ETS), agriculture and waste.

While ESD emissions represent about 60 % of total EU emissions, the GHG emission reductions achieved in these sectors are expected to account for one third of total emission reductions projected by Member States between 2013 and 2020.

The transport sector is the largest contributor to GHG emissions across the ESD sectors (see Figure 4.6). This is also the only sector under the ESD where GHG emissions are projected to increase until 2020 if no additional measures are implemented. Under current policies and measures, GHG emissions are projected to stagnate in the transport sector between 2013 and 2020 (see Figure 4.6). In 2020, this stagnation translates into a GHG emission increase of 136 Mt CO_2-eq. compared to 1990. Taking into account additional measures GHG emissions would be reduced by 45 Mt CO_2-eq. by 2020, but this still translates into higher GHG emissions than in 1990. As GHG savings from policies and measures (PAMs) require time to materialise, most of the further substantial GHG emissions cuts that could be achieved by taking immediate action in this sector might only take place after 2020.

Figure 4.6 Sector trends and projections of GHG emissions in ESD sectors



Note: Solid lines represent historic GHG emissions up to 2013, and WEM projections from 2010 onwards. Dashed lines represent projections with additional measures. The projected trends were calibrated to the 2010 year of the latest available inventory data (to date of the submission), which is the base year for the projections for most Member States.

The hypothesis made for assigning emission trends in the ESD sectors is the following: 30 % of the GHG emissions projected for the industrial processes sector (IPCC sector 2) and 20 % of projected GHG emissions of the energy industries (IPCC sectors 1.A.1 and 1.B) are assumed to be not covered by the EU ETS, and they thereby fall under the scope of the ESD.

Source: EEA, 2014a, 2014c, 2014d and 2014g.

Information from Member States on savings from individual policies and measures shows that energy efficiency measures in the residential and service sectors (the second largest source of emissions under the ESD) are expected to contribute towards three quarters of the projected savings from PAMs in the ESD sectors. The contributions from the other sectors (waste, transport, a share of industrial processes and energy supply ([41]) and a share of energy use, mostly direct combustion in households/services) are expected to be much more limited. Planned additional measures will mainly deliver reductions in the residential and services sectors and in the transport sector.

Key policies and measures in the ESD

In 2013, Member States reported information on a number of key PAMs which affect their GHG emissions and underpin their GHG projections. The reported PAMs may act upon GHG emissions across a range of emission sources and sectors (Table 4.2).

Of all 288 policies and measures reported (planned, adopted, implemented, expired), those targeting ESD sectors represented a relatively limited share of the total number of PAMs, particularly in view of the fact that ESD emissions represent the largest share of total GHG emissions, and because these are the emissions which Member States have the responsibility to limit or reduce through national measures (as opposed to EU ETS emissions). Some 9 % of the reported PAMs targeted the industry and construction sectors, while 15 % targeted the residential sector, and 8 % targeted the commercial and agricultural sector. Some 25 % of all measures targeted the transport sector.

Of the reported PAMs be linked to specific pieces of EU legislation (e.g. PAMs resulting from the transposition of an EU directive into national legislation) those referring to EU policies targeting energy efficiency (Energy Services Directive (EU, 2006) and Energy Performance of Buildings Directive (EPBD) (EU, 2010b)) account for most of the EU-related national policies and measures.

Table 4.2 EU key policies and measures in ESD sectors in place, 2012

EU legislation		Main sector(s) targeted WEM	Projection scenario	
			WAM	WEM
Directive 2006/32/EC	End-use efficiency and energy services	Non-ETS; cross-cutting	x	x
Directive 1999/31/EC	Landfill	Waste	x	x
Directive 2008/98/EC	Waste	Waste	x	x
Directive 2000/76/EC	Waste incineration	Waste		x
Regulations related to Common Agricultural Policy (CAP)	Agricultural measures	Agriculture	x	x
Directive 2000/60/EC	Water	Agriculture	x	
Directive 2003/30/EC	Biofuels	Transport	x	x
Regulation 842/2006	F-gases	Industrial Processes	x	
Directive 2006/28/EC	Infrastructure charging for heavy goods	Transport	x	x
Directive 2006/40/EC	Mobile air conditioning	Transport	x	x
Regulation 2009/443/EC	CO_2 from cars	Transport	x	x
Directive 2009/33/EC	Clean and energy-efficient road transport	Transport	x	x
Regulation 510/2011	CO_2 from vans	Transport		x
Directive 2010/31/EC	Energy performance of buildings	Residential	x	x
Directive 2009/28 /EC	Promotion of use of renewable energies in heating and transport	Residential, transport	x	x

Note: The crosses in the columns referring to the projection scenarios (WEM or WAM) indicate if the EU policy is a major contributor to projected GHG savings as reflected by Member States projections. The WEM column is marked if the EU PAM has been reflected in the projections by existing national PAMs, while the WAM column is marked in case the EU PAM is reflected in Member States projections as planned measures.

Source: EEA, 2014i.

([41]) See Figure 4.6 for assumptions made regarding the sectoral share of industrial processes and energy supply which has been attributed to the ESD.

Further policy developments took place at EU level after the submissions of GHG emission projections by Member States in 2013: adoption of the EED, revision of the F-Gas Regulation (517/2014), the Cars Regulation (333/2014) and the Vans Regulation (253/2014), and further implementation of the ecodesign legislation for boilers and water heaters (Regulation No 813/2013 and No 814/2013).

Member State progress

Current progress towards 2013 ESD targets

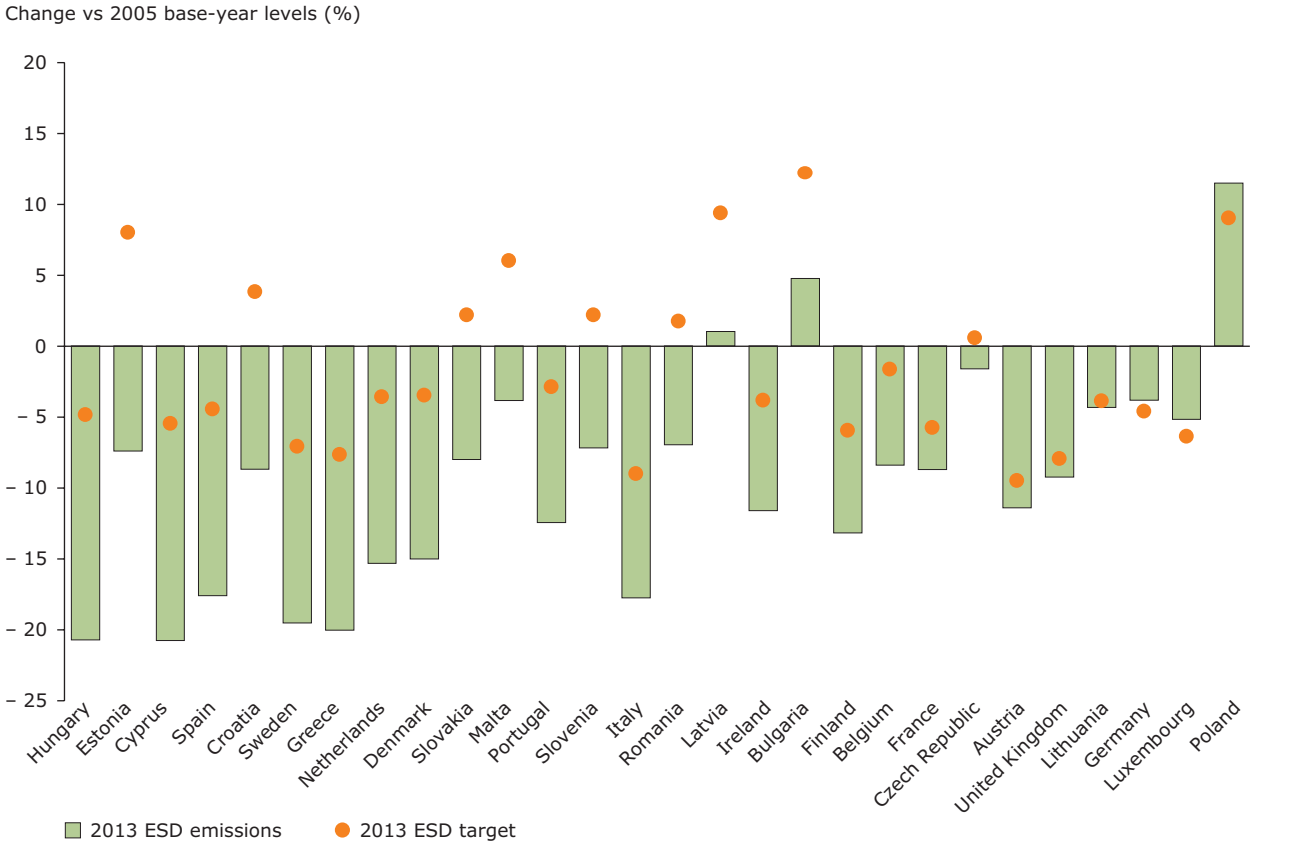
Based on approximated GHG estimates for 2013, 25 Member States are likely to meet their first annual target under the ESD in 2013; however, the extent to which ESD targets were over-achieved in 2013 varies considerably.

For example, Cyprus and Estonia each will likely surpass their ESD target by 15 percentage points relative to their 2005 base-year ESD emissions. This is illustrated in Figure 4.7 by the gap between the ESD target (i.e. the orange dot) and the ESD emissions (i.e. the green bar) in 2013.

By contrast, Lithuania and the United Kingdom are just on track for meeting their ESD targets in 2013, but will likely over-achieve it by not more than one percentage point relative to their 2005 base-year ESD emissions, respectively. The only Member States currently not on track to meet their ESD targets in 2013 are Germany, Luxembourg and Poland. Luxembourg submitted an approximated GHG inventory for 2013 too late to be considered in this assessment. According to these estimates, Luxembourg would actually achieve its 2013 ESD target.

The only Member States currently not on track to meet their ESD targets in 2013 are Germany, Luxembourg and Poland. Luxembourg submitted

Figure 4.7 Progress in meeting national ESD targets in 2013



Note: The countries are ordered according to the decreasing distance between 2013 ESD emissions and 2013 ESD targets, expressed in relative terms (share of 2005 base-year levels). Countries appearing on the left side of the figure are the best performers in achieving their 2013 ESD targets.

Luxembourg submitted an approximated GHG inventory for 2013 on 14 August 2014, after the cut-off date for inclusion in this report. According to these estimates, Luxembourg would actually achieve its 2013 ESD target.

Source: EU, 2009b, 2013a and 2013g; EEA, 2014b, 2014d and 2014e.

an approximated GHG inventory for 2013 after the cut-off date for inclusion in this report. According to these estimates, Luxembourg would actually achieve its 2013 ESD target.

Projected progress to 2013–2020 targets in ESD

At national level, 15 Member States (Croatia, Cyprus, Czech Republic, Denmark, Estonia, France, Greece, Hungary, Malta, Poland, Portugal, Romania, Slovakia, Sweden, and the United Kingdom) have projected 2020 ESD emissions below their 2020 annual targets under the current set of existing measures (Figure 4.8). The extent to which these Member States foresee overachieving their ESD target in 2020 ranges from 1 percentage point (Greece) to 46 percentage points (Cyprus), relative to their 2005 base-year ESD emissions.

National projections indicate that implementation of currently planned (additional) measures in seven Member States (Bulgaria, Italy, Germany, Latvia, Lithuania, the Netherlands and Slovenia) could reduce ESD emissions below target levels in 2020, albeit only narrowly for some of them. For example, according to the WAM scenario, Latvia will over-achieve its ESD target in 2020 by two percentage points relative to its 2005 base-year ESD emissions. Bulgaria and Italy anticipate that implementing additional measures will have the greatest impact on their ESD emissions, in comparison with other Member States (see Figure 4.8). Both countries project overachieving their 2020 ESD target by 11 percentage points and 5 percentage points respectively (relative to their 2005 base-year ESD emissions).

The remaining six Member States (Austria, Belgium, Finland, Ireland, Luxembourg and Spain) are not on track to meet their 2020 annual target through domestic emissions reductions, despite the implementation of currently planned (additional) measures. The largest projected gap to 2020 target in the WAM scenario is observed in Luxembourg, where 2020 ESD emissions could be 16 percentage points higher than the target of – 20 %, compared to 2005 base-year ESD emissions (see Figure 4.8). The gap between projected emissions and the ESD target is considerably smaller for both Austria and Finland. For Austria and Finland, national projections actually indicate achievement of the 2020 targets; however, projections adjusted by EEA indicate that the targets will be missed by a small margin.

The annual compliance cycle introduced by the ESD requires Member States to limit their emissions below their ESD target for each year of the period from 2013 to 2020 (although flexibility mechanisms can also be used to increase their permitted emissions in a specific year).

The 'heat map' in Table 4.3 illustrates the projected difference between projected ESD emissions, in both WEM and WAM scenarios, and annual ESD targets from 2013 to 2020, by visualising the **relative distance to the annual national target** for each projection year for every Member State ([42]).

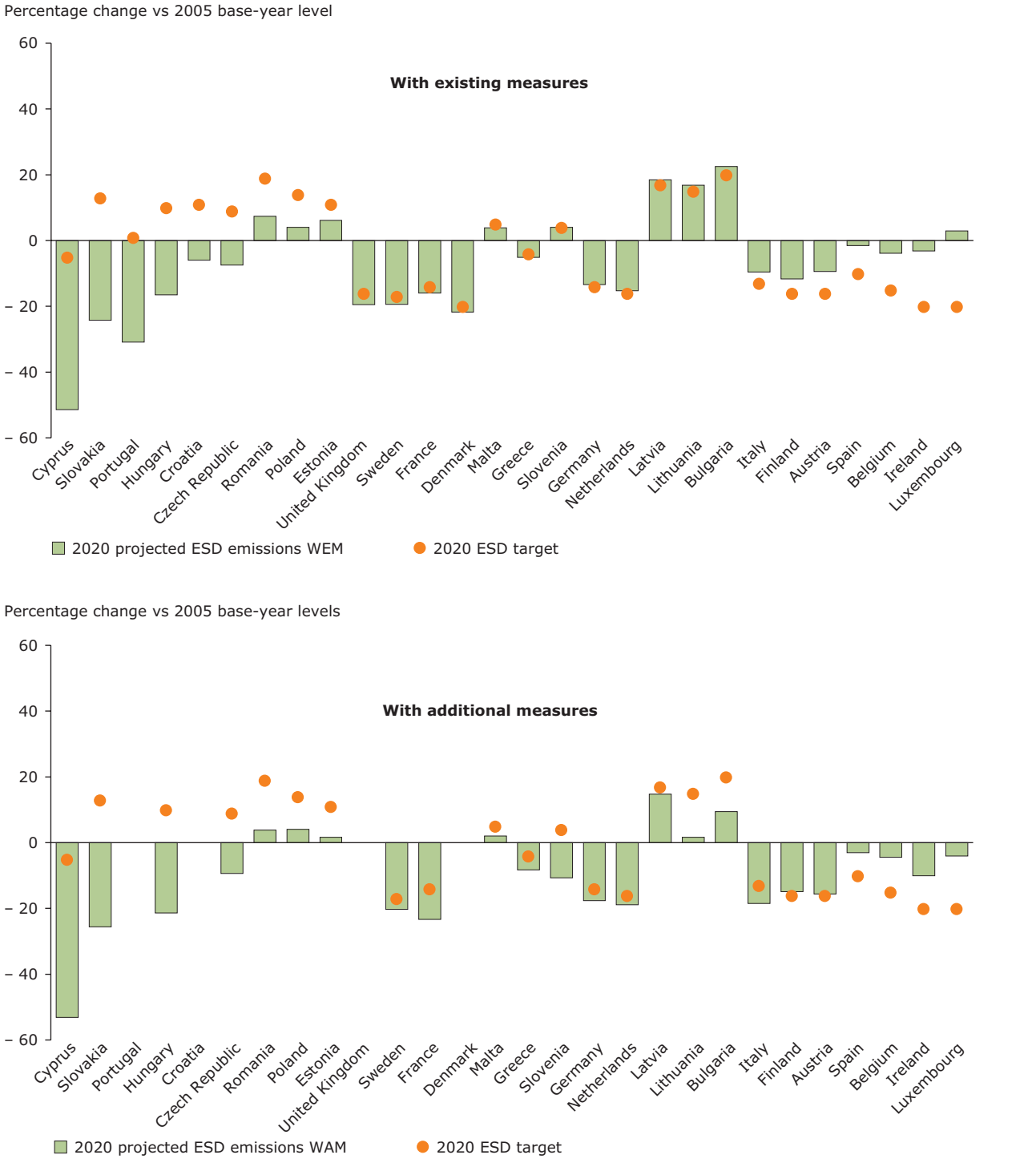
Projections from Member States show that for a majority (15), ESD emissions are expected to stay below their annual ESD targets for every year between 2013 and 2020, under the WEM scenario. The implementation of additional measures would raise this number to 22 Member States. For the six Member States that are not expected to reach their ESD target in 2020, despite the implementation of additional measures, increasing domestic action and using flexibility mechanisms (e.g. purchasing AEAs from other Member States) will be necessary.

Cyprus has the largest projected surplus of AEAs in each year between 2013 and 2020 relative to its ESD target, under both the WEM and the WAM scenarios (illustrated in Table 4.3 by the green shaded cells). This situation is mainly due to recalculations in Cyprus' GHG inventory in 2013 which resulted in significantly decreased emissions compared to those used to establish the ESD base year and ESD targets. However, the situation of Cyprus could significantly change if all ESD targets undergo a recalculation pursuant to Article 27(2) of the MMR. Such recalculations are foreseen if the impact of the use of the 2006 IPCC guidelines for national GHG inventories, or a significant change to UNFCCC methodologies used in determining the greenhouse gas inventories, leads to a difference of more than 1 % in a Member State's ESD emissions.

Hungary, Slovakia and Portugal are also expected to achieve a large AEA surplus (relative to their ESD targets) each year between 2013 and 2020. This surplus increases over time under both the WEM and WAM scenarios, because GHG emissions are not projected to grow as fast as the (positive) linear target path for these countries.

([42]) The relative distance for each Member State is calculated as follows: Distance = 1 – (projected ESD emissions/ESD target).

Figure 4.8 Projected ESD emissions and targets in 2020 compared to 2005 base-year levels



Note: WEM: with existing measures scenario; WAM: with additional measures scenario.

The countries are ordered according to the decreasing distance between 2020 projected ESD emissions WEM and 2020 ESD targets, expressed in relative terms (share of 2005 base-year levels). Countries appearing on the left side of the figure are the best performers in achieving their 2020 ESD targets. To make comparison of the results across both figures easier, the same ordering of countries is kept for the lower figure.

For Austria and Finland, national projections indicate achievement of the 2020 targets; however, projections adjusted by EEA indicate that the targets will be missed by a small margin.

Croatia, Denmark, Portugal and the United Kingdom did not provide projections in a WAM scenario.

Source: EC, 2013a and 2013e; EEA, 2014d; EU, 2009a.

Table 4.3 Projected annual difference to ESD targets in Member States, 2013–2020

Member State	Scenario	2013 (proxy) (%)	2014 (%)	2015 (%)	2016 (%)	2017 (%)	2018 (%)	2019 (%)	2020 (%)
Austria	WEM	2.2	– 3.5	– 4.0	– 4.8	– 5.5	– 6.3	– 7.1	– 7.9
	WAM		– 0.2	0.2	0.0	– 0.1	– 0.3	– 0.4	– 0.5
Belgium	WEM	6.9	– 1.6	– 2.8	– 4.7	– 6.7	– 8.8	– 10.9	– 13.2
	WAM		– 1.2	– 2.4	– 4.2	– 6.2	– 8.2	– 10.2	– 12.4
Bulgaria	WEM	6.6	6.5	6.8	5.0	3.1	1.3	– 0.4	– 2.2
	WAM		11.0	14.6	13.4	12.2	11.0	9.9	8.8
Croatia	WEM	12.1	8.9	10.3	11.4	12.4	13.3	14.3	15.2
	WAM		n/a	n/a	n/a	n/a	n/a	n/a	n/a
Cyprus	WEM	16.3	40.3	44.0	45.7	46.8	48.4	47.6	48.7
	WAM		40.1	43.8	45.8	47.4	49.4	49.0	50.6
Czech Republic	WEM	2.2	4.4	7.4	9.0	10.5	12.1	13.6	15.0
	WAM		5.1	8.2	10.0	11.8	13.5	15.2	16.8
Denmark	WEM	12.0	9.6	8.3	6.5	4.9	3.2	1.5	2.0
	WAM		n/a	n/a	n/a	n/a	n/a	n/a	n/a
Estonia	WEM	14.3	5.8	3.7	3.9	4.0	4.1	4.2	4.3
	WAM		6.7	5.9	6.4	6.9	7.4	8.8	8.4
Finland	WEM	7.7	– 3.3	– 4.1	– 4.3	– 4.5	– 4.8	– 5.0	– 5.2
	WAM		– 2.5	– 3.1	– 2.8	– 2.4	– 2.1	– 1.7	– 1.3
France	WEM	3.2	4.4	4.3	3.9	3.5	3.1	2.7	2.2
	WAM		7.7	8.5	8.9	9.4	9.8	10.3	10.8
Germany	WEM	– 0.7	1.6	0.7	0.4	0.1	– 0.2	– 0.5	– 0.8
	WAM		3.7	3.3	3.5	3.7	3.8	4.0	4.2
Greece	WEM	13.5	10.1	13.3	10.8	8.3	5.9	3.5	1.1
	WAM		10.8	14.2	12.2	10.2	8.3	6.3	4.4
Hungary	WEM	16.8	11.6	13.9	16.1	18.2	20.2	22.2	24.1
	WAM		14.3	17.1	19.6	22.0	24.2	26.4	28.5
Ireland	WEM	8.2	4.9	0.9	– 2.8	– 7.2	– 11.6	– 16.3	– 21.2
	WAM		7.5	4.2	1.5	– 1.9	– 5.3	– 8.8	– 12.5
Italy	WEM	9.7	3.4	4.3	2.7	1.0	– 0.6	– 2.3	– 4.0
	WAM		3.0	3.8	4.3	4.8	5.3	5.8	6.3
Latvia	WEM	7.7	3.5	4.6	3.4	2.1	1.0	– 0.2	– 1.3
	WAM		4.4	5.8	5.0	4.2	3.4	2.6	1.9
Lithuania	WEM	0.5	– 15.8	– 13.3	– 10.6	– 8.2	– 5.9	– 3.8	– 1.7
	WAM		– 9.6	– 4.8	– 2.1	0.6	3.1	6.0	11.6
Luxembourg	WEM	– 1.2	– 7.4	– 10.4	– 13.7	– 17.2	– 20.9	– 24.7	– 28.7
	WAM		– 5.0	– 6.7	– 9.1	– 11.6	– 14.3	– 17.0	– 19.9
Malta	WEM	9.4	2.1	2.0	2.0	1.9	1.7	1.7	1.0
	WAM		3.0	2.9	2.9	2.9	2.9	3.2	2.8
Netherlands	WEM	12.2	9.7	9.6	7.7	5.6	3.5	1.3	– 1.0
	WAM		11.2	11.6	10.1	8.5	6.8	5.1	3.3
Poland	WEM	– 2.2	2.7	5.0	5.7	6.5	7.2	8.0	8.7
	WAM		2.7	5.0	5.7	6.5	7.2	8.0	8.7
Portugal	WEM	9.9	15.0	17.8	20.6	23.3	26.1	28.8	31.4
	WAM		n/a	n/a	n/a	n/a	n/a	n/a	n/a
Romania	WEM	8.6	4.9	6.5	7.2	7.9	8.5	9.1	9.7
	WAM		7.2	9.4	10.2	10.8	11.5	12.1	12.7
Slovakia	WEM	10.0	17.0	19.9	22.7	25.3	27.9	30.5	32.9
	WAM		17.4	20.5	23.4	26.2	28.9	31.6	34.1

Table 4.3 Projected annual difference to ESD targets in Member States, 2013–2020 (cont.)

Member State	Scenario	2013 (proxy) (%)	2014 (%)	2015 (%)	2016 (%)	2017 (%)	2018 (%)	2019 (%)	2020 (%)
Slovenia	WEM	9.2	0.6	– 0.5	– 0.3	– 0.2	– 0.2	0.0	– 0.1
	WAM		10.2	11.4	12.1	12.6	13.2	13.7	14.1
Spain	WEM	13.8	0.9	– 0.5	– 2.0	– 3.7	– 5.6	– 7.5	– 9.5
	WAM		1.6	0.4	– 0.9	– 2.5	– 4.2	– 5.9	– 7.7
Sweden	WEM	13.5	6.2	6.0	5.4	4.8	4.2	3.5	2.8
	WAM		6.6	6.5	6.1	5.6	5.0	4.5	3.9
United Kingdom	WEM	1.5	5.5	5.3	4.9	4.6	4.4	4.2	4.0
	WAM		n/a	n/a	n/a	n/a	n/a	n/a	n/a
EU-28	**WEM**	**5.3**	**4.0**	**4.2**	**3.7**	**3.1**	**2.6**	**2.1**	**1.6**
	WAM		**5.3**	**5.8**	**5.9**	**5.9**	**5.9**	**5.9**	**6.0**

Note: The 2013 data presented in this table are based on approximated GHG inventories (using global warming potentials from the IPCC's AR4) and the corresponding 2013 ESD targets (also expressed using the same set of global warming potentials). For the years from 2014 onwards, the projections and ESD targets are based on global warming potential values from the IPCC's SAR. The use of two distinct sets of global warming potentials is only necessary in this year's assessment, as in 2015 Member States will report projections based on AR4 GWPs.

For this representation, the relative distance for each Member State is calculated as follows:
Distance = 1 – (projected ESD emissions/ESD target).

The shaded cells represent for the given year the relative difference between the projected GHG emissions of the ESD sector for the WEM (upper row) or WAM (lower row) scenario compared to this year's ESD target for the given Member State.

Orange shaded cells indicate that a Member States projection shows that it has not reached the annual ESD target (the darker the orange shaded cell, the greater the difference between the projection and the annual ESD target).

Green shaded cells indicate that a Member State has met or exceeded the annual ESD target for a given projection year (the darker the green shaded cell, the greater the 'over-achievement' of the annual ESD target).

Source: EC, 2013a and 2013e; EEA, 2014d and 2014g; EU, 2009a.

Luxembourg is expected to have the largest annual deficit in AEAs (relative to its ESD targets) for most of the period from 2013 to 2020, and this shortfall is projected to increase. The shortfall in AEAs for Luxembourg increases from 1.2 % in 2013 to 29 % in 2020 in the WEM scenario, and from 1.2 % to 20 % in the WAM scenario. Although Ireland is expected to initially have an annual surplus in AEAs under both the WEM and WAM scenarios, it is projected that by 2020, the Member State will experience a deficit in AEAs second only to Luxembourg's in size (relative to their ESD targets).

Member State projections allow for an estimate of the overall cumulated surplus or shortfall of AEAs that these countries may end up with at the end of the compliance period, in the absence of transfers of AEAs between Member States and of international credits (see Figure 4.9).

Under the WEM scenario, the United Kingdom is expected to hold the largest amount of surplus AEAs in 2020 (115 Mt CO_2-eq.), followed by France (102 Mt CO_2-eq.), Portugal (84 Mt CO_2-eq.) and Poland (80 Mt CO_2-eq.). Belgium is projected to experience the largest cumulated deficit of AEAs in 2020 (28 Mt CO_2-eq.) followed by Spain (27 Mt CO_2-eq.), Austria (18 Mt CO_2-eq.), and Ireland (16 Mt CO_2-eq.).

Under the WAM scenario, projections indicate that France may hold the largest amount of surplus AEAs in 2020 (250 Mt CO_2-eq.), followed by Italy (127 Mt CO_2-eq.) and the United Kingdom (130 Mt CO_2-eq.). Belgium is projected to have the largest deficit of AEAs in 2020 (26 Mt CO_2-eq.) followed by Spain (9 Mt CO_2-eq.) and Luxembourg (7 Mt CO_2-eq.).

Overall assessment

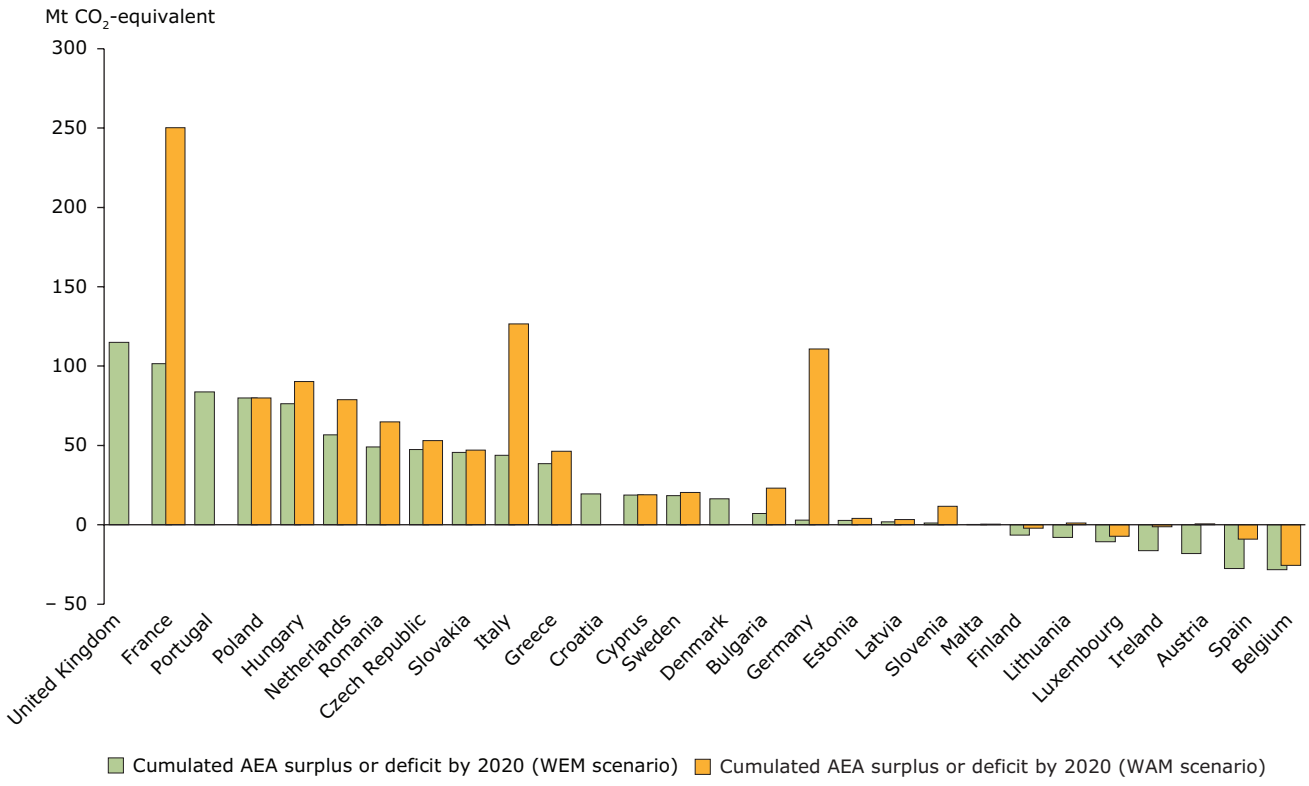
Bringing together the results of the assessment of current progress towards 2013 targets (based on 2013 proxy data) and projected progress to 2020 targets (based on Member States projections) allows for an overall assessment of the progress made so far by Member States towards their objectives under the ESD (see Table 4.4).

- 14 Member States (Croatia, Cyprus, Czech Republic, Denmark, Estonia, France, Greece, Hungary, Malta, Portugal, Romania, Slovakia, Sweden and the United Kingdom) are on track towards their 2013 ESD target, and project that

current policies and measures are sufficient to achieve their 2020 targets through domestic emission limitations or reductions only. These countries are considered to be well on track to meet their ESD targets.

- Six Member States (Bulgaria, Italy, Latvia, Lithuania, the Netherlands and Slovenia) are partly on track towards their ESD targets (see the last column in Table 4.4). According to their approximated GHG estimates, their 2013 ESD emissions were below their 2013 ESD targets, but implementing additional policies and measures is needed if they are to remain on track to meet their 2020 targets through domestic emission limitations or reductions only.
- Germany, Luxembourg ([43]) and Poland are considered not to be on track for meeting their ESD targets, because their 2013 ESD emissions are expected to be higher than their ESD targets. Germany and Luxembourg do not actually project either to achieve their 2020 targets through domestic reductions, even in the WAM scenario. These countries may need to use flexibility options from the very beginning of the ESD period (such as borrowing AEAs from later years) in order to achieve compliance in 2013.
- Five other Member States (Austria ([44]), Belgium, Finland ([45]), Ireland and Spain) are considered not to be on track to meet their ESD targets either, because their projections do not indicate that

Figure 4.9 Cumulated surplus AEAs in 2020 of each Member State under WEM and WAM projections



Note: Comparison made using data with global warming potential values from the IPCC's *Second Assessment Report*.

Croatia, Denmark, Portugal and the United Kingdom did not report projections under the WAM scenario.

Source: EC, 2013a and 2013e; EEA, 2014d and 2014g; EU, 2009a.

([43]) Luxembourg submitted an approximated GHG inventory for 2013 too late for consideration in this assessment. According to these estimates, Luxembourg would actually achieve its 2013 ESD target. However, 2020 projections indicate that the 2020 ESD target would be missed despite additional measures being implemented.

([44]) For Austria, national projections indicate achievement of the 2020 target. However, projections adjusted by EEA indicate that the target will be missed by a small margin. The adjustment to the projection was accomplished in order to calibrate reference year emissions in the sector 'Energy (services and others)' to latest inventory submission.

([45]) For Finland, national projections indicate achievement of the 2020 target. However, projections adjusted by EEA indicate that the target will be missed. Finland submitted total GHG emissions for the sector 'industrial processes' but NE and a blank cell for the non-ETS sector for the years 2020, 2025 and 2030. Therefore the sector 'industrial processes' was gap-filled by the ETC using the total industrial processes emissions reported by the MS and the relative split of ETS/non-ETS emissions as in 2010.

Table 4.4 Overall assessment of Member State progress, based on 2013 and projected 2020 ESD emissions

Member States	Current progress 2013		Projected progress 2020			Overall assess-ment in 2014
	ESD targets	ESD emissions	ESD targets	ESD projection WEM	ESD projections WAM	
Austria	52.6	51.5	47.9	51.7	48.1	
Belgium	78.4	72.9	66.7	75.5	75.0	
Bulgaria	26.9	25.1	27.2	27.8	24.8	
Croatia	19.6	17.2	20.4	17.3	n/a	
Cyprus	5.9	5.0	5.5	2.8	2.7	
Czech Republic	62.5	61.1	65.7	55.9	54.7	
Denmark	36.8	32.4	29.7	29.1	n/a	
Estonia	6.3	5.4	6.3	6.0	5.7	
Finland	31.8	29.3	27.7	29.1	28.1	
France	394.1	381.4	350.1	342.3	312.4	
Germany	472.5	476.0	417.3	420.7	399.8	
Greece	59.0	51.0	58.9	58.2	56.3	
Hungary	50.4	42.0	56.6	43.0	40.5	
Ireland	46.9	43.1	37.2	45.1	41.8	
Italy	308.2	278.3	287.9	299.4	269.9	
Latvia	9.3	8.5	9.6	9.7	9.4	
Lithuania	12.9	12.9	14.9	15.1	13.1	
Luxembourg	9.5	9.7	8.1	10.4	9.7	
Malta	1.2	1.1	1.1	1.1	1.1	
Netherlands	122.9	107.9	104.5	105.5	101.0	
Poland	193.6	197.9	195.0	178.0	178.0	
Portugal	49.3	44.4	49.0	33.6	n/a	
Romania	75.6	69.1	83.6	75.5	73.0	
Slovakia	24.0	21.6	25.4	17.1	16.7	
Slovenia	12.3	11.2	12.1	12.1	10.4	
Spain	227.6	196.1	208.6	228.5	224.7	
Sweden	41.7	36.1	36.4	35.4	35.0	
United Kingdom	358.7	353.4	319.5	306.6	n/a	
EU-28	**2 790.6**	**2 641.5**	**2 572.9**	**2 532.5**	**2 418.5**	

Note: WEM: with existing measures scenario; WAM: with additional measures scenario.

In the coloured cells containing numbers (three first coloured columns), a green colour indicates that emissions were (in 2013) or are projected to be (in 2020) lower than the respective target, while an orange colour indicates emissions being higher than the respective target. In the last column, the colour indicates whether Member States are considered to be on track (green), partly on track (light yellow) or not on track (orange).

Member States are considered to be on track if their 2013 ESD emissions are below their respective 2013 ESD target, and if their 2020 projected ESD emissions WEM are below their 2020 ESD target. Member States are considered to be partly on track if their 2013 ESD emissions are below their respective 2013 ESD target, and if their 2020 projected ESD emissions WEM are above their 2020 ESD target, but their 2020 projected ESD emissions WAM are below their 2020 ESD target. Member States are considered not to be on track if their proxy 2013 emissions are below their respective 2013 ESD target, or if their 2020 projected ESD emissions WAM are above their 2020 ESD target.

Data for 2013 are based on global warming potentials from the IPCC's *Fourth Assessment Report*, while data for 2020 are based on global warming potentials from the IPCC's *Second Assessment Report*.

Source: EC, 2013a and 2013e; EEA, 2014d and 2014g; EU, 2009a.

Table 4.5 Evolution of progress on GHG targets between the 2013 and 2014 assessments

	ESD emissions vs 2013 ESD target		2020 ESD projections vs 2020 ESD targets				Overall progress	
Statistical year for assessment	**2012 ESD emissions [a]**	**2013 proxy ESD emissions**	**WEM projections**		**WAM projections**			
			2013	**2014**	**2013**	**2014**	**2013**	**2014**
Austria	→	→	→	→	→	→	→	→
Belgium	→	→	→	→	→	→	→	→
Bulgaria	→	→	→	→	→	→	→	→
Croatia [b]	n/a	→	→	→	→	→	→	→
Cyprus	→	→	→	→	→	→	→	→
Czech Republic	→	→	→	→	→	→	→	→
Denmark	→	→	→	→	→	→	→	→
Estonia [c]	→	→	→	→	→	→	→	→
Finland	→	→	→	→	→	→	→	→
France	→	→	→	→	→	→	→	→
Germany	→	↘	→	→	→	→	→	↘
Greece	→	→	→	→	→	→	→	→
Hungary	→	→	→	→	→	→	→	→
Ireland	→	→	→	→	→	→	→	→
Italy	→	→	→	→	→	→	→	→
Latvia	→	→	→	→	→	→	→	→
Lithuania	→	→	→	→	→	→	→	→
Luxembourg	→	→	→	→	→	→	→	→
Malta	→	→	→	→	→	→	→	→
Netherlands	→	→	→	→	→	→	→	→
Poland [d]	→	→	→	→	→	→	→	→
Portugal	→	→	→	→	→	→	→	→
Romania	→	→	→	→	→	→	→	→
Slovakia	→	→	→	→	→	→	→	→
Slovenia	→	→	→	→	→	→	→	→
Spain	→	→	→	→	→	→	→	→
Sweden	→	→	→	→	→	→	→	→
United Kingdom	→	→	→	→	→	→	→	→
EU [e]	→	→	→	→	→	→	→	→

Note: The colour of the cells indicates whether emissions are below (green) or above (orange) their respective targets. In the last two columns, the colour corresponds to the overall assessment. See also Table 4.4.

([a]) In 2013, the assessment of current progress was based on a comparison between approximated 2012 ESD emissions and 2013 ESD targets (using the GWP values of the SAR). In 2014, this assessment was based on a comparison between 2013 proxy ESD emissions and 2013 ESD targets (using the GWP values of the AR4). The assessment of projected progress in 2013 and 2014 was based on a comparison between 2020 projected ESD emissions and 2020 ESD targets (using the GWP values of the SAR). In 2014, six Member States (Cyprus, Ireland, Lithuania, Luxembourg, Romania and Poland) updated their GHG projections.

([b]) Croatia did not have any emissions under the EU ETS in 2012; therefore no assessment of current progress was made in 2013.

([c]) Due to a mistake in Estonia's energy statistics on which approximated 2012 emissions were based, this country's 2012 ESD emissions were overestimated. This resulted in Estonia being assessed as not on track towards its ESD targets. In this table the error has been corrected, using actual 2012 inventory data.

([d]) Conversely, Poland underestimated its 2012 emissions in its proxy inventory, which resulted in assessing this country as on track. In this table, actual 2012 inventory data were used, which shows that Poland would have been assessed as not being on track in 2013.

([e]) The 2013 assessment of EU's current progress pertains to the EU-27, since Croatia could not be assessed against its 2013 ESD target (see ([b])).

Source: EC, 2013a and 2013e; EEA, 2014a, 2014c, 2014d and 2014g; EU, 2009a.

they would achieve their 2020 targets through domestic policies and measures, despite the implementation of additional measures. These countries — which all have an overall deficit of AEAs over the full period from 2013 to 2020 — may need to rely on the purchase of AEAs from other Member States in order to achieve their ESD targets.

An aggregation of all the results at national level indicates that overall, the EU can be considered to be on track towards its 2013–2020 reduction objectives for ESD emissions.

Progress compared to previous year

The results presented here are based on the latest data available (2013 approximated ESD emissions, and 2013–2020 projections, as of May 2014). In the 2013 assessment, 2012 approximated ESD emissions were used, as well as 2020 projections submitted in 2013. A comparison between the two sets of results, based on the same methodology ([46]), shows that the situation of Member States in terms of progress towards their ESD targets did not change in the last year, apart from Germany (see Table 4.5). In order to provide a more accurate picture of the changes from one year to another, approximated 2012 ESD emissions (which were available in 2013) have been replaced by data for 2012 based on official GHG inventory submissions in 2014. Despite the submission of updated ESD projections by six Member States (Cyprus, Ireland, Lithuania, Luxembourg, Poland and Romania), these do not affect the assessment of these countries' projected progress towards their respective ESD 2020 targets.

In the case of Germany, 2013 ESD emissions were higher than the 2013 target, while 2012 ESD emissions were lower. Indeed, total GHG emissions and ESD emissions in this country increased between 2012 and 2013. This was mainly due to weather conditions (also impacting other parts of northern Europe), which required more oil and gas for heating in homes and buildings ([47]) (UBA, 2014).

The use of official 2012 GHG inventory data, submitted in 2014, instead of approximated 2012 inventories, submitted in 2013, affects the calculated progress of Estonia and Poland for 2012, compared to the situation presented in the 2013 report. In the case of Estonia, erroneous energy statistics upon which 2012 approximated emissions were calculated led to this country being assessed as not on track towards its 2013 targets, while 2012 inventory data indicate that Estonia actually was on track towards its 2013 target — this error was already noted in the 2013 EEA report (EEA, 2013). The approximated 2012 GHG emissions of Poland were underestimated by this country to such an extent that this country was considered to be on track in the GHG assessment, while actual inventory data revealed that this was not the case.

4.4 Progress in the land use, land-use change and forestry (LULUCF) sector

The LULUCF sector is currently not covered by the measures aiming at achieving the EU's 20 % reduction goal. Yet close linkages exist between emissions occurring in the land-use sector and mitigation efforts in the energy sector, e.g. through renewable energy use such as biomass.

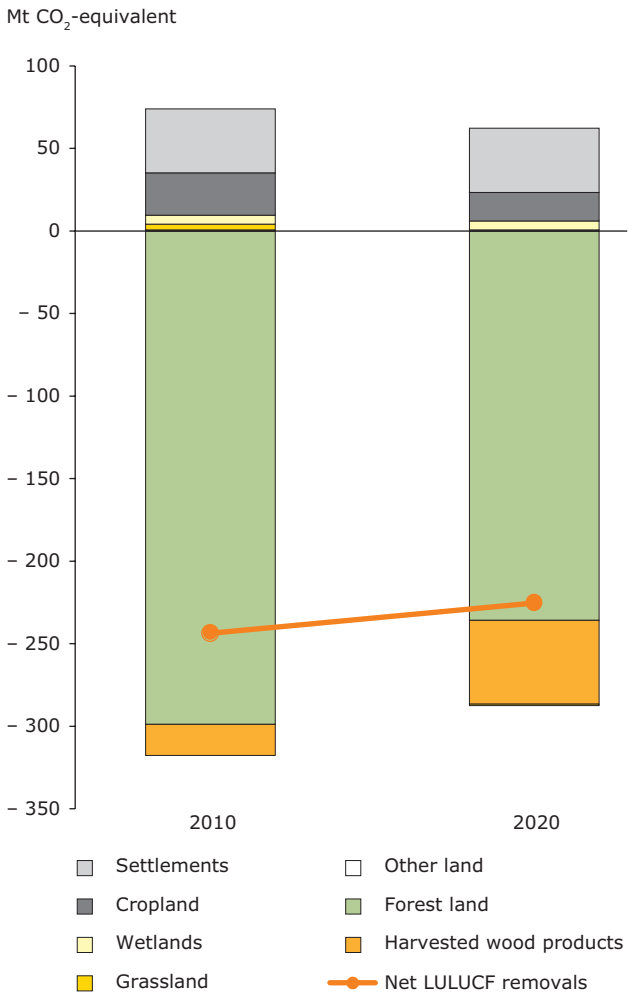
Unlike in other sectors, land-use activities can result in GHG emissions, but also in removals of CO_2. In 2012, the whole EU LULUCF sector represented a carbon sink of about 303 Mt CO_2-eq. (EEA, 2014a and 2014c). This sink was dominated by CO_2 absorbed from existing and new forests. The relatively large shares of young forests and moderate harvest rates over the last decade that are below the increment of forests, lead to a net carbon accumulation in EU forests. The largest sources were land conversions, especially to settlements and emissions from cropland. A relevant question for EU climate policy is whether the current sink of EU forests will be maintained in future, as it could potentially be affected by an increased use of bioenergy.

The EU 2013 reference scenario (EC, 2014c) assumes that national and EU targets for renewable energy for 2020 are met. These targets include the mobilisation of imports and domestic bioenergy from agricultural land and forests, making up for more than 50 % of the 2020 20 % renewable energy target. Overall, the bioenergy contribution to final energy consumption is expected to more than double, from 5.4 % in 2005 to almost 12 % (124 Mtoe) in 2020 (Atanasiu, 2010).

([46]) In 2013, 2012 ESD emissions were compared with the 2013 ESD target, and 2020 projections in both WEM and WAM scenarios were compared with 2020 ESD targets.
([47]) In the ETS sectors, emissions increased due to greater use of hard coal for the production of electricity.

According to the EU Reference Scenario, in 2020 the EU LULUCF net sink is expected to be reduced by about 7 %, compared to 2010, despite decreased emissions from cropland and grassland (due to reduced rates of land conversion to cropland and decreasing carbon stocks in agricultural soils) (see Figure 4.10). This development would lead to an increase of the net sink if forestry emissions remain stable. The expected net sink reduction is driven by a reduction of carbon sinks in EU forests of more than 20 % compared to 2010. The sink reduction can be mainly attributed to ageing of EU forests (Böttcher et al., 2012), as well as the increased use of wood from EU forests for both wood products and energy use. Young forests have higher growth rates compared to old forests. As the age class distribution of EU forests is increasingly shifting from young to old, the sink strength naturally diminishes. Figure 4.10 highlights EU-28 emissions and removals from LULUCF in 2010 and 2020, according to the EU Reference Scenario 2013.

Figure 4.10 EU emissions and removals from LULUCF in 2010 and 2020



Source: EC, 2014c.

The trend of the net LULUCF sink is likely to continue after 2020 up to 2050 (EC, 2014c). While the diminishing sink will affect future net emissions, whether this expected decrease will be taken into account will depend on post-2020 LULUCF accounting rules, e.g. a Forest Management Reference Level.

4.5 Post-2020 GHG targets

Projections from Member States, based on policies existing or planned in 2013, show moderate decreases in GHG emissions between 2020 and 2013. National projections for 2025 and 2030 were available from 23 and 24 Member States, respectively. When 2025 or 2030 projections were not reported, results from the Commission's 2013 'baseline with adopted measures' climate policy scenario were used (EU, 2014a) ([48]).

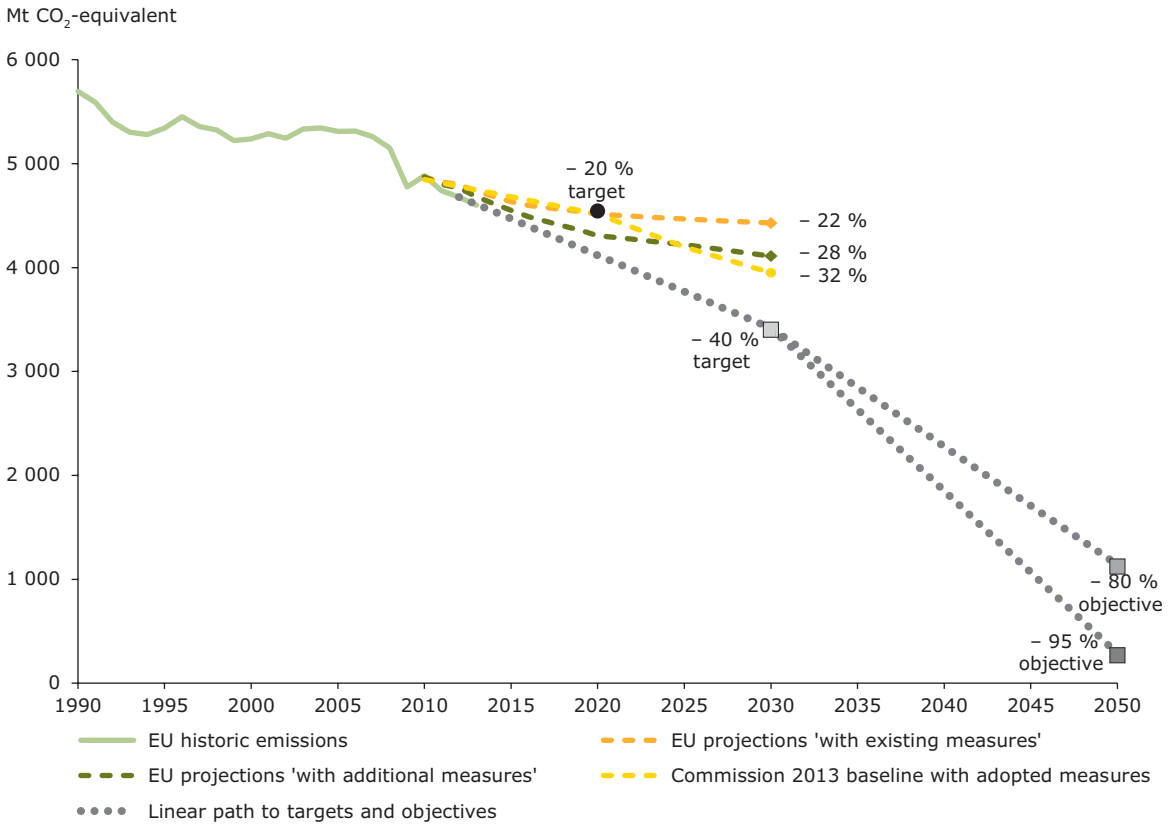
With existing measures, EU GHG emissions could decrease by only one percentage point between 2020 and 2030, from – 21 % to – 22 % compared to 1990. This would correspond to an average 0.2 % reduction per year. This decrease would be slower than the projected decrease for the period up to 2020 (average annual decrease of 0.5 % per year between 2015 and 2020). ESD emissions in particular are projected to barely decrease any further (0.04 % per year on average), while ETS GHG emissions would decrease by 0.6 % per year on average (compare Figure 4.4 and Figure 4.6). With the implementation of additional national measures which were at planning stage when projections were prepared, 2030 emissions could be reduced to a level 28 % below 1990 levels (compared to – 24 % in 2020).

These results are somewhat more pessimistic compared to those of the EU Reference Scenario 2013 for EU energy, transport and GHG trends to 2050 (EC, 2014c). Under current trends and adopted policies, it projects EU-wide GHG emission reductions of 32 % in 2030, including a reduction of non-ETS emissions to – 20 % compared to 2005.

The more modest decreases projected by Member States might be explained by the fact that these

([48]) The 2020–2025 and 2025–2030 relative trends from the Commission's 2013 'baseline with adopted measures' scenario were applied to 2020 projections reported by Member States.

Figure 4.11 EU GHG emission trends and projections, and long-term targets



Note: GHG emissions include international aviation but exclude LULUCF.

Source: European Council, 2007, 2009 and 2014; EEA, 2014a, 2014c, 2014d and 2014g; EU, 2014a.

projections, submitted for the most part in 2013, and prepared between 2012 and 2013, do not fully factor in national implementation of recent EU policy developments. In particular, they might not fully include the effects of the EED adopted in 2012 and still being transposed in national law ([49]). Other examples are the revised EPBD, which mainly has emission reduction effects from 2020 onwards and on which implementation in national legislation is still ongoing in some countries. Furthermore, the CO_2 and Cars Regulation includes a decrease of the fleet average to be achieved by all new cars to 95 g/km by 2020, of which the effect on transport emissions will mainly occur after 2020 with the turnover of the car fleet. These post-2020 effects might not yet be fully covered in national projections. Finally, these results do not take into account the policy framework, adopted in October 2014, to support the achievement of the 40 % reduction target by 2030, such as the increase of the EU ETS linear reduction factor from 2021 onwards.

Emission reductions of approximately 40 % by 2030 would correspond to the cost-effective reduction consistent with the long-term target of an at least 80 % reduction by 2050, according to the Commission's *Roadmap for moving to a competitive low-carbon economy in 2050* (EC, 2011a) ([50]).

While the ongoing implementation of PAMs seems to result in clear GHG emission reductions, projected trends post-2020 point to a lack of structural measures able to achieve further and deeper emission cuts.

4.6 Progress towards GHG targets in other EEA member countries

Of the remaining EEA member countries not included in the EU-28, Iceland, Liechtenstein, Norway and Switzerland provided updated information on emissions projections in 2014. No recent projections are available from Turkey.

([49]) The transposition deadline of the EED was 5 June 2014.
([50]) The scope of GHG emissions covered includes international aviation.

Figure 4.12 shows the emission trends and projections along with the national targets, which have been drawn from the respective sixth National Communications under the UNFCCC.

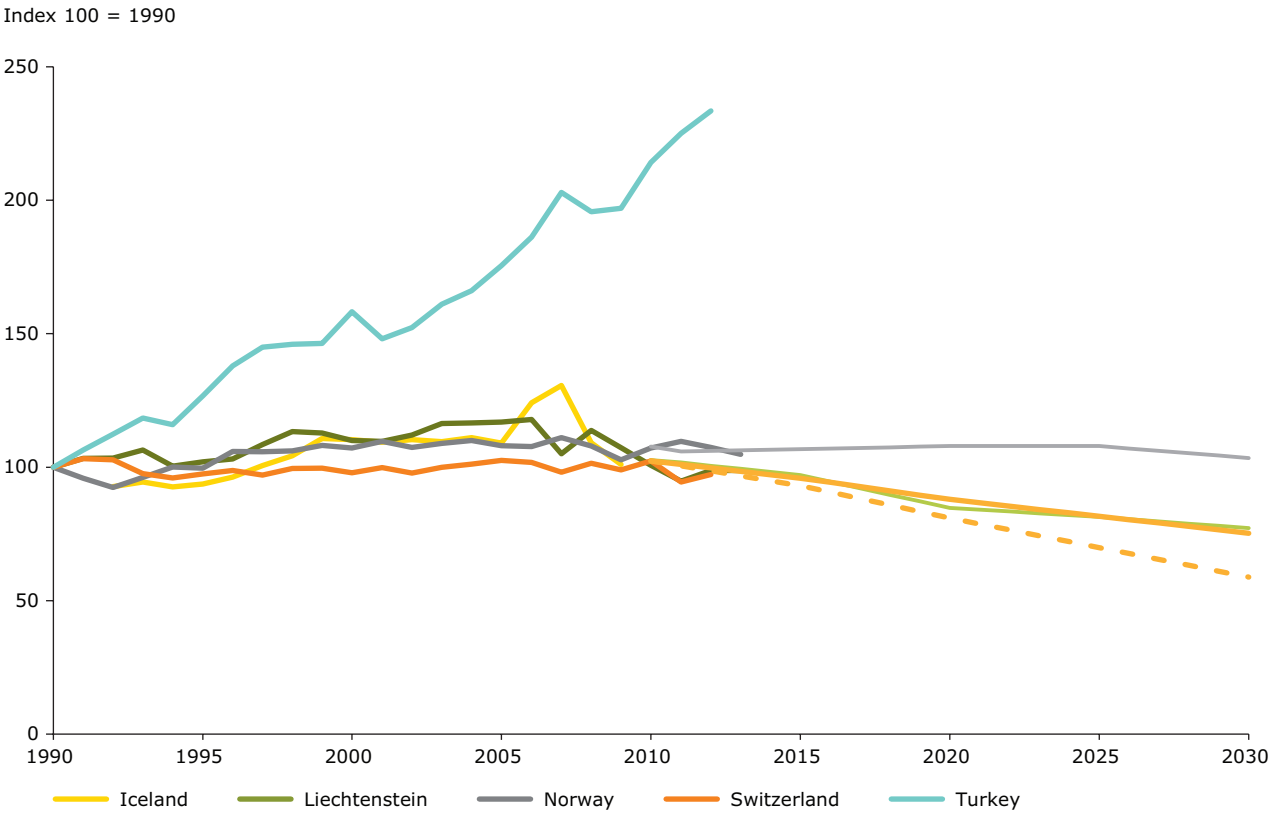
- **Iceland** plans to reduce its GHG emissions by 20 % by the year 2020 compared to 1990. It aims to reach this target together with the EU and its Member States. Iceland also set a long-term GHG mitigation target of between 50 % and 75 % by the year 2050 compared to the GHG emissions in 1990.

- **Liechtenstein** aims to emit at least 20 % less of its GHG emissions from 1990 in 2020. To reach this target, Liechtenstein has also set itself a sectoral goal: GHG emissions from the energy sector will decrease by 20 % between 1990 and 2020.

- **Norway** aims to reduce its GHG emissions by at least 30 % in 2020 compared to 1990. If there is an ambitious global climate agreement, it would reduce its GHG emissions by 40 %. Norway also has a long-term mitigation target: by 2050, the country wants to have reached climate neutrality. Under a potential ambitious global climate agreement, Norway has stated that it will become climate neutral in the year 2030.

- **Switzerland** targets to reduce its GHG emissions by 20 % in 2020 compared to 1990. Like Norway, it also sets a more ambitious GHG reduction target of 30 % reduction in 2020 compared to 1990. This target will, however, only come into force when the international community agrees on a stricter climate policy.

Figure 4.12 GHG emission trends and projections in other EEA member countries, 1990–2030



Note: Projections display total GHG emissions excluding LULUCF and international aviation. Solid lines (until 2012) represent historic values. Solid lines (2010–2020) represent WEM projections. The dashed line represents WAM projections for Switzerland. All projections were adjusted to bring the 2010 data in line with the latest emissions inventories.

In Switzerland, a mechanism of 'inland compensation' will bring further emission reductions by 2030. With these reductions, total GHG emission projections would be equal to 37.9 Mt CO_2-eq. in the WEM scenario and 30.1 Mt CO_2-eq. in the WAM scenario.

Source: EEA, 2014c and 2014d.

5 Progress towards 2020 targets for renewable energy sources (RES)

Key messages

- In 2012, the share of RES in gross final energy consumption in the EU was 14.1 %, a level higher than the 13.0 % target for 2012 resulting from Member States' NREAPs. The 13.5 % average for 2011 and 2012 was also more than the 11.0 % indicative target for 2011 to 2012 set in the RED. The EU is therefore on track for achieving its 20 % target on renewables for 2020.

- In 2012, 22 Member States (Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Luxembourg, Poland, Romania, Slovakia, Slovenia, Sweden and the United Kingdom) plus Iceland and Norway were considered to be on track towards meeting their RES targets. The RES share of these countries had met or exceeded both their indicative RED target for 2011 to 2012, and their expected 2012 NREAP target. The share of renewables was actually already higher than the 2020 targets in Bulgaria, Estonia, Sweden and Iceland. In Austria, Lithuania, Finland, Romania as well as Norway, it was 90 % or more of the 2020 target levels. Austria, Finland, Latvia and Sweden had the highest relative RES share in gross final consumption among all EU Member States. Austria, Cyprus, the Czech Republic, Latvia, Luxembourg and the United Kingdom, as well as Iceland, improved their situation compared to 2011, when their RES shares were above targets. Ireland, Portugal and Spain were partly on track towards their targets. Their RES share had reached or exceeded their indicative RED target for 2011 to 2012, but not their expected national NREAP target for 2012. In France, Malta and the Netherlands, the shares of RES in 2012 remained below both the indicative RED targets for 2011 to 2012 and the expected 2012 NREAP targets.

- A number of Member States need to increase their support for the development of renewable energy by 2020 in order to reach their legally binding 2020 target. The indicative renewable energy trajectory outlined in the RED becomes increasingly steeper towards 2020 as in absolute terms more renewable energy needs to be deployed until 2020 than the cumulative deployment since 2005. In relative terms, this corresponds to an average increase of absolute renewable energy consumption by 5.4 % per year between 2012 and 2020, in comparison to an increase of 6.4 % per year observed between 2005 and 2012. By 2020, Ireland, Luxembourg, Malta, the Netherlands, Portugal and the United Kingdom need to achieve absolute RES growths that are four to seven times higher than the absolute increases these countries achieved between 2005 and 2012. Belgium, Croatia, Cyprus, France, Greece, Hungary, Latvia, Romania and Spain also need to achieve absolute growth two to three times higher compared to the period 2005 to 2012.

- Beyond 2020, the analysis from the European Commission shows that a 55 % to 75 % share of renewables will be needed by 2050, if they are to meet the EU's long-term decarbonisation objectives. Renewables therefore remain a key long-term climate mitigation option. For 2030, a binding target of at least 27 % renewable energy target for Europe was adopted by the European Council in October 2014.

5.1 Progress towards the EU's 2020 RES target

Progress towards interim EU RES targets

In 2012, RES ([51]) accounted for 160.7 Mtoe ([52]) in EU's gross final energy consumption ([53]). This represents a share of 14.1 %, an increase by 1.2 percentage point compared to 2011.

The EU is therefore on track to meet its target of achieving a share of 20 % by 2020: in 2012, it surpassed both its interim target for 2011–2012 set under the RED, as well as the NREAP trajectory (see Figure 5.1):

- an average share of renewables, of 11.0 % of gross final energy consumption for the years 2011 to 2012 under the RED ([54]);
- a share of renewables of 13.0 % of gross final energy consumption in 2012, based on the national targets for renewables set out by Member States in their NREAPs ([55]).

Between 2005 and 2012, renewables increased strongly in the EU, at an average growth rate of 6.4 % per year (6.6 % per year if only biofuels complying with the RED sustainability criteria are taken into account ([56]). Stimulated by national targets under the RED and supported through country-specific frameworks, the consumption of renewables increased in absolute terms by 58 Mtoe over this period. At the same time, modern RES technologies, such as onshore wind and solar PV, experienced substantial cost reductions reflected in high growth rates.

Progress towards 2020 EU RES targets

The EU's share of renewables of 14.1 % in 2012 represents about 70 % of the mandatory 20 % RES target for 2020. Renewables (mostly solar photovoltaic (PV) and wind) accounted in 2012 for almost 70 % of new electrical capacity added in Europe (REN21, 2013).

If all national commitments adopted by countries in the NREAPs of 2010 were fulfilled, then the EU would achieve a 20.6 % renewable energy share for 2020, slightly above the EU's 2020 RED target. According to the national NREAP commitments, the share of RES consumption at EU level should increase at a faster rate from 2012 to 2018, compared to the indicative RED trajectory for this period.

To reach the expected 20.6 % renewable energy share for 2020 according to the NREAPs, the EU needs to sustain an average growth rate of absolute RES consumption of 5.4 % per year between 2012 and 2020. While this growth rate may seem less demanding than the average growth rate of 6.4 % per year the EU achieved between 2005 and 2012, in absolute terms the increase needed between 2012 and 2020 (83 Mtoe) is 1.4 time larger than the absolute growth achieved in the EU from 2005 until 2012 (58 Mtoe).

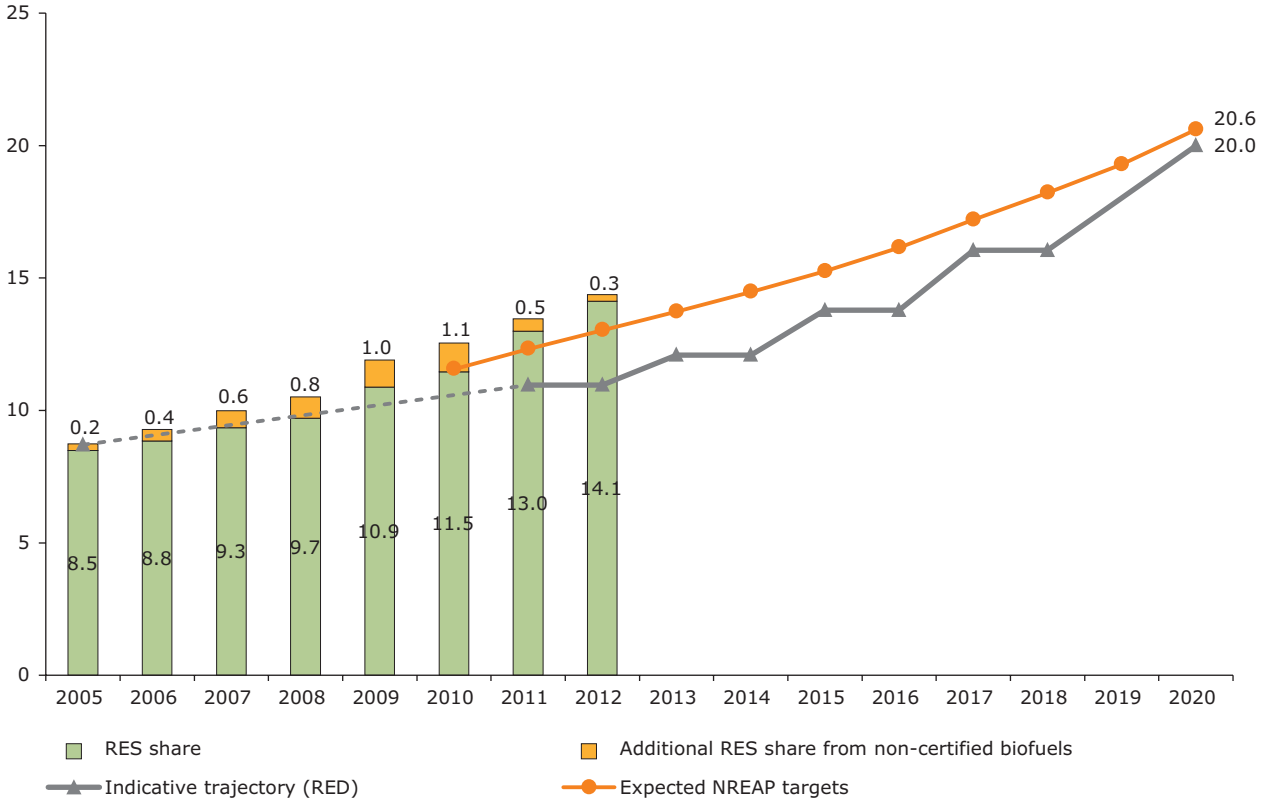
Technological developments and cost reductions to date have surpassed previous expectations. In addition, the implementation of the EED (and its energy savings obligation) is expected to open up new opportunities for the deployment of renewables until 2020, in particular through the Energy Performance of Buildings Directive, due to its compulsory shares of renewable energy consumption in new constructed buildings and certain refurbishments (EU, 2010b).

However, meeting the 2020 RES target still represents a considerable challenge, and several factors in the run-up to 2020 will have a less positive impact on RES dynamics compared to the period from 2005 to 2012. For instance, the

([51]) Energy from renewable sources means energy from renewable non-fossil sources, namely wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases.
([52]) In accordance with the accounting rules in the RED, electricity generated by hydro and wind must be normalised for annual variations (hydro for 15 years and wind for 5 years). Without normalisation and including all biofuels, energy consumption from renewable sources in 2012 would correspond to 163.5 Mtoe, i.e. 2.8 Mtoe more than with normalisation and with compliant biofuels only.
([53]) Gross final consumption of energy means the energy commodities delivered for energy purposes to industry, transport, households, services including public services, agriculture, forestry and fisheries, including the consumption of electricity and heat by the energy branch for electricity and heat production, and including losses of electricity and heat in distribution and transmission.
([54]) The RED sets for each Member State a mandatory national overall target for 2020 and an indicative trajectory for the period from 2011 until 2018, intended to ensure that each Member State achieves its 2020 target. An interim indicative RED target for the EU can be derived from the minimum indicative trajectories of the Member States in the run-up to 2020 (RED, Annex I Part B).
([55]) The NREAPs adopted by Member States in 2010 outline expected trajectories for the share of RES in gross final energy consumption towards the legally binding national 2020 RES targets. The cumulative expected realisations according to Member States' NREAPs show a European renewables path towards 2020 that is more ambitious than the indicative RED trajectory.
([56]) Compliant biofuels can only be accounted for from 2011, when sustainability requirements kicked in under the RED. This results in a steeper growth curve for compliant biofuels compared to the growth curve for 'all biofuels'.

Figure 5.1 EU progress to interim and 2020 RES targets

RES shares in gross final consumption (%)



Note: The EU's indicative trajectory is calculated from all national indicative RED trajectories.
The other trajectory represents cumulative expected realisations according to Member States' NREAPs.
For a consistent comparison across years, this figure separately provides the RES shares accounting only for biofuels complying with RED sustainability criteria, and the additional RES shares due to the other biofuels consumed in transport. However, the RES shares in gross final energy consumption reported by Eurostat (SHARES Results 2012) takes into account all biofuels consumed in transport for the period from 2005 to 2010, and only biofuels complying with RED sustainability criteria for the years following 2011.

Source: EEA (based on RED and Eurostat SHARES Results, 2012) for the indicative RED trajectory; Eurostat SHARES Results 2012 for the actual RES shares 2005–2012; NREAPs ([57]) (using gross final energy consumption after reduction for aviation in the energy efficiency scenario) for the period from 2010 to 2020.

EU's energy demand may not necessarily decrease in the next years as national economies recover from the economic recession. This is in contrast to the overall declining gross final consumption of energy observed in Europe between 2005 and 2012 (– 1.0 % per year), which mechanically contributed to increasing the RES share in gross final energy consumption ([58]). The economic recession has also negatively affected the environment for investments in renewables (including investments in the development of integrated flexible markets and smarter energy systems that are necessary to accommodate growing RES shares). At the same time, the restructuring of RES support frameworks

([57]) National Renewable Energy Action Plans: see http://ec.europa.eu/energy/renewables/action_plan_en.htm.

([58]) According to Article 2f of the RES Directive, gross final energy consumption represents the energy commodities delivered for energy purposes to industry, transport, households, services including public services, agriculture, forestry and fisheries, including the consumption of electricity and heat by the energy branch for electricity and heat production and including losses of electricity and heat in distribution and transmission. This excludes transformation losses which are included in primary energy consumption. In calculating a Member State's gross final energy consumption for the purpose of measuring its compliance with the targets and indicative trajectory laid down in the RES Directive, the amount of energy consumed in aviation shall, as a proportion of that Member State's gross final consumption of energy, be considered to be no more than 6.18 % (4.12 % for Cyprus and Malta).

in many European countries affected investors' confidence in projects with long investment returns. Other factors that may also slow down the penetration of renewables by 2020 relate to subsidies for fossil fuels, infrastructure lock-ins and opposition to change from incumbent energy utilities.

To ensure that Member States and the EU as a whole will meet the binding renewables targets for 2020, efforts should be directed towards better adapting the energy system, in order to integrate growing shares of variable renewable energy, overcome obstacles to RES deployment and reap cost-effective opportunities from the integration of renewables into the buildings and transport sectors within this decade. The transport sector represents today the largest contributor to GHG emissions in the ESD sectors and its emissions are expected to increase by 136 Mt CO_2-eq. in 2020 compared to 1990 under current policies and measures (see Section 4.3 and Figure 4.6). Increasing renewable electricity consumption in transport could reduce GHG emissions in this sector and provide higher flexibility for cost-efficient load-balancing.

Contributions by energy market sectors in Europe

Renewable energy can replace conventional fuels in three distinct sectors: power generation, heating and cooling, and transport fuels. The three renewable energy carriers, renewable electricity (RES-E), renewable heating and cooling (RES-H/C), and renewable energy used in transport (RES-T) are therefore often assessed individually, to express the evolution in the different market sectors in which renewables compete with non-RES.

Renewables were mostly used for heating and cooling, and electricity, in Europe in 2012 (52 % and 40 %, respectively, of the total 2012 RES share), while RES-T was significantly smaller (8 %).

Nevertheless, the gross final consumption of renewables recorded the most rapid growth rate in transport, where it increased on average by 25 % per year between 2005 and 2012 ([59]), albeit from a very low level. Sustainability standards for biofuels used in transport have been in place since 2011. Not all countries have been able to demonstrate compliance with the RED sustainability requirements for biofuels. In 2012, some 21 % of all renewables consumption in transport in the EU came from biofuels which did not comply with the RED sustainability requirements. This was not accounted for towards achievement of the RES targets (see Table 5.1). Compared to the transport sector, the gross final consumption of renewable electricity and of renewable heating and cooling in Europe grew at a slower pace, on average of 7 % and 4 % per year respectively, between 2005 and 2012.

Table 5.1 Gross final consumption by renewable energy carriers (electricity, heating/cooling, transport)

	Gross final energy consumption (Mtoe)				Share in total RES %	Historic growth %/year	Indicative growth %/year
Energy carrier	**2005**	**2011**	**2012**	**2020**	**2020**	**2005–2012**	**2012–2020**
Electricity	42.2	61.1	66.4	103.2	42	6.7	5.7
Heating and cooling	61.1	78.7	82.9	111.8	45	4.5	3.8
Transport	0.0	8.4	11.6	31.5	13		13.3
() = including all biofuels	(3.0)	(13.7)	(14.6)			(25.2)	(10.1)
Total	103.0	148.0	160.7	246.6	100	6.6	5.5
() = including all biofuels	(106.3)	(153.5)	(164.0)			(6.4)	(5.2)
Total GFEC	1 223.1	1 143.9	1 143.2			– 1.0	

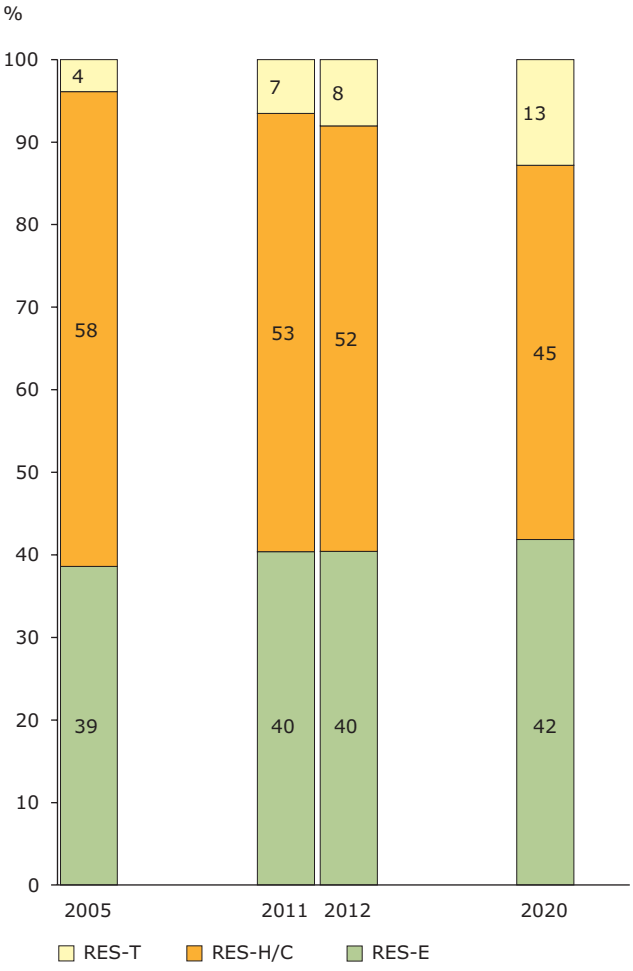
Note: Eurostat SHARES Results 2012 takes into account all biofuels consumed in transport for the period from 2005 to 2010, but starting with 2011, it only considers biofuels complying with RED sustainability criteria. For a consistent comparison across years, this table provides the gross final consumption of renewables accounting only for biofuels complying with RED sustainability criteria (which is only possible from 2010 onwards and for countries that confirmed, in due time, compliance with RED Articles 17 and 18) and, respectively, the gross final consumption of renewables including all biofuels consumed in transport. The specific RED multipliers are not accounted for in the series.

Source: EC, 2013i (for the 2020 shares and absolute contributions); Eurostat, 2014a (for the gross final consumption of renewable transport fuels including only those biofuels complying with RED sustainability criteria) and 2014b (for the other 2005–2012 values).

([59]) All biofuels in transport included; no RED-specific multiplier accounted in the series.

The national RES commitments adopted by Member States in their NREAPs imply that, by 2020, renewable consumption in electricity, heating and cooling and transport should increase by 6 % per year, 4 % per year and 13 % per year, respectively, compared to 2012 levels. In the case of renewable electricity and renewable heating and cooling, this corresponds approximately to the same pace as the growth observed between 2005 and 2012. For renewable transport fuels, maintaining for 2012–2020 the same pace of growth as between 2005 and 2012 would be well sufficient to meet the target. The share of renewable transport fuels is expected to grow both as a share of gross final energy consumption, but also as a share of all renewables (see Figure 5.2).

Figure 5.2 Breakdown of EU renewable energy share into RES-E, RES-H/C and RES-T, and comparison with NREAP 2020



Note: RES-T and total RES shares consider only biofuels in compliance with RED sustainability criteria.

Source: EC, 2013i; Eurostat, 2014a and 2014b.

Contributions of main renewable technologies in gross final energy consumption

As in 2011, solid biomass for heating was the single largest contributing technology also in 2012, at an equivalent of 71 Mtoe (+ 5 % over 2011 levels; 43 % of all 2012 RES). With 30 Mtoe, hydropower provided the second largest contribution in 2012 (18 % of all RES and 45 % of all EU RES-E consumption) (see Figure 5.3). However, the relative importance of hydropower decreased rapidly since 2005, when it provided over 70 % of all RES-E consumption. This trend was observed in the context of a faster penetration of more recent renewable technologies such as wind power (17 Mtoe in 2012, or 10 % all RES), heat pumps (7 Mtoe in 2012, or 4 % of all RES) and solar PV (6 Mtoe in 2012, or circa 4 % of all RES) ([60]). Together, remaining technologies represented only 20 % of the total RES share (33 Mtoe) in 2012.

Countries anticipated in 2010 (NREAPs) that the three main technologies by 2020 will be solid biomass for heating (33 % of total RES share, or circa 80 Mtoe), hydropower (13 % of total RES share, or roughly 32 Mtoe) and wind power (17 % of total RES share, or 42 Mtoe). Together, the remaining technologies were expected to contribute 36 % of the total RES share (circa 90 Mtoe) in that year. Although the main characteristics of the RES technologies were known back in 2010, assumptions regarding the projected evolution of individual technology costs and learning rates were based on 2010 (or earlier) knowledge. Recent developments in certain RES technologies have nevertheless surpassed considerably previous expectations (e.g. solar PV, onshore wind and heat pumps), suggesting that technology-specific expectations in the 2010 NREAP could by now be outdated.

Table 5.2 shows a summary of renewable energy technologies, their historic contributions and their expected contributions by 2020. The breakdown of technologies by RES energy carrier is meant to clarify the past and the expected contribution

([60]) 'Hydropower' refers to normalised hydropower. Shares have been calculated against 'Final consumption of renewable energy including flexibility mechanisms', which assumes normalised hydropower and wind power and includes renewable energy captured by heat pumps (ERES) and final energy consumption of biomethane blended with natural gas.

Table 5.2 Breakdown by RES technologies for electricity (E), heating and cooling (H/C) and transport (T) for EU-28

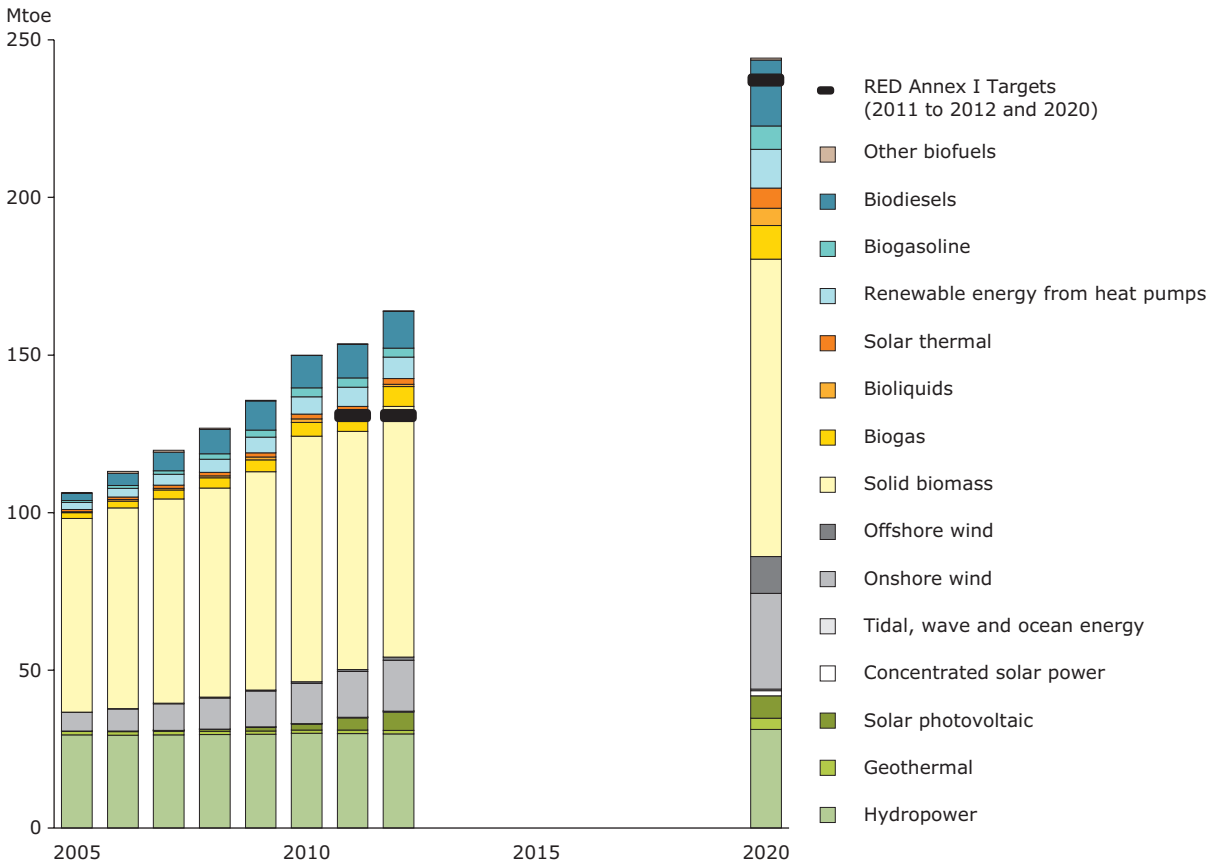
	Actual contribution			NREAP targets	Annual growth		
RES technology	2005	2011	2012	2020	2005–2012	2011–2012	2012–2020
		Mtoe		Mtoe		% per year	
Electricity	**42.17**	**61.12**	**66.4**	**103.48**	**6.7**	**8.6**	**5.7**
Hydropower	29.58	29.97	29.83	31.22	0.1	– 0.5	0.6
Geothermal	0.46	0.51	0.50	0.94	0.9	– 2.0	8.4
Solar photovoltaic	0.13	3.90	5.78	7.06	72.8	48.4	2.5
Concentrated solar power	0.00	0.17	0.32	1.63	n/a	92.8	22.4
Tidal, wave and ocean energy	0.04	0.04	0.04	0.56	– 0.6	– 3.4	39.2
Onshore wind	5.80	14.45	16.15	30.30	15.8	11.8	8.2
Offshore wind	0.15	0.66	0.93	11.74	30.4	40.7	37.2
Solid biomass	4.76	7.89	8.54	13.43	8.7	8.3	5.8
Biogas	1.10	3.25	3.99	5.49	20.2	22.7	4.1
Bioliquids	0.15	0.28	0.31	1.10	10.8	9.4	17.0
Heating and cooling	**61.11**	**78.69**	**82.94**	**111.8**	**4.5**	**5.4**	**3.8**
Geothermal	0.58	0.57	0.61	2.65	0.7	7.2	20.1
Solar thermal	0.70	1.71	1.84	6.46	14.8	7.6	17.0
Solid biomass	56.65	67.67	71.04	80.89	3.3	5.0	1.6
Biogas	0.75	2.21	2.29	5.11	17.3	3.6	10.5
Bioliquids	0.17	0.40	0.39	4.42	12.9	– 4.7	35.6
Renewable energy from heat pumps	2.26	6.12	6.78	12.29	17.0	10.7	7.7
Transport	**3.03**	**13.71**	**14.61**	**28.88**	**25.2**	**6.5**	**8.9**
Biogasoline	0.56	2.89	2.85	7.32	26.3	– 1.2	12.5
Biodiesels	2.31	10.73	11.64	20.98	26.0	8.5	7.6
Other biofuels	0.17	0.10	0.12	0.57	– 4.5	20.5	21.3
Total (wind and hydro not normalised; including all biofuels)	103.65	150.64	163.55	n/a	**6.7**	**8.6**	n/a
Total (normalised; including all biofuels)	106.31	153.53	163.96	244.16	**6.4**	**6.8**	**5.1**

Note: Some deviations from the figures may result from rounding off and differences in the statistical calculations used.

Source: EC, 2013i; Eurostat, 2014a and 2014b.

(NREAP) of each technology towards the three distinct energy market sectors. It is also possible to group technologies by their renewable energy source, in which case biomass-based technologies become visibly dominant among other technologies both in the year 2012 (101 Mtoe, corresponding to 61 % of all RES consumption) and in 2020 (139 Mtoe, corresponding to a slightly lesser, 57 % RES share).

Figure 5.3 Historic and expected contributions from renewable energy technologies



Source: EC, 2013i; EurObserv'ER, 2014; Eurostat, 2014a and 2014b.

5.2 Progress towards national 2020 RES targets

Progress towards interim targets

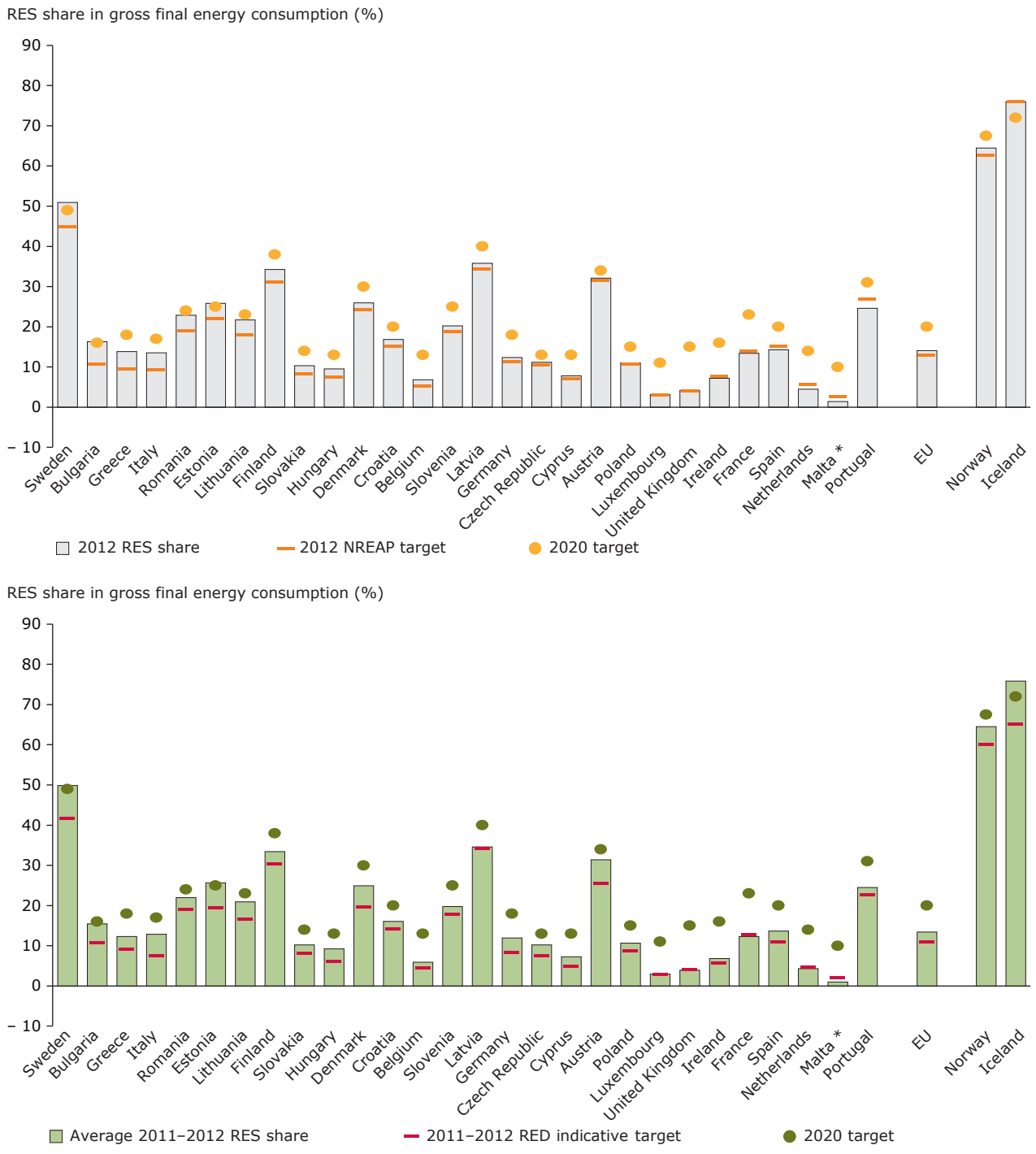
In 2012, 22 Member States (Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Germany, Estonia, Greece, Croatia, Italy, Latvia, Lithuania, Luxembourg, Hungary, Austria, Poland, Romania, Slovenia, Slovakia, Finland, Sweden and the United Kingdom), as well as Iceland and Norway, were considered to be on track for meeting their RES targets: these countries had exceeded both their indicative 2011–2012 RED targets and their expected 2012 NREAP targets. The United Kingdom had exceeded its expected 2012 NREAP target and was just about in compliance with its 2011–2012 RED target (see Table 5.3).

Three Member States (Ireland, Portugal and Spain) had reached or exceeded their indicative RED targets for 2011 to 2012, but were below their expected 2012 NREAP target.

Three Member States (France, Malta and the Netherlands) were not on track towards their RES targets. These countries had not reached in 2012 their indicative RED target nor their expected NREAP targets.

Renewable shares in national gross final energy consumption vary considerably across European countries. In 2012, Luxembourg, Malta, the Netherlands and the United Kingdom each had a share lower than 5 % (compared with an EU share of 14.1 %), while the national shares in Austria, Iceland, Latvia, Norway and Sweden exceeded 30 % (see Figure 5.4).

Figure 5.4 2012 share of renewable energy in gross final energy consumption in EEA countries and RES targets



Note: The 2020 targets are set in the RED. The targets for Iceland and Norway are part of Annex IV to the EEA Agreement.

The countries are ordered according to the decreasing distance between 2012 RES share and expected 2012 NREAP target. Countries appearing on the left side of the figure are the best performers in increasing their share of renewables. To make comparison of the results across both figures easier, the same ordering of countries is kept for the lower figure.

In accordance with the accounting rules in the RED, electricity generated by hydro and wind were normalised for annual variations (hydro for 15 years and wind for 5 years). For details on the normalisation rule, please see the SHARES manual provided by Eurostat: see http://epp.eurostat.ec.europa.eu/portal/page/portal/energy/other_documents.

* Data are estimated by Eurostat, based on the national data transmission under Regulation (EC) No 1099/2008 on energy statistics.

Source: Eurostat, 2014a and 2014b.

Table 5.3 Member State progress towards interim RES targets in 2012

	Interim RED target (%)	RES share (%)	Expected NREAP target (%)	RES share (%)	Overall progress in 2014
	2011–2012 average	2011–2012 average	2012	2012	2012
Austria	25.4	31.4	31.6	32.1	
Belgium	4.4	6.0	5.2	6.8	
Bulgaria	10.7	15.5	10.7	16.3	
Croatia	14.1	16.1	15.1	16.8	
Cyprus	4.9	7.3	7.1	7.8	
Czech Republic	7.5	10.3	10.5	11.2	
Denmark	19.6	25.0	24.2	26.0	
Estonia	19.4	25.7	22.0	25.8	
Finland	30.4	33.5	31.0	34.3	
France	12.8	12.4	14.0	13.4	
Germany	8.2	12.0	11.4	12.4	
Greece	9.1	12.3	9.5	13.8	
Hungary	6.0	9.3	7.4	9.6	
Ireland	5.7	6.9	7.6	7.2	
Italy	7.6	12.9	9.2	13.5	
Latvia	34.1	34.7	34.3	35.8	
Lithuania	16.6	21.0	18.0	21.7	
Luxembourg	2.9	3.0	2.9	3.1	
Malta	2.0	1.1	2.6	1.4	
Netherlands	4.7	4.4	5.6	4.5	
Poland	8.8	10.7	10.6	11.0	
Portugal	22.6	24.6	26.9	24.6	
Romania	19.0	22.1	19.0	22.9	
Slovakia	8.2	10.3	8.2	10.4	
Slovenia	17.8	19.8	18.7	20.2	
Spain	11.0	13.7	15.1	14.3	
Sweden	41.6	49.9	44.9	51.0	
United Kingdom	4.0	4.0	4.0	4.2	
EU	11.0	13.5	13.0	14.1	
Iceland	65.1	75.9	76.0	76.0	
Norway	60.1	64.5	62.7	64.5	

Note: RED: Renewable Energy Directive; NREAP: National Renewable Energy Action Plan.

In the coloured cells containing RES shares, a green colour indicates that the RES share was higher than the respective target, while a orange colour indicates a RES share being lower than the respective target.

In the last column, Member States are considered to be on track (green cells) if the RES share was higher than both interim targets. Member States are considered to be partly on track (light yellow cells) if, while the RED target was met, the NREAP target was not. Member States are considered not to be on track (orange cells) if the RED target was not met.

With regard to the calculation of its gross final energy consumption, Cyprus notified the EEA that it intends to make use of the derogation in Directive 2009/28/EC, which allows it to consider the amount of energy consumed in aviation, as a proportion of its gross final consumption of energy, to be no more than 4.12 %.

Source: EC, 2013i; EU, 2009b; Eurostat, 2014a and 2014b.

Although this reflects differences in policies to stimulate renewables, it also largely reflects different starting points in the deployment of renewables and different availabilities of low cost renewables sources (such as hydro and geothermal) in each country.

Sweden, Latvia and Finland had the highest shares of renewables in the EU (51 %, 36 % and 34 % of RES in gross final consumption). Among EEA member countries, Iceland and Norway had a very high consumption of renewables, of 76 % and 64 %

Table 5.4 Evolution of progress on RES targets between the 2013 and 2014 assessments

	RES share vs 2011–2012 RED target		RES share vs NREAP target		Overall progress	
Statistical year used for the assessment	2011	2011–2012	2011	2012	2011	2012
Austria		→		↗		↗
Belgium		→		→		→
Bulgaria		→		→		→
Croatia		→		→		→
Cyprus		→		↗		↗
Czech Republic		→		↗		↗
Denmark		→		→		→
Estonia		→		→		→
Finland		→		→		→
France		→		→		→
Germany		→		→		→
Greece		→		→		→
Hungary		→		→		→
Ireland		→		→		→
Italy		→		→		→
Latvia		↗		↗		↗
Lithuania		→		→		→
Luxembourg		↗		↗		↗
Malta		→		→		→
Netherlands		→		→		→
Poland		→		→		→
Portugal		→		→		→
Romania		→		→		→
Slovakia		→		→		→
Slovenia		→		→		→
Spain		→		→		→
Sweden		→		→		→
United Kingdom		↗		↗		↗
EU		→		→		→
Iceland	n/a		n/a		n/a	
Norway		→		→		→

Note: NREAP progress is assessed based on the actual RES share and the expected NREAP target. RED progress is assessed based on the 2011 RES share (2013 assessment) or the 2011–2012 average RES share (2014 assessment), and the indicative RED targets for 2011 to 2012.

The colour of the cell indicates whether the country is on track towards meeting its target (see also Table 5.3). Arrows indicates a change in the situations observed in 2011 and in 2012.

Source: EC, 2013i; EU, 2009b; Eurostat, 2014a and 2014b.

respectively of gross final consumption in 2012. The lowest 2012-RES shares were reported in Malta (1 %), Luxembourg (3 %), and the United Kingdom and the Netherlands (4 % each).

Progress compared to previous year

A comparison of these assessment results, based on 2011 and 2012 data on RES shares, with assessment results based only on 2011 statistics, shows an overall improvement of the situation in the EU. Six Member States (Austria, Cyprus, the Czech Republic, Latvia, Luxembourg and the United Kingdom), as well as Iceland, improved their performance. In all these countries, RES shares in 2012 were higher than the expected 2012 NREAP targets, while 2011 shares were lower than the expected 2011 NREAP targets. Conversely, no Member States has seen its situation deteriorate. Yet this also means that three Member States (France, Malta and the Netherlands) are still not on track to meet their renewable objectives.

Intended progress towards national 2020 RES targets

According to the Member States' indicative trajectories presented in their 2010 NREAP reports ([61]), 23 of 28 countries intend to reach their binding renewable energy target for 2020 (RED) without using the cooperation mechanisms provided under the RED; 10 countries expect to over-achieve their binding RES target, and four countries expect a deficit in 2020 compared to their binding RES target. The national NREAP surplus was estimated at around 5.5 Mtoe (or around 2 % of the total renewables needed in 2020), but an updated assessment of the estimated NREAP deficit or surplus at EU level would need to take into account the latest Member States' progress reports of 2013. If achieved, a RES surplus could be available for transfer among Member States through the use of the directive's cooperation mechanisms ([62]).

From the entry into force of the RED (on 5 December 2010), Member States and the EU have 10 years to increase their RES shares, so as to comply with the mandatory (RED) and expected (NREAP) targets for 2020. For some countries, the remaining progress until 2020 in relation to their 2020 NREAP target is slightly higher than the 2020 RED target.

In 2012, all countries, with the exception of Malta, had achieved a RES share equivalent to 20 % or more of their 2020 RED targets in the year 2012. Three Member States (Luxembourg, the Netherlands and the United Kingdom) had a RES share below 40 % of their 2020 RED target. Four Member States (Cyprus, Belgium, France and Ireland) had a RES share of between 40 % and 60 % of their 2020 RED target, seven Member States (Germany, Hungary, Italy, Poland, Portugal, Slovakia and Spain) had a share between 60 % and 80 % of their 2020 RED target and 13 other Member States had a RES share either very close to their 2020 RED target (Romania at 95 %, Austria and Lithuania at 94 %, Finland and Latvia at 90 %, and Denmark at 87 %) or already above it (Bulgaria, Estonia and Sweden). Iceland also had a RES share above its 2020 RED target, while the RES share of Norway was about 96 % of its 2020 RED target in 2012.

By 2020, however, Ireland, Luxembourg, Malta ([63]), the Netherlands, Portugal and the United Kingdom need to achieve absolute RES growths that are four to seven times higher than the absolute increases these countries achieved between 2005 and 2012. Belgium, Croatia, Cyprus, France, Greece, Hungary, Latvia, Romania and Spain also need to achieve absolute growth two to three times higher compared to the period 2005 to 2012.

To date, most EU countries provide financial incentives (subsidies, soft loans for investments/equipment) or fiscal incentives (tax reduction for energy/CO_2 efficient equipment/investments, tax credit/deduction) to promote RES, especially in the household sector. Most countries have implemented feed-in tariffs and/or green certificates to increase electricity production from renewable sources. The RED provides also for specific cooperation mechanisms (joint projects, joint support schemes and the possibility for statistical transfers between countries) in order to help countries achieve their targets in a cost-effective way, without undermining market stability.

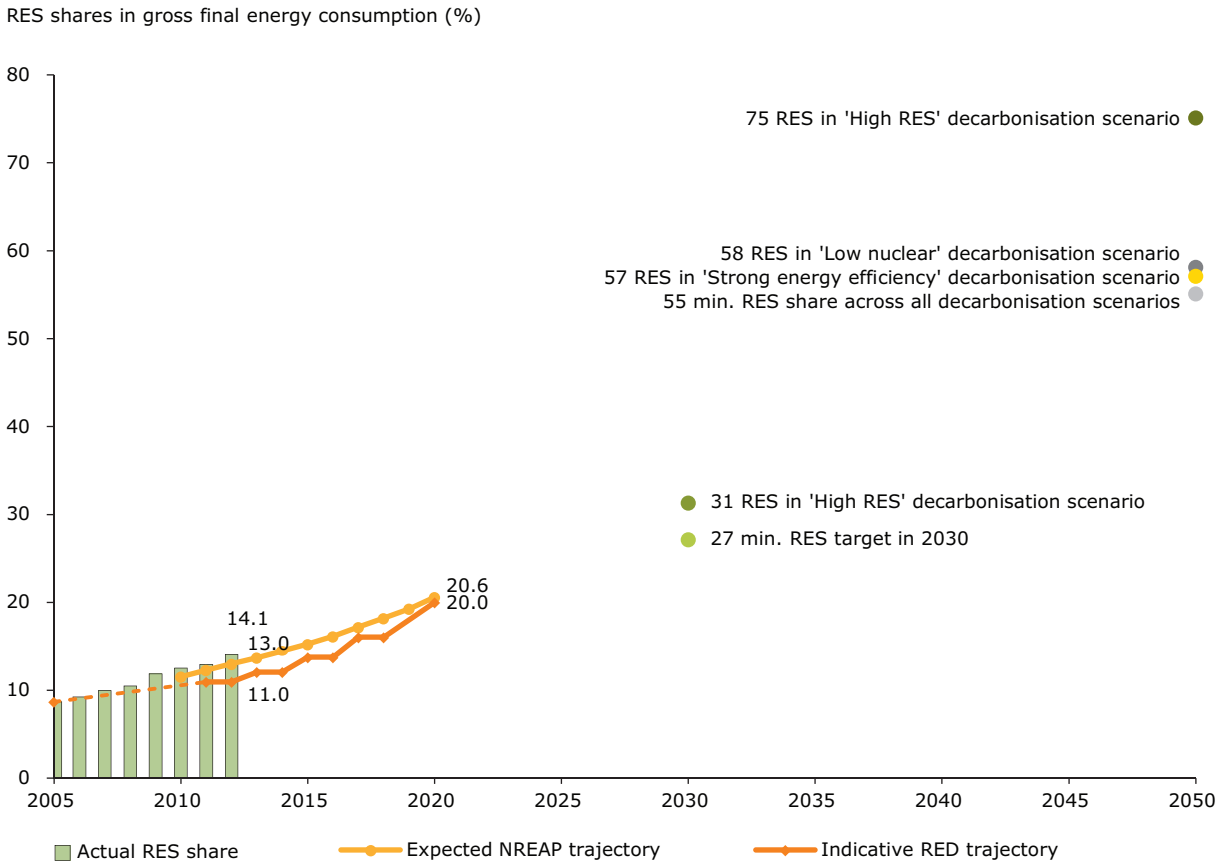
([61]) Results from the European Commission (2010), 'Summary of the Member States Forecast documents' (available on the website, see http://ec.europa.eu/energy/renewables/action_plan_en.htm) and information provided by Denmark to the EEA.
([62]) Total transfers required by Member States with expected deficit shares of renewable energy in gross final energy consumption in 2020 was estimated to be around 2 Mtoe, or less than 1 % of the total RES in 2020 based on the NREAPs.
([63]) For Malta, the necessary increase would be up to 13 times higher.

5.3 Post-2020 RES targets

In October 2014, the European Council endorsed a target of at least 27 % renewable energy in final energy consumption by 2030. It thereby endorsed the target proposed by the Commission in its 2030 framework for climate and energy policies (EC, 2014a) (see Figure 5.5). This target, binding at EU level, will not be translated into nationally binding targets. Individual Member States are free to set their own higher national targets. This minimum RES target is slightly higher than the 23 % to 26 % RES share expected to be achieved in Europe in 2030 in the absence of new climate and energy policies, post-2020 (see EU Reference Scenarios in EC, 2014c).

Beyond 2030, many moderate projections estimate the penetration of renewables in the 30 % to 50 % range, while high-renewables scenarios project the RES share in the 55 % to 95 % range. The European Commission's long-term decarbonisation scenarios in the Energy Roadmap 2050 estimate that a minimum 55 % share of renewables in gross final EU energy consumption will be necessary to achieve the EU's long-term GHG reduction objective of 80 % to 95 % below 1990 levels (EC, 2011e). The penetration of renewables in Europe reaches 75 % of gross final energy consumption in the high RES scenario of the Energy Roadmap 2050 (i.e. up 65 % from 2010 levels, representing over 1 900 GW of installed RES capacity, or roughly 8 times today's installed RES capacity, and more than twice the size of the total current generation capacity for all fuels), with renewables in transport increasing to 73 % of all transport fuels, and renewables in power generation reaching 86 % of all generation.

Figure 5.5 Trends, targets, and long-term scenarios for renewable energy in the EU



Note: The share of at least 27 % in 2030 is a target endorsed by the European Council in October 2014. The post-2020 RES shares belong to scenarios presented in the Commissions' Energy Roadmap 2050. These scenarios correspond to various mixes of mitigation options to achieve the EU's GHG reduction objective of 80 % to 95 % below 1990 levels by 2050.

Source: EC, 2011e and 2013i; EU, 2009b; European Council, 2014; Eurostat, 2014a and 2014b.

6 Progress towards 2020 target for energy efficiency

Key messages

- The EU is currently on track towards meeting its energy efficiency target. In 2012, its primary and final energy consumption had decreased faster since 2005 than if they would just have been linearly decreasing to meet the 2020 targets. In conjunction with the implementation of energy efficiency policies, the economic recession played an important part in this result. As economic growth slowly picks up again across Europe, further efforts will be necessary to adequately implement and enforce energy efficiency policies at national level, in order to ensure that the 2020 target is actually met.

- All Member States have set their own energy efficiency targets for 2020, as required under the EED. Taken together, these national targets currently fall short of the 20 % EU-level target. Their collective primary energy consumption in 2020 is expected to remain higher than the EU objective by a gap of 4 %. According to the Commission's July 2014 energy efficiency communication, the EU could miss its 2020 target by a gap of 1 % to 2 % (between 20 Mtoe and 40 Mtoe) in the absence of better implementation or enforcement of the current policies and measures in place in Member States.

- Seventeen Member States (the Czech Republic, Croatia, Cyprus, Denmark, Finland, Greece, Hungary, Ireland, Italy, Latvia, Luxembourg, Portugal, Romania, Slovakia, Slovenia, Spain and the United Kingdom) are considered to be on track towards their 2020 energy efficiency targets. These countries have so far succeeded in reducing or limiting their primary energy consumption and final energy consumption below a linear target path between 2005 levels and the 2020 targets. Seven Member States (Austria, Bulgaria, France, Lithuania, Malta, the Netherlands and Poland) are only partly on track to meet their energy consumption targets, because they are only on track towards either their primary or their final energy consumption target. Four Member States (Belgium, Estonia, Germany and Sweden) are not considered to be on track towards any of these targets. All these Member States need to enhance the reduction or limitation of their energy consumption by better implementing and further develop their energy efficiency policies in order to achieve their 2020 targets. Compared to the situation observed in 2011, the assessment results based on 2012 energy consumption levels show an improvement in the situation of Finland, Malta, Poland and Slovenia, while the situation deteriorated in Estonia, France and Germany.

- Article 7 of the EED sets a target for Member States to achieve final energy savings in end-use sectors. The target must be equal to achieving new final energy savings of at least 1.5 % every year between 2014 and 2020 by using energy efficiency obligations schemes or other alternative policy measures. This means that by 1 December 2020, at least 10.5% savings have to be achieved through new measures since 1 January 2014. The use of exemptions by Member States to reduce this target on energy savings, as well as the inclusion of measures which are not eligible, might limit the contribution of the commitments made under this requirement to fulfilling national energy efficiency targets.

- In October 2014, the European Council endorsed an indicative target of 27 % for energy efficiency, to be reviewed in 2020 having in mind a 30 % target. The European Commission had proposed a 30 % energy savings target for 2030, following a review of the Energy Efficiency Directive.

6.1 Overall progress towards the EU's 2020 energy efficiency target

Current progress

The EU has been reducing its energy consumption since 2005 (see Figure 6.1). In 2012, the EU's primary energy consumption ([64]) was 1 585 Mtoe, while the final energy consumption ([65]) was equal to 1 104 Mtoe (see Box 2.1 for definitions of primary and final energy consumption). Compared to 2011, primary and final energy consumption decreased by 0.5 % and 0.3 %, respectively. In 2012, primary energy consumption was 7.3 % lower than in 2005 and final energy consumption was 7.1 % lower than in 2005.

Primary and final energy consumption in Europe decreased every year between 2005 and 2012 except for a slight increase in 2010 due to a severe winter combined with a mild recovery from the economic recession in 2009.

The observed trend in primary energy consumption results from a number of factors with opposing effects. Factors driving primary energy consumption down include an increased efficiency in conversion, as well as a decreasing share of nuclear energy and thermal generation (excluding combined heat and power (CHP)), and an increasing share of renewables in electricity. This is because nuclear is considered as having a lower than average transformation efficiency, while renewables such as hydro, solar PV, wave and tidal, and wind, are considered to have 100 % transformation efficiency, which improves statistically the overall conversion efficiency of the system. The increase in consumption of renewables (such as wind, solar photovoltaics (PV) and hydro) from 2005 levels is estimated to have contributed to a 3.2 % reduction in primary energy consumption (EEA, 2014j). Conversely, an increasing share of electricity as energy carrier results in an increase in primary energy consumption because it lowers overall conversion efficiencies.

The trend in final energy consumption was influenced by structural changes in various end-use sectors (in particular industry), improvements in end-use efficiency, increasing living standards, and climatic conditions ([66]).

The EU's 20 % energy efficiency target corresponds to:

- an absolute level of 1 483 Mtoe in primary energy consumption ([67]). This represents a 13.3 % reduction compared to the EU's primary energy consumption in 2005 and is equivalent to an average annual reduction of 0.9 % per year over the whole 2005–2020 period.
- Or an absolute level 1 086 Mtoe in final energy consumption. This is 8.7 % lower than the 2005 level and corresponds to an average annual reduction of 0.6 % per year during the period 2005–2020.

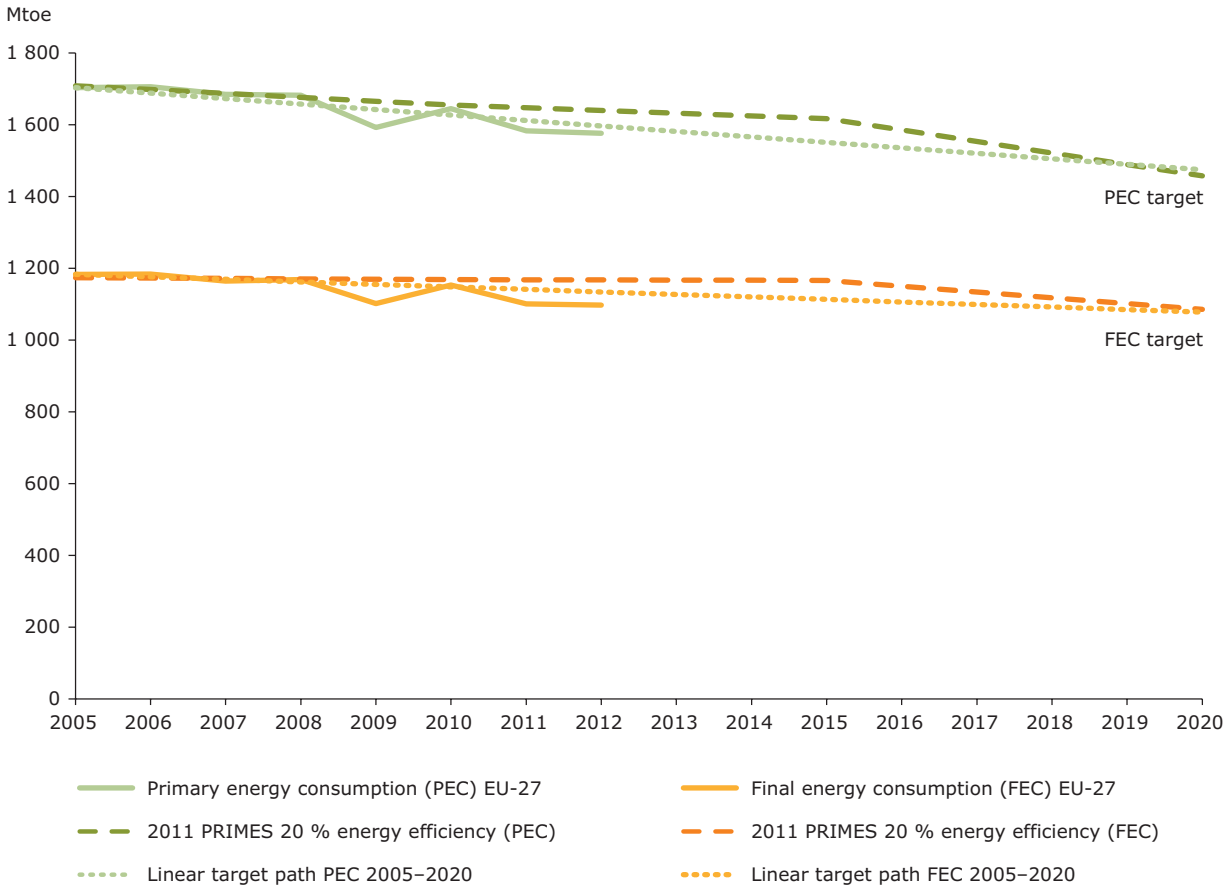
The EU is currently on track towards achieving its 2020 target on energy efficiency. The 2005–2012 overall reductions in primary and final energy consumption were faster than the average 2005–2020 reductions required to achieve both targets: primary energy consumption decreased by an annual average of 1.1 % per year vs a linear decrease to target of 0.9 % per year and final energy consumption decreased by an annual average of 1.0 % per year vs a linear decrease to target of 0.6 % per year (see Figure 6.1).

In addition, the 2012 levels of primary and final energy consumption were lower than those projected for that year in the PRIMES 20% efficiency scenario, which encompasses sufficient measures to meet the 20% energy efficiency target. This reference scenario was developed in 2011 as part of the impact assessment for the EED ([68]) (see Figure 6.1).

This result can be partly attributed to the effects of policies and measures promoting renewable energy and energy efficiency. The effects of the economic recession on energy demand are also likely to have had a significant influence on these developments and to continue having a lasting effect on energy consumption in the EU (EEA indicator ENER17).

([64]) Primary energy in the context of the EED means gross inland energy consumption minus non-energy use. See also definition in Box 2.1.
([65]) Final energy consumption includes all energy delivered to the final consumer's door (in industry, transport, households and other sectors) for all energy uses. It excludes deliveries for transformation and/or own use of the energy-producing industries, as well as network losses.
([66]) For example, 2010 was an exceptionally cold year, and 2012 was colder than 2011. Therefore energy consumption, in particular in households, was significantly influenced by climatic conditions.
([67]) This level is 20 % lower than the projection for 2020 defined in the PRIMES baseline scenario in 2007.
([68]) This scenario was used in the impact assessment of the EED and assumes that sufficient measures are in place to achieve the 20 % energy efficiency objective at EU level. For details, see http://ec.europa.eu/energy/efficiency/eed/doc/2011_directive/sec_2011_0779_ia_annexes.pdf.

Figure 6.1 Trends and projections of EU's primary and final energy consumption, 2005–2020



Note: Croatia was not included in the graph because it was not included in the PRIMES energy efficiency scenario in 2011; for the sake of consistency it was excluded from the EU observed trend. Croatia's energy consumption is sufficiently small in relation to the EU-27's so as to not significantly impact the overall conclusion.

Source: EC, 2011d.

The European Commission's 2007 baseline scenario was used to quantify the levels of primary and final energy consumption that the EU should achieve by 2020 in order to improve its energy efficiency by 20 %. This exercise was reproduced in 2009, taking the effects of the economic recession into account ([69]). According to the 2009 baseline energy scenario, recovery from the crisis is not expected to be so vigorous that the current GDP losses will be compensated for. A comparison of the two baseline energy scenarios shows that the 2009 baseline assumes a lower energy consumption between 2005 and 2020 than the 2007 baseline (– 8 % in 2020). This can be explained mainly by the impact of additional policy initiatives and the economic recession.

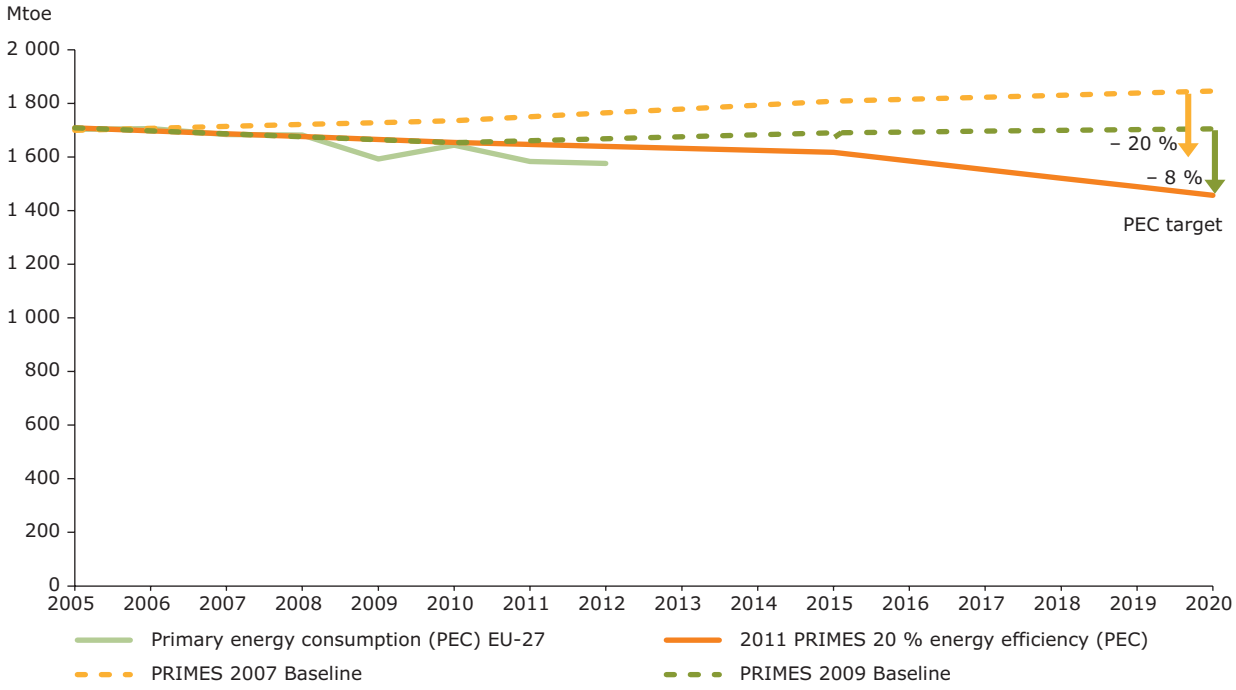
Projected progress

In its energy efficiency communication of July 2014 (EC, 2014i), the European Commission projects that if the current policies and measures in place in Member States are not better implemented or enforced, the EU will achieve energy savings of between 18 % and 19 % in 2020, falling short of the 20 % savings target by between 20 Mtoe and 40 Mtoe.

This result may appear somewhat in contradiction with the assessment of current progress according to which, on the basis of 2012 energy consumption levels, the EU is currently on track towards its 20 % energy efficiency target. It can actually be explained

([69]) The recent EU Member State Croatia is not included in the PRIMES 2007 as well as the PRIMES 2009 baseline scenario. This omission has no significant impact on the results and conclusions in general.

Figure 6.2 Primary energy consumption baseline in the EU-27 (PRIMES 2007, PRIMES 2009) in comparison with the 2020 energy efficiency target



Source: EC, 2008 and 2010.

by the effects of the economic recession on current and projected EU energy consumption levels.

The economic recession in the EU contributed to reduced energy consumption levels in 2012 and this effect is expect to last in the long term, as explained in the previous section. The recent impact assessment accompanying the energy efficiency communication (EC, 2014i) estimates that, if the current economic trends continue, about a third of the reduction in energy consumption compared to the 2007 baseline scenario can be attributed to growth being lower than expected during the financial crisis. At the same time, economic recovery could stimulate energy demand across the EU and make the 2020 target less easy to reach as could be anticipated on the basis of current levels.

The EU's 2020 target could nevertheless be achieved through full implementation of the current policies and measures. In its assessment of the Member States' third NEEAPs, the Commission noted that the full implementation of some national measures could allow certain Member States to over-achieve their national targets (see Section 6.2).

Because the recession risks sending the misleading signal that energy efficiency targets might be achieved with a reduced level of policy effort, all Member States should pursue their efforts to fully implement and enforce the agreed legislation, and to overcome common barriers associated with energy efficiency improvements, such as high capital costs and lack of access to information.

6.2 Ambition level of national 2020 energy efficiency targets

Implementing the EED at national level should provide a significant contribution towards achieving the EU 2020 target on energy efficiency, but the overall level of ambition of Member States still remains insufficient.

Under the EED, Member States determined their own indicative (non-binding) targets for primary and/or final energy consumption. These targets are supported by the EED itself, as well as the EPBD, product regulations laying down minimum energy performance standards and putting energy performance information on labels, CO_2 performance standards for cars and vans, increased financing through EU Structural and Investments (ESI) Funds, Horizon 2020, and dedicated facilities such as ELENA and the European Energy Efficiency Fund, the roll-out of smart meters following the Internal Electricity Market Directive, as well as the EU ETS.

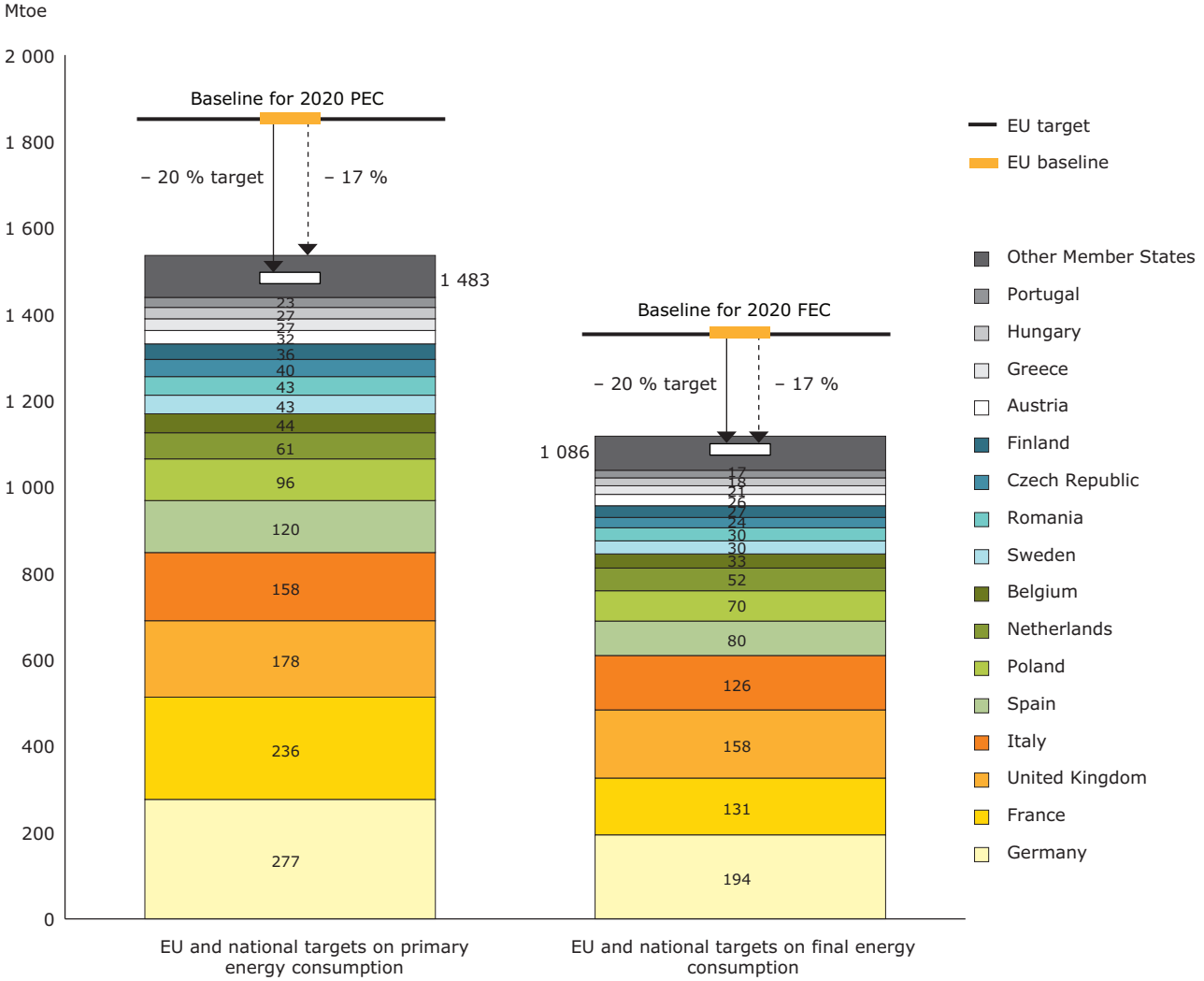
Although achieving the level of ambition currently seen in the Member States targets would go a long way towards meeting the 20 % energy efficiency target, it would not be sufficient to achieve it. If all Member States would strictly achieve their national targets under the EED, the EU's primary and energy consumption would decrease to levels close to overall EU 2020 targets (see Figure 6.3).

The sum of all 2020 targets for primary energy consumption from 27 Member States (Croatia does not have a target on primary energy consumption) is equal to 1 536 Mtoe, a level 17 % lower than the baseline level for 2020 (established in 2007) and higher by 53 Mtoe than the EU target of 1 483 Mtoe.

When it comes to final energy consumption, the cumulated target for the 28 Member States is also 18 % lower than the baseline level for 2020 and 32 Mtoe above the EU target of 1 086 Mtoe.

When comparing 2020 targets with 2012 emission levels, it appears clearly that for some Member States, the set targets provide large potential for increasing either primary or energy consumption between 2012 and 2020 (see Figure 6.4).

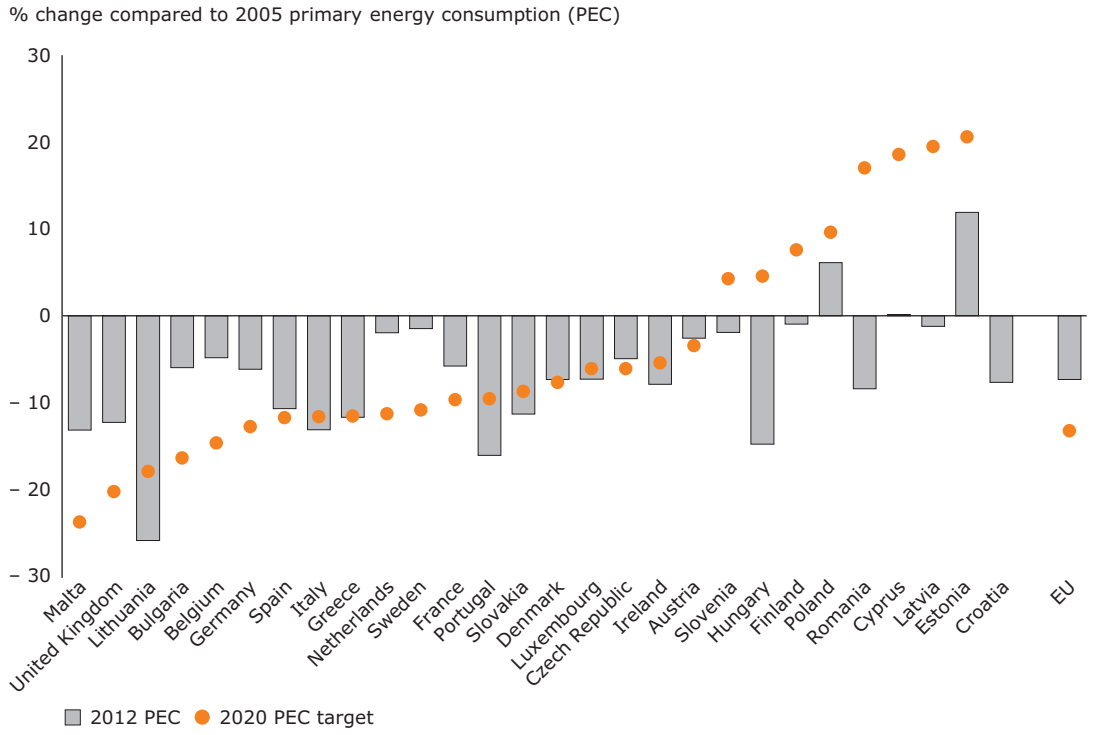
Figure 6.3 Overall ambition level of national targets for primary and final energy consumption by 2020

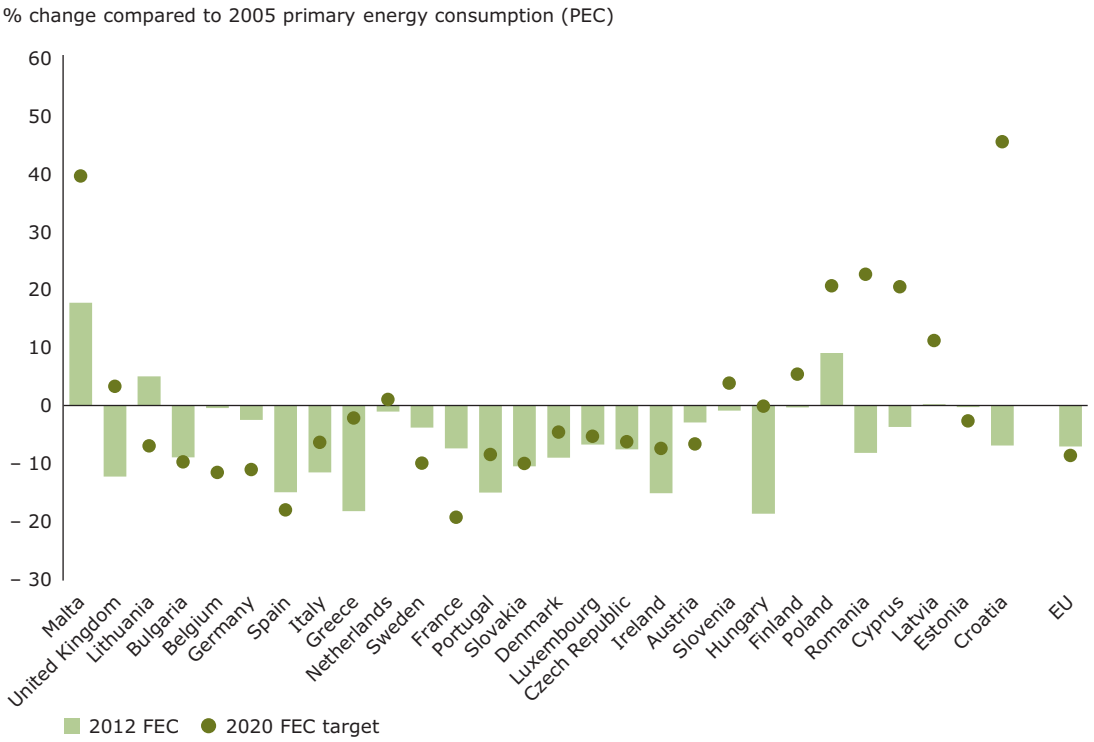


Note: The Member States grouped as 'Other Member States' are those which have a 2020 target on primary energy consumption lower than 20 Mtoe and a 2020 target on final energy consumption lower than 15 Mtoe. These countries are (in decreasing magnitude of 2020 target on primary energy consumption): Denmark, Slovakia, Bulgaria, Ireland, Slovenia, Estonia, Lithuania, Latvia, Luxembourg, Cyprus, Malta and Croatia. Croatia does not have any target on primary energy consumption; its final energy consumption target ranks between those of Slovakia and Bulgaria,

Source: EC, 2008; Reported targets under Article 3 of the EED in 2013, including updates of Cyprus, Malta, Spain and Sweden.

Figure 6.4 2012 primary energy consumption and 2020 national targets compared to 2005 levels





Note: PEC: primary energy consumption; FEC: final energy consumption.

The countries are ordered according to their 2020 target on primary energy consumption (relative to 2005 levels). To make comparison of the targets across both figures easier, the same ordering of countries is kept for the lower figure.

Croatia has not defined any 2020 target on primary energy consumption.

Source: Eurostat, 2014b; Reported targets under Article 3 of EED in 2013, including updates of Cyprus, Malta, Spain and Sweden.

6.3 Contribution from energy efficiency obligation schemes

Under Article 7 of the EED, Member States must achieve 1.5 % of new energy savings from sales to final consumers every year between 2014 and 2020 by using energy efficiency obligations schemes or other alternative policy measures to drive energy efficiency improvements at the end consumer's side. This corresponds to a cumulative 10.5 % saving on energy end use, by 2020.

In December 2013, Member States had to report on how they plan to establish energy efficiency obligation schemes under Article 7 of the EED. In April 2014, Member States submitted their third NEEAPs. Only five Member States had transposed the EED into national legislation by the official deadline of 5 June 2014 (EC, 2014i).

The implementation of Article 7 (energy efficiency obligation schemes) is expected to be responsible for around three quarters of the savings the EED should achieve. National submissions under Article 7 of the EED in December 2013 describe how countries plan to implement this requirement; therefore, an assessment of these submissions should provide insights on progress toward meeting the 2020 targets ([70]).

The *Guidebook for Strong Implementation* (CES, 2014) of the Coalition for Energy Savings ([71]) estimates that only about 0.8 % annual savings from energy sales will be achieved on average through Article 7 type measures, rather than 1.5 % as envisaged in the EED. This is due to the exemptions that Member States are permitted to use when setting their energy efficiency obligation scheme, as well as the inclusion in their plans, by some Member States, of measures that would not normally qualify as relevant, according to the implementation guidelines (EC, 2013g).

The exemptions, that Member States are permitted to use when setting their energy efficiency obligation scheme, may include sales of energy used in transport, the progressive phase-in of the 1.5 % target, and part or complete exclusion of the energy sold to EU ETS operators. In addition, certain savings can also count towards the target: savings resulting from energy-saving actions implemented between 2008 and 2014 that continue to have an impact in 2020, and savings achieved in the energy transformation, distribution and transmission sectors under Articles 14 and 15 of the EED.

As an alternative to setting up energy efficiency obligation schemes, Member States may implement other policies and measures aiming to achieve energy savings among final consumers, provided that those measures meet certain criteria laid out in Article 7(10). In addition, they should ensure that those policies and measures qualify to be included, and that their additionality (among others) can be proved. Some countries included in their Article 7 reporting measures that do not qualify to be counted against their commitments. For example, Croatia, Cyprus, Denmark, France, Italy and Malta report support to renewable energy which, according to the guidelines (EC, 2013g) would not normally qualify to be included as part of the measures eligible to comply with requirements under Article 7, because its main purpose is not energy efficiency ([72]) (CES, 2014). Other countries show a very strong reliance on a particular single measure, without specifying whether it actually qualifies to be included. For example, the United Kingdom reported that building codes represent a measure meant to achieve over 50 % of the Article 7 target, but did not specify whether the codes go beyond the minimum requirements according to the EPBD (EU, 2010b) ([73]).

6.4 Progress towards national 2020 energy consumption targets

Progress achieved between 2005 and 2012

Between 2005 and 2012, most Member States experienced an overall decline of their primary and their final energy consumption (see Figure 6.5 and Table 6.1). Six Member States (Cyprus, Estonia, Latvia, Lithuania, Malta and Poland) showed an

([70]) The assessment of the national reporting under Article 7 of the EED builds significantly on the report 'Implementing the EU Energy Efficiency Directive: Analysis of Article 7 Member States reports' by the Coalition for Energy Savings (CES, 2014).
([71]) An organisation uniting businesses, professionals, local authorities, trade unions and civil society organisations to 'make energy efficiency and savings the first consideration of energy policies and the driving force towards a secure, sustainable and competitive EU'.
([72]) In the case of Italy, the information is not clear enough to distinguish between energy efficiency and renewable energy.
([73]) Directive 2010/31/EU provides for a common general framework for a methodology to calculate minimum energy performance standards for buildings and building units. Regulation (EU) No 244/2012 includes a comparative methodology. Member States may use national methodologies, but if there is a difference of more than 15 % between the results from the application of the comparative methodology provided in the regulation and building codes in force, Member States would have to justify this difference, or take appropriate steps to reduce the difference.

increasing trend in either primary or final energy consumption during this period. Poland is the only Member State which experienced an increase in both primary and final energy consumption between 2005 and 2012. This increase in energy consumption can be explained by economic growth, particularly driving energy consumption in the transport sector. The largest relative increase in final energy consumption during the period took place in Malta (+ 17.8 %). This increase took mainly place in the transport sector (+ 39 %) and, to a lesser extent, in the industry and service sectors (+ 9 % and + 9.7 %, respectively). As these increases cannot be fully explained by increases in activity, energy efficiency could actually have declined. In 2014, Malta also reduced the ambition level of its 2020 target for final energy consumption by 44 %.

In the absence of reliable projections on energy consumption level at Member State level, the assessment of progress towards achieving energy efficiency targets at national level was solely based on historic energy consumption levels. The assessment consists in comparing the effort achieved by each Member State in 2012 in reducing or limiting its energy consumption (trends in primary and final energy consumption between 2005 and 2012) and indicative levels of effort which would be required to achieve the 2020 targets in a linear way between 2005 and 2020 (this corresponds to a linear target path between 2005 levels and 2020 targets). 2005 was chosen here as a single base year to allow for a comparable assessment of trends across Member States. This method allows an equal treatment of Member States, irrespective of whether their targets require reductions in energy consumption or actually allow energy consumption to increase compared to historic levels.

This methodology does not take into account the level of ambition of the national target (which varies significantly across the EU), nor does it capture the complexity of the national context (economic development, ability to attract financing for energy efficiency projects, etc.).

The overall assessment of progress combines the results obtained for progress towards primary energy targets and final energy targets: a Member State is considered to be on track towards its energy efficiency target if it is on track in 2012 towards both targets for primary and final energy consumption, and not on track if it is not on track towards any of these two targets. The results of this assessment per Member State (including at the EU-28 level) are presented below in Table 6.1.

Some 17 Member States are considered to be on track towards their 2020 energy efficiency targets (see Table 6.1).

Five of these countries (Cyprus, Finland, Latvia, Romania and Slovenia) have a positive 2020 target for both primary and final energy consumption compared to 2005 levels and managed to keep their 2012 levels in both primary and final energy consumption below linear target paths between 2005 and 2020 targets. Finland, Romania and Slovenia actually reduced both primary and final energy consumption between 2005 and 2012, while in Cyprus and Latvia, primary energy consumption or final energy consumption actually increased moderately between 2005 and 2012 (+ 0.1 % per year in primary energy consumption for Cyprus and + 0.2 % per year in final energy consumption for Latvia).

For the remaining twelve countries, the situation is more nuanced in terms of target setting and energy consumption trends.

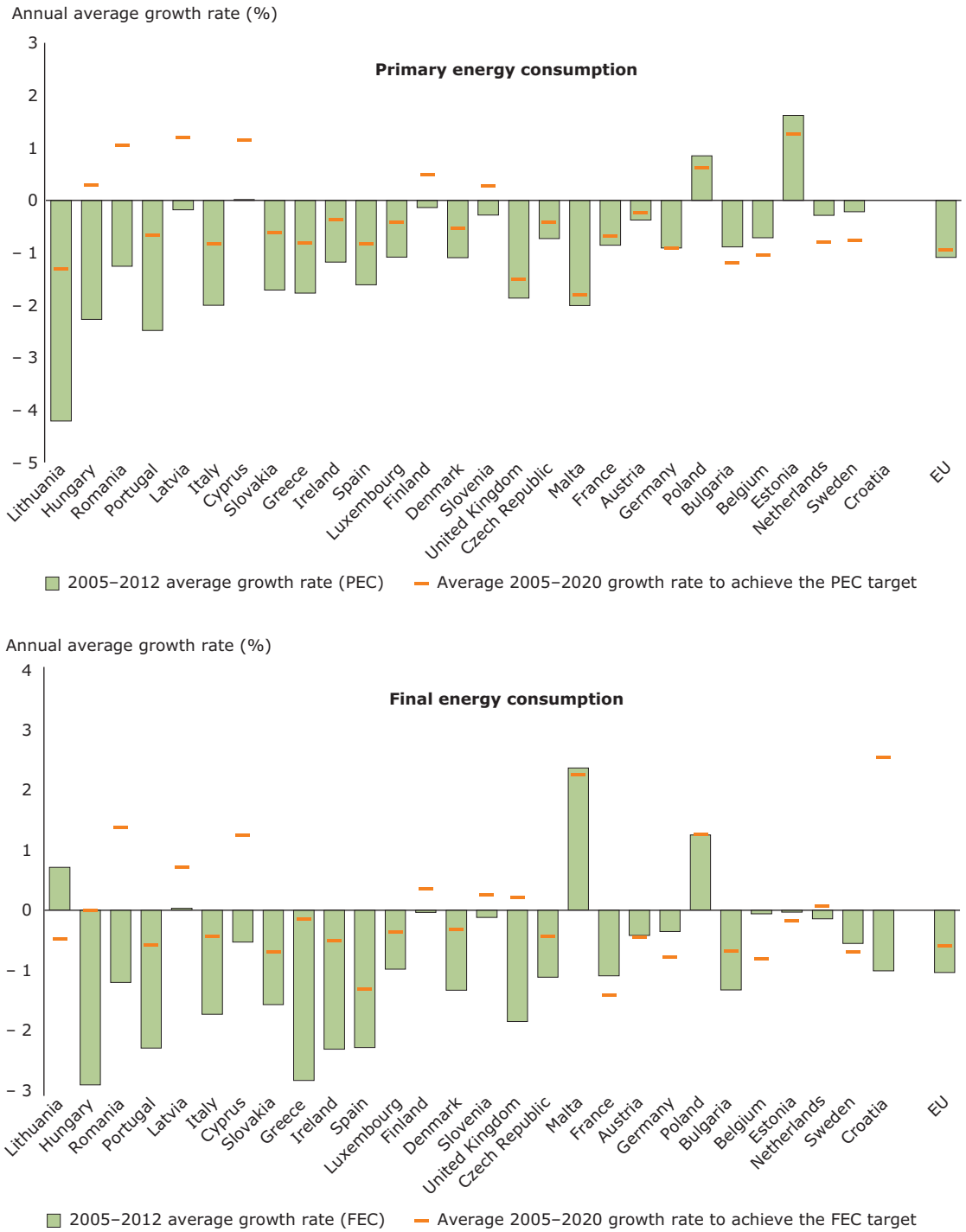
- Hungary set a reduction target for final energy consumption and a limitation (positive) target for primary energy consumption for 2020, while the United Kingdom set a reduction target in primary energy consumption and a positive target in final energy consumption for 2020, compared to 2005 levels. Both countries actually reduced significantly both primary and energy consumption between 2005 and 2012.

- Croatia has not set any national target on primary energy consumption. It is well on track towards its 2020 target on final energy consumption (which corresponds to a 46 % allowed increase compared to 2005).

- In nine Member States (the Czech Republic, Denmark, Greece, Ireland, Italy, Luxembourg, Portugal, Slovakia and Spain), the pace of the reductions in primary and final energy consumption between 2005 and 2012 has been sufficient for these countries to be considered to be on track towards their energy targets. Greece, Ireland, Italy, Luxembourg, Portugal and Slovakia had actually already achieved both 2020 targets for primary and final energy already in 2012. These Member States should therefore focus on stabilizing their energy consumption, especially as their economies recover from the crisis.

Seven Member States (Austria, Bulgaria, France, Lithuania, Malta, the Netherlands and Poland)

Figure 6.5 Average annual change in energy consumption between 2005 and 2012, in comparison with 2005–2020 target linear trajectories



Note: The assessment of progress is based on a comparison between the average change between 2005 and 2012, and the average change between 2005 and the 2020 target.

The countries are ordered according to the difference between the average change in primary consumption between 2005 and 2012, and the average change between 2005 and the 2020 target. Countries appearing on the left side of the figure are the best performers in reducing or limiting primary energy consumption between 2005 and 2012, compared to the 2005–2020 linear trajectory. To make comparison of the results across both figures easier, the same ordering of countries is kept for the lower figure.

Croatia has not defined any 2020 target on primary energy consumption.

Source: EEA indicator ENER 16; Eurostat, 2014b; reported targets under Article 3 of EED in 2013 (including updates of Cyprus, Malta, Spain and Sweden in NEEAP 2014).

are considered to be partly on track towards their energy efficiency targets because they are on track towards only one of their two own-defined targets for primary and final energy consumption, but not both.

- In Poland, both primary and final energy consumption increased between 2005 and 2012. While the 2005–2012 increase in final energy consumption was slightly slower than a linear increase between 2005 and 2020, primary energy consumption increased faster (0.8 % per year on average) than the linear target path (0.6 % per year on average). This means that Poland will have to reduce its growth rate in primary energy consumption between 2012 and 2020 in order to achieve its 2020 primary energy target.

- Malta and the Netherlands have set reduction targets for primary energy consumption and limitation (positive) targets for final energy consumption for 2020 compared to 2005. The Netherlands reduced both primary and final energy consumption in 2012 compared to 2005, but the 2.0 % reduction in primary energy consumption (0.3 % per year on average) is currently insufficient for this country to be considered to be on track towards its target (which implies an 11.3 % reduction in primary energy consumption between 2005 and 2012, or 0.8 % per year). In the case of Malta, despite a 2020 target on primary energy consumption equivalent to a 23.8 % reduction compared to 2005, Malta had sufficiently reduced its consumption between 2005 and 2012 to be on track towards this target. However, during the same period, final energy consumption increased by 17.8 % (an average 2.4 % per year). Malta should reduce this growth rate to 2.2 % per year maximum in order to achieve its target. Malta is therefore considered partly on track towards its 2020 energy efficiency target

- Austria, Bulgaria, France and Lithuania have set reduction targets in both primary and final energy consumption. Apart from Austria, these countries have set at least one target exceeding a 16 % reduction. In Lithuania, despite a significant reduction in primary energy consumption between 2005 and 2012 to a level already below the 2020 target, final energy consumption increased on average by 0.7 % per year during this period. Important efforts will therefore be required to bend this trend and achieve an average 1.5 % annual reduction in final energy consumption. In Austria and France, both primary and final energy consumption decreased between 2005 and 2012, but the pace of the reductions in final energy consumption as of 2012 was still insufficient and requires enhanced efforts between 2012 and 2020. In Bulgaria, sufficient reductions in final energy consumption took place between 2005 and 2012, but primary energy consumption increased during this period.

Four Member States (Belgium, Estonia, Germany and Sweden) are not on track towards either primary or final energy consumption targets.

- Estonia set a reduction target on final energy consumption and a limitation (positive) target in primary energy target. Both primary and final energy consumption trends between 2005 and 2012 are currently above linear target paths between 2005 and 2020. Estonia therefore needs to reduce the pace at which primary energy consumption has been increasing so far, and needs to enhance the pace of its reduction in final energy consumption.

- Belgium, Germany and Sweden have somewhat ambitious (exceeding 10 %) reduction targets in both primary and final energy. Despite reductions in both primary and final energy consumption in these three countries, further efforts will be necessary between 2012 and 2020 to achieve faster reductions during that period than those achieved between 2005 and 2012.

Member States have already put in place a wide range of energy efficiency measures that should go a long way towards meeting the 2020 energy efficiency objective, but the challenge remains the full implementation and enforcement of regulatory requirements at national level.

Progress compared to previous year

Because the methodology used to track progress towards energy efficiency targets was updated between the 2013 and the 2014 EEA 'Trends and projections' reports, the assessment results between these two years would not be directly comparable. It is however, possible to implement the methodology used in the present assessment in both 2011 and 2012 energy statistics. This allows a comparison of the situation of Member States between these two years, and observation of the changes that occurred in specific countries (see Table 6.2).

Such comparison shows a certain stability in the overall performance of Member States vis-à-vis their

Table 6.1 Member States progress towards their 2020 energy efficiency targets

	Progress to primary energy consumption targets			Progress to final energy consumption targets			Overall progress in 2014
	2005–2020 linear trajectory	2005–2012 trend	2012– 2020 indicative trend	2005–2020 linear trajectory	2005–2012 trend	2012– 2020 indicative trend	
Country	Average annual change (%)			Average annual change (%)			
Austria	– 0.24	– 0.37	– 0.12	– 0.46	– 0.42	– 0.48	
Belgium	– 1.05	– 0.71	– 1.35	– 0.82	– 0.06	– 1.47	
Bulgaria	– 1.19	– 0.88	– 1.46	– 0.68	– 1.33	– 0.11	
Croatia	n/a	– 1.14	n/a	2.54	– 1.01	5.75	
Cyprus	1.14	0.02	2.14	1.25	– 0.53	2.84	
Czech Republic	– 0.42	– 0.73	– 0.15	– 0.43	– 1.12	0.18	
Denmark	– 0.53	– 1.09	– 0.05	– 0.31	– 1.33	0.59	
Estonia	1.26	1.62	0.94	– 0.18	– 0.03	– 0.31	
Finland	0.49	– 0.14	1.04	0.35	– 0.04	0.70	
France	– 0.68	– 0.85	– 0.52	– 1.42	– 1.09	– 1.70	
Germany	– 0.91	– 0.91	– 0.91	– 0.78	– 0.36	– 1.15	
Greece	– 0.82	– 1.76	0.02	– 0.15	– 2.84	2.27	
Hungary	0.30	– 2.26	2.59	– 0.01	– 2.91	2.61	
Ireland	– 0.37	– 1.17	0.33	– 0.51	– 2.32	1.10	
Italy	– 0.82	– 1.99	0.21	– 0.44	– 1.74	0.72	
Latvia	1.19	– 0.18	2.41	0.71	0.03	1.31	
Lithuania	– 1.31	– 4.20	1.28	– 0.48	0.71	– 1.51	
Luxembourg	– 0.42	– 1.08	0.16	– 0.36	– 0.99	0.19	
Malta	– 1.79	– 2.00	– 1.61	2.25	2.37	2.16	
Netherlands	– 0.80	– 0.28	– 1.25	0.07	– 0.14	0.26	
Poland	0.61	0.85	0.41	1.26	1.25	1.27	
Portugal	– 0.67	– 2.48	0.94	– 0.59	– 2.30	0.93	
Romania	1.05	– 1.25	3.11	1.37	– 1.21	3.69	
Slovakia	– 0.61	– 1.71	0.36	– 0.70	– 1.57	0.06	
Slovenia	0.28	– 0.28	0.76	0.26	– 0.12	0.59	
Spain	– 0.83	– 1.61	– 0.15	– 1.32	– 2.29	– 0.46	
Sweden	– 0.77	– 0.22	– 1.24	– 0.70	– 0.55	– 0.82	
United Kingdom	– 1.50	– 1.86	– 1.18	0.22	– 1.86	2.07	
EU-28	**– 0.95**	**– 1.08**	**– 0.83**	**– 0.60**	**– 1.04**	**– 0.21**	

Note: In the columns '2005–2012 trend', the colour of the cells indicate whether the country is on track to meet its 2020 target. A green colour indicates that between 2005 and 2012, on annual average, energy consumption decreased faster (or increased slower) than the linear trajectory between 2005 and the 2020 target, while a orange colour indicates that energy consumption increased faster (or decreased slower) than the linear trajectory between 2005 and the 2020 target.

In the last column, Member States are considered to be on track (green cells) if both the primary and final energy consumption remained below the linear target path. Member States are considered to be partly on track (light yellow cells) if either the primary or the final energy consumption was below the respective linear target path, but not both. Member States are considered not to be on track (orange cells) if both primary and final energy consumption were above the linear target path.

Source: EEA indicator ENER 16; Eurostat, 2014b; reported targets under Article 3 of EED in 2013 (including updates of Cyprus, Malta, Spain and Sweden in NEEAP 2014).

energy efficiency targets. However at individual level, it shows that the situation improved for three Member States (Finland, Malta, Poland and Slovenia) and deteriorated for three others (Estonia, France and Germany). In four of these six cases, the change occurred with respect to final energy consumption.

- Finland and Slovenia reduced sufficiently their primary energy consumption and are now on track towards their primary energy target, in addition to their final energy target.
- Malta and Poland limited their increase in primary and final energy consumption, respectively to become on track towards the corresponding targets, but remain not on track towards the other target.
- France's final energy consumption increased in 2012 to a level above the linear target path between 2005 and the 2020 target, but this Member State remains on track towards its primary energy consumption target.

Table 6.2 Evolution of progress on energy efficiency targets

	Progress to PEC targets		Progress to FEC targets		Overall progress to energy efficiency targets	
Statistical year used for the assessment	2011	2012	2011	2012	2011	2012
Austria		→		→		→
Belgium		→		→		→
Bulgaria		→		→		→
Croatia	No target	No target		→		→
Cyprus		→		→		→
Czech Republic		→		→		→
Denmark		→		→		→
Estonia		→		↘		↘
Finland		↗		→		↗
France		→		↘		↘
Germany		↘		→		↘
Greece		→		→		→
Hungary		→		→		→
Ireland		→		→		→
Italy		→		→		→
Latvia		→		→		→
Lithuania		→		→		→
Luxembourg		→		→		→
Malta		↗		→		↗
Netherlands		→		→		→
Poland		→		↗		↗
Portugal		→		→		→
Romania		→		→		→
Slovakia		→		→		→
Slovenia		↗		→		↗
Spain		→		→		→
Sweden		→		→		→
United Kingdom		→		→		→
EU		→		→		→

Note: The colour of the cell indicates whether the country is on track towards meeting its target. Arrows indicates a change in the situations observed in 2011 and in 2012.

Source: EEA indicator ENER 16; Eurostat, 2014b; reported targets under Article 3 of EED in 2013 (including updates of Cyprus, Malta, Spain and Sweden in NEEAP 2014).

- In the case of Estonia and Germany, the situation worsened compared to 2011 and these countries are now 'not on track' towards any of their two targets for primary and energy consumption. In Estonia final energy consumption increased, while primary energy consumption decrease. In Germany, both primary and final energy consumption increased.

Certain Member States also display noticeable differences with regards to the distance to their 2020 targets:

- The Netherlands and Spain are closing the gap to the 2020 targets for primary energy consumption, while Italy is now already below its target level. In the Netherlands, this development may be due to energy efficiency measures adopted to reduce losses in energy distribution and conversion. In Italy and Spain, in addition to improvements in energy efficiency, such as the implementation of a white certificate scheme in Italy, the effects of the economic recession played a key role in the decrease in primary energy consumption.

- Greece, Hungary and Spain have reduced significantly the distance to their 2020 target in final energy consumption. In all three countries, besides improvements in energy efficiency, the economic recession played an important role in the decrease in final energy consumption, as observed in the reduced energy consumption of economic sectors.

6.5 Progress towards the 2016 targets under the End-use Efficiency and Energy Services Directive

The End-use Efficiency and Energy Services Directive (EU, 2006) sets an 'interim' target of 9 % reduction in final energy consumption by 2016. Based on NEEAPs from 15 Member States ([74]), there seems to be a good progress made towards this target with some countries expecting to over-achieve it (e.g. Spain, (mainly due to the collapse of construction and transport sectors), Germany, Italy and the United Kingdom). Some countries, however, point to the high risk of double counting some of the measures (e.g. France, Italy) as well as the high uncertainty surrounding the quantification of energy savings resulting from the implementation of the EPBD (Italy). In fact, in its impact assessment accompanying the energy efficiency communication (EC, 2014i), the Commission as well recognises that proper enforcement of the Energy Performance Certificates in buildings remains a critical issue and that limited compliance checking of energy performance requirements in new and renovated buildings risk reducing the impact of the regulatory framework.

6.6 Post-2020 targets

In July 2014, the European Commission proposed a target for energy efficiency of 30 %, following a review of the Energy Efficiency Directive. This target was consistent with decarbonisation scenarios included in the *Roadmap for moving to a low carbon economy 2050* (EC, 2011a) as well as with the High energy efficiency scenario included in the *Energy Roadmap 2050* (EC, 2011e). The latter would involve a 16 % reduction in primary energy consumption by 2030 and a 38 % reduction in primary energy consumption by 2050 compared to a reference scenario. While the Reference scenario based on which the 2030 target was determined in 2014 (EC, 2014b) and the one included in the Energy Roadmap (EC, 2011e) differ (and therefore the numbers are not directly comparable), both show a consistent level of ambition and assume a strong implementation of energy efficiency measures, as well as a rapid change in consumer behaviour.

In October 2014, the European Council endorsed an indicative target of 27 % to be reviewed in 2020 having in mind a 30 % target. This will not be translated into nationally binding targets. The Commission will propose priority sectors in which significant energy-efficiency gains can be reaped, and ways to address them at EU level, with the EU and the Member States focusing their regulatory and financial efforts on these sectors. Individual Member States are free to set their own higher national targets.

([74]) The limited number of Member States screened is due to limited availability of the NEEAPs as of July 2014.

7 Integrated progress towards the '20-20-20' climate and energy targets

Key messages

- The EU continues making good progress towards its three climate and energy targets set for 2020. 2012 levels in primary energy consumption, final energy consumption and RES shares (in gross final energy consumption) were below interim target levels, and 2013 levels in GHG emissions were very close to 2020 target levels, with projections for 2020 indicating clear over-achievements.

- Achievements at national level remain mixed. Nine Member States (Croatia, Cyprus, Czech Republic, Denmark, Greece, Hungary, Romania, Slovakia and the United Kingdom) are on track to meet their three targets for climate and energy. As in 2013, the assessment shows that no Member State underperforms for all three policy objectives. Noticeable progress has been achieved compared to the assessment presented in last year's report, particularly in the deployment of renewable energy, where six more Member States are now on track to achieve their RES targets. One Member State (Germany) has seen its performance deteriorate in two domains compared to the last assessment (GHG targets under the ESD and energy efficiency targets).

- Policies and measures implemented to reduce GHG emissions, improve energy efficiency and stimulate the growth of renewable energy are having an impact. Clearly, however, the economic recession has played an important role by affecting economic activity and thereby energy demand. This, in turn, drove GHG emissions down and boosted (statistically) the share of renewables in final energy consumption. At the same time, the recession risks inhibiting future progress: it resulted in a surplus in the EU ETS that needs to be adequately addressed; it reduced investment in renewables; and, overall, it risks sending the misleading signal that climate and energy targets might be achieved with a reduced level of policy effort.

- Beyond 2020, additional efforts will be needed to abate GHG emissions in all sectors (those covered by the EU ETS, those by the ESD, as well as the LULUCF sector), improve energy efficiency and ensure further penetration of renewables in the EU. The EU energy sector will also need to undergo a rapid decarbonisation, with a share of renewables reaching between 55 % and 75 % by 2050 (up to 73 % in transport and 86 % in power generation), according to the European Commission. Overhauling the energy system will also require the modernisation of power grids, including through interconnections and expansions, the development of cost-effective load balancing and energy storage options, implementation of demand response and energy efficiency improvements across all sectors, along with the deployment of CCS at the majority of the remaining fossil fuel plants.

- Progressing towards several climate and energy targets at the same time presents a number of co-benefits. For example, the significant deployment of renewable energy between 2005 and 2012 resulted in GHG emission savings and, to a certain extent, in a reduction in primary energy consumption through the replacement of less efficient fossil fuel plants. At the same time, the detail of policy interactions — in particular with the EU ETS —and the coherence of assumptions underpinning policies could benefit from further empirical analysis in order to optimise the policy mix. In this respect, the new reporting requirements on policies and measures and GHG-related data, adopted in the EU in 2013, could help expanding the knowledge base to support such analysis.

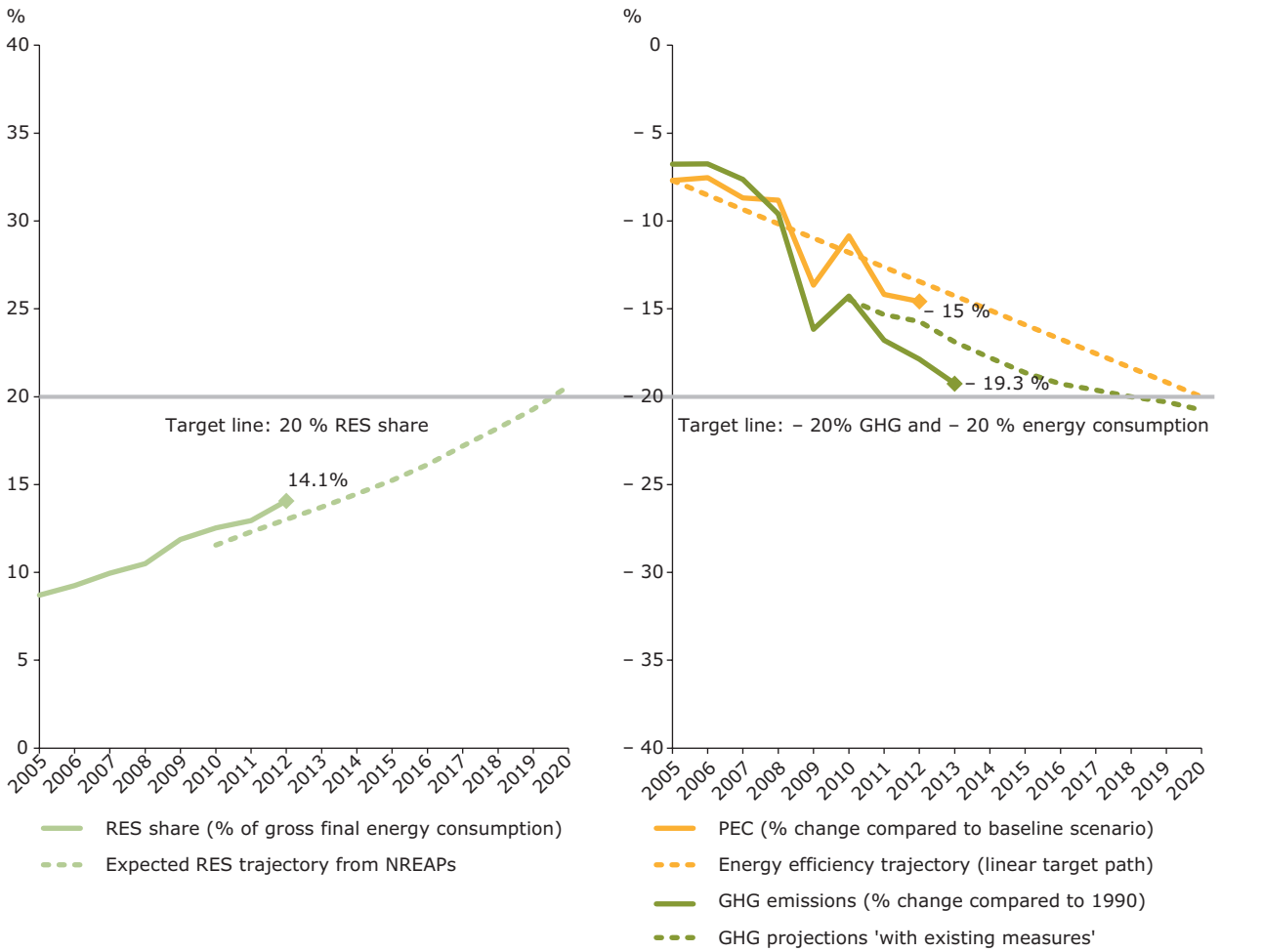
Chapters 4, 5 and 6 each present an in-depth assessment of the progress of Member States and the EU towards their 2020 targets for GHG emissions, renewable energy and energy efficiency. This chapter aims at integrating these in-depth assessments to provide an overview of the current and projected progress to meet the EU's '20-20-20' targets and Member States' individual objectives for 2020.

7.1 Progress towards the EU's 2020 climate and energy objectives

Overall, the EU is on track to meet its '20-20-20' targets for GHG emissions, RES and energy efficiency. Progress in respect of the GHG target is substantial and more pronounced than for the RES and the energy efficiency targets (see Figure 7.1). In all three domains, current progress is greater than previously anticipated in scenarios where the achievement of targets is projected. Despite the EU overachieving its indicative RES target for 2011–2012, the largest distance to a 2020 target concerns renewables (see Figure 7.1). The key drivers influencing progress to date in these interlinked domains are summarised below.

- **GHG target:** with reductions in GHG emissions of 19 % compared to 1990 levels, the EU is currently on track to meet its GHG target. The falling final energy intensity over this period, the decreasing carbon intensity of fossil fuels, improvements in energy-transformation

Figure 7.1 Current and projected progress of the EU-28 towards 20/20/20 targets



Note: The horizontal line represents achievement of the '20-20-20' targets. Solid lines represent progress made as of 2012 (RES, energy efficiency) or 2013 (GHG emissions). Dashed lines represent projected GHG emissions by Member States with existing policies and measures (WEM), expected RES trajectory based on Member States' NREAPs, and linear target path between 2005 levels and 2020 target for primary energy consumption (PEC).

Source: EC, 2013i; EEA, 2014a, 2014c, 2014d and 2014g; EU, 2009a; Eurostat, 2014b.

efficiency and the increase in the share of non-carbon fuels all played a role in the observed decrease in emissions between 2005 and 2012, alongside the economic recession. GHG emissions decreased, while GDP increased from 2005 to 2008, whereas both GHG emissions and GDP decreased between 2008 and 2012. These trends show that the EU has been decoupling its GDP growth from GHG emissions (EEA, 2014i). Based on the projections of Member States, it is expected that the EU will over-achieve its GHG target in 2020. At national level, a number of Member States still need to tackle effectively their ESD emissions, in particular in the transport and agriculture sectors.

- **RES target:** in 2012, the share of RES in gross final energy consumption was 14.1 %, which is above the aggregated 2012 targets presented by Member States in their NREAPs. The 2011–2012 average was also above the first indicative target set for 2011–2012 under the RED. Despite good progress being made towards the RES target to date, the remaining current distance to the 2020 target underlines the need for additional efforts by Member States to overcome administrative and infrastructural barriers, and reductions or delays in investments, as a result of the economic recession. The European Commission has indicated in its latest progress report on renewable energy that Member States may need to take further measures in order to achieve their RES targets (EC, 2013c). With these additional efforts by Member States, the EU is expected to slightly over-achieve its 20 % target.

- **Energy efficiency target:** in 2012, the EU's primary energy consumption was 7.3 % below 2005 levels while its final energy consumption was 7.1 % lower than in 2005. This is more than would be necessary for the EU to meet its 2020 targets in a linear manner. The EU is therefore on track towards its energy efficiency target. In addition to the likely effects of energy efficiency policies, the economic recession played a key role in the decreases in energy consumption observed in 2012. To achieve further progress, additional efforts will be necessary. These efforts should be focused on implementing and enforcing existing policies, and in overcoming common barriers associated with energy efficiency improvements (i.e. high capital costs and lack of access to information).

7.2 Progress towards national 2020 climate and energy objectives at Member State level

The assessments presented in Chapters 4, 5 and 6 allow for an assessment of Member States' performance across the three EU's climate and energy policy objectives for 2020.

The assessment is based on the following.

- Current (2013) and projected (2020) GHG emission levels in the ESD sectors in each Member State, compared with the relevant ESD targets for 2013 and 2020. The assessment also takes into account plans to adopt and implement measures at planning stage (WAM) (see Chapter 4);

- Current (2011 and 2012) RES shares in gross final energy consumption compared to indicative 2011–2012 targets provided for in the RED and indicative 2012 RES shares, as outlined in Member States' NREAPs (see Chapter 1);

- Current trends (2005–2012) of primary and final energy consumption in 2012, compared with linear trends between 2005 levels and 2020 target levels (see Chapter 6).

EU progress towards 2020 GHG emission objectives covers both ETS and non-ETS sectors, since the GHG reduction target is formulated as a percentage of total emissions. At Member State level, the assessment focuses only on ESD emissions, since there are no 2020 targets for ETS or total GHG emissions at national level.

Despite sharing the same objective — of assessing progress made to date and expected future progress of Member States towards fulfilling their commitments — the methodologies used to track progress are specific to each policy objective. They depend on different types of data and information, for which the availability and quality vary. The same method can therefore not be used for assessing progress towards all three policy objectives. The results are based on the latest country-specific information available, and reflect the current or projected situation in each Member State resulting from the implementation of existing national policies and measures.

Progress observed to date (based on 2012 energy consumption and 2013 GHG emissions)

An overview of the climate and energy performance of all Member States is given in Table 7.2. For each Member State, the colour of the cell indicates whether the country is on track, partly on track or not on track towards each of its policy targets. The methodology used to assess progress for each policy objective is summarised below in Table 7.1.

A diverse picture can be observed across the EU. Nine Member States (Croatia, Cyprus, the Czech Republic, Denmark, Greece, Hungary, Romania, Slovakia and the United Kingdom) perform positively towards all three policy objectives, while no Member State underperforms for all three policy objectives — as was already the case in the 2013 assessment. Renewable energy represents the policy objective for which most Member States are considered on track (22), with only three Member States not being on track to meet their targets. Although at EU level GHG emissions under the ESD are very close to their overall 2020 target level, most Member States are expecting certain difficulty in limiting or reducing their domestic emissions below their respective targets, either in the short term (2013 ESD emissions) or longer term (2020 projected ESD emissions). As regards reducing energy consumption to achieve energy efficiency targets, Member States seem on track overall for reducing or limiting their energy consumption, although in some instances the self-defined non-binding targets might appear somewhat lacking in ambition.

These results vary across Member States, irrespective of their GDP levels and geographic location. This is indicative of the fact that an effort was made to take into account individual Member State situations in the different targets set under the ESD and the RED. For example, under the ESD, the 2020 targets were set on the basis of Member States' relative wealth (measured by GDP per capita): they range from limiting the increase in GHG emissions to 20 % to reducing GHG emissions by 20 %, depending on GDP levels for each country.

Annual progress

For most Member States, progress has remained stable between the last two years for which historic data are available (see Table 7.3). This most likely reflects a continuation of existing policies to promote emission reductions, deployment of RES and energy efficiency savings. The situation has nevertheless

Table 7.1 Criteria for assessing progress towards 2020 climate and energy targets

	GHG target under the ESD	RES target under the RED	EE target as defined by Member States under the EED
On track	2013 ESD emissions were below the 2013 ESD targets **and** 2020 projected ESD emissions WEM are lower than the 2020 ESD target	The 2011–2012 average RES share was above the indicative 2011–2012 average share from the trajectory set out in the RED **and** The 2012 RES share was above the 2012 trajectory value set out in the NREAP	The 2012 primary energy consumption was below the linear target path between 2005 levels and the 2020 target **and** The 2012 final energy consumption was below the linear target path between 2005 levels and the 2020 target
Partly on track	2013 ESD emissions were below the 2013 ESD targets **and** 2020 projected ESD emissions WEM are higher than the 2020 ESD target 2020 **but** projected ESD emissions WAM are lower than the 2020 ESD target	The 2011–2012 average RES share was above the indicative 2011–2012 average share from the trajectory set out in the RED **and** The 2012 RES share was below the 2012 trajectory value set out in the NREAP	The 2012 primary energy consumption was above the linear target path between 2005 levels and the 2020 target **or** The 2012 final energy consumption was above the linear target path between 2005 levels and the 2020 target
Not on track	2013 ESD emissions were above the 2013 ESD targets **or** 2020 projected ESD emissions are above the 2020 ESD target, even if planned additional measures are implemented	The 2011–2012 average RES share was below the indicative 2011–2012 average share from the trajectory set out in the RED	The 2012 primary energy consumption was above the linear target path between 2005 and the 2020 target **and** The 2012 final energy consumption was above the linear target path between 2005 levels and the 2020 target

Table 7.2 Member State progress towards national 2020 climate and energy targets

Countries	GHG target under the ESD	RES target under the RED	EE target as defined by Member States under the EED
Austria			
Belgium			
Bulgaria			
Croatia			
Cyprus			
Czech Republic			
Denmark			
Estonia			
Finland			
France			
Germany			
Greece			
Hungary			
Ireland			
Italy			
Latvia			
Lithuania			
Luxembourg			
Malta			
Netherlands			
Poland			
Portugal			
Romania			
Slovakia			
Slovenia			
Spain			
Sweden			
United Kingdom			
EU			

Source: EC, 2013i; EEA, 2014c and 2014d, EU, 2009a; Eurostat, 2014b.

evolved for 14 Member States. Ten Member States have actually improved their performance towards one of the three policy objectives. None improved for more than one objective. Germany is the only Member State for which assessment results deteriorated with respect to two policy objectives within one year (progress towards ESD targets and energy efficiency targets).

Most improvements were seen in renewables. The increasing rates of RES deployment observed for the Member States in Table 7.3 can partly be explained by the favourable regulatory conditions (i.e. implementation of financial incentives such as feed-in tariffs) and declining technology costs (see Chapter 5). Results are more mixed for energy efficiency, with four improved performances and three deteriorated performances. The observed improvements may be due to the implementation of a range of energy efficiency policies (i.e. energy efficiency standards for buildings and products), as well as ongoing structural changes in the industry (see Chapter 6).

As pointed out in Sections 4.3, 5.2 and 6.4, the results presented in this 2014 report are not directly fully comparable with the results from the 2013 assessment (EEA, 2014b), essentially for methodological reasons (use of final GHG inventory data in 2014 compared to proxy data in 2013, and change in the assessment method for energy efficiency compared to last year).

Table 7.3 Progress in meeting 2020 climate and energy targets, compared to previous year

	Progress achieved compared to previous year		
Country	**ESD targets (2013 vs 2012)**	**RES targets (2012 vs 2011)**	**Energy efficiency targets (2012 vs 2011)**
Austria		↗	
Belgium			
Bulgaria			
Croatia			
Cyprus		↗	
Czech Republic		↗	
Denmark			
Estonia			↘
Finland			↗
France			↘
Germany	↘		↘
Greece			
Hungary			
Ireland			
Italy			
Latvia		↗	
Lithuania			
Luxembourg		↗	
Malta			↗
Netherlands			
Poland			↗
Portugal			
Romania			
Slovakia			
Slovenia			↗
Spain			
Sweden			
United Kingdom		↗	
EU			

Note: The absence of an arrow indicates a stable annual performance compared to the previous year.

7.3 Links between progress across the three policy objectives

Interactions between 2020 climate and energy targets and policy instruments

The EU's climate and energy package set out legally binding targets and trajectories for both GHG emissions (in both ETS and ESD sectors) and the share of RES in gross final energy consumption (see Chapter 2). To achieve the EU's 20 % reduction target by 2020, the package determined the respective contributions and trajectories of EU ETS sectors and non-ETS sectors until 2020, taking into account the other 2020 targets on renewable energy and energy efficiency. In the ETS sectors, GHG emissions are covered by a common single binding cap. In the non-ETS sectors, Member States were allocated annual ESD targets, which were developed in such a way that their achievement would represent a comparable level of effort for all Member States, given the diversity of their individual situations (see Chapter 4). Legally binding RES targets under the RED were also set for each Member State, reflecting their different starting points and potential for increasing RES production (see Chapter 2).

The adopted mix of policy instruments should result in a series of complementary interactions to facilitate compliance at both EU and Member State level (see Figure 7.2). These interactions should help improve policy design and implementation, correct for market failures and meet additional policy objectives. For example, it may be assumed that the development of RES resulted in avoided GHG emissions and, to some extent, reduced primary energy production (because certain renewables are assumed to have 100 % transformation efficiency, which improves statistically the overall conversion efficiency of the system). This helped meet not only the GHG target, but also the energy efficiency target. The RED has also, to a certain extent, compensated the impact of the low EUA prices in the EU ETS by requiring Member States to increase their share of RES via the introduction of RES-E support schemes at national level. In some cases, the introduction of feed-in tariffs in particular has helped support the innovation of less mature technologies.

At the same time, the implementation of energy efficiency measures in a number of sectors, such as buildings or transport, also represents a key contributions towards achieving national ESD targets. The EED is expected to promote the uptake in Member States of abatement options that are, at the moment, above the EUA prices, thus overcoming common barriers (i.e. high capital costs). Energy efficiency measures may also reduce the demand for electricity generated within the ETS and reduce the quantity of renewable energy needed to meet RES targets.

In turn, the GHG target might induce investment into energy efficiency or RES projects, in particular if the ETS allowance price increases or if other instruments, such as taxes or subsidies, are used. The GHG target might also stimulate behavioural changes (e.g. lower space-heating temperature) either through the ETS price signal or through the ESD target and its accompanying policies and measures.

In certain cases however, the overlap of policy instruments might also have less positive effects. For example, although the ETS cap was set in a way that accounted for the expected GHG reduction effects induced by the binding RES targets until 2020, the overlap between establishing emission caps under the ETS and setting RES targets introduced an element of uncertainty, because the success of RES policies cannot be predicted with certitude. In 2011 and 2012, the EU achieved a RES share in gross final energy consumption higher than the indicative

Figure 7.2 Interaction between the '20-20-20' targets

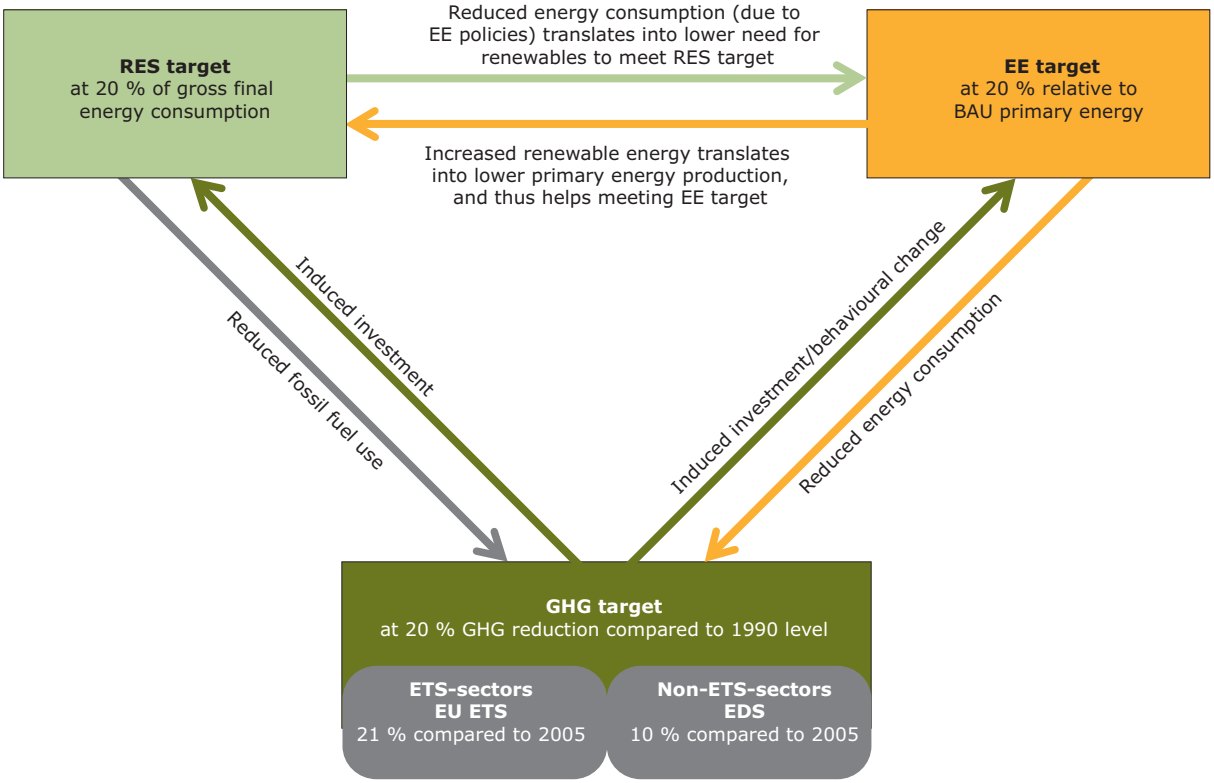
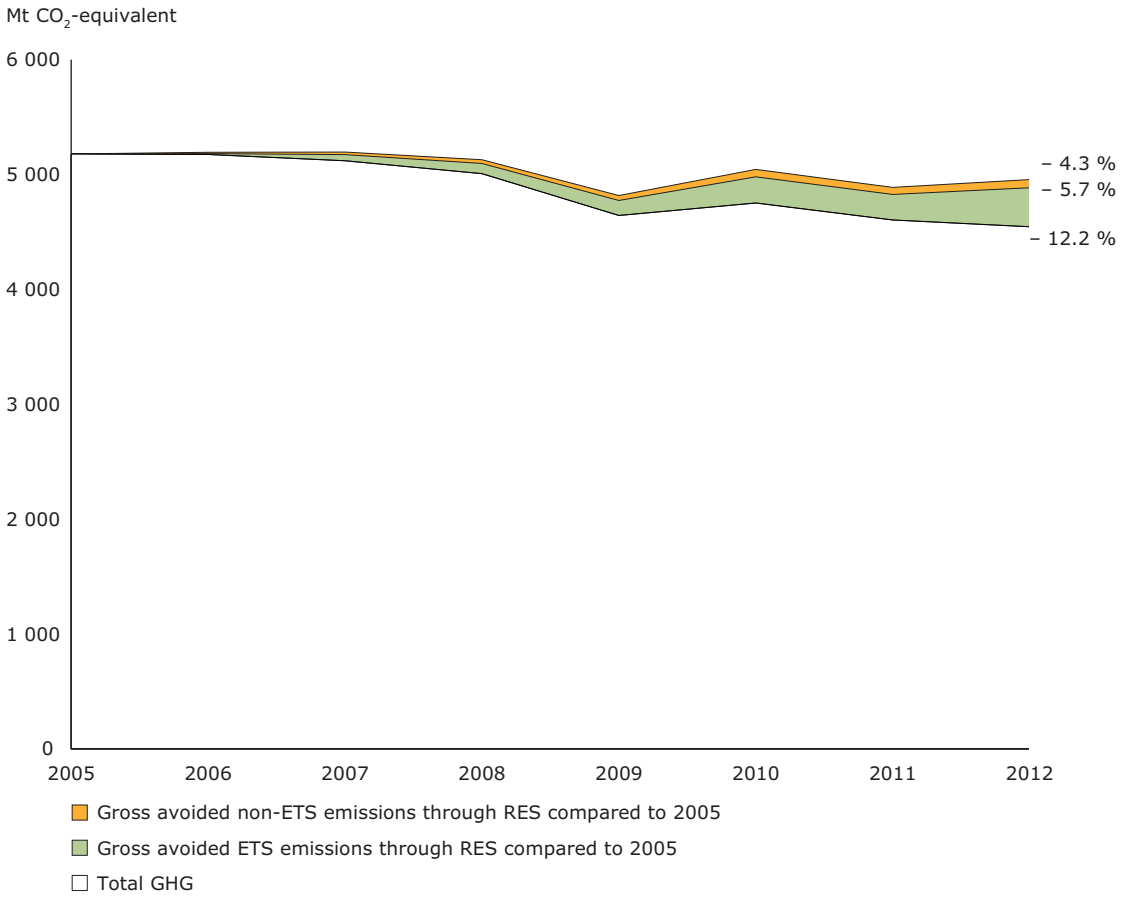


Figure 7.3 Additional gross avoided emissions from RES in ETS and non-ETS sectors, compared to 2005 levels



Source: EC, 2013i; EEA, 2014c; Eurostat, 2014b.

RED target for this period. This over-achievement resulted in additional gross avoided emissions ([75]) which, for the most part, took place in the EU ETS (see Figure 7.3). It may therefore have freed up more ETS allowances than initially anticipated ([76]) and further affected the carbon price signal in the EU ETS (in addition to the predominant effect of the economic recession on the demand and supply balance of allowances in the last years). At the same time, however, the support for RES and the additional capacity has positive impacts on other important factors, such as air quality, energy security, job creation and development of highly dynamic sectors and markets for the future.

In practical terms, establishing a link between the assessment results observed at national level for the growth in RES shares, energy efficiency improvements and the limitation or reduction of GHG emissions in ESD sectors proves to be difficult. For example, despite being considered on track or partly on track towards their RES and energy efficiency objectives, six Member States (Austria, Finland, Ireland, Luxembourg, Poland and Spain) are also considered as not being on track towards their ESD targets. One initial explanation can be due to the fact that the assessment of progress towards RES and energy efficiency targets is based on data for the year 2012, while the assessment of progress towards ESD targets relies on data for 2013 (in addition to projections for 2020). Furthermore, the deployment of renewables contributes more towards gross avoided GHG emissions under the ETS, than towards GHG emissions reductions under

([75]) Gross avoided GHG emissions in the EU result from the substitution by renewable energy of more GHG-intensive forms of energy production in the energy mix. These effects can be determined for each year starting with 2005 and until t-2 (where t represents the current year), based on official statistical data reported by countries to Eurostat.

([76]) Furthermore emission reductions achieved through RES-E schemes are associated with abatement costs above the ETS price and therefore affect the static efficiency of the policy instrument mix (Rey et al., 2013).

the ESD (see Figure 7.3). Likewise, the benefits of energy efficiency improvements are shared between ETS sectors (e.g. electricity savings in buildings, which results in GHG emission reductions in the power sector) and ESD sectors (e.g. energy savings for other energy sources than electricity in buildings). The contribution of energy policies to the achievement of ESD targets may also depend on the share of energy-related emissions in total national ESD emissions.

Options for further policy evaluation

Establishing an optimal mix and balance of policies and instruments, at national and European levels, requires optimisation of complementarities and minimisation of countervailing interactions between these policies. Several areas for further policy evaluation may be outlined, which all can contribute to achieving this objective.

- Better identifying the effects of policies and measures in the observed trends (e.g. in GHG emissions or in energy consumption trends) and distinguishing these effects from those of other factors, such as economic development, weather conditions (temperature and precipitation in a particular season) and population dynamics. This type of analysis can be done in various ways (e.g. econometric analysis, decomposition analysis) and provide clear findings about the role played by policies in observed trends, compared to the roles played by other, non-policy factors.
- Analysing the level of consistency of the sets of assumptions on the basis of which policy makers establish their policies. Such assumptions may concern the expected developments of factors interacting, or competing with policies (e.g. macroeconomic factors, such as population or GDP), as well as the actual effects, co-benefits and adverse effects of individual policies and measures. It may help in identifying and overcoming some of the existing barriers to improved policy coherence. For example, insufficient harmonisation of key assumptions on input parameters for projections or policy impact assessments, such as assumptions on future fossil fuel prices, carbon prices and exchange rates might lead to inconsistent assumptions being taken, not only between Member States, but even at national level (see Box 7.1).
- These analyses could then be complemented and put into perspective with further analysis of how different policies interact, as outlined above, in particular with ETS and ESD sectors.
- Finally, sharing the experiences gained at national level on these issues would greatly help understanding better how and why similar or different results are obtained when apparently similar policies are implemented in different contexts.

In this respect, the new information to be reported by Member States in 2015 under the MMR, in particular on their low carbon development

Box 7.1 Differences in parameters used for projections and progress report by Member States

In 2013, the EEA and its ETC/ACM analysed, for five Member States, the consistency of the information reported by Member States under different reporting requirements concerning GHG emissions and projections (under the MMD), RES (under the RED) and energy efficiency (under the Energy Services Directive). The assessment, which looked at key projection parameters (such as GDP levels, energy use, CO_2 prices and fuel import prices) used in reporting under the EED, Energy Services Directive, RED and Monitoring Mechanism Decision (MMD), found that information on parameters in general was limited: input parameters were not systematically reported in public submissions by Member States. Furthermore, available data was difficult to compare due to differences in the units reported, the policies included, and the definitions applied (e.g. for energy use). Some parameters showed fewer differences across reporting requirements (GHG, RED and EED) within the investigated Member States than others, in particular: energy consumption levels, GDP levels and population size. More discrepancies were observed across reporting requirements for fossil fuel import prices, in particular for oil and CO_2 prices. This seemed particularly notable, as these prices are expected to be exogenous to Member States and are traded on international markets (fuel prices) and a common EU market (CO_2 price).

strategies and on national policies and measures (and their estimated past (ex post) or expected (ex ante) effects), should help expanding the knowledge base to underpin some of the options for further policy analysis and evaluation outlined above.

7.4 Post-2020 climate and energy targets

Beyond 2020, additional efforts will be needed to abate GHG emissions, improve energy efficiency and ensure further penetration of renewables in the EU. Achieving a GHG emission reduction of between 80 % and 95 % by 2050, compared to 1990 levels, will require significant GHG mitigation efforts in industrial sectors covered by the EU ETS as well as sectors covered by the ESD and LULUCF. The Commission's *Roadmap for moving to a low-carbon economy in 2050* (EC, 2011a) set out a cost-efficient pathway to achieve an 80 % reduction of domestic emissions by 2050, consistent with milestones of a 40 % reduction by 2030 and a 60 % reduction by 2040, compared to 1990 levels. Based on a number of decarbonisation scenarios, the roadmap also includes a cost-effective distribution of efforts between different economic sectors.

The largest emission cuts should come from the EU's energy sector, which should almost completely decarbonise by 2050, with renewables reaching up to 86 % of all power generation and 73 % of all transport fuels by 2050 under certain Energy Roadmap 2050 scenarios (EC, 2011e). Overhauling the energy system will also require the modernisation of power grids, the development of cost-effective load balancing and energy storage options, implementation of demand response and energy efficiency improvements across all sectors, along with the deployment of CCS at the majority of remaining fossil fuel plants.

To ensure that the EU is on a cost-effective track towards meeting its long-term climate objective, the European Commission's proposal for a climate and energy policy framework for 2030 includes a target of reducing EU GHG emissions by 40 % below 1990 levels, a target of achieving a share of minimum 27 % renewable energy consumption in the EU, and a target of reducing by 30 % the EU's primary energy consumption, all by 2030. The Commission has indicated that it will aim at strengthening the coherence between these policy objectives and providing the necessary flexibility to Member States so that the Union-wide commitments can be achieved in an optimal manner.

Acronyms, units and terms

AAU	Assigned amount unit. A Kyoto unit representing an allowance to emit one metric tonne of carbon dioxide equivalent (CO_2-eq.) AAUs are created (issued) up to a level of a Party's initial assigned amount
AEA	Annual emission allocation
Annex I	The annex to the UNFCCC specifying which developed country Parties and other Parties to the UNFCCC have committed to limiting anthropogenic emissions and enhancing their GHG sinks and reservoirs
AR	IPCC Assessment Report
ARD	afforestation, reforestation and deforestation
Assigned amount	The total quantity of valid emission allowances (Kyoto units) held by a Party within its national registry. The initial assigned amount for a Party is determined by its base-year emissions, and its emission limitation and reduction objective contained in Annex B to the Kyoto Protocol. Any Kyoto units that the Party acquires through the Kyoto mechanisms, or issues for removals from LULUCF activities under Article 3, paragraphs 3 and 4, are added to the Party's assigned amount; any units that the Party transfers, or cancels for emissions from LULUCF activities under Article 3, paragraphs 3 and 4, are subtracted from the Party's assigned amount. At the end of the commitment period, each Party must ensure that its total emissions over the commitment period are less than or equal to its total assigned amount
Cancellation	The transfer of a unit to a cancellation account. Such units may not be further transferred, and may not be used towards meeting a Party's Kyoto target
Carry-over	The authorisation for a unit that was issued in one commitment period to be used in a subsequent commitment period. Individual unit types are subject to different rules for carry-over
CCS	Carbon capture and storage
CDM	Clean Development Mechanism. A Kyoto Protocol mechanism that allows Annex I Parties to purchase emission allowances from projects in non-Annex I Parties that reduce or remove emissions. The emission allowances from CDM projects are CERs
CER	Certified emission reduction. A Kyoto unit representing an allowance to emit 1 metric tonne of CO_2-eq. CERs are issued for emission reductions from CDM project activities.
CH_4	methane
CM	Cropland management
CO_2	Carbon dioxide

CO_2-eq.	Carbon dioxide equivalent
COP	Conference of the Parties to the UNFCCC
CRF	Common reporting format
Domestic	Pertaining to a country's or group of countries' own emissions or internal action to reduce emissions
EEA	European Environment Agency
EED	Energy Efficiency Directive (Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC)
EFTA countries	European Free Trade Association countries: Liechtenstein, Switzerland, Norway, Iceland
EPBD	Energy Performance of Buildings Directive (Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings)
ERU	Emission reduction unit. A Kyoto unit representing an allowance to emit 1 metric tonne of CO_2-eq. ERUs are issued for emission reductions or emission removals from JI project activities by converting an equivalent quantity of the Party's existing AAUs or RMUs
ESD	Effort Sharing Decision (Decision No 406/2009/EC of the European Parliament and of the Council of 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020)
ETC/ACM	European Topic Centre on Air Pollution and Climate Change Mitigation. The ETC/ACM is a consortium of European institutes contracted by the EEA to carry out specific tasks in the field of air pollution and climate change
EU ETS	European Union Emissions Trading System
EU	European Union
EU-12	Bulgaria, Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia and Slovenia
EU-13	Bulgaria, Croatia, Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia and Slovenia
EU-15	Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and the United Kingdom
EU-25	Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Slovenia, Slovakia, Spain, Sweden and the United Kingdom
EU-27	Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovenia, Slovakia, Spain, Sweden and the United Kingdom

EU-28	Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovenia, Slovakia, Spain, Sweden and the United Kingdom
EUA	European Union allowance
EUAA	European Union aviation allowance
EUTL	European Union Transaction Log
FEC	Final energy consumption
FM	Forest Management
GAINS	Greenhouse Gas and Air Pollution Interactions and Synergies. Model providing a consistent framework for the analysis of co-benefits reduction strategies from air pollution and greenhouse gas sources.
GDP	Gross domestic product
GHG	Greenhouse gas
GM	Grazing-land management
GWP	Global warming potential
HFCs	Hydrofluorocarbons
ICAO	International Civil Aviation Organisation
IED	Industrial Emissions Directive (Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control)
IET	International emissions trading. One of the three Kyoto Protocol emissions trading mechanisms by which an Annex I Party may transfer Kyoto units to or acquire units from another Annex I Party. A Party must meet specific eligibility requirements to participate in emissions trading
IIEP	Institute for European Environmental Policy
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial processes and product use
ITL	International Transaction Log. An electronic data system, administered by the UNFCCC Secretariat, which monitors and tracks Parties' transactions of Kyoto units.
JI	Joint implementation. A Kyoto Protocol mechanism that allows Annex I Parties to purchase emission allowances from projects of other Annex I Parties that reduce or remove emissions. The emission allowances from JI projects are ERUs
JRC	Joint Research Centre
KP	Kyoto Protocol

ktoe	kilotonne of oil equivalent
LDC	Least developed countries
LULUCF	Land Use, Land-Use Change and Forestry. A GHG inventory sector subject to specific accounting rules
MBM	Market-based mechanism
MMD	Monitoring Mechanism Decision (Decision 28/2004/EC of 11 February 2004 concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol)
MMR	Monitoring Mechanism Regulation (Regulation (EU) No 525/2013 of the European Parliament and of the Council of 21 May 2013 on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change and repealing Decision No 280/2004/EC)
MS	Member State
Mt	Mega (million) tonne
Mtoe	million tonne of oil equivalent
N_2O	nitrous oxide
NAP	National allocation plan
NAT	National allocation table
National registry	An electronic database maintained by a Party, or group of Parties, for the transfer and tracking of units in accordance with the Kyoto Protocol rules
NEEAP	National Energy Efficiency Action Plan
NER	new entrants reserve
NER 300	Funding programme, funded from the sale of 300 million allowances from the NER set up for the third phase of the EU ETS, for demonstration projects of environmentally-safe CCS and innovative RES technologies on a commercial scale within the EU.
NF_3	nitrogen trifluoride
NIM	National implementation measure
Non-Annex I Parties	Parties not included in Annex I to the UNFCCC
NREAP	National Renewable Energy Action Plan
PAM	Policies and measures
Party	A Party is a state (or regional economic integration organization such as the EU) that agrees to be bound by a treaty and for which the treaty has entered into force. Annex I Parties are those listed in Annex I to the UNFCCC; they comprise industrialised countries that were members of the OECD in 1992 as well as countries with economies in transition, including the Russian Federation, the Baltic States and several central and eastern European States (UNFCCC, 2014b). These countries are asked by the convention to reduce their emissions, while non-Annex I countries are not obliged to do so.

PEC	Primary energy consumption
PFCs	Perfluorocarbons
Pledge	Emission reduction expressed as a percentage reduction, relative to the base year, which has to be achieved by a given year in the future
PPSR	Previous Period Surplus Reserve. Account in a Party's national registry where the Party's AAU surplus under a commitment period of the Kyoto Protocol, is transferred to be carried over to the subsequent commitment period.
PRIMES	Price-driven and Agent-based Simulation of Markets Energy System Models
QELRC(s)	Quantified Emission Limitation or Reduction Commitment(s), average level of anthropogenic carbon dioxide equivalent emissions of GHG expressed as a percentage in relation to the base year
RED	Renewable Energy Directive (Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC)
RES	Renewable Energy Sources
Retirement	The transfer of a unit to a retirement account to be used towards meeting a Party's Kyoto commitment
RICE	Regulation on International Credit Entitlements (Commission Regulation (EU) No 1123/2013 of 8 November 2013 on determining international credit entitlements pursuant to Directive 2003/87/EC of the European Parliament and of the Council)
RMU	Removal unit. A Kyoto unit representing an allowance to emit 1 metric tonne of CO_2-eq. RMUs are issued for emission removals from LULUCF activities under Article 3, paragraphs 3 and 4
SEF	Standard electronic format for reporting Kyoto Protocol units
SF_6	Sulphur hexafluoride
SHARES	Short Assessment of Renewable Energy Sources. Tool developed by Eurostat and aimed at facilitating the calculation of the share of energy from renewable sources according to the RED.
SIDS	Small island developing states
True-up period	A 100-day period after final emissions have been reported for the commitment period during which Parties have the opportunity to undertake final transactions necessary to achieve compliance with their Kyoto commitment
UNFCCC	United Nations Framework Convention on Climate Change
WAM	with additional measures
WEM	with existing measures

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Annex 1 Data sources for greenhouse gas emissions energy consumption and targets

A1.1 Legal reporting requirements for GHG data

The assessments of progress towards GHG targets presented in this report are for the most part based on information submitted by Member States themselves under the Monitoring Mechanism Decision (MMD) (EU, 2004) ([77]).

The initial purpose of the reporting requirements stipulated in the MMD was to enable the EU to meet its reporting requirements under the UNFCCC and to evaluate the projected progress of the EU and its Member States towards fulfilling their GHG mitigation commitments under the Kyoto Protocol in annual reports prepared by the European Commission and the EEA.

In 2014, Member States started reporting new information under the Monitoring Mechanism Regulation (MMR), which was adopted in 2013. The MMR (Regulation (EU) No 525/2013) sets up a Union inventory system (Article 6) and lays down the obligation for the Union and the Member States to yearly determine and report GHG inventories in accordance with reporting requirements of the UNFCCC (Article 7).

A Delegated Act (Commission Delegated Regulation (EU) No 666/2014, (EC, 2014e)) has defined the substantive requirements for a Union inventory system in order to fulfil the obligations pursuant to Decision 19/CMP.1.

Implementing provisions (Commission Implementing Regulation (EU) No 749/2014 (EC, 2014g)), adopted in June 2014, provide structure and format for the reporting of GHG inventories, approximated GHG inventories, information on policies and measures, GHG projections, and the use of auctioning revenue and project credits and for the purposes of the LULUCF Decision (Decision No 529/2013/EU of the European Parliament and of the Council).

A1.2 Historic greenhouse gas emission data

The analysis presented in this report is based on the following.

- GHG emission data for the period from 1990 to 2012, as included in GHG inventory reports reported under the UNFCCC. National GHG emission inventories are prepared according to approved guidelines under the UNFCCC. These guidelines are developed by the IPCC. 2014 GHG emission inventories were prepared using the 1996 IPCC guidelines. From 2015 onwards, national inventories by Annex I countries will be prepared according to 2006 IPCCC guidelines. Early estimates of 2013 GHG emissions reported by Member States to the European Commission under the MMR. Proxy data of Luxembourg and revised proxy data from Belgium were submitted after the legal deadline and cut-off date for inclusion in this report. For Luxembourg, the report uses EEA's own estimates of approximated 2013 GHG inventories for Member States. Norway also provided the EEA with information on estimated emissions in 2013.

- Data relative to the EU ETS, publicly available from the EUTL ([78]) as well as the EEA ETS data viewer (EEA, 2014e).

The assessment of progress towards targets under the ESD is based on ESD emissions for the year 2013. These emissions were calculated based on approximated estimates of 2013 total GHG emissions (excluding LULUCF) available from 21 Member States and the EEA as of 31 July 2014. 2013 verified emissions from installations covered by the ETS (stationary installations only) and CO_2 emissions from domestic aviation were subtracted from these national totals.

([77]) Replaced by the MMR, as of 8 June 2013.
([78]) The EUTL automatically checks, records and authorises all transactions in the EU ETS.

A1.3 Projected GHG emissions

The report uses GHG projection data until 2030, as reported by Member States in 2013 and 2014 under the MMD. All Member States reported updated GHG emission projections under this biennial requirement in 2013 and via their National Communications. In 2014, Member States were not required to report new projections under the MMR. However, seven Member States, as well as Switzerland, provided updated GHG emission projections in 2014. These projections were taken into account in this report ([79]).

Projections are reported in two separate scenarios: WEM, which considers the implementation of existing (already implemented) measures only, and WAM, which considers in addition the implementation of additional (at planning stage) measures.

QA/QC activities

In order to ensure timeliness, completeness, consistency, comparability, accuracy and transparency of the reporting of projections by the EU and its Member States, the projections reported by Member States and used in the report underwent QA/QC activities performed by the EEA and its European Topic Centre on Air pollution and Climate Change Mitigation (ETC/ACM).

The detailed checks are described in *Trends and projections in Europe 2013* (EEA, 2013), and in the EU's 6th National Communication (EU, 2014a). Such activities include the recalibration of projected trends on the basis of GHG inventory data, where discrepancies between historic trends and projected trends are observed.

When such calibration took place in 2014, national GHG inventory data as of 15 January 2014 were used. Calibrations performed in 2013 were performed against national GHG inventory data from 15 January 2013.

The EEA also used for comparison results from the 2013 update of the climate policy 'baseline with adopted measures' scenario from the European Commission (EU, 2014a). These results were also used for gap filling, where necessary, in close cooperation with Member States.

Projected ESD emissions

While projections of total emissions are relevant to the assessment of the EU's progress towards its 20 % reduction target by 2020, the assessment of the projected progress of Member States towards their national 2020 targets, set under the ESD as part of the climate and energy package, is based on projection data concerning emissions not covered by the EU ETS submitted by Member States on a voluntary basis.

While 23 Member States provided a split of their projections between ETS and ESD emissions until 2020, 18 Member States reported ESD emission projections consistent with the scope of the ETS for the third trading period from 2013 to 2020. For another two Member States, quality checks indicated that the reported projections were consistent with the scope of the ETS for the second trading period from 2008 to 2012. These projections were therefore adjusted by the EEA, based on the annual ratio between AEAs consistent with the two different scopes of the EU ETS. Four Member States reported incomplete or no projections of ESD emissions. These projections were gap-filled by the EEA, by applying the share of ESD emissions in total emissions by 2020 available from the European Commission's 2013 baseline 'with adopted measures' scenario to the total emissions for 2020 as reported by the Member States. In the case of Croatia, the 2005–2020 relative growth of non-ETS emissions available from the Commission's baseline was applied to Croatia's 2005 base-year emissions.

A1.4 Energy consumption data

The assessment of progress towards RES objectives and targets was for the most part based on information reported by Member States to Eurostat under the Energy Statistics Regulation and under the RED, and published by Eurostat via its energy statistics database (Eurostat, 2014b) and Eurostat's Short Assessment of Renewable Energy Sources (Eurostat, 2014a). Targets regarding the RES share in each Member State in 2020 were taken from Part A of Annex I of the RED; indicative trajectories for the 2011–2018 period were taken from Part B of Annex I of the RED. Expected national RES trajectories for the 2011–2012 period and until 2020 were derived from information submitted by Member States to the European Commission in 2010, in the context of their NREAPs. Additional data published by

([79]) Cyprus, Ireland, Lithuania, Liechtenstein Luxembourg, Romania and Poland.

EurObserv'ER (EurObserv'ER, 2014) were used for the breakdown of the RES share by energy technologies to supplement, where necessary, the data sourced from Eurostat.

The assessment of progress towards energy efficiency objectives was based on the following.

- National progress reports submitted by Member States in 2014 in compliance with requirements laid out in Article 24 of the EED.
- National reports prepared under the EU project Energy Efficiency Watch and the final report assessing the quality of the second NEEAPs.
- National reports prepared within the framework of the ODYSSEE-MURE project by national experts.

A1.5 2020 climate and energy targets

The main targets applicable to Member States under international and EU commitments are presented in Table A1.1.

A1.6 Influence of the scope of the EU ETS on targets under the Effort Sharing Decision

The absolute annual ESD targets (AEAs) considered for the assessment of current and projected progress are consistent with the scope of the EU ETS during the third trading period (2013–2020).

In either case, the AEA values taken into account are consistent with the scope of the EU ETS for the compliance period of 2013 to 2020, based on the data published by the European Commission in 2013. These AEAs were determined in the following two stages.

- In March 2013, the Commission published AEA values consistent with the scope of the EU ETS during the second trading period, from 2008 to 2012 (EC, 2013a).
- In October 2013, the Commission published adjustments (under Article 10 of the ESD), to account for the change in the scope of the EU ETS between the second trading period and the third trading period (from 2013 to 2020) (EC, 2013e). The final AEA values were therefore calculated on the basis of these two Commission decisions.

A1.7 Influence of global warming potential values on targets under the Effort Sharing Decision

In 2013, the European Commission published two sets of values for AEAs (annual targets for the period from 2013 to 2020 under the ESD). One set was based on GWP values from the IPCC's SAR, while the other set was based on GWP values from the IPCC's AR4. The present assessment of progress makes use of both sets, as explained below.

- For the assessment of **current progress** (2013 ESD emissions vs 2013 ESD targets), ESD emissions are compared with 2013 AEA values (ESD targets) expressed according to AR4 GWPs. This is because the calculation of 2013 ESD emissions depends on 2013 verified emissions in the EU ETS, which are provided using GWP values from the IPCC's *Fourth Assessment Report* (AR4). ESD emissions are therefore also calculated on the basis of the AR4 GWPs.
- For the assessment of **projected progress** (2013–2020 projections vs 2013–2020 ESD targets), projections are therefore compared with 2013–2020 AEA values (ESD targets) expressed according to SAR GWPs. This is because the projections used were provided by Member States on the basis of GWP values from the IPCC's *Second Assessment Report* (SAR).

The use of two distinct sets of GWPs (and consequently two sets of ESD targets) is only necessary in this year's assessment, as Member States will report their projections using AR4 GWPs in 2015.

A1.8 Calculation of '2005 ESD base-year emissions'

The assessment of progress towards ESD targets presents results in both absolute and relative terms. Absolute gaps between ESD emissions and targets correspond to the difference between the two values. These gaps represent the only parameter used to check compliance.

For the year 2005, several emission data can be considered, depending on their use. In order to compare the assessment results across EU Member States, the gaps to targets are also expressed in relative terms, as a share of 2005 ESD base-year emissions. These base-year emissions are determined by the EEA so as to be consistent with

Table A1.1 Main national targets

			GHG emissions			Renewable energy	Energy efficiency	
	Annex I Party to the Convention	Partici-pating in EU ETS	2020 target under the Effort Sharing Decision	2020 target under the Effort Sharing Decision (SAR)	2020 target under the Effort Sharing Decision (FAR)	2020 target under the Renewable Energy Directive	2020 indicative target for primary energy consump-tion	2020 indicative target for final energy consump-tion
			% compared to 2005 base year	Mt CO_2-eq.	Mt CO_2-eq.	% of RES in gross final energy consump-tion	Mtoe	Mtoe
EU	x					20	1 483.0	1 086.0
Austria	x	x	– 16	47.9	48.8	34	31.5	26.3
Belgium	x	x	– 15	66.7	67.7	13	43.7	32.5
Bulgaria	x	since 2007	20	27.2	28.8	16	15.8	9.2
Croatia	x	since 2013	11	20.4	21.0	20	n/a	9.2
Cyprus ([b])	-	x	– 5	5.5	5.9	13	2.9	2.2
Czech Republic	x	x	9	65.7	67.7	13	39.6	24.4
Denmark ([a])	x	x	– 20	29.7	30.5	30	17.8	14.8
Estonia	x	x	11	6.3	6.5	25	6.5	2.8
Finland	x	x	– 16	27.7	28.4	38	35.9	26.7
France	x	x	– 14	350.1	359.3	23	236.3	131.4
Germany	x	x	– 14	417.3	425.6	18	276.6	194.3
Greece	x	x	– 4	58.9	61.2	18	27.1	20.5
Hungary	x	x	10	56.6	58.2	13	26.6	18.2
Ireland	x	x	– 20	37.2	39.0	16	13.9	11.7
Italy	x	x	– 13	287.9	294.4	17	158.0	126.0
Latvia	x	x	17	9.6	9.9	40	5.4	4.5
Lithuania	x	x	15	14.9	15.5	23	6.5	4.3
Luxembourg	x	x	– 20	8.1	8.1	11	4.5	4.2
Malta	x ([c])	x	5	1.1	1.2	10	0.7	0.5
Netherlands	x	x	– 16	104.5	107.0	14	60.7	52.2
Poland	x	x	14	195.0	202.3	15	96.4	70.4
Portugal	x	x	1	49.0	51.2	31	22.5	17.4
Romania	x	since 2007	19	83.6	88.4	24	43.0	30.3
Slovakia	x	x	13	25.4	26.5	14	16.2	10.4
Slovenia	x	x	4	12.1	12.5	25	7.3	5.1
Spain	x	x	– 10	208.6	214.2	20	119.9	80.1
Sweden	x	x	– 17	36.4	37.2	49	43.4	30.3
United Kingdom ([a])	x	x	– 16	319.5	327.1	15	177.6	157.8
Iceland	x	since 2008	n/a	n/a	n/a	n/a	n/a	n/a
Liechtenstein	x	since 2008	n/a	n/a	n/a	n/a	n/a	n/a
Norway	x	since 2008	n/a	n/a	n/a	n/a	n/a	n/a
Switzerland	x	-	n/a	n/a	n/a	n/a	n/a	n/a
Turkey ([d])	x	-	n/a	n/a	n/a	n/a	n/a	n/a

Note: ([a]) The Faeroes and Greenland, in the case of Denmark, and the United Kingdom Overseas territories are not Members of the European Union and therefore are not included here.

([b]) Cyprus ratified the UNFCCC in 1997 and the Kyoto Protocol in 1999.

([c]) Malta ratified the UNFCCC in 1994 and became an Annex I Party to the Convention at the end of 2010. It ratified the Kyoto Protocol in 2001.

([d]) Turkey was not Party to the UNFCCC when the Kyoto Protocol was adopted. It ratified the Kyoto Protocol in 2009.

Source: EC, 2013a and 2013e; EU, 2009b, 2009d and 2012b.

the relative 2020 ESD target (in % of 2005 emissions) and the absolute 2020 target as published in the Commission decisions mentioned above.

Therefore:

ESD base-year emissions = 2020 absolute target/ (1 + % 2020 ESD target)

and:

Relative gap (in percentage points of base-year emissions) = (ESD target – projected ESD emissions)/ ESD base-year emissions

For the purpose of analysis emission trends in the ESD, **historic 2005 ESD emissions** are calculated using the latest GHG inventory data, from which ETS emissions (including scope corrections) and CO_2 emissions from domestic aviation are subtracted.

Table A1.2 Historic 2005 ESD emissions vs 2005 ESD base-year emissions, based on SAR GWPs (used for tracking projected progress) and AR4 GWPs (used for tracking current progress)

Country	Historic 2005 ESD emissions, SAR GWPs	2005 ESD base-year emissions, SAR GWPs	2005 ESD base-year emissions, AR4 GWPs
	Mt CO_2-eq.	Mt CO_2-eq.	Mt CO_2-eq.
Austria	56.8	57.0	58.1
Belgium	77.4	78.4	79.6
Bulgaria	22.7	22.7	24.0
Croatia	18.4	18.3	18.9
Cyprus	4.8	5.8	6.3
Czech Republic	60.5	60.3	62.1
Denmark	37.5	37.2	38.1
Estonia	5.6	5.6	5.8
Finland	33.0	33.0	33.8
France	403.0	407.1	417.8
Germany	483.0	485.2	494.9
Greece	61.4	61.3	63.8
Hungary	50.4	51.5	52.9
Ireland	46.9	46.5	48.7
Italy	330.5	330.9	338.4
Latvia	8.2	8.2	8.5
Lithuania	12.4	12.9	13.4
Luxembourg	10.2	10.1	10.2
Malta	1.0	1.1	1.1
Netherlands	123.0	124.4	127.4
Poland	179.6	171.0	177.5
Portugal	49.5	48.5	50.7
Romania	63.8	70.2	74.3
Slovakia	21.0	22.5	23.5
Slovenia	11.6	11.7	12.1
Spain	229.1	231.8	238.0
Sweden	43.5	43.9	44.8
United Kingdom	400.4	380.4	389.4
EU	**2 845.3**	**2 837.6**	**2 914.0**

Note: The 2005 base-year emissions were estimated by EEA based on 2020 ESD targets published in the Decision determining Member States' AEAs, the adjustment to account for the EU ETS scope of 2013 through 2020 (laid out in Annex I of the Commission Decision (2013/634/EU) and the percentage reduction targets for 2020 set out in the ESD. Historic 2005 ESD emissions are calculated from total 2005 GHG emissions, from which are subtracted EU ETS emissions (including scope corrections) and CO_2 emissions from domestic aviation.

Source: EC, 2013a and 2013e; EEA, 2014; EU, 2009a.

Annex 2 Detailed assessment results (progress under the Effort Sharing Decision)

A2.1 Current progress towards targets under the Effort Sharing Decision

The assessment of current progress towards 2013 ESD targets is based on a comparison between estimated domestic ESD emissions in 2013 and ESD targets (AEAs) for 2013. It does not take into account the possible use of flexibility options as permitted under the ESD. All the data used for this assessment are consistent with the scope of the EU ETS for the period from 2013 to 2020.

A2.2 Projected progress towards ESD targets

The assessment of projected progress towards 2020 ESD targets is based on a comparison between projections of domestic ESD emissions under WEM and WAM scenarios and ESD targets (AEAs) for 2020 taking into account SAR GWPs. It does not take into account the possible use of flexibility options as permitted under the ESD. All the data used for this assessment are consistent with the scope of the EU ETS for the period from 2013 to 2020.

The absolute annual ESD targets (AEAs) considered for the assessment of projected progress are consistent with the scope of the EU ETS during the third trading period (2013–2020). They represent tentative estimates by the EEA of ESD targets consistent with the ESD/EU ETS scope for the period from 2013 to 2020.

The detailed figures used in the assessment of current and projected progress are presented in Tables A2.1 and A2.2.

Further details on the determination of ESD targets and base years, depending on the scope of the EU ETS and the global warming potential values considered, are presented in Annexes 1.6, 1.7 and 1.8.

Further details on compliance under the ESD, in particular on the permitted use of flexibility provisions for meeting annual targets, are presented in Annex 3.1.

Table A2.1 Current progress towards 2013 ESD targets: difference between 2013 emissions and 2013 ESD target

	2005 base-year ESD emissions	2013 ESD target		2013 ESD emissions		Gap (2013 ESD emissions vs. 2013 ESD target)	
Country	**Mt CO_2-eq.**	**Mt CO_2-eq.**	**% change compared to 2005 base-year emissions**	**Mt CO_2-eq.**	**% change compared to 2005 base-year emissions**	**Mt CO_2-eq.**	**Percentage points**
Austria	58.1	52.6	– 9	51.5	– 11	1.2	2
Belgium	79.6	78.4	– 2	72.9	– 8	5.4	7
Bulgaria	24.0	26.9	12	25.1	5	1.8	7
Croatia	18.9	19.6	4	17.2	– 9	2.4	13
Cyprus	6.3	5.9	– 5	5.0	– 21	1.0	15
Czech Republic	62.1	62.5	1	61.1	– 2	1.4	2
Denmark	38.1	36.8	– 3	32.4	– 15	4.4	12
Estonia	5.8	6.3	8	5.4	– 7	0.9	15
Finland	33.8	31.8	– 6	29.3	– 13	2.5	7
France	417.8	394.1	– 6	381.4	– 9	12.7	3
Germany	494.9	472.5	– 5	476.0	– 4	– 3.5	– 1
Greece	63.8	59.0	– 8	51.0	– 20	7.9	12
Hungary	52.9	50.4	– 5	42.0	– 21	8.4	16
Ireland	48.7	46.9	– 4	43.1	– 12	3.8	8
Italy	338.4	308.2	– 9	278.3	– 18	29.8	9
Latvia	8.5	9.3	9	8.5	1	0.7	8
Lithuania	13.4	12.9	– 4	12.9	– 4	0.1	1
Luxembourg	10.2	9.5	– 6	9.7	– 5	– 0.1	– 1
Malta	1.1	1.2	6	1.1	– 4	0.1	10
Netherlands	127.4	122.9	– 4	107.9	– 15	15.1	12
Poland	177.5	193.6	9	197.9	11	– 4.2	– 2
Portugal	50.7	49.3	– 3	44.4	– 12	4.9	10
Romania	74.3	75.6	2	69.1	– 7	6.5	9
Slovakia	23.5	24.0	2	21.6	– 8	2.4	10
Slovenia	12.1	12.3	2	11.2	– 7	1.1	9
Spain	238.0	227.6	– 4	196.1	– 18	31.5	13
Sweden	44.8	41.7	– 7	36.1	– 20	5.6	13
United Kingdom	389.4	358.7	– 8	353.4	– 9	**5.4**	1
EU-28	**2 914.0**	**2 790.6**	**– 4**	**2 641.5**	**– 9**	**149.1**	**5**

Note: Values consistent with EU ETS scope of the third trading period (2013–2020), with GWP values from AR4.

Absolute gaps calculated as the difference between targets and emissions. Relative gaps calculated as the ratio between absolute gaps (2013 proxy emissions vs 2013 targets) and 2005 base-year emissions: absolute gap (in Mt CO_2-eq.) = ESD target 2013 – ESD proxy emissions 2013, and relative gap (in percentage points of 2005 ESD base-year emissions) = absolute gap / adjusted 2005 base-year ESD emissions.

Source: EC, 2013a and 2013e; EEA, 2014; EU, 2009a.

Table A2.2 Projected progress towards 2020 ESD targets: difference between ESD WEM and WAM projections and ESD targets

	2005 base-year ESD emissions	2020 ESD target		2020 projections WEM		2020 projections WAM	
Country	**Mt CO_2-eq.**	**Mt CO_2-eq.**	**% change compared to 2005 base-year emissions**	**Mt CO_2-eq.**	**% change compared to 2005 base-year emissions**	**Mt CO_2-eq.**	**% change compared to 2005 base-year emissions**
Austria	57.0	47.9	– 16	51.7	– 9	48.1	– 16
Belgium	78.4	66.7	– 15	75.5	– 4	75.0	– 4
Bulgaria	22.7	27.2	20	27.8	23	24.8	9
Croatia	18.3	20.4	11	17.3	– 6	17.3	– 6
Cyprus	5.8	5.5	– 5	2.8	– 51	2.7	– 53
Czech Republic	60.3	65.7	9	55.9	– 7	54.7	– 9
Denmark	37.2	29.7	– 20	29.1	– 22	29.1	– 22
Estonia	5.6	6.3	11	6.0	6	5.7	2
Finland	33.0	27.7	– 16	29.1	– 12	28.1	– 15
France	407.1	350.1	– 14	342.3	– 16	312.4	– 23
Germany	485.2	417.3	– 14	420.7	– 13	399.8	– 18
Greece	61.3	58.9	– 4	58.2	– 5	56.3	– 8
Hungary	51.5	56.6	10	43.0	– 16	40.5	– 21
Ireland	46.5	37.2	– 20	45.1	– 3	41.8	– 10
Italy	330.9	287.9	– 13	299.4	– 10	269.9	– 18
Latvia	8.2	9.6	17	9.7	18	9.4	15
Lithuania	12.9	14.9	15	15.1	17	13.1	2
Luxembourg	10.1	8.1	– 20	10.4	3	9.7	– 4
Malta	1.1	1.1	5	1.1	4	1.1	2
Netherlands	124.4	104.5	– 16	105.5	– 15	101.0	– 19
Poland	171.0	195.0	14	178.0	4	178.0	4
Portugal	48.5	49.0	1	33.6	– 31	33.6	– 31
Romania	70.2	83.6	19	75.5	7	73.0	4
Slovakia	22.5	25.4	13	17.1	– 24	16.7	– 26
Slovenia	11.7	12.1	4	12.1	4	10.4	– 11
Spain	231.8	208.6	– 10	228.5	– 1	224.7	– 3
Sweden	43.9	36.4	– 17	35.4	– 19	35.0	– 20
United Kingdom	380.4	319.5	– 16	306.6	– 19	306.6	– 19
EU	**2 837.6**	**2 572.9**	**– 9**	**2 532.5**	**– 11**	**2 418.5**	**– 15**

Note: Absolute gaps calculated as the difference between emissions and targets and expressed in Mt CO_2-eq. Relative gaps are calculated as the ratio between absolute gaps and 2005 base-year emissions: absolute gap (in Mt CO_2-eq.) = ESD target 2020 – projected 2020 ESD emissions, and relative gap (in percentage points of 2005 ESD base-year emissions) = absolute gap/adjusted 2005 base-year ESD emissions.

Source: EC, 2013a and 2013e; EEA, 2014; EU, 2009a.

Annex 3 Additional information on targets under the Effort Sharing Decision, the Kyoto Protocol and the UNFCCC

A3.1 National targets and compliance under the Effort Sharing Decision

The ESD covers emissions from all sources outside the EU ETS, except for emissions from international maritime, domestic and international aviation (which were included in the EU ETS from 1 January 2012) and emissions and removals from LULUCF. It thus includes a diverse range of small-scale emitters in a wide range of sectors such as transport (cars, trucks), buildings (in particular heating), services, small industrial installations, agriculture and waste. Such sources currently account for about 60 % of total GHG emissions in the EU.

The ESD sets binding annual targets for all Member States for the period from 2013 to 2020. At EU level, this will deliver an approximate 9 % reduction of emissions in 2020 compared with 2005 levels, from those sectors covered by the decision.

Each Member State contributes to this effort, according to its relative wealth in terms of GDP per capita. The national emission targets range from a 20 % reduction for the richest Member States to a 20 % increase for poorer ones in 2020 compared with 2005 levels (see Figure 2.1). At EU level, this will deliver an approximate 9 % to 10 % reduction of emissions in 2020 compared with 2005 levels, from those sectors covered by the decision. Less wealthy countries are allowed emission increases in these sectors because their relatively higher economic growth is likely to be accompanied by higher emissions. Nevertheless, their targets still represent a limit on emissions, and a reduction effort will be required in all Member States; they will need to introduce policies and measures to limit or lower their emissions in the various ESD sectors.

The annual ESD targets —AEAs — are expressed in tonnes of CO2-equivalent (t CO_2-eq.). The European Commission determined in 2013 the AEAs of Member States for the period from 2013 to 2020, using reviewed and verified emission data for the years 2005, 2008, 2009 and 2010. The AEAs were later adjusted to reflect the change in ETS scope from 2013 onwards (EC, 2013e).

The ESD allows Member States to make use of flexibility provisions for meeting their annual targets, with certain limitations.

- Within the Member State itself, any overachievement in a year of the period from 2013 to 2019 can be carried over to subsequent years, up to 2020. An emission allocation of up to 5 % during the period from 2013 to 2019 may be carried forward from the following year.
- Between Member States, Member States may transfer up to 5 % of their AEAs to other Member States, which may use this emission allocation until 2020 (ex ante). Any overachievement in a year of the period from 2013 to 2019 may also be transferred to other Member States, which may use this emission allocation until 2020 (ex post).
- Member States may use JI/CDM credits according to the following provisions.
- The use of project-based emission credits is capped on a yearly basis up to 3 % of 2005 ESD emissions in Member State.
- Member States that do not use their 3 % limit for the use of project-based credits in any specific year can transfer their unused part for that year to other Member States or bank it for their own use until 2020.
- Member States fulfilling additional criteria (Austria, Belgium, Cyprus, Denmark, Finland, Ireland, Italy, Luxembourg, Portugal, Slovenia, Spain and Sweden) may use credits from projects in Least Developed Countries (LDCs) and Small Island Developing States (SIDS) up to an additional 1 % of their verified emissions in 2005. These credits are not bankable and transferable.

Overall, a maximum of JI/CDM credits representing 750 Mt CO_2 at EU level can be used during the period from 2013 to 2020. As most Member States are expected to meet their ESD targets

(see Section 4.3) without the flexibility provisions or through intra-EU transfers of AEAs, the actual use of project credits is expected to be significantly smaller.

Any Member State exceeding its annual AEA, even after taking into account the flexibility provisions and the use of JI/CDM credits, will face an infringement procedure from the Commission, as well as the following consequences:

- deduction from the AEA for the next year of the excess non-ETS emissions multiplied by 1.08 (8 % interest rate);
- development of a corrective action plan; the Commission may issue an opinion based on comments from Climate Change Committee;
- transfer of emission allocations and project-based credits from the account of that Member State will be temporarily suspended.

A3.2 Kyoto target in the first commitment period

The first commitment period of the Kyoto Protocol ran from 2008 until 2012. In this first period, 37 industrialised countries committed to reduce GHG emissions by an average of 5 % against 1990 levels. Under this commitment period, the 15 countries which were EU Member States at the time pledged to jointly reduce their GHG emissions by 8 % compared to base-year levels (which are roughly equivalent to 1990 levels) ([80]). To determine the contribution of each Member State to reaching this overall target, differentiated emission limitation or reduction targets were agreed for each of the 15 pre-2004 Member States under an EU accord known as the Burden-Sharing Agreement (EU, 2002).

While the EU-15 has a target under the Kyoto Protocol's first commitment period, the EU-28 does not, because the protocol was ratified before 13 countries became EU Member States in 2004, 2007 and 2013. Eleven of these 13 Member States have individual targets under the Kyoto Protocol's first commitment period, while Cyprus and Malta do not have targets. These two latter countries became Annex I Parties to the convention in 2013 and 2010, respectively (UNFCCC, 2009, 2011a).

Of the other countries members of the EEA, Iceland, Liechtenstein, Norway and Switzerland have individual targets under the Kyoto Protocol's first commitment period. Turkey, which acceded to the Kyoto Protocol in February 2009, has no quantified emission reduction commitment. Despite being an Annex I Party to the UNFCCC, Turkey is not included in the Kyoto Protocol's Annex B where individual targets for Annex I Parties are listed because it was not a Party to the UNFCCC when the Kyoto Protocol was adopted ([81]).

The target under the Kyoto Protocol for the first commitment period was based on the following methodological assumptions and conditions:

- emissions or removals from LULUCF are included;
- the target refers to 1990 as a single base year, but is subject to the flexibility rules on F-gases and Economies in Transition contained in Article 3(5) of the Kyoto Protocol;
- emissions from international aviation are excluded from the target; the sectors included are energy, IPPU, agriculture and waste;
- the use of CERs, ERUs and possible recognition of units from new market-based mechanisms is possible to achieve the target (yet the EU ETS is capped for the use of units under EU domestic legislation);
- the target is based on the GWPs included in the *Second Assessment Report* of the IPCC;
- the target covers the gases CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, consistent with the GHGs covered under the reporting requirements under the UNFCCC.

([80]) The target refers to 1990 as a single base year, but is subject to the flexibility rules regarding F-gases and economies in transition contained in Article 3(5) of the Kyoto Protocol. This paragraph stipulates that Parties included in Annex I undergoing the process of transition to a market economy whose base year or period was established by decision 9/CP.2 of the COP shall use that base year or period for the implementation of their commitments. Furthermore, 1995 may be used as a base year for HFCs, PFCs and SF_6. Accordingly, 1990 is used as a base year for emissions of CO_2, CH_4 and N_2O for all countries except Bulgaria (1988), Hungary (average of 1985 through 1987), Slovenia (1986), Poland (1988) and Romania (1989); and 1995 is used as a base year for F-gases (HFCs, PFCs and SF_6) for all countries except Austria, Croatia, France, Italy and Slovakia (all 1990) and Romania (1989).

([81]) See also UNFCCC's Kyoto Protocol target information (UNFCCC, 2013a).

A3.3 Amendments to Kyoto Protocol rules for the second commitment period

The main amendments to Kyoto Protocol rules for the second commitment period (from 2013 to 2020) compared to the rules that were applicable in the first commitment period (from 2008 to 2012) include the following.

- The introduction of an ambition mechanism through Article 3.1quater, which allows a Party to adjust its commitment by increasing its ambition during a commitment period.
- The introduction of Article 3.7ter which allows for the adjustment of assigned amounts for the second commitment period in order to prevent an increase in its emissions for the period 2013 to 2020 beyond its average emissions for the years 2008 to 2010. According to this rule, the AAUs of a Party will be cancelled if and to the extent that its assigned amount for the second commitment period exceeds its average emissions in the first three years of the preceding commitment period multiplied by eight (the number of years in the second commitment period).
- New accounting rules for emissions removals from LULUCF according to the relevant decisions made at COP 17 in Durban (UNFCCC, 2012a).
- The carry-over of surplus AAUs from the first commitment period of the Kyoto Protocol is possible according to specific accounting rules (see Section 2.3).
- Use of the GWPs included in the *Fourth Assessment Report* of the IPCC (instead of GWPs from the *Second Assessment Report*).
- In addition to the gases covered in the first commitment period, the target for the second commitment period also covers NF_3.

A number of other rules have not changed for the second commitment period. Like in the first commitment period, the target for the second commitment period refers to 1990 as a single base year, but allows for different base years according to the flexibility rules for F-gases and Economies in transition (as described above). For the newly added GHG NF_3, 1995 or 2000 may be used as a base year. Base years for individual Member States have not yet been set for the second commitment period. Also, the use of CERs, ERUs and possible recognition of units from new market-based mechanisms is still possible to achieve the target (yet capped under EU domestic legislation), and the sector coverage remains the same.

A3.4 Accounting rules under the UNFCCC

The EU clarified that the accounting rules for the target under the UNFCCC are more ambitious than the current rules under the Kyoto Protocol, for example, including international aviation, adding an annual compliance cycle for emissions under the ESD or higher CDM quality standards under the ETS (UNFCCC, 2013b). Accordingly, the following assumptions and conditions apply to the EU's 20 % target under the UNFCCC:

- Emissions or removals from LULUCF are not included.
- The target refers to 1990 as a single base year for all gases and all Member States.
- Emissions from international and domestic aviation are included in the target.
- CERs, ERUs and units from new market-based mechanisms may be used to achieve the target: in the EU ETS, the use of units is capped (up to 50 % of the reduction required from EU ETS sectors by 2020). In the ESD sectors, the annual use of carbon credits is limited to up to 3 % of each Member State's ESD emissions in 2005, with a limited number of Member States being permitted to use an additional 1 % from projects in LDCs or SIDS, subject to conditions. Moreover, higher CDM quality standards apply to the use of CERs for compliance with the EU's target under the convention.
- The carry-over of surplus assigned amount units (AAUs) from the first commitment period of the Kyoto Protocol is not possible (but surplus EU emissions allowances allocated under the EU ETS can be banked from the 2008–2012 period into subsequent periods).
- The target is based on the GWPs included in the *Second Assessment Report* (SAR) of the IPCC (while reporting from 2015 onwards will be based on the GWPs included in the IPCC's *Fourth Assessment Report* (AR4)).
- The target covers the gases CO_2, CH_4, N_2O, HFCs, PFCs and SF_6, consistent with the GHGs covered under the reporting requirements under the convention (UNFCCC, 2013b).

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