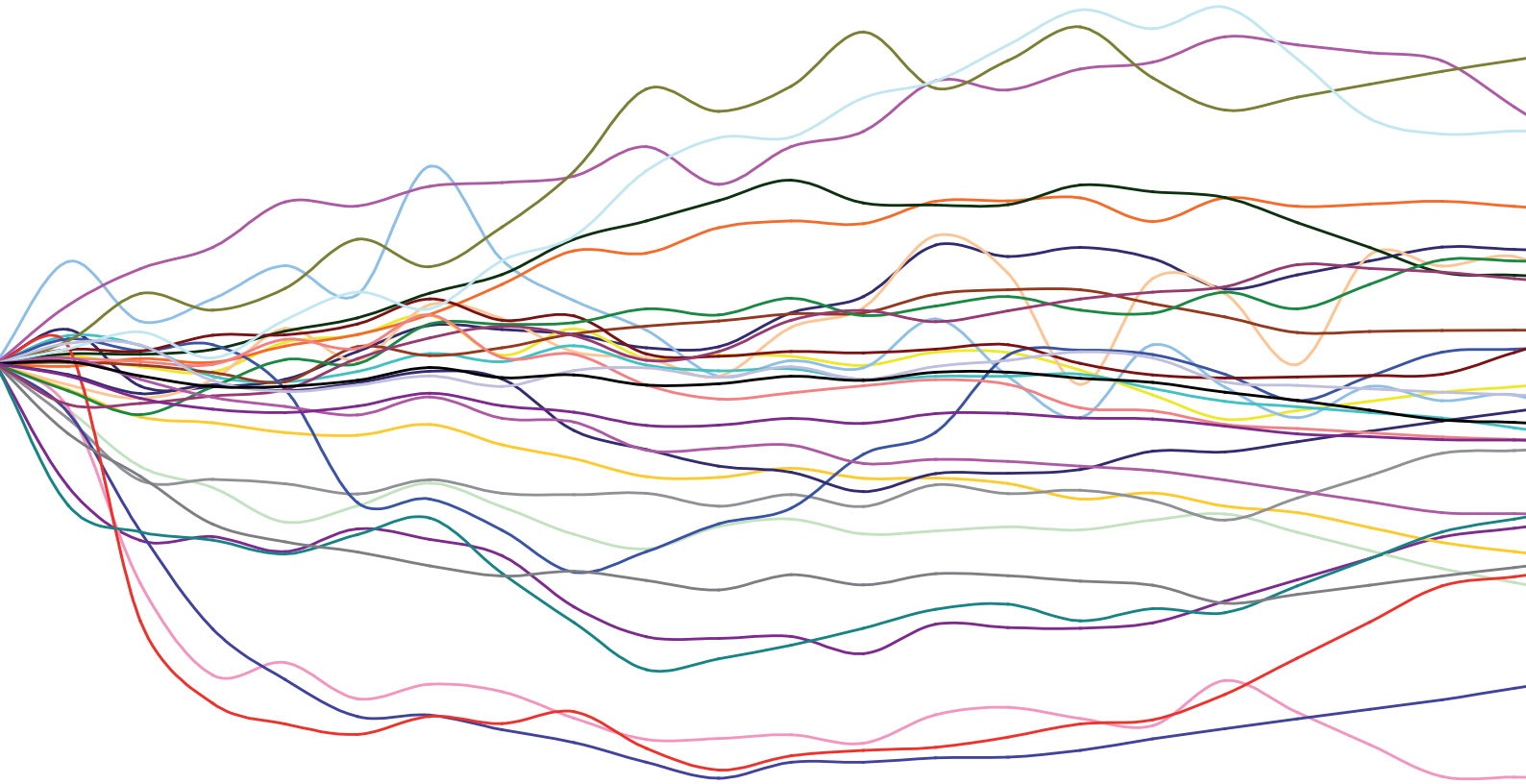
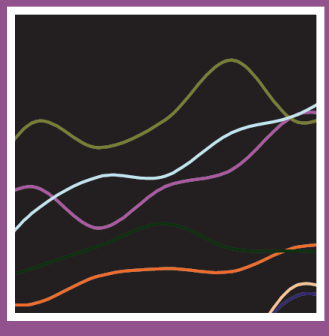
EEA Report | No 9/2009

# Greenhouse gas emission trends and projections in Europe 2009

## Tracking progress towards Kyoto targets

ISSN 1725-9177





European Environment Agency

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Layout: EEA/Pia Schmidt



Information about the European Union is available on the Internet. It can be accessed through the Europa server (www.europa.eu).

Luxembourg: Office for Official Publications of the European Communities, 2009

ISBN 978-92-9213-035-0
ISSN 1725-9177
DOI 10.2800/23935



**Environmental production**
This publication is printed according to high environmental standards.

**Printed by Schultz Grafisk**
— Environmental Management Certificate: ISO 14001
— IQNet – The International Certification Network DS/EN ISO 14001:2004

— Quality Certificate: ISO 9001: 2000
— EMAS Registration. Licence no. DK – 000235
— Ecolabelling with the Nordic Swan, licence no. 541 176

**Paper**
RePrint — 90 gsm.
CyclusOffset — 250 gsm.
Both paper qualities are recycled paper and have obtained the ecolabel Nordic Swan.

*Printed in Denmark*


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# Acknowledgements

This report was coordinated by François Dejean under the guidance and support of Andreas Barkman. Assistance and feedback from EEA colleagues was much appreciated. It was written by the EEA and its European Topic Centre for Air and Climate Change (ETC/ACC). The ETC/ACC task manager was Elisabeth Kampel (Umweltbundesamt, Austria). The authors were:

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***Öko-Institut, Germany (ETC/ACC)***

Julia Busche, Verena Graichen, Hauke Herman and Lennart Mohr (Section 5.1, Annexes A.4 and A.5).

***Umweltbundesamt, Austria (ETC/ACC)***

Bernd Gugele, Sabine Göttlicher, Elisabeth Kampel and Nicole Mandl (Chapters 2, 3 and 9, and Annexes A.1, A.3, A.6 and A.7).

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The EEA acknowledges the comments received on the draft report from the EEA national focal points, the experts of EEA member countries and the European Commission. These comments are included in this report as far as practically feasible.

# Executive summary

This report presents an analysis of historic and projected trends of greenhouse gas emissions in Europe. It assesses the current and projected progress of EU Member States, EU candidate countries and other EEA member countries towards their respective targets under the Kyoto Protocol and under EU commitments for 2020. This analysis is based on greenhouse gas emissions inventories for 1990 to 2007, available estimates of 2008 emissions and greenhouse gas emission projections for 2010, 2015 and 2020, derived from data and related information reported by EEA member countries. All EEA member countries except Hungary, Iceland, Liechtenstein, Poland and Turkey provided updated information on emission projections and national programmes in 2009.

**Greenhouse gas emission trends in Europe are, on the whole, encouraging but developments in transport emissions and the emissions of certain fluorinated gases are alarming.**

Greenhouse gas emissions in the European Union are decreasing and are expected to continue to do so with the implementation of all measures planned by Member States. In 2008, for the fourth consecutive year, emissions in the EU decreased to reach their lowest level since 1990. The EU-27 has been achieving significant decoupling of its emissions from economic growth. Greenhouse gas emissions in the EU-27 now represent 11 to 12 % of global greenhouse gas emissions and each EU citizen emits on average 10.2 t $CO_2$-equivalent every year.

Historic trends of greenhouse gas emissions in the EU during the period 1990–2007 are the result of two sets of opposing factors. On the one hand, emissions have been driven upward by the increases in electricity and heat production by thermal plants (both in absolute terms and in comparison with other sources), industrial activity, transport volumes (passengers and freight) and the share of road transport compared to other modes. On the other hand, large emission reductions occurred in the same period, due to the economic downturn affecting eastern Member States in the 1990s, energy efficiency improvements (in particular by industrial end users and energy industries), a shift from coal to less polluting fuels (in particular gas and biomass) for the production of electricity and heat, and fuel efficiency improvements in vehicles.

Transport still remains the most problematic emitting sector, with upward emission trends (+ 26 % between 1990 and 2007, + 0.5 % between 2006 and 2007) due to an ever-increasing demand for transport of passengers and goods and a preference for road over other less-polluting ground transport modes. International aviation and shipping emissions have increased most of all sectors (+ 110 % and + 60 % respectively between 1990 and 2007).

Of all greenhouse gases, hydrofluorocarbons are the only ones for which emissions have drastically increased between 1990 and 2007 in the EU (+ 125 %), due to their use as a substitute for ozone-depleting substances phased-out under the Montreal Protocol and to the expansion of air conditioning.

**The EU-15 is making good progress towards its common Kyoto target. Five EU-15 Member States (France, Germany, Greece, Sweden and the United Kingdom) have already achieved average GHG emission levels below their Kyoto target.**

Compliance of Parties to the Kyoto Protocol with their emission targets can only finally be determined in the year 2014, when inventory data for the five-year commitment period 2008–2012 is available. This report assesses progress in two ways: using past emissions on the one hand and emission projections on the other. Taking the first approach, emissions currently available for the latest five-year period are compared to targets for the Kyoto commitment period 2008–2012. This gives an indication of how close countries currently stand to their targets. Taking the second approach, Member State projections for the Kyoto commitment period 2008–2012 are compared to targets. This gives an indication of Member State expectations with regard to their expected performance against their Kyoto targets.

Under the Kyoto Protocol, the 15 countries which were Member States of the EU when the Protocol was agreed (EU-15) are committed to reducing their collective greenhouse gas emissions in the period 2008–2012 to 8 % below levels in a chosen base year. This collective commitment has been translated into differentiated national emission targets for each EU-15 Member State which are binding under EU law.

Looking firstly at present emissions levels, the EU-15 was approximately 6.2 % below its base-year emissions in 2008. During the last five-year period 2004–2008, EU-15 emissions were on average 3.9 % below base-year level, compared to an 8.0 % reduction commitment under the Kyoto Protocol, to be achieved during the period 2008–2012.

Five EU-15 and nine EU-12 Member States (Bulgaria, Czech Republic, Estonia, France, Germany, Greece, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Republic, Sweden and the United Kingdom), and Croatia have already achieved GHG emission levels below their Kyoto target during 2003–2007 or 2004–2008 (Table ES.1).

**The EU-15 could reduce its greenhouse gas emissions levels to 8.5 % below the Kyoto base year. This reduction is particularly dependent on the combined emission reductions expected in main emitting countries, in particular France, Germany, Spain and the United Kingdom.**

Looking at Member State projections, if all domestic emission reductions take place as a result of the implementation of existing measures, greenhouse gas emissions in the EU-15 will be reduced to 6.8 % below Kyoto base-year levels. A number of Member States anticipate implementing additional measures in order to

**Table ES.1 Current progress towards Kyoto targets (domestic emissions and targets only)**

| Country grouping | Party to the Kyoto Protocol with current average emissions lower than target | Party to the Kyoto Protocol with current average emissions higher than target |
|---|---|---|
| EU-15 Member States | • France<br>• Germany<br>• Greece<br>• Sweden<br>• United Kingdom | • EU-15<br>• Austria<br>• Belgium<br>• Denmark<br>• Finland<br>• Ireland<br>• Italy<br>• Luxembourg<br>• Netherlands<br>• Portugal<br>• Spain |
| EU-12 Member States | • Bulgaria<br>• Czech Republic<br>• Estonia<br>• Hungary<br>• Latvia<br>• Lithuania<br>• Poland<br>• Romania<br>• Slovakia | • Slovenia |
| Other EEA member countries, EU candidate country | • Croatia | • Iceland<br>• Liechtenstein<br>• Norway<br>• Switzerland |

**Note:** Current average emissions represent average emissions in the period 2003–2007 except for the EU-15, Denmark, Finland, Germany, Greece, Italy, Luxembourg and Slovenia, where average emissions in the period 2004–2008 estimates are available.
Average emissions are compared to the initial Kyoto or burden-sharing target (initial assigned amount units) for the Kyoto commitment period 2008–2012. The possible use of Kyoto mechanisms and removals from carbon sinks are not taken into account in this table.

**Source:** EEA, 2009.

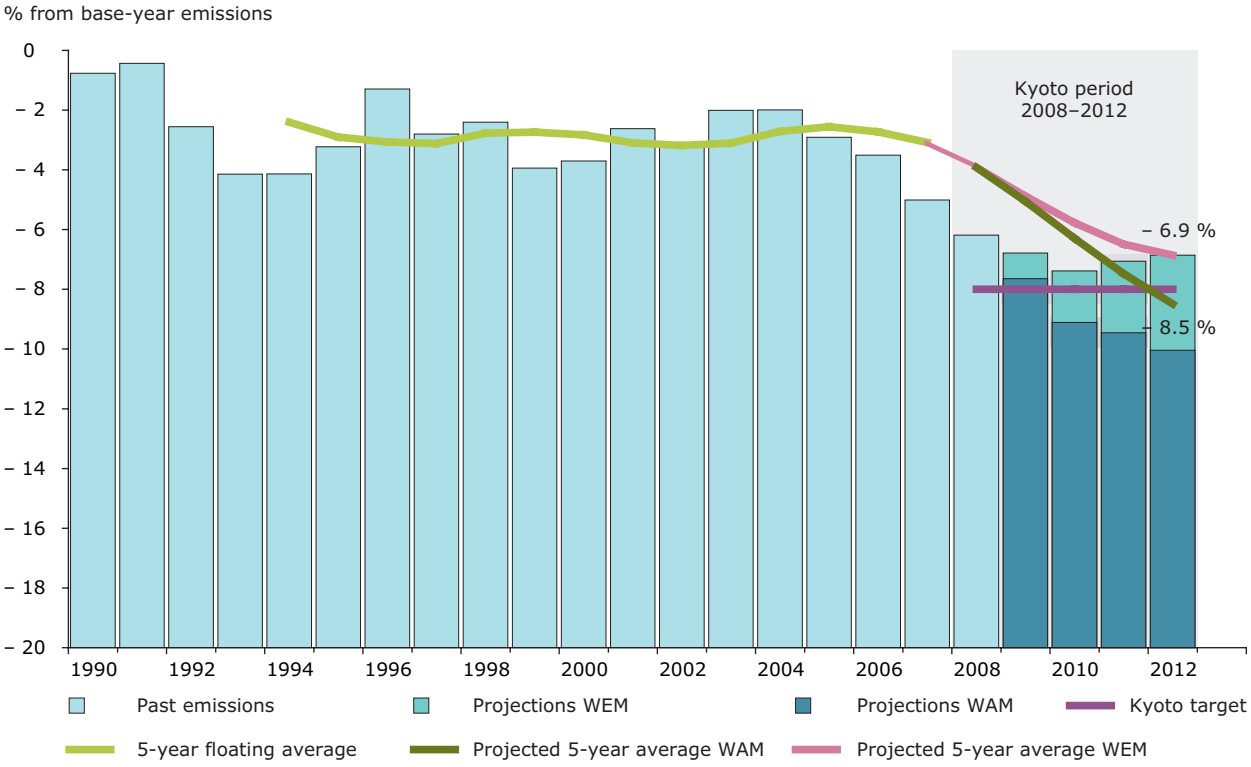
further reduce emissions by 2012. In this instance, EU-15 emissions in the period 2008–2012 would be 8.5 % below base-year emissions (Figure ES.1). This reduction is particularly dependent on the combined emission reductions expected in main emitting countries such as France, Germany, Spain and the United Kingdom. EU-wide policies are expected to contribute towards most of the planned emissions savings by the end of the period 2008–2012, in particular the European Union Emission Trading Scheme (EU ETS), the promotion of renewable energy sources, policies targeting the energy performance of buildings and internal energy market policies. Further implementation of EU legislation on renewable energy, energy end-use efficiency and energy services might also provide additional savings.

**The EU-15 could over-achieve its Kyoto target by an average 217 Mt $CO_2$-equivalent per year over the Kyoto period if all existing and planned additional measures are fully implemented in a timely manner and if Member States use Kyoto mechanisms and enhance carbon sinks as planned. This represents a 5.1 % overachievement beyond the 8 % Kyoto target.**

Under the Kyoto Protocol, Parties can increase the quantity of emission rights held (or Kyoto units), which constitute their assigned amount, by using the Kyoto Protocol's flexible mechanisms, as well as by enhancing carbon sinks. The EU ETS, which requires operators of certain industrial installations to meet emission caps during 2008–2012, will also have an effect on the assigned amount of Member States and of the EU-15.

Use of flexible mechanisms by ten Member States to cover the shortfall between expected emissions in 2008–2012 and their total assigned amounts is expected to generate Kyoto units equivalent to 2.2 % of EU-15 base-year levels ([1]). Spain and Italy

**Figure ES.1 Projected emission scenarios in the EU-15**




**Note:** WEM: with existing measures (measures implemented or adopted), WAM: with additional measures (planned measures)

**Source:** EEA, 2009.

([1]) Based on information reported Member States under the Monitoring Mechanism Decision. Here, only Hungary reports net sales of Kyoto units. However, latest information available from other sources indicates that additional transfers of Kyoto units are taking place between at least eight EU-15 and six EU-12 Member States.

are expected to make a significant contribution to the overall anticipated increase of the EU-15's assigned amount.

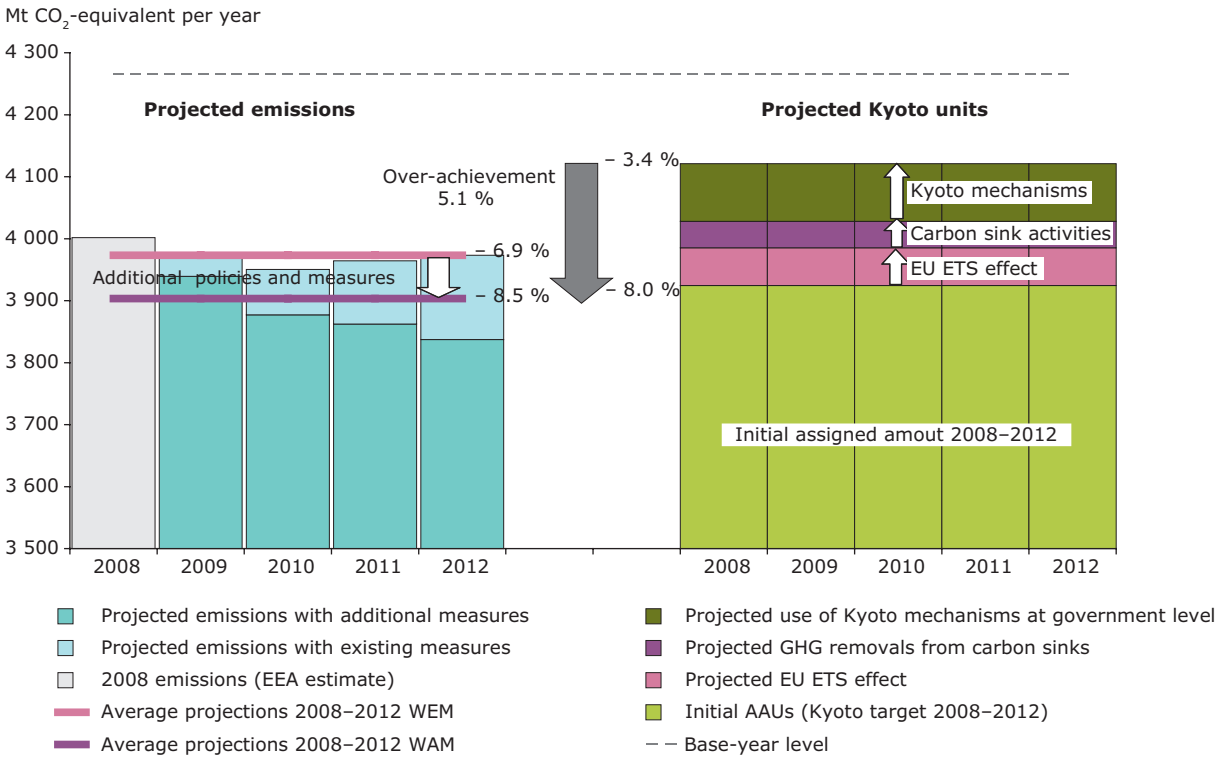
The EU ETS is expected to result in important reductions of domestic EU emissions. In addition, EU ETS operators may also acquire emission allowances or project-based credits using the Kyoto flexible mechanisms. It is estimated that such acquisitions would increase the EU-15's assigned amount by approximately 1.4 % of EU-15 base-year levels. In comparison, in 2008 ETS operators in the EU-15 had to purchase the equivalent of 3.9 % of EU-15 base-year emissions in order to comply with their obligations.

$CO_2$ removals from the atmosphere due to enhancement of carbon sinks (e.g. through improved forest management) are expected to generate Kyoto units equivalent to 1.0 % of base-year levels.

Overall, if all existing and planned additional measures are fully implemented in a timely manner, the EU-15 could over-achieve its Kyoto target by an average 217 Mt $CO_2$-equivalent per year over the Kyoto period, which represents 5.1 % of base-year emissions. This represents the difference between EU-15 projected emissions over 2008–2012 (8.5 % below the base-year) and the EU-15 total assigned amount, expected to be increased from the initial level 8 % below the base year to a level 3.4 % below the base year (Figure ES.2). The projected achievement of its Kyoto target by the EU-15 relies on each single EU-15 Member State achieving its own burden-sharing target through domestic emission reductions, enhancement of carbon sinks and use of Kyoto mechanisms. Should any EU-15 Member State miss its own target, the EU-15 would need to rely on the use of surplus Kyoto units from other Member States at the end of the commitment period in order to fill any shortfall.

**All but one EU Member State as well as all other EEA member countries anticipate that they will meet their commitments under the Kyoto Protocol. To ensure that domestic**

**Figure ES.2 Summary of EU-15 projections of greenhouse gas emissions compared to projected Kyoto units**




**Note:** The left section shows the projected emissions considering domestic measures (existing and additional) and is showing them as average 2008–2012 emissions (lines) and annual emissions (bars). The right section shows the projected amount of Kyoto units (emission rights) by the end of the commitment period, which is the initial EC assigned amount, the contribution of the EU ETS, carbon sink removals and use of Kyoto mechanisms.

**Source:** EEA, 2009.

**emission reductions contribute toward targets, governments should focus on reducing emissions in the sectors not covered by the EU ETS (for example the transport, residential and agriculture sectors).**

Through the second national allocation plans for the period 2008–2012, Member States have fixed the overall contribution that the EU ETS will provide towards reaching burden-sharing or Kyoto targets at national level. Therefore governments should focus on reducing emissions in the sectors not covered by the EU ETS (for example the transport, residential and agriculture sectors). Although the economic downturn is likely to trigger lower greenhouse gas emissions in most sectors, it is now only the emission reductions in the non-ETS sectors that are needed in order for Member States to comply with their Kyoto or burden-sharing targets. Success here will determine the extent to which governments will need to use the Kyoto flexible mechanisms (acquisition of Kyoto units from other parties to the Kyoto Protocol), if at all, to achieve their targets.

France, Germany, Greece, Sweden and the United Kingdom expect that they will maintain emission levels below their burden-sharing targets with the existing measures in place. Further emission reductions from additional domestic policies and measures, along with $CO_2$ removal from carbon sink activities, are projected to lead to over-achievement of the burden-sharing targets for these countries. These countries do not plan to rely on acquiring extra Kyoto units to meet their targets.

The planned domestic actions in the ten remaining EU-15 Member States will not be sufficient to reduce national GHG emission below their burden sharing targets. Nine of these Member States expect to meet their target through planned domestic action, carbon sink activities and use of Kyoto mechanisms (Figure ES.3).

Only Austria does not expect to reach its burden-sharing target under current arrangements. Domestic emission reductions, the use of Kyoto mechanisms as currently planned and emission removals from carbon sink activities will not suffice to meet the target. However, the projections reported by Austria do not reflect the current economic downturn, and recent GDP growth estimates are much lower than those that Austria has used in their projections.

Compared to the EEA analysis from 2008, Denmark, Italy and Spain are now expected to reach their burden-sharing target. Denmark has now reported updated projections that take into account recent measures in the energy sector. Italy now expects higher $CO_2$ removal from carbon sinks than last year. Spain now expects a more intensive use of the Kyoto flexible mechanisms. The EU ETS, which was not fully factored in the 2008 EEA analysis, will also play an important role in bringing additional allowances or credits from Kyoto mechanisms to these countries — thereby increasing their assigned amounts.

In the EU-12, the emissions reductions achieved since 1990 are such that, despite the expected emission increases from current levels, all Member States with a Kyoto target expect to meet or over-achieve their Kyoto targets. This will result in a surplus of Kyoto units. Slovenia is the only EU-12 Member State which anticipates that it will need to use the Kyoto mechanisms to meet its target. Cyprus and Malta do not have a target under the Kyoto Protocol.

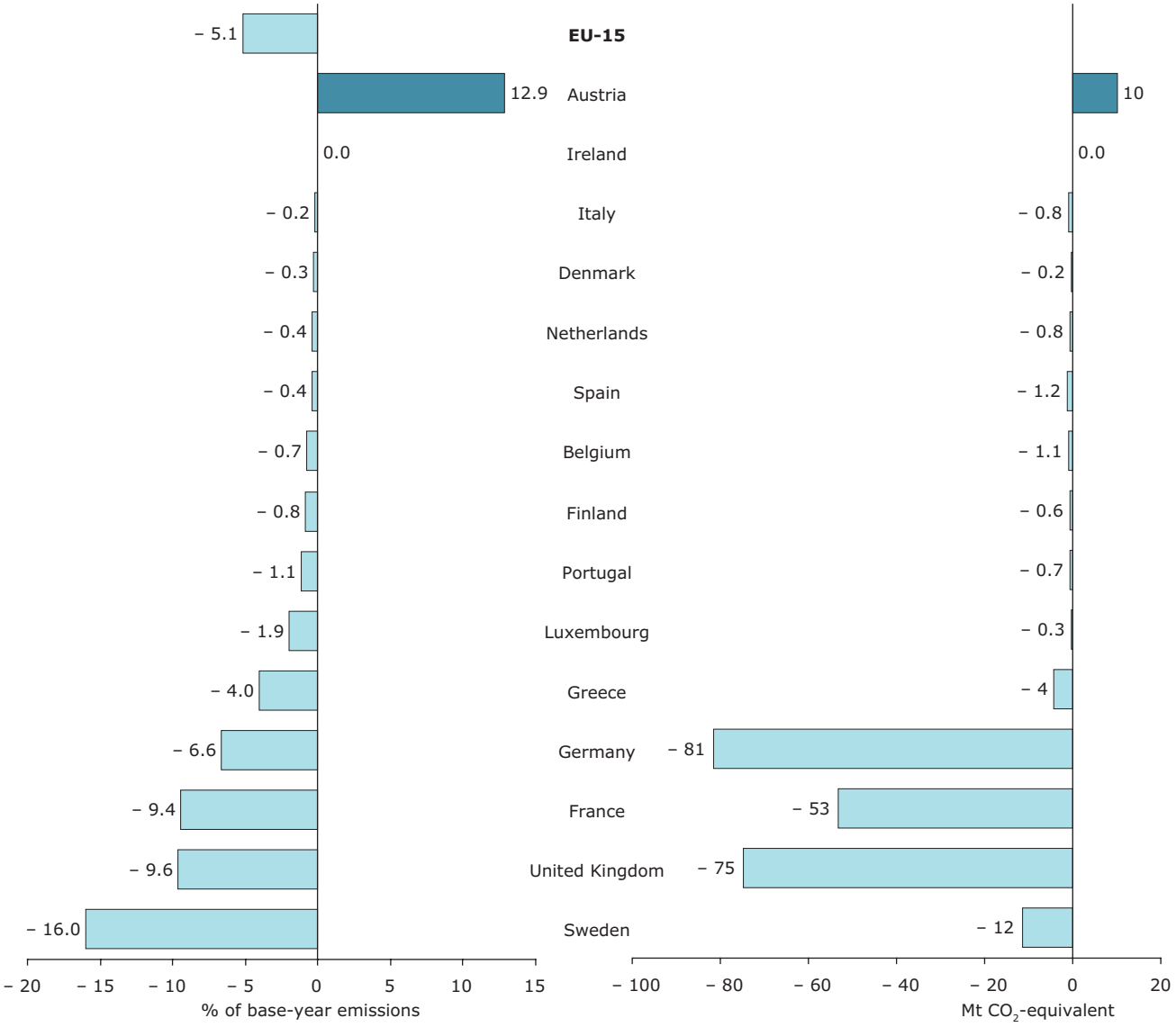
The other EEA member countries which have Kyoto targets (Iceland, Liechtenstein, Norway and Switzerland) and the EU candidate country Croatia, project that they will meet their target through a combination of domestic emission reductions, carbon sink removals and use of the Kyoto mechanisms.

**In 2009 the progress of EU-15 Member States towards their targets was assessed, for the first time, by focusing on projections of their non-ETS emissions. In the future, new indicators with a focus on these non-ETS emissions will be used to track the annual progress of Member States towards their targets.**

**The EU-27 is making good progress towards its 2020 emission reduction target of – 20 % and the implementation of planned additional measures is expected to bring domestic emissions down to 14 % below 1990 levels.**

The EU-27 is estimated to have reduced domestic greenhouse gas emissions by approximately 10.7 % between 1990 and 2008. The EU-27 is more than halfway through achieving its unilateral target of – 20 % by 2020, accounting for domestic emission reductions only. Full implementation of the planned additional measures is expected to bring EU-27 domestic emissions down to 14 % below 1990 levels by 2020, thus potentially delivering almost three quarters of EU's unilateral 2020 commitment through domestic measures only (Figure ES.4). These projected domestic emission reductions in the EU-27 could be larger if more than the current 11 Member States had accounted

**Figure ES.3 Projected gap between EU-15 GHG emissions and Kyoto units (emission rights) during the Kyoto commitment period 2008–2012**




**Note:** EU-15 figure in absolute terms (– 217 Mt $CO_2$-equivalent) not represented due to significantly higher scale.
Countries are ranked by increasing absolute gap between their 2008–2012 projected emissions in the sectors not covered by the EU ETS and their corresponding Kyoto target.
Projections from most Member States, including Austria, do not fully reflect the effects of the economic recession.

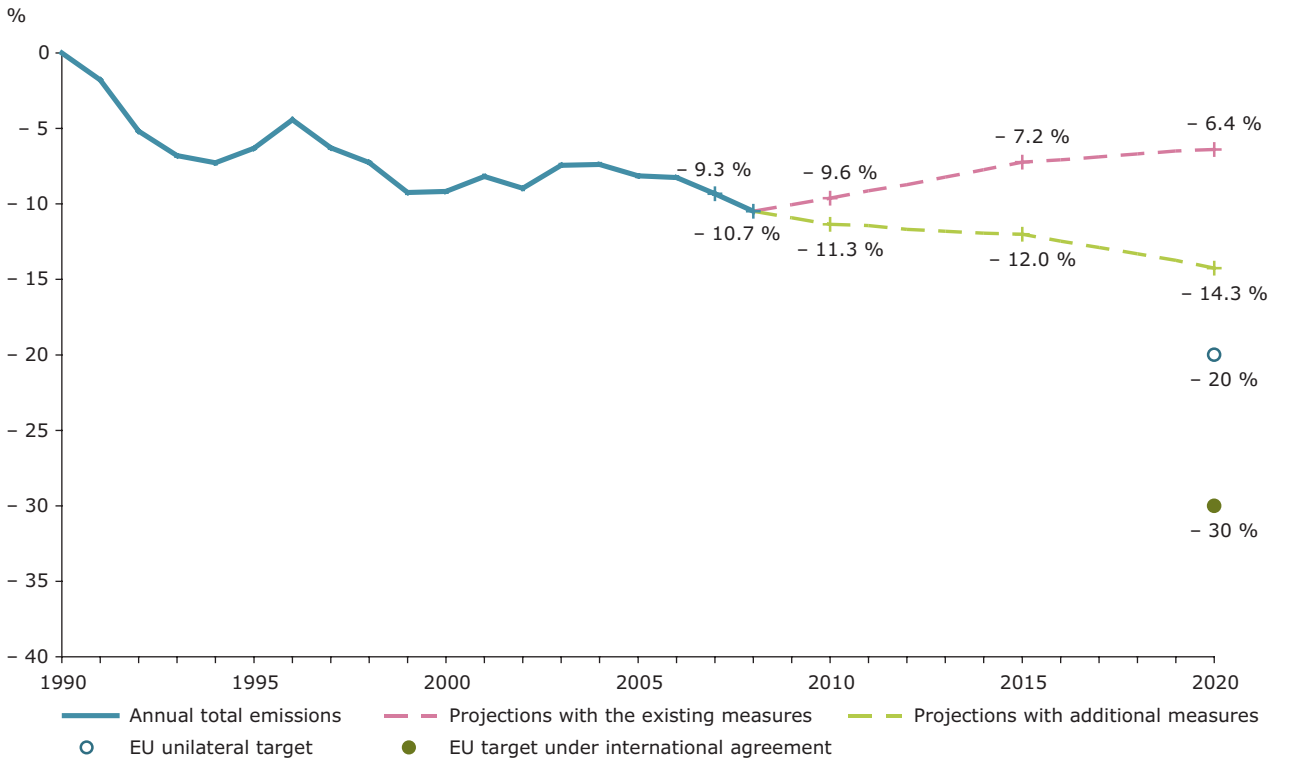
**Source:** EEA, 2009.

for the effects of the EU climate change and energy package in their projections of domestic emissions by 2020. In addition, the potential use of flexible mechanisms in the period 2013–2020, in line with the EU climate and energy package, could further reduce EU-27 emissions.

In the sectors not covered by the EU ETS, additional measures addressing energy use (energy performance of buildings) and transport (modal shift, biofuels and car efficiency) are expected to play an important role in meeting the national 2020 targets. In the agriculture sector, very little emission reductions are projected from both existing and additional measures for 2010 and 2020. Agriculture is the sector where the least absolute and relative reductions are expected, despite contributing 9 % of the EU-27 total emissions in 2007.

Quantitative estimates from Member States so far lack consistency and completeness to allow an accurate quantification of savings at the EU level, in particular for newly adopted EU policies. The European Commission estimates that eco-efficiency requirements of energy-using products, the inclusion of aviation in EU ETS, the strategy for $CO_2$ from cars and new requirements on fuel quality will bring important emission reductions by 2020. In addition, part of the reduction towards the 2020 targets could be achieved through use of flexible mechanisms both in the trading and in the non-trading sectors, as foreseen in the climate and energy package.

**Figure ES.4 EU-27 GHG emission trends and projections to 2020**




**Note:** Emissions from international aviation, although included in the 2020 target, are not taken into account in this figure (past trends, projections and targets).

**Source:** EEA, 2009.

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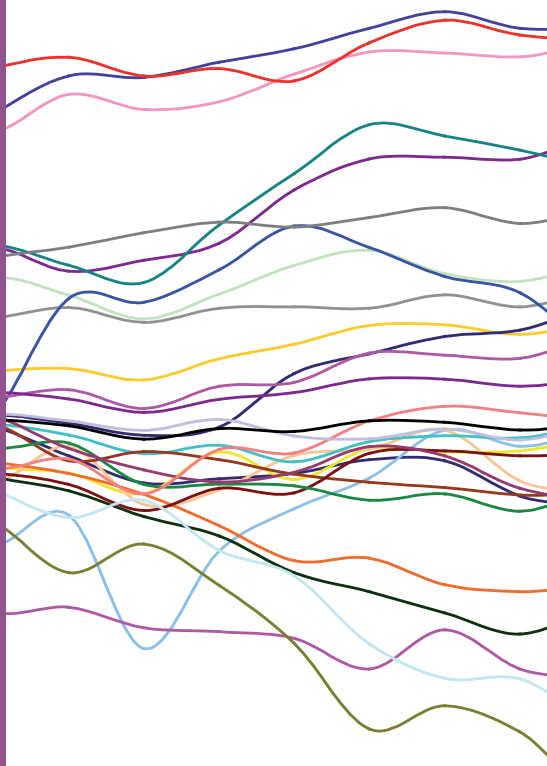
ISBN 978-92-9213-035-0
DOI 10.2800/23935

TH-AL-09-009-EN-C
DOI 10.2800/23935



Price (excluding VAT): EUR 10.00

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ISBN 978-92-9213-035-0

Publications Office
Publications.europa.eu

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