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Greenhouse gas emission trends and projections in Europe 2006

Annex: Additional information on greenhouse gas trends and projections by sector and by Member State

European Environment Agency

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Contents

A 1 Use of Kyoto mechanisms in EU Member States

In addition to domestic measures, Member States are also allowed to make use of the flexible mechanisms under the Kyoto Protocol (Kyoto mechanisms) to achieve their EU burden sharing targets by activities abroad. The Kyoto mechanisms are explained further in Box 1.

Box 1: Flexible mechanisms under the Kyoto protocol (Kyoto mechanisms)

Joint implementation (JI) is provided for under Article 6 of the Kyoto Protocol. It enables industrialised countries (Annex I Parties to the Kyoto Protocol) to work together to meet their emission targets. A country with an emissions reduction target can meet part of that target through a project aimed at reducing emissions in any sector of another industrialised country's economy. Any such projects need to have the approval of the countries involved and must result in emission reductions that would not otherwise have occurred in the absence of the JI project. The use of carbon sinks (e.g. forestry projects) is also permitted under JI.

Clean development mechanism (CDM) is set out by Article 12 of the Kyoto Protocol. This is similar to joint implementation, but project activities must be hosted by a non-annex country which does not have a quantitative target under the Kyoto Protocol. As with JI, CDM projects must result in reductions that are additional to those that would have been achieved in the absence of the project. They also have the additional aim of promoting sustainable development in the host developing country. The CDM is supervised by an Executive Board, which approves projects. CDM projects have been able to generate credits since January 2000 and these can be banked for use during the first commitment period (2008–12). The rules governing CDM projects allow only certain types of sinks project (afforestation and reforestation), and countries will not be able to use credits generated by nuclear power projects towards meeting their Kyoto targets. To encourage small-scale projects, special fast-track procedures are being developed.

Emissions trading (ET): Article 17 of the Kyoto Protocol allows Annex I Parties to trade their Assigned Amount Units with each other. Countries that have achieved emissions reductions over and above those required by their Kyoto targets may sell the excess to countries finding it more difficult or expensive to meet their commitments. In this way, it seeks to lower the costs of compliance for all concerned.

Information from Member States on the use of Kyoto mechanisms

Nineteen Member States – all EU-15 Member States plus the Czech Republic, Estonia, Slovakia and Slovenia – have provided information on their intended use of the Kyoto mechanisms. This information was provided through a questionnaire under the greenhouse gas monitoring mechanism (Directive 2004/280/EC) and national allocation plans for the first phase (2005–2007) of the EU emission trading scheme (Directive 2003/87/EC) or the fourth national communication under the UNFCCC. During the assessment of the first national allocation plans (for 2005–2007) the European Commission evaluated the state of advancement of financial and institutional preparations for the use of Kyoto mechanisms. They found that only some Member States substantiated it sufficiently in their national allocation plans. Information contained in notified second national allocation plans (due date of submission to the European Commission was 30 June 2006) has not been included as this information was not available on time for inclusion in this report.

Twelve EU Member States have decided to use the Kyoto mechanisms (Austria, Belgium, Denmark, Finland, France, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Slovenia and Spain, see Table 1). Within the EU-15 only Germany and the United Kingdom project they will achieve their Kyoto targets without using Kyoto mechanisms. The United Kingdom also reported on plans to offset emissions attributable to a variety of central government activities through CDM projects. The credits will be cancelled and not used towards meeting Kyoto targets. Two countries (Greece and Sweden) have not yet decided whether they intend to use Kyoto mechanisms for reaching their targets, although activities to implement project-based mechanisms have been started in Sweden.

Of the new Member States, the Czech Republic, Estonia, Slovakia and Slovenia have provided answers to the questionnaire. Slovenia intends to use Kyoto mechanisms as an investor country but did not yet decide on the possible contribution of these mechanisms to its Kyoto target. The Czech Republic, Estonia and Slovakia will participate in JI projects as host countries only and do not intend to use the Kyoto mechanisms for achieving their respective targets.

Table 1 Planned use of Kyoto mechanisms by EU Member State

Member State	Planned use of Kyoto mechanisms	Which Kyoto mechanisms? (ET, CDM, JI)	Achieving the national or burden-sharing target through domestic action (no use of Kyoto mechanisms)?	Projected emission reduction 2008–12 through the use of Kyoto mechanisms[1] [Million tonnes CO_2-equivalents per year]
Austria	Yes	Priority on JI and CDM	No	7.0[2]
Belgium	Yes	ET, CDM, JI	No	3.8[3]
Denmark	Yes	CDM, JI	No	4.5
Czech Republic	No	-	Yes	-
Estonia	No	-	Yes	-
Finland	Yes (Pilot programme to gain experiences implemented)	ET, CDM, JI	No	2.4
France	Yes	Priority on JI and CDM	Not yet decided	Not yet decided
Germany	Use of Kyoto mechanisms allowed at company level, no acquisition by government planned	ET, JI, CDM	Yes	No projected estimate as the amount will depend on private action
Greece	Not yet decided	Not yet decided	Not yet decided	Not yet decided
Ireland	Yes	Not yet decided	No	3.6
Italy	Yes	ET, CDM, JI	No	39.6
Luxembourg	Yes	ET, CDM, JI	No	3.0
Netherlands	Yes	CDM, JI	No	20.0[4] (CDM and JI)
Portugal	Yes	ET, CDM, JI	No	No estimate provided[5] Studies on the use of JI/CDM initiated
Slovakia	No	-	Yes	
Slovenia	Yes	ET, CDM, possibly JI	Not applicable (not yet decided for national Kyoto target)	Not yet decided
Spain	Yes	Priority on ET and CDM	No	20.0
Sweden	Not yet decided, under consideration (Pilot programme to gain experiences)	ET, CDM, JI	Yes	Investments made are estimated to amount to 1 Mt/year in emission credits
United Kingdom	Use of Kyoto mechanisms allowed at company level, no acquisition by government planned	ET, CDM, JI	Yes	No projected estimate as the amount will depend on private action

Source: Questionnaires submitted under the EC greenhouse gas Monitoring Mechanism; Fourth National Communications under the UNFCCC; European Commission, 2004a, 2004b.

[1] The projected emission reduction through the use of Kyoto mechanisms for Austria and Luxembourg stems from the Commission decisions on the national allocation plans of those countries (COM(2004) 500 final, COM(2004) 681 final). The Commission has based its decision on information provided in the NAPs and/or in further correspondence during the assessment of the NAPs. The figures for the other countries are derived from the latest questionnaire submitted or the fourth national communication under the UNFCCC.

[2] Austria assumes in the questionnaire a maximum of 50 % of the efforts required for compliance with its burden sharing target to be accomplished by means of JI and CDM.

[3] Brussels Capital Region 0.2 Mt CO_2-eq/yr, Walloon Region 1.1 Mt CO_2-eq/yr, Federal Government 2.5 Mt CO_2-eq/yr, Flanders 4.8 Mt CO_2-eq/yr.

[4] The Netherlands expect in the questionnaire a contribution of 100 million tonnes CO_2-equivalents from project based activities in 2008-12 (20.0 million tonnes CO_2-equivalents per year). By the end of 2004 99.0 million tonnes CO_2-equivalents have already been contracted, two thirds of which from CDM projects and the remaining third from JI.

[5] Portugal assumes in the questionnaire a maximum of 50% of the additional efforts required (described as the difference, for each of the years of the commitment period, between emissions levels considering the effects of policies and measures, and the burden sharing target) will be accomplished by means of JI and CDM.

Quantitative estimates on the use of Kyoto mechanisms in Table 13 derive from Commission decisions on the national allocation plans for the first trading period and questionnaires submitted under the EC monitoring mechanism or the fourth National Communications under the UNFCCC. Belgium, Czech Republic, Finland, Germany, Ireland, Netherlands, Portugal, Slovakia, Spain and the United Kingdom provided updated information through the questionnaire in 2006. Numbers included in the second national allocation plans were not taken into account as they are still subject to Commission approval.

- Austria intends to purchase 7.0 million tonnes CO_2-equivalents credits from project based Kyoto mechanisms per year of the first commitment period under the Kyoto Protocol. Austria has set a maximum of 50 % for use of Kyoto mechanisms to cover its reductions commitment (gap between base-year emissions and target).
- In Belgium the federal government and the three regions plan to acquire in total 42.7 million Kyoto units.
- Denmark estimates so far a contribution of 4.5 million tonnes CO_2-equivalents per year from project-based activities abroad.
- Finland decided in 2005 to purchase 12 million tonnes CO_2-equivalents for the commitment period.
- Ireland plans to purchase 3.6 million tonnes CO_2-equivalents per year through emissions trading to comply with its burden sharing target.
- According to the Commission decision on Italy's national allocation plan, Italy intends to obtain up to 39.6 million tonnes of CO_2-equivalents per year by the use of Kyoto mechanisms.
- Luxembourg intends to purchase 3 million Kyoto units per year of the first commitment period.
- The Netherlands are planning to use Kyoto mechanisms to purchase an average of 20 million tonnes of CO_2-equivalent reductions per year during the commitment period.
- Portugal intends to acquire 1.86 million tonnes CO_2-equivalents per year of the commitment period.
- Spain intends to acquire 20 million tonnes CO_2-equivalents per year of the commitment period. Purchase agreements have already been signed for 8.5 million tonnes CO_2-equivalents and an additional 10.5 Mt CO_2-equivalents are expected to be acquired soon.
- Finally, Sweden has already acquired around 1 million tonnes CO_2-equivalents per year through pilot programmes but has not yet decided whether it intends to use the mechanisms for reaching its target and if so, the total quantity to be used.

Together, ten Member States (Austria, Belgium, Denmark, Finland, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain) intend to purchase 110.6 million tonnes CO_2-equivalents per year during the first commitment period of the Kyoto Protocol.[6]

[6] Although Sweden already provided funds for pilot projects and started acquiring Kyoto units it is not included in this figure. A final decision has not been taken by the Swedish government and the total quantity of units used – if any at all – is not yet known.

Portugal has not substantiated the intended use of Kyoto Mechanisms further and is not included either.

The status of preparation for the use of JI and CDM project-based activities differs greatly between Member States: ten Member States have already allocated resources for the use of Kyoto mechanisms (Austria, Belgium, Denmark, Finland, Germany, Ireland, Italy, the Netherlands, Spain and Sweden). Austria, Italy, the Netherlands and Spain allocated the largest budgets (€ 288 million, € 1,320 million, € 600 million and € 250 million, respectively, for the five-year commitment period). The Netherlands reported that it has been decided to increase the budget by 10% in 2007 to counter rising allowance prices and the risks of project failure.

The total budget allocated by these ten Member States that provided respective information amounts to € 2,830 million. This corresponds to an average price of € 5-6 per tonne of CO_2-equivalents. Assuming a theoretical price of € 7.40 per tonne of CO_2-equivalents[7], those resources would be able to contribute with 77 million tonnes CO_2-equivalents per year of the commitment period to the EU-15 Kyoto target.

Most Member States have also started to implement legal arrangements such as the preparation of national legal frameworks or bilateral/multilateral agreements for JI/CDM programmes (Table 2).

Table 2 Preparations for the use of project based activities by EU Member States

Member State	Preparation of JI/CDM programmes	Bilateral / multilateral agreements, memorandum of understanding or contracts arranged with countries		Allocated budget
		JI	CDM	
Austria	Legal framework and programmes under preparation	Czech Republic, Slovakia, Bulgaria, Romania	No arrangements yet	Up to € 288 million for 2003-2012[8]
Belgium	Federal Government: first JI/CDM tender 2005 Flemish region: preparation of legal framework and start of pilot projects in 2003 Walloon region: CDM project currently launched	No arrangements yet	Capital Region: DR Congo Walloon region: agreements with French-speaking African countries	Federal Government: € 60 million Capital Region: € 9 million Flemish region: € 22 million in 2005 and € 15 million in 2006 Walloon region: USD 5 million
Czech Republic	Host country only	Austria, Denmark		
Denmark	5 JI project contracted, several JI projects in progress Several CDM projects are being negotiated	Slovakia, Romania, Ukraine, Latvia, Estonia, Bulgaria, Hungary, Lithuania, Poland	Moldova, Armenia, Kyrgyzstan, Georgia, Armenia, Azerbaijan, Malaysia, China, Thailand, South Africa, Nicaragua, Chile, Argentina	€ 152 million for public procurement programme of JI and CDM credits 2003-2008
Finland	Pilot programme 9 CDM project ideas and 4 JI projects on-going	Estonia, Latvia, Lithuania, Poland, Hungary, Ukraine	China, Costa Rica, El Salvador, Nicaragua	Pilot Programme: € 9 million PCF[9]: USD 10 million BASREC[10]: € 1.75 million € 30 million for 2005

[7] This is the average implied price level the Commission has taken into account in its decision on the first national allocation plans of Austria, Denmark and the Netherlands.

[8] Amount indicated in PointCarbon 25 March 2004 ("The budget managed by Kommunalkredit Public Consulting GmbH, is worth € 1 million in 2003, rising to € 11 million in 2004, € 24 million in 2005 and € 36 million in 2006, although this includes administrative fees. The government expects that it will earmark € 36 million each year from then on until 2012."), whereas response to questionnaire and Austrian national strategy foresee annually up to € 36 million starting in 2003.

[9] Prototype Carbon Fund of the World Bank.

[10] Baltic Sea Region Energy Co-operation Testing Ground Facility.

Member State	Preparation of JI/CDM programmes	Bilateral / multilateral agreements, memorandum of understanding or contracts arranged with countries		Allocated budget
		JI	CDM	
France	No programme to date	Romania	Argentina, Brazil, Chile, China, Colombia, Morocco, Mexico and Uruguay	No arrangements yet
Germany	Participation in BASREC and initiation of climate fund	Norway, Finland, Sweden, Denmark, Estonia, Lithuania, Latvia and Poland through BASREC	Mexico	€ 8 million for climate fund € 5 million for BASREC[11]
Greece	Studies on use of JI/CDM initiated	-	-	No arrangements yet
Ireland	DNA[12] will be established in 2006	No arrangements yet	No arrangements yet	€ 20 for 2006
Italy	Multilateral and Regional Financial Institutions: participations in CDCF[13], ICF[14], BCF[15], MEDREP[16], MEDREC[17], Trust Fund for the Environment in Asia and China (GEF), bilateral agreements	Bulgaria, Croatia, Moldavia, Kazakhstan, Slovenia, Romania	Algeria, China, Cyprus, Cuba, Egypt, Israel, Morocco, El Salvador, Argentina, Brazil, Mexico, Uruguay, Panama, Congo, Nigeria, Laos, Serbia and Montenegro	€ 169.5 million already allocated: € 58.7 million for World Bank funds € 8.5 million for GEF Trust Fund €10.3 million for MEDREP[16] € 8.5 million for MEDREC[17] € 79 million for China-Italian Facility € 4.5 million for various funds € 1,150 million for the years 2006-2011 [18]
Netherlands	ERUPT CERUPT Multilateral and Regional Financial Institutions, Participation in PCF[19], Community Development Carbon Fund**,** Private Financial Institutions, bilateral contracts	MoU with Bulgaria, Croatia, Estonia, Hungary, Romania, Slovakia, , New Zealand, participation in CDCF and PCF[19]	MoU with Argentina, Bolivia, Brazil, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Indonesia, Mexico Nicaragua, Panama, Uruguay, participation in PCF[19]	€ 600 million
Portugal	DNA established, Portuguese Carbon Fund initiated	First MoU signed, others in preparation	First MoU signed, others in preparation	No arrangements yet
Slovakia	Host country only	Austria, Denmark, Netherlands		

[11] The funds provided by Germany are for pilot programmes. Germany does not intend to use Kyoto mechanisms for reaching its target.

[12] Designated National Authority

[13] Community Development Carbon Fund

[14] Italian Carbon Fund

[15] BioCarbon Fund

[16] Mediterranean Renewable Energy Program

[17] Mediterranean Renewable Energy Centre

[18] During the negotiation with the Commission for the approval of the NAP Italy committed to allocate additional € 1,150 million for the years 2006-2011 (€ 100 million/year in 2006-2007, € 350 million in 2008 and € 200 million/year in 2009-2011).

[19] Community Development Carbon Fund and Prototype Carbon Fund, both of the World Bank.

Member State	Preparation of JI/CDM programmes	Bilateral / multilateral agreements, memorandum of understanding or contracts arranged with countries		Allocated budget
		JI	CDM	
Spain	2002 :Pilot phase for JI/CDM, priority on CDM, 2004: Establishment of the DNA and the Iberoamerican Climate Change Network	Negotiations with several countries initiated	MoU with 16 countries (Mexico, Uruguay, Argentina, Panama, Colombia, Brazil, Chile, Costa Rica, Ecuador, El Salvador, Guatemala, Dominican Republic, Bolivia, Paraguay, Peru and Morocco)	€ 200 million for World Bank Funds[20] € 49 million in CAF[21] € 0.6 million with Inter American development Bank
Sweden	4 CDM projects in advanced stages of development, several JI proposals are under consideration Participation in PCF[22] and BASREC[23]	Bilateral agreements concluded with Romania; negotiations with Estonia, Russia Lithuania in progress. Multilateral agreement in Baltic Sea Region for high quality JI projects with ICE, NOR, SWE, DEN, GER, FIN, EST, LAT, LIT.	No arrangements yet	€ 10 million (SEK 94 million) in CDM-SICLIP[24] € 6.5 million (SEK 61 million) in JI-SICLIP € 3.5 million in BASREC[23] USD 10 million in PCF[22]
United Kingdom	DNA established	No arrangements yet	No arrangements yet	None

Source: Questionnaires submitted under the EC greenhouse gas Monitoring Mechanism; 4th national communications; European Commission, 2004a

In the assessment of the first national allocation plans the Commission evaluated the state of advancement against the following aspects:

"(a) Does the plan indicate how many Kyoto units the Member State intends to purchase for the period 2008-2012?

(b) Does the plan indicate which Kyoto units (JI, CDM, and international emission trading) will be used to what extent?

(c) Does the plan present information on the state of advancement of relevant legislation?

(d) Has the Member State established and notified to the UN a designated national authority?

(e) Does the plan show that implementing provisions (operational programmes, institutional decisions) are in place at the national level?

(f) Have any credit purchase contracts been signed or any credit purchase tenders been initiated?

(g) Has the Member State set up or made any financial contributions to carbon purchase funds?

(h) Does the plan specify how much money has been committed at this stage? […]

[20] Spanish Carbon Fund (€ 170 million), Carbon Fund for Community Development (€ 20 million) and BioCarbon Fund (€ 10 million). Additional € 5 million will be invested in the Carbon Finance Assist Program for capacity building projects by the World Bank

[21] Corporación Andina de Fomento (Iboamerican Initiative for Carbon)

[22] Prototype Carbon Fund of the World Bank

[23] Baltic Sea Region Energy Co-operation on JI and Emissions Trading

[24] Swedish International Climate Investment Programme

The Commission finds that the intended use of the Kyoto mechanisms is not substantiated where a Member State has not signed any contracts or initiated any carbon purchase tenders, has not designated a national authority, has no operational programme in place, and has not committed any or sufficient budgetary resources." (European Commission, 2004a, pp. 4-5)

Of those Member States who intend to purchase Kyoto units some did not substantiated the intended use in their notified national allocation plans sufficiently. The Commission has accepted the intended use of Kyoto mechanisms in the national allocation plans of Austria, Belgium, Denmark, Ireland, Italy, Luxembourg, the Netherlands and Spain.

The contribution of Kyoto mechanisms by these countries as updated by the 2006 questionnaire is considered for the closure of the gaps between greenhouse gas projections and 2010 targets. The 1 million tonne/year acquired by Sweden is not included as a final decision on the use and if applicable, the quantity of Kyoto units has not yet been taken by the Swedish government. For the EU-15, the use of Kyoto mechanisms amounts to 110.6 million tonnes of CO_2-equivalents per year of the commitment period. This amount corresponds to over 30 % of the total required emission reduction for the EU-15 of approximately 340 million tonnes (an 8% reduction from base-year emissions) CO_2-equivalents per year during the first commitment period.

Out of the EEA Member States which are not also a member of the European Union two countries intend to use flexible mechanisms. Norway reported that it will acquire around 50 million tonnes of CO_2-equivalents in total for the first commitment period under the Kyoto Protocol. Switzerland is charging a climate cent on transport fuels which will be used to reduce emissions domestically and to invest in projects abroad. Through this mechanism up to 8 million tonnes of CO_2-equivalents will be bought for the first commitment period in total.

A 2 Key domestic policies and measures

A 2.1 Common and coordinated policies and measures of the EU

The European Climate Change Programme (ECCP)[25], launched in 2000, provides a cohesive policy development framework. The initial work to develop further policies and measures focused on the Kyoto flexible mechanisms, the energy supply and consumption, transport and industry sectors and research. Under the first phase of the Programme, the Commission committed itself to 12 priority actions and the majority of these have been or are close to being implemented. The figures in the table below are based on ex-ante estimates of the emissions reduction potential. There are a number of reasons why these measures are unlikely to deliver the full amount of the ex-ante estimates as discussed previously. In 2006, the Commission will review these figures taking into account actual implementation of adopted measures.

In October 2005, the Commission launched ECCP II as a continued programme for policy preparation and development. As well as the review and further work on the implementation of existing policies and measures, it investigates new policy areas such as adaptation, aviation and carbon capture and storage.

Summary of implemented and planned policies and measures

Table 3 Cross-cutting issues

Policies and measures 'Cross-cutting'	Emission reduction potential by 2010 in EU-15 (Mt CO_2-eq.)	Stage of implementation /timetable /comments
1. EU emissions trading scheme		In force
2. Revision of the monitoring mechanism	N/a	In force
3. Link Kyoto flexible mechanisms to emissions trading		In force

[25] Report on the first phase of the ECCP www.europa.eu.int/comm/environment/climat/pdf/eccp_longreport_0106.pdf
Second ECCP progress report www.europa.eu.int/comm/environment/climat/pdf/second_eccp_report.pdf
Details of Phase II of the ECCP. http://ec.europa.eu/environment/climat/eccp.htm

Table 4 Energy Supply

Policies and measures 'Energy supply'	Emission reduction potential by 2010 in EU-15 (Mt CO_2-eq.)	Stage of implementation /timetable /comments
4. Directive on renewable electricity	**100-125**[26]	In force Review in 2005
5. Directives on the promotion of transport bio-fuels	**35-40**[26]	In force
6. Directive on promotion of cogeneration	**22-42**[27]	In force
7. Further measures on renewable heat (including biomass action plan)	36-48	In preparation
8. Intelligent Energy for Europe: programme for renewable energy	N/a	Programme for policy support in renewable energy
TOTAL in implementation	**193-255**	

Table 5 Energy demand

Policies and measures 'Energy demand'	Emission reduction potential by 2010 in EU-15 (Mt CO_2-eq.)	Stage of implementation / timetable /comments
9. Directive on the energy performance of buildings	**20**[28]	In force Monitoring and review
10. Directive requiring energy labelling of domestic appliances		In force Monitoring and review
• Existing labels	**20**[26]	
• New (el. ovens &AC)	**1**	in preparation
• Envisaged revisions (refrigerators / freezers / dishwashers)	**10**	
• Planned new (hot water heaters)	**23**	In preparation
• Extension of scope of Directive	N/k	In preparation
11. Framework Directive on eco-efficiency requirements of energy-using products	2010: dependent on implementation of daughter directives	In co-decision (institutional agreement)
12. Directive on Energy services	**40-55**[26]	In co-decision Includes requirements regarding energy efficient public procurement
13. Action Plan on Energy efficiency as a follow-up to the Green Paper	N/a	In preparation (2006)
14. Action under the directive on integrated pollution prevention and control (IPPC) on energy efficiency	Not known	In preparation
15. Intelligent Energy for Europe programme for energy efficiency	N/a	Programme for policy support in energy efficiency
16. Public awareness campaign on energy efficiency	N/a	Supporting program as part of Intelligent Energy for Europe: In implementation
17. Programme for voluntary action on motors (Motor Challenge)	N/a	Supporting programme for voluntary action on efficient motor systems
18. Public procurement	N/a	EU Handbook developed for guidance for increased energy efficient public procurement
TOTAL in implementation	**114-129**	

[26] Second ECCP progress report April 2003 http://europa.eu.int/comm/environment/climat/pdf/second_eccp_report.pdf

[27] COM (2004)366 – final "The share of renewable energy in the EU, May 2004

[28] COM (2004)366 – final "The share of renewable energy in the EU, May 2004

Table 6 Transport

Policies and measures 'Transport'	Emission reduction potential by 2010 in EU-15 (Mt CO_2-eq.)	Stage of implementation / timetable / comments
19. Community strategy on CO_2 from passenger cars (including voluntary commitment – VC - of car associations)	Total 107-115 Of which VC: **75-80**[29]	VC: monitoring; review ongoing Labelling: in force Communication on fiscal measures: in implementation Directive on taxation of passenger cars: in preparation
20. Framework Directive Infrastructure use and charging	Not known	In implementation, in relation to heavy duty road transport only
21. Shifting the balance of transport modes	Not known	Package of measures in implementation
22. Fuel taxation	Not known	In force Focus on EU harmonisation of taxation, not on CO_2 reduction
23. Directive on mobile air conditioning systems: HFCs	See regulation on fluorinated gases	In co-decision, as part of regulation on fluorinated gases
TOTAL in implementation	**107 - 115**	

Table 7 Industry & non CO_2 gases

Policies and measures 'Industry'	Emission reduction potential by 2010 in EU-15 (Mt CO_2-eq.)	Stage of implementation / timetable / comments
24. Regulation on fluorinated gases	**23**[30]	In co-decision
25. IPPC & non-CO_2 gases	Not known	In force Review periodically

Table 8 Waste

Policies and measures 'Waste'	Emission reduction potential by 2010 in EU-15 (Mt CO_2-eq.)	Stage of implementation / timetable / comments
26. Landfill Directive	**41**[29]	In force
27. Thematic strategy on waste	Not known	In preparation

Table 9 Integration Research & Development

Policies and measures	Emission reduction potential by 2010 in EU-15 (Mt CO_2-eq.)	Stage of implementation /timetable /comments
28. R&D framework Program	n/a	In force 6 Framework Programme for research and development Includes support for R&D in the fields of energy, transport and climate In preparation 7 Framework Programme

[29] Second ECCP progress report April 2003
http://europa.eu.int/comm/environment/climat/pdf/second_eccp_report.pdf

[30] COM (2003) 492 final

Table 10 Integration Structural funds

Policies and measures	Emission reduction potential by 2010 in EU-15 (Mt CO_2-eq.)	Stage of implementation /timetable /comments
29. Integration climate change in structural funds &cohesion funds	n/a	For the new budgetary period 2007-2013 renewable energy and energy efficiency have been identified as eligible areas for support –EU strategic guidelines In preparation

Table 11 Agriculture

Policies and measures 'Agriculture'	Emission reduction potential by 2010 in EU-15 (Mt CO_2-eq.)	Stage of implementation /timetable /comments
30. Integration climate change in rural development	N/a	For the new budgetary period 2007-2013 renewable energy and energy efficiency have been identified as eligible areas for support –EU strategic guidelines In preparation
31. Support scheme for energy crops	N/a	In force
32. N_2O from soils	**10**	improved implementation of the nitrates Directive

Table 12 Forests

Policies and measures 'Forests'	Emission reduction potential by 2010 in EU-15 (Mt CO_2-eq.)	Stage of implementation /timetable /comments
33. Afforestation and reforestation: - Afforestation programmes - Natural forest expansion	Not known	Identified potential: 14 Mt of CO_2-equivalents. Possibility for support through forestry scheme of rural development
34. Forest management (various measures)	Not known	Identified potential: 19 Mt CO_2-equivalents. Possibility for support through forestry scheme of rural development, dependent on national implementation.

Climate change continues to be integrated into other policy areas of the EU and climate change measures are being implemented by the Commission. The most important results of 2005 are:

- The operation in practice of the EU-wide emissions trading scheme, and the development of national allocation plans (NAPs) for Phase II.
- Energy savings of 20% identified in the Green Paper on Energy Efficiency in 2005[31], potentially saving the EU an estimated €60 billion on its energy bill. Half these savings could be achieved through full implementation by Member States of existing measures, notably Community directives already in force or tabled.
- Adoption of Directive 2005/32/EC in July 2005, establishing a framework for the setting of ecodesign requirements for energy-using products and the adoption in April 2006 of Directive 2006/32/EC on energy end-use efficiency and energy services. According to the latter Directive the Member States must adopt national action plans in order to achieve 1% yearly energy savings over nine years, starting in January 2008.
- A Communication on EU climate change strategy post 2012[32] highlighting the need for broader participation by countries and sectors, the development of low-carbon technologies, the continued and expanded use of market mechanisms and the need to adapt to the inevitable impacts of climate change.

[31] COM(2005) 265 final: Green Paper on Energy Efficiency or Doing More with Less

[32] COM(2005) 35 – Winning the battle against climate change.

A 2.2 Main savings from existing and additional domestic policies and measures of the EU-15 Member States

EU-15 Member States have provided information on which policies and measures (PAMs) are included in their 'with existing domestic measures' projections and in their 'with additional domestic measures' projections. The type of policies and measures can be either common and coordinated policies and measures or specific national policies and measures. In some cases this distinction is clear from the information reported by the Member States, but in general, total effects of policies and measures are aggregated at a sector level and are not available at this level of detail.

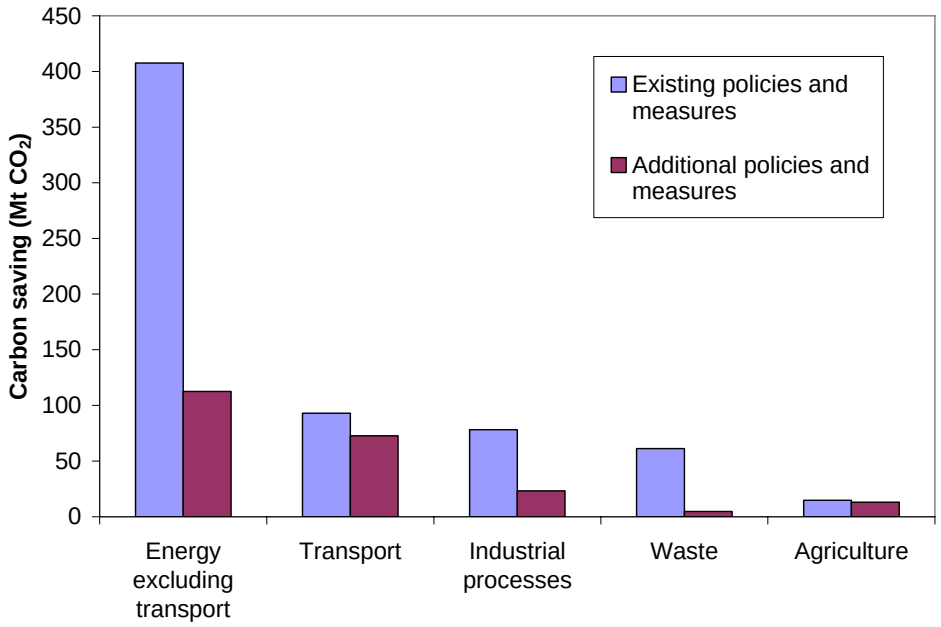
Figure 1 provides an overview of the estimated effects of domestic policies and measures on total EU-15 greenhouse gas emissions in each of the main sectors. All of the original EU-15 Member States have provided quantified sectoral emission savings in 2006 for at least some sectors, except for Germany, Italy, and Luxembourg. Not all Member States quantified the savings by sector from all policies and measures; ten Member States have provided information on the savings from at least some implemented policies and measures (a drop in reporting compared to the thirteen reporting in 2005) and seven Member States report quantified savings from planned policies and measures (compared to nine in 2005). The level of reporting on savings was less comprehensive than in 2005 Monitoring Mechanism submissions, partly because Member States were not obliged to report officially under the Monitoring Mechanism in 2006. The source of information used for the majority of Member States were the 4th National Communications and Demonstrable Progress Reports submitted to the UNFCCC.

Policies and measures in the energy sector (all energy-related emissions except transport) account for 56 % of the total savings from implemented domestic measures and 57 % of the planned domestic measures savings for the EU-15 as a whole. The high contribution of this sector is because the majority of both implemented and planned policies and measures are targeted at moving to cleaner and more efficient energy production or making energy use more efficient. Transport measures are expected to deliver the second highest savings, followed by the effect of measures on industrial processes. As transport is the most rapidly growing source of greenhouse gases, the measures implemented and planned by Member States only go a small way to addressing this and provide 16 % and 28 % of the total savings from implemented and planned policies and measures respectively. This is a drop compared to 2005, where the share of savings, particularly from implemented transport policies, was more significant. Most savings from implemented transport policies can be attributed to Germany, France and the United Kingdom, while savings from planned transport policies are set to come mainly from Germany, Italy and France. As was the case in 2005, the vast majority of savings from industrial processes stem from measures in Germany and France to address nitrous oxide emissions from industry – it is not known whether these savings have been fully realised yet. Spain and the Netherlands also report savings in excess of remaining Member States in the industrial process sector. Finally, savings from measures in the waste and agriculture sectors are expected to be small over the period in question. The 8% of savings in the waste sector, for implemented and adopted domestic measures, can be attributed to the implementation of the landfill directive. Based on the quantification provided by Member States, about half of the savings from implemented /adopted waste measures are from Germany – though some Member States have not reported on their savings for this sector.

Comparing the results between 2006 and 2005 findings under the Monitoring Mechanism reveals that:

- Reported emissions savings from existing policies and measures have fallen by 8 % compared to 2005 and reported emissions savings from additional policies and measures have fallen by 29 % compared to 2005;
- the savings from the energy sector (excluding transport) have increased by over 58 Mt for existing policies and measures, and decreased by over 26 Mt for additional policies and measures compared to 2005; some of this decrease in savings from additional measures in the energy sector may be attributable to Spain who did not report additional measures in 2006;
- savings with existing measures in the Transport sector have fallen by over 34 Mt compared to 2005 and by 23 Mt with additional policies and measures.
- the percentage share of savings for the transport sector has remained constant for additional policies and measures compared to 2005 but for existing policies and measures it increased an, share of savings dropped by 4 percentage points;
- savings for additional measures for industrial processes and waste have decreased as planned policies become implemented in the Member States as the Kyoto Commitment Period is approached;
- emission savings reported in the agriculture sector have roughly doubled in 2006, because Spain has submitted its emission savings for non-CO_2 gases for the first time in 2006 – Spain's newly reported emission savings in the agriculture sector amount to 7 Mt CO_2 equivalents.

Figure 1 Projected annual greenhouse gas emission savings by sector by 2010 in the EU-15



Note: This figure shows projected emission savings reported by Member States in their most recent national communications to the UNFCCC or demonstrable progress reports under the Kyoto Protocol.
Projected savings by 2010 are estimated by comparison with a hypothetical reference case in which no measure was implemented since the base-year.
In some cases 'with additional policies and measures' savings could be calculated by subtracting the 'with existing measures' projection from the 'with additional measures' projection. In other cases Member States overtly quantified savings from individual policies and measures in their policies and measures chapter. Member States did not provide quantification for all reported policies and measures. This figure shows the savings only for those measures with quantified reductions of emissions. The reported effects of single quantified measures do not necessarily sum to the projections for the total effect of all reported measures. However, all policies and measures are included in the total projections and in the sectoral projections presented in this report. Therefore the savings shown in this figure are lower than the projections for emissions reductions by sector presented in the section below.

Source: Information submitted under the EC greenhouse gas monitoring mechanism, in fourth national communications to the UNFCCC and in demonstrable progress reports under the Kyoto Protocol. Individual Member States detail can be found in the Country Profiles (Annex 8).

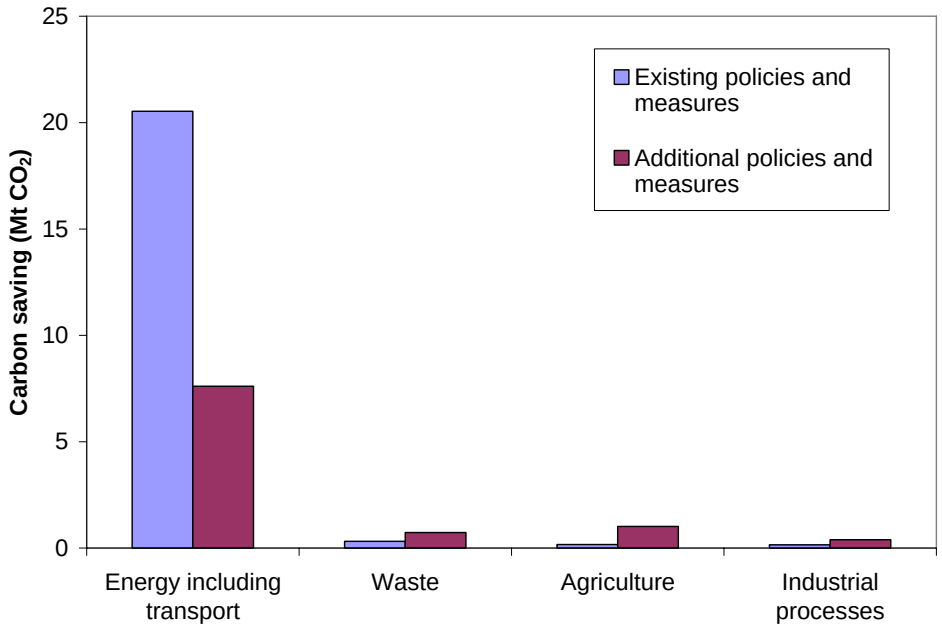
A 2.3 Main savings from existing and additional domestic policies and measures of the EU-10 Member States

The ten new Member States (EU-10) have also provided information on which policies and measures (PAMs) are included in their 'with existing domestic measures' projections and in their 'with additional domestic measures' projections. In the majority of cases reporting was split along the CRF sectors: energy, waste, agriculture and industrial process, with no further breakdown within the energy sector. Therefore, the savings for the new Member States have been presented in Figure 2 for these four key sectors.

It should be noted that the chart below only covers seven of the EU-10 Member States, with the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Slovenia and Slovakia providing new information on savings from domestic policies and measures in 2006. It is included to give a first indication of the significance of policies acting on the key sectors. Due to the smaller size of these Member States compared to the EU-15 bloc, and also to the limited quantification of savings by Member States, the total savings reported are almost thirty times lower than the EU-15. Despite more Member States providing some quantification of savings from domestic policies and measures in 2006 compared to 2005 (7 Member States compared to 5 in 2005), there has been a considerable drop in the total amount of savings reported for existing policies and measures (from 54 Mt in 2005 to 21 Mt in 2006). This drop stems mainly from reduced savings reported by the Czech Republic and Estonia. Conversely, reported savings from additional policies and measures have risen by 3.2 Mt CO_2 equivalents.

Policies and measures acting on the energy sector (including transport) provide by far the biggest savings, with 97% of savings from existing measures coming from energy policies. For the seven Member States that provided information, savings in each of the remaining sectors are low, with agriculture, waste and industrial processes each contributing a saving of 1 Mt or below. Transport sector measures contribute a total saving of 3.3 Mt by 2010 for all policies and measures.

Figure 2 EU-10 projected greenhouse gas emission savings by sector in 2010



Notes: This figure covers projected emissions savings reported by 7 new EU Member States (Czech Republic, Estonia, Hungary, Latvia, Lithuania, Slovenia and Slovakia) in their most recent national communications to the UNFCCC or demonstrable progress reports under the Kyoto Protocol.
Projected savings by 2010 are estimated by comparison with a hypothetical reference case in which no measure was implemented since the base-year.
In some cases 'with additional policies and measures' savings could be calculated by subtracting the 'with existing measures' projection from the 'with additional measures' projection. In other cases Member States overtly quantified savings from individual policies and measures in their policies and measures chapter.
Member States did not provide quantification for all reported policies and measures. This figure shows the savings only for those measures with quantified reductions of emissions.
The reported effects of single quantified measures do not necessarily sum to the projections for the total effect of all reported measures. However, all policies and measures are included in the total projections and in the sectoral projections presented in this report. Therefore the savings shown in this figure are lower than the projections for emissions reductions by sector presented in the section.

Source: Information submitted in the 4th national communications and demonstrable progress reports. Individual Member State detail can be found in the Country Profiles (Annex 8).

A 2.4 Key policies and measures

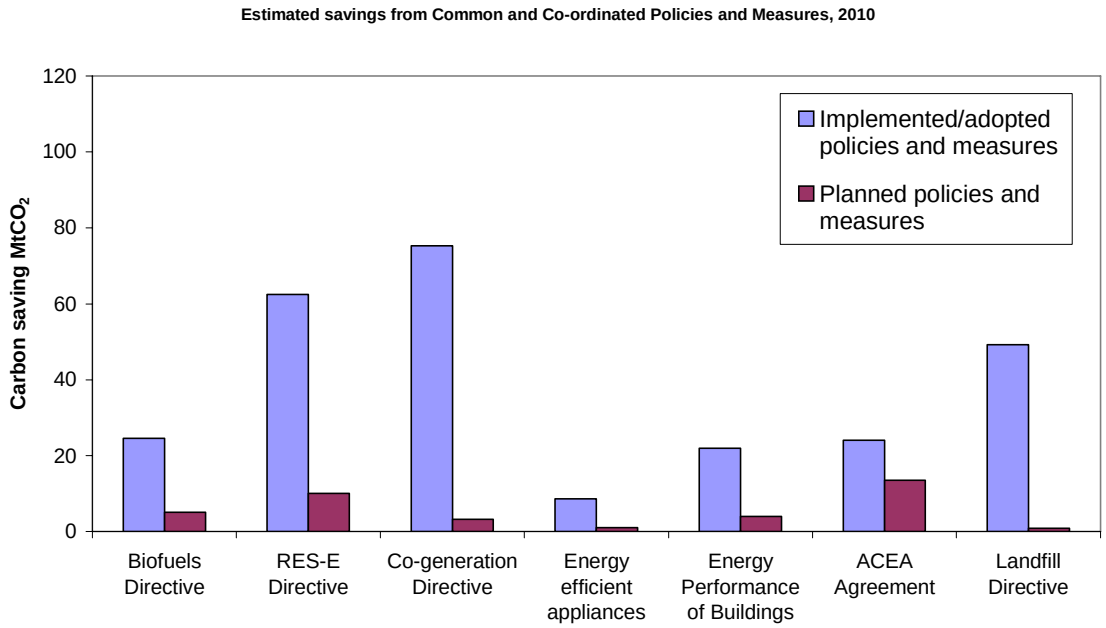
For the EU-15, the matrix assessment of Member States' policies and measures identified eight broad areas of policy intervention that are both widespread and are projected to deliver substantial greenhouse gas emissions reductions. In the energy supply and use sectors these were the use of renewable energy, CHP, energy end-use efficiency and energy services, energy efficient appliances and building standards; in transport, the EU-wide ACEA agreement and biofuels directive and for the waste sector, the Landfill Directive. This section examines the contribution seven of these key policies and measures to greenhouse gas emission reductions across the EU.

In 2006, for the first time, data on Member States savings for the key policies and measures was obtained from the European Climate Change Programme (ECCP) Database on Policies and Measures in Europe. In the case of the energy end-use and energy services Directive, data is not yet available as the Directive was very recently adopted. Additionally, there is insufficient quantification of key policies and measures savings for the EU-10 to enable a graph to be constructed.

Quantification of savings from key policies and measures was available for 13 of the EU-15 Member States on at least one of the seven policies. The savings shown for the EU-15 in Figure 3 are the sum of those presented in the ECCP Database. Most savings from measures stem from Germany, Italy, France, Spain and the United Kingdom. Quantification of planned policies and measures was not available for eight Member States. A range of different policies and measures provide the rest of the savings in Member States.

The data gathered on EU-15 emissions savings from the implemented/adopted key policies show that the CHP policies generate the most carbon savings, followed closely by renewable energy and landfill Directive policies and measures. Germany by a significant margin shows the largest projected savings from the seven key policies, particularly policies associated with the Landfill Directive, the RES-E Directive (related to the promotion of electricity produced from renewable energy sources) and the Directive on the promotion of Co-generation. There has been a very small increase in 'planned' policies and measures in 2006 compared to 2005 'additional measures'. This may be due to changes in classification of PAMs. There has also been an increase of around 17 Mt estimated savings for adopted /implemented policies and measures in 2006, compared to 2005.

Figure 3 Aggregated savings for seven key policies split by status (implemented/adopted or planned)



Note: This figure shows savings projected by Member States with existing measures or with additional domestic measures by 2010, by comparison with a hypothetical reference case in which no measure were implemented since 1990.
The reported effects of single quantified measures do not necessarily sum to the projections for the total effect of all reported measures. The ECCP database provides detail on PAM status, split by 'implemented/adopted' and 'planned' status. These categories do not necessarily transpose to the PAMs included in Member States' 'existing measures/additional measures' projections. The amounts for planned domestic measures are not the difference between the 'with existing domestic measures' projections and 'with additional domestic measures' projection. Also, for this reason hypothetical without measures projections cannot be derived as a large proportion of policies and measures have not been quantified.

Source: European Climate Change Programme (ECCP) Database on Policies and Measures in Europe (http://www.oeko.de/service/pam/sector.php) as of 24th August 2006.

In total, when savings from both scenarios are combined, the seven key policies are expected to deliver savings of approximately 304 million tonnes CO_2, compared to 283 million tonnes CO_2. The key policies are therefore very important in helping the EU achieving its emission reduction commitments. Renewable energy, CHP and landfill policies show the largest savings (201 million tonnes CO_2). Since the data source has changed in 2006, it is not possible to directly compare figures gathered in 2005 to those gathered in 2006. However it is possible to note that:

- quantified savings from policies and measures related to the energy end-use and energy services Directive is not yet available;
- 10 Member States estimate savings from renewable energy policies in 2006, with the largest savings stemming from Spain and the United Kingdom. For planned measures there was no quantification available for Austria, the Netherlands or the United Kingdom although quantification was provided in 2005. Overall there was a drop of over 30 Mt CO_2-equivalents in 2006 compared to last in estimated savings from renewable energy policies;
- there was also a slight drop in estimated savings from the energy efficiency of appliances directives and the Energy Performance of Buildings Directive;

- the ECCP database provides increased quantification of ACEA agreement related measures, with the addition of considerable savings from the United Kingdom and Italy, to add to savings from Germany (who reported large savings in 2005 from ACEA policies);
- there was little change in the savings reported for the landfill directive the largest increase from 2005 derived from the CHP Directive, where estimated savings from adopted and implemented policies have risen to 75 Mt CO_2 equivalents.

For the ten New Member States, there was limited data available on savings for the seven key policies discussed above. Quantification of these policies was available for four Member States (Czech Republic, Lithuania, Hungary and Slovenia), amounting to around 13 Mt CO_2-equivalents estimated savings, though unfortunately this was not enough to provide an informative chart of savings by policy for the group.

Table 13 Link between the seven key policies and EU CCPMs

Key policy	CCPMs covered
Renewable energy	Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001on the promotion of electricity produced from renewable energy sources in the internal electricity market
Biofuels Directive	Directive 2003/30/EC of the European Parliament and the Council of 8 May 2003 on the promotion of the use of biofuels or other renewable fuels for transport
CHP	Directive 2004/7/EC on the promotion of cogeneration
Building standards	Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002on the energy performance of buildings
Energy efficient appliances	Various Directives on the energy labelling of household appliances 2003/66/EC of 3 July 2003 (refrigerators – freezers) 2002/40/EC of 8 May 2002 (electric ovens) 2002/31/EC of 22 March 2002 (air-conditioners) 99/9/EC of 26 February 1999 amending 97/17/EC (dishwashers) 98/11/EC of 27 January 1998 (lamps) 96/89/EC of 17 December 1996 amending 95/12/EC (washing machines) 96/60/EC of 16 September 1996 (washer-driers) 92/75/EC of 22 September 1992
ACEA agreement	Commission Recommendations of 5 February 1999 and 13 April 2000 on the reduction of CO2 emissions from passenger cars (voluntary agreement of the car manufacturers from EU, Japan and Korea to reduce fleet average CO_2 emissions to 140 g/km by 2008/09)
Landfill directive	Council directive 1999/31/ECof 26 April 1999 on the landfill of waste

Member States have transposed EU Common and Coordinated Policies using a variety of domestic policies and measures. It has proved difficult to separate out savings for domestic policies and measures directly resulting from CCPMs, and the savings presented for the EU-15 above on the seven key policies also cover measures not directly implemented as a result of a CCPM. A summary is provided in Table 13 showing the link between the seven key policies and the corresponding CCPMs which contribute to the total savings.

A 3 Sectoral emission trends and projections in the EU-15

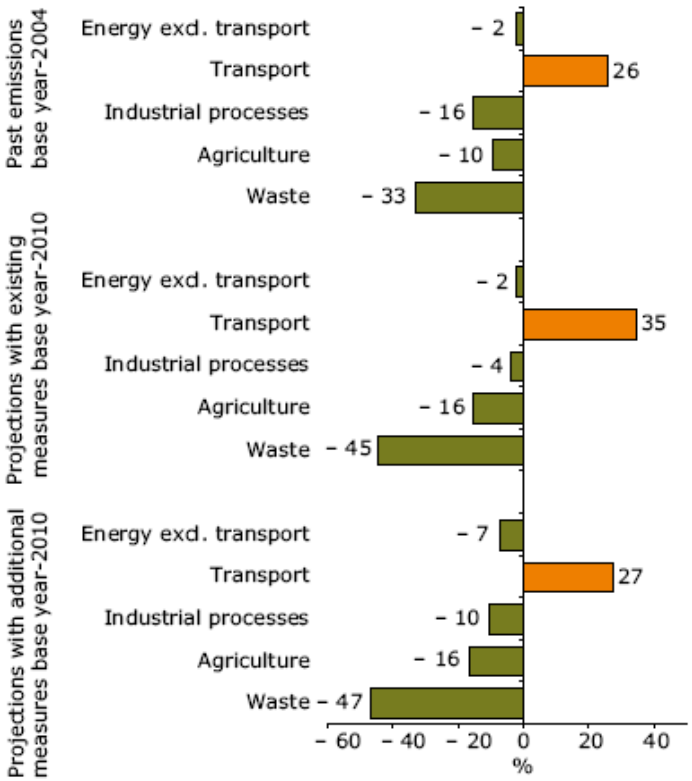
This chapter provides an analysis of greenhouse gas trends and projections for the following sectors.

1. *Energy supply and use excluding transport:* this sector corresponds to IPCC Sector 1 'Energy', except 1.A.3. 'Transport', and includes mainly energy supply in electricity and heat production and refineries, and energy use in manufacturing industries, households and services; fugitive emissions from energy are also included in this sector.
2. *Transport:* this sector corresponds to the IPCC source category 1.A.3 'Transport' and includes mainly road transport, but also rail and domestic aviation and navigation (it does not include international aviation and navigation).
3. *Agriculture:* this sector corresponds to IPCC sector 4 'Agriculture' and includes mainly enteric fermentation and soils (it does not include energy-related emissions from agriculture).
4. *Industrial processes:* this sector corresponds to IPCC sector 2 'Industrial processes' and includes mainly process-related emissions from mineral production (cement), the chemical industry (nitric and adipic acid production) and fluorinated gases (it does not include energy-related emissions from industry).
5. *Waste:* this sector corresponds to IPCC sector 6 'Waste' and includes mainly emissions from landfills (it does not include waste incineration used for electricity and heat production, which is included in the energy sector).
6. *Solvents and other products:* this sector corresponds to IPCC sector 3 'Solvent and other product use' and to IPCC sector 7 'Other'. Due to the low share of this sector, no detailed analysis of emissions from this sector is provided.

A 3.1 Overview

Figure 4 provides an overview of the change in EU-15 greenhouse gas emissions by sector between base-year and 2004, sectoral projections 'with existing' and 'with additional measures' between base-year and 2010; Figure 5 presents the share of sectors in 2004 for greenhouse gas total and each greenhouse gas separately. Detailed information for the development of greenhouse gas emissions in each sector is given below as well as information on the most important key sources in each sector (see Figure 5).

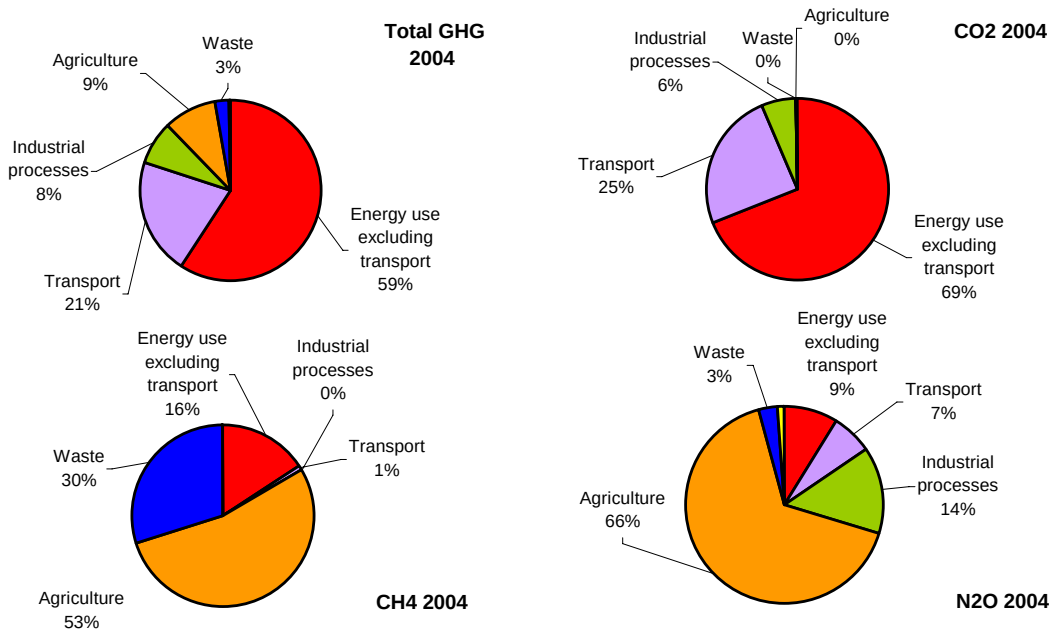
Figure 4 Changes in EU-15 greenhouse gas emissions by sector



Note: Several Member States did not report projections for all sectors/scenarios. Therefore, the information on the total EU-15 projections is not complete and has to be interpreted with care.

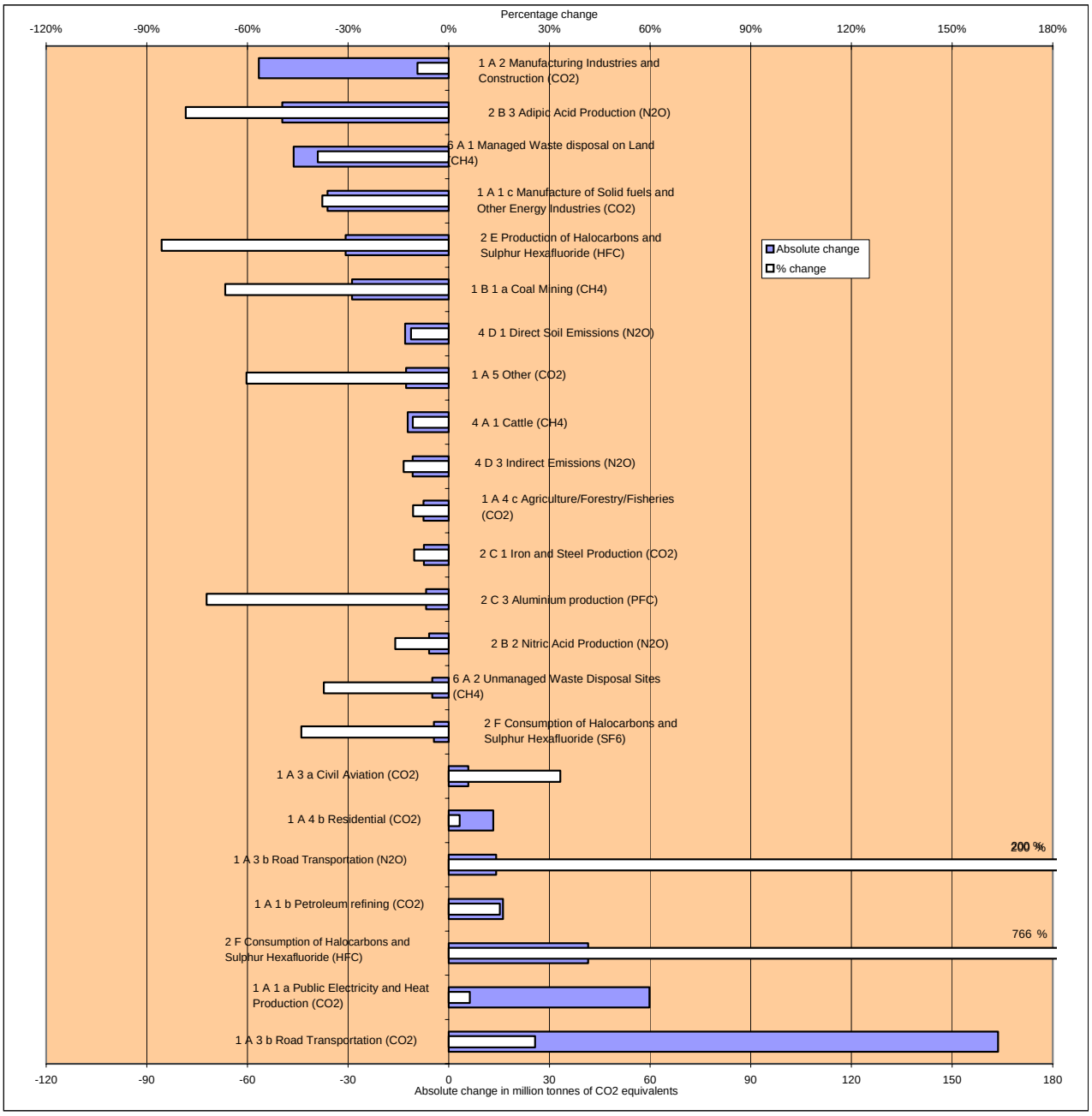
Source: EEA.

Figure 5 Sector shares of total greenhouse gases, CO_2, CH_4 and N_2O



Source: EEA.

Figure 6 Absolute and relative changes of EU key source emissions from the base-year to 2004



Note: This figure includes the EU key sources with changes of more than +/– 4 million tonnes of CO_2 equivalent; it excludes emissions and removals from LUCF.

Source: EEA, 2006.

Energy supply and use excluding transport

Energy supply and use excluding transport is by far the largest sector, accounting for 59 % of total EU-15 greenhouse gas emissions (mainly CO_2 from fossil fuel combustion in electricity and heat production, refineries, manufacturing industries, households and services). Total greenhouse gas emissions from energy supply without transport were 2 % below 1990 levels in 2004, and are projected to stabilise at 2004 levels by 2010, in the 'with existing measures' scenario (Figure 10). In the 'with additional measures' scenario emissions are projected to be 7 % below 1990 levels in 2010 ([33]).

- The largest reductions in absolute terms were achieved in CO_2 emissions from fossil fuel combustion in the manufacturing industries, mainly due to economic restructuring and efficiency improvements in the German manufacturing industry after German unification. In 2004, emissions had decreased by 57 million tonnes, or 9 %, from the 1990 level.
- Greenhouse gas emissions also decreased due to the decline of coal mining (responsible for CH_4 emissions), fuel use from manufacture of solid fuels and military fuel use (both responsible for CO_2 emissions).
- CO_2 emissions from public electricity and heat production were 60 million tonnes of CO_2 equivalent in 2004 or 6 % above 1990 levels. The 8 % reduction achieved in the 1990s has been compensated by considerable growth of coal-fired power production in recent years. Compared to 2003, CO_2 from public electricity and heat production decreased by 0.3 %: whereas power production increased by 2 % in line with increasing electricity demand within the EU-15, a shift of fuel use in thermal power stations from coal and oil to gas and biomass in combination with increased use of wind power, hydro power and nuclear power contributed to emission decreases from electricity and heat production.
- In 2004, CO_2 emissions from households and from services were 3 % above the 1990 level, respectively. Compared to 2003, CO_2 emissions from households decreased by 2 % which was mainly due to warmer winter temperatures compared to the 2003 winter.
- CO_2 emissions from oil refining increased almost every year in the 1990s. CO_2 emissions in 2004 were 15 % above the 1990 level.

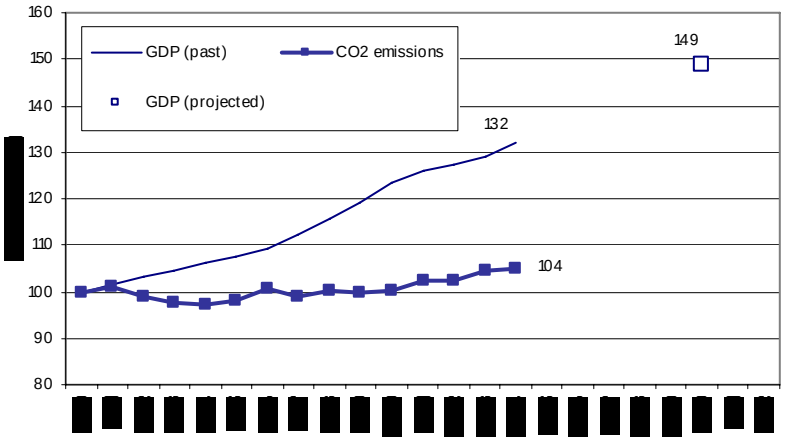
Transport

Transport accounts for 21 % of total EU-15 greenhouse gas emissions in 2004 (mainly CO_2 from fossil fuel combustion, but also N_2O). Total greenhouse gas emissions from transport were 26 % above 1990 levels in 2004 and are projected to further increase to 35 % above 1990 levels by 2010 in the 'with existing measures' projections. 'With additional measures' emissions are projected to be 27 % above 1990 levels in 2010. The rapid increase of transport-related greenhouse gas emissions is mainly due to the growth of road transport demand in almost all Member States. In 2004, CO_2 emissions from road transport had increased by 164 million tonnes, or 26 %, compared with 1990. Nitrous oxide emission increases from transport are mainly due to the increased use of catalytic converters, which reduce emissions of air pollutants but emit N_2O as a by-product. However, for newer catalytic converters, N_2O emissions have been reduced.

[33] Several Member States did not report projections for all sectors/scenarios. Therefore, the information on projections has to be interpreted with care.

Figure 7 provides an overview of CO_2 emissions from fossil fuel combustion in all fuel combustion related sources. These emissions account for 77 % of total EU-15 greenhouse gas emissions. The figure shows that these emissions were 4 % above 1990 levels in 2004 and that they increased since the late 1990s. As GDP grew by 32 % between 1990 and 2004 emissions decoupled from GDP growth basically between 1990 and 2000. In recent years no further decoupling took place.

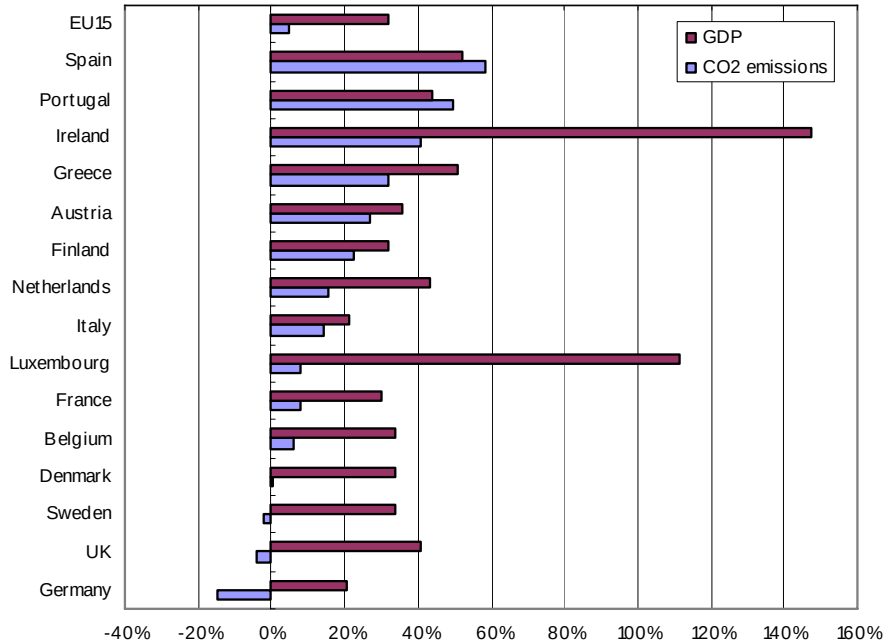
Figure 7 CO_2 emissions from fossil fuel combustion compared with GDP (1990-2004), EU-15



Source: EEA, 2006; Eurostat; European Commission, 2006.

Figure 8 shows that several EU-15 Member States decoupled energy related CO_2 emissions from GDP; some Member States even achieved a strong decoupling, i.e. increasing GDP and declining CO_2 emissions (Germany, the United Kingdom, Sweden). In some Member States however, CO_2 emissions grew faster than GDP (Spain and Portugal).

Figure 8 EU-15 Member States CO_2 emissions from fossil fuel combustion compared with GDP (change 1990-2004 in %)



Source: EEA, 2006; Eurostat.

Agriculture

Agriculture accounts for 9 % of total EU-15 greenhouse gas emissions (mainly CH_4 emissions from enteric fermentation and manure management and N_2O emissions from soils and manure management). In 2004, total greenhouse gas emissions from agriculture were 10 % below 1990 levels and are projected to further decrease to 16 % below 1990 levels by 2010 in the 'with existing measures' and 'with additional measures' projections. The main reasons for declining agricultural emissions are decreasing cattle numbers and declining fertiliser and manure use.

Industrial processes

Industrial processes account for 8 % of total EU-15 greenhouse gas emissions (mainly CO_2 from cement production, N_2O from the chemical industry and HFCs from refrigeration and air conditioning). In 2004, total greenhouse gas emissions from industrial processes were 16 % below base-year levels, but are projected to increase to 4 % below base-year levels by 2010 in the 'with existing measures' projections. 'With additional measures' emissions are projected to be 11 % below base-year levels by 2010. Cement production dominated the trend until 1997. Factors for declining emissions in the early 1990s were low economic growth and cement imports from eastern European countries. Between 1997 and 1999, the trend is dominated by reduction measures in adipic acid production in Germany, France and the United Kingdom. In addition, between 1998 and 1999, large reductions were achieved in the United Kingdom due to reduction measures in HCFC production. After 1999 the trend was mainly dominated by cement production and iron and steel production.

Waste management

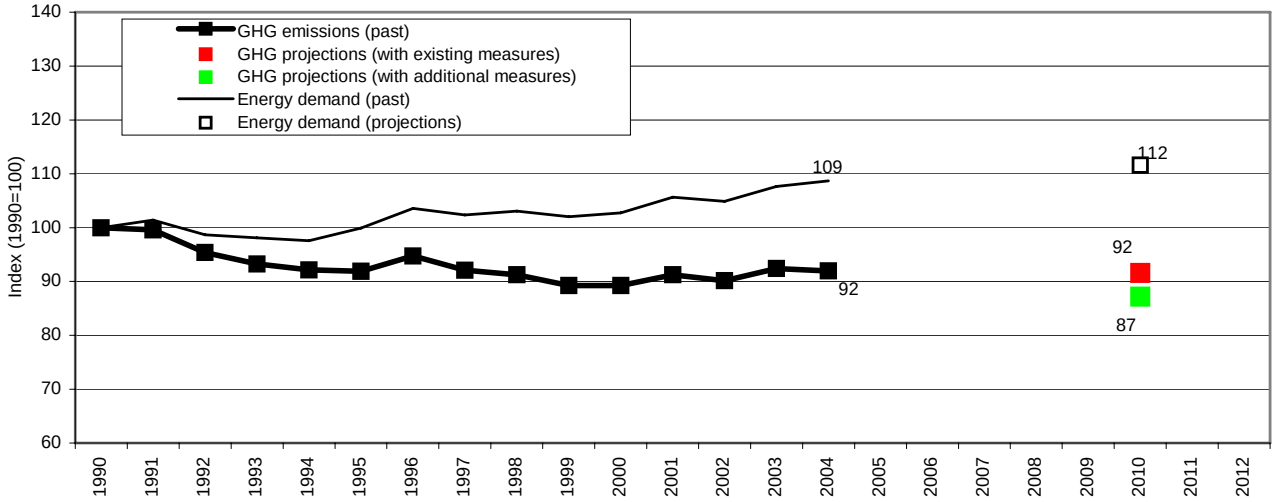
Waste management accounts for 3 % of total EU-15 greenhouse gas emissions (mainly CH_4 from waste disposal sites). In 2004, total greenhouse gas emissions from waste management were 33 % below 1990 levels and are projected to further decrease to 45 % below 1990 levels by 2010 in the 'with existing measures' projections and to 47 % below 1990 levels 'with additional measures' projections. The decline of biodegradable waste being landfilled and the growing share of CH_4 recovery from landfill sites are the main reasons for falling emissions.

A 3.2 Energy supply and use excluding transport[34]

Energy supply and use excluding transport is by far the largest sector, accounting for 63 % of total EU-25 greenhouse gas emissions and 59 % of total EU-15 greenhouse gas emissions (mainly CO2 from fossil fuel combustion in electricity and heat production, refineries, manufacturing industries, households and services). Since 1990, emissions in the EU-25 decreased by 8 % in 2004. They are projected to decrease by 8 % below 1990 level until 2010 with existing measures and to decrease by 13 % below base-year level with additional measures (Figure 9). However, projections have to be interpreted with care, as only 21 EU-25 Member States reported with existing measures projections for the energy sector (excluding transport) and only 13 EU-25 Member States reported projections with additional measures.

[34] This sector includes energy supply and use, except energy use for transport. This corresponds to Sector 1 'Energy', except 1.A.3 'Transport', according to UNFCCC guidelines for greenhouse gas inventories.

Figure 9 **EU-25 past and projected greenhouse gas emissions from energy supply and use excluding transport, compared with energy consumption excluding transport**

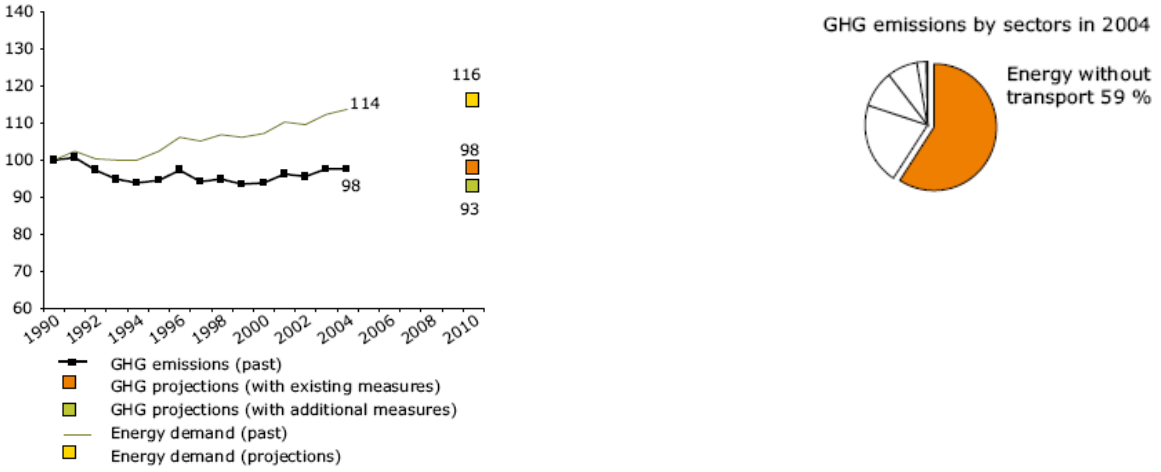


Note: Since sectoral emission projections are missing for Germany, Cyprus, Malta and Poland, greenhouse gas projections for the EU-25 are calculated on the basis of projections reported by 21 Member States. The percentage change for 2004–10 of the EU-21 is applied to EU-25. No additional measures were reported for Denmark, Ireland, Luxembourg, Spain and Sweden, Hungary and Lithuania. For these countries, the 'with existing measures' projections were used for the calculation of the EU-25 'additional measures' projections. Final Energy Demand in 1990 is calculated without Cyprus, because no data were available for 2006.

Source: EEA, 2006; Eurostat; European Commission, 2006.

Total EU-15 greenhouse gas emissions from energy supply and use excluding transport were 2 % below 1990 levels in 2004 (Figure 10). Compared with 2003, greenhouse gas emissions from energy excluding transport decreased by 0.1 %. Between 1990 and 2004, total energy demand decoupled from energy emissions to a certain extent and increased by 14 % above 1990 levels in 2004.

Figure 10 **EU 15 greenhouse gas emissions from energy supply and use (excluding transport) compared with energy demand**



Note: Since sectoral emission projections are missing for Germany, greenhouse gas projections for the EU-15 are calculated on the basis of projections reported by 14 Member States. The percentage change for 2004–10 of the EU-14 is applied to EU-15. No additional measures were reported for Denmark, Ireland, Luxembourg, Spain and Sweden. For these countries, the 'with existing measures' projections were used for the calculation of the EU-15 'additional measures' projections.

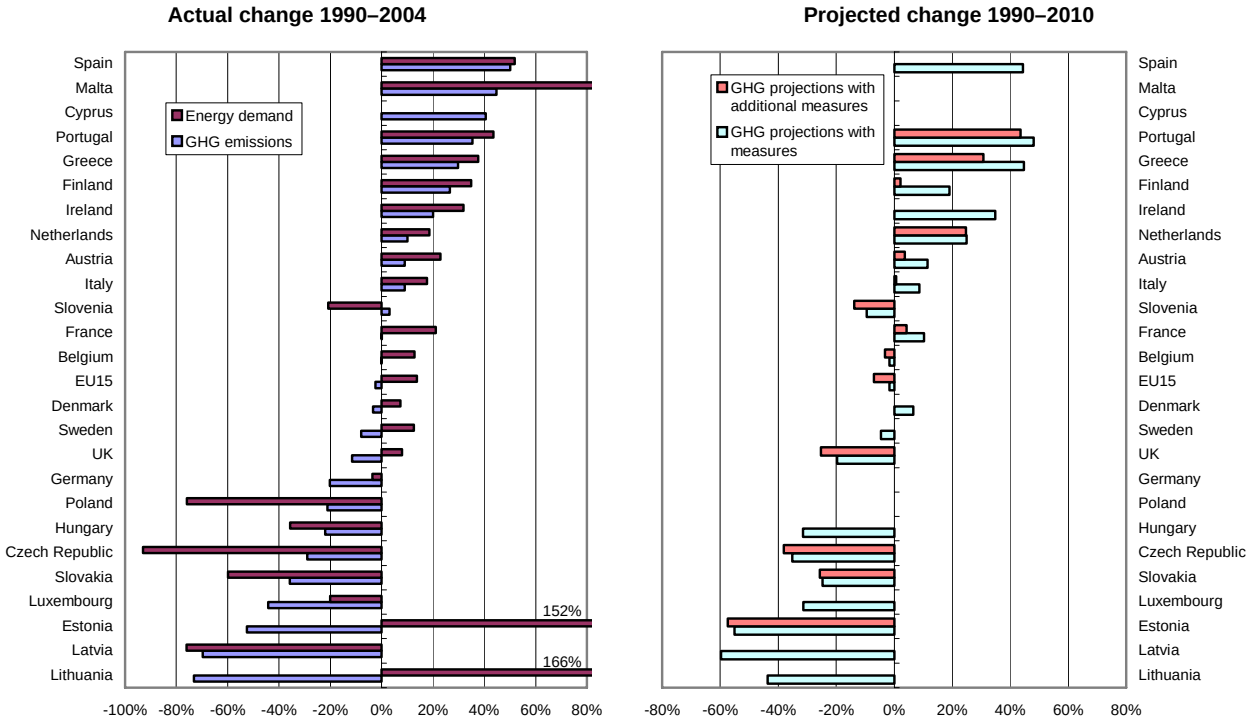
Source: EEA, 2006; Eurostat; European Commission, 2006.

The decline in the early 1990s is primarily the result of reductions in Germany (efficiency improvements in electricity and heat production and the restructuring of the industry) and the United Kingdom (fuel switch in electricity and heat production), but also due to low economic growth. Over the whole period 1990–2004, in the EU-15 energy consumption excluding transport increased by 14 %, real GDP by 32 %. This means that both energy consumption and GDP have decoupled from energy-related greenhouse gas emissions excluding transport, except in the Netherlands and in Italy. Figure 11 shows that five EU-15 Member States (Denmark, Luxembourg, Germany, Sweden and the United Kingdom) and seven new Member States (Hungary, Poland, Slovakia, Czech Republic, Estonia, Latvia and Lithuania) achieved emission reductions between 1990 and 2004. All Member States decoupled greenhouse gas emissions from energy consumption at least to a certain extent.

Aggregated EU-15 total greenhouse gases from energy supply and use excluding transport are projected to stabilise at 2004 level by 2010 in the 'with existing domestic measures' projections. Greenhouse gas emission projections 'with additional measures' have to be interpreted with care, because data were reported only by nine EU-15 Member States. Based on this data, with additional domestic measures, greenhouse gas emissions are projected to decrease to approximately 7 % below 1990 levels by 2010. Total energy demand is projected to further increase to 16 % above 1990 levels.

Compared to the analysis in 2005, EU-15 'with existing measures' projections increased by 2 %.

Figure 11 Actual and projected change in EU-25 greenhouse gas emissions from energy supply and use excluding transport, compared with energy consumption excluding transport



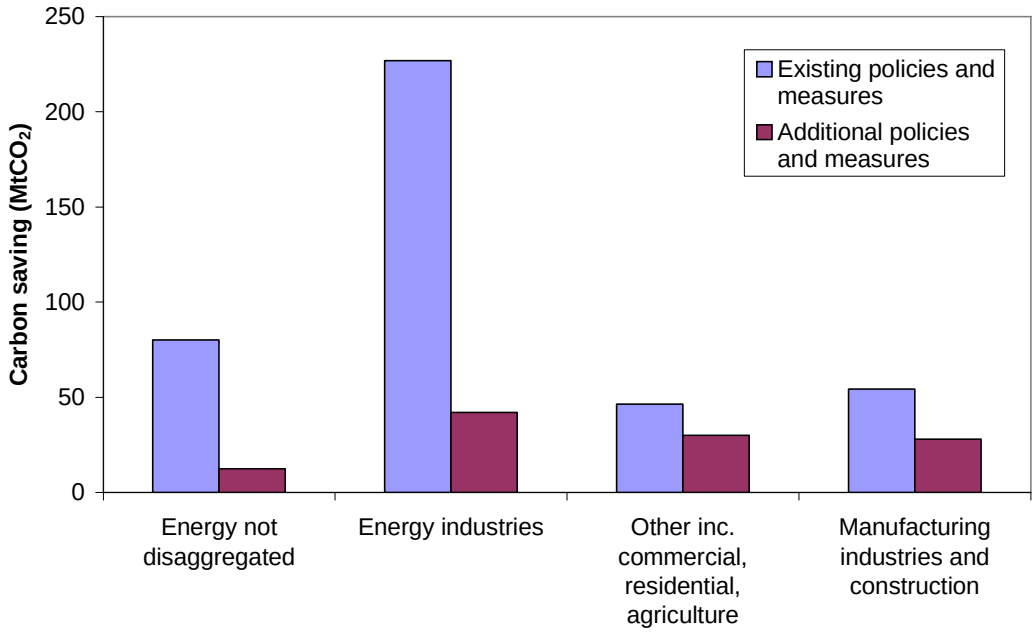
Note: GHG projections for the EU-15 are calculated on the basis of projections reported by 14 Member States, as sectoral emission projections are missing for Germany. The percentage change 2004–2010 of the 'EU-14' was applied to the EU-15.

Source: EEA; Eurostat; information submitted under the EC greenhouse gas monitoring mechanism and in fourth national communications.

The largest reductions in EU-15, with existing domestic measures, are projected for Luxembourg and the United Kingdom (31 % and 20 %). All other EU-15 Member States (except Sweden and Belgium) project increasing emissions, some of them even with additional domestic measures (Figure 11). Germany did not provide sectoral emissions projections. The new Member States project emission reductions by up to 60 % in the case of Latvia.

Figure 12 provides a breakdown of projected greenhouse gas savings for the EU-15 in the energy sector by 2010. Savings from policies and measures acting on energy industries are the most significant, accounting for 56 % of savings from existing measures in the energy sector (excluding transport) and 37 % from additional measures, with countries such as Germany, Italy, Greece and France reporting significant projected savings, often from renewable energy policies and measures. Policies and measures applied to the end use sectors of manufacturing industries and to commercial, residential and agriculture energy use also make significant contributions to savings in the energy sector. This possibly reflects the fact that in the EU as a whole there are many zero or low cost options for improvements in energy efficiency that can make industry and commerce more competitive. These are stimulated by economic instruments and voluntary agreements.

Figure 12 EU-15 projected greenhouse gas emission savings in energy supply and use excluding transport



Note: This figure shows savings projected by Member States with existing measures or with additional domestic measures by 2010, by comparison with a hypothetical reference case in which no measure were implemented since 1990.
Member States did not provide quantification for all reported policies and measures. Not all Member States disaggregated their projected greenhouse gas savings in the energy sector, as shown by the savings presented as 'energy not disaggregated'. This graph illustrates predicted savings in 2010 from those individual policies and measures included in either the 'existing measures' or 'additional measures' projections. It does not necessarily correspond to emission reductions implied by MEMBER STATES projections.
The majority of New Member States did not quantify savings by energy sector and so they could not be included in the analysis.

Source: The source of information used for the majority of Member States were the 4th National Communications and Demonstrable Progress Reports submitted to the UNFCCC.

Comparing 2006 results with 2005 findings under the Monitoring Mechanism reveals that:

- There is no net change to savings from existing policies in the energy sector overall. The breakdown across energy sectors in 2006 is not directly comparable to 2005 as the 2006 breakdown is not complete.
- Thus, the considerable drop observed in 2006 in savings from existing policies in all specifically identified energy sectors can be explained by an equal rise in energy sector savings which were not disaggregated in Member States reporting. Additionally, Member States are not obliged to report officially under the Monitoring Mechanism in 2006.
- Reported emissions savings in all energy sectors decreased significantly for additional measures. There is no corresponding increase in savings predicted to come from existing measures. This may be the result of Spain removing their additional measures. Additionally, fewer Member States reported on their savings from policies and measures in 2006.
- Emissions savings from additional policies were more comprehensively disaggregated by energy sector and it can be deduced that there has been little change in the split compared to 2005.

All EU-15 Member States have provided information on savings key policies and measures, including quantification of their emission savings. Germany, Italy, Luxembourg and France did not, however, update their quantification in 2006. For these countries, any data used for the report *Greenhouse gas emission trends and projections in Europe 2005* has been carried forward and used in 2006 calculations. For the energy supply and use sector excluding transport, Member States' key policies and measures are in the following areas: renewable energy, CHP, building standards, energy end-use efficiency and energy services and energy-efficient appliances (Figure 13).

Key policies and measures in the energy industries sector

Savings from existing renewable energy policies and measures play the major role, amounting to over 60 million tonnes of CO_2-equivalents. For additional measures as well, the largest savings are projected to come from ACEA and renewable energy. In 2006 estimated savings from existing measures on CHP outstrip those of CHP, reaching 75 million tonnes of CO_2-equivalents. More information on policies related to renewable energy and CHP is provided in the next section. The directive on energy end-use efficiency and energy services is expected to create 1% annual savings in the energy industries sector. However, the directive was adopted very recently (December 2005) and no quantification is yet available from Member States. The directive requires member states to draw up national action plans to achieve 1% yearly energy savings in the retail, supply and distribution of electricity, natural gas, urban heating, and other energy products including transport fuels. Savings from the Energy Performance of Buildings and Energy Efficiency of Appliances directives are relatively small.

Key policies and measures on energy use in manufacturing industries

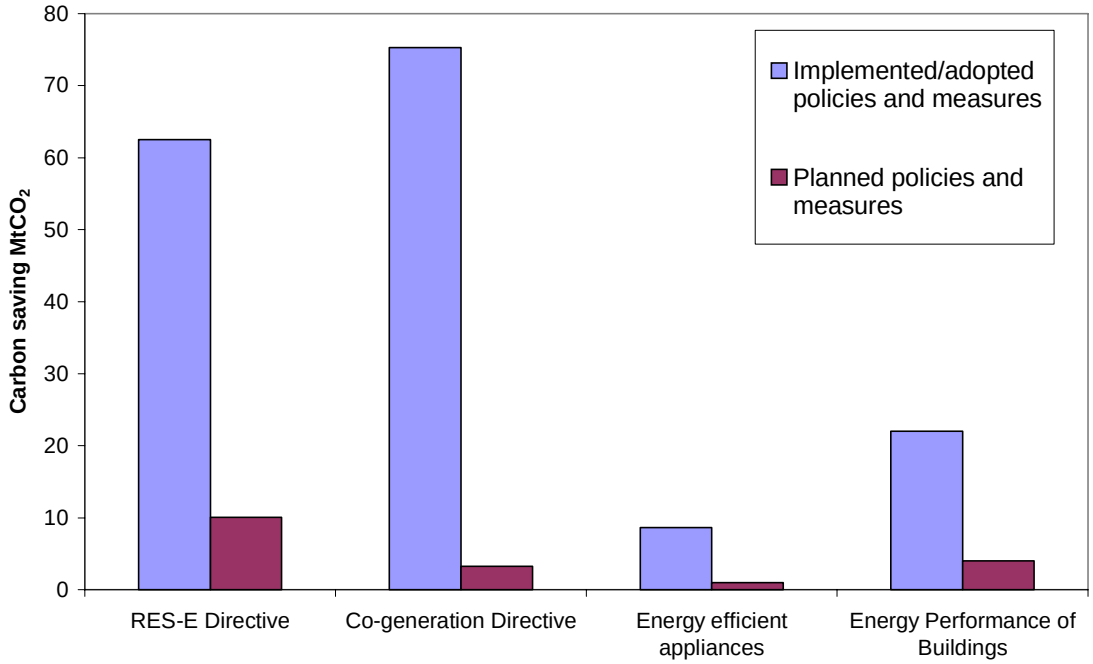
The reduction in CO_2 emissions from manufacturing industries in the past was due to an improvement in energy intensity (ratio of energy use to value added) in industry of approximately 1 % per year over the last decade (EEA, 2002b). This was due to structural changes in favour of higher value-added products, changes in some industries to less energy-intensive processes, improvements in the energy efficiency of processes and import substitution. Only part of these

developments was due to specific policies and measures aimed at reducing greenhouse gas emissions. The improvement in energy intensity is projected to continue or be enhanced, with the help of existing and additional policies and measures. The promotion of CHP in industry is also expected to reduce energy intensity.

Key existing policies and measures for other energy use including households

The decoupling of CO_2 emissions from the number of dwellings in the last decade (see Chapter A 3.2.3) was mainly due to efficiency improvements through thermal insulation of buildings, fuel switch and increases in solar thermal energy production and biomass district heating. Member States project that these efficiency improvements will continue, helped by policies and measures. A key policy is the EU Directive on the Energy Performance of Buildings, which includes minimum standards for new buildings and for existing buildings when they are renovated, and the requirement for all buildings to have energy performance certificates. Other key policies are the EU appliances labelling scheme and schemes for energy efficiency standards. Some Member States already have similar policies and measures in place. The CCPMs matrix in chapter A 2.1 gives an overview of the implementation of these and other key policies across the EU.

Figure 13 EU-15 projected greenhouse gas emission savings from key policies in energy supply and use



Note This figure shows savings projected by Member States with existing measures or with additional domestic measures by 2010, by comparison with a hypothetical reference case in which no measure were implemented since 1990.
Limited quantification of key policies by the new Member States meant that a savings table could not be produced.

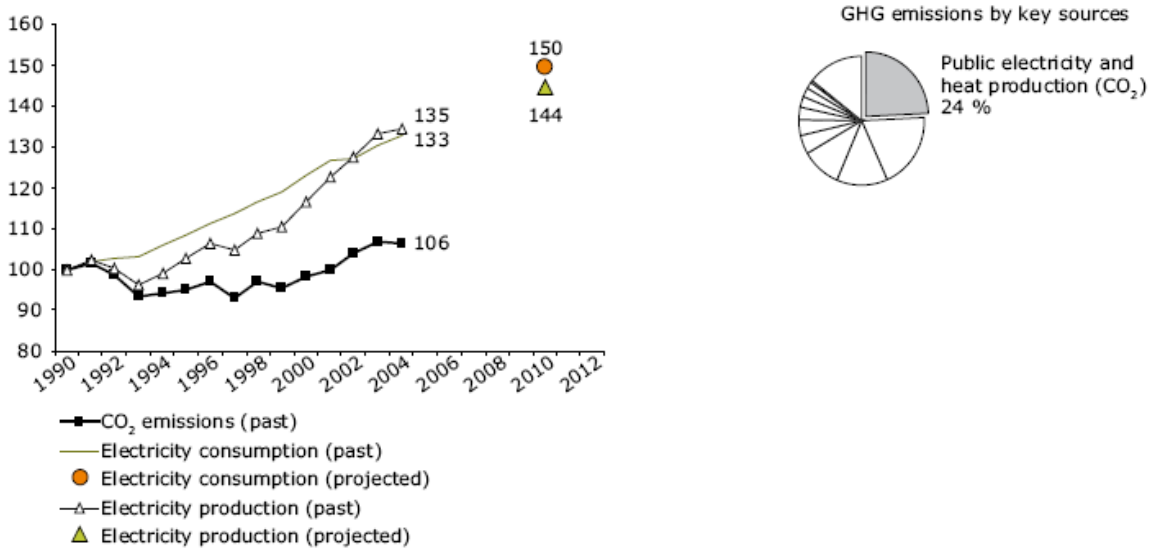
Source: European Climate Change Programme (ECCP), Database on Policies and Measures in Europe

A 3.2.1 Energy supply by electricity and heat production

Public electricity and heat production is the largest source of greenhouse gas emissions. Its CO_2 emissions account for 24 % of the EU-15 total greenhouse gas emissions. Between 1990 and 2004, CO_2 emissions from electricity and heat production increased by 6 % in the EU-15. The main driving force of this source is electricity production and consumption.

In the EU-15, final electricity consumption increased by 33 % between 1990 and 2004 (Figure 14) and is projected to further increase to 50 % above 1990 level by 2010 in the PRIMES baseline projections (European Commission, 2006). Electricity production in public thermal power plants increased by 35 % between 1990 and 2004 and is projected to further increase to 44 % above 1990 level. Carbon dioxide emissions from electricity and heat production decoupled considerably from electricity consumption and production. This was mainly due to fuel shifts in power production from coal to natural gas, and larger shares of electricity generation from renewable energy sources and nuclear power, and efficiency improvements. In recent years, no further decoupling took place. In 2004, CO_2 emissions from electricity and heat production decreased by 0.3 % compared with 2003.

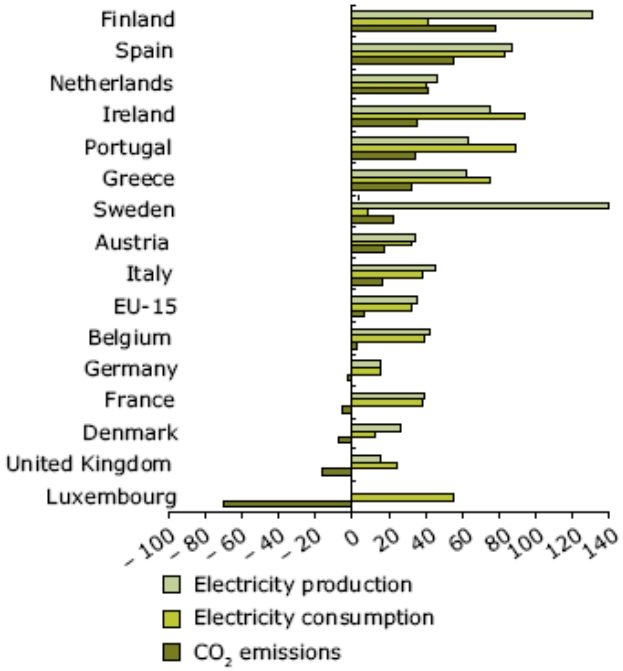
Figure 14 EU-15 CO_2 emissions from public electricity and heat production compared with electricity production in thermal power plants and final electricity consumption



Source: EEA, 2006; Eurostat; European Commission, 2006.

In some Member States, CO_2 emissions from electricity and heat production declined during the past decade, whilst electricity consumption increased in almost all Member States by more than 10 % (Figure 15). Only Sweden managed to limit growth in electricity consumption to below 10 %. Thermal power production increased in all Member States. A decoupling of electricity production in thermal power plants and CO_2 emissions occurred in all Member States. In Germany and the United Kingdom, accounting for approximately 40 % of EU-15 emissions, emission decreases were mainly due to improved efficiency in Germany's coal-fired power plants and the fuel switch from coal to gas in power production in the United Kingdom. The remarkable decoupling between thermal power production and CO_2 emissions in Sweden was mainly due to a shift towards biomass (see also Figure 17).

Figure 15 Member States CO_2 emissions from public electricity and heat production compared with electricity production in thermal power plants and final electricity consumption (change 1990–2004)

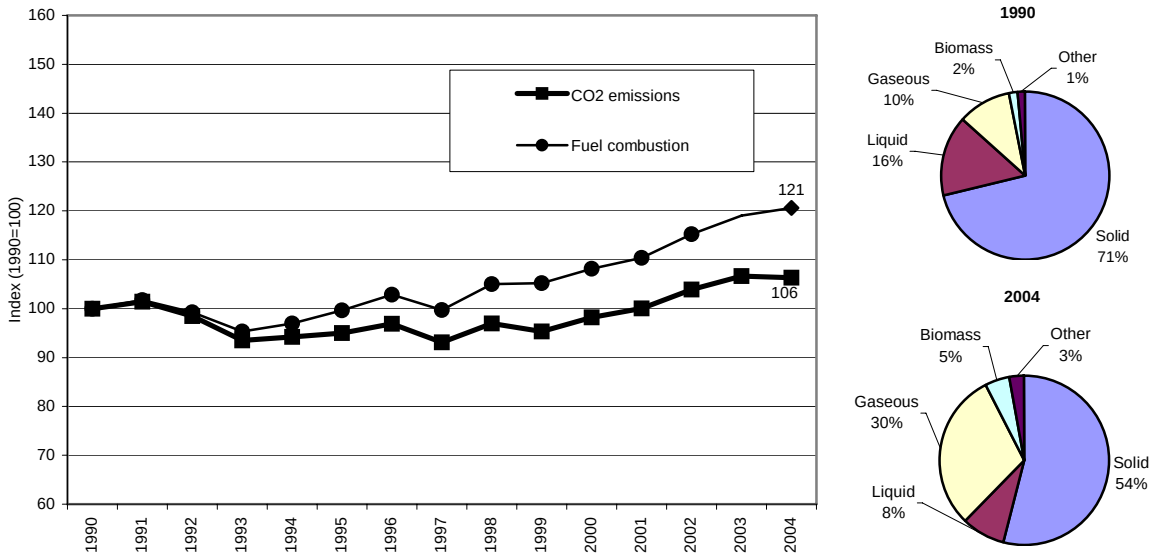


Source: EEA, 2006; Eurostat.

Figure 16 shows that CO_2 emissions somewhat decoupled from fuel combustion in public electricity and heat production. This is due to a shift from solid fuels to gaseous fuels. The share of solid fuels in total fuel combustion decreased from 71 % in 1990 to 54 % in 2004, whereas the share of gaseous fuels increased from 10 % to 30 %.

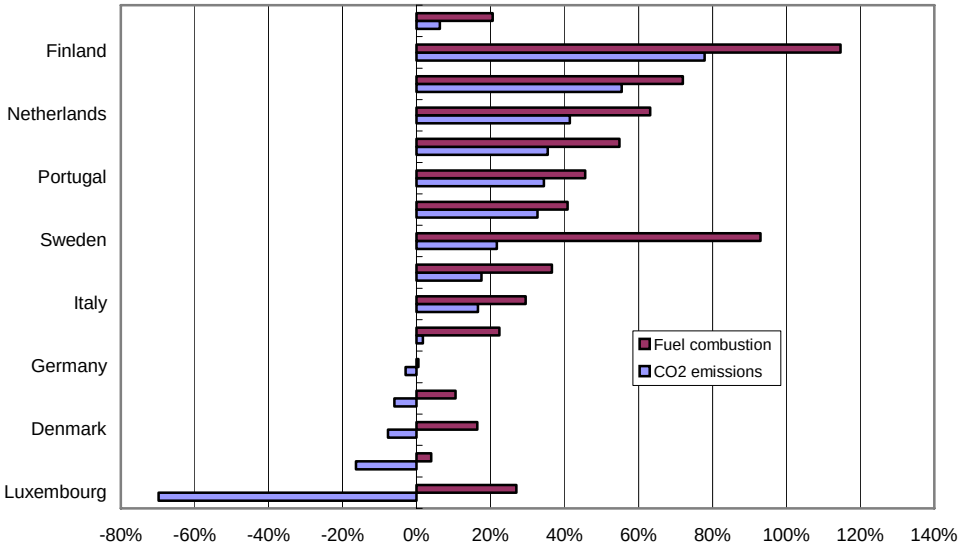
Figure 17 shows that all Member States emissions decoupled to a certain extent from fuel combustion.

Figure 16 EU-15 CO_2 emissions from public electricity and heat production compared with fuel combustion and share of fuel use in electricity and heat production 1990 and 2004



Source: EEA, 2006.

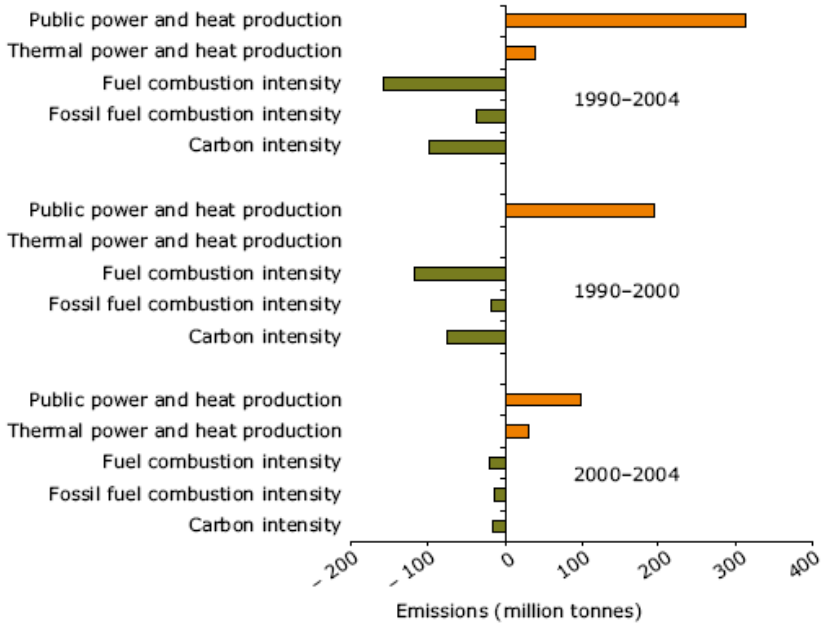
Figure 17 EU-15 CO_2 emissions from public electricity and heat production compared with fuel combustion (change 1990–2004)



Source: EEA, 2006.

Figure 18 provides an overview about the main driving forces influencing the development of CO_2 emissions from public electricity and heat production in the EU-15 between 1990 and 2004. Increasing electricity and heat production and consumption in the EU-15 between 1990 and 2004 was the main driving force increasing CO_2 emissions from public electricity and heat production. A shift to thermal power production between 2000 and 2004 additionally increased CO_2 emissions. Decreasing fuel combustion intensity due to efficiency improvements in power stations, decreasing fossil fuel combustion intensity due to a shift from fossil fuel to biomass use in public thermal power plants and decreasing carbon intensity due to a shift from coal and oil to gas reduced CO_2 emissions from public electricity and heat production mainly between 1990 and 2000.

Figure 18 Decomposition analysis of the main factors influencing the CO_2 emissions from public electricity and heat production between 1990 and 2004

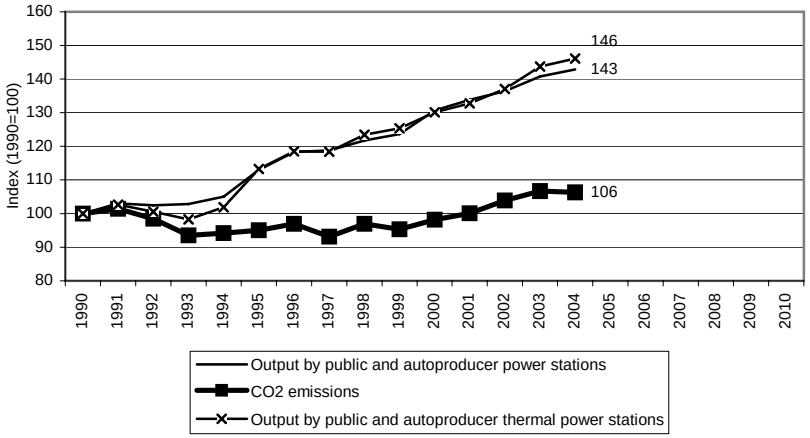


Note: The orange bars show the factors that have an increasing effect on emissions whereas the green bars show the factors that have a reduction effect. Aggregating both effects provides the actual emission changes.
Fuel combustion intensity describes the effect resulting from a change in the amount of fuel used in public power plants.
Fossil fuel combustion intensity describes the effect resulting from a change in the amount of fossil fuels used in public power plants (e.g. increased use of biomass).
Carbon intensity describes the effect resulting from a change to less carbon intensive fossil fuels in public power plants (e.g. shift from coal to oil or gas).

Source: EEA; Eurostat

Figure 19 shows CO_2 emissions from both public and autoproducer power stations against power and heat production in these plants. It shows that significant decoupling took place between 1994 and 1997, since then the pace of decoupling has slowed down. Note that the figure refers to both, public and autoproducer power plants because the differentiation between these two types of plants is not always easy. In addition it shows all products output which means that it refers to electricity and heat production.

Figure 19 EU-15 CO_2 emissions from public and autoproducer total and thermal power stations compared with all products-output (change 1990–2004)



Source: Eurostat.

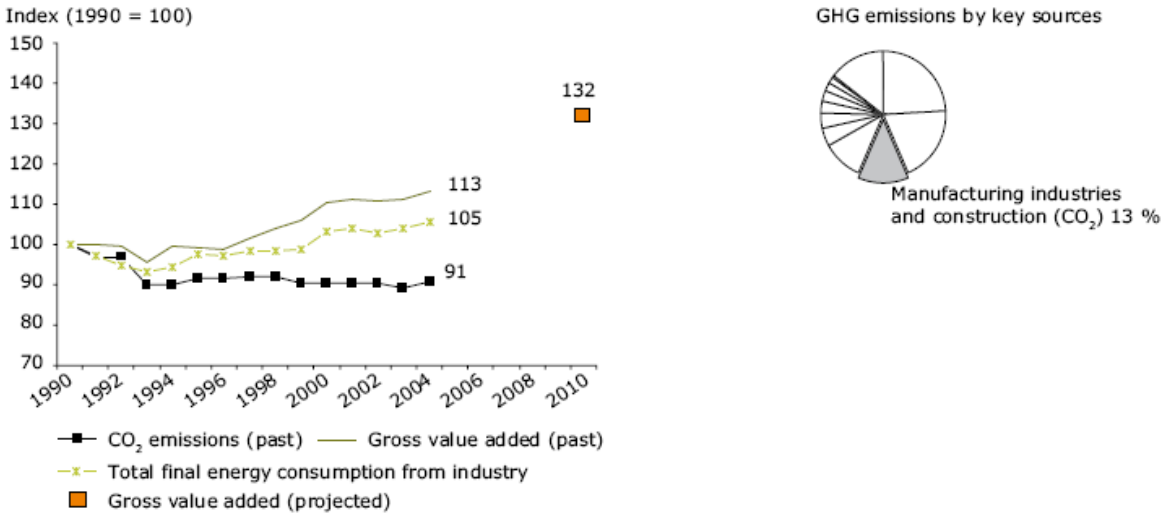
A 3.2.2 Energy use in manufacturing industries

Carbon dioxide emissions from fossil fuel combustion in manufacturing industries accounted for 13 % of total EU-15 greenhouse gas emissions in 2004. Between 1990 and 2004, CO_2 emissions from manufacturing industries declined by 9 %. Emissions reduced entirely between 1990 and 1993 and mainly due to efficiency improvements and structural change in Germany after reunification and the relatively small economic growth in the EU-15 (Figure 20). Afterwards emissions changed only by +/-2 percentage points. Compared with 2003, emissions increased by 2 % in 2004, mainly from iron and steel production in Germany and Spain.

Between 1990 and 2004, industrial output — the main driving force for emissions from the industry sector — increased by 13 % in terms of gross value added. Therefore, for the EU-15 as a whole, CO_2 emissions from manufacturing industries decoupled from gross value added. Total final energy consumption from industry increased by 5 % between 1990 and 2004.

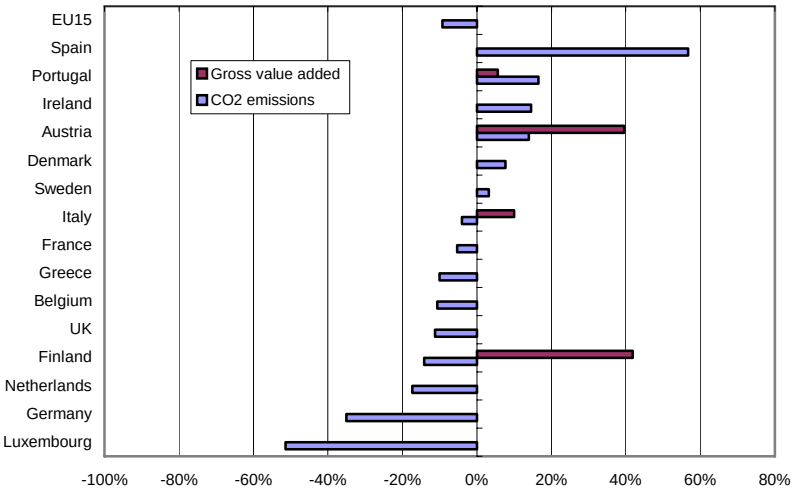
Of the three Member States which reported gross value added in industry under the EC greenhouse gas Monitoring Mechanism for 1990 and 2004, Austria and Finland achieved decoupling of CO_2 emissions and gross value added in industry between 1990 and 2004 (Figure 21). In Portugal, CO_2 emissions increased more than gross value added in industry.

Figure 20 EU 15 CO_2 emissions from manufacturing industries and construction 1990–2004 compared with value added and energy consumption and share in total greenhouse gas emissions



Source: EEA, 2006; Eurostat; European Commission, 2006.

Figure 21 EU-15 Member States' CO_2 emissions from manufacturing industries and construction compared with gross value added (change 1990–2004)

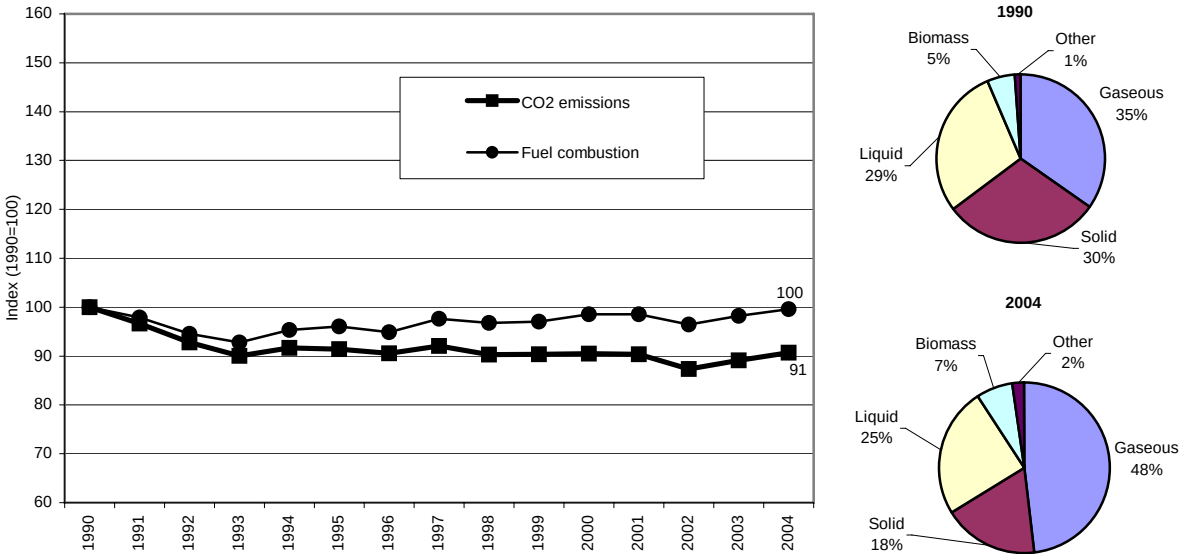


Source: EEA, 2006; EC greenhouse gas Monitoring Mechanism.

Note: Data for gross value added from industry for the years 1990 and 2004 were only reported by Portugal, Austria, Italy and Finland.

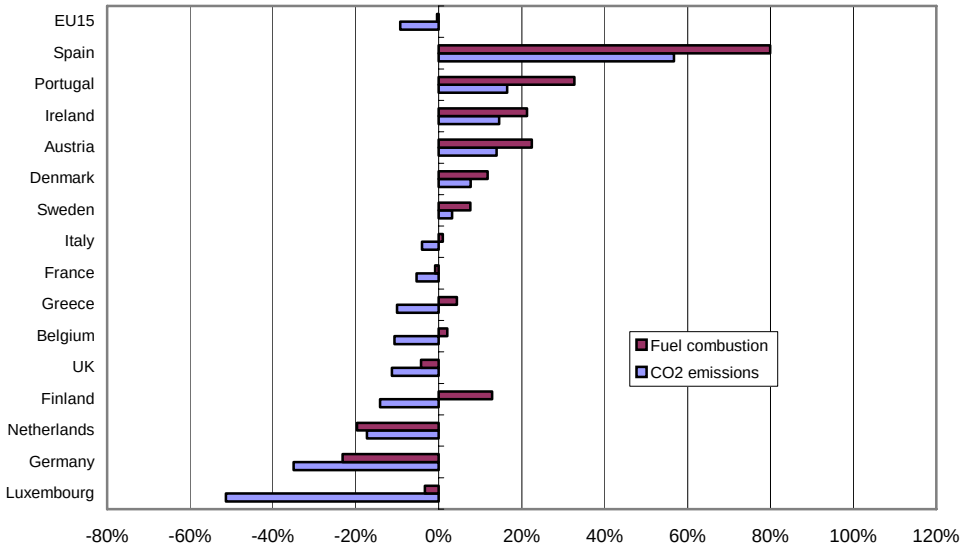
Figure 22 shows that CO_2 emissions decoupled slightly from fuel combustion in manufacturing industries and construction. This is due to a shift from solid fuels to gaseous fuels. The share of solid fuels in total fuel consumption decreased from 30 % in 1990 to 18 % in 2004, whereas the share of gaseous fuels increased from 35 % to 48 %. Figure 23 shows that all Member States except the Netherlands decoupled emissions to a certain extent from fuel combustion.

Figure 22 EU-15 CO_2 emissions from manufacturing industries and construction compared with fuel combustion and share of fuel use in manufacturing industries and construction 1990 and 2004



Source: EEA, 2006.

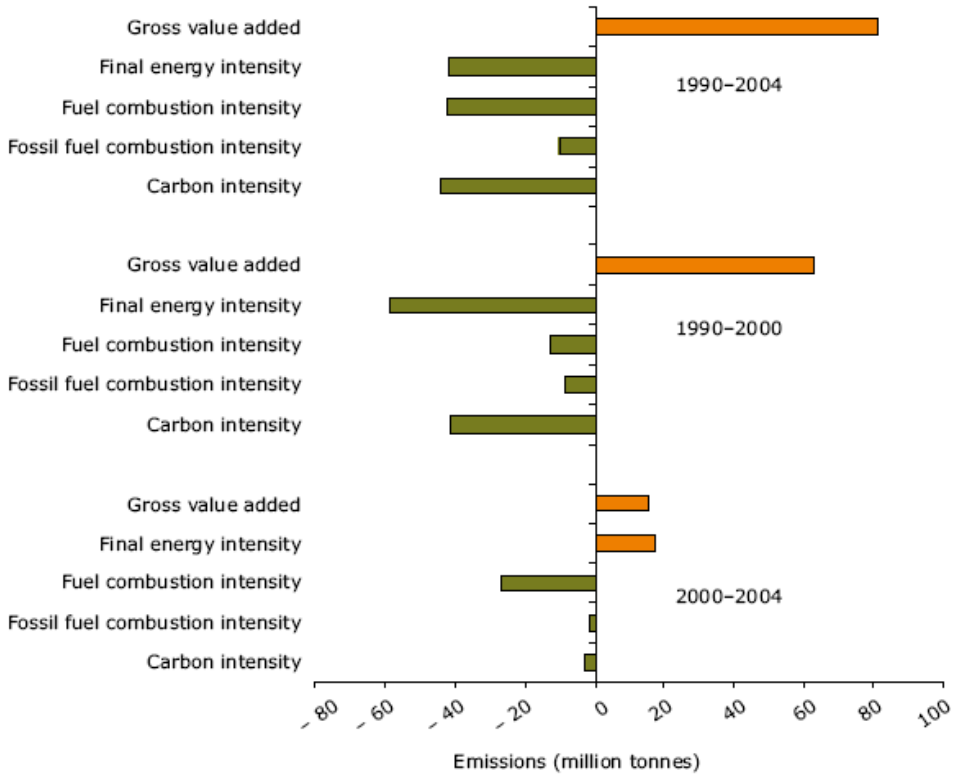
Figure 23 EU-15 CO_2 emissions from manufacturing industries and construction compared with fuel consumption (change 1990–2004)



Source: EEA, 2006.

Figure 24 provides an overview about the main driving forces influencing the development of CO_2 emissions from manufacturing industries in the EU-15 between 1990 and 2004. Increasing gross value added from industry is the main factor raising CO_2 emissions. Decreasing final energy intensity per gross value added, decreasing fuel combustion intensity and decreasing carbon intensity due to a shift from the use of coal and oil to gas had a decreasing effect on CO_2 emissions from manufacturing. The shift from fossil fuels to biomass (expressed as fossil fuel combustion intensity) only had a minor effect on the development of CO_2 emissions from manufacturing industries. The influence of the factors – both positive and negative - described above was higher between 1990 and 2000 than between 2000 and 2004. Between 2000 and 2004, final energy consumption per gross value added even increased.

Figure 24 Decomposition analysis of the main factors influencing the development of EU 15 CO_2 emissions from manufacturing industries and construction between 1990 and 2004



Note: The orange bars show the factors that have an increasing effect on emissions whereas the green bars show the factors that have a reduction effect. Aggregating both effects provides the actual emission changes.
Final energy intensity: effect resulting from the change of final energy consumption per gross value added.
Fuel combustion intensity describes the effect resulting from a change in the amount of fuel used in public power plants.
Fossil fuel combustion intensity describes the effect resulting from a change in the amount of fossil fuels used in public power plants (e.g. increased use of biomass).
Carbon intensity describes the effect resulting from a change to less carbon intensive fossil fuels in public power plants (e.g. shift from coal to oil or gas).

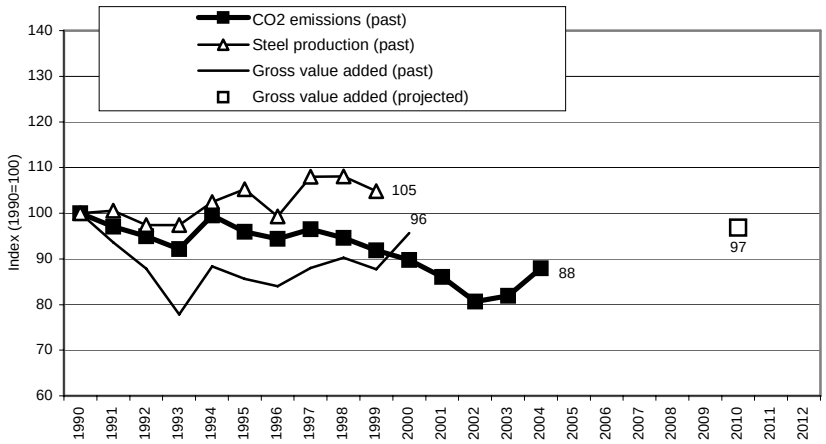
Source: EEA; Eurostat

In 2004, iron and steel production accounts for 18 % of total CO_2 emissions from fossil fuel combustion in manufacturing industries, followed by the chemical industry (12 %) and food production (7 %). Between 1990 and 2004, CO_2 emissions from fossil fuels decreased in all of the largest industrial branches except pulp and paper production, and food, drink and tobacco industry. The chemical industry shows the largest degree of decoupling of CO_2 emissions from gross value added.

Iron and steel production

Iron and steel production accounts for 18 % of total CO_2 emissions from fossil fuel combustion in manufacturing industries. In 2004, emissions were 12 % below 1990 levels (Figure 25).

Figure 25 EU-15 CO_2 emissions from iron and steel production (change 1990–2004) compared with steel production and gross value added

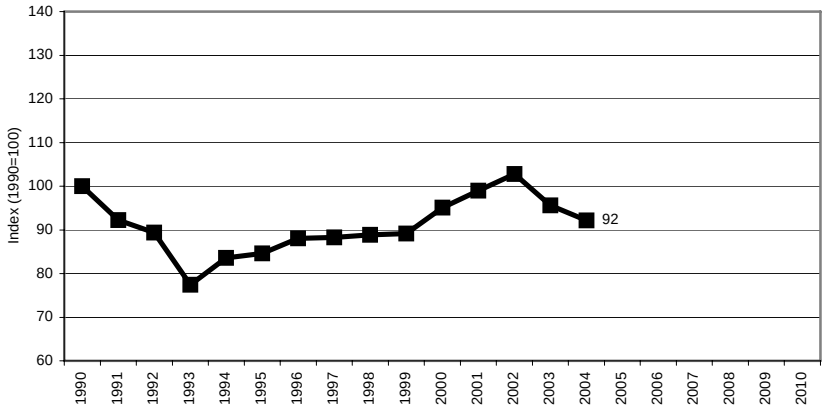


Source: EEA, 2006; Eurostat; European Commission, 2006.

Non-ferrous metal production

The non-ferrous metal production includes mainly copper, lead, zinc and aluminium production and accounts for approximately 2 % of total CO_2 emissions from fossil fuel combustion in manufacturing industries. In 2004, emissions were 8 % below 1990 levels (Figure 26).

Figure 26 EU-15 CO_2 emissions from non-ferrous metal production (change 1990–2004)



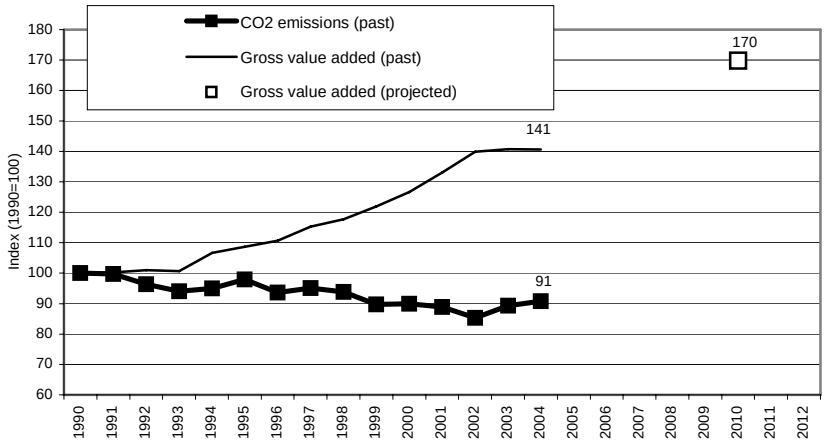
Source: EEA, 2006.

Chemical industry

The chemical industry accounts for approximately 12 % of total CO_2 emissions from fossil fuel combustion in manufacturing industries. In 2004, emissions were 9 % below 1990 levels (Figure 27). Gross value added increased by 41 % in the 1990s and is projected to further increase to 70 % above 1990 level by 2010 according to PRIMES baseline projections. The chemical industry shows the largest decoupling of the industries mentioned in this chapter.

The chemical industry is a very heterogeneous branch consisting of, for example, the production of agrochemicals, petrochemicals, inorganic chemicals and pharmaceuticals. The most energy-intensive processes are the production of ammonia, which is the raw material for most fertilisers. Structural changes from energy-intensive chemical branches to less energy-intensive branches might be an important factor for overall reductions in CO_2 intensity of the branch. For this reason, a further split into energy-intensive and less energy-intensive chemical branches would be useful.

Figure 27 EU-15 CO_2 emissions from the chemicals industry (change 1990–2004) compared with gross value added

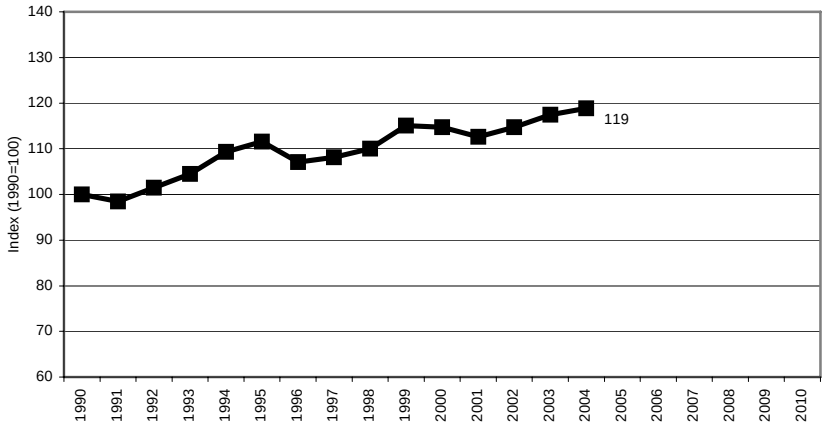


Source: EEA, 2006; Eurostat; European Commission, 2006.

Food, drink and tobacco industry

The food, drink and tobacco industry accounts for approximately 7 % of total CO_2 emissions from fossil fuel combustion in manufacturing industries. In 2004, emissions were 19 % above 1990 levels (Figure 28).

Figure 28 EU-15 CO_2 emissions from food, drink and tobacco industry (change 1990–2004)

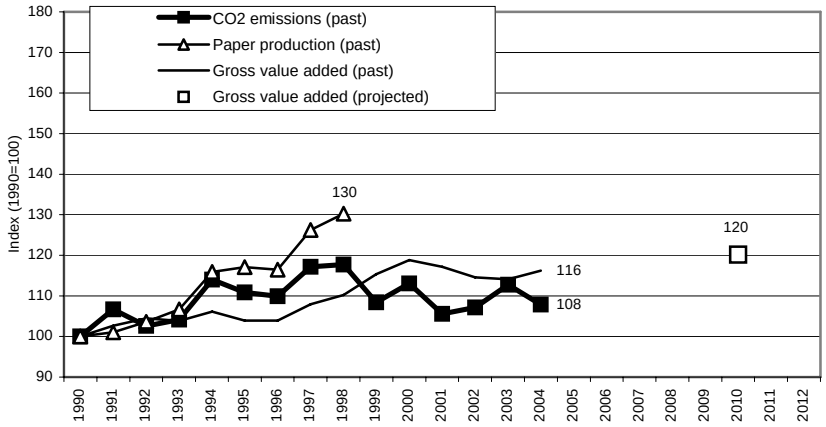


Source: EEA, 2006.

Pulp and paper production

The pulp and paper industry accounts for approximately 5 % of total CO_2 emissions from fossil fuel combustion in manufacturing industries. In 2004, emissions were 8 % above 1990 levels (Figure 29). Emissions decoupled slightly from paper production and from gross value added. Gross value added from pulp and paper production increased to 16 % above 1990 level and is projected to further increase to 20 % above 1990 level.

Figure 29 EU-15 CO_2 emissions from pulp and paper production (change 1990–2004) compared with paper production and gross value added



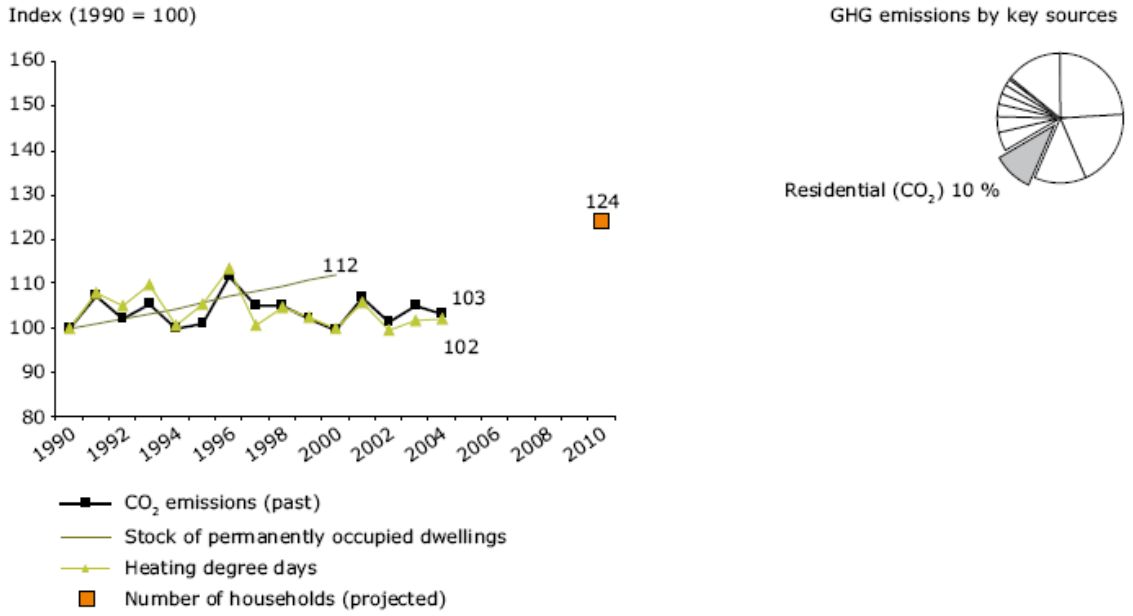
Source: EEA, 2006; Eurostat; European Commission, 2006.

A 3.2.3 Energy use in households

Carbon dioxide emissions from fossil fuel use in households accounted for 10 % of total EU-15 greenhouse gas emissions in 2004. Between 1990 and 2004, CO_2 emissions from households fluctuated mainly in line with outdoor temperatures in the winter season (Figure 30).

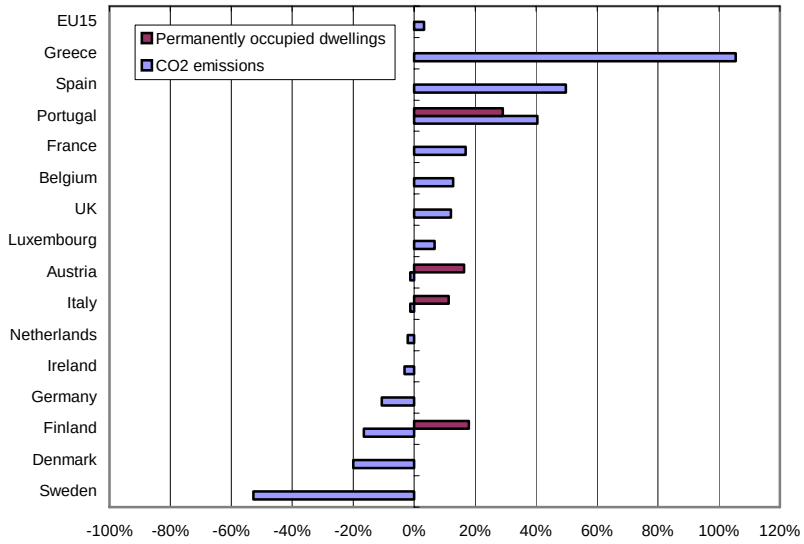
For households, CO_2 emissions are mainly influenced by the number and size of dwellings, building codes, the age distribution of the existing building stock, the fuel split for heating and warm water, and outdoor temperatures. For the EU-15, the number of dwellings increased by 12 % between 1990 and 2000 (no data for 2004) while CO_2 emissions from households remained more or less stable, with small fluctuations linked with outdoor temperatures (Figure 31). This decoupling may be an indication of energy efficiency improvements and fuel shifts of space heating. Of the four Member States which reported the number of permanently occupied dwellings, the decoupling was highest in Finland. However, it should be noted that the high performance is also influenced by a shift from household heating boilers to district heating plants (Figure 31). That shift in heating facilities reduces CO_2 emissions from households but may increase emissions from energy industries in case that district heating is based on fossil fuels. In Portugal, CO_2 emissions from households increased to a greater extent than the number of dwellings.

Figure 30 EU 15 CO_2 emissions from households compared with the number of permanently occupied dwellings, heating degree days and share of households in total greenhouse gas emissions



Source: EEA, 2006; Eurostat; European Commission, 2006.

Figure 31 EU-15 Member States' CO_2 emissions from households and number of dwellings (change 1990–2004)

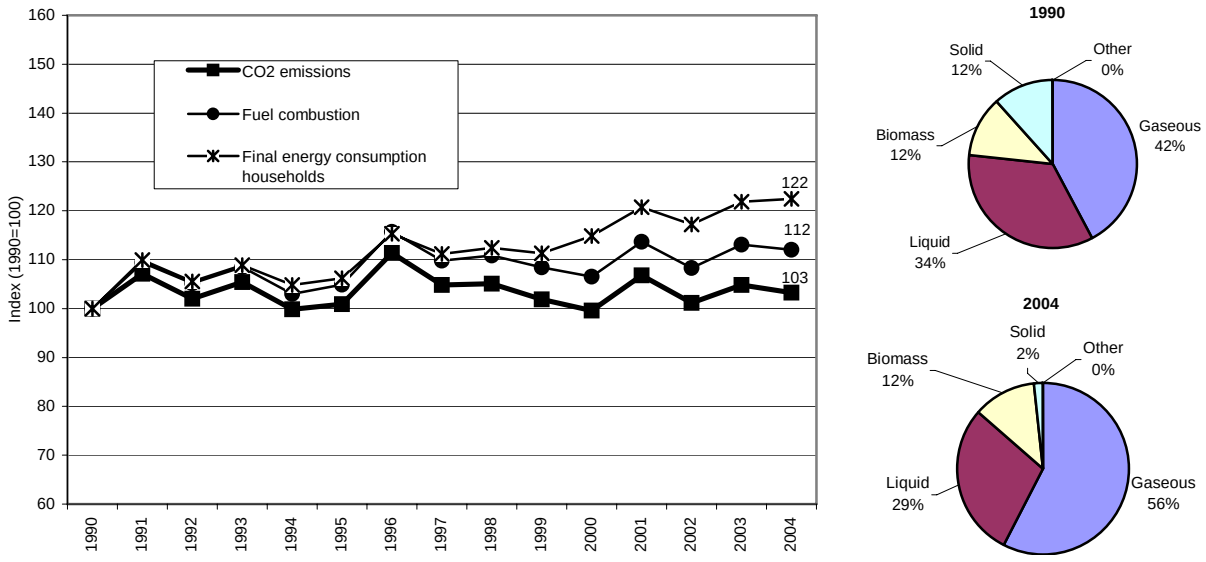


Note: Data for the number of dwellings for the years 1990 and 2003 were only reported by Portugal, Italy, Austria and Finland.

Source: EEA, 2006; EC greenhouse gas Monitoring Mechanism.

Figure 32 shows that CO_2 emissions decoupled slightly from fuel combustion in households. This is due to a shift from solid fuels to gaseous fuels. The share of solid fuels in total fuel consumption decreased from 12 % in 1990 to 2 % in 2004, whereas the share of gaseous fuels increased from 42 % to 56 %. Final energy consumption (including district heating and electricity consumption) increased by 22 %.

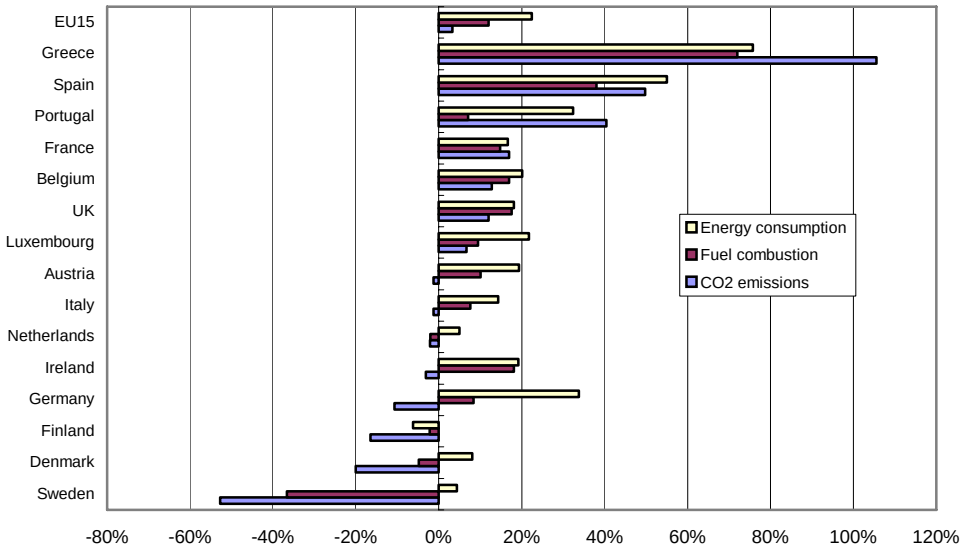
Figure 32 EU-15 CO_2 emissions from households compared with fuel combustion and share of fuel use in households 1990 and 2004



Source: EEA, 2006; Eurostat

Figure 33 shows that most Member States decoupled emissions to a certain extent from fuel combustion; exceptions are France, Greece, Portugal and Spain. A main reason for absolute reductions in fuel use in Denmark, Finland and Sweden is the increase of district heating which is shown by a decrease in fuel combustion but an increase in final energy consumption. In Germany, efficiency improvements through thermal insulation of buildings and fuel switch in particular in eastern German households, solar thermal energy production and biomass district heating were largely responsible for CO_2 reductions from households.

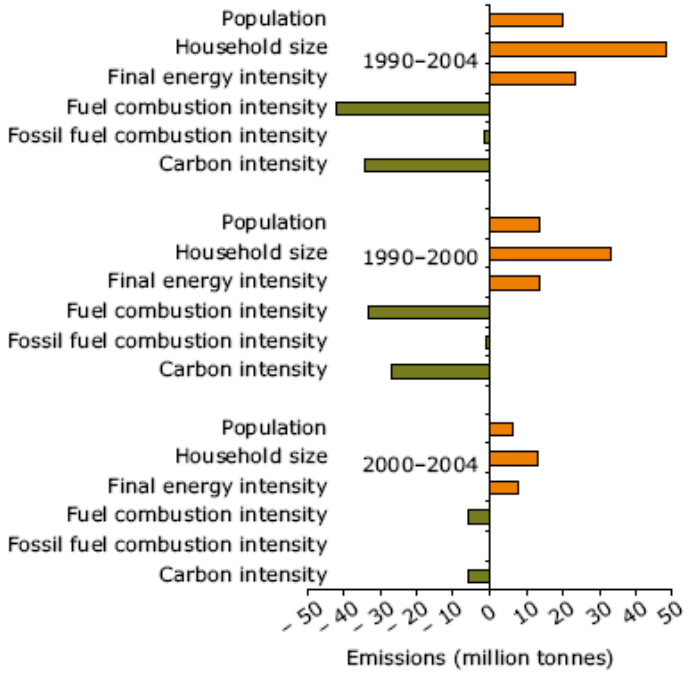
Figure 33 EU-15 CO_2 emissions from households compared with fuel consumption (change 1990–2004)



Source: EEA, 2006.

Figure 34 provides an overview about the main factors influencing the development of CO_2 emissions from households in the EU-15 between 1990 and 2004. Increases in population and household size had an increasing effect on CO_2 emissions. The increasing final energy intensity per household is mainly due to increasing electricity consumption which causes CO_2 emissions in the electricity and heat sector. Fuel combustion intensity decreases due to efficiency improvements, better insulation of houses and the extended use of district heating. The decreasing carbon intensity reflects the shift from coal to gas. Both fuel combustion intensity and carbon intensity decreased CO_2 emissions from households. The shift from fossil fuels to biomass (expressed as fossil fuel combustion intensity) only had a minor effect on the development of CO_2 emissions from households. The influence of the factors – both positive and negative - described above was higher between 1990 and 2000 than between 2000 and 2004.

Figure 34 Decomposition analysis of the main factors influencing the development of EU 15 CO_2 emissions from households between 1990 and 2004



Note: The orange bars show the factors that have an increasing effect on emissions whereas the green bars show the factors that have a reduction effect. Aggregating both effects provides the actual emission changes.
Final energy intensity: effect resulting from the change of final energy consumption per gross value added.
Fuel combustion intensity describes the effect resulting from a change in the amount of fuel used in public power plants.
Fossil fuel combustion intensity describes the effect resulting from a change in the amount of fossil fuels used in public power plants (e.g. increased use of biomass).
Carbon intensity describes the effect resulting from a change to less carbon intensive fossil fuels in public power plants (e.g. shift from coal to oil or gas).

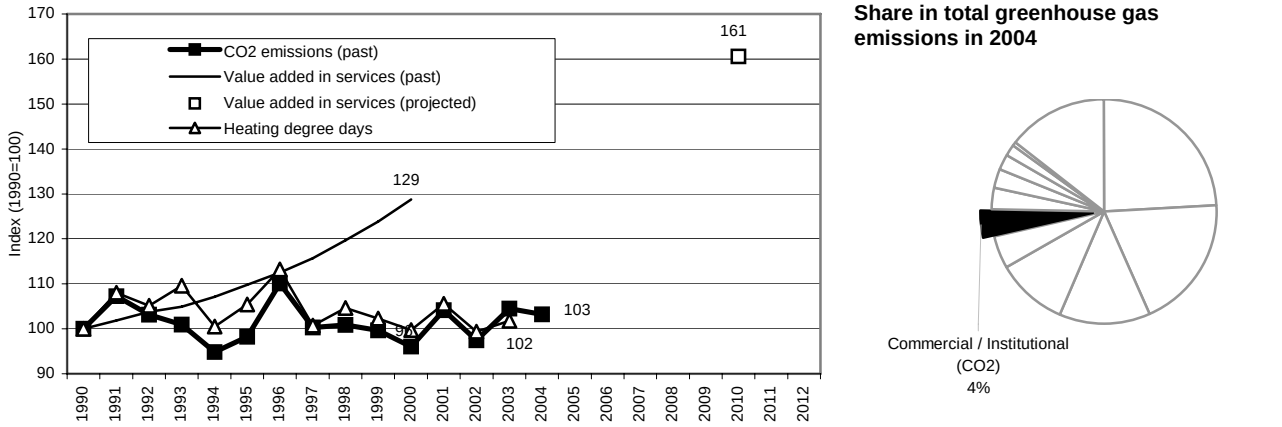
Source: EEA; Eurostat

A 3.2.4 Energy use in services

Carbon dioxide emissions from fossil fuel use in services accounted for 4 % of total EU-15 greenhouse gas emissions in 2004. Between 1990 and 2004, CO_2 emissions from services fluctuated mainly in accordance with outdoor temperatures in the winter season. In 2004, emissions were slightly below 1990 levels (Figure 35). As in households, a fuel switch also took place in services: whereas the share of solid fuels in total fuel consumption decreased from 12 % in 1990 to 1 % in 2004 and the share of liquid fuels declined from 42 % to 30 %, the share of gaseous fuels increased from 44 % to 66 %. Emissions have decoupled from gross value added in services, which increased by approximately 30 % between 1990 and 2000.

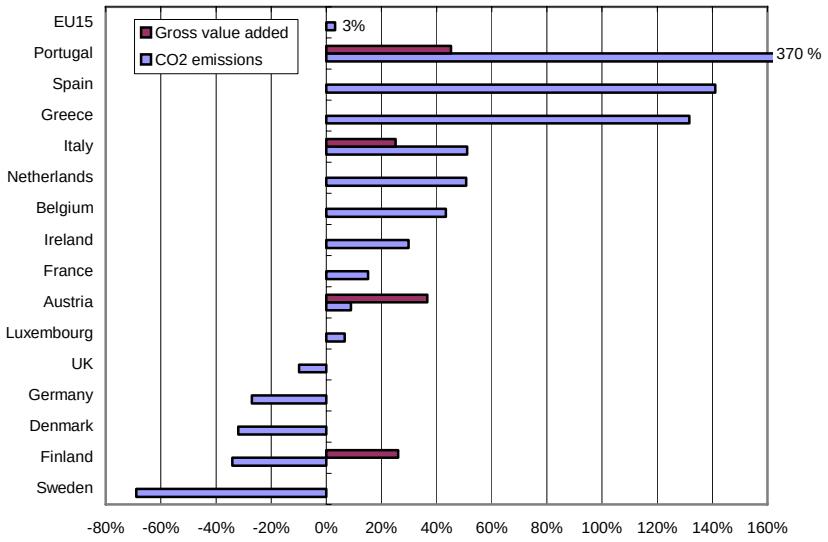
Denmark, Finland, Germany, Sweden and the United Kingdom decreased their emissions; all other Member States increased emissions from services (Figure 36). The reasons for the decreases might be similar to those mentioned above for households. However, the emission trends need to be interpreted with care, because Member States have difficulties in allocating emissions to this source because of weaknesses in the statistical basis.

Figure 35 EU-15 CO_2 emissions from services, compared with gross value added and heating degree days



Source: EEA, 2006; Eurostat; European Commission, 2006.

Figure 36 CO_2 emissions from services and gross value added (change 1990–2004) EU-15 Member States



Source: EEA, 2006; EC greenhouse gas Monitoring Mechanism.

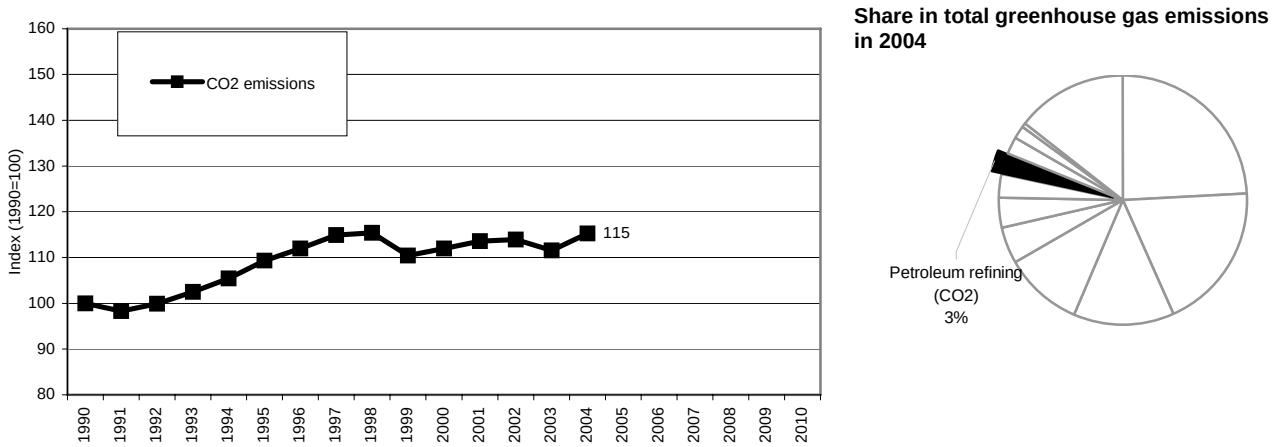
A 3.2.5 Energy supply by petroleum refining

Petroleum refining accounts for 3 % of the EU-15 total greenhouse gas emissions and is a smaller part of the energy supply sector compared with electricity and heat production. This source includes all combustion activity supporting the refining of petroleum products; it does not include evaporative emissions.

Between 1990 and 2004, CO_2 emissions from petroleum refining increased by 15 % in the EU-15 (Figure 37). After a decline in 1991, emissions increased in almost every year up to 1998. From then on they remained more or less constant. However, CO_2 emissions from oil refining increased by +3.8 million tonnes in the EU-15 between 2003 and 2004. This was the third largest increase in greenhouse gas emissions (in absolute value) by sector.

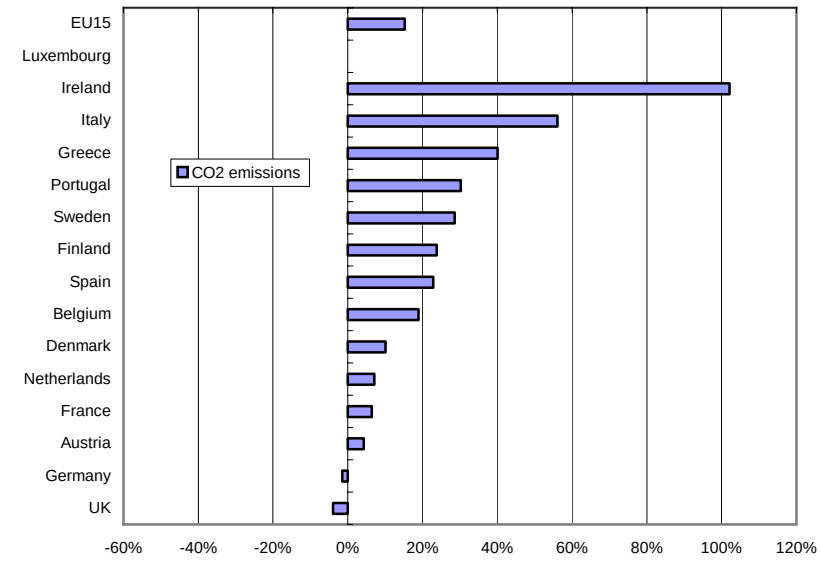
In almost all Member States, CO_2 emissions from petroleum refining increased during the past decade; only in the United Kingdom and Germany they decreased slightly (Figure 38). Ireland had increases of more than 100 %. Italy has the largest crude oil refining capacity in the EU-15 and accounts for approximately 50 % of absolute emission increases between 1990 and 2004.

Figure 37 CO_2 emissions from petroleum refining, EU-15



Source: EEA, 2006.

Figure 38 CO_2 emissions from petroleum refining (change 1990–2004), EU-15



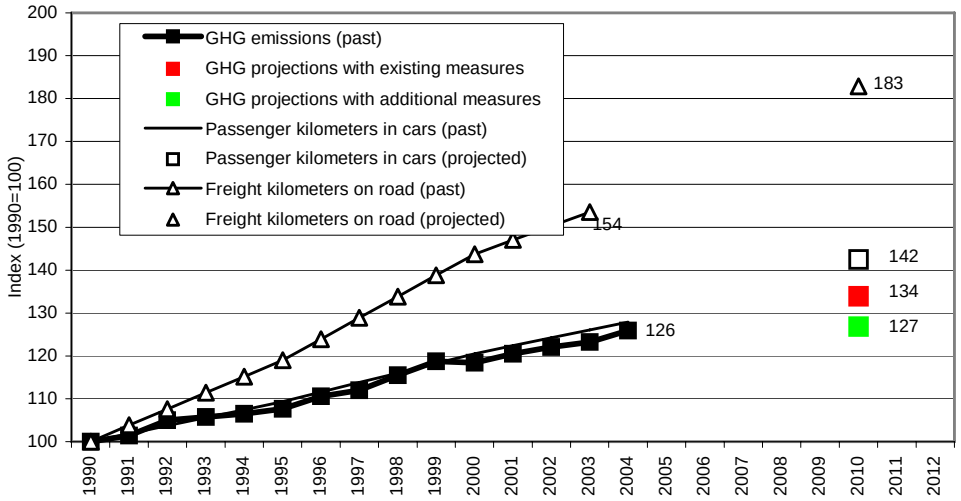
Source: EEA, 2006.

A 3.3 Transport

Transport is the second largest sector of greenhouse gas emissions, accounting for 19 % of EU-25 emissions and 21 % of EU-15 emissions.

Between 1990 and 2004, EU-25 emissions from transport increased by 26 % and are projected to further increase to 34 % by 2010 with existing measures. With additional measures emissions are projected to increase by one percentage point between 2004 and 2010 (Figure 39).

Figure 39 EU-25 past and projected greenhouse gas emissions from transport and freight kilometres on road and share of the sector in total greenhouse gas emissions



Note: Since sectoral emission projections are missing for Germany, Cyprus, Estonia, Malta and Poland, greenhouse gas projections for the EU-25 are calculated on the basis of projections reported by 20 Member States. The percentage change for 2004–10 of the EU-20 is applied to EU-25. No additional measures were reported for Denmark, Ireland, Spain, Sweden, Hungary and Lithuania. For these countries, the 'with existing measures' projections were used for the calculation of the EU-25 'additional measures' projections.

Source: EEA, 2003c; EEA, 2006; Eurostat; European Commission, 2006.

Total EU-15 greenhouse gas emissions from transport were 26 % above 1990 levels and are projected to further increase (Figure 40). Compared with 2003, emissions increased by 2 % in 2004; all Member States showed increases compared with the previous year, except Portugal. The +1.5% increase in road transport emissions in the EU-15 between 2003 and 2004 was the largest increase in absolute value (+11.7 million tonnes) from all sectors.

Transport causes CO_2 emissions through fossil fuel combustion in road transportation, national civil aviation, railways, national navigation and other transportation ([36]), with road transport being by far the largest source within transport (93 % in 2004 for EU-15). In 2004, CO_2 emissions from road transport had increased by 26 % compared with 1990, due to continuous increases in road

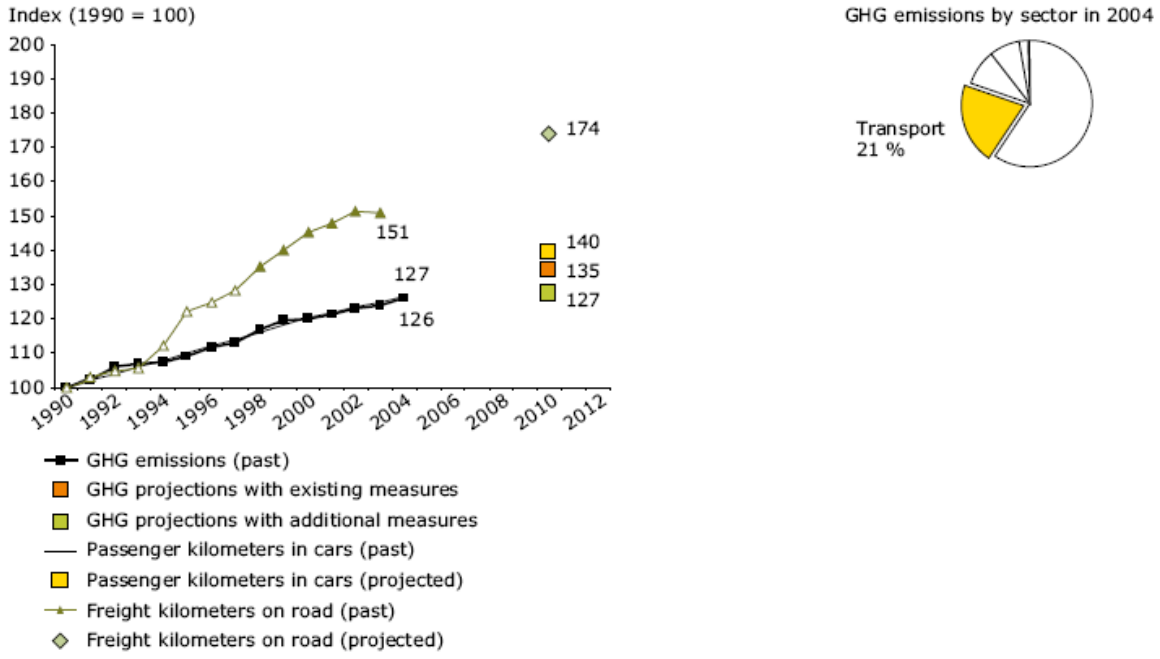
[35] This sector includes domestic transport but excludes international aviation and international maritime transport. This corresponds to sector 1.A.3 'Transport' according to UNFCCC guidelines for greenhouse gas inventories.

[36] In accordance with UNFCCC guidelines, these emissions do not include CO_2 emissions from international aviation and navigation, which were 265 million tonnes in 2004 or 6 % of total EU-15 greenhouse gas emissions. Total EU-15 CO_2 emissions from international aviation and navigation grew by 59 % between 1990 and 2004.

transport volume (both passenger and freight). In particular, freight transport increased substantially between 1990 and 2003 (+ 51 %) and is projected to further increase to 74 % above 1990 level according to the PRIMES baseline scenario (European Commission, 2006).

Emissions of N_2O from transport account for only 0.5 % of total EU greenhouse gas emissions, and are closely linked to the introduction of petrol cars equipped with catalysts. Nitrous oxide emissions are mostly formed during the warm-up phase. EU-15-wide N_2O emissions from transport increased sharply (178 %) between 1990 and 2004. However, more modern catalytic converters are emitting much less N_2O.

Figure 40 EU-15 past and projected greenhouse gas emissions from transport, passenger kilometres in cars and freight kilometres on road and share of the sector in total greenhouse gas emissions



Notes: Since sectoral emission projections are missing for Germany, greenhouse gas projections for the EU-15 are calculated on the basis of projections reported by 14 Member States. The percentage change for 2004–10 of the EU-14 is applied to EU-15. No additional measures were reported for Denmark, Ireland, Luxembourg, Spain and Sweden. For these countries, the 'with existing measures' projections were used for the calculation of the EU-15 'additional measures' projections.
Past trends of passenger km in cars is almost identical with greenhouse gas emissions, which is the reason why it cannot be seen in the graph.

Source: EEA, 2003c; EEA, 2006; Eurostat; European Commission, 2006.

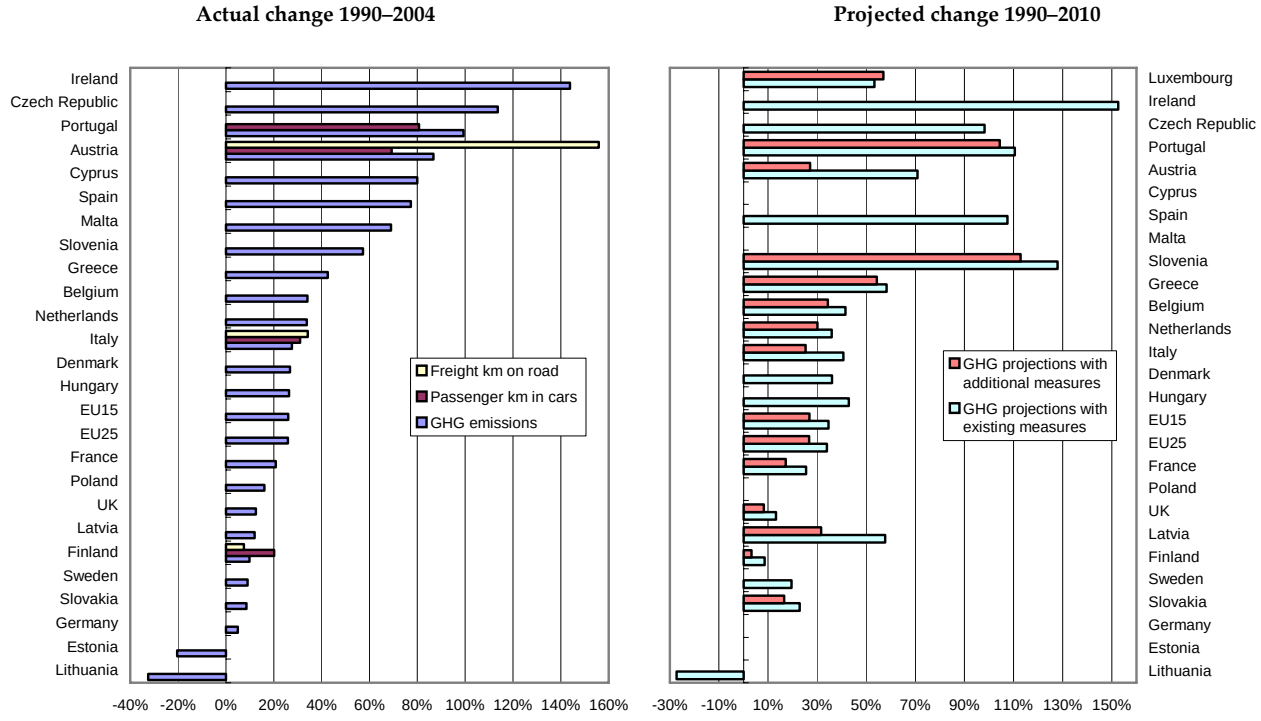
Aggregated total greenhouse gases from transport are projected to be 35 % above 1990 levels in 2010 when existing domestic measures are taken into account. Additional measures are projected to limit the increase of emissions to 27 % above 1990 levels in 2010. As with past transport emissions, by far the largest contribution is from road transport, although the exact contribution cannot be given due to lack of information on the shares of the various transport modes in the projections reported by Member States. Compared to the analysis in 2005, EU-15 with existing measures projections for the transport sector increased by four percentage points mainly due to revised projections of Spain.

Figure 41 shows that, between 1990 and 2004, greenhouse gas emissions from transport increased in all EU-25 Member States, except Estonia and Lithuania. Finland, Germany, Sweden and Slovakia limited their emission increases below 10 %. Austria, Greece, Portugal, Spain, Cyprus, Czech Republic, Malta and Slovenia registered emission increases of more than 40 %, Ireland and

Luxembourg more than doubled their greenhouse gas emissions from transport. The main reasons for the large increases in Ireland and Luxembourg are growth in road transport volumes and 'fuel tourism': e.g. road fuels are bought in Ireland, where fuel prices are relatively low, but consumed outside Ireland, particularly in Northern Ireland. 'Fuel tourism' due to comparatively low fuel prices is also an important reason in other EU-15 Member States such as Austria and Luxembourg.

Explanations for the relatively small changes in emissions in Finland, Germany, Sweden and the United Kingdom may be, high per capita greenhouse gas emissions from transport in 1990 and high and/or rapidly growing road fuel prices. For the cohesion countries (Greece, Ireland, Portugal and Spain), the opposite is true: low starting points in terms of per capita emissions and low road fuel prices. They have experienced strong growth in transport demand, particularly road, driven by economic growth, and have therefore also experienced large increases in greenhouse gas emissions.

Figure 41 Actual and projected change in EU-25 greenhouse gas emissions from transport compared with passenger kilometres in cars and freight kilometres on road



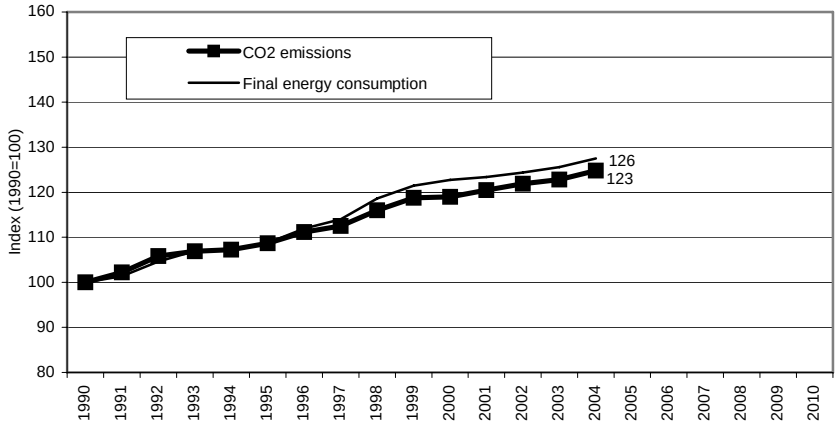
Note: Since sectoral emission projections are missing for Germany, greenhouse gas projections for the EU‑15 are calculated on the basis of projections reported by 14 Member States. The 2004–2010 percent variation for the EU‑14 was applied to Germany to obtain a EU‑15 projection for 2010. No additional measures were reported for Denmark, Ireland, Luxembourg, Spain and Sweden. For these countries, the 'with existing measures' projections were used for the calculation of the EU‑15 'additional measures' projections. Past sectoral emissions are complete.

Source: EEA, 2006; Eurostat; information submitted under the EC greenhouse gas monitoring mechanism and in fourth national communications.

All reporting EU-25 Member States (except Lithuania) project growing transport emissions (excluding international aviation and shipping), indicating that policies and measures are not sufficient. Ireland, Portugal, Slovenia and Spain expect the strongest growth, with Ireland projecting that, compared with 1990, emissions will almost triple by 2010. Austria, Belgium, Italy and Latvia expect that additional measures will significantly reduce the projected growth in transport emissions. For the other Member States, any additional measures are regarded as having less effect.

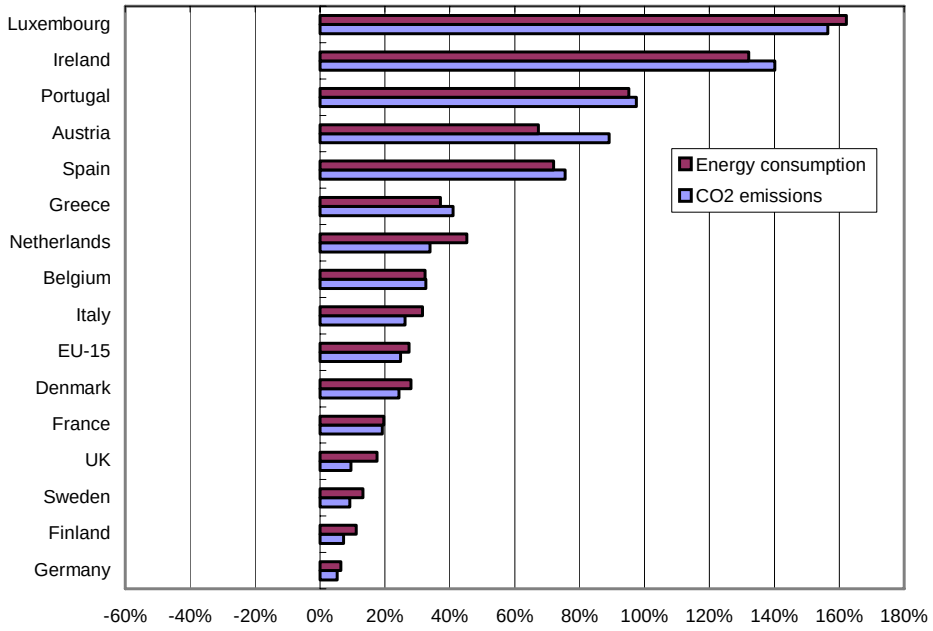
Figure 42 shows that CO_2 emissions decoupled slightly from final energy consumption from transport. Only in Ireland, Portugal, Austria, Spain, Greece and Belgium, CO_2 emissions increased by a higher percentage than final energy consumption (Figure 43).

Figure 42 EU-15 CO_2 emissions from transport compared with final energy consumption (change 1990-2004)



Source: EEA, 2006; Eurostat

Figure 43 EU-15 CO_2 emissions from transport compared with final energy consumption (change 1990-2004)



Source: EEA, 2006; Eurostat

A 3.3.1 Road transport

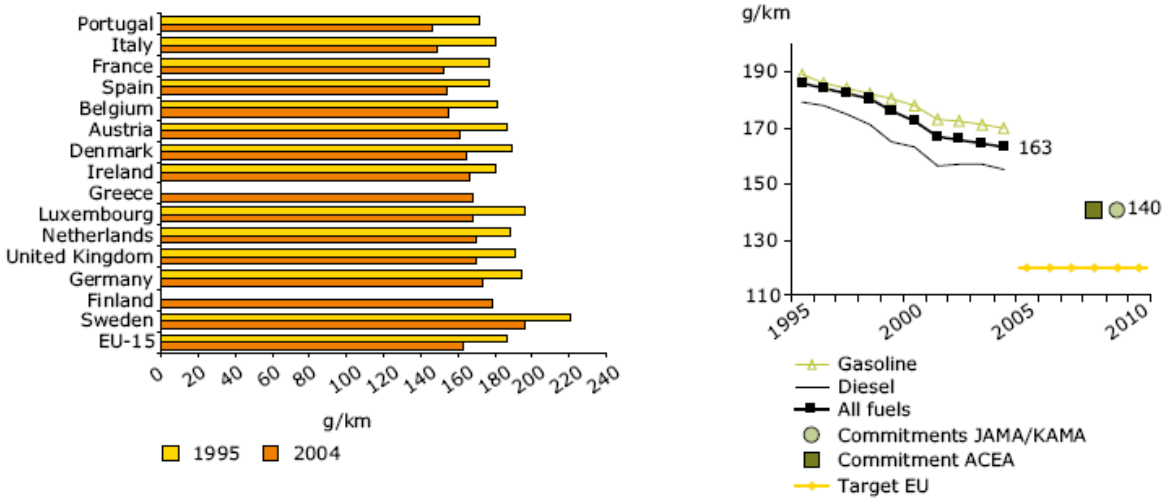
Carbon dioxide emissions contribute substantially to the total greenhouse gas emissions from transport, and measures to reduce these emissions are therefore important.

As far as passenger cars are concerned, the EU aims to reduce the average specific CO_2 emissions of new cars to 120 g CO_2/vehicle-km by 2005, and by 2010 at the latest. In order to meet these targets, commitments by the European, Japanese and Korean automobile manufacturers' associations (ACEA, JAMA, KAMA ([37])) have been made. In these, the automobile industry commits itself to aim at average specific CO_2 emissions of 140 g CO_2/vehicle-km for new passenger cars by 2008 (ACEA) and 2009 (JAMA/KAMA).

According to the sixth annual report on the effectiveness of the strategy to reduce CO_2 emissions from cars (European Commission, 2006b), all three associations reduced the average specific CO_2 emissions of their cars registered for the first time on the EU market in 2004 compared to 2003 (ACEA and JAMA by approximately 1.2 % and KAMA by approximately 6.1 %). Overall average specific CO_2 emissions from new cars were 163 g CO_2/vehicle-km in 2004. This was 0.6 % below the 2003 level and 12.4 % below 1995 levels (Figure 44). In order to meet the EU's final target of 120 g CO_2/km, additional efforts are necessary.

Manufacturers would need to cut CO_2 by 3.3% (ACEA and KAMA) and 3.5 % (JAMA) every year for the years remaining until 2008/09 in order to meet the final target of 140 g CO_2/km. It was anticipated from the beginning that the average reduction rates would be higher in the later years. However, it is noted that the gaps to be closed, expressed in required annual performance, have further increased in 2004.

Figure 44 Average specific CO_2 emissions of new passenger cars per fuel type



Note: The consistency of the time series 1995–2004 is not guaranteed. For the first time, in the European Commission's 2006 report, CO_2 monitoring data were used. These data were officially reported by countries to the European Commission for calculating the 2002 figures. For previous years, the car manufacturing associations provided the underlying data.

Source: European Commission, 2006b.

([37]) ACEA: European Automobile Manufacturers Association; JAMA: Japan Automobile Manufacturers Association; KAMA: Korea Automobile Manufacturers Association.

The reasons for the specific emission reductions between 1995 and 2004 were the technological development made, especially in diesel cars, and an increased share of diesel passenger cars in the vehicle fleet. All associations increased the diesel share of their fleets between 1995 and 2004. The increased share of diesel cars raises concerns, because this could result in higher emissions of particulates and nitrogen oxides and thus negatively affect air quality.

There are considerable differences in the specific fuel emissions in the fleet of new cars in different Member States, ranging from 149 g CO_2/km in Italy to 196 g CO_2/km in Sweden. For Sweden this is partly due to the very low share of new diesel cars.

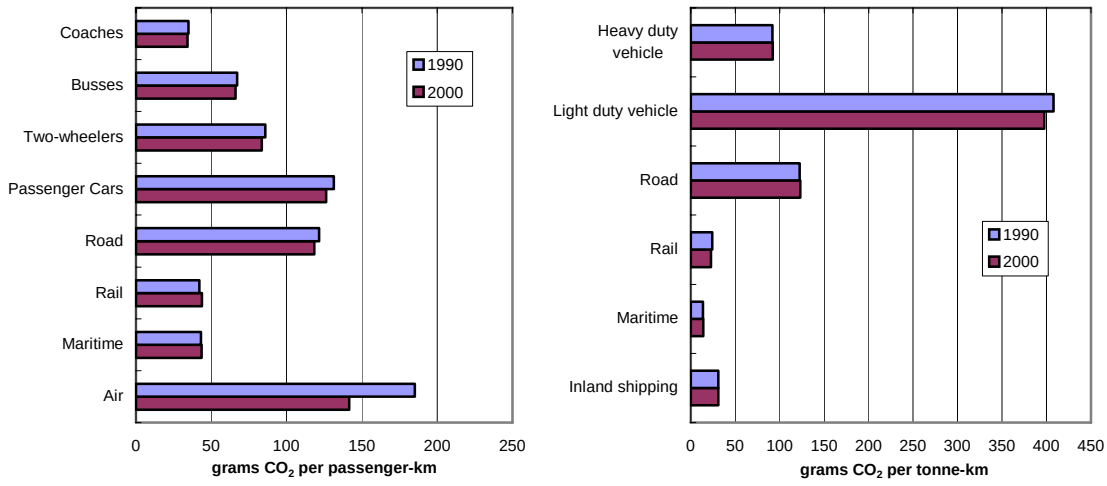
For the first time, average new car fleet CO_2 emission data became available for most new Member States (except Slovakia and Malta). Table 14 presents the situation in the EU-15, EU-10 and EU-25.

Table 14 Average new car fleet CO_2 emissions in the EU-25 in 2004 (g CO_2/km)

	EU-15	EU-10	EU-25
Petrol	170	158	169
Diesel	155	151	155
All fuels	**163**	**156**	**162**

Road freight transport and other transport modes are not directly included in any EU strategy to reduce CO_2 emissions, but several EU transport policies aim at increasing shares of non-road transport modes (e.g. rail). Rail remains the most energy-efficient mode and there have been no improvements in the energy efficiency of rail diesel engines. Despite improvements during the 1990s, aviation is generally the least energy-efficient mode (Figure 45).

Figure 45 Specific CO_2 emissions per passenger-km and per mode of transport (left) and specific CO_2 emissions per tonne-km and per mode of transport (right) in the EU-15 1990/2000

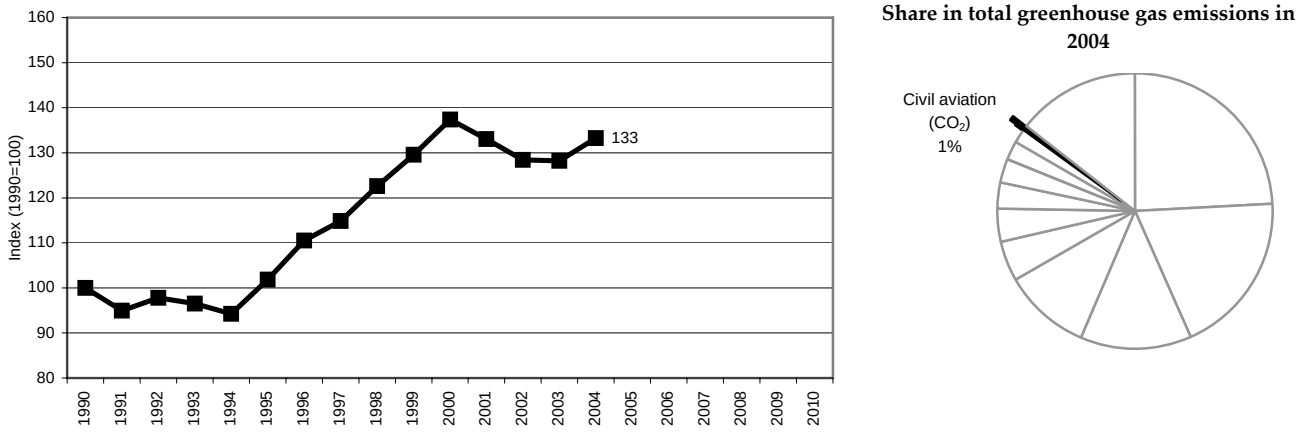


Source: Eurostat.

A 3.3.2 Domestic civil aviation

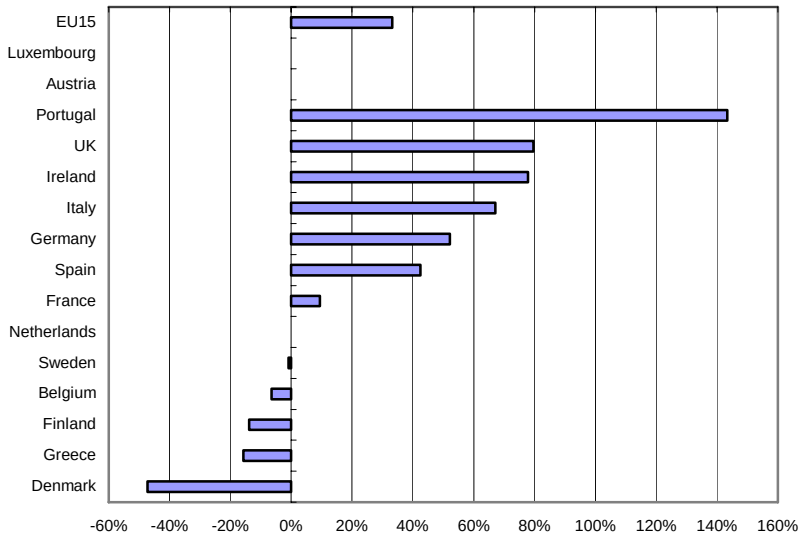
CO_2 emissions from domestic civil aviation accounted for approximately 1 % of total EU-15 greenhouse gas emissions in 2004. After a sharp increase (+46 %) between 1994 and 2000, CO_2 emissions from civil aviation decreased between 2000 and 2002. In 2004, emissions were 33 % above 1990 levels (Figure 46). Most Member States increased their emissions from domestic civil aviation between 1990 and 2004 (Portugal by more than 100 %); only Greece, Belgium and the Nordic countries Sweden, Finland and Denmark report emission reductions (Figure 47). The main reason for the remarkable decrease in Denmark is the building of the Great Belt Bridge.

Figure 46 EU-15 CO_2 emissions from domestic civil aviation (change 1990-2004) and share of the source in total greenhouse gas emissions



Source: EEA, 2006.

Figure 47 EU-15 CO_2 emissions from domestic civil aviation (change 1990-2004)



Note: Data for Austria and Luxembourg were not included due to an inconsistent time-series.

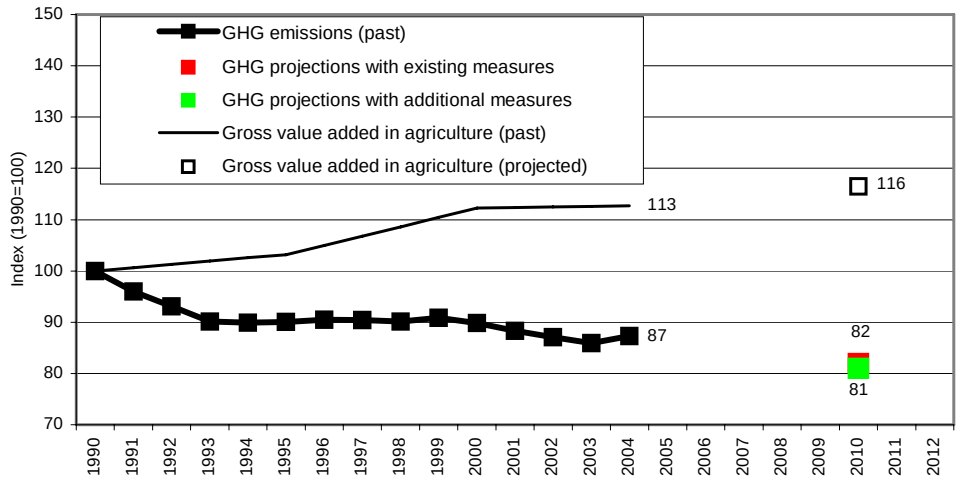
Source: EEA, 2006

A 3.4 Agriculture

Agriculture is the third largest sector of greenhouse gas emissions, accounting for 9.2 % of EU-25 emissions and 9.3 % of EU-15 greenhouse gas emissions. Agriculture's main emission sources are N_2O from soils and manure management and CH_4 from enteric fermentation and manure management.

Total EU-25 greenhouse gas emissions from agriculture decreased by 13 % between 1990 and 2004. Existing and additional measures are projected to further decrease emissions to 18 % and 19 % below 1990 level, respectively. Gross value added from agriculture decoupled from greenhouse gas emissions. According to the PRIMES baseline scenario, it is projected to be 16 % above 1990 level in 2010 (Figure 48).

Figure 48 EU-25 past and projected greenhouse gas emissions from agriculture and gross value added from agriculture

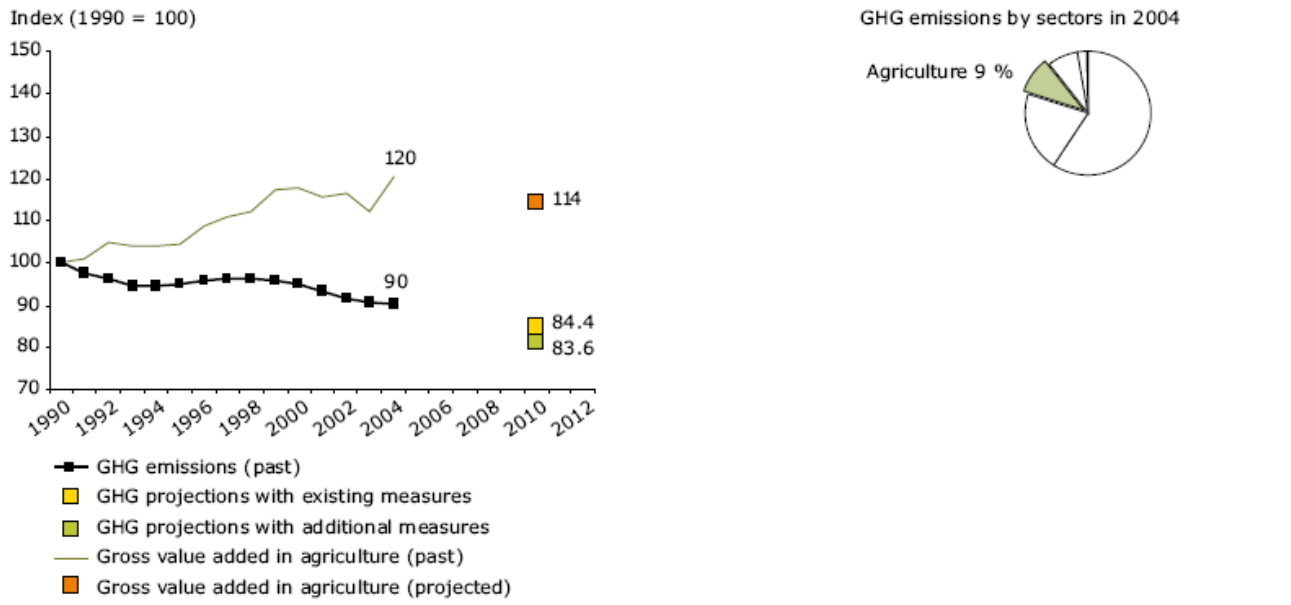


Note: Since sectoral emission projections are missing for Germany, Cyprus, Luxembourg, Malta and Poland, greenhouse gas projections for the EU-25 are calculated on the basis of projections reported by 20 Member States. The percentage change for 2004–10 of the EU-20 is applied to EU-25. No additional measures were reported for Denmark, Finland, Greece, Ireland, the Netherlands, Spain, Sweden, the Czech Republic and Lithuania. For these countries, the 'with existing measures' projections were used for the calculation of the EU-25 'with additional measures' projections.
Past Trends of Gross Value Added in Agriculture originate from PRIMES of the European Commission.

Source: EEA, 2006; European Commission, 2006.

Total EU-15 greenhouse gas emissions from agriculture were 10 % below 1990 levels in 2004 and are projected to further decrease by 2010 (Figure 49). The main reasons for declining agricultural emissions are decreasing cattle numbers and declining fertiliser and manure use. Agricultural emissions have decoupled from gross value added in agriculture. According to the PRIMES baseline scenario, it is projected to be 14 % above 1990 level in 2010.

Figure 49 EU-15 past and projected greenhouse gas emissions from agriculture and gross value added and share of the sector in total greenhouse gas emissions



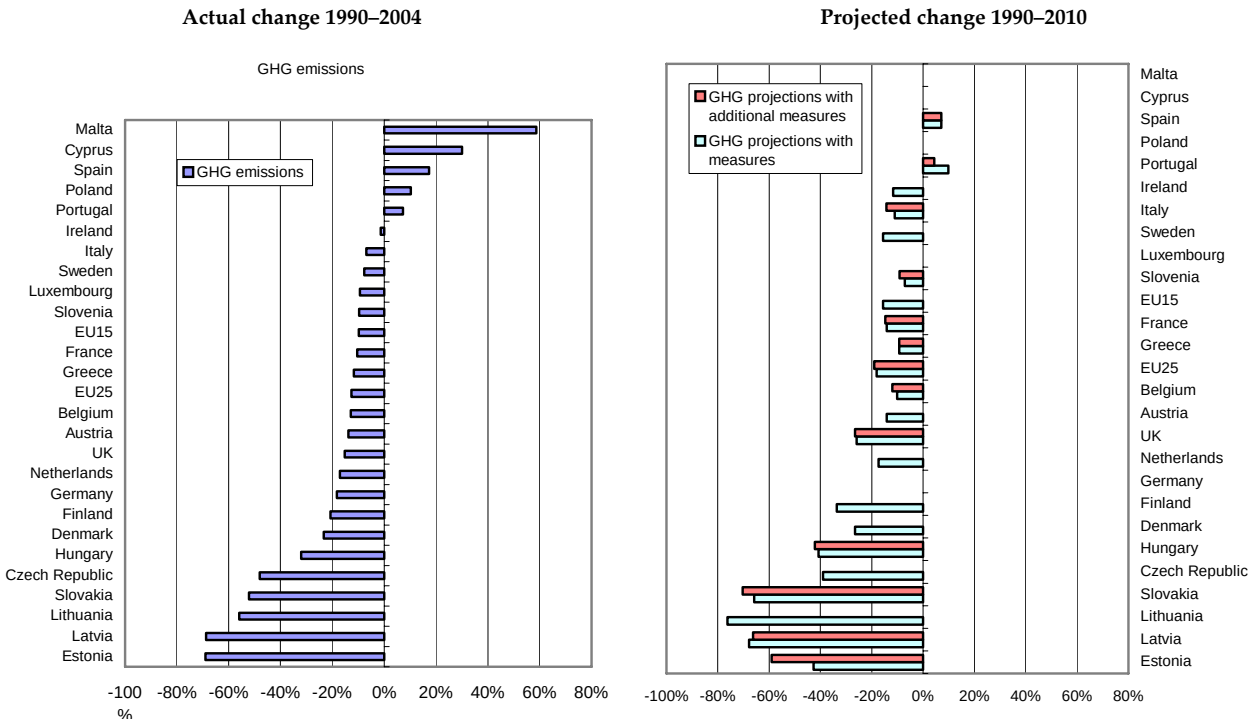
Note: Since sectoral emission projections are missing for Germany and Luxembourg, greenhouse gas projections for the EU-15 are calculated on the basis of projections reported by 13 Member States. The percentage change for 2004–2010 of the EU-13 is applied to EU-15. No additional measures were reported for Denmark, Finland, Greece, Ireland, the Netherlands, Spain and Sweden. For these countries, the 'with existing measures' projections were used for the calculation of the EU-15 'with additional measures' projections.

Source: EEA, 2006; European Commission, 2006.

Emission projections provided in Figure 49 have to be interpreted with care because the sectoral projections of the large emitter Germany are missing. Based on figures for the EU-13, aggregated total greenhouse gas emissions for the EU-15 are projected to be 16 % below 1990 levels in 2010 with existing domestic measures. Additional measures are not projected to provide substantial emission reductions. Compared to the analysis in 2005, EU-15 with existing measures projections decreased by 4 %.

Figure 50 shows that between 1990 and 2004, greenhouse gas emissions from agriculture decreased in all EU-25 Member States except Spain, Portugal, Cyprus, Malta and Poland. For all Member States, except Spain and Portugal, total greenhouse gas emissions in agriculture are expected to decrease by 2010 from 1990 in both the existing measures and the additional measures projections. Denmark and the United Kingdom as well as most new Member States project significant decreases of more than 20 %. Slovakia, Latvia and Lithuania even project decreases of more than 60 %.

Figure 50 Actual and projected change in EU-25 greenhouse gas emissions from agriculture



Note: GHG projections for the EU-15 are calculated on the basis of projections reported by 13 Member States. The percentage change 2004–10 of the EU-13 is applied to the EU-15. Sectoral emission projections are missing for Germany and Luxembourg.

Source: EEA, 2006; information submitted under the EC greenhouse gas monitoring mechanism and in fourth national communications.

Key policies and measures for agriculture

Decreases in fertiliser use and a reduction in the application of manure on land are likely to reduce N_2O emissions, while decreases in the number of cattle and increases in cattle productivity are likely to contribute to a decline in emissions of methane.

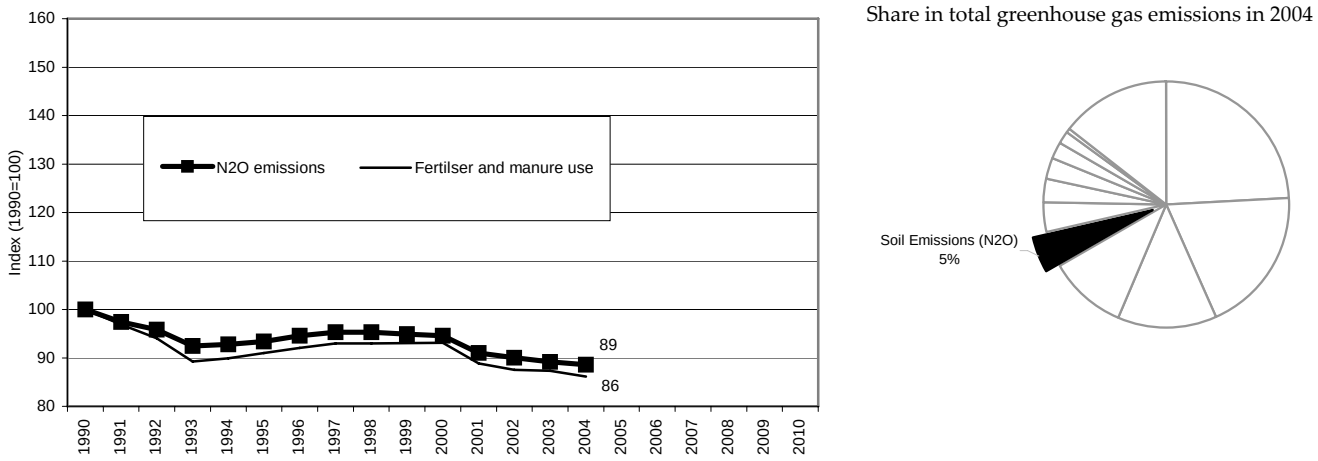
The drop in fertiliser use between 1990 and 2004 was achieved partly through the 1992 reform of the common agricultural policy (CAP), resulting in a shift from production-based support mechanisms to direct area payments in arable production. In addition, reduction in fertiliser use has also been achieved due to the implementation of EU directives such as the nitrate directive, and the agro-environment programmes supporting extensification measures. Promotion of good practice codes for the agricultural sector is a widespread measure for Member States to reduce N_2O and methane emissions. Changes in agricultural emissions are generally driven by economic policies or those aimed at the wider issue of sustainable production, rather than targeting specifically climate change. There is an increasing awareness of the potential impacts of climate change on agriculture and the need to develop adaptation measures, although policy development is at an early stage.

A 3.4.1 Agricultural soils

Agricultural soils are the largest source of N_2O emissions in the EU-15, accounting for approximately 5 % of total EU greenhouse gas emissions in 2004. Emissions of N_2O from agricultural soils occur mainly from the application of mineral and organic nitrogen from fertilisers and animal manure.

Between 1990 and 2004, N_2O emissions from agricultural soils declined by 11 % in the EU. The main driving force of N_2O emissions from agricultural soils is the use of nitrogen fertiliser and manure, which was 14 % below 1990 levels in 2004 (Figure 51).

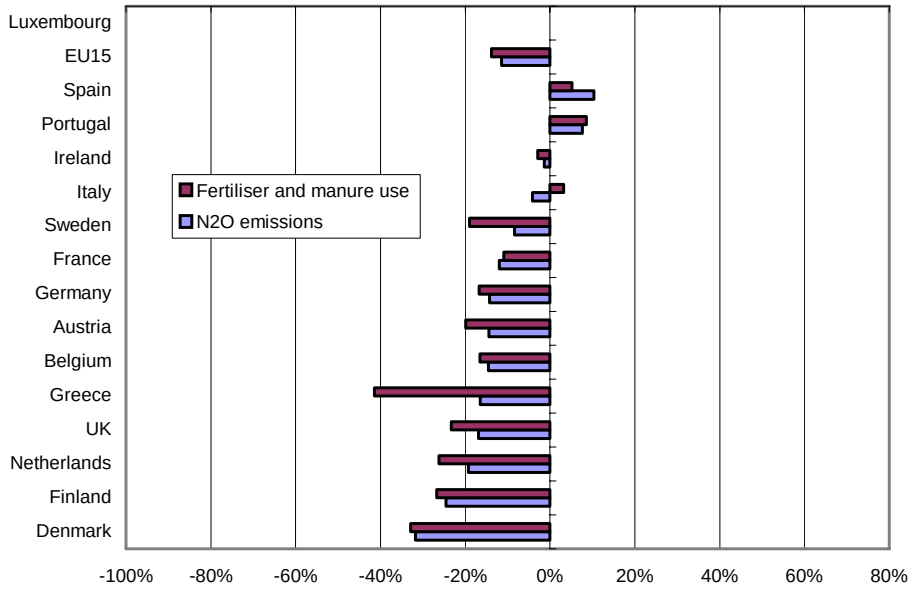
Figure 51 EU-15 N_2O emissions from agricultural soils, compared with nitrogen fertiliser and manure use, and share of the source in total EU-15 greenhouse gas emissions



Source: EEA, 2006.

Nitrous oxide emissions from agricultural soils declined in most Member States (Figure 52); the largest reductions over the period 1990–2004 occurred in Denmark and Finland with reductions of more than 20 %. Portugal and Spain had increases between 1990 and 2004. The decoupling of Dutch emissions from soils and fertiliser use is due to the phasing out of manure spreading on the land and the incorporation of manure into the soil; this is a measure to reduce ammonia emissions from manure but which has the negative side-effect of increasing N_2O emissions. The reason for the decoupling of Greek emissions is that direct emissions from soils have a comparatively low share, therefore total N_2O emissions from soils are not as closely linked to fertiliser and manure use as in other Member States.

Figure 52 EU-15 Member States' N_2O emissions from agricultural soils and fertiliser and manure use (change 1990–2004)

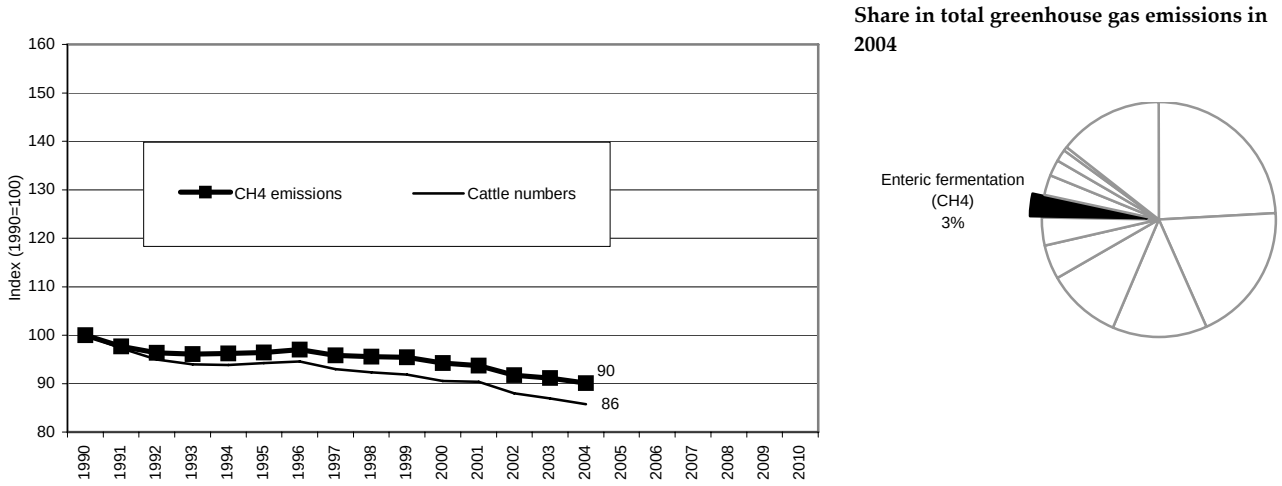


Note: N_2O emissions from soils in Luxembourg did not change between 1990 and 2004.
Source: EEA, 2006.

A 3.4.2 Enteric fermentation

Enteric fermentation of animal feeds in the stomachs of cattle is the largest source of CH_4 emissions in the EU-15, accounting for 3 % of total greenhouse gas emissions in 2004. Between 1990 and 2004, CH_4 emissions from enteric fermentation declined by 10 % in the EU. The main driving force of CH_4 emissions from enteric fermentation is the number of cattle (Figure 53), which fell as a result of CAP reform.

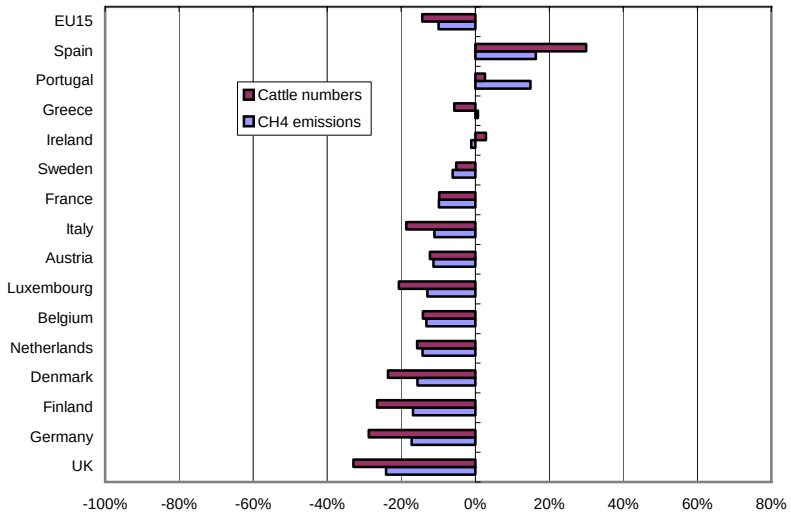
Figure 53 CH_4 emissions from enteric fermentation, compared with the cattle numbers, EU-15



Source: EEA, 2006.

All Member States, except Greece, Portugal and Spain, reduced emissions from enteric fermentation. Emission decreases were largest for the United Kingdom, with reductions of more than 20 % (Figure 54).

Figure 54 CH_4 emissions from enteric fermentation and cattle numbers (change 1990–2004), EU-15



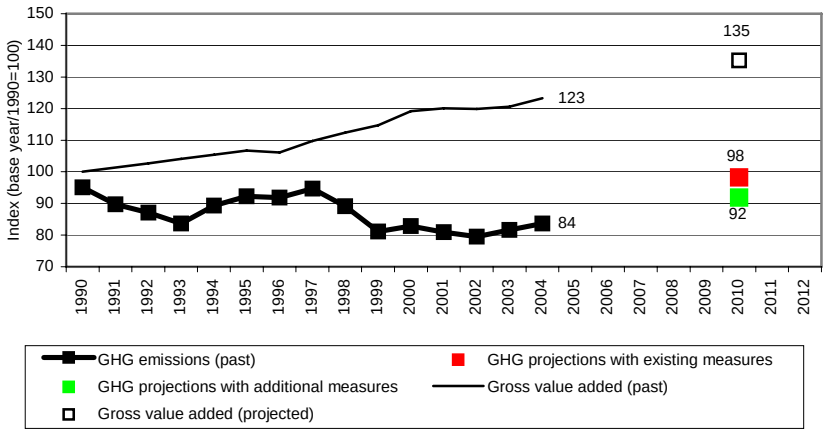
Source: EEA, 2006.

A 3.5 Industrial processes

Industrial processes (non-fuel combustion) contributed 8 % of total greenhouse gas emissions, in particular CO_2, HFC and N_2O, in the EU-15 and in the EU-25, respectively, in 2004. The main sources of industrial process emissions are CO_2 from mineral products (cement and lime production) and iron and steel production, HFCs from consumption of halocarbons (mainly in refrigeration, air conditioning, foam production and as aerosol propellants), and N_2O from the chemical industry (adipic and nitric acid production).

EU-25 greenhouse gas emissions from industrial processes decreased between 1990 and 2004 by 16 % and are projected to decrease to 2 % below base-year level in 2010 with existing measures. Additional measures are projected to lead to a decrease of 18 % below base-year level. Greenhouse gas emissions decoupled from gross value added which increased by 23 % since 1990 and is projected to further increase to 35 % above 1990 level by 2010 according to the PRIMES baseline scenario (Figure 55).

Figure 55 Past and projected greenhouse gas emissions from industrial processes, EU-25



Note: Since sectoral emission projections are missing for Germany, Cyprus, Luxembourg, Malta and Poland, greenhouse gas projections for the EU-25 are calculated on the basis of projections reported by 20 Member States. The percentage change for 2004–10 of the EU-20 is applied to EU-25. No additional measures were reported for Denmark, Ireland, Portugal, Spain, Sweden, the United Kingdom, the Czech Republic, Estonia, Hungary, Latvia and Lithuania. For these countries, the 'with existing measures' projections were used for the calculation of the EU-25 'with additional measures' projections.

Source: EEA, 2005; European Commission, 2006.

Total EU-15 greenhouse gas emissions from industrial processes for 2004 were 16 % below base-year levels (Figure 56); in 2004, the emissions increased by 2 % compared with 2003. Greenhouse gas emissions decoupled from gross value added which increased by 13 % since 1990 and is projected to further increase to 32 % above 1990 level by 2010 according to the PRIMES baseline scenario (European Commission, 2006).

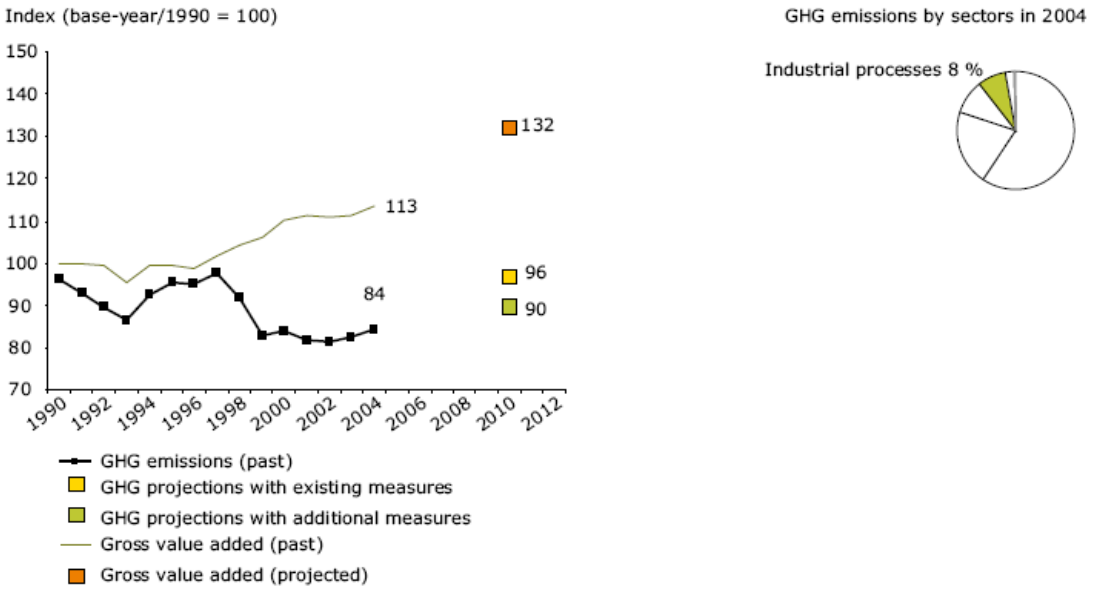
([38]) Sector 2 'Industrial processes', according to UNFCCC guidelines for greenhouse gas inventories.

Cement production dominated the trend of total greenhouse gas emissions from industrial processes until 1997. Factors for declining emissions in the early 1990s were low economic growth and cement imports from east European countries. Between 1997 and 1999, the trend was dominated by reduction measures in adipic acid production in Germany, France and the United Kingdom. In addition, between 1998 and 1999, large reductions were achieved in the United Kingdom due to reduction measures in HCFC production. Because of the reduction measures after 1997, emissions decoupled from gross value added in industry. The main reasons for the increase in 2004, compared with 2003, were increases in cement production in France, Germany and Italy and increases in HFC consumption from refrigeration and air conditioning equipment in Germany and Italy.

Emission projections provided in Figure 56 have to be interpreted with care because the sectoral projections of two Member States are missing (in particular from the largest emitter, Germany). Based on figures for the EU-13, aggregated greenhouse gas emissions for the EU are projected to be 4 % below base-year levels by 2010 based on existing domestic measures. With additional measures, emissions are projected to be 10 % below base-year levels. The projected reductions in N_2O emissions from adipic and nitric acid production offset substantial projected increases in HFC emissions, due to continuing replacement of chlorofluorocarbons which are being phased out to protect the ozone layer.

Compared to the analysis in 2005, EU-15 with existing measures projections are one percentage points lower mainly due to the inclusion of the Spanish projections. With additional measures projections are eight percentage points higher than in 2005.

Figure 56 Non-energy related greenhouse gas emissions from industrial processes compared with the value added and energy consumption in the EU 15 1990–2004 and share in total greenhouse gas emissions

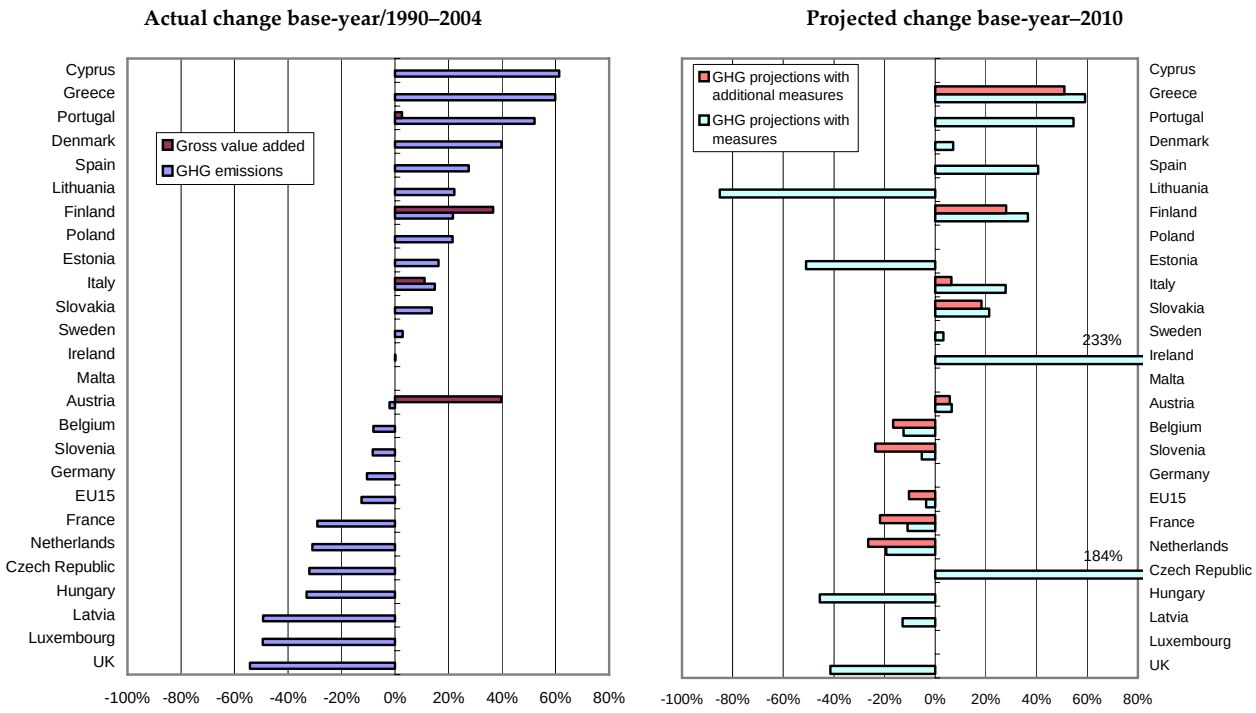


Note: Gross value added is the difference between output and intermediate consumption for any given sector/industry, i.e. the difference between the value of all newly generated goods and services, and the value of all goods and services consumed as intermediate consumption.
Since sectoral emission projections are missing for Germany and Luxembourg, greenhouse gas projections for the EU□15 are calculated on the basis of projections reported by 13 Member States. The 2004–2010 percent variation for the EU□13 was applied to Germany and Luxembourg to obtain a EU□15 projection for 2010. No additional measures were reported for Denmark, Ireland, Spain and Sweden. For these countries, the 'with existing measures' projections were used for the calculation of the EU□15 'additional measures' projections.

Source: EEA, 2006; Eurostat.

Figure 57 shows that between the base-year and 2004, about half of the EU-15 Member States achieved emission reduction from industrial processes, particularly the large emitters: Germany, France and the United Kingdom. In two of four countries which reported gross value added from industry, gross value added increased more rapidly than process-related emissions. The largest increases were reported by Cyprus (+61 %) and Portugal (+52 %). As regards 'with existing measures' projections, for eleven EU-25 Member States, total greenhouse gas emissions from industrial processes are expected to increase by 2010 compared with the base-year. Ireland and the Czech Republic in particular forecast strong growth. Italy expects that additional measures will significantly reduce the projected growth in emissions. Only the United Kingdom, Lithuania and Estonia project emissions to decrease significantly with existing domestic measures. With additional measures, France also projects large decreases.

Figure 57 Actual and projected change in EU-25 greenhouse gas emissions from industrial processes compared with gross value added



Note: Gross value added is the difference between output and intermediate consumption for any given sector/industry, i.e. the difference between the value of all newly generated goods and services, and the value of all goods and services consumed as intermediate consumption.
Greenhouse gas projections for the EU-15 are calculated on the basis of projections reported by 13 Member States. The percentage change 2004–2010 of the EU-13 is applied to the EU-15. Sectoral emission projections are missing for Germany and Luxembourg. The large emission increase for Cyprus is mainly due to an inconsistent time series in metal production.

Source: EEA, 2006; information submitted under the EC greenhouse gas monitoring mechanism and in fourth national communications.

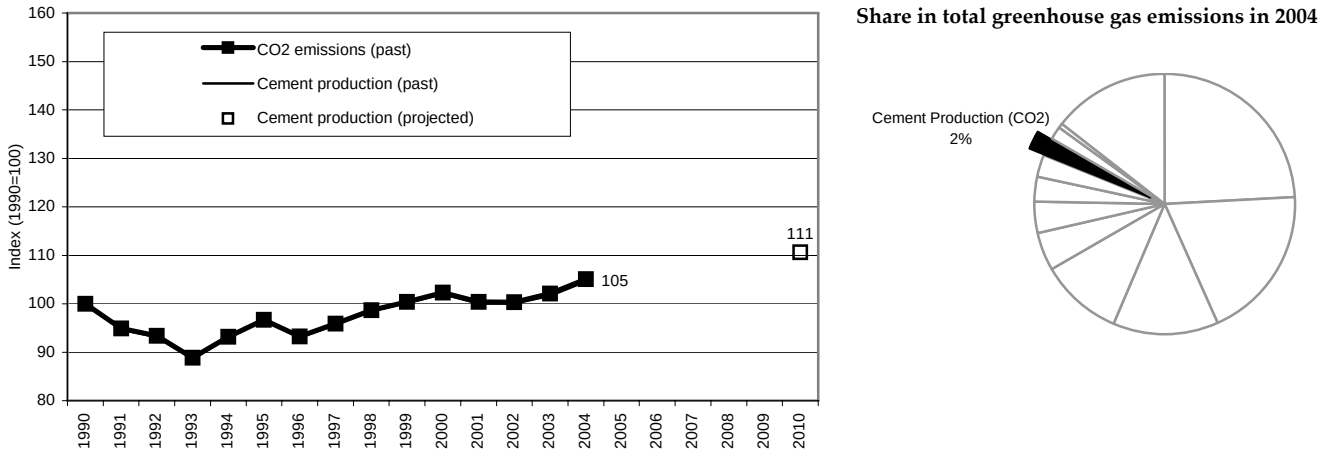
Key policies and measures for non-energy-related industrial processes

Policies and measures are mainly aimed at abatement measures in adipic and nitric acid production (to reduce N_2O emissions) and on alternatives (substitutes) for HFCs in refrigeration and air conditioning. Measures aimed at adipic acid production are mainly in the 'with existing measures' projections, but some countries report both existing and additional domestic measures for the other process emissions. However, four of the EU-15 Member States did not report any policies and measures for these source categories. The reporting Member States expect some greenhouse gas savings in industrial processes to be achieved by regulatory policies and measures and through voluntary agreements. Policies and measures in most Member States to implement the F-gas framework directive are at an early stage of development.

A 3.5.1 Cement production

EU-15-wide CO_2 emissions from industrial processing of mineral products had a 2 % share of total EU-15 greenhouse gas emissions in 2004. In 2004, CO_2 emissions from mineral products were 5 % above 1990 levels in the EU (Figure 58). They declined in the early 1990s but have increased in recent years. Factors for declining emissions in the early 1990s were low economic growth and cement imports from east European countries.

Figure 58 EU-15 CO_2 emissions from cement production, compared with cement production, and share of the source in total EU-15 greenhouse gas emissions

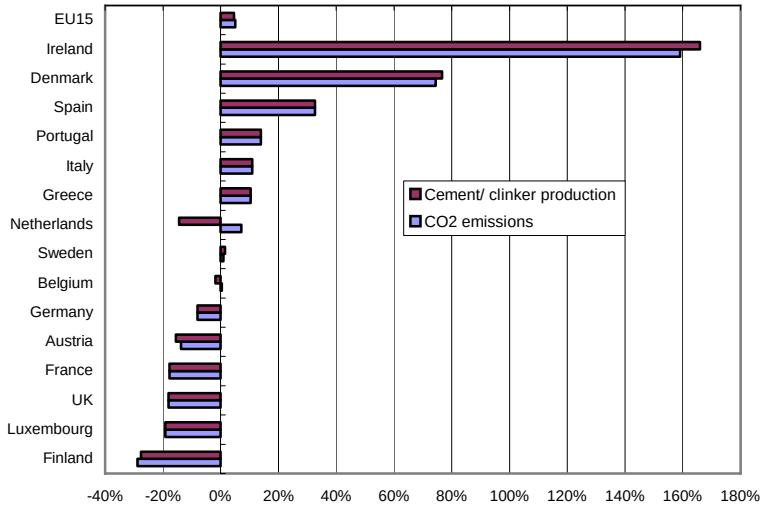


Note: CO_2 emissions from cement production and cement production changed equally between 1990 and 2004 (explanation see below)

Source: EEA, 2006; European Commission, 2006.

Figure 59 shows that in all Member States (except Belgium and the Netherlands) CO_2 emissions changed in line with cement or clinker production. The reason for this is that process-related emissions are calculated on the basis of data on cement or clinker production and are directly linked to the carbon content of the activity data. Therefore, there is hardly any scope for decoupling CO_2 emissions from cement or clinker production.

Figure 59 EU-15 Member States' CO_2 emissions from cement production and cement/clinker production (change 1990–2004)



Source: EEA, 2006.

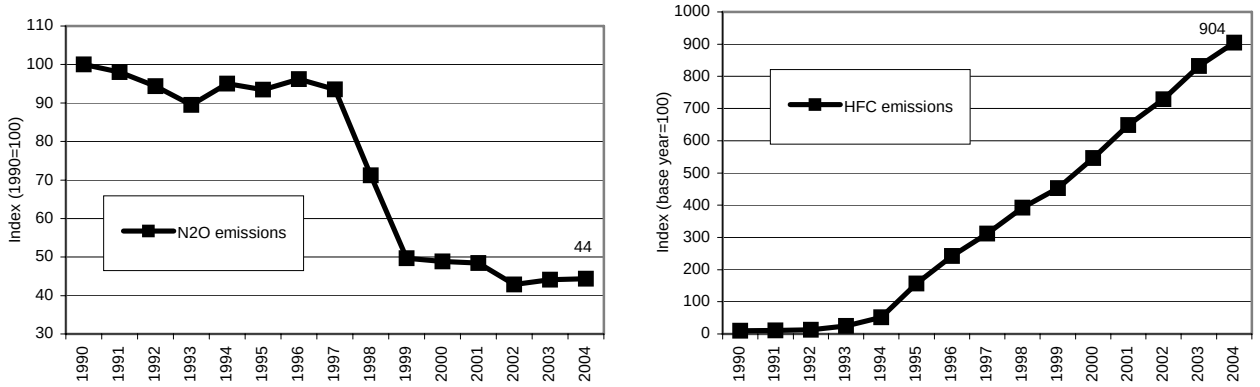
A 3.5.2 Other sources

Other important sources of greenhouse gas emissions in the industrial processes sector, which in addition had large changes between 1990 and 2004, are the chemical industry (N_2O) and the consumption of halocarbons (HFC).

EU-15-wide N_2O emissions from the chemical industry had a 1 % share of total EU-15 greenhouse gas emissions in 2004. Most N_2O emissions from chemical industries occur in adipic and nitric acid production. In the EU, adipic acid is produced only in four countries (France, Germany, Italy and the United Kingdom), whereas nitric acid is produced more widely. Between 1990 and 2004, N_2O emissions from chemical industries dropped by 56 % in the EU-15 (Figure 60). In particular, the United Kingdom (– 86 %), France (– 74 %) and Germany (– 47 %) achieved large reductions, both in relative and absolute terms, primarily due to emission abatement measures in adipic acid production. Italy and Portugal had increases in N_2O emissions from chemical industries.

HFC emissions from consumption of halocarbons and SF_6 currently account for 1.0 % of total EU-15 greenhouse gas emissions but have grown substantially. The main reason is the phasing out of ozone-depleting CFCs. HFCs are replacing CFCs mainly in refrigeration and air conditioning, and as aerosol propellants and blowing agents for the production of thermal insulation foams. Between the base-year and 2004, EU-15 HFC emissions from consumption of halocarbons and SF_6 increased by a factor of nine (Figure 60). This was the highest increase in relative terms of all emission sources in the EU-15.

Figure 60 EU-15 Member States' N_2O emissions from the chemical industry (left) and HFC emissions from the consumption of halocarbons and SF6 (right)



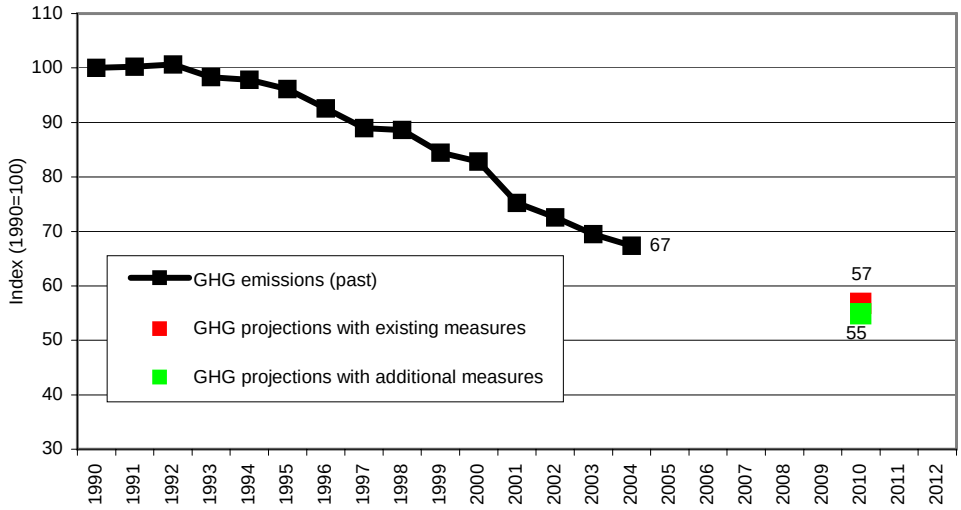
Source: EEA, 2006.

A 3.6 Waste management

Waste management contributed 2.6 % of total greenhouse gas emissions in the EU-25 in 2004, and 2.7 % in the EU-15. Waste management causes mainly CH_4 from solid waste disposal in landfills (88 % of waste-related emissions). Smaller sources are waste water handling (CH_4, N_2O) and waste incineration (mainly CO_2) ([39]).

Between 1990 and 2004, EU-25 greenhouse gas emissions from waste management decreased by 33 % and are projected to be 43 % and 45 % below 1990 levels by 2010 with existing measures and with additional measures, respectively (Figure 61).

Figure 61 EU-25 past and projected greenhouse gas emissions from waste management



Note: Since sectoral emission projections are missing for Germany, Cyprus, Luxembourg, Malta and Poland, greenhouse gas projections for the EU-25 are calculated on the basis of projections reported by 20 Member States. The percentage change for 2004–10 of the EU-20 is applied to EU-25. No additional measures were reported for Austria, Belgium, Denmark, France, Ireland, the Netherlands, Portugal, Spain, Sweden, the United Kingdom, the Czech Republic, Hungary, Latvia and Lithuania. For these countries, the 'with existing measures' projections were used for the calculation of the EU-25 'with additional measures' projections.

Source: EEA, 2006.

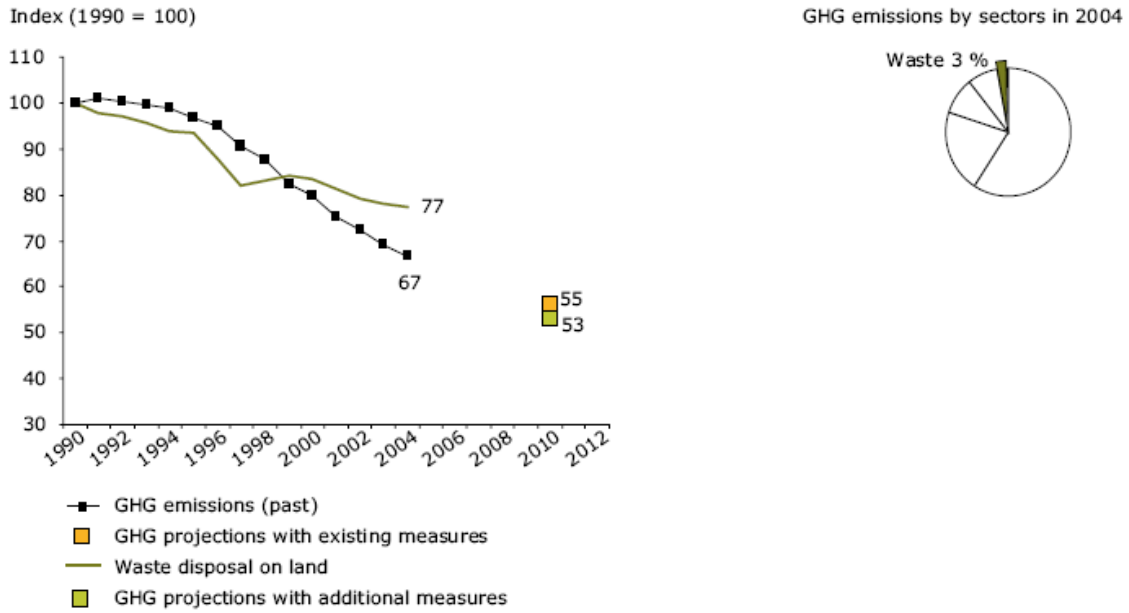
Total EU-15 greenhouse gas emissions from waste management were 33 % below 1990 levels and are projected to further decline by 2010 in the 'with existing measures' scenario (Figure 62). In 2004, the emissions decreased by 4 % compared with 2003.

Methane emissions from solid waste disposal on land dominate this sector. They result from the breakdown of biodegradable carbon compounds by anaerobic methanogenic bacteria in landfills. Between 1990 and 2004, EU-15 CH_4 emissions from landfills declined by 38 %. The main driving force of CH_4 emissions from solid waste disposal on land is the amount of biodegradable waste going to landfills and the amount of CH_4 recovered and utilised or flared. Total municipal waste disposal on land declined by 23 % between 1990 and 2004.

([39]) This sector does not include waste-to-energy facilities. Emissions from waste burnt for electricity and heat production are included in the energy sector.

Emission projections provided in Figure 62 have to be interpreted with care because the sectoral projections of Germany and Luxembourg are missing. Based on figures for the EU-13, aggregated greenhouse gas emissions from waste for the EU-15 are projected to be more than 45 % below 1990 levels by 2010 both in the 'with existing domestic measures' scenario and in the 'with additional domestic measures' projections. Compared to the analysis in 2005, EU-15 'with existing measures' projections increased by 7 percentage points.

Figure 62 EU 15 past and projected greenhouse gas emissions from waste

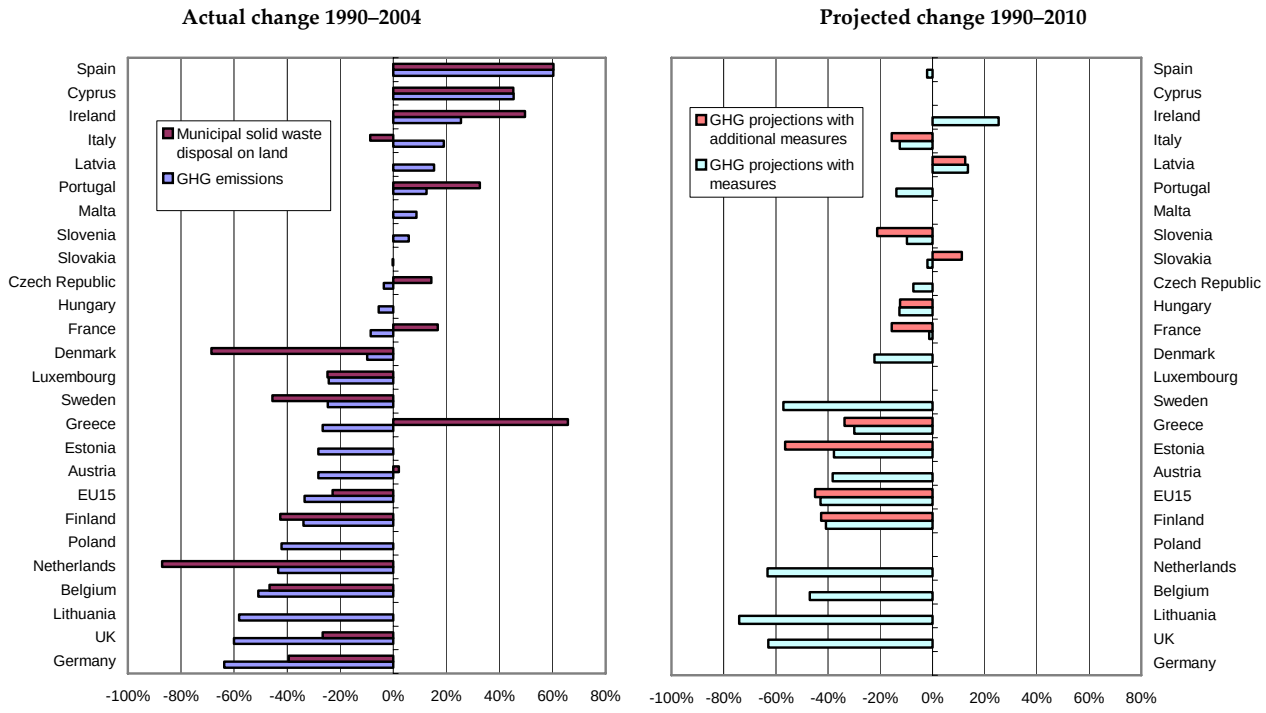


Note: Since sectoral emission projections are missing for Germany and Luxembourg, greenhouse gas projections for the EU-15 are calculated on the basis of projections reported by 13 Member States. The percentage change for 2004–10 of the EU-13 is applied to EU-15. No additional measures were reported for Austria, Belgium, Denmark, France, Ireland, the Netherlands, Portugal, Spain, Sweden and the United Kingdom. For these countries, the 'with existing measures' projections were used for the calculation of the EU-15 'with additional measures' projections.

Source: EEA, 2006.

Figure 63 shows that most EU-15 Member States reduced greenhouse gas emissions from waste management between 1990 and 2004; only Ireland, Italy, Portugal and Spain showed emission increases. Also most countries had decreasing amounts of solid waste disposal in landfills. Four new Member States increased greenhouse gas emissions from waste management, whereas five new Member States decreased them. In addition, Figure 63 shows that all Member States (except Ireland, Latvia and the Czech Republic) which report emission projections (also those with large increases between 1990 and 2004) expect emission decreases well below 1990 levels by 2010. The largest reductions are projected for the Netherlands, the United Kingdom and Lithuania (with more than 60 % in the 'with existing measures' projections).

Figure 63 Actual and projected change in EU-25 greenhouse gas emissions from waste management compared with waste disposal on land



Note: GHG projections for the EU-15 are calculated on the basis of projections reported by 13 Member States. The percentage change 2004–2010 of the EU-13 is applied to the EU-15. Sectoral emission projections are missing for Germany and Luxembourg.

Source: EEA, 2006; Eurostat; information submitted under the EC greenhouse gas monitoring mechanism and in fourth national communications.

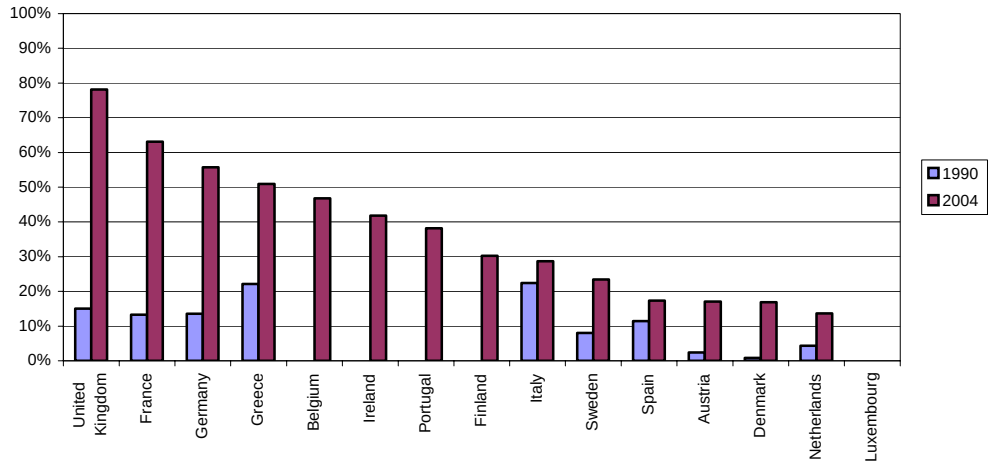
Key policies and measures for waste management (landfills)

The emission reductions from waste management were partly achieved due to the implementation of the landfill waste directive and similar legislation in Member States. The landfill waste directive is one of the EU's common and coordinated policies and measures and was adopted in 1999. Member States are obliged to reduce the amount of biodegradable waste disposed untreated in landfills, and to install landfill gas recovery at all new sites. The 'with existing domestic measures' and 'with additional domestic measures' projections assume that the landfill directive will be implemented according to time schedules required.

The estimated emission savings from the implementation of the landfill directive for the EU-15 as a whole is approximately 50 million tonnes CO_2-equivalents from the combination of with existing and additional measures under the directive, as assessed individually by Member States (see Figure 1).

Figure 64 shows the shares of CH_4 recovery in total CH_4 emissions from solid waste disposal on land between 1990 and 2004. All Member States increased the share between 1990 and 2004 substantially. The highest share of CH_4 recovery is for the United Kingdom, with almost 70 %. For some Member States, no data are available.

Figure 64 Share of CH_4 recovery in total CH_4 emissions for EU-15 Member States 1990 and 2004



Source: EEA, 2006.

A 3.7 Comparison with EU-15-wide estimates

Member States' projections are not fully comparable due to different underlying assumptions and parameters. It is therefore useful to compare these with a set of consistent projections calculated by one model. Such a comparison cannot determine the quality of individual projections but may help to improve both national and EU-wide projections and to achieve a more consistent view on the projected effects of Member States' policies and measures. This section compares the aggregated national projections for CO2 emissions taking into account existing domestic measures with recent Community-wide emission projections for CO_2 emissions related to fuel combustion (European Commission, 2006). The EU-wide CO_2 emission projections were developed for the European Commission by the National Technical University of Athens (NTUA), using the PRIMES Energy System Model.

Detailed analysis of the differences is, however, hampered by a lack of consistency between the coverage and disaggregation of the EU-wide projections and those from Member States. The EU-wide projections cover CO_2 emissions from fuel combustion only whereas Member States normally project all greenhouse gases and all sectors. For most countries PRIMES data was compared to national projections of total emissions of the energy sector including N_2O and CH_4. This should distort the analysis as the two non-CO_2 gases together contributed only around 2% to the total greenhouse gas emissions from the energy sector in the EU. For Germany and Poland no separate projections for the energy sector are available and total CO_2 emissions were used instead. Apart from fuel combustion carbon dioxide emissions from industrial processes are included in the CO_2 emission projections for these two Member States. The analysis presented here compares trends only using the relative emission in- or decreases between 1990 and 2010 to reduce the error due to the different coverage. Malta and Cyprus did not provide projections and are not further considered in this chapter.

In general Member States project lower emissions in 2010 than the EU wide projections. The EU-23-wide projections show an increase in energy-related CO_2 emissions of 2.7% between 1990 and the year 2010, whereas the aggregate national projections based on existing measures project the same emissions levels in both years. For EU-15, PRIMES predicts an increase of emissions by

7.2%, aggregating Member States' calculations leads in an increase of 5.9%. EU-8 countries predict an emissions decrease by 21.3% whereas the EU-wide model projects a decrease of only 17.3% (Table 15).

Table 15 Comparison of the aggregated national 'with existing domestic measures' projections for CO_2 and greenhouse gas emissions with EU-wide projections

	Member State projections	PRIMES projection	Difference
EU23	0.0%	2.7%	2.7%
EU15	5.9%	7.2%	1.3%
EU8	-21.3%	-17.3%	4.0%

Note: Cyprus and Malta did not provide projections and are not included in the EU-8 and EU-23 numbers.

Source: Information submitted under the EC greenhouse gas monitoring mechanism and in fourth national communications; European Commission, 2006.

However, at the Member State level, there are considerable differences. In Figure 65 both types of projections are compared to their base-year whereas in Figure 66 differences between both projections expressed in percentage points are presented. With the exception of Denmark, Luxembourg and the United Kingdom the different projections agree on the general trend between 1990 and 2010. For Denmark, national projections show an increase of emissions by 13% whereas the EU-wide model predicts a decrease of 5%. For Luxembourg and the United Kingdom Primes calculations show a small increase in emissions by 2010 but national data indicates a strong decrease (-25% and -13% respectively). These three countries together with the Netherlands, Hungary and Lithuania are also those countries with a difference above 10 percentage points. For Germany, Greece, Ireland, Italy, Spain and Latvia the two different data sets agree best with differences at or below two percentage points. Such discrepancies can easily be explained by the different coverage of the projections and differences in the assumptions on underlying parameters like GDP development or oil prices. In 14 out of the 23 Member States the gap between national projections and the results of the EU-wide model is relatively small and does not exceed five percentage points.

Changes with regard to the 2004 analysis

Since the last time this analysis was carried out in the report on *Greenhouse gas emission trends and projections in Europe 2004* (EEA, 2004), projections have been updated by most Member States and new model runs for PRIMES were undertaken. At that time, the necessary projections for the new Member States were not available; this section therefore only compares the changes for EU-15 Member States. France, Germany and Sweden updated the relative emissions change between 1990 and 2010 in the 'with existing measures' projections only slightly (+/– 2 percentage points or less compared with the prior projection). Belgium, Finland, Ireland and the United Kingdom reduced their projections for the 'with existing measures' scenario by around 6 percentage points and Denmark by 12 percentage points. Austria, Italy and the Netherlands increased projections by over 12 percentage points and Portugal by 28 percentage points.

In the EU-15-wide projection of CO_2 emissions the largest emission increases were calculated for Austria (+18 percentage points), Denmark (+7 percentage points), Finland (+25 percentage points), Italy (+7.5 percentage points), Spain (+16 percentage points) and the United Kingdom (+9 percentage points). The largest decreases of emission projections occurred in Luxembourg and Portugal with a decrease of over 7 percentage points each.

The aggregation of the updated 'with existing measures' projections results in an increase of 5.9% for the EU-15, which is 2.3 percentage points above the increase calculated from the Member States' projections in 2004. For EU-15 wide projections the projected emissions increase from fuel combustion between 1990 and 2010 is 7.2%, which is 3.3 percentage points above the 2004 data.

Figure 65 Comparison of 1990-2010 changes in emission levels using national 'with existing measures' projections for energy emissions and projections of the EU-wide baseline scenario (Primes model)

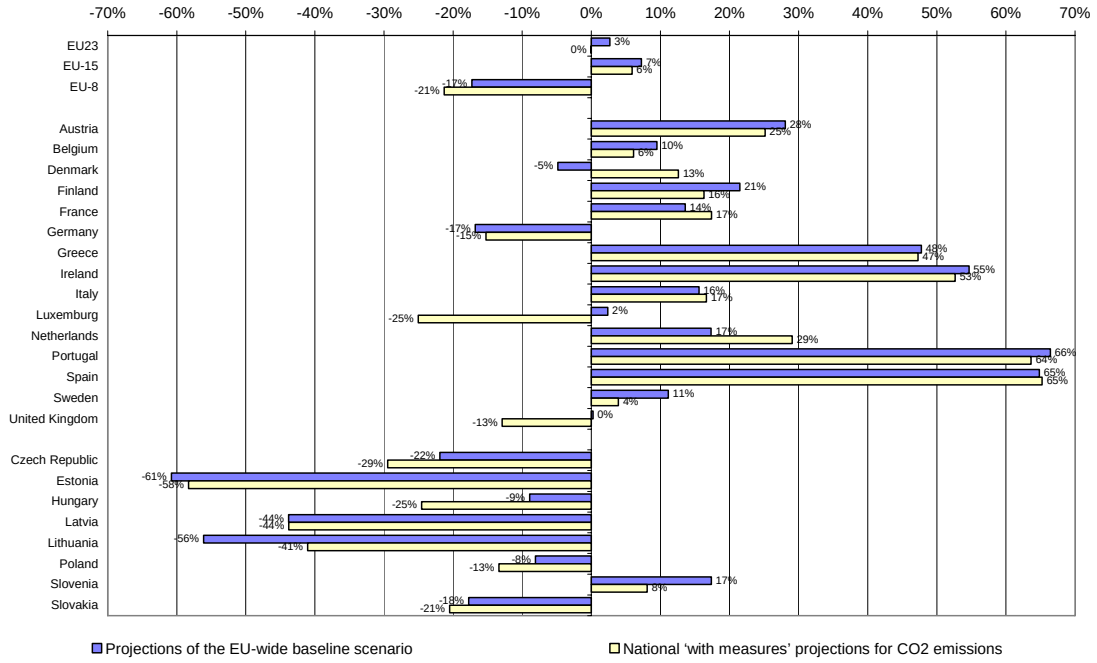
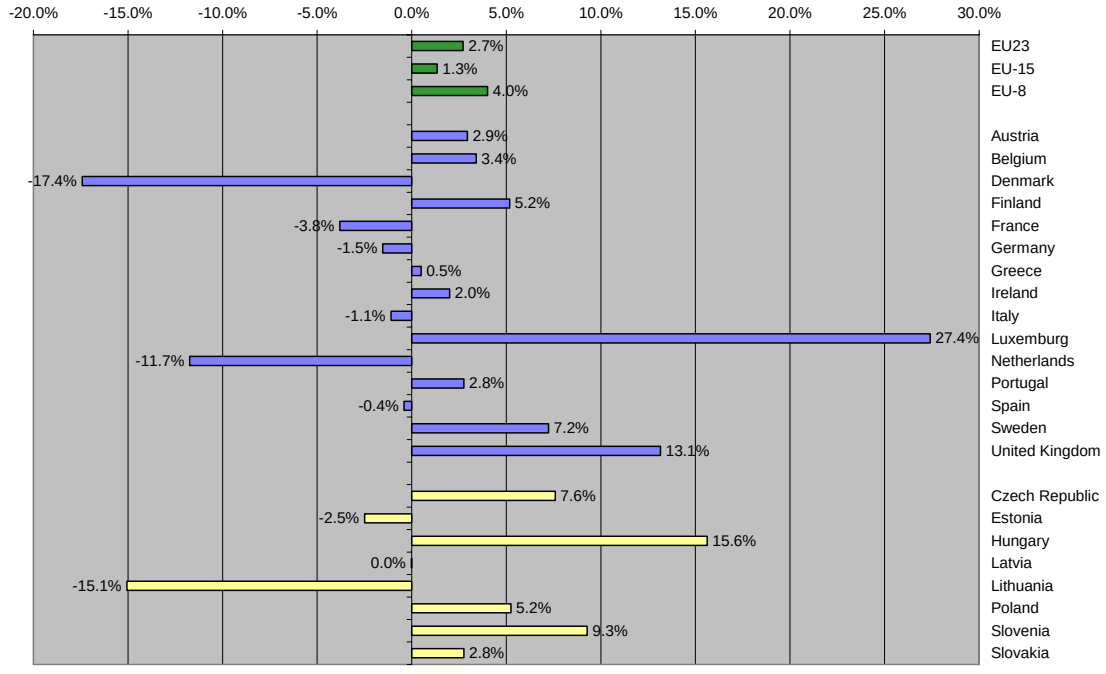


Figure 66 Differences in percentage points between Member State 2010 'with existing measures' projections and the EU-wide baseline scenario



Note: A positive deviation signifies that EU-wide projections predict higher emissions than national projections.

Reasons for differing projections

The comparison has revealed several differences between the EU-wide CO_2 baseline projection using the PRIMES model and the Member States' projections. These differences occur for a number of reasons.

- Differences in the database used: the PRIMES model is based on Eurostat energy balances; some of the Member States use different databases, not fully compatible with the Eurostat data.
- Different definition of the sectors covered: an important example is the different approach for the consideration of emissions from bunker fuels used in international aviation. While PRIMES takes international bunker fuels into account, they are excluded from the national projections.
- Differences in emission factors: the PRIMES model applies emission factors for each Member State from Eurostat's default emission factor database. However, most Member States apply national emission factors, which are suited for national circumstances.
- Differences in the models applied: the Primes model is an econometric model driven by prices, which simulates economic decisions by representative sectors simultaneously. Some of the Member States use quite different model approaches. Germany, for example, applies a technological optimisation model which, in general, tends to show a lower projection result than an econometric model.
- Different assumptions applied in the models. These include:
  - coverage of policies by the projections, and different assumptions on the effectiveness of policies;
  - growth assumptions on driving forces of the models, like population, gross domestic product (GDP) and fuel prices;
  - assumptions on technological development.

A 4 Accounting of carbon sinks by EU Member States

In addition to reducing or limiting emissions of greenhouse gases, Member States can make use of CO_2 removals by land use change and forestry (LUCF) activities, or "carbon sinks", to achieve their Kyoto Protocol and EU 'burden-sharing' targets. These carbon sinks include mandatory activities covered by Article 3.3 of the Protocol (afforestation, reforestation and deforestation) and voluntary activities under Article 3.4 (forest management, cropland management, grazing land management and revegetation). Further information on the use of carbon sinks under the Kyoto Protocol is given in Box 2.

Box 2: Carbon sinks under the Kyoto Protocol

The rules about how carbon sinks are accounted for under the Kyoto Protocol are described in Articles 3.3 and 3.4 and in the UNFCCC Marrakech Accords (2001).

Article 3.3 activities

Article 3.3 describes how net changes in greenhouse gas emissions by sources and removals by sinks resulting from certain land-use change and forestry activities are accounted for in meeting the Kyoto Protocol targets. These activities are defined as direct human-induced land-use change and forestry activities, limited to afforestation, reforestation and deforestation (ARD) since 1990.

Article 3.4 activities

Article 3.4 identifies additional human-induced activities related to changes in greenhouse gas emissions by sources and removals by sinks in the agricultural soils and other land-use change and forestry categories which a country may choose to use in order to meet its Kyoto Protocol target. In the Marrakech Accords, activities under this Article were defined as forest management, revegetation, cropland management and grazing-land management. The extent, to which Parties can account for emissions and removals from these activities for the first commitment period, is limited by a capping system.

Information from Member States on the use of carbon sinks

Fourteen Member States (Austria, Belgium, Czech Republic, Denmark, Finland, Ireland, Italy, Luxemburg, Netherlands, Portugal, Slovenia, Spain, Sweden and United Kingdom) provided estimates for their projected annual net carbon stock change under Article 3.3 during the commitment period (Table 16)[40]. Out of these, only Finland and Sweden expect additional emissions from ARD activities during the commitment period. Belgium expects no net carbon stock changes; projections in all other reporting Member States predict net sinks. The net CO_2 removal from the nine EU-15 Member States that provided quantitative information on Article 3.3 activities amounts to approximately –17.8 million tonnes CO_2 per year. Expected net removals

[40] Nine Member States (Belgium, Czech Republic, Finland, Ireland, Luxemburg, Portugal, Slovakia, Spain and United Kingdom) provided updated information on the accounting of carbon sinks through a questionnaire in 2006. For other Member States information from 2005 questionnaires and National Communications under the UNFCCC has been used.

have decreased by around 13 Mt CO_2 per year since the 2005 estimate. This is due to corrections by Ireland and the United Kingdom, who reduced projected emission reductions by 11 Mt CO2/year and 4 Mt CO_2/year respectively. Additionally, Slovenia expects a sequestration of -0.4 million tonnes CO_2 per year.

Table 16 Preliminary projected net carbon stock changes under Article 3.3 for the first commitment period

Member State	Net carbon stock change during 2008–2012 (million tonnes CO_2 per year)	Type of carbon pools included
Austria	-0.7	Not indicated
Belgium	No net change expected	Not indicated
Czech Republic	Probably small net sink	Not indicated
Denmark	- 0.283	Forest biomass
Finland	+ 0.9	Not indicated
Ireland	- 2.1	Forest biomass
Italy	- 6.480	Not indicated
Luxemburg	Probably net sink	Forest biomass
Netherlands	- 0.11	Not indicated
Portugal	- 3.36	Not indicated
Slovenia	-0.36	Not indicated
Spain	Approx. - 3	Not indicated
Sweden	Probably small net source	Not indicated
United Kingdom	- 2.71	Above-ground and below-ground biomass, litter and soil organic matter
EU-15 total (9 Member States)	**- 17.8**	

Note: Consistent with the reporting of emission inventories, a negative sign '-' is used for removals and a positive sign '+' for emissions.

Source: Questionnaires submitted by Member States.

By 31 December 2006 all Parties to the Kyoto Protocol have to submit a report to the UNFCCC Secretariat determining their assigned amount which includes the election of Article 3.4 activities. For the preparation of the EC assigned amount report EU-15 Member States had to submit their information by 15 January 2006 to the Commission, new Member States by 15 June. Therefore the available information on activities under Article 3.4 of the Kyoto Protocol has increased substantially since the 2005 report. Twelve Member States decided to account for forest management under Article 3.4 while nine will not do so; two are still undecided[41]. Belgium, Czech Republic, Denmark, France, Portugal, Slovenia, Spain, Sweden and United Kingdom expect that carbon sequestration from forest management during the commitment period will exceed their maximum allowance for the accounting of forest management under Article 3.4 according to the Marrakech Agreements (Table 17). Only Denmark, Portugal and Spain elected cropland management; Denmark and Portugal also elected grazing land management; revegetation has not been elected by any Member State so far. Only Portugal has provided a quantitative estimate of activities under Article 3.4 other than forest management.

[41] Cyprus and Malta as non-Annex 1 countries are not concerned by these rules.

Table 17 Potential projected net carbon stock changes from forest management under Article 3.4 for the Kyoto Protocol commitment period

Member State	Forest management	Cropland management	Grazing land management	Revege-tation	Net carbon stock change during 2008–12 (Mt CO_2 per year)	Max. allowance for FM[42] (Mt CO_2 per year)	Carbon pools included
Austria	No	No	No	No	No data provided	- 2.31	
Belgium	No	No	No	No	-3.1 to -3.3	- 0.11	
Czech Republic	Yes	No	No	No	Amount is likely to be larger than maximum allowance	- 1.17	
Denmark	Yes	Yes	Yes	No	- 0.2 to - 0.6	- 0.18	Not clearly indicated
Estonia	No	No	No	No	No data provided	- 0.37	
Finland	No	No	No	No	No data provided	- 0.59	
France	Yes	No	No	No	-3.23	- 3.23	
Germany	Not yet decided	Not yet decided	Not yet decided	Not yet decided	No data provided	-4.55	
Greece	Not yet decided	Not yet decided	Not yet decided	Not yet decided	No data provided	-0.33	
Hungary	Yes	No	No	No	No data provided	- 1.06	
Ireland	No	No	No	No	No data provided	- 0.18	
Italy	Yes	No	No	No	- 4.11	- 10.2	Not clearly indicated
Latvia	No	No	No	No	No data provided	- 1.25	
Lithuania	Yes	No	No	No	No data provided	- 1.03	
Luxemburg	No	No	No	No	No data provided	- 0.04	
Netherlands	No	No	No	No	Unclear whether the country-specific maximum threshold for forest mana-gement activities will be fully utilized	- 0.04	Not clearly indicated
Poland	Yes	Not yet decided	Not yet decided	Not yet decided	No data provided	- 3.00	
Portugal	Yes	Yes	Yes	No	- 0.8 from forest management, -0.5 from crop-/ grazing land management	- 0.81	Not clearly indicated
Slovakia	No	No	No	No	No data provided	- 1.83	
Slovenia	Yes	No	No	No	- 1.32	- 1.32	Not clearly indicated
Spain	Yes	Yes	No	No	Approx. -3	- 2.46	Not indicated
Sweden	Yes	No	No	No	Amount is likely to be larger than maximum allowance	- 2.13	Not clearly indicated
United Kingdom	Yes	No	No	No	- 8.5	- 1.36	Above-ground and below-ground biomass, litter and soil organic matter

Note: Consistent with the reporting of emission inventories, a negative sign '-' is used for removals and a positive sign '+' for emissions.

Source: Questionnaires submitted by Member States, fourth national communications and personal communication.

[42] Forest Management

Apart from using Article 3.3 and 3.4 of the Kyoto Protocol, Article 3.7 allows Parties that had net emissions from the land use, land-use change and forestry sector in their base-year to include this amount in their assigned amounts, hence reducing the reduction required for reaching their respective targets. Out of the EU-15, this rule applies to Portugal, the United Kingdom and the Netherlands only. These three countries had in 1990 net emissions of 820.4 kt CO_2-equivalents, 370 kt CO_2-equivalents and 286.4 kt CO_2-equivalents respectively. This effect was accounted for but only results in minor adjustments in the gap and distance to target assessments.

Use of sinks for achieving the EU's Kyoto target

The projections from Member States presented in this chapter show that so far a total net sequestration of approximately 17.8 million tonnes CO_2 per year of the commitment period from afforestation and reforestation activities under Article 3.3 of the Kyoto Protocol has been identified by EU-15 Member States and an additional sequestration of 0.4 million tonnes CO_2 per year by Slovenia. The use of forest management is projected to reduce greenhouse gas emissions in EU-15 Member States by an additional 14.3 million tonnes CO_2 per year taking into account the maximum allowances for this activity for the countries which submitted quantitative estimates. This figure rises to 14.8 Mt CO_2 per year if the estimates for grazing land management and cropland management provided by Portugal are included. The four new Member States which decided to elect forest management will together be able to account for a total of 7.6 Mt CO_2/year if the maximum allowance is fully used.

For EU-15 the aggregated use of sinks under Articles 3.3, 3.4 and 3.7 of the Kyoto Protocol adds up to 34.1 Mt CO_2/year. This is modest when compared to the EU-15 Kyoto commitment (around 10 % of the total of 340 million tonnes CO_2-equivalents to be reduced by the EU in total or 0.8 percentage points of the EU-15 Kyoto target of - 8 %). The European climate change programme estimates that potentially 112-121 million tonnes CO_2 (equivalent to approximately 30 % of the EU reduction) could be sequestered in the agriculture and forestry sector (European Commission, 2003b).

A 5 The reporting scheme

For the preparation of this report, EU-25 greenhouse gas inventories as compiled under the EU monitoring mechanism and submitted by the European Commission to the UNFCCC (May 2006) have been used (EEA, 2006). All Member States reported data for 2004 except for Cyprus and Malta. Data availability has improved over previous years. Table 18 shows data gaps for the EU-25 Member States. Table 19 shows the gap filling approaches used (for more detail see EEA, 2006).

Table 18 Gaps in reporting for the EU-25 Member States

Country	Years	Gas	Sectors
Cyprus	1990-2003	HFC, PFC, SF_6	Industrial processes
	2004	All	All
Estonia	1990–2004	HFC, PFC, SF_6	Industrial processes
Lithuania	1991–1997 1999–2000	CO_2, CH_4, N_2O	All
	1990–2004	PFC	Industrial processes
	1990–1997 1999–2000	HFC, SF_6	Industrial processes
Luxembourg	1990-2004	All	All (sectoral background data)
Malta	1990-2004	HFC, PFC, SF_6	Industrial processes
	2001–2004	CO_2, CH_4, N_2O	All
Poland	1990–1994	HFC, PFC, SF_6	Industrial processes

Table 19 Gap filling approaches used

Type of estimates	Type of emission / sector	Gap-filling approach used
Estimates at the beginning or at the end of a time series	Fuel combustion related greenhouse gas emissions (CO_2, CH_4, N_2O of sector 1A)	The percentage change from Eurostat CO_2 emission estimates was used for extrapolation, where available
		If there were no Eurostat CO_2 emission estimates available linear trend extrapolation was used.
	Other sectors	Linear trend extrapolation was used, where no striking dips or jumps in the time series were identified. In general the trend extrapolation was made on basis of the time series 1994-2003. If only a limited number of years were available or a more consistent time series was available for specific years then these years were used for trend extrapolation.
		Previous year values were used where striking dips or jumps in the time series were identified.
Estimates for years within a time series		Linear interpolation between the years available was used
Estimates if no time series is available (only relevant for fluorinated gases):	HFCs	Emissions were estimated for 2F1 'Refrigeration and air conditioning equipment' on basis of average per capita emissions of either a set of similar countries (if available) or on basis of one single country (if a set of similar countries was not available). Population data was used from Eurostat.
	PFCs	It was checked if aluminium production occurs in the relevant countries, which was not the case. For other PFC emissions no estimates were prepared because of lack of data.
	SF6	Emissions were estimated for 2F7 'Electrical equipment' on basis of average emissions per electricity consumption of either a set of similar countries (if available) or on basis of one single country (if a set of similar countries was not available). Data on electricity consumption was provided used from Eurostat.

Note that data on CO_2, CH_4 and N_2O emissions used in this report do not include emissions and removals from land-use change and forestry.

In order to support the evaluation of progress towards fulfilling the Kyoto targets, the EU Member States are required to report to the European Commission information on indicators as outlined in Council Decision 280/2004/EC (Art. 3(1)(j)) and Commission Decision 2005/166/EC (Annex II). Table 20 shows submission data and availability of information on indicators for the EU-25 Member States.

Table 20 Availability of indicators under the EC greenhouse gas Monitoring Mechanism

	Date	Priority indicators	Additional priority indicators	Supplementary indicators
Austria	13 January	all (1990-2004)	all (1990-2004)	all except 8,10,11 (1990-2004)
Belgien	15 March	all (2004)	all (2004)	
Czech Republic	12 January	all except 3,7 (2003,2004)	all except 4,6 (2003,2004)	3,4,5,6,7,12,13,14,15 (2003,2004)
Denmark	15 March / 23 March	all (2004)	all (2004)	
Finland	12 January / 15 March	all (1990-2004)	all (1990-2004)	
Greece	18 January	all except 3 (2004)	all except 1 (2004)	
Hungary	8 June	all (1990-2004)	all (1990-2004)	3,5,6,7,9,12,13,14,15 (2004)
Ireland	23 January	all (2004)	3 and 6 (2004)	1,2,4,7,9,11,12,14,15 (2004)
Italy	6 July	all (1990; 2000-04)	all (1990; 2000-04)	all (1990; 2000-04)
Latvia	13 January / 15 March	1,2,4,6 (1992-2004) 3,7 (1990-2004)	1 (1990-2004) 3,4 (1994-2004) 5,6 (1990; 1994-1998)	1,12 (1994-2004) 4,5 (1992-2004) 6 (1993-2004) 2,14,15 (1990-2004)
Lithuania	14 March	1,2,5 (2004)	3 (2004)	5,6,7,11,12,13,14,15 (2004)
Netherlands	24 January	all (2004)	all (2004)	all except 4,8 (2004)
Poland	February	1,2,3,6,7 (2004)	5,6 (2004)	1,2,4,9,10,11,12,13,14,15 (2004)
Portugal	24 March	all (1990-2004)		
Slovakia	14 January	all (2004)	all (2004)	
Sweden	16 January	all (2004)		
United Kingdom	15 January / 31 January	all (2004)	1,2 (2004)	

As the availability of the indicators is still rather limited in addition to the submissions under the greenhouse gas MM, the following data sources have been used for selected indicators:

- data from Eurostat (NewCronos database);
- data as compiled in the Eurostat publication on energy-efficiency indicators (Eurostat, 2003b).

The geographical coverage of emission data and Eurostat statistics is not fully consistent (i.e. inclusion of overseas territories in emission data). However, this is not expected to distort overall trends and the main conclusions.

The level of reporting in 2006 has improved, with 18 Member States providing updated reports on projections (compared to 17 in 2005) and the number of Member States providing updated information on policies and measures remaining stable at 16. The overall quality of reporting for EU-25 Member States declined slightly in 2006 in terms of the level of detail provided on projections, indicators and assumptions. This is due to the fact that Member States are not obliged to report officially under the Monitoring Mechanism in 2006. The table below summarises the

extent of reporting by each Member State and is based on submitted 4th National Communications and Demonstrable Progress Reports, except where otherwise noted.

Austria submitted updated projections as reported to the European Commission in 2006. Ireland submitted their NAP 2006 as their projections submission under the monitoring mechanism.

The number of EU-15 Member States submitting new reports or updates to existing projections and policies is similar to 2005. The quality of reporting in 2006 in general was less comprehensive than in 2005.

With regard to new information submitted by the EU-15 Member States, reporting of uncertainty analysis, parameters and indicators are weak points in 2006. Reporting was also less comprehensive regarding quantification of estimated effects of policies and measures. With regard to information on projections and policies submitted by the EU-10 in 2006, there is, in some cases, room for improvement in the presentation of sectoral and gas break downs of greenhouse gas emissions projections. As with the EU-15, information on indicators, uncertainty analysis and sensitivity analysis was often lacking. For all EU-25, clearer tabularised summaries of key information on projections and the policies would be beneficial.

More needs to be done by the countries in the EU-25 to improve the availability and completeness of projections to ensure submission of up-to-date projections within the Commissions specified deadlines.

Table 21 Reporting of new information in 2006 for EU-25 Member States

Country	New policies and measures reported in 2005?	New projections reported in 2005?
Austria	No	Yes
Belgium	Yes	Yes
Cyprus	No	No
Czech Republic	Yes	Yes
Denmark	Yes	Yes
Estonia	Yes	Yes
Finland	Yes	Yes
France	No	No
Germany	No	No
Greece	Yes	Yes
Hungary	Yes	Yes
Ireland	No	Yes - NAP 2006*
Italy	No	No
Latvia	Yes	Yes
Lithuania	Yes	Yes
Luxembourg	No	No
Malta	No	No
Netherlands	Yes	Yes
Poland	No	No
Portugal	Yes	Yes**
Slovakia	Yes	Yes
Slovenia	Yes	Yes

Country	New policies and measures reported in 2005?	New projections reported in 2005?
Spain	Yes	Yes
Sweden	Yes	Yes
United Kingdom	Yes	Yes

Notes: * Projections in preparation for the NAP were sent to the EC in April 2006 with a request to use them as Ireland's main greenhouse gas projection submission.
** Portuguese Climate Change Programme (PNAC) Instituto do Ambiente, Portugal May 2006, Policies and Measures and Projections (2010-2020).

In 2005 for the first time EU-25 Member States were required to report to the European Commission information on indicators for projections to monitor and evaluate progress with policies and measures as outlined in Commission Decision 2005/166/EC (Annex III). Table 22 below shows submission date and availability of information on indicators for the EU-25 Member States.

There is no updated information on indicators for projections from Member States as there is no official obligation to report under the Monitoring Mechanism in 2006. Updated information will be provided by Member States next year. Notwithstanding this reporting scheme, Ireland has in 2006 submitted a new set of indicators for 2010 to the European Commission in accompaniment to its 2006 projections, prepared for the NAP.

Table 22 Reporting on indicators for projections by EU-25 Member States

Member State	Information Submitted	Year
Austria	Indicators for transport, waste & agriculture	2005,2010,2015, 2020
Belgium	Numerator	2005,2010,2015, 2020
Denmark	Indicator given, source described	2005,2010,2015, 2020
Finland	Indicator given, some numerators	2005,2010,2015, 2020
Greece	Indicators given	2005,2010,2015, 2020
Ireland	Indicator & numerator	2010 only
Netherlands	Full set	2005,2010,2015, 2020
Portugal	Some indicators & numerators given	2005,2010,2015, 2020
Slovakia	Some numerators given	2005,2010,2015, 2020
Slovenia	Indicators given	2005,2010,2015, 2020
Sweden	Most indicators & numerators given	2005,2010,2015, 2020
UK	Most numerators, transport indicators	2005,2010,2015, 2020

Of the 25 Member States, only 12 provided at least some of the specified indicators and numerators for projections. The reporting over the time series was generally good. Future reporting on indicators for projections could be improved by ensuring that the units specified in Annex III are used and that Member States aim to submit as complete a set of indicators as possible. A more complete set of indicators and an increased number of Member States reporting would enable a valuable and informative EU-25 level assessment of overall progress using the indicators. In 2006, indicators for projections are used in the annexes to the report for the EU-15 Member States.

A 6 Information sources for national projections

Country	Information source(s) used	Date of publication or submission[43]
General	• 4th national communications on climate change under the UNFCCC and reports on demonstrable progress under the Kyoto Protocol	
	• Submissions under the monitoring mechanism, pursuant to Decision No. 280/2004/EC[44]	
	• When data was missing or incomplete: other relevant documents	
	• European Climate Change Programme (ECCP), database on Policies and Measures in Europe (list of sources for each PAM): www.oeko.de/service/pam/index.php.	As of 24 Aug. 2006
Austria	• 3rd national communication on climate change under the UNFCCC	29/11/2001
	• Austrian Climate Strategy	18/06/2002
	• National Allocation Plan 2005–2007	01/04/2004
	• Austria's Emission Projection on Greenhouse Gases 2003–2020: Interim Report (unpublished)	15/06/2005
	• Austrian greenhouse gas emissions projections (2006)	2006
Belgium	• 4th national communication on climate change under the UNFCCC	23/12/2005
	• Report on demonstrable progress under the Kyoto Protocol	23/12/2005
Bulgaria	• Second national action plan on climate change 2005–2008	21/12/2004
Croatia	*Kyoto protocol not ratified, no projection data.*	
	• 2006 GHG Inventory Submission to UNFCCC	31/08/06
	• 1st national communication on climate change under the UNFCCC	07/02/02
	• UNFCCC Country Profile, Croatia	21/03/2005
Cyprus	*No Kyoto target, no projection.*	
Czech Republic	• 4th national communication on climate change under the UNFCCC	03/02/2006
	• Report on demonstrable progress under the Kyoto Protocol	03/02/2006
Denmark	• 4th national communication on climate change under the UNFCCC	30/12/2005
	• Report on demonstrable progress under the Kyoto Protocol	30/12/2005
Estonia	• 4th national communication on climate change under the UNFCCC	30/12/2005
	• Report on demonstrable progress under the Kyoto Protocol	30/12/2005
Finland	• 4th national communication on climate change under the UNFCCC	10/02/2006
	• Report on demonstrable progress under the Kyoto Protocol	14/02/2006
France	• Submission pursuant to Decision No. 280/2004/EC (*aggregated projections*)	26/01/2006
	• 4th national communication on climate change under the UNFCCC (*partial projections by sector and by gas*)	07/07/2006

[43] Date of submission refers to the date the information was received at the European Commission (DG Environment) or submitted to UNFCCC.

[44] Decision No 280/2004/EC of the European Parliament and of the Council of 11 February 2004 concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol

Germany	• German Monitoring Report 2002	31/01/2003
	• Endbericht zum Forschungsvorhaben — Politikszenarien für den Klimaschutz — Langfristszenarien und Handlungsempfehlungen ab 2012 (Politikszenarien III)	Mar. 2004
	• 3rd national communication on climate change under the UNFCCC	22/10/2002
	• National Allocation Plan 2005–2007	31/03/2004
Greece	• 4th national communication on climate change under the UNFCCC	10/03/2006
Hungary	• 4th national communication on climate change under the UNFCCC	10/03/2006
	• Report on demonstrable progress under the Kyoto Protocol	17/01/2006
Iceland	• 4th national communication on climate change under the UNFCCC	28/04/2006
	• Report on demonstrable progress under the Kyoto Protocol	28/04/2006
	• UNFCCC Country Profile on Iceland	30/03/2005
Ireland	• Determining the Share of National Greenhouse Gas Emissions for Emissions Trading in Ireland 2008–2012	Mar. 2006
	• Submission pursuant to Decision No. 280/2004/EC	2005
Italy	• 'BAU Scenario of Environment and Industry Ministers' Submission pursuant to Decision No. 280/2004/EC	June 2005
	• Domestic P&Ms and KP-MEX in the Italian Strategy to Meet the Kyoto Target — Synthesis Document	19/09/2005
	• 3rd national communication on climate change under the UNFCCC	20/01/2003
Latvia	• 4th national communication on climate change under the UNFCCC	25/05/2006
	• Report on demonstrable progress under the Kyoto Protocol	25/05/2006
Liechtenstein	• 4th national communication on climate change under the UNFCCC	07/04/2006
	• UNFCCC Country Profile	22/03/2005
Lithuania	• 4th national communication on climate change under the UNFCCC	28/12/2005
	• Report on demonstrable progress under the Kyoto Protocol	06/02/2006
Luxembourg	• Stratégie nationale de réduction des émissions de gaz à effet de serre — First part	May 2000
Malta	*No Kyoto target, no projection data.*	
Netherlands	• 4th national communication on climate change under the UNFCCC	22/12/05
	• 2005 Climate Policy Progress Report pursuant to Decision No. 280/2004/EC	June 2005
	• Questionnaire on the use of Kyoto mechanisms and update of greenhouse gas emissions projections for 2010 pursuant to Decision No. 280/2004/EC	May 2006
	• Climate Policy Evaluation memorandum 2005: On the way to Kyoto	Oct. 2005
Norway	• 4th national communication on climate change under the UNFCCC	16/02/2006
	• Report on demonstrable progress under the Kyoto Protocol	16/02/2006
	• UNFCCC Country Profile	28/01/2005
Poland	• 3rd national communication on climate change under the UNFCCC	30/11/2001
Portugal	• Portugal's National Climate Change Programme 2006	17/05/2006
	• Updated information regarding the use of mechanisms and Art.3(3) and 3(4) of the Kyoto Protocol (as submitted in Portugal's Assigned Amount Report)	May 2006
Romania	• Report on demonstrable progress under the Kyoto Protocol	31/01/2006
	• National Action Plan on Climate Change (NAPCC) 2005–2007	2005
	• 3rd national communication on climate change under the UNFCCC	17/06/2005

Slovakia	• 4th national communication on climate change under the UNFCCC	30/12/2005
	• Report on demonstrable progress under the Kyoto Protocol	30/12/2005
Slovenia	• 4th national communication on climate change under the UNFCCC	12/06/2006
	• Report on demonstrable progress under the Kyoto Protocol	12/06/2006
Spain	• 4th national communication on climate change under the UNFCCC	23/03/2006
Sweden	• 4th national communication on climate change under the UNFCCC	30/12/2005
	• Report on demonstrable progress under the Kyoto Protocol	30/12/2005
Switzerland	• 4th national communication on climate change under the UNFCCC	02/12/2005
	• Report on demonstrable progress under the Kyoto Protocol	02/12/2005
	• UNFCCC Country Profile	01/03/2005
Turkey	*No Kyoto target, no projection data.*	
United Kingdom	• 4th national communication on climate change under the UNFCCC	15/05/2006
	• Report on demonstrable progress under the Kyoto Protocol	08/03/2006
	• Climate Change the UK Programme 2006	28/03/2006
	• UK Energy and CO_2 Emissions Projections: Updated Projections to 2020	Feb. 2006

A 7 Summary of EU-25 greenhouse gas emission trends and projections

Table A7.1 EU-25 and Member States' greenhouse gas emission trends and Kyoto targets (burden-sharing) for 2008–2012

Table A7.2 EU-15 and Member States' EU burden-sharing or Kyoto targets for 2008–2012, compared with emission projections based on existing and additional domestic policies and measures

Note: Tables A7.1 and A7.2 are based on data provided by EU Member States before 6 June 2006.

Tables A7.1 and A7.2 both present base-year emissions and EU burden sharing or Kyoto targets for EU Member States. However, the data presented differ from one table to the other for the following reasons:

- The base-year emissions reported in table A7.1 are the latest data available from national greenhouse gas inventories, as of 6 June 2006[45].
- The base-year emissions used for the projections assessment and presented in table A7.2 are the data on which projections were based. Many countries have updated these base-year emissions since then, and are reflected in their last inventory submissions of 2006.

[45] See for more detail EEA report "Annual European Community greenhouse gas inventory 1990-2004 and inventory report 2006': http://reports.eea.europa.eu/technical_report_2006_6/en. However, final base-year data will be available in the report on the EU's assigned amount (pursuant to Article 3, Paragraphs 7 and 8 of the Kyoto Protocol) under the UNFCCC, due for publication end of 2006.

Table A7.1 EU and Member States' greenhouse gas emission trends and targets (burden-sharing) for 2008–2012

	Base-year (Mt CO_2)	GHG emissions 2004 (Mt CO_2)	Change 2003–2004 (in %)	Change 2004 relative to base-year (in %)	EU burden-sharing or Kyoto target (in %)	EU burden-sharing or Kyoto target (Mt CO_2)	Distance to target indicator (index points). In brackets: excluding Kyoto mechanisms and sinks
Austria	78.9	91.3	– 1.3 %	+ 15.7 %	– 13.0 %	68.68	+ 17.9 (+ 24.8)
Belgium	146.9	147.9	+ 0.2 %	+ 0.7 %	– 7.5 %	135.87	+ 1.8 (+ 5.9)
Cyprus	6.0	8.9	– 3.0 %	+ 48.2 %	no target	no target	no target
Czech Republic	196.3	147.1	– 0.3 %	– 25.1 %	– 8.0 %	180.58	– 19.9 (– 19.5)
Denmark	69.3	68.1	– 8.1 %	– 1.8 %	– 21.0 %	54.77	+ 7.9 (+ 12.9)
Estonia	42.6	21.3	+ 0.7 %	– 50.0 %	– 8.0 %	39.23	– 44.4
Finland	71.1	81.4	– 4.9 %	+ 14.5 %	0.0 %	71.10	+ 13.1 (+ 14.5)
France	567.1	562.6	+ 0.3 %	– 0.8 %	0.0 %	567.09	– 1.2 (– 0.8)
Germany	1230.0	1015.3	– 0.9 %	– 17.5 %	– 21.0 %	971.67	– 2.8
Greece	111.1	137.6	+ 0.3 %	+ 23.9 %	+ 25.0 %	138.82	+ 6.4
Hungary	122.2	83.1	– 0.2 %	– 32.0 %	– 6.0 %	114.89	– 27.8
Ireland	55.8	68.5	+ 0.1 %	+ 22.7 %	+ 13.0 %	63.03	+ 6.5 (+ 13.6)
Italy	519.6	582.5	+ 0.9 %	+ 12.1 %	– 6.5 %	485.83	+ 9.9 (+ 16.7)
Latvia	25.9	10.7	+ 0.4 %	– 58.5 %	– 8.0 %	23.82	– 52.9
Lithuania	50.9	20.3	+ 17.9 %	– 60.1 %	– 8.0 %	46.86	– 54.5
Luxembourg	12.7	12.7	+ 11.3 %	+ 0.3 %	– 28.0 %	9.14	+ 3.3 (+ 19.9)
Malta	2.2	3.2	+ 4.2 %	+ 45.9 %	no target	no target	no target
Netherlands	214.3	217.8	+ 1.1 %	+ 1.6 %	– 6.0 %	201.45	– 0.7 (+ 5.8)
Poland	565.3	386.4	+ 1.0 %	– 31.6 %	– 6.0 %	531.34	– 27.4
Portugal	60.0	84.5	+ 1.0 %	+ 41.0 %	+ 27.0 %	76.15	+ 14.6 (+ 22.1)
Slovakia	73.2	51.0	– 0.1 %	– 30.3 %	– 8.0 %	67.36	– 24.7
Slovenia	20.2	20.1	+ 2.0 %	– 0.8 %	– 8.0 %	18.60	– 1.0 (+ 4.8)
Spain	289.4	427.9	+ 4.8 %	+ 47.9 %	+ 15.0 %	332.79	+ 31.2 (+ 37.4)
Sweden	72.5	69.9	– 1.5 %	– 3.6 %	+ 4.0 %	75.35	– 8.4 (– 6.4)
United Kingdom	767.9	659.3	+ 0.2 %	– 14.1 %	– 12.5 %	671.90	– 5.8 (– 5.4)
EU-15	**4266.4**	**4227.4**	**+ 0.3 %**	**– 0.9 %**	**– 8.0 %**	**3925.11**	**+ 2.3 (+ 4.7)**
EU-25	**5371.3**	**4979.6**	**+ 0.4 %**	**– 7.3 %**	**no common target**	**no common target**	**no common target**

Notes: The base-year emissions reported in this table are the latest data available from national greenhouse gas inventories (6 June 2006). Final data will be available in the report on the EU's assigned amount (pursuant to Article 3, Paragraphs 7 and 8 of the Kyoto Protocol) under the UNFCCC, due end of 2006.
For fluorinated gases, the EU-15 base-year emission is the sum of 15 Member States' base-year emissions. A total of 13 Member States have indicated they will select 1995 as base-year under the Kyoto Protocol; Finland and France indicate that it will use 1990. Therefore, the EU-15 base-year estimates for fluorinated gas emissions are the sum of 1995 emissions for 13 Member States and 1990 emissions for Finland and France.
For Austria, Belgium, Czech Republic, Denmark, Finland, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Slovenia, Spain, Sweden, the United Kingdom and the EU-15, the effect of Kyoto mechanisms and carbon sinks were included in the calculations of the distance to target indicator (DTI). For these countries, the values in brackets give the DTI without Kyoto mechanisms and sinks.

Source: EEA, based on EU Member States greenhouse gas inventories.

Table A7.2 EU-15 and Member States' EU burden-sharing or Kyoto targets for 2008–2012, compared with emission projections based on existing and additional domestic policies and measures

	GHG emissions for base-year used for projections assessment[1]	EU burden sharing or Kyoto target[1] [2]		With existing policies and measures				With additional policies and measures				With additional measures, Kyoto mechanisms and carbon sinks							
				Projections for 2010		Gap between projections and target[3]		Projections for 2010		Gap between projections and target[3]		Use of Kyoto mechanisms[5]		Use of carbon sinks[5]		Projections for 2010		Gap between projections and target[3]	
	(Mt CO_2)	(in % of base-year)	(Mt CO_2)	(Mt CO_2)	(in % of base-year)	(Mt CO_2)	(in % of base-year)[4]	(Mt CO_2)	(in % of base-year)	(Mt CO_2)	(in % of base-year)[4]	(Mt CO_2)	(in % of base-year)	(Mt CO_2)	(in % of base-year)	(Mt CO_2)	(in % of base-year)	(Mt CO_2)	(in % of base-year)[4]
Austria	78.4	– 13.0	68.2	89.9	+ 14.8	+ 21.8	+ 27.8	81.0	+ 3.3	+ 12.8	+ 16.3	– 7.0	– 8.9	– 0.7	– 0.9	73.3	– 6.5	+ 5.1	+ 6.5
Belgium	146.8	– 7.5	135.8	148.5	+ 1.2	12.7	+ 8.7	145.7	– 0.7	9.9	+ 6.8	– 8.6	– 5.8			137.2	– 6.6	+ 1.4	+ 0.9
Czech Republic	192.1	– 8.0	176.8	145.3	– 24.4	– 31.4	– 16.4	140.8	– 26.7	– 36.0	– 18.7			– 1.2	– 0.6	139.6	– 27.4	– 37.2	– 19.4
Denmark[6]	69.6	– 21.0	55.0	72.5	+ 4.2	17.5	+ 25.2	72.5	+ 4.2	17.5	+ 25.2	– 4.5	– 6.5	– 0.5	– 0.7	67.5	– 3.0	+ 12.5	+ 18.0
Estonia	43.5	– 8.0	40.0	18.9	– 56.5	– 21.1	– 48.5	17.4	– 60.0	– 22.6	– 52.0					17.4	– 60.0	– 22.6	– 52.0
Finland	71.5	0.0	71.5	78.5	+ 9.9	7.1	+ 9.9	70.1	– 1.9	– 1.4	– 1.9	– 2.4	– 3.4	0.9	+ 1.3	68.6	– 4.0	– 2.9	– 4.0
France	564.0	0.0	564.0	600.0	+ 6.4	36.0	+ 6.4	567.0	+ 0.5	3.0	+ 0.5			– 3.2	– 0.6	563.8	– 0.0	– 0.2	– 0.0
Germany	1 248.3	– 21.0	986.2	1 000.9	– 19.8	14.7	+ 1.2	985.7	– 21.0	– 0.5	– 0.0					985.7	– 21.0	– 0.5	– 0.0
Greece	111.7	+ 25.0	139.6	150.4	+ 34.7	10.8	+ 9.7	139.5	+ 24.9	– 0.1	– 0.1					139.5	+ 24.9	– 0.1	– 0.1
Hungary	122.2	– 6.0	114.9	87.4	– 28.5	– 27.5	– 22.5	87.1	– 28.8	– 27.8	– 22.8					87.1	– 28.8	– 27.8	– 22.8
Ireland	55.8	+ 13.0	63.0	72.3	+ 29.6	9.2	+ 16.6	72.3	+ 29.6	9.3	+ 16.6	– 3.6	– 6.5	– 2.1	– 3.8	66.6	+ 19.4	+ 3.6	+ 6.4
Italy	509.4	– 6.5	476.3	580.4	+ 13.9	104.1	+ 20.4	530.1	+ 4.1	53.8	+ 10.6	– 39.6	– 7.8	– 10.6	– 2.1	479.9	– 5.8	+ 3.6	+ 0.7
Latvia	25.3	– 8.0	23.3	13.7	– 46.1	– 9.7	– 38.1	13.0	– 48.6	– 10.3	– 40.6					13.0	– 48.6	– 10.3	– 40.6
Lithuania	50.9	– 8.0	46.9	25.2	– 50.5	– 21.7	– 42.5	25.2	– 50.5	– 21.7	– 42.5					25.2	– 50.5	– 21.7	– 42.5
Luxembourg	12.7	– 28.0	9.2	9.9	– 22.4	0.7	+ 5.6	9.9	– 22.4	0.7	+ 5.6	– 3.0	– 23.6			6.9	– 46.0	– 2.3	– 18.0
Netherlands	214.0	– 6.0	201.4	221.7	+ 3.6	20.5	+ 9.6	215.6	+ 0.7	14.4	+ 6.7	– 20.0	– 9.3	– 0.1	– 0.1	195.5	– 8.6	– 5.9	– 2.8
Poland	498.5	– 6.0	468.6	438.4	– 12.1	– 30.2	– 6.1	438.4	– 12.1	– 30.2	– 6.1					438.4	– 12.1	– 30.2	– 6.1
Portugal	60.0	+ 27.0	77.2	88.0	+ 46.7	11.8	+ 19.7	85.6	+ 42.7	9.4	+ 15.7	– 1.9	– 3.1	– 4.7	– 7.8	79.1	+ 31.9	+ 1.9	+ 3.1
Slovakia	71.9	– 8.0	66.1	55.8	– 22.4	– 10.4	– 14.4	54.1	– 24.8	– 12.0	– 16.8					54.1	– 24.8	– 12.0	– 16.8

Table A7.2 (continued)

	GHG emissions for base-year used for projections assessment[1]	EU burden sharing or Kyoto target[1] [2]		With existing policies and measures				With additional policies and measures				With additional measures, Kyoto mechanisms and carbon sinks							
				Projections for 2010		Gap between projections and target[3]		Projections for 2010		Gap between projections and target[3]		Use of Kyoto mechanisms[5]		Use of carbon sinks[5]		Projections for 2010		Gap between projections and target[3]	
	($Mt CO_2$)	(in % of base-year)	($Mt CO_2$)	($Mt CO_2$)	(in % of base-year)	($Mt CO_2$)	(in % of base-year)[4]	($Mt CO_2$)	(in % of base-year)	($Mt CO_2$)	(in % of base-year)[4]	($Mt CO_2$)	(in % of base-year)	($Mt CO_2$)	(in % of base-year)	($Mt CO_2$)	(in % of base-year)	($Mt CO_2$)	(in % of base-year)[4]
Slovenia	20.2	– 8.0	18.6	21.2	+ 4.7	2.6	+ 12.7	19.9	– 1.7	1.3	+ 6.3			– 1.7	– 8.3	18.2	– 10.0	– 0.4	– 2.0
Spain	288.4	+ 15.0	331.7	436.3	+ 51.3	104.6	+ 36.3	436.3	+ 51.3	104.6	+ 36.3	– 20.0	– 6.9	– 5.5	– 1.9	410.9	+ 42.4	+ 79.2	+ 27.4
Sweden	72.2	+ 4.0	75.1	71.5	– 1.0	– 3.6	– 5.0	71.5	– 1.0	– 3.6	– 5.0			– 2.1	– 3.0	69.4	– 3.9	– 5.7	– 7.9
United Kingdom	766.7	– 12.5	671.2	622.2	– 18.8	– 48.6	– 6.3	588.7	– 23.2	– 82.2	– 10.7			– 4.1	– 0.5	584.6	– 23.7	– 86.6	– 11.3
EU-15[7] [8] [9]	**4 269.4**	**– 8.0**	**3 929.2**	**4 243.1**	**– 0.6**	**315.2**	**+ 7.4**	**4 071.4[7]**	**– 4.6**	**143.6**	**3.36**	**– 110.5**	**– 2.59**	**– 32.6**	**– 0.76**	**3 928.3[7]**	**– 8.0**	**– 0.9**	**– 0.02**

Notes: (1) The base-year emissions used for the projections assessment and presented in this table are the data on which projections were based. Many countries have updated these base-year emissions since then, reflected in their last inventory submissions. This explains why, for many countries, the base-year emissions presented in this table A7.2 differ from base-year emissions reported in the emission inventories (Table A7.1). This also explains why many EU burden-sharing or Kyoto targets (in $Mt CO_2$) differ from the ones presented in Table A7.1.

(2) In the Council decision (2002/358/EC) on the approval by the EU of the Kyoto Protocol, the various commitments of the Member States are expressed as percentage changes from the base-year. In 2006 the respective emission levels (assigned amounts) will be determined in terms of tonnes of CO_2-equivalent and reported separately. The countries' and the EU-15 Kyoto target levels in this table (in $Mt CO_2$) were derived from the base-year emissions levels (in $Mt CO_2$) provided in this table (which are somewhat different from the base-year emissions in table 7.1 as explained above) and the reduction targets in %.

For Portugal, the Netherlands and the United Kingdom, in accordance with Art. 3.7 of the Kyoto Protocol, net emissions from the land use, land-use change and forestry sector in their base-year were also taken into account to calculate these countries respective emissions target levels (in $Mt CO_2$). This inclusion results in a small increase of the total EU-15 emission target level of 1.36 $Mt CO_2$-equivalent. See chapter 2 for more details.

(3) For gaps between projections and targets, positive figures signify that the target is not met; negative figures mean a projected over-delivery of emissions.

(4) Relative gaps between projections and targets (in percentage points) are relative to base-year emissions, not to target levels.

(5) The negative figures for Kyoto mechanisms and carbon sinks represent projected emission reductions.

(6) The Council of Environment Ministers and the Commission have, in a joint statement, agreed to take into account *inter alia* the assumptions in Denmark's statement to the Council Conclusions of 16–17 June 1998 relating to base-year emissions.

(7) Some Member States did not report any additional measures, Kyoto mechanisms or carbon sinks or do not intend to use Kyoto mechanisms. In order to calculate EU emission 'with additional measures' projections, 'with existing measures' projections are taken for those Member States for which additional measures projections are not available.

(8) Gaps for total EU in terms of million tonnes of CO_2-equivalent are not equal to the sum of Member States' gaps due to slight inconsistency between the Member States' burden-sharing targets and the EU's Kyoto target in terms of percentages.

(9) There is no joint target for the EU-8 or EU-23. Therefore, the gaps between projections and target are only given for the EU-15.

Source: EEA, based on EU Member States greenhouse gas inventories and projections.

A 8.1 Actual and projected greenhouse gas emissions of EU-15 Member States

Actual greenhouse gas emissions:

- In 2004, two Member States (Sweden and the United Kingdom) were on track towards reaching their burden-sharing targets in 2010 and project that existing domestic policies and measures will be sufficient to meet or even exceed their targets.
- In 2004, seven Member States (Austria, Belgium, Denmark, Ireland, Italy, Portugal and Spain) were heading towards missing their burden-sharing targets.
- Compared with the analysis in 2005 (of 2003 data), the situation in 2004 got worse as the distance-to-target path of the several EU-15 Member States increased.

Projected greenhouse gas emissions:

- Sweden and the United Kingdom project that existing domestic policies and measures will be sufficient to meet their burden sharing targets.
- Austria, Belgium, Denmark, Ireland, Italy, the Netherlands, Portugal and Spain project that with existing domestic measures their emissions will be significantly above their burden-sharing targets by 2010.
- Finland, France, Germany and Greece project that with additional domestic policies and measures they are going to meet their burden-sharing targets by 2010.
- Austria, Belgium, Italy, the Netherlands and Portugal project that they will stay above their burden-sharing targets by 2010 even with additional domestic policies and measures. Denmark, Ireland, Luxembourg, Spain, Sweden and the United Kingdom did not report any additional domestic policies and measures.
- Luxembourg projects that it will achieve its targets by a combination of existing domestic policies and measures and the use of Kyoto mechanisms. The Netherlands project that they will achieve their targets by a combination of additional measures and the use of Kyoto mechanisms.

See separate Country Profiles for further information.

A 8.2 Actual and projected greenhouse gas emissions of the new EU Member States

- All new Member States were on track in 2004 to meet their Kyoto targets (excluding land-use change and forestry), using existing domestic policies and measures.
- Seven new Member States (Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland and Slovakia) project that existing domestic policies and measures will be sufficient to meet their Kyoto targets by 2010. Slovenia projects that it will meet the target with additional domestic measures and the use of sinks according to Articles 3.3 and 3.4 of the Kyoto Protocol.

See separate Country Profiles for further information.

A 8.3 Actual and projected greenhouse gas emissions of non EU Member States

See separate Country Profiles for further information.

References

DIW, 2004: *Straßenverkehr: Eher Ausweichreaktionen auf hohe Kraftstoffpreise als Verringerung der Fahrleistungen.* DIW Wochenbericht 41/04

EEA, 2002a: *Energy and environment in the EU*, Environmental issue report No 31, European Environment Agency.

EEA, 2003a: *Greenhouse gas emission trends and projections in Europe 2003*, Environmental issue report No 36, European Environment Agency (http://reports.eea.eu.int/environmental_issue_report_2003_36/en/GHG_issue_36_FINAL_www.pdf).

EEA, 2003b: *Energy and environment updated indicator fact sheets*, European Environment Agency.

EEA, 2003c: *Transport and environment updated indicator fact sheets*, European Environment Agency.

EEA, 2004: Analysis of greenhouse gas emission trends and projections in Europe 2004; EEA Technical report No 7/2004, European Environment Agency.

EEA, 2005b: *Climate change and a European low-carbon energy system*, Report No 1/2005, European Environmental Agency

EEA, 2006: *Annual European Community greenhouse gas inventory 1990–2004 and inventory report 2006*, Submission to the UNFCCC Secretariat, EEA Technical report No 6/2006, European Environment Agency.

Eichhammer, W. et al. 2001: *Greenhouse gas reductions in Germany and the United Kingdom — Coincidence or policy induced? — An analysis for international climate policy*, study for the German Federal Ministry of the Environment (BMU) and the German Federal Environmental Agency (UBA) by the Fraunhofer-Institute Systems and Innovation Research (ISI, Germany), Deutsches Institut für Wirtschaftsforschung (DIW, Germany) and Science Policy and Technology Policy Research (SPRU, United Kingdom).

European Commission, 1997a: *A Community strategy to promote combined heat and power (CHP) and to dismantle barriers to its development* (COM (1997) 514 final), Commission of the European Communities, Brussels.

European Commission, 2003a: *Report (2003) under the Council Decision 1999/296/EC for a monitoring mechanism of Community CO_2 and other greenhouse gas emissions*, Commission of the European Communities, Brussels.

European Commission, 2003b: *Second ECCP progress report — Can we meet our Kyoto targets?* (http://europa.eu.int/comm/environment/climat/second_eccp_report.pdf).

European Commission, 2003c: *European energy and transport trends to 2030*, Commission of the European Communities, Brussels.

European Commission, 2004a: *Communication from the Commission to the Council and to the European Parliament on Commission decisions of 7 July 2004 concerning national allocation plans for the allocation of greenhouse gas emission allowances of Austria, Denmark, Germany, Ireland, the Netherlands, Slovenia, Sweden, and the United Kingdom in accordance with Directive 2003/87/EC* (COM(2004) 500 final), (http://europa.eu.int/eur-lex/en/com/cnc/2004/com2004_0500en01.pdf).

European Commission, 2004b: *Communication from the Commission to the Council and to the European Parliament on Commission Decisions of 20 October 2004 concerning national allocation plans for the*

allocation of greenhouse gas emission allowances of Belgium, Estonia, Finland, France, Latvia, Luxembourg, Portugal, and the Slovakia in accordance with Directive 2003/87/EC (COM(2004) 681 final), (http://europa.eu.int/eur-lex/en/com/gpr/2004/com2004_0681en01.pdf).

European Commission, 2004c: *Report (2004) under the Council Decision 1999/296/EC for a monitoring mechanism of Community CO_2 and other greenhouse gas emissions*, Commission of the European Communities, Brussels.

European Commission, 2005a: *European energy and transport trends to 2030*. Brussels, Commission of the European Communities.

European Commission 2005c: Emissions trading - Commission approves last allocation plan ending NAP marathon (IP/05/762), (http://europa.eu.int/rapid/pressReleaseAction.do?reference=IP/05/762&formal=PDF&aged=0&lanGuag=EN&guiLanguage=en)j)

European Commission, 2005d: *Communication from the Commission to the Council and the European Parliament on Implementing the Community Strategy to Reduce CO2 Emissions from Cars: Fifth annual Communication on the effectiveness of the strategy {SEC(2005) 826 }* (COM(2005) 269 final), Brussels, 22.6.2005

European Commission, 2006: EU-15 baseline scenario. Brussels, Commission of the European Communities.

European Commission, 2006b: *Implementing the Community strategy to reduce CO_2 emissions from cars*, Sixth annual communication on the effectiveness of the strategy (COM (2006) 463 final), Commission of the European Communities, Brussels.

Eurostat, 2003: 'Electricity statistics', *Statistics in focus*, Theme 8, Environment and energy, 4/2003.

Eurostat, 2003: *Energy efficiency indicators.* Data 1990-1999. European Communities, Luxembourg, 2003.

IPCC, 2001: *Climate change 2001*, Third assessment report, WMO/UNEP/IPCC.

Glossary

ACEA	European Automobile Manufacturers Association (EU-wide agreement with ACEA and similarly also with Japanese (JAMA) and Korean (KAMA) automobile manufacturing industries)
ARD	afforestation, reforestation and deforestation
CCPMs	common and coordinated policies and measures at EU level
CDM	clean development mechanism as defined in the Kyoto Protocol, Article 12, meaning projects on the reduction of greenhouse gas emissions between industrialised countries and developing countries
CER	certified emission reduction unit caused by a CDM project
CFCs	chlorofluorocarbons
CHP	combined heat and power
CH_4	methane
CITL	Community Independent Transaction Log
CLRTAP	Convention on Long-range Transboundary Air Pollution
CO_2	carbon dioxide
COP	Conference of the Parties
CRF	common reporting format
DNA	Designated National Authority
DTI	distance-to-target indicator
ECCP	European climate change programme
EEA	European Environment Agency
ERU	emission reduction unit caused by JI projects
ETC/ACC	European Topic Centre on Air and Climate Change
EUA	European Union Allowance
GDP	gross domestic product
GHG	greenhouse gases
HCFC	hydrochlorofluorocarbon
HFC	hydrofluorocarbon
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
IPPC	integrated pollution prevention and control
JAMA	Japanese Automobile Manufacturers Association
JI	Joint implementation as defined in the Kyoto Protocol, Article 6, meaning projects on the reduction of greenhouse gas emissions between industrialised countries and countries in transition
KAMA	Korean Automobile Manufacturers Association

KP	Kyoto Protocol
LUCF	land-use change and forestry
monitoring mechanism	Council Decision No 280/2004/EC concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol
MoU	Memorandum of Understanding
MS	Member States
Mt	Mega (million) tonnes
NAP	national action plan
N_2O	nitrous oxide
PFCs	perfluorocarbons
RES	renewable energy sources
SF_6	sulphur hexafluoride
UNECE/EMEP	United Nations Economic Commission for Europe/Cooperative Programme for Monitoring and Evaluation of the Long-Range Transmission of Air Pollutants in Europe
UNFCCC	United Nations Framework Convention on Climate Change