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FIFTH NATIONAL COMMUNICATION FROM THE EUROPEAN COMMUNITY UNDER THE UN FRAMEWORK CONVENTION ON CLIMATE CHANGE (UNFCCC)

EUROPEAN COMMISSION

environment

FIFTH NATIONAL COMMUNICATION FROM THE EUROPEAN COMMUNITY UNDER THE UN FRAMEWORK CONVENTION ON CLIMATE CHANGE

(required under Article 12 of the United Nations Framework Convention on Climate Change)

This document is a synthesis of the following European Commission documents:

COM (2009)667 - Communication from the Commission: Fifth National Communication from the European Community under the UN Framework Convention on Climate Change (UNFCCC) (required under Article 12 of the United Nations Framework Convention on Climate Change)

Staff Working Document:
SEC (2009)1652 Part 1, 2a, 2b, 3 - Commission Staff Working Document accompanying the Communication from the Commission: Fifth National Communication from the European Community under the UN Framework Convention on Climate Change (UNFCCC) (required under Article 12 of the United Nations Framework Convention on Climate Change)

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1. EXECUTIVE SUMMARY

This is the 5th National Communication of the European Community (EC) under Article 12 of the United Nations Framework Convention on Climate Change (UNFCCC).

The EC and its 27 Member States, both individually and jointly, have been active on action against climate change now for a number of years. This action took a significant step forward in 2008, when an integrated and ambitious package of policies and measures to tackle energy and climate change was agreed for the EC. The package contains proposals covering: renewable energy, the emissions trading scheme (EU ETS), shared efforts of Member States to reduce emissions from sectors outside the EU ETS, and geological storage of carbon dioxide and sets specific targets for 2020. The package also contains a legally binding commitment to a reduction in greenhouse gas emissions of 20 % compared to 1990 levels by 2020. At the same time as the energy and climate change package was agreed, a regulation setting emission performance standards for new passenger cars was passed, and an obligation was agreed for fossil fuel suppliers to reduce greenhouse gas emissions from their entire fuel production chain. Other important recent developments are the inclusion of aviation activities into the EU ETS and a new directive to promote clean and energy-efficient road transport vehicles.

The EC is active in implementing policies and in continuously developing new ones to meet the changing circumstances. These policy developments are supported by research on the climate system, the understanding of the impacts of climate change and the identification of options for mitigation and adaptation. A set of projects focuses on technologies and strategies to reduce GHG emissions from specific economic sectors, such as energy and transport.

The policies already in place are having an effect, for example, since 2003, EU-27 per capita energy consumption has declined slowly. In the period 1990-2007, greenhouse gas emissions also decreased. Primary energy intensity has continued a downward trend since 1996. The use of renewable forms of energy has also increased substantially.

With existing measures and the use of Kyoto mechanisms the EU-15 is expected to meet its Kyoto target. Moving forward to 2020; with existing measures EU-15 projected emissions (excluding LULUCF[1]) are expected to plateau at around 2010 levels, whilst EU-27 emissions as a whole are expected to decrease slightly before returning to 2005 levels by 2020. However, with additional measures in place it is projected that EU-27 emissions will continue to decrease steadily to 2020, a reduction of 15 % compared to 1990 levels (although many Member State projections do not yet account for the full impact of the newly proposed climate policies).

Concerning LULUCF, data available from twenty Member States show that net removals generally increased over the period 1990 to 2007. However, the net uptake of carbon from LULUCF is expected to decrease rapidly up to 2020, returning to 1990 levels. Therefore, net GHG emissions from LULUCF may increase up to 2020.

While reducing emissions of greenhouse gases is of paramount importance to avoid dangerous climate change, the EC also recognises that some impacts are unavoidable because of past emissions. The EC has therefore undertaken research and taken

[1] Land-Use, Land-Use Change and Forestry

action to understand these impacts, develop adaptation responses and assist developing countries in strengthening their capacity to cope with climate change. This action includes a more coordinated approach on policy development through a White Paper to define the policy direction of the EC in the forthcoming years.

As well as action domestically on climate change, the EC is strongly committed to assisting developing countries in the fight against poverty and the achievement of the UN Millennium Development Goals. Combating climate change forms an integral part of this agenda. In recent years specific cooperation on climate change has been strengthened significantly across a range of different frameworks. EC financial contributions related to climate change have steadily increased over the last few years.

The importance of public awareness and education and training on climate change is recognized by the EC. As part of the preparation of this Communication, a 6 week consultation was held, inviting feedback from European organisations with a relationship to the climate change agenda. This feedback helped improve the presentation of certain information in this Communication. In addition, a range of views were given on the recent progress of EU climate policy. Whilst these were largely positive, particularly with respect to the recent Energy and Climate package, they also raised some concerns and indicated areas where stakeholders felt further action is needed.

Moving beyond 2012, the EC's agreed objective is to limit the average global temperature increase to less than $2^{o}C$ compared to pre-industrial levels. If current emission trends continue, this threshold may already be crossed in 2050. Significant adaptation efforts will be required even if global average temperature increase is kept below $2^{o}C$.

The EC believes that there are three key challenges to achieving this: targets and actions; financing; and building an effective global carbon market. The post-2012 international agreement must be sufficiently ambitious and comprehensive, providing for comparable reductions by all developed countries, and including appropriate action by developing countries to limit emissions. If such an agreement is secured, the EC has a firm commitment to increase its reduction target to 30 % from the binding 20 % target that is already in place.

National Circumstances

Population

- The EU now comprises 27 Member States following the accession of Bulgaria and Romania on 1st January 2007. The EU-27's population has continued to grow, at around 0.3 % per annum, a similar trend as in the 4^{th} National Communication (NC).

Economy

- EU-27 GDP has grown steadily (at around 2.3 % from 1995-2007), driven primarily by strong growth in the services sector.

Energy

- Total primary and final energy consumption grew over the period from 1990-2007 (around 0.5 % per annum), although this has stabilized in recent years.

- The trend reported in the 4th NC of a shift in the primary fuel mix from coal to gas has continued. However, the rate of growth in renewables (driven largely by wind and biomass) has increased from 2002 onwards.

- The EU's dependence on imported fossil fuels has increased more rapidly in the period since the 4th NC, leading to concerns about energy security.

Transport

- The rise in final energy consumption has been driven to a large extent by continued growth in demand for energy in transport.

- Both freight and passenger transport has continued to grow strongly since 1990. Growth in passenger transport is beginning to show a slight decoupling from economic growth.

Land-use, agriculture and forestry

- In general the share of land used for agriculture has declined in most Member States by around 10 % from 1990 to 2005. Forested area (excluding other wooded land) has increased by around 8 % over the same period.

Inventory

- Total GHG emissions in the EU-27 (without LULUCF) decreased by 9.3 % from 1990 to 2007. In the EU-15 total GHG emissions decreased by 4.3 % over the same period. In both EU-27 and EU-15 the biggest relative change has been in the waste sector where the emissions of CH_4 from managed solid waste landfills decreased substantially.

- Averaged over the latest five years, EU-15 emissions (without LULUCF) were 3.1 % below their base year level.

- Emissions of total greenhouse gases decreased by 1.2 % in the EU-27 and 1.6 % in the EU-15 in 2007 compared with 2006. This was largely due to the reduction in CO_2 emissions from the household and service sectors, because of the warmer weather conditions in 2007 compared to the previous year and due to shifts in types of fuel purchased (from 2007 to 2006 and 2008) because of fuel price variations.

Policies and Measures

- Many existing EC-level policies and measures are being strengthened to meet the goals from the integrated package on energy and climate change.

- The EC has made a commitment to reduce greenhouse gas emissions by at least 20 % compared to 1990 by 2020, with a firm commitment to increase this target to 30 % in the event of a satisfactory international agreement being reached.

- The EC has committed to supplying 20 % of total EU gross final energy consumption from renewable sources (including electricity, heat and transport) by 2020, supplemented by a target requiring the share of energy from renewable sources in all forms of transport in 2020 to be at least 10 % of final consumption of energy in transport.

- The EC has committed to a 20 % reduction of total primary energy consumption by 2020, compared to a Business as Usual baseline.

- The EU Emissions Trading Scheme is now into its second phase (2008-2012), strengthened by lessons learned from the first (2005-2007). Further strengthening and expansion is planned for Phase III, including the incorporation of the aviation sector into the scheme (already from 2012).

- Recent developments include also new legislation concerning reduction of GHG emissions from sectors not covered by the EU ETS, carbon capture and storage, emission performance standards for new passenger cars, production of transport fuels and energy-efficient road transport vehicles.

- A successful conclusion to the international climate change negotiations at Copenhagen in December 2009 is a key priority for the EC.

Projections

- Under the Kyoto Protocol, the EU-15 has adopted a target to reduce emissions by 8 % on average between 2008 and 2012, compared to base-year emissions. Emissions of GHG in the EU-15 are projected to be 7.5 % below base year emissions in 2010 (existing measures reduce emissions by 320 Mt against base year emissions of 4266 Mt). The implementation of additional measures is projected to reduce EU-15 emissions to 9.2 % below base year emissions (additional measures reduce emissions by a further 73 Mt against base year emissions) in 2010. EU-15 emissions in 2010, considering the expected impact of domestic policies and measures, are therefore projected to be 1.2 percentage points below the Kyoto target in 2010.

- The intended use of flexible mechanisms by the EU Member States is expected to increase the projected emission rights for the EU-15 in the commitment period by a *further* 2.2 % against base year emissions to 94.2 % (93 Mt), while use of carbon sinks is expected to increase this *further* by 1.0 % to 95.2 % (42 Mt) against base year emissions. In addition the acquisition of emission credits stemming from flexible mechanisms by the EU ETS operators is expected to increase the projected emission rights in the commitment period by a *further* 1.4 % to 96.6 % (61.2 Mt) against base year emissions.

Illustration - 1-1 Greenhouse gas emissions and projections in the EU-15 (excluding LULUCF) for the 'with measures and 'with additional measures' scenarios, EU-15 1990 – 2020

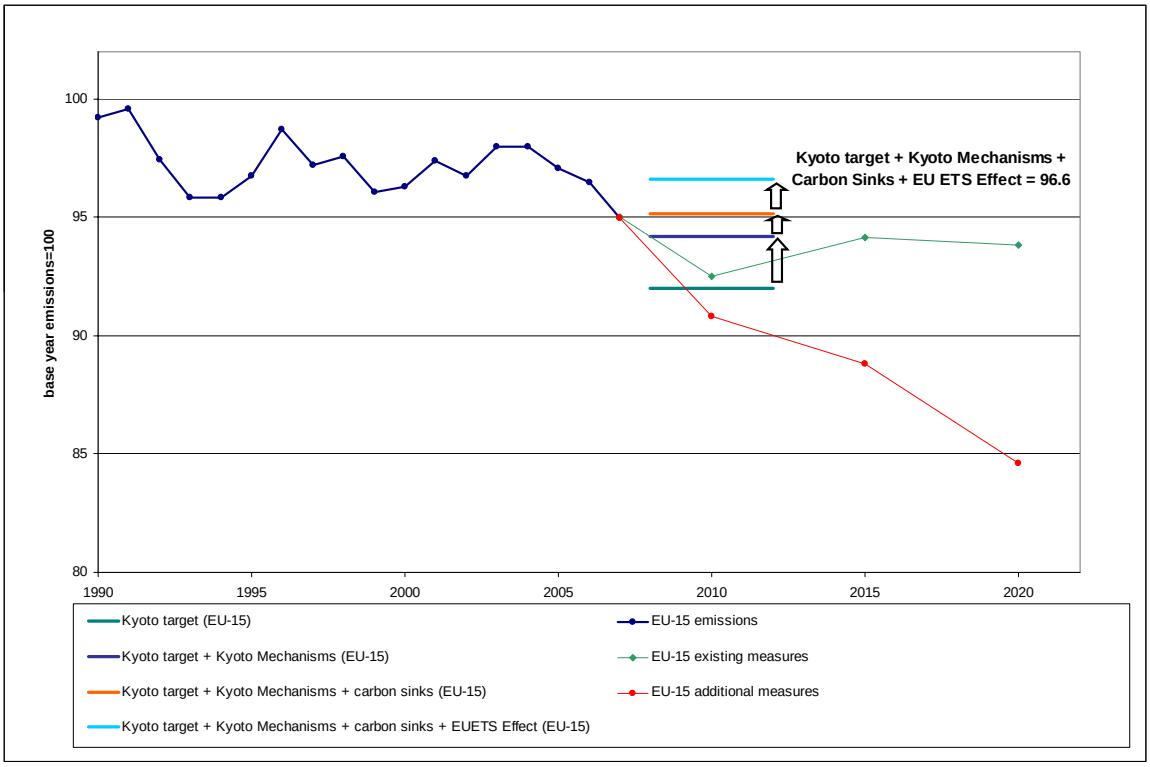
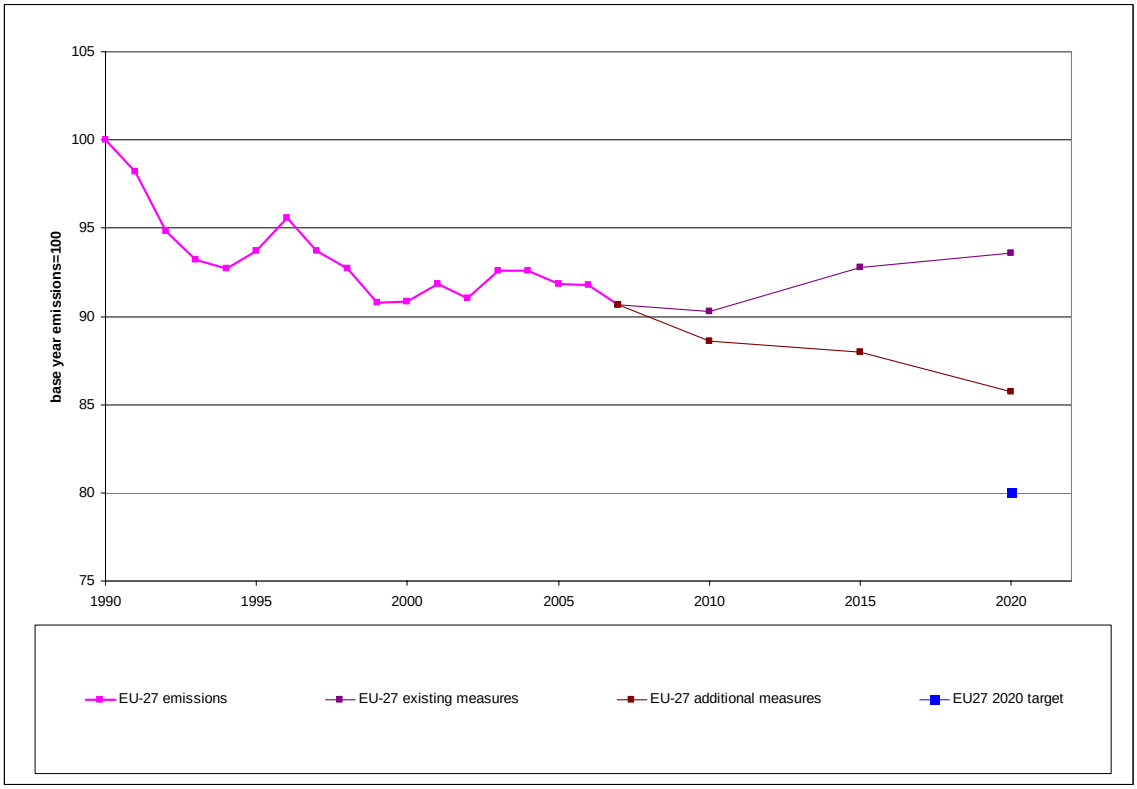


Illustration – 2 Greenhouse gas emissions and projections in the EU-27 (excluding LULUCF) for the 'with measures and 'with additional measures' scenarios



Note: The index on the vertical axis refers to the base year for the EU-15, that is 1990 emissions for CO_2, CH_4 and N_2O and 1995 emissions for the F gases (with the exception of Austria, France and Italy where the base year for F gases is 1990). This means that the value for 1990 is not exactly 100 for the EU-15. As the EU-27 does not have a collective Kyoto target and therefore no collective base year, the index on the vertical axis refers to 1990 emissions for the EU-27.

- Considering Member States' intended use of Kyoto mechanisms, carbon sinks and EU ETS effect, in addition to the effect of domestic measures, the EU-15 is expected to overshoot its target by 5.8 percentage points in 2010 (with emissions projected to be 3677 Mt).

- Emissions of GHG in the EU-27 are projected to be 9.7 % below 1990 levels in 2010 as a result of implemented measures and 11.4 % below 1990 levels in 2010 when planned measures are also considered.

- EU-27 emissions are currently projected to be 6.4 % below 1990 levels in 2020 under the "with existing measures" scenario and 14.3 % below 1990 levels under the "with additional measures" scenario, compared to the EU's target to reduce emissions by 20 % compared to 1990. However, most Member States (16) have not yet accounted for the EU's 2020 Climate and Energy Package in their projections estimates.

- 20 Member States have not considered the impact of the financial crisis in their latest projections estimates.

Impacts, Vulnerability and Adaptation

- Since the 4th National Communication, there has been much progress on assessing the impacts of climate change and developing adaptation policy in Europe.

- The Fourth Assessment Report (4AR) of Intergovernmental Panel on Climate Change (IPCC) issued in 2007 provided conclusive evidence that climate change is caused by man made emissions of greenhouse gases and provided new impetus to climate change research and policy development in Europe. European researchers have made a significant contribution to this effort by supporting the process and providing new scientific evidence that has fed in to the assessment.

- Since the IPCC 4AR publication, greater rates of change have been observed. Reports by the European Environment Agency (EEA), the EC Joint Research Centre (JRC-IES) and EC funded projects from the Framework Programme for Research have provided new evidence that climate change will have significant implications across Europe and beyond. A number of new research programmes are being funded to improve our understanding of adaptation.

- The EC has adopted a more coordinated approach on policy development and has published a White Paper on adaptation to climate change to define the policy direction of the EC in the forthcoming years. The EC is currently working on the design of an Adaptation Framework to reduce the EU's vulnerability to the impacts of climate change. This framework will complement and strengthen the actions taken by the EU Member States. The White Paper on Adaptation was released in April 2009.

- The EC has advanced a number of initiatives to support developing countries in their efforts to adapt to climate change. For instance, the Global Climate Change Alliance, launched in 2007 to deepen cooperation between the EC and developing countries, renews the EC's commitment to mainstream climate change into development cooperation and provides technical and financial support for adaptation in the Least Developed Countries (LDCs) and Small Island Developing States (SIDS).

- The European Commission is developing a European "Clearing house" of the most up-to-date and state-of-the-art information - an IT tool and database on climate change impact, vulnerability and best practices on adaptation.

- Adaptation to climate change is hampered by large uncertainties in the future climatic conditions – precipitation, sunshine, temperature – at a local level. A long-term sustainable system for observing the planet is a necessary condition for reducing these uncertainties. The EC is in the process of setting up such a system through the Global Monitoring for Environment and Security initiative[2] and the European Marine Observation and Data Network[3]

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[2] Global Monitoring for Environment and Security (GMES): we care for a safer planet Brussels, 12.11.2008, COM(2008) 748 final

[3] Building a European marine knowledge infrastructure: Roadmap for a European Marine Observation and Data Network, SEC (2009) 499 (final), 4th April 2009

Financial Resources and Transfer of Technology

- Since the 4th National Communication, more accurate and detailed categorisation of the nature of climate change projects have been used to provide a clearer picture of the level of financial contributions dedicated to different climate change activities, with increased use of the Rio Markers to identify the climate change element in projects.

- EC financial contributions[4] from external cooperation programme development projects related to climate change in developing countries have steadily increased from €160 million in 2004 to €318 million in 2007[5]. These projects are not Clean Development Mechanism projects.

- The importance of actions on adaptation to climate change has continuously grown, as indicated by the increasing financial resources[6] committed to this area.

- The Communication 'Stepping up international climate finance: A European blueprint for the Copenhagen deal', adopted on 10th September 2009 presents a blueprint for scaling up international finance to help developing countries combat climate change. It recognises that the financing issue is central to prospects for reaching an ambitious agreement in Copenhagen.

- There are a number of new financial mechanisms and initiatives to support this increased focus on climate change, such as the Global Energy Efficiency and Renewable Energy Fund (GEEREF), the Global Climate Change Alliance (GGCA) and the EU-ACP Energy Facility, the latter of which has a different scope but contributes equally significantly to the fight against climate change.

- Climate change kept a prominent role within the (7th) European Framework Programme for Research, including a number of initiatives and projects having the specific objective of assisting developing countries with climate change related issues. Institutions from non-Annex I Parties benefited from €19.3 million of EC funding for research activities since 2004.

Research and Systematic Observation

- Since the 4th National Communication, there have been key developments in climate change research at the EC level, particularly in the 7th Framework Programme (FP7) for Research and Technological Development which started in 2007:

- The total budget of FP7 amounts to €50.52 billion over the period (2007-2013) which represents an increase of 65 % compared to FP6 budget in average annual terms. The structure of FP7 is larger and more integrated,

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4 From funding from European Commission - DG AIDCO project database.

5 These figures include funds directed to three (Russia, Ukraine and Turkey) Annex I countries (UNFCCC), where an EU instrument covers both non-Annex 1 and Annex 1 countries. For 2004, this amounts to €3.95m, for 2005 it amounts to €2.8m, for 2006 it amounts to €4.3m and for 2007, it amounts to €22m

6 These figures represent the projects that are adaptation specific and do not include mitigation projects that also have an element of adaptation. Consequently, the total figure for all adaptation activities is likely to be higher.

with four main areas – “Cooperation”, “People”, “Ideas”, and “Capacities” (with a fifth, Euratom €2.75 billion, dedicated to nuclear research). Sustainable development has been mainstreamed as a component and objective of all EC research.

- The main area , “Cooperation” (64 % of FP7 budget), consists of ten themes, comprising “Environment (including climate change)”[7]which is granted €1.89 billion over the period 2007-2013, and of which 14 % funded since 2007 is related to climate research projects. on the climate system, the understanding of the impacts of climate change and the identification of options for mitigation and adaptation.

- Research projects funded in themes such as Space and Global Monitoring for Environment and Security (GMES), Energy, Transport, Agriculture and Fisheries in the "Cooperation" component of FP7 contribute to research on the climate system, the understanding of the impacts of climate change and the identification of options for mitigation and adaption. Additional climate relevant research projects are granted in the “People”, “Ideas”, and “Capacities” components of FP7. Since 2003, expenditures on climate research in the EC Framework Programme are estimated to nearly €570 million.

- Research projects funded in the areas of GMES (€1.43 billion in FP7), Energy (€2.35 billion), Transport (€4.16 billion), Agriculture and Fisheries (€1.93 billion) are instrumental to supporting research relevant to the implementation of mitigation and adaptation measures including the development of relevant technologies. A large proportion of the research undertaken in those areas relates the reduction of GHG emissions.

- The European Union has adopted a strategic plan to accelerate the development and deployment of cost-effective low carbon technologies through joint strategic planning and a more effective implementation of programmes.

- Under the Strategic Energy Technology Plan (SET-Plan), adopted in 2007, research into low-carbon technologies is focussed on those technologies that can best support achieving the EU's "20-20-20" targets (20 % more energy efficiency, 20 % more renewables, 20 % less GHG emissions) by 2020. The SET-Plan calls primarily on FP7 ("Energy") funds. Beyond standard FP7 contributions, in 2009, wind (€565 million) and CCS (€1050 million) research have additional approved budget under the European Economic Recovery Plan, to be used by end 2010. Further proposals for supplements to the SET-Plan funding are in the pipeline.

[7] Under FP6, climate change research was funded mainly under the thematic sub-priority area “Sustainable development, global change and ecosystems”. Specific measures in support of "international cooperation" also supported a large number of international collaborations in relation to environmental and ecosystem sustainability and food security issues of direct relevance to climate change in developing countries.

- Under FP7, a new tool - known as Joint Technology Initiatives (JTIs)[8] – that combines private sector investment and/or national and European public funding has been introduced. The Clean Sky, and Hydrogen and Fuel Cell JTIs directly aim at reducing GHG emissions in aeronautic, surface transport and stationary applications.

- In FP7 international cooperation has been mainstreamed, with any third country researcher or institution being able to participate in FP7 calls. In addition, under the cooperation programme, there are projects dedicated specifically to international cooperation. So far about 6 % of all participants are from third countries, including developing countries.

- Climate research undertaken in the EC Joint Research Centre (total budget of €1.75 billion in FP7) provided support EC climate change policies and enhancement of scientific knowledge on climate change.

- Last, the European Research Council (ERC) has been established, with the aim of encouraging groundbreaking science proposed by leading researchers themselves. ERC, which will effectively work as a national research council at the EC level, will also take responsibility for project implementation.

Education, Training and Public Awareness

Major developments that have occurred in the EC since the 4th National Communication include:

- Major developments that have occurred in the EC since the 4th National Communication include:

- Public awareness campaigns on climate change:

- Climate Change Campaign (2006-2009)

- Sustainable Energy Europe Campaign (2005-2011)

- Climate Action Programme (2007-2009)

- Covenant of Mayors on energy and climate (2008 onwards)

- New Lifelong Learning Programme (2007-2012) with an increasing number of education and training projects related to climate change

- Eurobarometer survey on Europeans' attitudes towards climate change (2008)

- Eco Agents website for children (2008 onwards)

- Development of a large range of online resources and tools to raise public awareness and educate on climate change

The full text of the EC's 5th National Communication is included in the Staff Working Document consisting of four volumes (Part 1, 2a, 2b and 3).

[8] The dedicated structures implementing the JTIs are independent legal entities, with a dedicated budget and staff. The European Commission is a founding member of each JTI and enjoys a veto right on a number of pre-defined items.

2. INTRODUCTION

This document represents the European Community's (EC) 5th National Communication (NC) required under the United Nations Framework Convention on Climate Change (UNFCCC). It provides a comprehensive overview of climate change-related activity at the EC level. The 27 Member States of the European Union submit separate NCs to the UNFCCC, however, in the EC's submission the chapters on Greenhouse Gas Inventory Information (see section 4) and Projections and the Total Effect of Policies and Measures (see section 6) reflect the sum of information compiled across the Member States.

A summary table outlining the location of supplementary information required under Article 7, paragraph 2, of the Kyoto Protocol within this National Communication is provided in Appendix I.

As part of the preparation of the European Community's 5th National Communication (NC) a 6 week consultation was held from end of March to beginning of May 2009. This invited feedback from European organisations with a relationship to the climate change agenda, to help enhance the quality of the new NC. Ten responses were received as part of the exercise.

An online questionnaire asked stakeholders the following questions:

1. What did the European Commission report well in the Fourth National Communication?

2. What would your organization have liked to have seen reported differently in the Fourth National Communication? Do you have any specific suggestions for improvements?

3. Does your organization have access to particular information that you believe could add value to the Fifth National Communication, noting that the primary information in the Fifth National Communication must come from official EU sources.

4. Does your organization have illustrative examples of recent European activities on climate change?

5. Please make a statement about your view of the recent progress of EU Climate Change policy (either in general or on a specific aspect most relevant to your organization).

The responses to question 1 highlighted the comprehensiveness of the document and its usefulness in communicating the wide-range of EC activity on climate change and so this has been maintained in the 5th NC.

The responses to question 2 provided a small number of potential improvements to the 4th NC. Some of these were not possible to include directly within the 5th NC as, for example, they were based on non-official sources of information. However, where possible they have been incorporated, for example, with respect to the presentation of additional information in tables and figures.

Similarly, the responses to question 3 provided a range of suggestions for additional information, but many of these were not from official sources. However, information

from a small number of EC commissioned studies (e.g. on climate change and unemployment) that had not been included in earlier drafts of the 5th NC was subsequently added.

The responses to questions 4 and 5 are most relevant within the context of EC policies and measures and so are discussed in section 5.11.

3. NATIONAL CIRCUMSTANCES RELEVANT TO GREENHOUSE GASES

Key developments

Population

- The EU now comprises 27 Member States following the accession of Bulgaria and Romania on 1st January 2007. The EU-27's population has continued to grow, at around 0.3 % per annum, a similar trend to the 4th NC.

Economy

- EU-27 GDP has continued to grow steadily (at around 2.3 % from 1995-2007) and at a similar rate to the 4th NC. This has been driven primarily by strong growth in the services sector.

Energy

- Total primary and final energy consumption grew over the period from 1990-2007 (around 0.5 % per annum), although this has stabilized in recent years.

- The trend reported in the 4th NC of a shift in the primary fuel mix from coal to gas has continued. However, the rate of growth in renewables (driven largely by biomass and waste) has increased from 2002 onwards. A similar trend can be seen in the fuel mix for electricity generation, with renewables now contributing 16 %.

- EU-27 per capita energy consumption grew over the period from 1990 to 2003, but has started to decline slowly from this point. By comparison, the gradual decline in energy primary energy intensity from around 1996 onwards has continued.

- The EU's dependence on imported fossil fuels has increased more rapidly in the period since the 4th NC, leading to concerns about energy security.

Transport

- The rise in final energy consumption has been driven to a large extent by continued growth in demand for energy in transport.

- As reported in the 4th NC both freight and passenger transport has continued to grow strongly since 1990. Growth in freight transport has exceeded GDP growth in recent years, however growth in passenger transport is beginning to show a slight decoupling from economic growth.

Land-use, agriculture and forestry

- In general the share of land used for agriculture has declined in most Member States by around 10 % from 1990 to 2005. Forested area (excluding other wooded land area) has increased by around 8 % over the same period.

3.1. Introduction

This chapter documents the national circumstances of the European Community (EC). It illustrates a number of key characteristics that relate directly or indirectly to the greenhouse gas emissions and include energy, transport, land use, climatic conditions and trade patterns. The chapter analyses how these various factors have influenced greenhouse gas emissions to-date and how the historic trends observed might influence emissions going forward.

Data is reported as the aggregate of the Member States which comprise the European Union (EU), both the EU-15 and EU-27[9] (where data is available), as the former has a collective emissions reduction target under the Kyoto Protocol. Information is also reported at the Member State level where appropriate.

The 4th National Communication focused primarily on the period from 1990 to 2002. This communication extends the analysis to the most recent years for which data is available (generally 2005 to 2007), changes in trends since 2002 are highlighted. A number of additional indicators have also been included[10]:

- An updated average EU temperature profile map (section 3.5)
- GDP (Gross Domestic Product) in PPS (Purchasing Power Standards) across EU Member States (section 3.6.1)
- Primary energy intensity (GDP in PPS) and per capita consumption across Member States (section 3.7.1)
- Share of renewable energy in final energy consumption by Member State (section 3.7.2)
- Change in end-user energy prices (section 3.7.4)
- Level of car ownership across Member States (section 3.8.2)
- Road transport fuel prices and tax levels (section 3.8.3)
- Decomposition of drivers of the change in household energy consumption (section 3.11)
- Per employee and per m^2 energy consumption in the services sector (section 3.11)
- Index of EU-15 nitrogenous fertilizer consumption and livestock numbers per capita (section 3.12)

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9 The *EU-15* comprises the Member States: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, Ireland, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom.
The *EU-27* comprises the Member States of the EU-15 and: Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia
In some cases, due to data availability, the *EU-25* is referred to – this is as per the EU-27 but excluding Bulgaria and Romania.

10 In other cases, the information in previous indicators has been expanded or consolidated within other indicators.

3.2. Government Structure

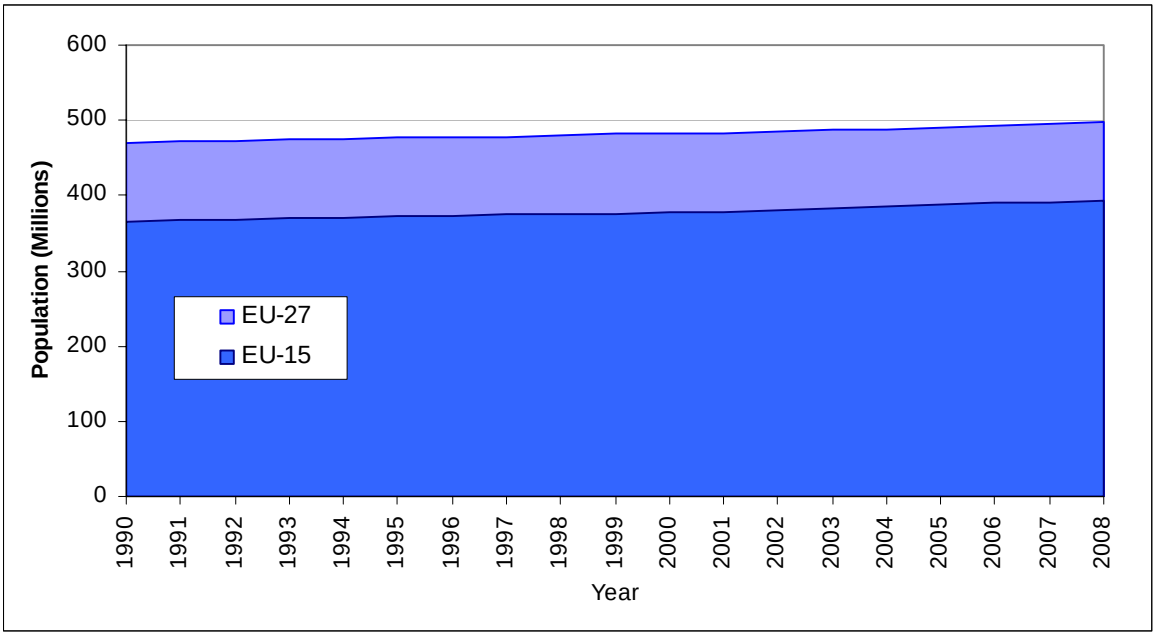
The European Union's institutional system is unique. The Member States (of which there are currently 27) delegate sovereignty for certain matters to independent institutions, which represent the interests of the Union as a whole, its member countries and its citizens[11]. Each national government is represented within the Council of the European Union and its citizens directly elect the European Parliament. The European Commission is the executive body of the Union and is responsible for drafting and implementing legislation. It also represents the Union on the international stage and negotiates international agreements, chiefly in the field of trade and co-operation. The structure is described in detail in the 3rd National Communication.

The sixth enlargement to the EU took place on 1st January 2007 with the accession of Romania and Bulgaria.

3.3. Population Profile

In general, aggregate increases in population in the EU will be drivers for increasing consumption, energy use and greenhouse gas emissions. Over the last 18 years the EU-27's population has increased steadily by an average of 0.3 % annually. The total population increase compared to 1990 is a 5.8 % increase. There is a similar trend in the EU-15 countries, with an annual average increase of around 0.4% over the same period. The trend has not changed significantly since the 4th NC. Trends in per capita GHG emissions are shown in section 4.2.6.

Illustration 3-1 Aggregate EU-27 population



Note: Population on 1st January of each year. Data for population in French overseas territories in 1990 is not available from Eurostat. This has been added based on data from the French statistical office INSEE.

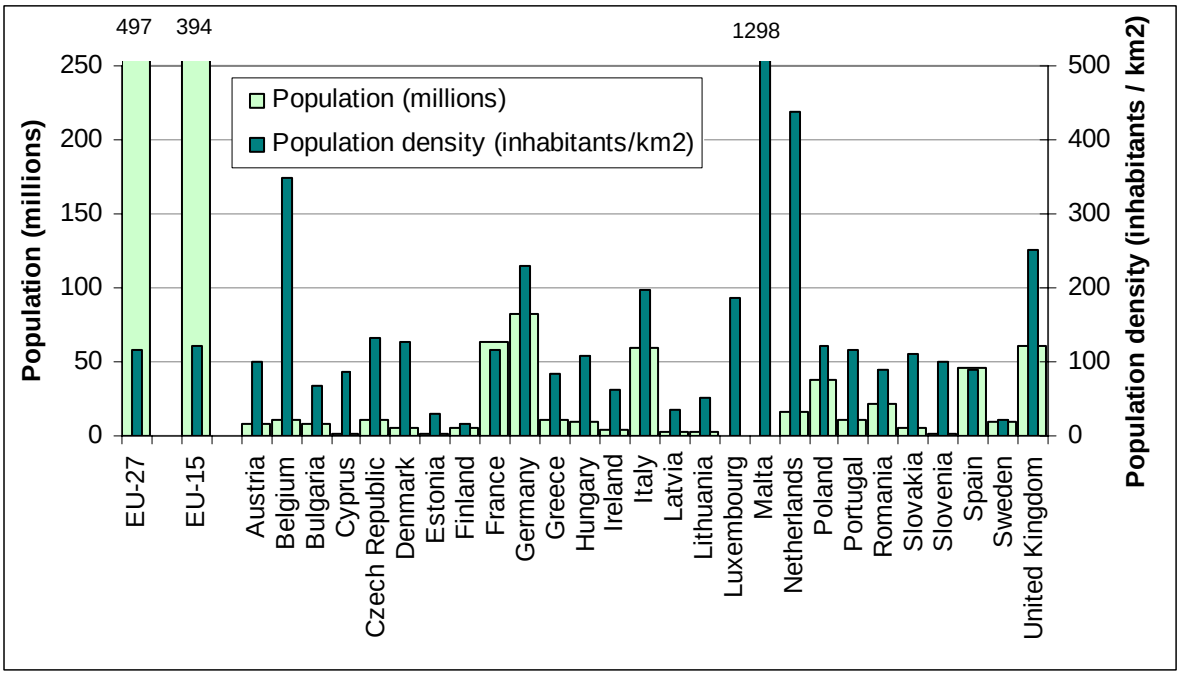
Source: Eurostat

11 http://europa.eu/institutions/index_en.htm

Populations of Member States vary considerably, between 0.4 million for Malta and 82.2 million for Germany. In addition, population density varies between 15.7 inhabitants/km^2 in Finland to 1,298 inhabitants/km^2 in Malta. The four most populous states (Germany, France, the United Kingdom and Italy) all have population densities of over 100 inhabitants/km^2.

Most EU Member States have a relatively high population density when compared to other Parties to the UN Convention. As higher population densities have implications for settlement and building patterns, this leads to differences in energy consumption and a tendency for shorter transport distances. However, shorter transport distances in turn facilitate economic integration among communities and regions, resulting in a tendency for higher transport intensity. So in this respect population density can have both a positive and negative impact on greenhouse gas emissions.

Illustration 3-2 EU Member State population and population density, 2008



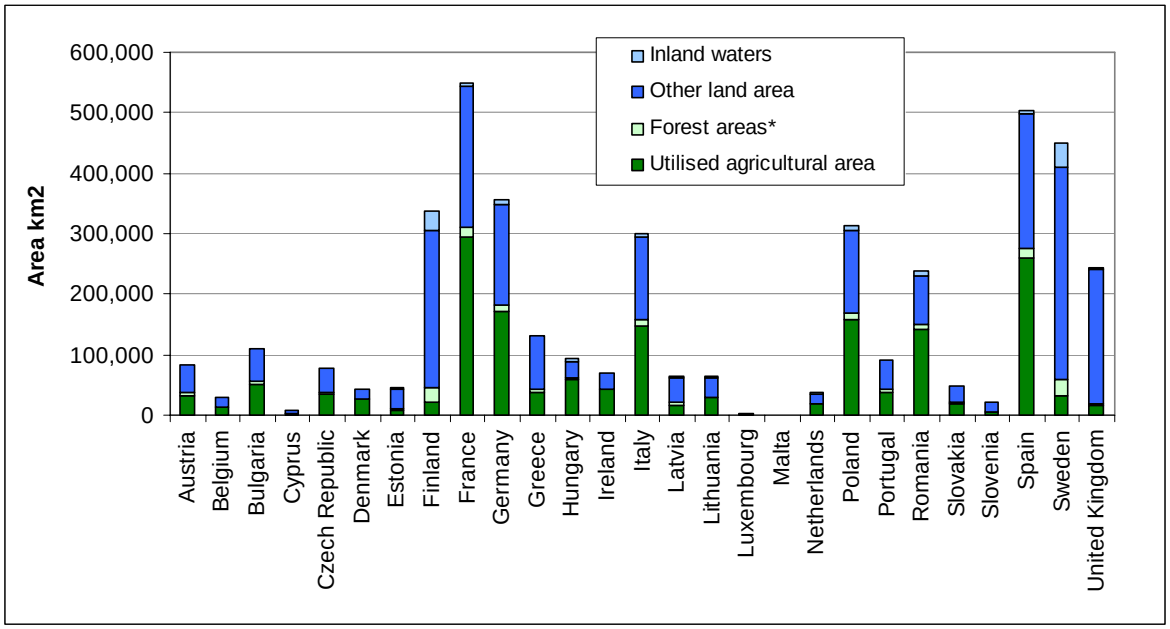
Note: Population on 1st January of each year.

Source: Eurostat

3.4. Geographic Profile

Total land area and its use varies widely across the EU. The proportion of land that is used for agricultural purposes varies throughout the Member States, from as low as 7 % in Finland to 66% in the United Kingdom in 2005. Furthermore, how the agricultural land is used also varies widely between Member States. Agriculture generates significant greenhouse gas emissions, this is discussed in more detail in Section 3.12. Forest and other wooded areas are also important for greenhouse gas emissions in terms of their role as carbon sinks, see section 3.13 for further details. Changes in land-use will be driven to some extent via policy actions in the agricultural sector (see section 5.7), particularly the Common Agricultural Policy as well as those in the forestry sector (see section 5.8).

Illustration 3-3 Land use patterns in the EU by Member State, 2005



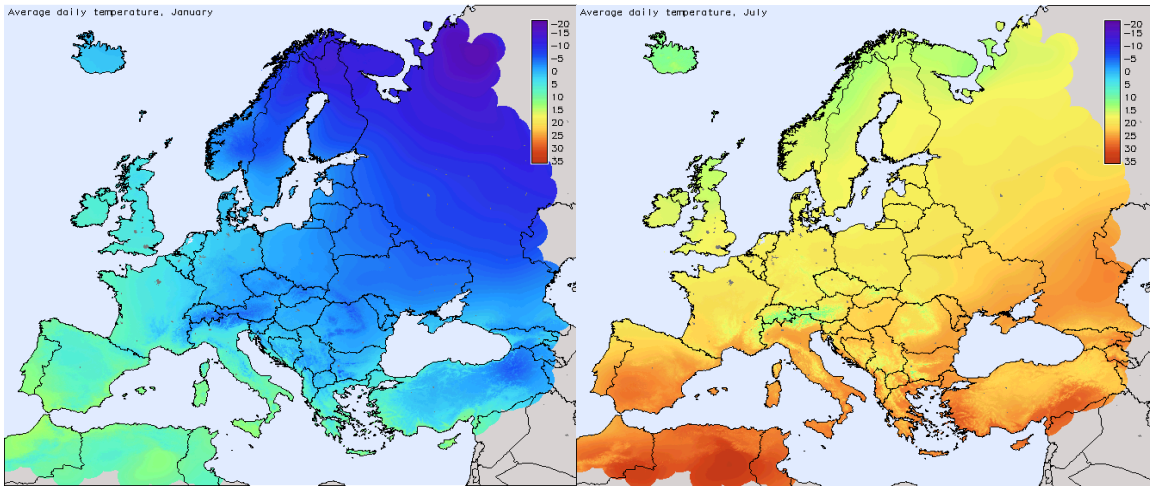
Note: Forest areas excludes Other Wooded Land given overlap in some definitions between this and Utilised Agricultural Area, see section 3.13 for further data. For consistency, 2005 data have been used as far as possible (N.B. there is negligible difference in total land area between years). In some cases gap filling is necessary, Utilized agricultural area for the UK and Bulgaria are based on 2003 and 2006 data respectively – see section 3.12 for further details on agriculture. Inland water area for Germany and Portugal are based on 2001 data.

Source: Eurostat, UNECE Forestry Statistics

3.5. Climate Profile

EU Member States close to the Atlantic Ocean or the North Sea generally experience relatively low temperature variations between summer and winter and relatively high rainfall. By contrast, Scandinavian countries (i.e. Denmark, Finland and Sweden) tend to have mild summers and cold winters. The central European States have mild winters and mild summers, with more continental climatic conditions further east. The countries bordering the Mediterranean Sea (Spain, France, Italy, Malta, Slovenia and Greece) generally have a hot, dry summer climate and mild, often rainy winters, although there are differences between regions.

Illustration 3 - 4 Average daily EU temperature in January and July (1995-2006)



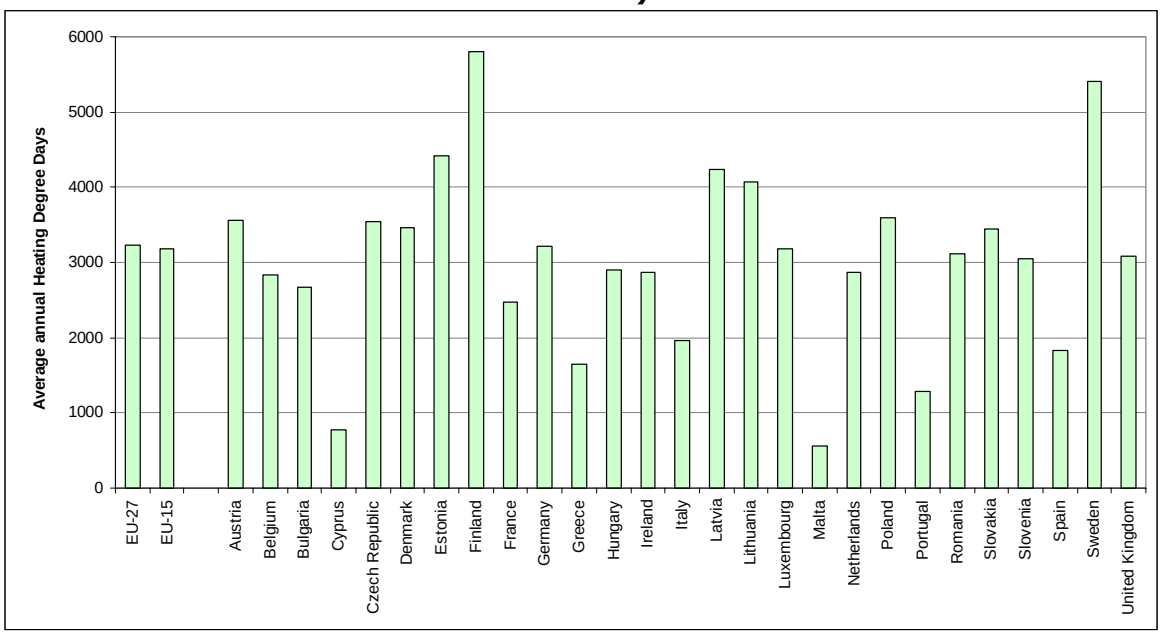
Source: PVGIS © European Communities, 2001-2008[12]

The energy requirements and emissions in both winter months (for space heating) and summer months (for air conditioning) vary according to the temperature. The figure above illustrates the average daily temperatures in January and July, and the figure below shows the average annual number of heating degree days in each Member State. Requirements for space heating are particularly high in the northern and eastern Member States, whilst in summer months the Southern and Eastern states will often experience average temperatures of more than 25 degrees Celsius. Tracking of cooling degree days[13] will also become of increasing importance, particularly given the demand this places on electricity consumption for space cooling. In some countries, such as Greece, peak electricity demand tends to occur in summer months whereas for the majority of others it is still over the winter period.

12 Huld T.A., Šúri M., Dunlop E.D., Micale F., *2006*. http://dx.doi.org/10.1016/j.envsoft.2005.07.010 Estimating average daytime and daily temperature http://dx.doi.org/10.1016/j.envsoft.2005.07.010 Profiles within Europe http://dx.doi.org/10.1016/j.envsoft.2005.07.010 Environmental Modelling & Software, 21, 12, 1650-166, http://re.jrc.ec.europa.eu/pvgis/

13 EU-27 data is generally more limited at present.

Illustration 3 -5 Average annual heating degree days by Member State (1980 to 2007)



Note: ADD: Actual heating degree-days express the severity of the cold in a specific time period taking into consideration outdoor temperature and room temperature. To establish a common and comparable basis, Eurostat defined the following method for the calculation of heating degree days (18 °C - Tm) x d if Tm is lower than or equal to 15 °C (heating threshold) and are nil if Tm is greater than 15 °C where Tm is the mean (Tmin + Tmax / 2) outdoor temperature over a period of d days. Calculations are to be executed on a daily basis (d=1), added up to a calendar month -and subsequently to a year- and published for each Member State separately.

Source: Eurostat

In addition, as noted in the 4th National Communication, the base year for Kyoto reduction commitments was relatively warm compared to the long-run average temperature. If the first commitment period (2008-2012) conforms to the long-run average there may be additional pressure on emissions due to higher heating requirements.

3.6. Economic Profile

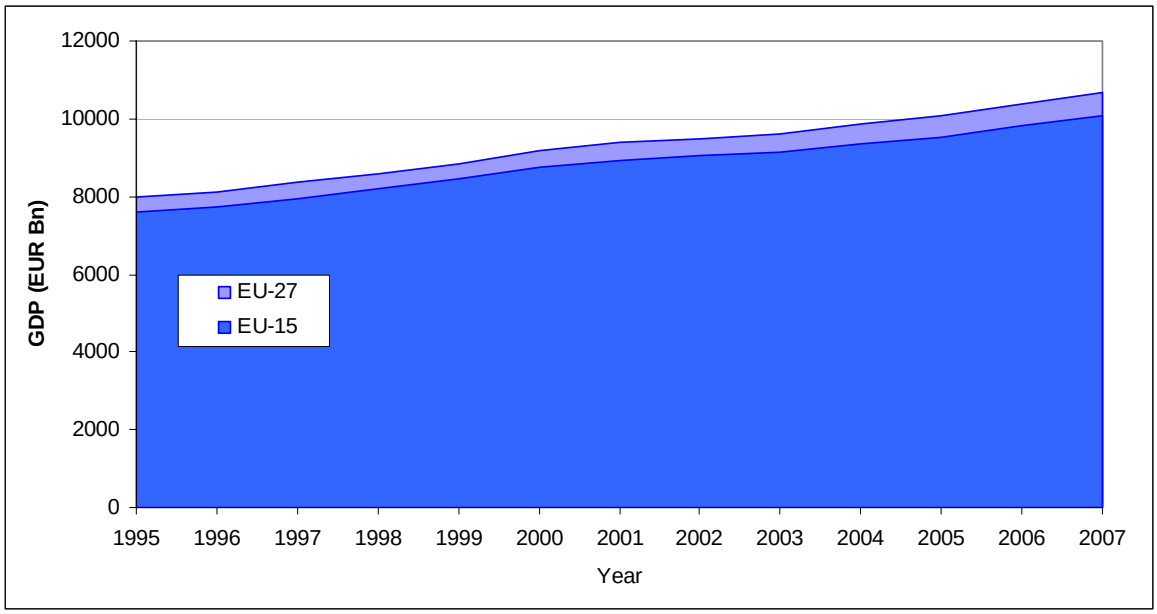
The economic profile of a country has a strong link to greenhouse gas emissions, with the overall level and types of economic activity, strongly correlated to energy use. However, this is also dependent on factors such as energy efficiency and the structure of the economy. Trends in these key economic factors are discussed below with the overall impact on energy intensity discussed in Section 3.7.

3.6.1.*Changes in Overall Gross Domestic Product (GDP)*

For the EU-27, GDP has increased 34 % (in absolute terms) from 1995 to 2007. When looking only at the EU 15 states, GDP has roughly followed the same pattern as the wider EU-27 with an overall increase in GDP of 32 %. The EU-15 countries account for around 94 % of all EU GDP. The trend in economic growth has not changed

significantly since the 4th NC, although the graph obviously does not account for the most recent economic changes in 2008/2009.

Illustration 3- 6 Development of GDP over time

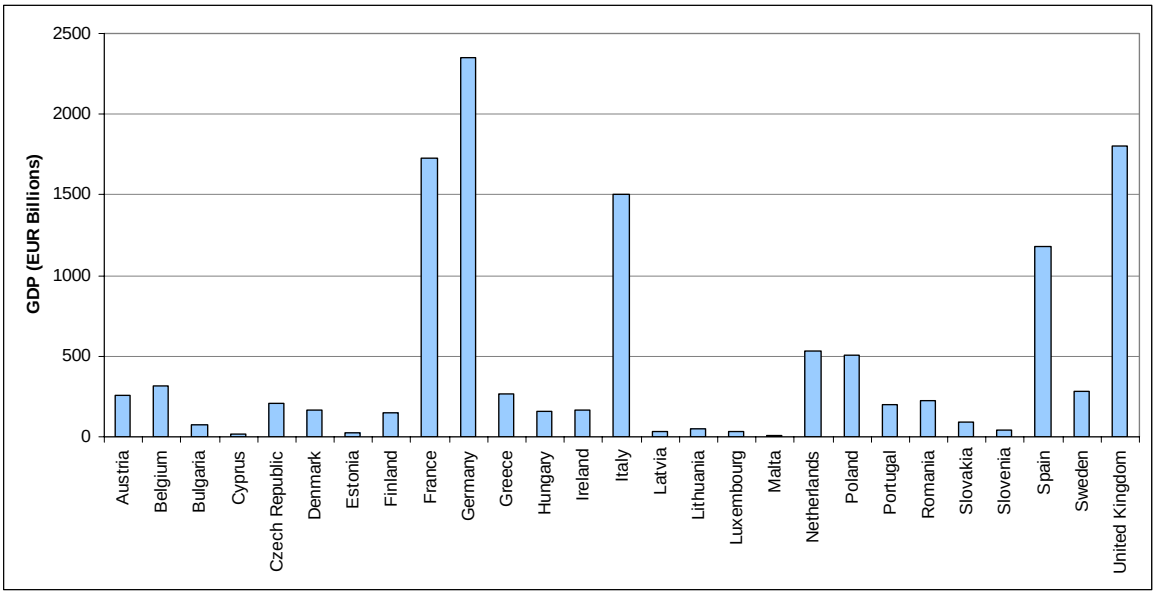


Note: Figures in chain-linked volumes, reference year 2000 (at 2000 exchange rates). Data for all Member States is not available prior to 1995.

Source: Eurostat (Data Explorer)

The chart below shows GDP in purchasing power standards (PPS). This provides a better comparison of the potential for total consumption in each country (based on the purchasing power for a "representative" basket of goods and services). France, Germany, Italy, Spain and the United Kingdom have significantly higher PPS than other Member States. This will allow for greater consumption within these countries and consequently a trend toward higher greenhouse gas emissions.

Illustration 3- 7 GDP in PPS (purchasing power standards) across Member States, 2007



Source: Eurostat

3.6.2. *Development of Economic Sectors*

The sectoral breakdown of the EU, in terms of the relative shares of Gross Value Added (GVA) across the sectors, has not changed significantly since the last National Communication. Emissions can vary significantly across sectors due to their transport and energy intensities, which tend to be higher and lower in services, respectively, compared to industry. A more detailed breakdown for GVA in industry is given in Section 3.9.

Table 3-1 Gross value added (at basic prices) of main economic sectors

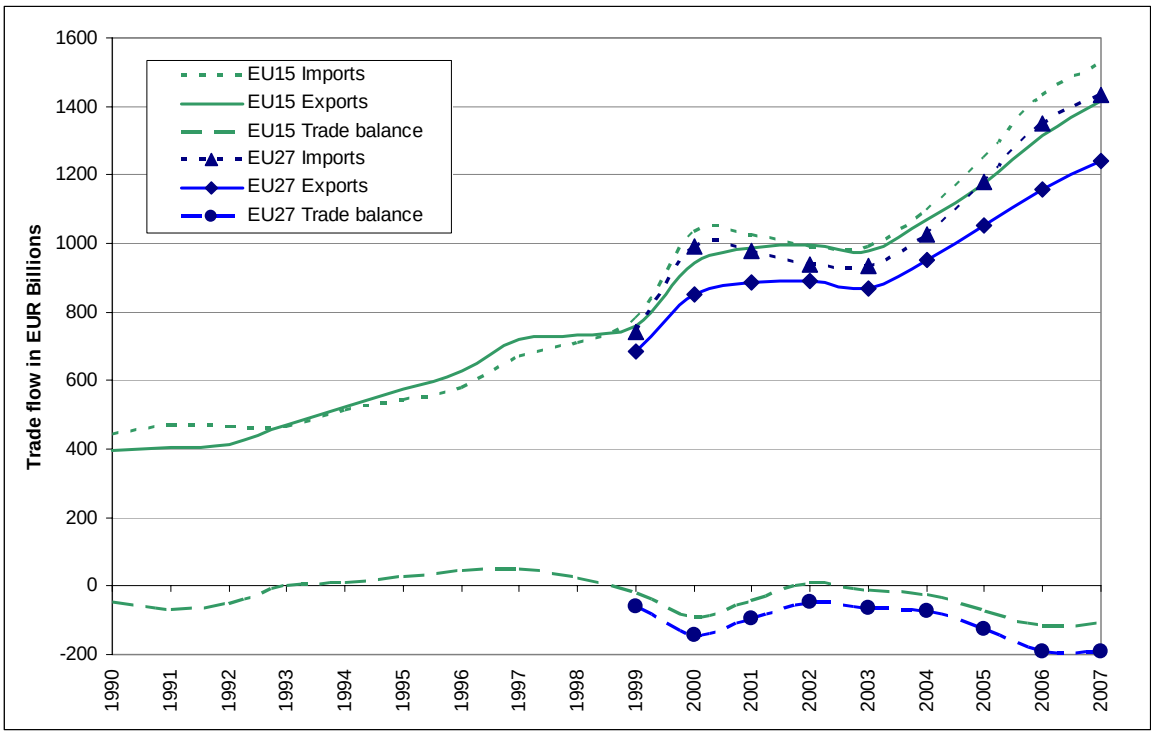
Unit = € Billion	EU-15				EU-27			
Branch	**1995**	**%**	**2007**	**%**	**1995**	**%**	**2007**	**%**
All branches – Total	6796	100%	9002	100%	7126	100%	9544	100%
Agriculture, hunting, forestry and fishing	154	2 %	167	2 %	177	2 %	191	2 %
Total industry (excluding construction)	1523	22 %	1926	21 %	1605	23 %	2081	22 %
Construction	424	6 %	488	5 %	448	6 %	525	5 %
Wholesale and retail trade, repair of motor vehicles, motorcycles and personal and household goods; hotels and restaurants; transport, storage and communication	1397	21 %	1966	22 %	1478	21 %	2116	22 %
Financial intermediation; real estate, renting and business activities	1682	25 %	2520	28 %	1740	24 %	2621	27 %
Public administration and defence, compulsory social security; education; health and social work; other community, social and personal service activities; private households with employed persons	1620	24 %	1932	21 %	1682	24 %	2010	21 %

Note: Figures in chain-linked volumes, reference year 2000 (at 2000 exchange rates). Data for all Member States is not available prior to 1995.

Source: Eurostat

3.6.3. *Trade Patterns*

Illustration 3 - 9 Development of Extra-EU trade



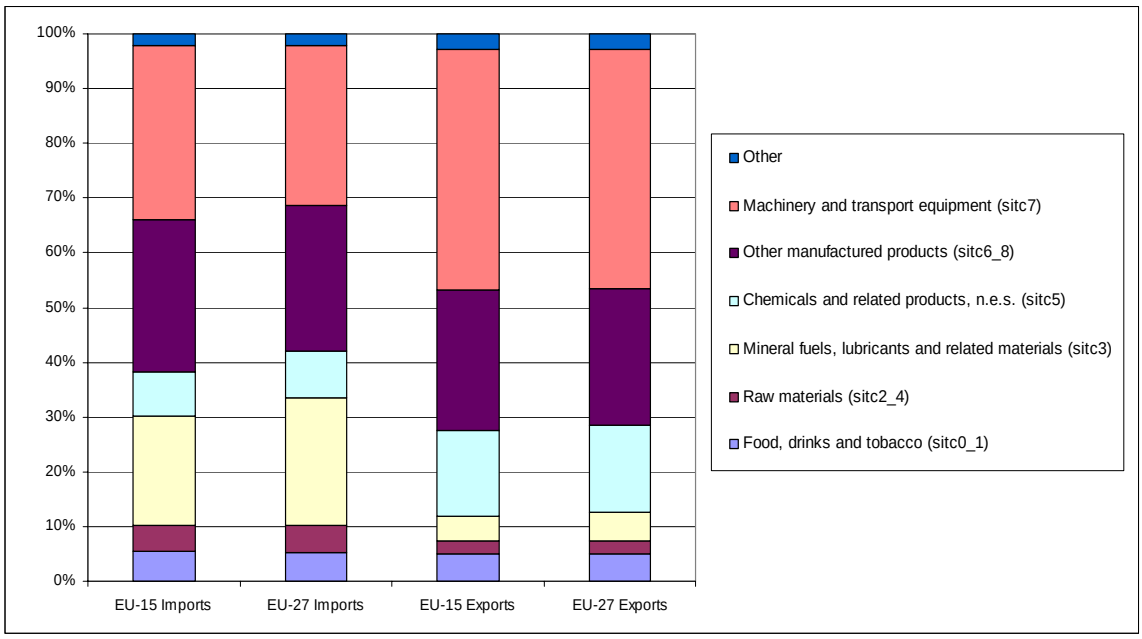
Note: Data for EU-27 is not available before 1999.

Source: Eurostat

Since the late 1990s, the EU has experienced a negative trade balance although the trend reversed slightly in the early part of the 2000s. Since the 4th NC the trade balance has deteriorated again, in particular in 2006 and 2007 imports exceeded exports by approximately €200 billion.

Significant import of goods such as this can be seen as “exporting” emissions – the emissions involved in the manufacture of goods are accounted for outside the EU. Therefore the graph above demonstrates that present trading patterns will have a broadly positive effect on decreasing the EU’s own greenhouse gas emissions, although the exact impact will depend on the composition of imports and exports, which is shown in the figure below.

Illustration 3 - 10 Composition of Extra-EU trade by value in 2007



Note: SITC = Standard International Trade Classification

Source: Eurostat

The graph above shows the percentage (as a proportion of total trade value) of extra-EU-27 trade by SITC (Standard International Trade Classification) category, for imports and separately for exports, in 2007. As in the 4th National Communication manufactured products such as Machinery and transport equipment and Chemicals and related products make up a higher proportion of the EU's exports than they do for its imports. These tend to have lower emissions intensity, given the much higher value added of the products compared to energy use, than mineral fuels, lubricants and related materials and other raw materials, which make up a higher proportion of imports.

3.7. Energy Profile

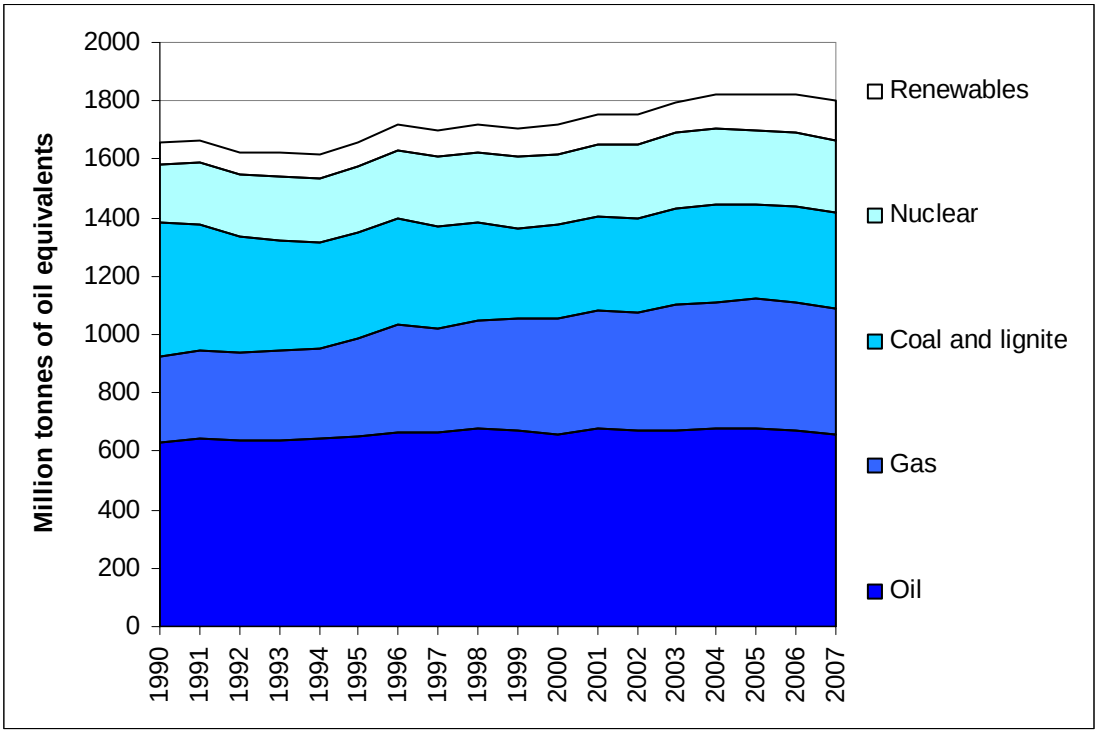
Energy use is the largest source of GHG emissions. The following sections provide a high-level overview of the most relevant factors. The recent "2008 Energy and Environment" report published by the European Environment Agency[14] provides more detail on the key drivers, environmental pressures and impacts from the production and consumption of energy. Climate policy drivers have had some impact on changes in the EU-27 energy system to-date (for-example leading to improvements in energy efficiency or increases in the share of renewables), although to a large extent these have been driven by other factors (e.g. the shift to gas as a result of price differentials with other fuels). Historic trends in GHG emissions from energy-related activities are shown in sections 4.2.3.

However, the impacts of future climate policy in the energy sector (see section 5.4 for further details) are likely to be far more significant, particularly as a result of the new energy and climate package. These will lead to more sizeable shifts in energy use

14 http://www.eea.europa.eu/publications/eea_report_2008_6

towards renewables (and also gas) as well as an overall impact on primary and final energy consumption due to improvements in energy efficiency; these effects should become more noticeable within these indicators in coming years.

Illustration 3 - 11 Primary energy consumption by fuel for EU-27



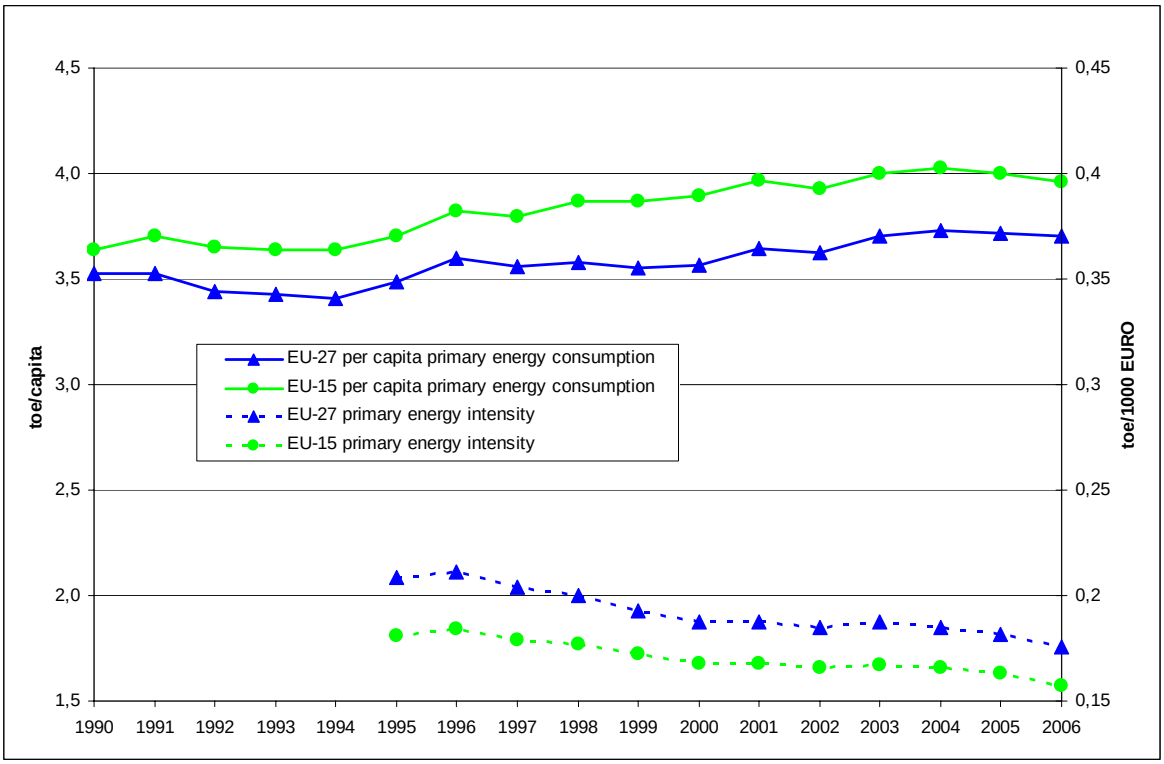
Source: EEA, Eurostat

Total primary energy consumption (see Section 3.7.2 for details of final energy consumption) in the EU-27 rose over the period from 1990 despite continued efforts to improve energy efficiency. However, since the 4th NC total consumption appears to have stabilized slightly in the period from 2004 onwards.

Trends in the consumption of different energy types within the total have changed significantly since 1990 and those trends reported in the 4th NC have broadly continued. Since 1990 there has been a decrease of nearly 30 % in the consumption of carbon intensive coal and lignite. Meanwhile there has been an increase of nearly 50 % in gas consumption which, in comparison to other fossil fuels, produces lower greenhouse gas emissions. The consumption of oil increased by just under 4 % between 1990 and 2007. Renewables have seen the most marked increase with consumption increasing by 93 % from 1990 levels. Consumption of energy generated from nuclear power has also increased by 19 % on 1990 levels.

These increases have had a positive effect on the EU's GHG emissions as shown in section 4.2.3. However, fossil fuels continue to dominate total energy consumption and the share of renewable energy sources remains small despite the increase in use. The overall increase in total primary energy consumption has also acted to counteract some of the environmental benefits from fuel switching.

Illustration 3 - 12 Primary energy intensity and per capita energy consumption

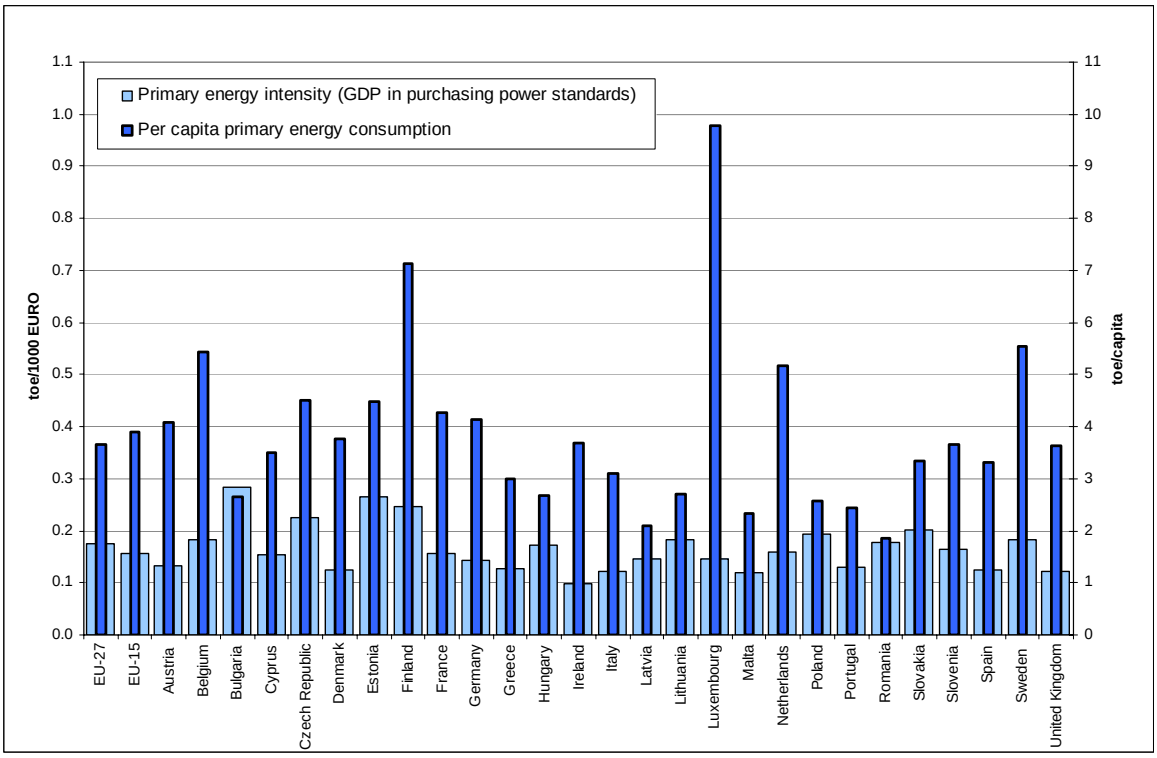


Source: Eurostat

Note: As per section 3.6.1 GDP figures (used to calculate primary energy intensity) are in chain-linked volumes, reference year 2000 (at 2000 exchange rates) - data for all Member States is not available prior to 1995.

The above graph shows primary energy intensity (toe/unit GDP) and per capita primary energy consumption for both the EU-15 and EU-27 Member States from 1990-2007. In comparison to the 4th NC, per capita energy use has actually decreased slightly since 2004. In addition, energy intensity has decreased steadily since 1996 for both the EU-27 and EU-15 states. Both these trends are having a positive impact in reducing greenhouse gas emissions.

Illustration 3 - 13 Primary energy intensity and per capita consumption by Member State in 2007



Source: Eurostat

The above bar graph shows primary energy intensity (toe/unit GDP at purchasing power standards) for each Member State and for the EU as a whole in 2007. The final energy needs of the EU economy represent less than 2/3 of the EU's primary energy consumption. There are very significant energy losses linked to the transformation and distribution of useful energy (e.g. as heat and electricity) to the end users. Energy losses broadly depend on the average efficiency of conventional thermal power stations and CHP plants, the use of nuclear power for electricity production, and the penetration of non-thermal renewables.

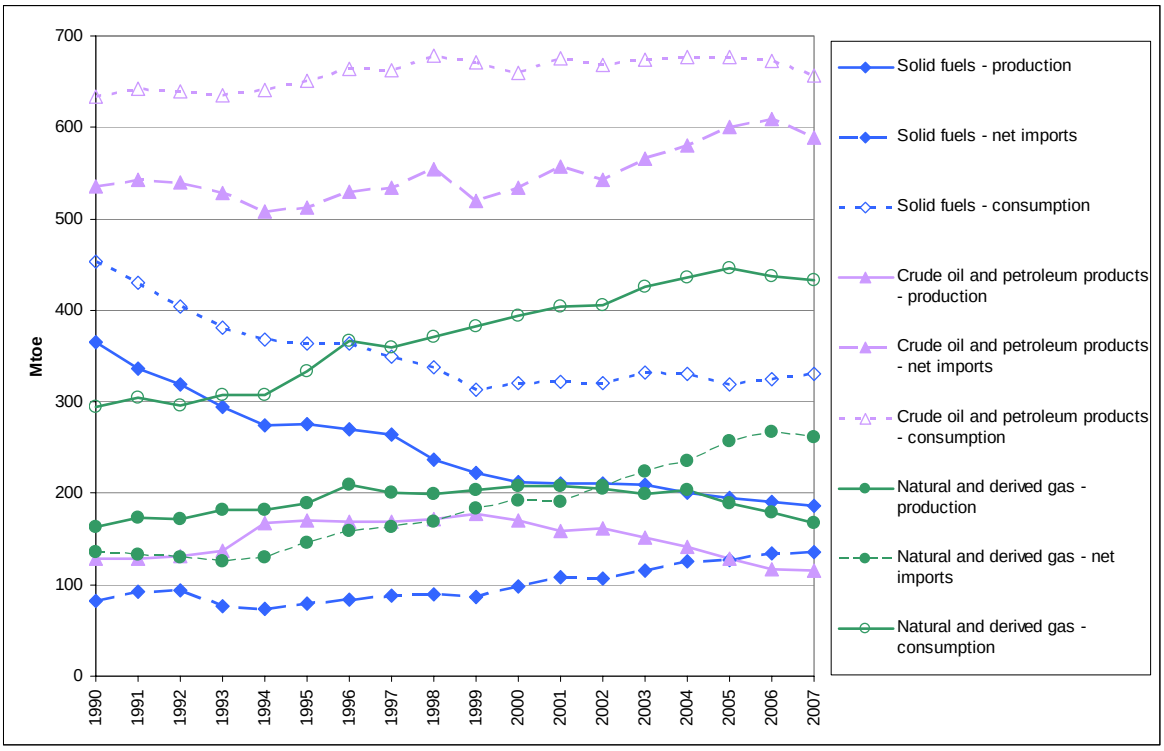
Countries with lower energy intensity may also have an economy structured less around heavy industry and more around the service industries. In addition or alternatively, they may have a higher degree of energy efficiency (both in energy generation and end-use) throughout the economy.

New Member States generally have higher energy intensities. However, six of those countries (namely Romania, Latvia, Lithuania, Poland, Bulgaria and Hungary) have particularly low per capita energy consumption – less than 2.8 toe/capita - compared with the EU-27 average of 3.6 toe/capita. Per capita energy consumption is particularly high in Luxembourg due to road fuel exports.[15]

[15] Purchase of road transport fuels by non-residents, which are allocated to Luxembourg's energy consumption, but consumed in other Member States.

3.7.1.*Energy Supply*

Illustration 3 - 14 Supply of fossil fuels, EU-27



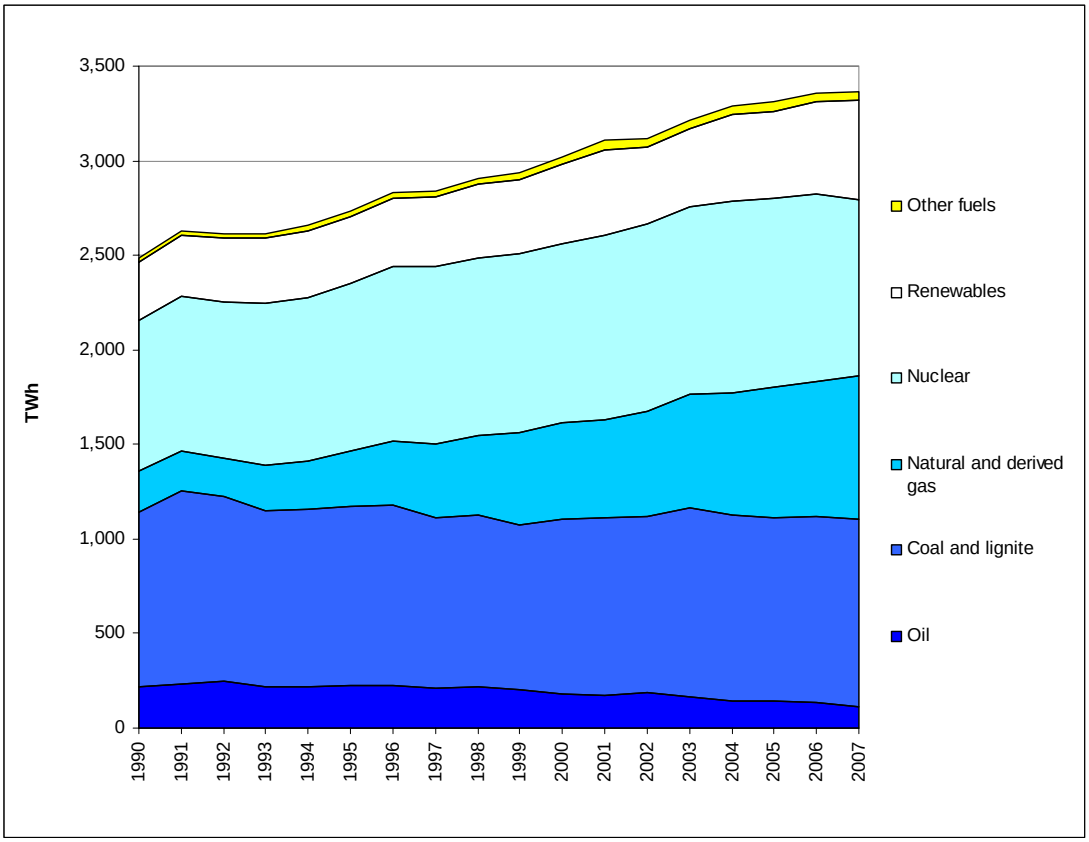
Source: Eurostat

The graph shows primary production, gross inland consumption and net imports of solid fuels, oil and gas in the EU-27 as a whole from 1990 to 2007. The vast majority of oil consumed is from imports and the trend, although cyclical since 1990, has been upwards with an annual growth of 0.6% since 1990. Overall oil consumption has stayed relatively constant over this period - there has been a decline in production at an average rate of 0.6% annually.

The same also applies to gas consumption with imports exceeding production for the first time in 2002. Imports now make up approximately two thirds of EU gas consumption. In the case of solid fuels, overall consumption is decreasing. Although imports have risen in recent years, production volumes still exceed imports. If current trends continue however it is likely that imports will exceed production volumes in the next few years.

In general, since the 4th NC the EU has seen a more rapid increase in its dependence on all imported fossil fuels (around 55 % of primary energy), which has led to growing concerns over security of supply. As in the 4th National Communication, oil still accounts for the largest share (46 %) of the EU's fossil fuel consumption. Next is gas at 30 % and then solid fuels, which contribute to 23 % of the fossil fuels the EU-27 consumes.

Illustration 3 - 15 Gross electricity production by fuel for EU-27

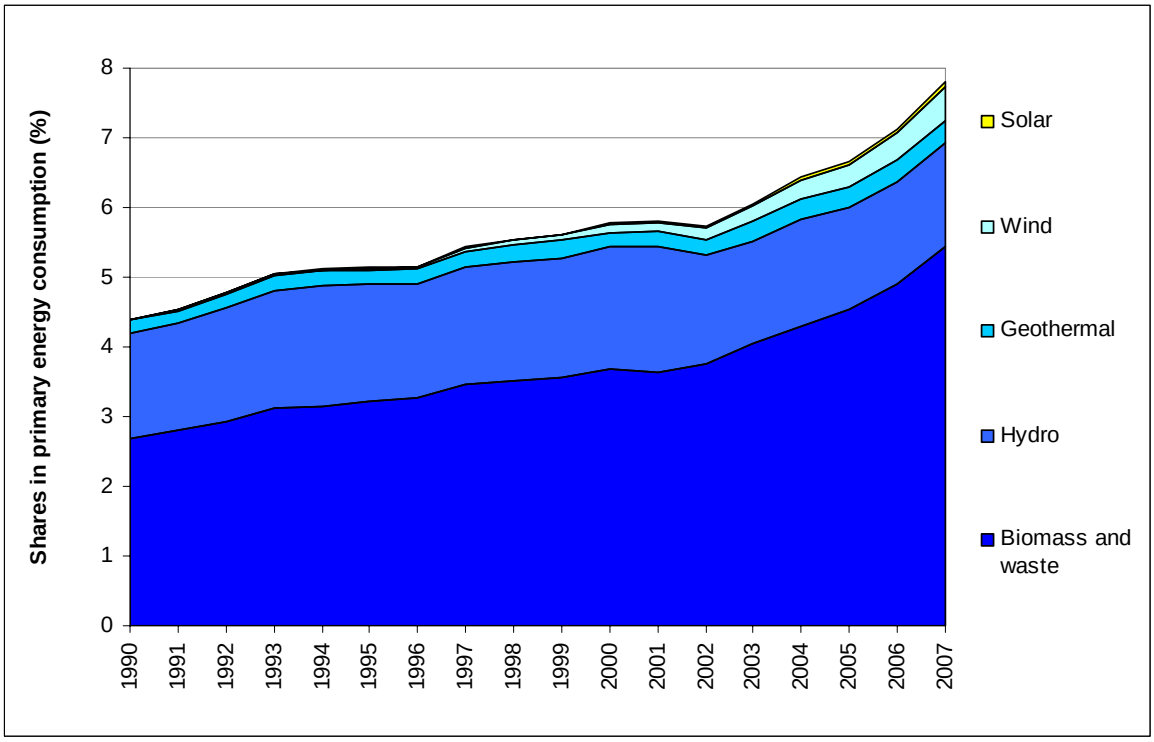


Source: Eurostat

Although the absolute amount of electricity production from renewables has increased by over two-thirds since 1990, renewable electricity still makes only a 16 % contribution to total generation. The proportion produced by nuclear has remained fairly constant and in 2007 it was approximately 28 % of total electricity production. There have been big decreases in both oil and coal and lignite production, together they accounted for one third of total production in 2007 (down from 44 % in 1990). Production from gas has increased from 8 % of the overall mix in 1990 to 23 % in 2007.

Overall, the generation mix of electricity in the EU-27 has become less carbon intensive since the beginning of the 1990s, with the trends seen in the 4th NC broadly continuing. However, the lower carbon intensity has been counterbalanced somewhat by the overall rise in total electricity production – an increase of 30 % from 1990 to 2007.

Illustration 3 - 16 Share of renewable energy in total primary energy consumption, EU-27

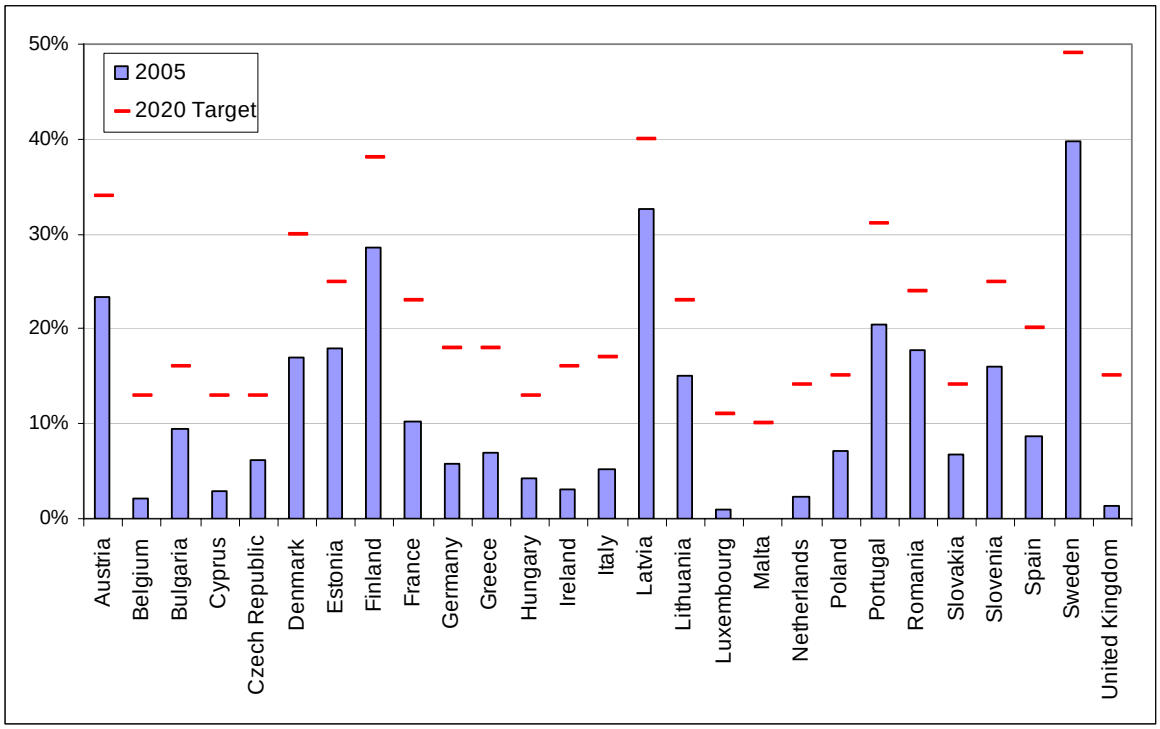


Source: Eurostat

The share of primary energy met by renewables has increased steadily over time to around 8 % of total primary energy consumption, however, in comparison to the 4th NC a more rapid increase in the share from biomass and waste was seen from 2002 onwards.

The bulk of renewable energy consumed, over two thirds, comes from biomass and waste. Hydro is the next biggest contributor, providing one fifth of total renewable energy, however hydro's relative contribution to overall renewables has decreased significantly (from a third in 1990). Wind has seen the biggest increase - from less than 0.1 % in 1990 to contributing around 6 % of total renewable energy in 2007.

Illustration 3 - 17 Share of renewable energy in gross final energy consumption in 2005



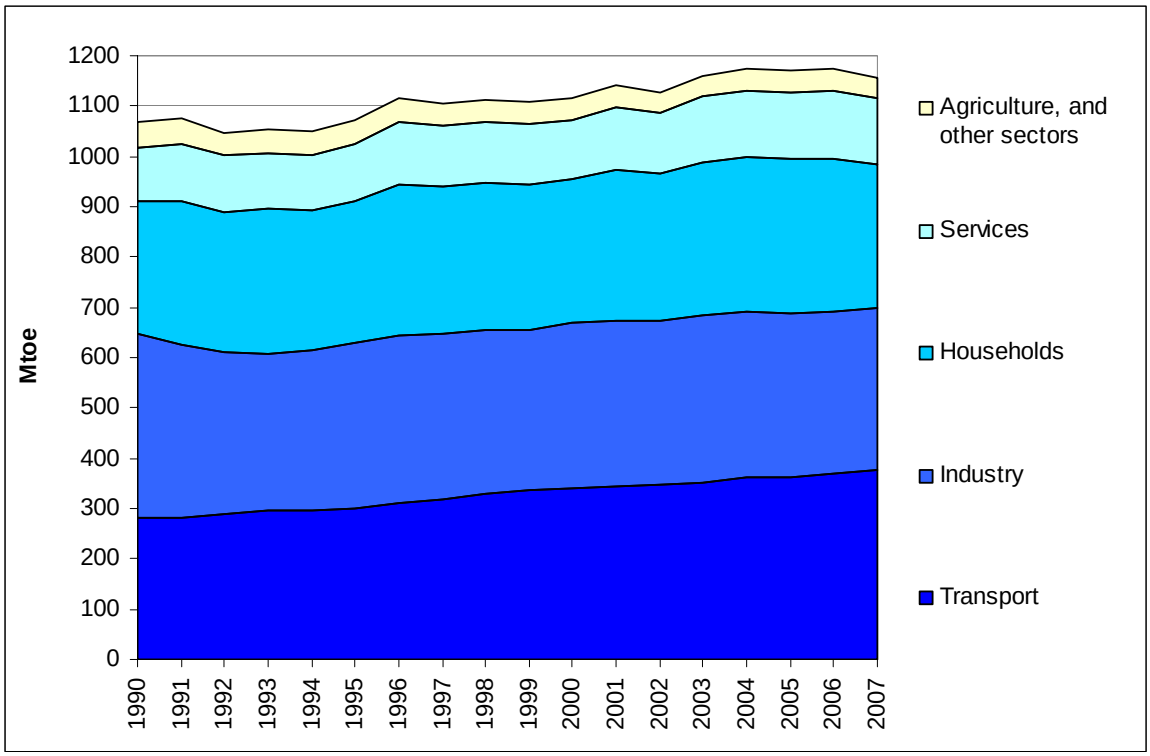
Source: Eurostat

Based on 2005 figures all EU countries have a significant challenge ahead to reach the new Renewable Energy Sources (RES) targets for 2020 (see section 5.1.2). The RES targets include all sources of electricity, heat and transport fuel. The country with the highest target is also the closest to meeting it, in 2005 39.8 % of Sweden's final energy consumption was from renewable sources close to its 2020 target of 49 %. Denmark, Portugal, Austria, Finland and Latvia also have renewable energy targets of at least 30 % and all are over halfway to meeting these targets.

Conversely, the United Kingdom, Ireland and the Netherlands have 2020 targets of 15 %, 16 % and 14 % respectively but in 2005 were sourcing 3.1 % of final energy or less from renewable sources. In absolute terms the UK needs to make the biggest increase – a further 13.7 % must come from renewable sources for the UK to meet its target of a 15 % share in final energy consumption.

3.7.2.*Energy Consumption in Different Sectors*

Illustration 3- 18 Final energy consumption by sector in the EU-27



Source: Eurostat

Final energy consumption in the EU-27 increased by about 8 % between 1990 and 2007. The transport sector has seen the biggest increase in overall energy consumption in the last two decades – increasing its consumption by over 34 % since 1990. This is further explored in Section 3.8. Due to the relatively small proportion of low carbon transport or transport fuels in the EU this is having a significant impact on GHG emissions (see section 4.2.3). The Services sector has also increased its energy consumption markedly, by one quarter since 1990, which correlates with an increasing share of GVA coming from this sector.

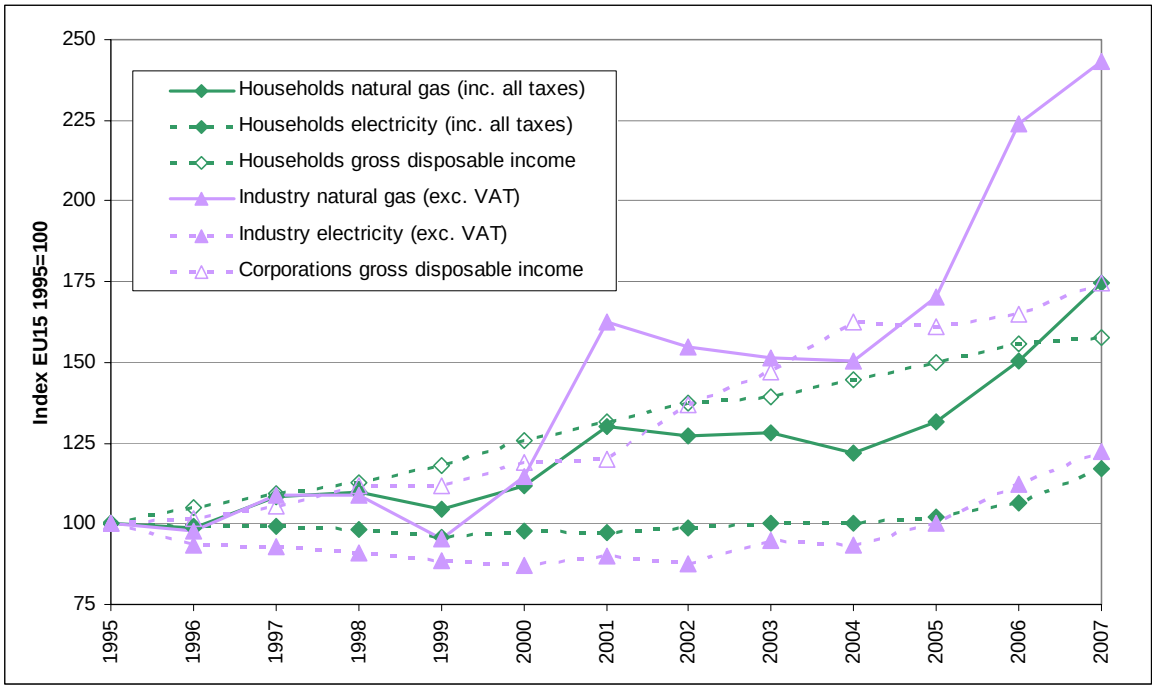
Households are also one of the largest consumers of final energy in the EU. Space heating and cooling are the most significant components of household energy demand, and can vary substantially from year to year depending on climatic conditions. In very recent years, household energy consumption has declined partly as a result of higher fuel prices and warmer weather conditions. Final energy consumption in industry has fallen since 1990, largely as a result of a shift towards less energy-intensive manufacturing industries, as well as the continuing transition to a more service-oriented economy.

3.7.3.*Liberalisation and Privatisation of Energy Markets*

With respect to the structuring of energy markets, one major change since the 4th National Communication is the EU's Third Energy Package[16] introduced on 19th September 2007. More details on these changes are described in section 5.4.

3.7.4.*Energy Prices*

Illustration 3 - 19 Change in average end-user energy prices in the EU-15, 1990-2007



Note: Data for Ireland is not available from 1995 to 2001, and hence the values to 2001 represent the evolution of the average nominal prices for the EU-15 excluding Ireland. Data is not available to compile a similar trend for the EU-27.

Source: Eurostat, DG ECFIN

The graph above illustrates how the average end-user prices of both electricity and gas have varied since 1995 for industry and households in the EU-15. In addition, it illustrates how disposable income has varied over this period, as this provides a very broad indication of how expenditure on energy varies as a share of income.

The price of natural gas has generally increased over the period with a spike in 2001 and dips in 1999 and 2004, with a sharp increase from this point onwards. The peak and troughs are more pronounced in the case of industry compared to households. The price of electricity decreased for both groups until 2002 and has since increased gradually.

16 Proposal for a Regulation of the European Parliament and of the Council amending Regulation (EC) No 1775/2005 Establishing an Agency for the Cooperation of Energy Regulators COM (2007) 0530

Increasing gas and electricity prices should have a positive impact on the EU's GHG emissions as both industry and households make efforts to conserve energy and, improve their level of energy efficiency.

3.8. Transport Profile

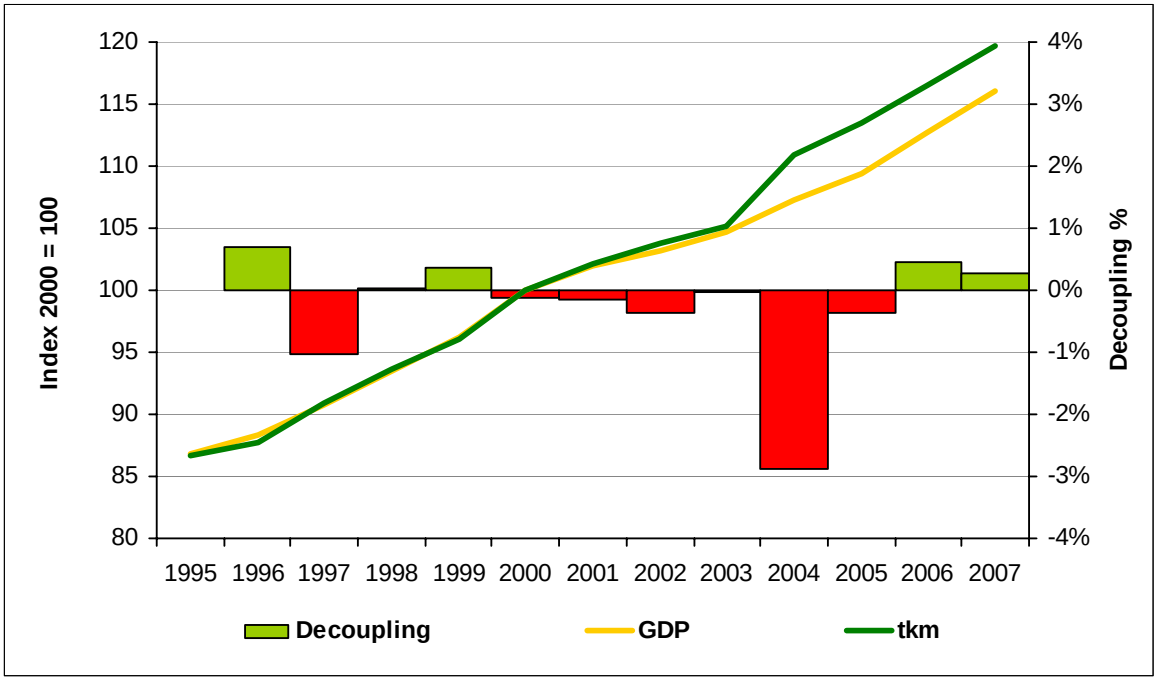
The following sections provide a high-level overview of the most relevant factors related to transport; however, the 2008 report on "Climate for a transport change" published by the European Environment Agency[17] provides more detail on the key drivers, environmental pressures and impacts from transport in the EU.

As reported in the 4th National Communication, both freight and passenger transport has continued to grow strongly since 1990 with continued growth in GHG emissions as shown in section 4.2.3. Growth in freight transport has exceeded both growth in GDP and industrial production, whilst growth in passenger transport, from the late 1990's onwards, has grown more slowly relative to GDP. This is particularly important as the transport sector is now the largest consumer of energy within the EU-27 and the issue of growing greenhouse gas emissions from this sector needs to be addressed. There now appears to be gradual decoupling of passenger transport growth from GDP, although this has not yet occurred for freight transport. However, there are a number of recent and newly proposed policies (such as mandatory efficiency requirements for road vehicles) that aim to accelerate such decoupling in the coming years, which are outlined in more detail in section 5.5.

[17] Climate for a transport change TERM 2007: indicators tracking transport and environment in the European Union http://www.eea.europa.eu/publications/eea_report_2008_1/at_download/file

3.8.1.*Freight Transport*

Illustration 3- 20 Growth in freight transport EU-27



Note: Air and Sea: only domestic and intra-EU-27 transport; provisional estimates. Road: national and international haulage by vehicles registered in the EU-27. Decoupling is calculated as the percentage change in freight intensity (tkm per unit of GDP) compared to the previous year. Data and definitions are taken directly from Eurostat and DG TREN sources and hence the figure is not identical to EEA indicator CSI036. The large change in 2004 appears to be tied to a change in methodology but no correction figure exists. The change appears to affect in particular data from Spain, Italy, Portugal, Poland and Romania.

Source: Eurostat, DG TREN

Since 2000 the demand for freight transport in the EU has increased at an average rate of around 3 % per year – this is a greater rise than that of GDP. Historical data shows that GDP is a key driver of freight transport demand and as GDP rises so does transport demand. This will have a negative effect on the EU's GHG emissions. As shown in Section 3.7.2 transport accounts for a significant portion of the EU's final energy consumption and on present trends this does not appear to be decreasing. On the other hand, the ratio of energy consumption of transport to GDP has decreased slightly compared to 2000[18]. Nevertheless, a decoupling of demand for freight transport from GDP has not yet been observed.

[18] Eurostat (2007) Measuring progress towards a more sustainable Europe: 2007 monitoring report of EU sustainable development strategy http://ec.europa.eu/sustainable/docs/estat_2007_sds_en.pdf

Table 3-2 Modal split of freight transport in EU-27

Modal split	tkm		%	
	1995	2007	1995	2007
Road	1289	1927	42 %	46 %
Rail	386	452	13 %	11 %
Inland Waterways	122	141	4 %	3 %
Oil Pipelines	115	129	4 %	3 %
Sea	1150	1575	38 %	37 %
Air	2	3	0.1 %	0.1 %
Total	**3064**	**4228**	**100%**	**100%**

Note: Air and Sea: only domestic and intra-EU-27 transport; provisional estimates. Road: national and international haulage by vehicles registered in the EU-27. Decoupling is calculated as the percentage change in freight intensity (tkm per unit of GDP) compared to the previous year.

Source: Eurostat, DG TREN

The table above shows the total tonne-kilometres for different modes of freight transport (road, rail, inland waterways, oil pipelines, sea and air) – comparing 2007 with 1995. Overall freight transport has increased by 38 % and indeed every mode of transport in the table has increased, by between 16 % (inland waterways) and 55 % (air). Road is still by far the most popular mode of freight transportation.

This overall increase in freight transport demand has had an adverse effect on greenhouse gas emissions. In addition, there has been an increase in the share of freight transport by road, which is generally more carbon intensive than alternative modes (excluding air transport)[19].

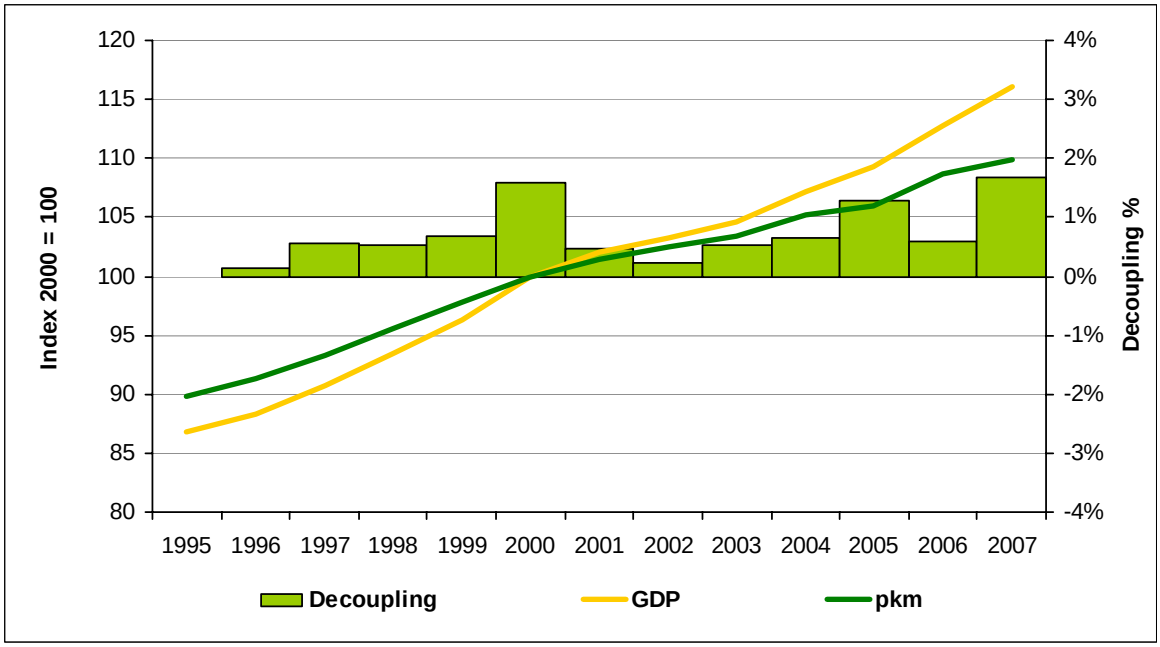
3.8.2.*Passenger Transport*

Since 2000 the demand for passenger transport in the EU has increased at an average rate of just 1 % per year but (in contrast to freight transport) at a relatively lower rate than GDP. It appears that the desired outcome, of a gradual decoupling in passenger transport from GDP, has been observed since 2000. Although this is more positive for greenhouse gas emissions than the situation seen with freight transport, overall passenger kilometres are still increasing. Given the continuing upward trend in demand, a reduction in absolute carbon emissions in this sector will need to come primarily via improved vehicle efficiency, modal shift to less energy intensive transport

[19] European Environment Agency: Transport and environment: on the way to a new common transport policy - EEA Report No 1/2007 www.eea.europa.eu/publications/eea_report_2007_1/eea_report_1_2007.pdf

modes, and the shift to less carbon intensive transport fuels (e.g. sustainably produced biofuels or low carbon electricity).

Illustration 3 - 22 Growth in passenger transport EU-27



Note: Air and Sea: only domestic and intra-EU-27 transport; provisional estimates. Road: national and international haulage by vehicles registered in the EU-27. Decoupling is calculated as the percentage change in passenger intensity (pkm per unit of GDP) compared to the previous year. Data and definitions are taken directly from Eurostat and DG TREN sources and hence the figure is not identical to EEA indicator CSI035.

Source: Eurostat, DG TREN

The table below shows the total distance travelled by passenger transport – comparing 2007 with 1995. Overall passenger transport has increased by 22 %, largely as a consequence of the 21 % increase in car transport. The only mode of passenger transport to have decreased is sea travel. Air travel has seen the biggest percentage increase, up 70 % from 1995. In 2007, it accounted for nearly one tenth of total passenger transport. This is important as growth in demand for air transport has exceeded improvements in efficiency, leading to significant increases in emissions[17].

Table 3 - 23 Modal split of passenger transport in EU-27

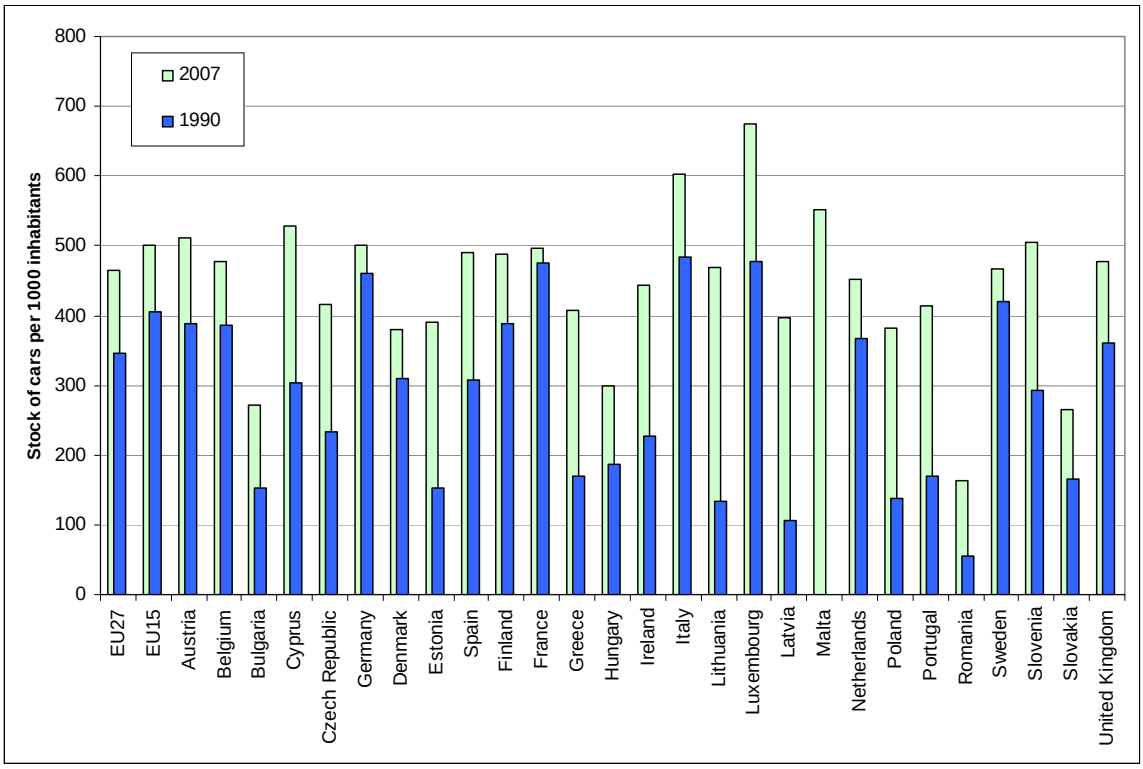
Modal split	pkm		%	
	1995	2007	1995	2007
Passenger Cars	3863	4688	73 %	72 %
Powered Two-wheelers	123	154	2 %	2 %
Bus & Coach	504	539	10 %	8 %
Railway	351	395	7 %	6 %
Tram & Metro	71	85	1 %	1 %
Air	335	571	6 %	9 %
Sea	44	41	1 %	1 %
Total	**5291**	**6473**	**100 %**	**100 %**

Note: Air and Sea: only domestic and intra-$_{EU-27}$ transport; provisional estimates. Road: national and international haulage by vehicles registered in the $_{EU-27}$. Decoupling is calculated as the percentage change in passenger intensity (pkm per unit of GDP) compared to the previous year. Data and definitions are taken directly from Eurostat and DG TREN sources and hence the figure is not identical to EEA indicator CSI035.

Source: Eurostat, DG TREN

The graph below shows that in every one of the EU-27 Member States the level of car ownership is increasing, overall ownership in the EU-27 increased by 21 % between 1995 and 2007. In Romania, Latvia and Lithuania car ownership levels have more than trebled. Although this still leaves Romania with the lowest level of ownership in the EU-27, Lithuania is now on a par with Sweden, Belgium, the United Kingdom, and Finland.

Illustration 2 - 24 Level of car ownership

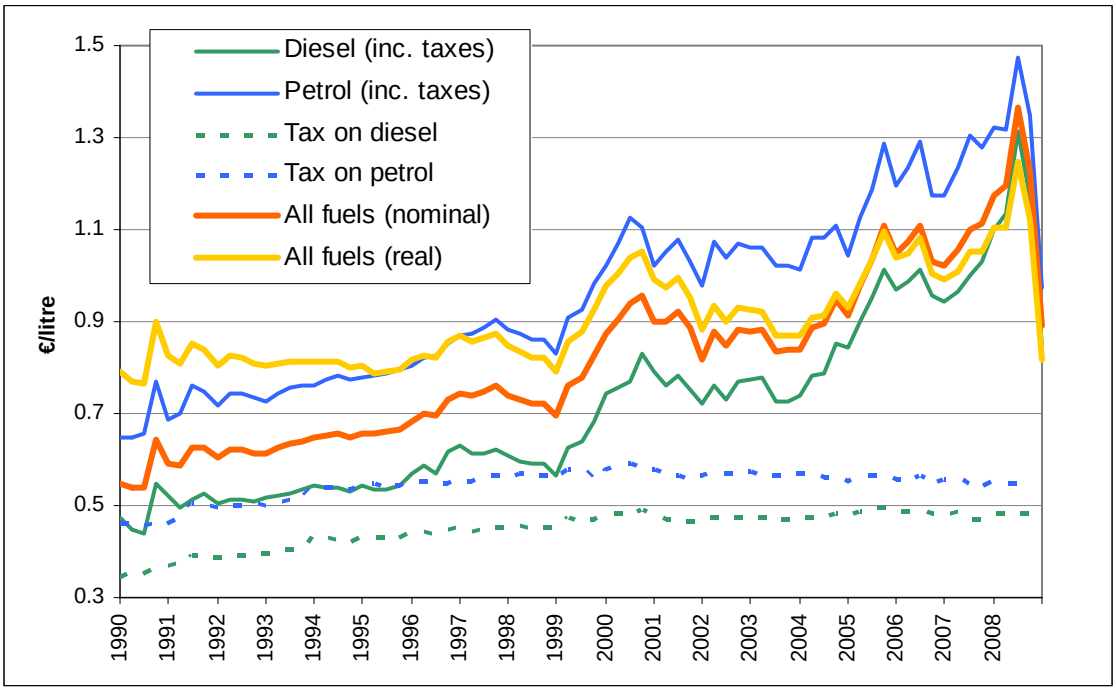


Note: Passenger car stock at end of year n divided by the population on 1st January of year n+1. Data is not available for Malta in 1990 and 2007, only 2006 data are used.

Source: Eurostat, DG TREN

3.8.3. *Taxes on and Prices of Transport Fuels*

Illustration 2 - 25 Average (nominal) EU road transport fuel prices and tax levels

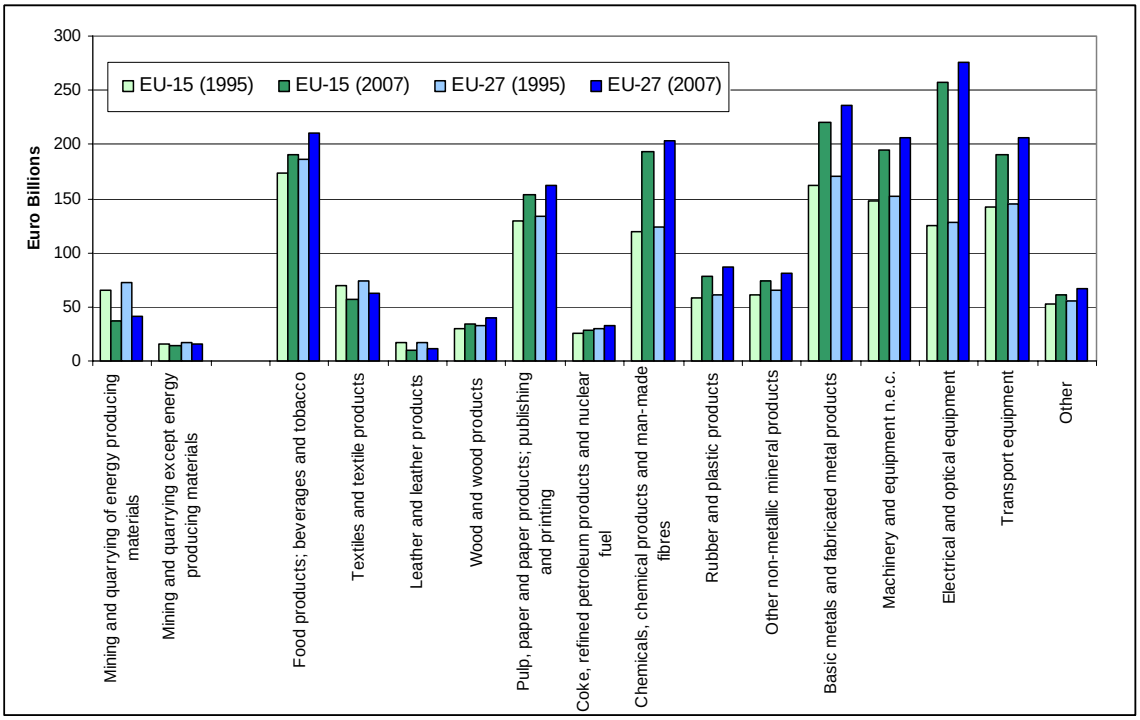


Source: DG TREN, EEA

The above line graph shows how average diesel and petrol prices have evolved in the EU Member States since 1990. Overall, the prices for both fuels approximately doubled between 1990 and 2007 due to substantial increases in oil prices (when adjusting for inflation, real prices increased by around a third over the same period). The tax on petrol increased by only 20 % and the tax on diesel increased 41 % over the same period, so the proportion of tax in the price of fuels has decreased. Despite this increase in prices, both freight and passenger transport are continuing to increase. However, rising prices will also help stimulate demand for more efficient vehicles. Road fuels have declined sharply from their peak in 2008 as the price of oil has declined, with (nominal) prices again similar to those in the early 2000s.

3.9. Industry

Illustration 2 - 26 Composition of industry based on gross value added (at basic prices) of main economic sectors



Note: NACE 31 branch level, for all C and D subsectors. Figures in chain-linked volumes, reference year 2000 (at 2000 exchange rates). Data for all Member States is not available prior to 1995. N.e.c = not elsewhere classified.

Source: Eurostat

The figure above shows the GVA of main sectors at NACE 31 branch level, for all C and D industrial subsectors in constant (2000) prices, in 1991/1995 and 2008 for both the EU-15 and EU-27. The energy and emissions intensity of different branches of manufacturing can change significantly. For example, manufacture of steel, paper and chemicals (including refining) is generally more intensive than other branches of manufacturing. GVA in manufacturing in the EU increased by 27 % from 1995 to 2007, and increased in most subsectors excluding textiles and leather. GVA in mining (both energy and non-energy products) declined by around 60 % over the same period. The structure of industry has also changed slightly from 1995 to 2007, with an increasing share of GVA in total EU-27 industrial GVA (excluding construction) from chemicals and electrical equipment manufacture (by 2 and 5.5 percentage points respectively).

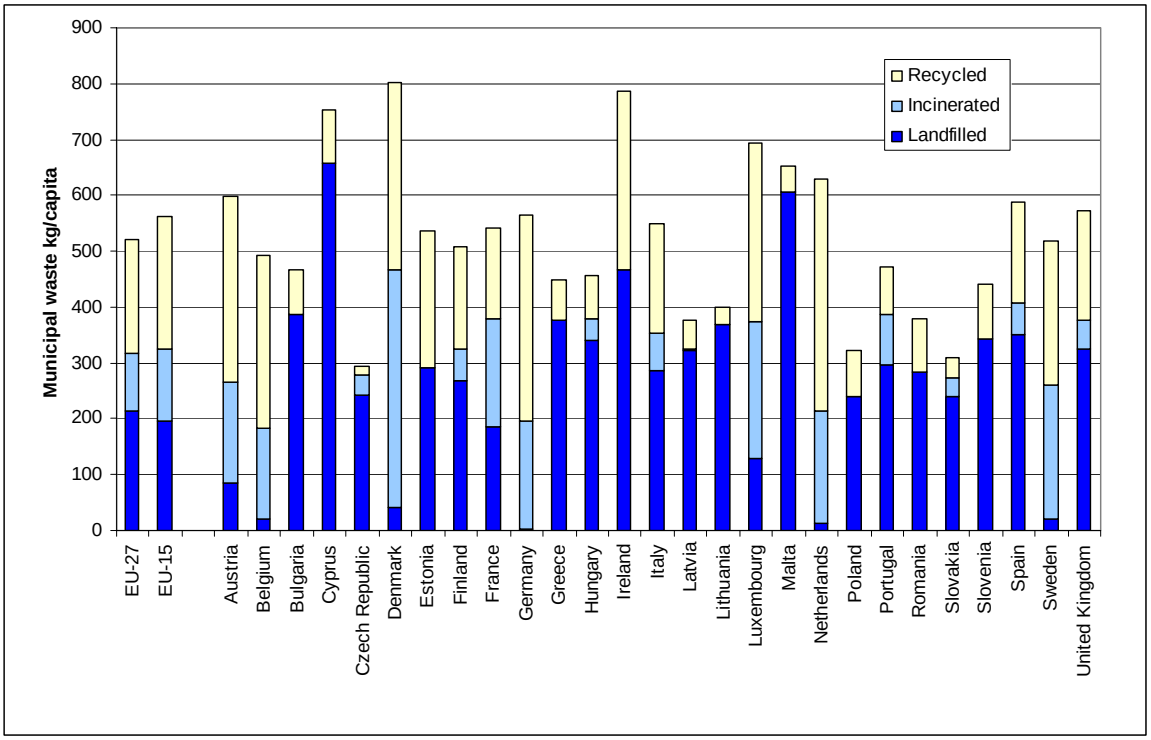
3.10. Waste

Greenhouse gas emissions from waste depend on the quantity of waste and how it is disposed of (including recycling, landfill and incineration). All routes have an impact on emissions through the consumption of energy in the collection, treatment and production of waste – trends in emissions from waste can be seen in section 4.2.3. Waste to landfill produces large methane emissions if not managed correctly (e.g. via

methane recovery and diversion of biodegradable municipal waste from landfill). Recycling and incineration of waste with energy recovery generally result in lower greenhouse gas emissions than disposing of the waste to landfill, and these routes are increasingly used, in part as a result of the policy drivers discussed in section 5.9.

The chart below shows the amount of municipal waste generated for each Member State (in 2007) broken down by different treatment route. For the EU-27 on average two fifths of waste is sent to landfill, two fifths is recycled and the remainder is incinerated. The lowest recycling rates are in Czech Republic, Malta and Lithuania – at less than 10 %. The amount of municipal waste is expected to grow by 25 % within the EU from 2005 to 2020, with great variability between Member States[20].

Illustration 2 - 27 Generation and treatment of municipal waste per capita in 2007



Note: The level of municipal waste recycled is assumed to be total waste generated minus that incinerated and sent to landfill

Source: Eurostat

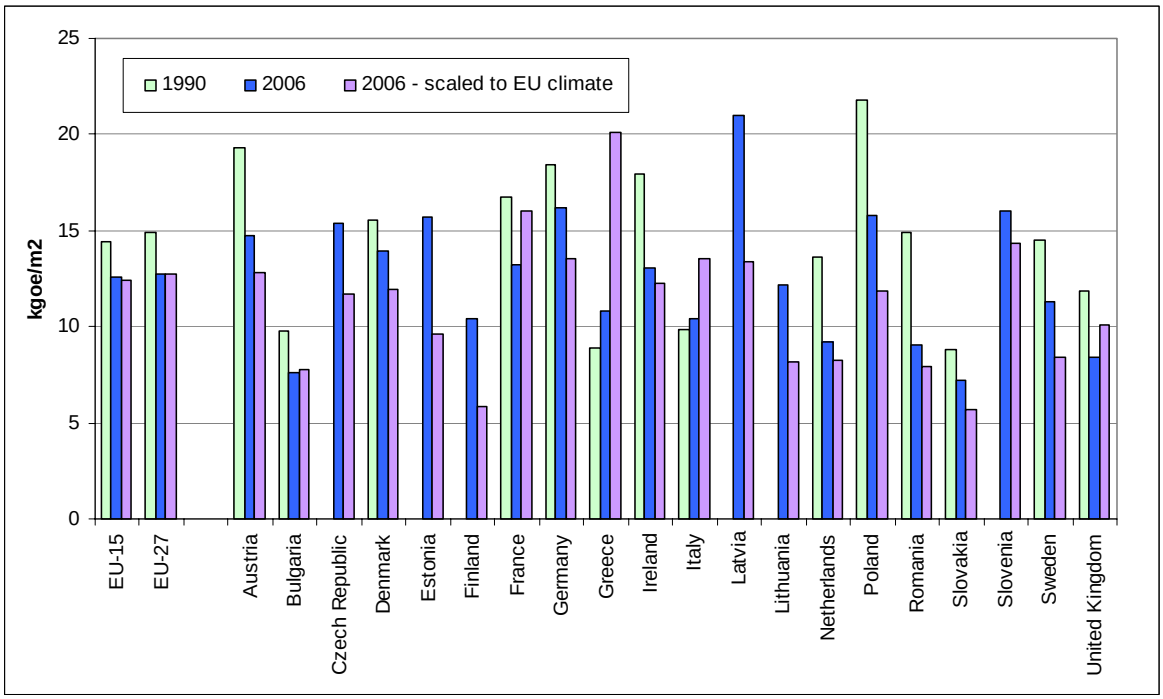
3.11. Building Stock and Urban Structure

Energy consumption for space heating within buildings forms a significant component of all EU energy consumption. Overall energy consumption in households alone consumes 26 % of total energy in the EU-27 (as shown in Section 3.7.2). The level of energy consumption within buildings is primarily affected by: the thermal properties of the building (in terms of insulation, building type – e.g. flat/house); the efficiency of

[20] http://www.eea.europa.eu/publications/briefing_2008_1/Supporting_document_to_EEA_Briefing_2008-01.pdf

the heating system; and the stock/efficiency of the appliances used. In general, newer dwellings are likely to be more energy efficient than older buildings.

Illustration 2 - 28 Household energy consumption, space heating per m^2, climate corrected



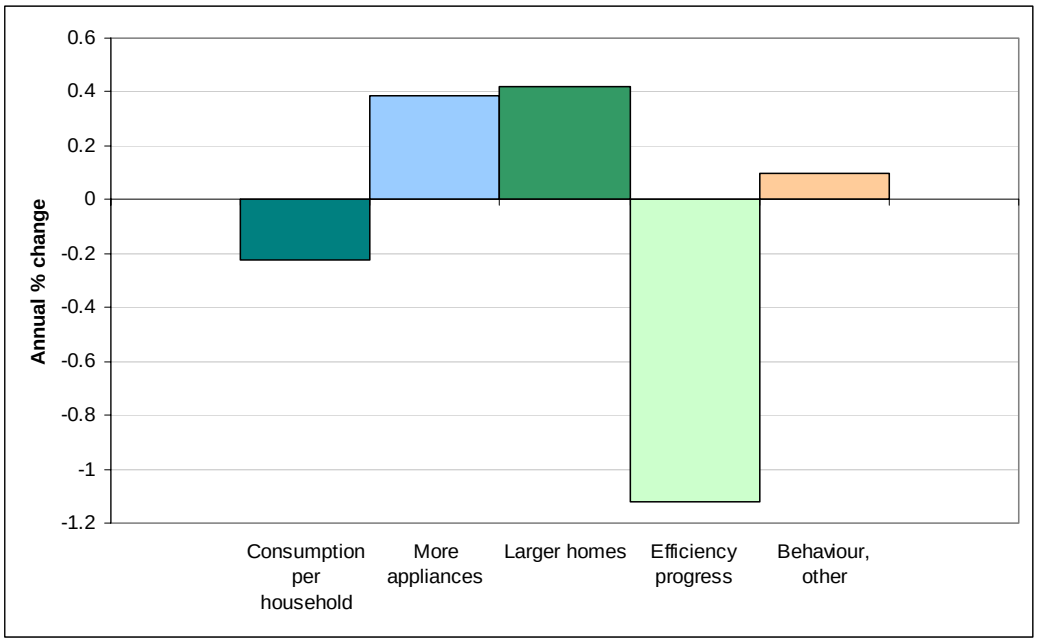
Note: 1990 and 2006 data are climate corrected against each country's long-term average climate, whereas the last series is climate corrected and scale against the EU long-term average climate to account for temperature differences between countries. Complete data is only available for the Member States shown. Data is not available for all EU Member States, values for the EU-15 and EU-27 reflect the average across available Member States within those groupings.

Source: Odyssee

The level of climate corrected household space heating energy consumption per m^2 provides a good proxy for the thermal and heating system efficiency of households (as it controls for the effect of size of building and temperature on consumption). This has on average, fallen for the EU-15 and EU-27 countries from 1990 to 2006 - indicating a slight improvement in energy efficiency. However, there is significant variation in the housing stock between the Member States as to the extent of this decrease – indeed in Greece and Italy it has increased.

However, the building sector has one of the highest potentials for improved energy efficiency and measures to reduce the space heating/cooling demand in buildings represent a significant part of this potential. Many of these measures (such as improved insulation) are highly cost-effective, but a number of other barriers to their implementation exist. These are being addressed by a number of the policies related to end-use energy efficiency described in section 5.4.4.

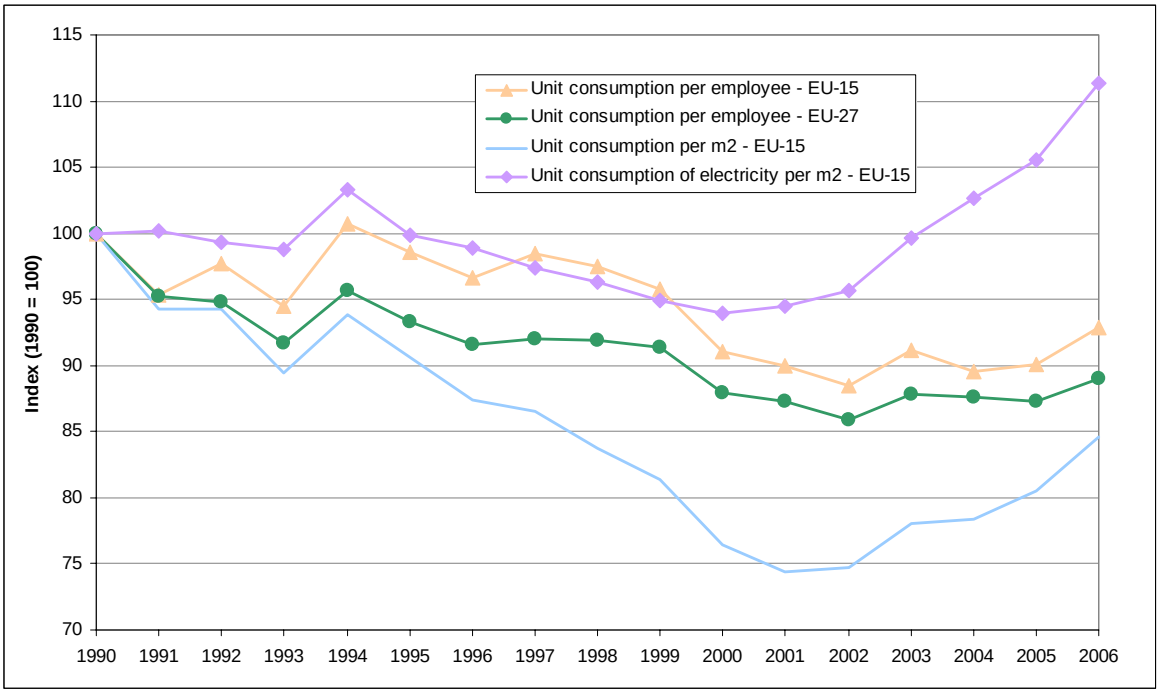
Illustration 2 - 29 Drivers of the change in average annual energy consumption per household in the EU-27 from 1990 to 2006



Source: Odyssee

Although the total amount of energy consumed by households has increased by 15 % (due primarily to rising population and corresponding increases in the building stock) the consumption per household has decreased on average by around 0.2 % annually from 1990 to 2006. This overall change contains a set of opposing drivers. Improved energy efficiency has helped to bring down the energy consumed and consequent greenhouse gas emissions for this sector. By contrast an increase in the number of appliances, larger homes and other factors (e.g. behavioural changes such as maintaining higher internal room temperatures) has acted to counteract this to a large extent by increasing energy use. For appliance consumption, higher levels of ownership acts to increase the overall level of energy consumption, but that has been counteracted to some extent by an increase in end-use efficiency of individual appliances.

Illustration 2 - 30 Services sector building energy consumption indicators



Source: Odyssee

Note: Data is not available to provide EU-27 values for all indicators

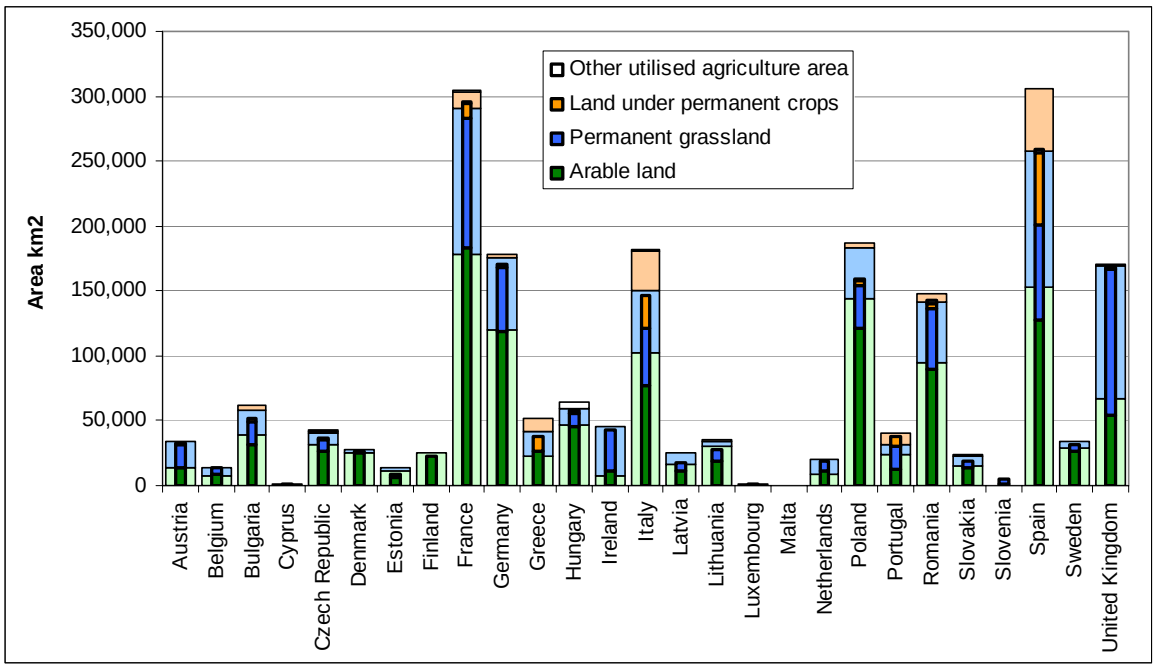
Data on energy efficiency in service sector buildings is generally more uncertain, but the indicators in the graph above provide a 'reasonable' proxy for this as most energy consumed within buildings is for space heating, cooling and appliances (such as for IT equipment). Unit consumption per m^2 controls for the effect of building size on energy consumption and consumption per employee controls, broadly, for the effect of total equipment ownership.

Total, unit consumption per employee and per m^2 have declined steadily since 1990, indicating a likely overall improvement in efficiency. The decrease is higher than for households, in part due the higher stock turnover in the services sector, which leads to a greater proportion of retrofitting and new buildings. However, since around 2001 these trends have stabilised or even strongly reversed in the case of unit consumption per m^2. A significant factor in this is rising electricity consumption, e.g. for I.T. equipment and air conditioning.

3.12. Agriculture

Overall the area of land under agricultural use across the EU-27 states has decreased by approximately 10 % from 1990 to around 2005. Estonia, Greece, Italy, and Slovakia have seen a decrease of over one-fifth. Agriculture is a significant source of GHG emissions, for example, due to N_2O associated with fertilizer use and CH_4 from livestock (as well as energy consumption in the sector itself). These trends are highlighted in more detail in the figure below (trends in agriculture emissions are outlined in section 4.2.3), but the overall decrease in agricultural activity will have a generally positive effect on total greenhouse gas emissions within the EU. Land-use has not changed significantly since 2000 (the period shown in the 4^{th} NC).

Illustration 2 - 31 Total utilised agricultural land and usage patterns, 1990 and 2005

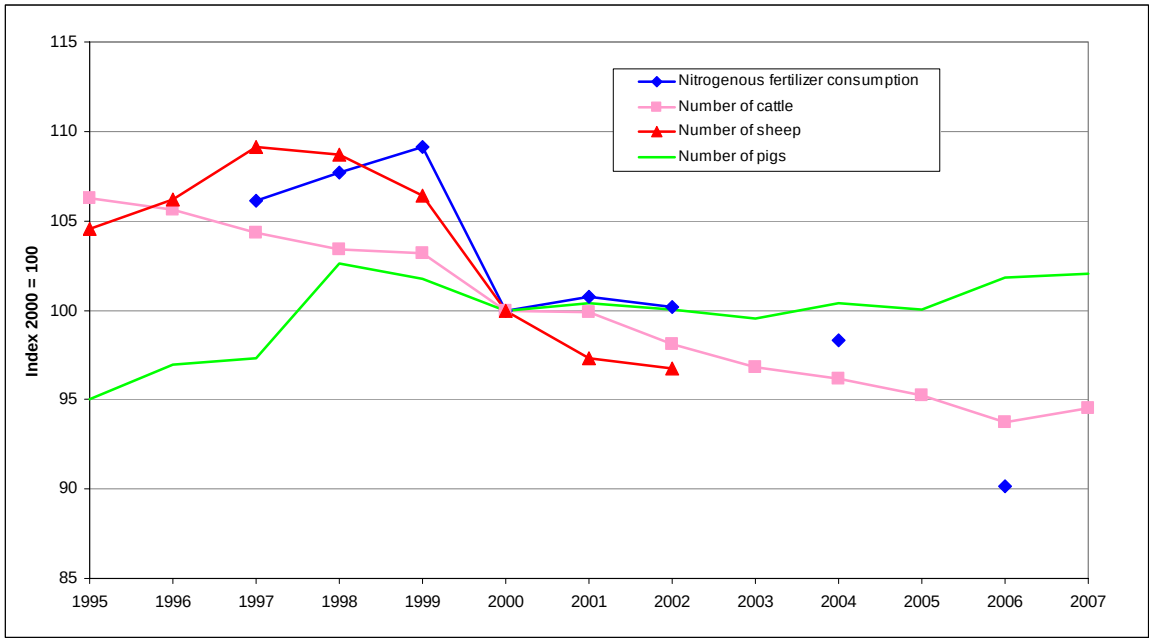


Note: Narrow bars indicate values for 2005, wider bars indicate values for 1990. Gap filling is necessary in some cases. 2003 data is used for the UK. For Bulgaria 2006 data is used for Arable Land and the Total Utilised Agriculture Area. 2004 Data is used for the Czech Republic and Land Under Permanent Crops.

Source: Eurostat

The consumption of nitrogenous fertilizer has fallen steadily in more recent years, by around 10 % since 2000, which will lead to an overall positive impact on total greenhouse gas emissions. In addition, the impact from livestock, has also decreased in the EU-15 due to falling cattle and sheep numbers. However, the number of pigs reared per capita has not fallen as rapidly and has stabilised in more recent years, albeit with a small increase in 2006 / 2007.

Illustration 2 - 32 Index of EU-15 fertilizer consumption and livestock numbers



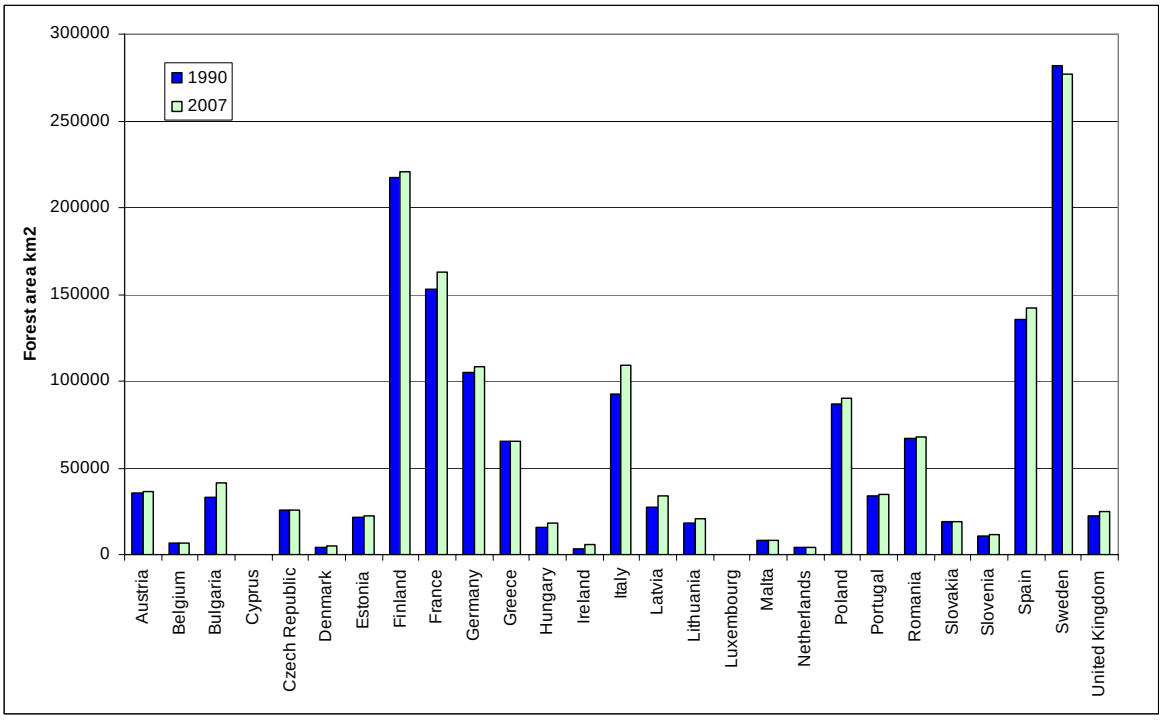
Note: Survey of livestock numbers (December). Time series data for the EU-27 is limited.

Source: Eurostat

3.13. Forest

Overall, the total forested area across the EU-27 Member States increased by 4.5 % between 1990 and 2007, the annual rate of increase (approximately 0.25 % per year) is similar to that seen in the 4th NC (including Other Wooded Land in the total, the increase was 5% over the period). With the exceptions of Sweden and Belgium (that have shown a decrease of 1.8 % and 3.1 % respectively between 1990 and 2007) there has been an increase in forested area in all Member States. Two thirds of the total forested area is comprised of just six countries: Finland, France, Germany, Italy, Spain and Sweden. The increase in forested and wooded areas throughout the EU is important for greenhouse gas emissions given their role as a carbon sink (trends in emissions related to Land-Use, Land-Use Change and Forestry are provided in section 4.2.3).

Illustration 2- 33 Changes in Forest area, 1990 and 2007



Note: Data is based on national definitions of forest area and may differ between countries and do not include other wooded areas.

Source: Member State Submissions to UNFCCC 2009, JRC

3.14. Other Circumstances

One of the main factors that may have an impact on the EU's greenhouse gas emissions in the near future is the global economic downturn. However, reliable estimates of this impact are not yet available.

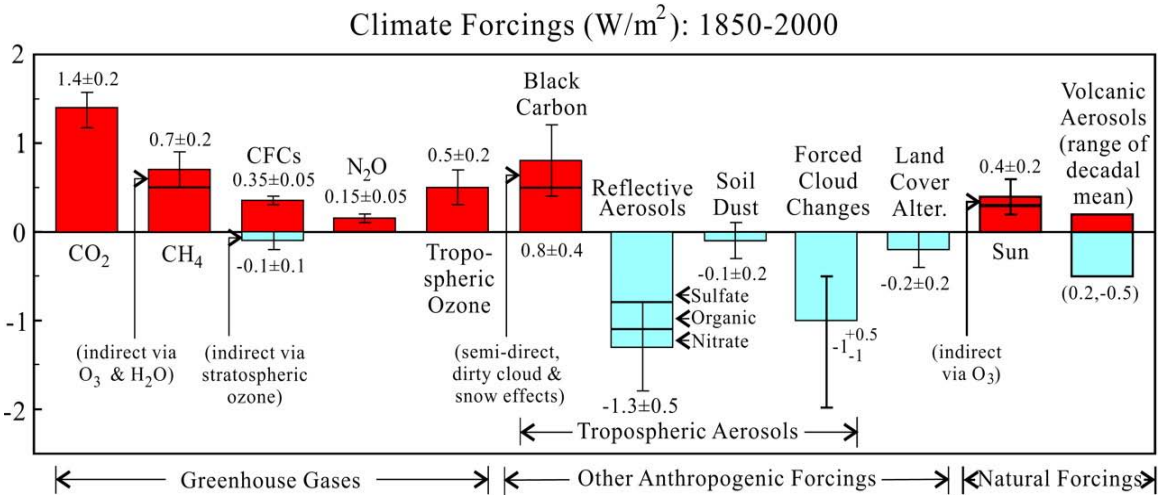
In addition, the impact of high oil prices in 2007/2008 is not fully accounted for in this National Communication given the coverage of available data (primarily to 2006/2007). This may have prompted recent investment in longer term energy saving measures, although the crash in oil prices toward the end of 2008 may well have ended such an investment cycle.

As discussed in more detail in the chapter on Policies and Measures many of the policies that were put in place to encourage renewable energy and energy efficiency were only implemented in more recent years. Therefore the impact of these policies will generally not yet be visible in the time series presented in this chapter. The effect of policies would also need to be separated from the other national circumstances influencing emissions described above.

Finally, whilst the focus of National Communications is on the basket of 6 main greenhouse gases (CO_2, CH_4, N_2O, HFCs, PFCs, SF_6) it is also important to highlight the impact of, and interaction with, other air pollutants on radiative forcing (which can be both positive and negative). The radiative impact of short-lived species such as

tropospheric ozone and aerosols may be particularly significant, but the uncertainties surrounding the level of impact are still large[21].

Illustration 2 - 34 Example of estimated climate forcings from different emission types



Note: Estimated climate forcings; error bars are partly subjective 1σ uncertainties.

Source: Hansen J. E., Sato M. PNAS (Proceedings of the National Academy of Sciences) 2001;98:14778-14783.

[21] JRC (2007) Presentation on interactions between atmospheric pollution and climate at regional scale, European Commission Joint Research Centre http://www.enero.eu/files/files/AIR_Climate_Wshp_2008/03_enero_aq_climate_rscale_080214_jrc_j_p_putaud_fr_raes.pdf

4. GREENHOUSE GAS INVENTORY INFORMATION

Key developments:

- Total GHG emissions in the EU-15 (without LULUCF) decreased by 4.3 % from 1990 to 2007. Over the same period, EU-27 GHG emissions decreased by 9.3 %. In both EU-15 and EU-27 the biggest relative change has been in the waste sector where the emissions of CH_4 from managed solid waste landfills decreased substantially.

- Averaged over the latest five years, EU-15 emissions (without LULUCF) were 3.1 % below their base year emission level.

- Emissions of total greenhouse gases decreased by 1.6 % in the EU-15 and 1.2 % in the EU-27 between 2006 and 2007. This was largely due to the reduction in CO_2 emissions from the household and service sectors, because of the warmer weather conditions of 2007 compared to the previous year and due to shifts in fuel purchase (from 2007 to 2006 and 2008) because of fuel price variations.

- The EEA produced preliminary EU-wide estimates of total greenhouse gas emissions for 2008, using verified EU ETS emissions for 2008 and other national and European statistical data sources, available as of mid-July 2009. The estimates indicate that EU greenhouse gas emissions decreased in 2008 for the fourth consecutive year. Compared to the 2007 emission data, the annual reduction is estimated to be about 1.3 % for the EU-15 and 1.5 % for the EU-27. In addition to these estimates, a number of Member States have also produced early estimates of 2008 emissions, including Denmark, Finland, Germany, Greece, Italy, Luxembourg, Slovenia and Spain. Official 2008 greenhouse gas emissions for the EU will be available in 2010, when the European Community Greenhouse Gas Inventory 1990–2008 and Inventory Report 2010 is published for submission to the UNFCCC.

4.1. Introduction and Summary Tables

This chapter presents greenhouse gas emission trends of the European Community (EC), for the EU-15 and EU-27 for the period 1990-2007. The legal basis of the compilation of the EC inventory and the inventory methodology and data availability are also described briefly. The greenhouse gas data presented in this chapter are consistent with the 2009 submission of the EC to the United Nations Framework Convention on Climate Change (UNFCCC) Secretariat[22]. Summary tables of GHG emissions for the EU-15 in the common reporting format are presented in Appendix A.

The submission to the UNFCCC also contains details of contacts, relevant institutions and the development and procedural arrangements of the inventory, beyond those presented in this chapter. The EC inventory has been compiled from data delivered by the Member States by 15th January 2009 under Council Decision 280/2004/EC and subsequent updates to these data received before 28th May 2009.

[22] European Environment Agency, Technical Report No 04/2009 Annual European Community greenhouse gas inventory 1990–2007 and inventory report 2009

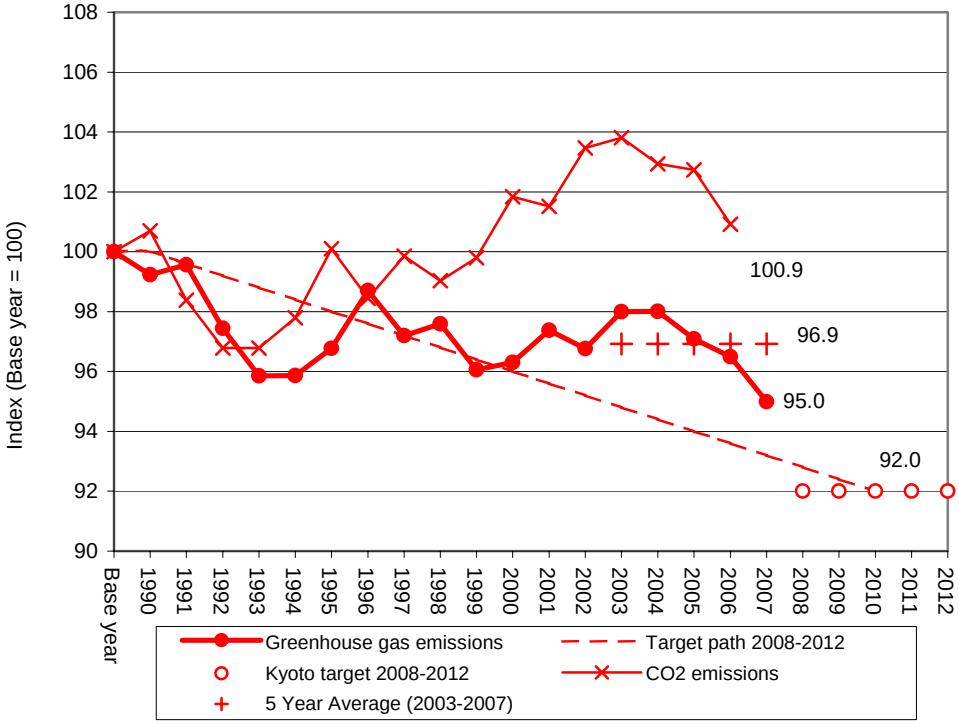
In addition, Appendix B also includes the emissions inventory summary tables of the EU-27 for 1990-2007. These data and the complete submissions of the Member States under Council Decision 280/2004/EC are available on the EEA website[23].

4.2. Descriptive Summary of EC GHG Emissions Trends

4.2.1. *Overall Greenhouse Gas Emissions Trends*

Total GHG emissions excluding LULUCF (land-use, land-use change and forestry) in the EU-15 decreased by 4.3 % between 1990 and 2007. Emissions decreased by 1.6 % between 2006 and 2007. Averaged over the last five years EU-15 emissions stood 3.1 % below their base year emissions – this measure is used because the Kyoto target itself is based upon a five-year average from 2008-2012 – which is shown in the illustration below.

Illustration 4-1 EU-15 GHG emissions 1990-2007 compared with Kyoto target for 2008-2012 (excluding LULUCF)



Notes: The linear target path is not intended as an approximation of past and future emission trends. It provides a measure of how close the EC emissions in 2007 are to a linear path of emissions reductions from 1990 to the Kyoto target for 2008–2012, assuming that only domestic measures will be used. Therefore, it does not deliver a measure of (possible) compliance of the EC with its GHG targets in 2008-2012, but aims at evaluating overall EC GHG emissions in 2007. The unit is index points with base year emissions being 100. GHG emission data for the EC as a whole do not

[23] http://www.eea.europa.eu/publications/european-community-greenhouse-gas-inventory-2009

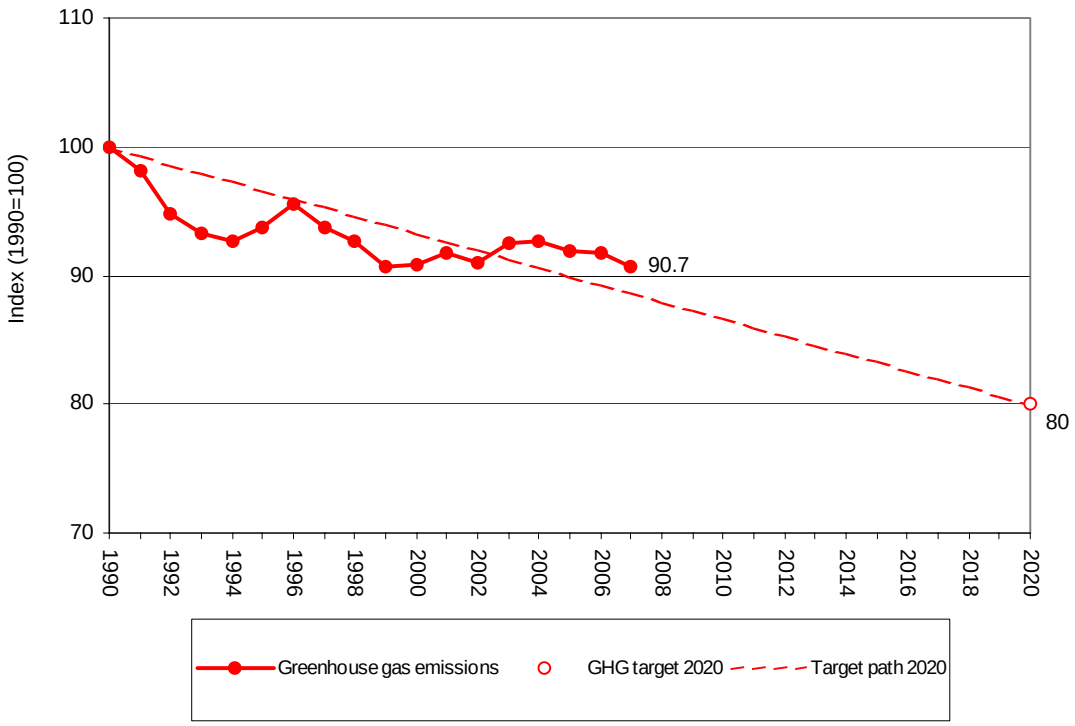
include emissions and removals from LULUCF. In addition, no adjustments for temperature variations or electricity trade are considered.

For the fluorinated gases the EC base year emissions is the sum of Member States' emissions in the respective base years. Twelve Member States have chosen to select 1995 as base year under the Kyoto Protocol. Austria, France and Italy have chosen to use 1990. Therefore, the EC base year estimates for fluorinated gas emissions are the sum of 1995 emissions for 12 Member States and 1990 emissions for Austria, France and Italy.

For this reason and because of recalculations for the emissions in 1990, the emissions in 1990 need not be exactly 100. The Kyoto target relates to average emissions over the five-year period 2008-2012, the latest five-year available (2003-2007) is shown, in addition to the GHG emission trends for 1990-2007.

Total GHG emissions excluding LULUCF (land-use, land-use change and forestry) in the EU-27 decreased by 9.3 % between 1990 and 2007. Emissions decreased by 1.2 % between 2006 and 2007.

Illustration 4-2 EU-27 GHG emissions 1990–2007 compared with the EC's target for 2020 (excluding LULUCF)



In the EU-15, the change of total GHG emissions excluding LULUCF between the fixed Kyoto base year and 2007 was -5.0 %. The effect of the recalculation in 2006, comparing the 2008 and 2009 inventories, was 0.8 %. This means that of the 5.0 % reduction in emissions between the Kyoto base year and 2007, 0.8 % has been due to recalculations. These were mainly due to the revised energy balance in Germany and the use of a revised emission factor for agriculture (nitrogen leaching) in Germany. The other main reason was more widespread use of the N_2O emission factors in the

COPERT4 model for estimating emissions from road transport. The N_2O emission factor in COPERT4 is lower than in COPERT3. This has the effect of reducing N_2O emissions more in later years because of the upward trend in the use of catalysts to reduce NO_x emissions. In the EU-15, recalculations for the year 1990 had only a small affect (-0.3 % between the 2008 and 2009 submissions). In the EU-27, recalculations affected the year 1990 by -0.2 % and the year 2006 by -0.7 %.

4.2.2. *Emission Trends by Gas*

Table 4-1 gives an overview of the main trends in the EU-15 GHG emissions and removals for 1990–2007. Also in the EU-15 the most important GHG is CO_2, accounting for 83.7 % of total EU-15 emissions in 2007 excluding LULUCF. In 2007, EU-15 CO_2 emissions without LULUCF were 3,391 Tg, which was 0.9 % above 1990 levels. Compared to 2006, CO_2 emissions decreased by 1.8 %.

Table 4-1 Overview of EU-15 GHG emissions and removals from 1990 to 2007 in CO2 equivalents (Tg)

GREENHOUSE GAS EMISSIONS	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Net CO_2 emissions/removals	3,138	3,122	3,051	3,004	2,995	3,024	3,080	3,025	3,077	3,037	3,087	3,135	3,111	3,156	3,190	3,156	3,158	3,126
CO_2 emissions (without LULUCF)	3,360	3,383	3,306	3,252	3,252	3,286	3,363	3,308	3,355	3,328	3,354	3,422	3,411	3,477	3,488	3,459	3,452	3,391
CH_4	436	432	426	423	414	411	406	394	385	376	366	354	344	331	320	314	309	305
N_2O	387	383	376	363	370	371	375	374	354	334	331	323	315	313	314	309	295	292
HFCs	28	28	29	31	36	41	47	53	54	47	46	44	46	50	50	53	54	57
PFCs	17	15	13	12	12	11	11	10	9	9	7	6	8	7	5	4	4	3
SF_6	11	11	12	13	14	15	15	14	13	11	11	10	9	9	9	9	9	9
Total (with net CO_2 emissions/removals)	**4,016**	**3,992**	**3,907**	**3,846**	**3,840**	**3,873**	**3,934**	**3,870**	**3,891**	**3,813**	**3,848**	**3,873**	**3,834**	**3,866**	**3,888**	**3,845**	**3,828**	**3,793**
Total (without CO_2 from LULUCF)	**4,239**	**4,253**	**4,162**	**4,095**	**4,097**	**4,136**	**4,218**	**4,153**	**4,170**	**4,104**	**4,114**	**4,160**	**4,134**	**4,187**	**4,187**	**4,148**	**4,122**	**4,058**
Total (without LULUCF)	**4,233**	**4,247**	**4,157**	**4,089**	**4,089**	**4,128**	**4,210**	**4,146**	**4,163**	**4,098**	**4,108**	**4,154**	**4,127**	**4,180**	**4,180**	**4,141**	**4,116**	**4,052**

When the 4th National Communication from the EC was produced[24], CO_2 emissions without LULUCF in 2003[25] were 3.4 %, above 1990 levels, although emissions of CH_4 and N_2O had declined over the same period. These features in the emission data have remained in the 2007 GHG inventory, although the increase in CO_2 emissions has been less significant. Emissions of CO_2 and F-gases increased slightly from 1990 to 2007 by 31 Tg (0.9 %) and 13 Tg CO_2 eq. (24 %), respectively. Emissions of CH_4 decreased by 131 Tg CO_2 eq. (–30 %) and emissions of N_2O decreased by 95 Tg CO_2 eq. (-25 %).

Table 4-2 gives an overview of the main trends in EU-27 GHG emissions and removals for 1990–2007. The most important GHG by far is CO_2, accounting for 83 % of total EU-27 emissions in 2007 excluding LULUCF. In 2007, EU-27 CO_2 emissions excluding LULUCF were 4,187 Tg, which was 4.8 % below 1990 levels. Compared to 2006, CO_2 emissions decreased by 1.3 %.

[24] Summary of 4th National Communication in Communication from the Commission (COM(2006) 40 final). See http://eur-lex.europa.eu/LexUriServ/site/en/com/2006/com2006_0040en01.pdf

[25] At the time of the 4th National Communication, 2003 was the latest inventory data available.

Table 4-2 Overview of EU-27 GHG emissions and removals from 1990 to 2007 in CO_2 equivalents (Tg)

GREENHOUSE GAS EMISSIONS	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Net CO_2 emissions/removals	4,057	3,943	3,791	3,738	3,710	3,755	3,838	3,753	3,741	3,669	3,714	3,758	3,722	3,793	3,819	3,783	3,794	3,771
CO_2 emissions (without LULUCF)	4,400	4,343	4,191	4,126	4,103	4,150	4,251	4,163	4,152	4,084	4,106	4,184	4,158	4,252	4,264	4,232	4,243	4,187
CH_4	602	588	571	561	548	547	541	525	505	494	481	466	457	446	433	426	422	416
N_2O	513	485	466	447	454	455	460	458	434	411	409	403	392	391	394	389	375	374
HFCs	28	28	29	31	36	41	48	54	55	48	48	46	49	53	54	59	60	63
PFCs	20	18	15	14	14	14	13	11	10	10	8	8	9	8	6	5	5	4
SF_6	11	11	12	13	15	16	15	14	13	11	11	11	10	9	9	9	10	10
Total (with net CO_2 emissions/removals)	**5,230**	**5,073**	**4,885**	**4,806**	**4,776**	**4,827**	**4,915**	**4,814**	**4,759**	**4,643**	**4,671**	**4,692**	**4,639**	**4,700**	**4,717**	**4,672**	**4,666**	**4,638**
Total (without CO_2 from LULUCF)	**5,573**	**5,473**	**5,284**	**5,194**	**5,169**	**5,223**	**5,328**	**5,224**	**5,170**	**5,059**	**5,063**	**5,118**	**5,074**	**5,160**	**5,162**	**5,120**	**5,114**	**5,054**
Total (without LULUCF)	**5,564**	**5,464**	**5,276**	**5,186**	**5,159**	**5,213**	**5,318**	**5,214**	**5,160**	**5,049**	**5,054**	**5,109**	**5,066**	**5,150**	**5,153**	**5,111**	**5,105**	**5,045**

4.2.3. *Emission Trends by Main Source*

Table 4-3 gives an overview of EU-15 GHG emissions, for 1990–2007, presented in the same sectors used for reporting the EU-27 emissions. Emissions from international aviation and shipping are presented in the table but are excluded from national totals. The emissions from the largest sector, energy, with 58.5 % the total emissions, decreased by 189 Tg CO_2 equivalents (-7.4 %). Emissions from the industrial processes sector decreased by 40 Tg CO_2 eq. (–10.8 %); emissions from the transport sector increased by 165 Tg CO_2 eq. (–23.6 %) emissions from the agriculture sector decreased by 48 Tg CO_2 equivalents (–11.5 %); emissions from the waste sector decreased by 66 Tg CO_2 eq. (–39 %); and emissions from 'other' sector decreased by 4 Tg CO_2 eq. (–28.6 %).

Table 4-4 gives an overview of EU-27 GHG emissions in seven sectors for 1990–2007. Emissions from international aviation and shipping are presented in the table but are excluded from the national totals. The energy sector is the largest sector by far, accounting for 59.8 % of total EU-27 emissions in 2007. The second largest sector is transport (19.5 %), followed by agriculture (9.2 %). The increase in emissions between 1990-2007 from the transport sector is due to both growth in passenger transport and freight transport (see section 3.8) although there have been policies and measures implemented in this sector to mitigate emissions (see section 5.5).

Table 4-3 Overview of EU-15 GHG emissions in the main source and sink categories 1990 to 2007 in CO_2 equivalents (Tg) [26]

GHG SOURCE AND SINK	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
1. Energy	2,558	2,577	2,479	2,423	2,399	2,418	2,486	2,409	2,428	2,383	2,397	2,459	2,434	2,487	2,477	2,452	2,438	2,369
2. Industrial Processes	372	361	349	339	361	371	369	378	357	325	330	321	320	325	331	332	325	332
3. Transport	699	713	738	746	750	760	777	786	810	830	831	840	850	856	867	862	863	864
4. Agriculture	419	410	405	398	400	402	406	407	407	406	403	394	389	385	383	377	373	371
5. Land-Use, Land-Use Change and Forestry	-217	-255	-250	-242	-249	-255	-276	-276	-271	-284	-260	-280	-294	-314	-292	-296	-288	-259
6. Waste	171	173	172	170	168	165	161	153	148	141	136	129	123	117	112	109	107	105
7. Other	14	13	13	13	12	12	12	12	12	12	12	11	11	11	10	10	10	10
Total (with net CO_2 emissions/removals)	**4,016**	**3,992**	**3,907**	**3,846**	**3,840**	**3,873**	**3,934**	**3,870**	**3,891**	**3,813**	**3,848**	**3,873**	**3,834**	**3,866**	**3,888**	**3,845**	**3,828**	**3,793**
Total (without LULUCF)	**4,233**	**4,247**	**4,157**	**4,089**	**4,089**	**4,128**	**4,210**	**4,146**	**4,163**	**4,098**	**4,108**	**4,154**	**4,127**	**4,180**	**4,180**	**4,141**	**4,116**	**4,052**
International aviation	62	62	67	71	75	80	84	89	96	104	110	109	106	110	119	124	129	133
International marine	104	103	104	108	105	107	114	124	130	124	130	135	140	142	150	158	168	170

[26] 7. 'Other' includes emissions from Solvent and Other Product Use reported in sector 3 and sector 7 from the CRF

Table 4-4 Overview of EU-27 GHG emissions in the main source and sink categories 1990 to 2007 in CO_2 equivalents (Tg)[27]

GHG SOURCE AND SINK	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
1. Energy	3,498	3,460	3,289	3,227	3,171	3,194	3,280	3,164	3,123	3,046	3,052	3,122	3,079	3,155	3,134	3,095	3,090	3,017
2. Industrial Processes	478	441	425	410	438	456	453	460	432	393	405	394	390	401	413	420	418	431
3. Transport	780	785	808	816	823	838	863	873	901	918	918	931	944	954	973	972	978	983
4. Agriculture	579	549	526	506	505	504	506	507	505	501	493	485	479	474	473	466	463	462
5. Land-Use, Land-Use Change and Forestry	-334	-391	-392	-380	-383	-385	-403	-400	-401	-406	-383	-417	-427	-450	-436	-439	-440	-407
6. Waste	213	215	213	212	210	207	203	196	184	178	172	164	160	154	149	146	144	141
7. Other	16	16	15	15	14	14	14	14	14	14	14	13	13	13	13	12	13	12
Total (with net CO_2 emissions/removals)	**5,230**	**5,073**	**4,885**	**4,806**	**4,776**	**4,827**	**4,915**	**4,813**	**4,758**	**4,643**	**4,671**	**4,692**	**4,638**	**4,700**	**4,717**	**4,671**	**4,665**	**4,638**
Total (without LULUCF)	**5,564**	**5,464**	**5,276**	**5,186**	**5,159**	**5,213**	**5,318**	**5,214**	**5,159**	**5,049**	**5,053**	**5,109**	**5,066**	**5,150**	**5,153**	**5,111**	**5,104**	**5,045**
International aviation	66	66	71	75	79	84	88	92	100	107	114	113	111	115	123	129	135	139
International marine	110	108	109	112	109	110	117	127	133	127	133	138	145	148	156	164	174	176

[27] 7. 'Other' includes emissions from Solvent and Other Product Use reported in sector 3 and sector 7 from the CRF

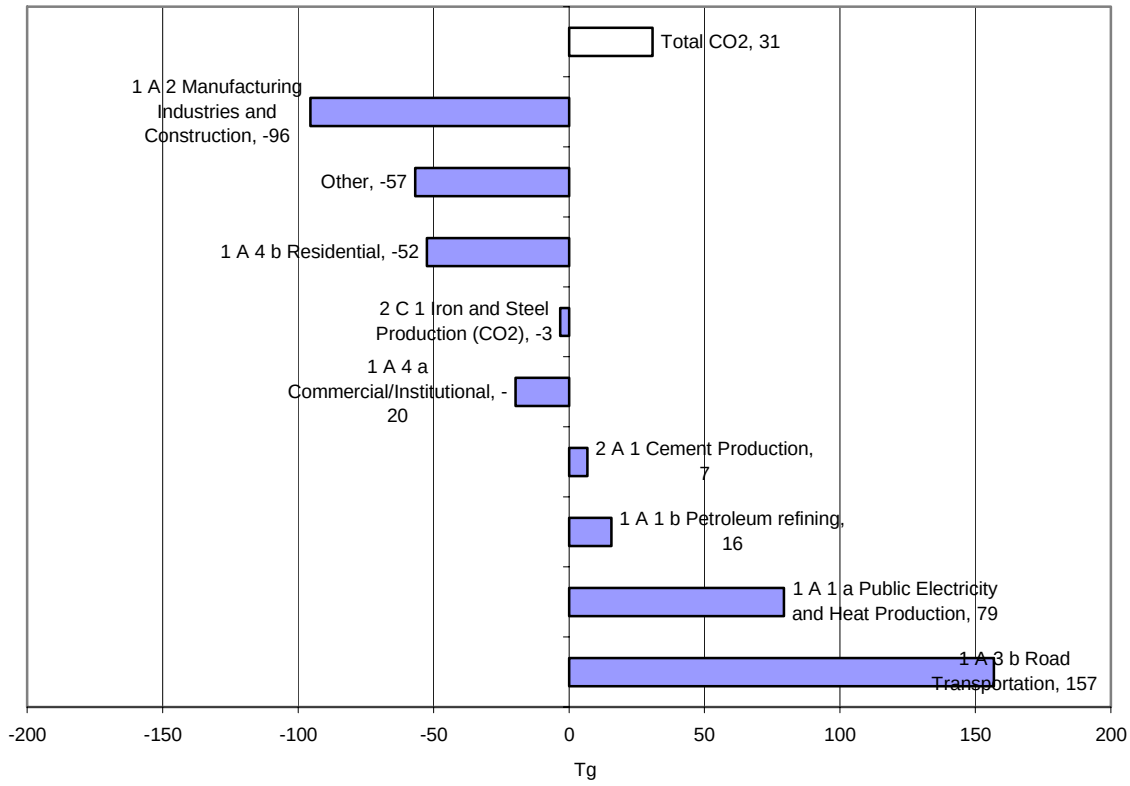
International bunker emissions of the EC inventory are the sum of the Aviation bunker and Maritime bunker emissions of the Member States[28]. Between 1990 and 2007, greenhouse gas emissions from international bunker fuels increased by 82 % in the EU-15 and by 79 % in the EU-27. Greenhouse gas emissions from maritime bunkers (international shipping) account for 56 % and emissions from aviation bunkers (international aviation) accounts for 44 % of the total international bunkers in the EU-27. These emissions are reported as memo items but excluded from national totals. The emissions from these two sources are equivalent to 4.2 % (170 Mt) and 3.3 % (133 Mt) of total EU-27 GHG emissions in 2007.

4.2.4. *Change in Emissions from Key Source Categories for EU-15*

Key source categories are defined as the sources of emissions that have a significant influence on the inventory as a whole, in terms of the absolute level of the emissions, the trend, or both. Road transport is a key source category in the EC inventory, and the main reason for the increase in EU-15 CO_2 emissions between 1990 and 2007 was the growth in road transport. The growth in passenger transport and freight is presented in section 3.8. The large increase in road transport-related CO_2 emissions was only partly offset by reductions in energy-related emissions from manufacturing industries and 'other' sectors Emissions from the sector 'other' are the sum of the reductions from sources not categorized as key sources. Carbon dioxide emissions from public electricity and heat production have increased despite some switching to lower carbon sources (see section 3.7.1) since 1990.

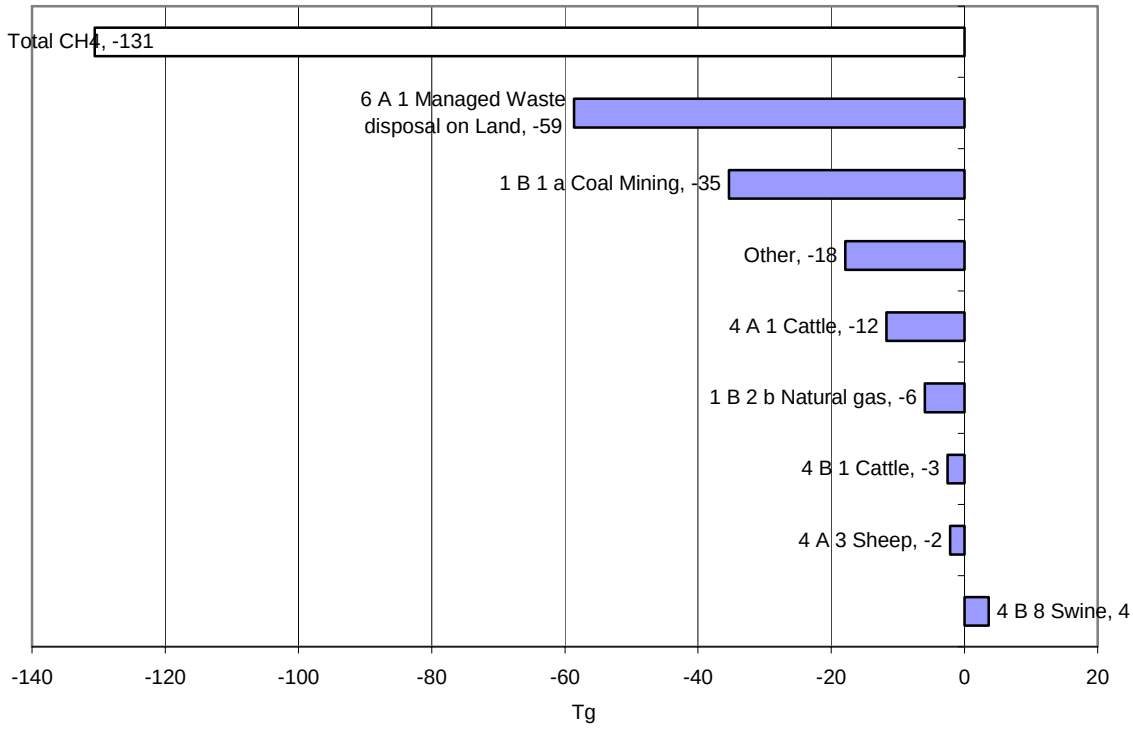
[28] The definitions in Tables 2.8 and 2.9 of the IPCC good practice guidance are based on activities within 'one country". This means domestic aviation is defined for individual countries. The decision tree in Figure 2.8 of the IPCC good practice guidance considers 'national fuel statistics' for domestic aviation. As the EC is neither a country nor a nation, the EC's interpretation of the good practice guidance is that the emission estimate at EC level has to be the sum of Member States estimates for domestic air or marine transport as they are the countries or nations addressed in the definition and decision trees of the IPCC good practice guidance.

Illustration 4-3 Absolute change of CO_2 emissions by large key source categories 1990 to 2007 in CO_2 equivalents (Tg) for EU-15



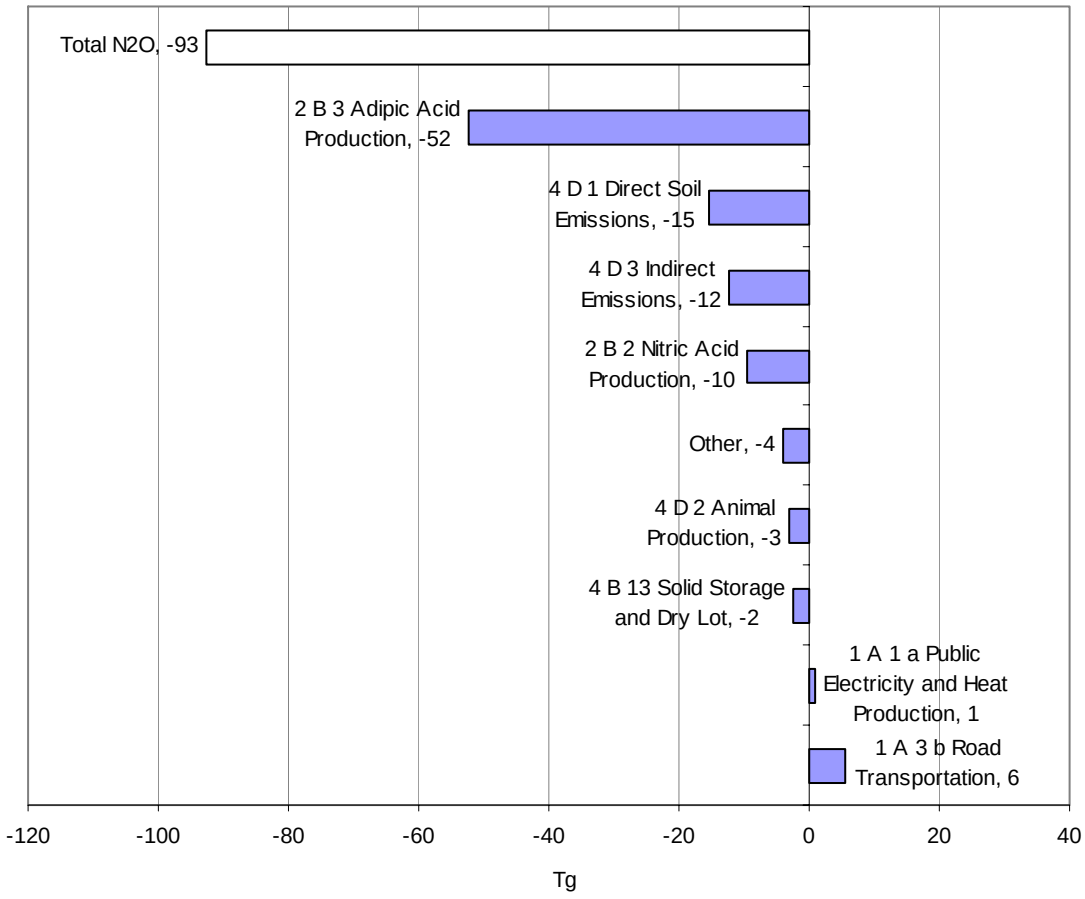
Methane emissions account for 7.5 % of total EU-15 GHG emissions excluding LULUCF and the net emissions and removals decreased by 30 % since 1990 to 305 Tg CO_2 eq. in 2007. The two largest key sources account for 55.2 % of CH_4 emissions in 2007. The illustration below shows the change in CH_4 emissions. The main reasons for declining CH_4 emissions were 1) reductions in solid waste disposal on land, due to the increased use of recycling and incineration of waste with energy recovery as a result of the policy drivers discussed in section 5.9, and 2) the decline of coal-mining.

Illustration 4-4 Absolute change of CH_4 emissions by large key source categories 1990 to 2007 in CO_2 equivalents (Tg) for EU-15



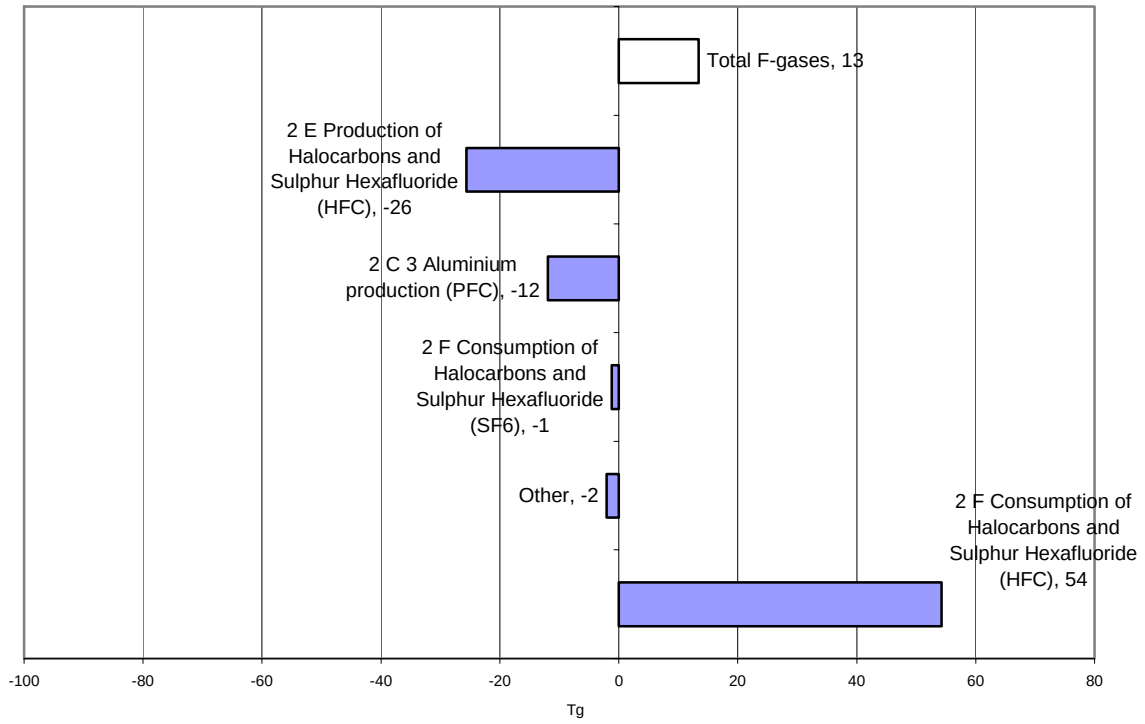
Nitrous oxide emissions are responsible for 7.2 % of total EU-15 GHG emissions excluding LULUCF and the net emissions and removals decreased by 24.5 % to 292 Tg CO_2 eq. in 2007. The two largest key sources account for 53 % of N_2O emissions in 2007. The figure below shows the change in N_2O emissions. The main reasons for the large reductions in N_2O emission were abatement measures to mitigate emissions from adipic acid production and reductions in direct soil emissions. The consumption of nitrogenous fertilizer has fallen steadily by approximately 10 % since 2000 (see section 3.12).

Illustration 4-5 Absolute change of N2O emissions by large key source categories 1990 to 2007 in CO2 equivalents (Tg) for EU-15



Fluorinated gas emissions account for 1.7 % of total EU-15 GHG emissions. In 2007, emissions were 69 Tg CO_2 eq., which was 24.1 % above 1990 levels. The two largest key sources account for 88 % of fluorinated gas emissions in 2007. The figure below shows that emission of HFCs from consumption of halocarbons and sulphur hexafluoride showed large increase between 1990 and 2007. The main reason for this is the phase-out of ozone-depleting substances such as chlorofluorocarbons under the Montreal Protocol and the replacement of these substances with HFCs (mainly in refrigeration, air conditioning, foam production and as aerosol propellants). On the other hand, HFC emissions from production of halocarbons and sulphur hexafluoride decreased substantially.

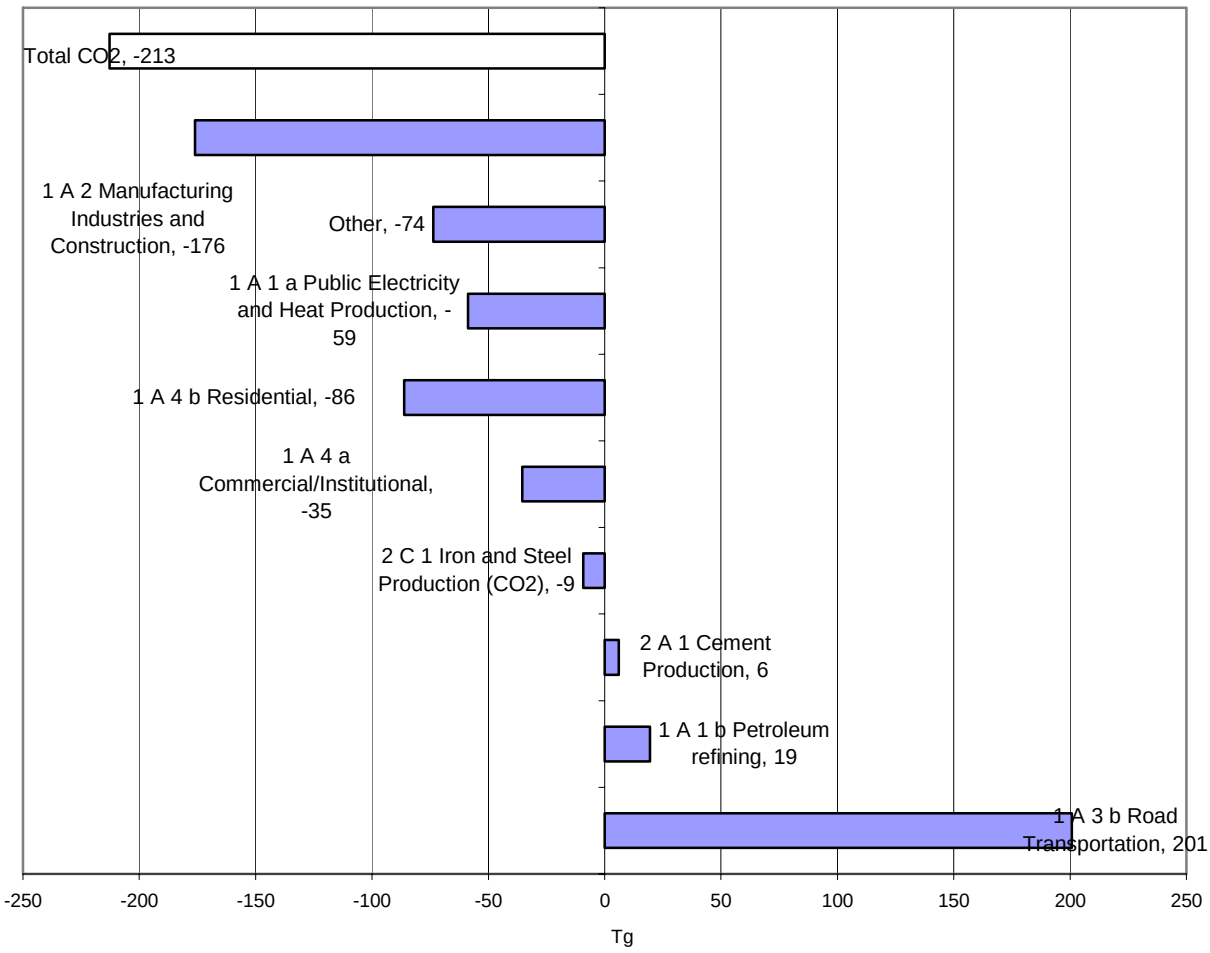
Illustration 4-6 Absolute change of fluorinated gas emissions by large key source categories 1990 to 2007 in CO2 equivalents (Tg) for EU-15



4.2.5.*Change in Emissions from Key Source Categories for EU-27*

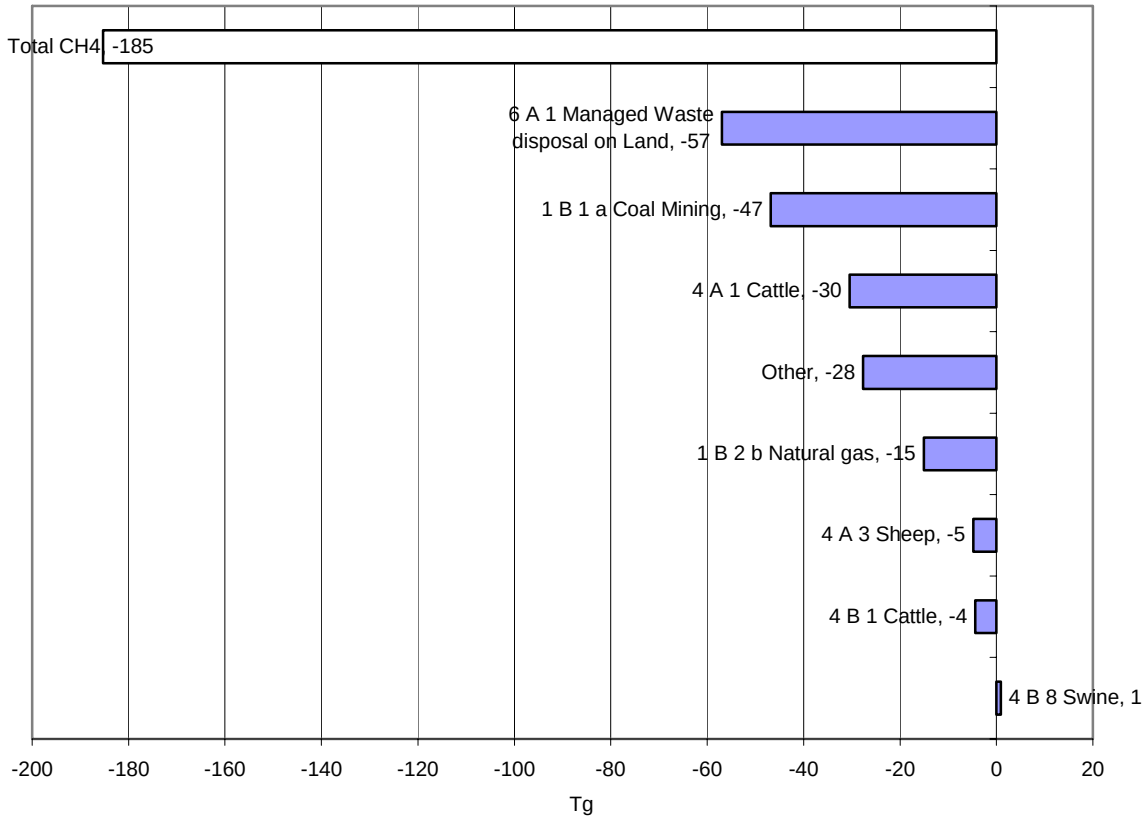
In the EU-27 inventory, many of the key source categories emissions reduced between 1990 and 2007. The main reasons for the decrease in EU-27 CO_2 emissions was due to the reduction in emissions from the manufacturing and construction industries and from public electricity and heat production. Emissions from the sector 'other' are the sum of the reductions from sources not categorized as key sources. Similar to the EU-15, road transport contributed significantly to the increase in CO_2 emissions, although in the case for the EU-27 the magnitude of the increase was less than the overall reduction that occurred in the other sectors.

Illustration 4-7 Absolute change of CO2 emissions by large key source categories 1990 to 2007 in CO2 equivalents (Tg) for EU-27



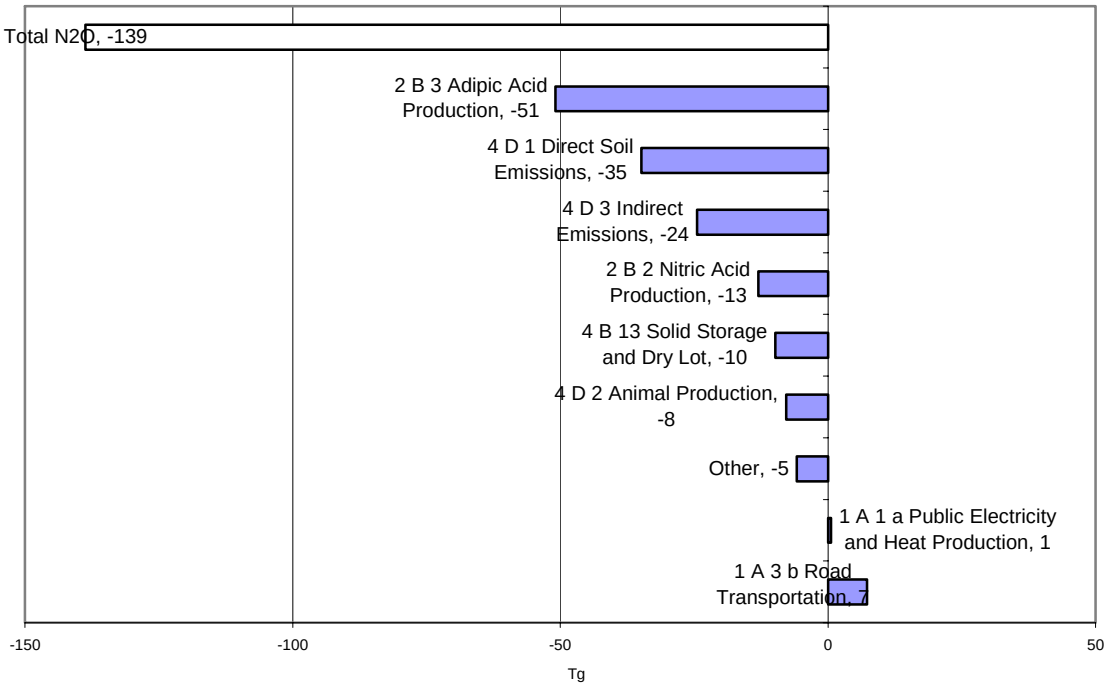
Methane emissions account for 8.3 % of total EU-27 GHG emissions excluding LULUCF and the net emissions and removals decreased by 31 % since 1990 to 416 Tg CO_2 eq. in 2007. The two largest key sources account for 50 % of CH_4 emissions in 2007. The illustration below shows that the change in CH_4 emissions.

Illustration 4-8 Absolute change of CH4 emissions by large key source categories 1990 to 2007 in CO2 equivalents (Tg) for EU-27



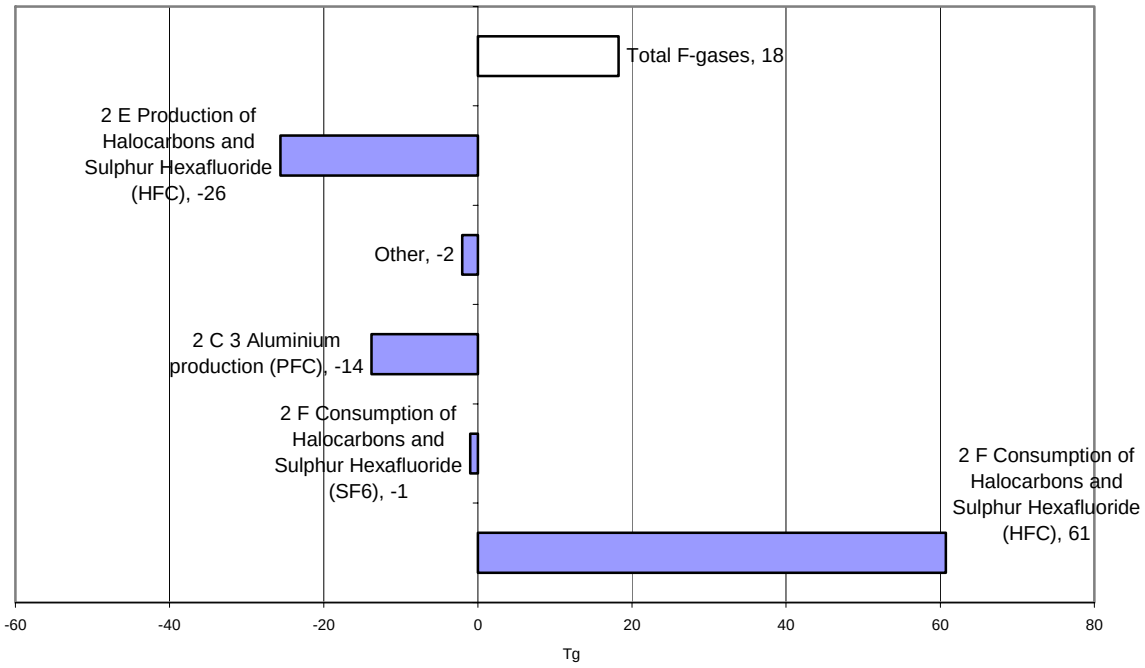
Nitrous oxide emissions are responsible for 7.4 % of total EU-27 GHG emissions excluding LULUCF and the net emissions and removals decreased by 27 % to 374 Tg CO_2 eq. in 2007. The two largest key sources account for 53 % of N_2O emissions in 2007. The figure below shows the change in N_2O emissions. The main reasons for the large reductions in N_2O emission were for the same reasons as the EU-15.

Illustration 4-9 Absolute change of N2O emissions by large key source categories 1990 to 2007 in CO2 equivalents (Tg) for EU-27



Fluorinated gas emissions account for 1.5 % of total EU-27 GHG emissions excluding LULUCF. In 2007, emissions were 77 Tg CO_2 eq., which was 31 % above 1990 levels. The two largest key sources account for 88 % of fluorinated gas emissions in 2007. The figure below shows that HFC emissions from the consumption of halocarbons and sulphur hexafluoride increased by 61 Tg between 1990 and 2007. The main reason for this is the phase-out of ozone-depleting substances such as chlorofluorocarbons under the Montreal Protocol and the replacement of these substances with HFCs (mainly in refrigeration, air conditioning, foam production and as aerosol propellants). On the other hand, HFC emissions from production of halocarbons and sulphur hexafluoride decreased substantially.

Illustration 4-10 Absolute change of F-gas emissions by large key source categories 1990 to 2007 in CO2 equivalents (Tg) for EU-27



4.2.6. *Key Drivers Affecting Emission Trends*

The sections below summarise the main reasons for the changes in emissions in the EU during the period 2006-2007. The main reasons for the changes during the period 1990-2007 are described in more detail in section 3 - National Circumstances.

EMISSION DECREASE

Contribution by EU-15:

- CO_2 emissions from households and the service sector[29] fell by 66.8 million tonnes or -10.8 %. The use of fossil fuels (i.e. oil, gas and coal) decreased by 10.1 %, particularly in households, mainly due to a lower number of heating degree days and due to shifts in fuel purchases (from 2007 to 2006 and 2008) because of fuel price variations.

29 This includes emissions from fuel combustion in commercial and institutional buildings, and all emissions from fuel combustion in households. It also includes a smaller source category covering fuel combustion emissions from agriculture, forestry and fishing. It should be noted that greenhouse gas emissions from households and services do not include indirect emissions. That is, greenhouse gas emissions resulting from the production of heat and electricity supplied to households and services are included under public electricity and heat production. Direct combustion emissions from households are outside the EU ETS.

- CO_2 emissions from manufacturing industries (excluding iron and steel) fell by 8.2 million tonnes or -1.9 %), with the main reductions in Italy, Spain and the United Kingdom.

- Fugitive emissions of CH_4 fell by 2.2 million tonnes or -6.5 % mainly in Germany and the United Kingdom, due to reduced coal mining activity and improvements to the gas distribution network.

- Emissions from iron and steel production fell due to reduced energy use, mainly in Germany (decline of 2.2 million tonnes or -1.4 %).

EU-27:

In addition to the factors driving EU-15 emissions outlined above, EU-27 emissions are also influenced by the following trends in the EU-12:

- CO_2 emissions from households and services fell by 79.1 million tonnes (-10.9 %). Substantial decreases were reported in Poland, Hungary and Czech Republic due to the decrease in use of solid, gaseous and liquid fuels, corresponding to the warmer weather conditions in 2007.

- CO_2 emissions from manufacturing industries excluding iron and steel fell by 4.7 million tonnes (-0.9 %). The decrease is mainly due to EU-15 Member States. Several newer Member States report increased emissions, with the Czech Republic reporting the highest increase.

- Fugitive CH_4 emissions from energy supply fell by 3.1 million tonnes (-4.4 %), with significant reductions reported by Czech Republic and Poland.

EMISSION INCREASE

Contribution by EU-15:

- CO_2 emissions from public electricity and heat production increased by 10.7 million tonne (1.0 %). CO_2 emissions from public electricity and heat production increased mainly in Germany, Greece, the Netherlands and Spain, due to higher electricity production in conventional thermal power plants. Denmark, Finland and the United Kingdom reported decreases in emissions from this sector. Denmark produced less electricity from coal and had higher imports and lower exports in 2007 relative to 2006; Finland reduced electricity production from coal and made more use of hydropower. The UK's reductions were mainly due to a further shift from coal to gas. In the EU-15 the use of liquid fuels decreased by 21 %, while the use of solid fuels was constant and the use of gaseous fuels increased by 8 %. These trends are reflected in the decrease in emissions

- HFC from the consumption of halocarbons increased by 3.1 million tonnes (6.1 %). The increase in emissions came from the refrigeration and air conditioning sectors. France, Germany and Italy report the highest increases.

EU-27:

In addition to the factors driving EU-15 emissions outlined above, EU-27 emissions are also influenced by the following trends in the EU-12:

- CO_2 from public electricity and heat production increased by 15.0 million tonnes (1.1 %). Among the EU-12 increases were reported by Bulgaria, Czech Republic and Estonia due to increased electricity generation from conventional thermal power plants. Poland and Slovakia reported decreases due to increased electricity imports.

- CO_2 from road transportation increased by 5.3 million tonnes (0.6 %). The highest increases are reported by Slovakia, Lithuania, the Czech Republic and Slovenia, mostly due to increased traffic volume.

- CO_2 emissions from cement production in Poland increased by 4.5 million tonnes (4.4 %). Beside increases in the EU-15 Member States, Poland reported a major increase in emissions from cement production.

- HFC from the consumption of halocarbons increased by 4.0 million tonnes (7.0 %) from refrigeration and air conditioning. From the new Member States, Poland and Czech Republic report the highest increases.

- CO_2 emissions from the manufacture of solid fuels increased by 3.6 million tonnes (5.4 %). Poland contributed most to this increase in emissions.

The trends in emissions of the EU-15 normally dominate the trends of the EU-27. The reductions in emissions from many sources are also driven by the Policies and Measures (PAMs) which have been implemented within the EU. Further detail can be found in section 5.

Per Capita and Intensity Trends

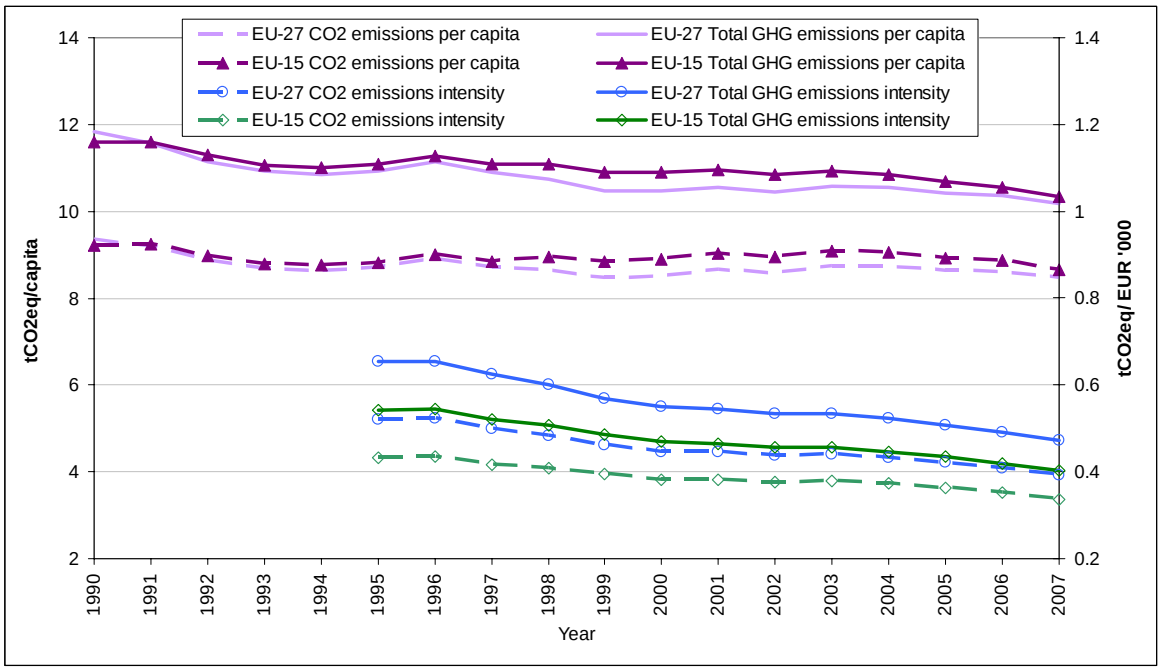
The previous sections highlighted overall trends in absolute emissions. It is also useful to view the trends in terms of emissions per capita as well as emissions intensity (per €k of GDP). Emissions intensity has declined for both the EU-15 and EU-27 over the period 1995 to 2007. This has been the result of a steady increase in GDP (as shown in section 3.3) over the period with a decline in emissions - with the exception of a slight increase in EU-15 CO_2 emissions, however, the increased in GDP was greater than this leading to a decline in emissions intensity overall.

A similar pattern is broadly observed in terms of total emissions per capita, but the increase in population over the period has been lower than that of GDP, hence the decline in emissions per capita is more gradual. In the case of EU-15 CO_2 the two trends, increase in CO_2 and population, roughly offset each other, hence EU-15 CO_2 emissions per capita has remained broadly stable over the period.

In 2007, average emissions per EU-27 citizen were approximately 10.2 tCO_2eq, with an EU-15 average of 10.3 tCO_2eq. This is above the world average of 6.7 tCO2 eq. per capita[30]. Greenhouse gas emissions show significant differences across European countries, correlated to the energy intensity (primary energy consumption per GDP) and the energy mix (affecting the level of emissions by energy unit produced) of each country.

[30] IEA, 2008: CO_2 emissions from fuel combustion, Edition 2008, International Energy Agency. Data refer to 2005 population and greenhouse gas emissions.

Illustration 4-11 Trends in emissions per capita and intensity (excluding LULUCF)



Note: GDP data for emissions intensity based on chain-linked volumes, reference year 2000 (at 2000 exchange rates). Values start only in 1995 for emission intensity because of missing data for 13 Member States (Belgium, Bulgaria, Cyprus, Czech Republic, Greece, Hungary, Ireland, Lithuania, Luxembourg, Malta, Poland, and Romania)

Source: Eurostat (Data Explorer)

Contribution of MS to Greenhouse Reduction Trends

The tables below give an overview of Member States' contributions to the EC GHG emissions excluding LULUCF, for 1990–2007. The emission trends of the Member States are highly variable.

Table 4-5 Overview of Member States' contributions to EC GHG emissions excluding LULUCF from 1990 to 2007 in CO2 equivalents (Tg)

Member State	1990	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Austria	79	81	84	83	82	81	81	85	87	93	92	93	92	88
Belgium	143	149	154	145	151	144	145	145	143	146	146	142	137	131
Bulgaria	118	89	87	84	75	70	69	70	67	72	71	71	72	76
Cyprus	5	7	7	7	8	9	9	9	9	9	10	10	10	10
Czech Republic	195	153	160	153	145	141	147	149	145	146	147	146	149	151
Denmark	69	76	90	80	76	73	68	69	69	74	68	63	71	67
Estonia	42	21	22	21	20	18	18	19	18	20	20	20	19	22
Finland	71	71	77	76	72	72	70	75	77	85	80	69	80	78
France	563	556	571	565	578	562	557	558	549	552	552	554	542	531
Germany	1,215	1,085	1,105	1,068	1,042	1,010	1,008	1,025	1,006	1,007	997	969	980	956
Greece	106	110	113	118	123	123	127	128	128	131	131	132	128	132
Hungary	99	80	82	80	80	80	78	80	78	81	80	80	79	76
Ireland	55	59	61	63	66	67	69	71	69	69	69	70	70	69
Italy	516	530	523	529	540	546	550	555	556	570	574	574	563	553
Latvia	27	13	13	12	12	11	10	11	11	11	11	11	12	12
Lithuania	49	22	23	23	23	21	19	20	21	21	22	23	23	25
Luxembourg	13	10	10	10	9	9	10	10	11	12	13	13	13	13
Malta	2	3	3	3	3	3	3	3	3	3	3	3	3	3
Netherlands	212	225	233	226	227	215	214	216	215	217	218	212	209	208
Poland	459	446	454	449	414	400	389	385	371	384	384	387	399	399
Portugal	59	70	68	71	76	84	82	84	89	84	86	89	85	82
Romania	243	181	187	167	149	132	136	140	147	154	155	149	154	152
Slovakia	73	53	51	50	50	49	48	50	49	50	50	49	49	47
Slovenia	19	19	19	20	19	19	19	20	20	20	20	20	21	21
Spain	288	319	312	333	343	372	386	386	403	410	426	441	433	442
Sweden	72	74	77	73	73	70	68	69	70	70	70	67	67	65
United Kingdom	771	712	733	708	704	671	674	677	656	661	658	653	648	637
EU-15	**4,233**	**4,128**	**4,210**	**4,146**	**4,163**	**4,098**	**4,108**	**4,154**	**4,127**	**4,180**	**4,180**	**4,141**	**4,116**	**4,052**
EU-27	**5,564**	**5,213**	**5,318**	**5,214**	**5,160**	**5,049**	**5,054**	**5,109**	**5,066**	**5,150**	**5,153**	**5,111**	**5,105**	**5,045**

Note: For some countries the data provided in this table is based upon the gap filling procedure, see section 4.3.6 for more details.

Table 4-6 Greenhouse gas emissions excluding LULUCF (CO2 equivalents) and Kyoto Protocol targets for 2008-2012

MEMBER STATE	1990	Kyoto Protocol base year[(1)]	2007	Change 2006–2007	Change 1990-2007	Change base year–2007	Targets 2008–12 under Kyoto Protocol an "EU burden sharing"
	(million tonnes)	(million tonnes)	(million tonnes)	(%)	(%)	(%)	(%)
Austria	79.0	79.0	88.0	-3.9	11.3	11.3	-13.0
Belgium	143.2	145.7	131.3	-3.9	-8.3	-9.9	-7.5
Bulgaria	117.7	132.6	75.8	5.4	-35.6	-42.8	-8.0
Cyprus	5.5	5.5*	10.1	1.6	83.6	83.6	Not applicable
Czech Republic	194.7	194.2	150.8	1.2	-22.5	-22.4	-8.0
Denmark	69.1	69.3	66.6	-6.2	-3.5	-3.9	-21.0
Estonia	41.9	42.6	22.0	14.8	-47.5	-48.3	-8.0
Finland	70.9	71.0	78.3	-2.0	10.6	10.3	0.0
France	562.6	563.9	531.1	-2.0	-5.6	-5.8	0.0
Germany	1215.2	1232.4	956.1	-2.4	-21.3	-22.4	-21.0
Greece	105.6	107.0	131.9	2.9	24.9	23.2	25.0
Hungary	99.2	115.4	75.9	-3.7	-23.5	-34.2	-6.0
Ireland	55.4	55.6	69.2	-0.7	25.0	24.5	13.0
Italy	516.3	516.9	552.8	-1.8	7.1	6.9	-6.5
Latvia	26.7	25.9	12.1	3.5	-54.7	-53.4	-8.0
Lithuania	49.1	49.4	24.7	8.1	-49.6	-49.9	-8.0
Luxembourg	13.1	13.2	12.9	-2.9	-1.6	-1.9	-28.0
Malta	2.0	2.0*	3.0	2.6	49.0	49.0	Not applicable
Netherlands	212.0	213.0	207.5	-0.5	-2.1	-2.6	-6.0
Poland	459.5	563.4	398.9	-0.1	-13.2	-29.2	-6.0
Portugal	59.3	60.1	81.8	-3.4	38.1	36.1	27.0
Romania	243.0	278.2	152.3	-1.0	-37.3	-45.3	-8.0
Slovakia	73.3	72.1	47.0	-4.1	-35.9	-34.8	-8.0

Slovenia	18.6	20.4	20.7	0.7	11.6	1.8	-8.0
Spain	288.1	289.8	442.3	2.1	53.5	52.6	15.0
Sweden	71.9	72.2	65.4	-2.2	-9.1	-9.3	4.0
United Kingdom	771.1	776.3	636.7	-1.7	-17.4	-18.0	-12.5
EU-15	**4232.9**	**4265.5**	**4052.0**	**-1.6**	**-4.3**	**-5.0**	**-8.0**
EU-27	**5564.0**	**5767.1***	**5045.4**	**-1.2**	**-9.3**	**-12.5***	**Not applicable**

Notes: ([1]) The base year for CO_2, CH_4 and N_2O is 1990; for the fluorinated gases 12 Member States have been chosen to select 1995 as the base year, whereas Austria, France and Italy have chosen 1990. As the EC inventory is the sum of Member States' inventories, the EC base year estimates for fluorinated gas emissions are the sum of 1995 emissions for 12 Member States and 1990 emissions for Austria, France and Italy.

* Additionally, as Cyprus, Malta, and EU-27 do not have targets under the Kyoto Protocol they do not have applicable Kyoto Protocol base years. However, for comparison between the base year and 2007 for the EU-27 it has been assumed that base year emissions for Cyprus and Malta are the same as their 1990 emissions.

The overall EC GHG emission trend is dominated by the two largest emitters Germany and the United Kingdom, accounting for about one third of total EU-27 GHG emissions. These two Member States achieved total GHG emission reductions of 393 million tonnes compared to 1990[31]. The main reasons for the trend in Germany were increasing efficiency in power and heating plants and the economic restructuring of the five new Länder after the German reunification. Reduced GHG emissions in the United Kingdom were primarily the result of liberalising energy markets and the subsequent fuel switching from oil and coal to gas in electricity production, and N_2O emission reduction measures in adipic acid production.

Italy and France are the third and fourth largest emitters in the EU-27 with shares of 11 % and 10.5 % respectively. Italy's GHG emissions are 7.1 % above 1990 levels in 2007. Italian GHG emissions increased since 1990 primarily from road transport, electricity and heat production and petroleum-refining. France's emissions were 5.6 % below 1990 levels in 2007. In France, large reductions were achieved in N_2O emissions from adipic acid production, but CO_2 emissions from road transport increased considerably between 1990 and 2007.

Spain and Poland are the fifth and sixth largest emitters in the EU-27 each accounting for 8.8 % and 7.9 % of total EU-27 GHG emissions. Spain increased emissions by 54 % between 1990 and 2007 (+53 % since the base year). This was largely due to emission increases from road transport, electricity and heat production, and manufacturing industries. Poland decreased GHG emissions by 13.2 % between 1990 and 2007 (-29.2 % since the base year, which is 1988 in the case of Poland). The

[31] This is equivalent to 20.7 % since the Kyoto Protocol base year for the two countries. The EU-15 as a whole needs emission reductions of total GHG of 8 %, i.e. 341 million tonnes on the basis of the 2007 inventory in order to meet the Kyoto target. This can be achieved by a combination of existing and planned domestic policies and measures, the use of carbon sinks and the use of Kyoto mechanisms.

main factors in decreasing emissions in Poland, as for other new Member States, were the decline of energy inefficient heavy industry and the overall restructuring of the economy in the late 1980s and early 1990s. The notable exception was transport (especially road transport) where emissions have increased.

Table 4-6 shows that 10 Member States (including Cyprus and Malta, which do not have a Kyoto target) were above base year levels in 2007 and 17 Member States were below. The percentage changes of GHG emissions from the base year to 2007 range from –53.4 % (Latvia) to +52.6 % (Spain).

4.2.7. *Information on Indirect Greenhouse Gas Emissions for EU-15*

Emissions of CO, NO_x, NMVOC and SO_2 have to be reported to the UNFCCC Secretariat as they have an indirect influence on climate change: CO, NO_x and NMVOC are precursor substances for ozone which itself is a greenhouse gas. Sulphur emissions produce microscopic particles (aerosols) that can reflect sunlight back out into space and also affect cloud formation. Table 4-7 shows the total indirect GHG and SO_2 emissions in the EU-15 between 1990–2007. All emissions were reduced significantly from 1990 levels: the largest reduction was achieved in SO_2 (– 75 %) followed by CO (– 58 %) NMVOC (– 48 %) and NO_x (– 35 %).

Table 4-7 Overview of EU-15 indirect GHG and SO2 emissions for 1990–2007 (Gg)

GREENHOUSE GAS EMISSIONS (Gg)	1990	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
NOx	13,448	11,870	11,610	11,209	11,039	10,761	10,494	10,279	10,007	9,916	9,704	9,442	9,141	8,812
CO	52,273	41,593	40,008	38,062	36,410	34,028	31,691	29,885	28,046	27,186	26,076	24,120	23,083	22,083
NMVOC	15,877	12,941	12,441	12,230	11,806	11,333	10,631	10,153	9,676	9,735	9,113	8,875	8,704	8,205
SO_2	16,464	9,941	8,914	8,163	7,623	6,756	6,072	5,807	5,567	5,096	4,879	4,562	4,354	4,163

4.2.8.*Information on Indirect Greenhouse Gas Emissions for EU-27*

In the EU-27, SO_2 emissions decreased by 70 %, followed by CO (-55 %), NMVOC (-45 %) and NOx (-34 %).

Table 4-8 Overview of EU-27 indirect GHG and SO2 emissions for 1990–2007 (Gg)

GREENHOUSE GAS EMISSIONS (Gg)	1990	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
NOx	16,740	14,488	14,287	13,807	13,423	12,997	12,314	11,965	11,674	11,640	11,845	11,538	11,352	10,977
CO	64,251	50,994	50,048	47,649	45,400	42,717	37,559	35,139	33,148	32,295	34,142	31,738	30,139	28,914
NMVOC	17,949	14,754	14,352	14,096	13,630	13,078	12,280	11,755	11,301	11,392	10,742	10,468	10,403	9,799
SO_2	24,952	16,622	15,463	14,414	12,741	11,287	9,978	9,650	9,167	8,671	8,458	7,956	7,799	7,587

4.2.9. *Accuracy/Uncertainty of the Data*

By 27th May 2009, Tier 1 uncertainty analyses were available for all EU-15 Member States. The EU-15 Tier 1 analysis was made on the basis of the Tier 1 uncertainty estimates of the Member States for seven sectors[32]. After calculating the uncertainty estimates for each source category, the uncertainty estimates for the sectors and for total GHG emissions were calculated.

The EC uncertainty estimate is complicated due to potential correlations between Member State uncertainties. Therefore, an analytical method, which allows more flexibility than IPCC Tier 1 was compiled. A quantitative overview of information provided by Member States on uncertainty estimates in their 2007 national inventory reports and the methodology used for estimating the trend uncertainty is contained within the 2009 submission of the EC inventory report to the UNFCCC Secretariat[22].

Table 4-9 Tier 1 Uncertainty estimates of EU-15 GHG emissions

Source category	Gas	Emissions 1990	Emissions 2007	Emission trends 1990-2007	Level uncertainty estimates based on MS uncertainty estimates	Trend uncertainty estimates based on MS uncertainty estimates
Fuel combustion in stationary	all	2,460,749	2,318,619	-6 %	1%	0.4
Transport	all	698,690	863,981	24 %	2%	1
Fugitive emissions	all	97,247	50,436	-48 %	22%	22
Industrial processes	all	372,437	332,326	-11 %	4%	4
Agriculture	all	418,905	371,482	-11 %	68 % (45 %-102 %)	8
LULUCF	all	-216,593	-259,416	20 %	41%	-
Waste	all	171,149	104,645	-39 %	18%	9
Total (incl LULUCF)	all	4,002,585	3,782,074	-6 %	7.3 % (5.4 %-10.5 %)	-
Total (excl LULUCF)	all	4.219,177	4,041,490	-4 %	6.7 % (4.6 %-10.1 %)	1.2

An overview of information provided by Member States on uncertainty estimates in their national inventory reports is contained within the 2009 submission of the EC inventory to the UNFCCC Secretariat.

4.2.10. *Changes from the 4th National Communication*

Since the publication of the 4th National Communication, various updates and revisions to methodologies have been implemented in the EC GHG inventory, which have impacted on the time-series of emissions. Overall, recalculations for the EU-15 and

32 Stationary fuel combustion, transport, fugitive emissions, industrial processes, agriculture, LULUCF and waste.

EU-25[33] are insignificant. Large recalculations in absolute terms were, however, made in Germany, the UK and Poland. These are highlighted in the table below:

Table 4-10 Major revisions to the EC GHG inventory since publication of 4National Communication

Country (Year of Change)	Change
Germany (2006)	Revised emission factor and change to Tier 2 methods in agriculture
Germany (2009)	New emission factors applied in Agriculture (IPCC 2006 guidelines)
UK (2006)	Updates to the inventory resulted in an increase in methane emissions from solid waste disposal over the entire time series (mainly due to oxidation factor)
Poland (2007)	Changes of emission factors in energy industries Updated share of Animal Waste Management System for livestock for entire period Corrected area for crops, correction of N_2O IEF from synthetic fertilizers

At the time of the 4th National Communication, the trend of EU-15 GHG excluding LULUCF between 1990-2003 was –1.7 %. In the 2009 submission this trend between 1990-2003 has decreased to –1.2 %. In the EU-25, the trend of GHG excluding LULUCF between 1990 and 2003 changed from –5.5 % in the 2005 submission to –5.3 % in the latest submission.

4.3. National systems

4.3.1. *The EC Monitoring Mechanism and National Inventory System*

The legal basis of the compilation of the EC inventory is Council Decision No 280/2004/EC concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol. More details of the decision are given in section 5.1.1 of this document. The Directorate General for the Environment of the European Commission is responsible for preparing the inventory of the European Community. Each Member State is responsible for the preparation of its own inventory and these inventories provide the necessary data for the inventory of the European Community. All Member States of the EU are Annex I parties to the UNFCCC, except Cyprus and Malta, and have committed themselves to prepare individual GHG inventories and submit those inventories to the UNFCCC secretariat by 15th April each year.

[33] At the time of the 4th National Communication, Bulgaria and Romania were not yet part of the European Community.

The EC GHG inventory is the direct sum of the sectoral emissions data contained in the national inventories of the EU-27 and EU-15 Member States. Emissions of CO_2 can also be calculated using the Reference Approach (RA)[34] based on Eurostat energy data. The Reference Approach is a top-down approach, using high-level energy supply data to calculate the emissions of CO_2 from combustion of mainly fossil fuels. Appendix A and B present emissions from both the sectoral approach and the reference approach.

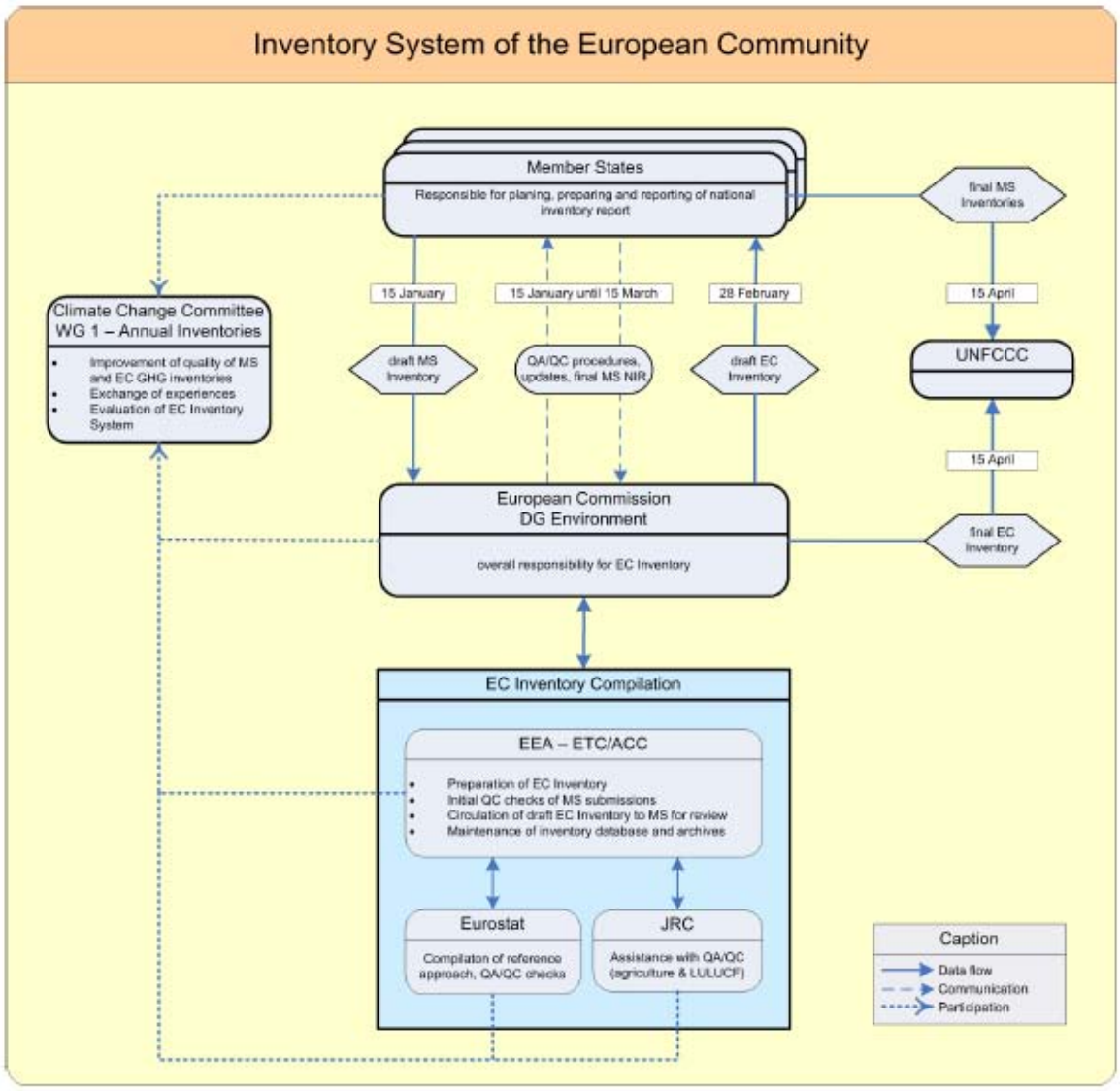
The main institutions involved in the compilation of the EC GHG inventory are the:

- Member States,
- The European Commission Directorate General for the Environment (DG ENV),
- The European Environment Agency (EEA) and its European Topic Centre on Air and Climate Change (ETC/ACC),
- Eurostat, and
- The Joint Research Centre (JRC).

The roles and responsibilities of various agencies and entities in relation to the inventory development process, as well as the institutional, legal and procedural arrangements made to prepare the inventory are shown in Illustration 3-12 below.

[34] 2006 IPPC Guidelines for National Greenhouse Gas Inventories Chapter 6: Reference Approach, http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_6_Ch6_Reference_Approach.pdf

Illustration 4-12 Inventory System and procedure of the European Community



The DG Environment of the European Commission is responsible for preparing the inventory of the EC while each Member State is responsible for the preparation of its own inventory which is the basic input for the inventory of the EC. DG Environment is supported in the establishment of the inventory by the following other institutions listed above. Further detail is provided in the 2009 submission of the EC inventory to the UNFCCC.

4.3.2.*Quality Assurance/Quality Control (QA/QC) Procedures*

The quality of EC GHG inventory depends on the quality of the Member States' inventories, the quality assurance and quality control (QA/QC) procedures of the Member States, and the quality of the compilation process of the EC inventory. Most EU Member States, and also the European Community as a whole, are currently implementing QA/QC procedures to comply with the IPCC good practice guidance.

The EC QA/QC programme describes the quality objectives and the inventory quality assurance and quality control plan for the EC GHG inventory including responsibilities and the time schedule for the performance of the QA/QC procedure. Definitions of QA, QC and related terms used are those provided in IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories and Guidelines for National Systems under the Kyoto Protocol. The EC QA/QC programme is reviewed annually and modified or updated as appropriate.

The European Commission (Directorate General for the Environment) is responsible for coordinating QA/QC activities for the EC inventory and ensures that the objectives of the programme are implemented. The European Environment Agency (EEA) is responsible for the annual implementation of QA/QC procedures for the EC inventory. A number of specific objectives have been elaborated to ensure that the EC GHG inventory complies with the UNFCCC inventory principles of transparency, completeness, consistency, comparability, accuracy and timeliness. The QA/QC procedures are discussed in detail in Section 1.6 of the 2009 submission of the EC inventory report to the UNFCCC.

4.3.3.*Further Improvement of QA/QC Procedures*

As reported in the 4th National Communication, in September 2004 a 'Workshop on quality control and quality assurance of greenhouse gas inventories and the establishment of national inventory systems' was organised. The Workshop facilitated the exchange of experience of Member States in the implementation of QC/QA procedures and the implementation of National Inventory Systems. The workshop brought together experts from 17 Member States, the European Commission (DG ENV, JRC), EEA, ETC/ACC and an observer from the UNFCCC secretariat. More details of the workshop are available within the workshop report available on the website of the ETA/ACC[35].

Workshops and expert meetings under the EC GHG Monitoring Mechanism are important activities for improving the quality of national and EC GHG inventories. For this reason, a number of other workshops and expert meetings have been organised in recent years with a focus on sector-specific quality improvements. This is listed in detail in Section 1.6.3 of the 2009 EC inventory report.

In addition, a collaborative internal review mechanism has been established within the European Community so that all participants (MS, EEA, Eurostat, and JRC) may contribute to the identification of shortcomings and propose amendments to existing procedures. The review activities with experts from Member States are coordinated by the ETC/ACC under Working Group I and take place during the period from April through September each year. The synthesised findings of collaborative reviews provide a basis for the planned progressive development of inventories both at Member state and at EC level. More information is provided in Section 1.6.1 of the 2009 EC inventory report.

4.3.4.*The EC Inventory Methodology and Data*

This National Communication has been compiled using the EC inventory and with regards to the UNFCCC guidance for parties preparing their 5th National

[35] ETA/ACC, http://air-climate.eionet.eu.int/docs/meetings/040902_GHG_MM_QAQC_WS/meeting040902.html

Communications[36]. The EC inventory is compiled, as far as possible, in accordance with the recommendations for inventories set out in UNFCCC guidelines[37], on the basis of the inventories of the 15 or 27 Member States. The estimates of emissions in the EC inventory are, where appropriate and feasible, consistent with the IPCC Revised 1996 Guidelines for National Greenhouse Gas Inventories[38], the 2000[39] Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories and the 2003[40] Good Practice Guidance for Land Use, Land-Use Change and Forestry. In addition Council Decision No 280/2004/EC and the Commission Decision 2005/166/EC applies to the compilation of the EC GHG inventory.

The emissions of each source category are the sum of the emissions of the respective source and sink categories of the 15 or 27 Member States. This also applies for the base year estimate of the EU-15 GHG inventory. Currently, 12 Member States have selected 1995 as the base year for fluorinated gases, while Austria, France and Italy have chosen 1990.

Member States use different national methodologies, national activity data or country specific emission factors in accordance with IPCC and UNFCCC guidelines. The EC believes that this is consistent with the UNFCCC reporting guidelines and the IPCC good practice guidelines, provided each methodology is consistent with the IPCC good practice guidelines. In general, no separate methodological information is provided at EC level except summaries of methodologies used by Member States. Details can be found in the Annual European Community greenhouse gas inventory 1990-2007 and inventory report 2009 submission to the UNFCCC Secretariat. For some sectors quality improvement projects, including expert workshops, have been started with the aim of further improving estimates at Member State level. These sectors include energy background data, emissions from international bunkers, emissions and removals from LULUCF, emissions from agriculture, and waste. The 2009 EC GHG inventory data consist of GHG submissions of the Member States to the European Commission in 2009.

4.3.5. *CRF Tables*

Appendix A and B contain greenhouse gas emission data for the European Community for 1990 to 2007 in accordance with the sectoral breakdown specified in the Common Reporting Format (Summary Tables 1.A). The complete CRF tables (including all

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36 Annotated Outline for Fifth National Communications of Annex I Parties under the UNFCCC, including Reporting Elements under the Kyoto Protocol. See http://unfccc.int/files/national_reports/annex_i_natcom_/application/pdf/nc5outline.pdf

37 UNFCCC guidelines for the preparation of national communications by parties included in Annex 1 to the Convention, Part 1:UNFCCC reporting guidelines on annual inventories. FCCC/SBSTA/2004/8. See http://unfccc.int/resource/docs/2004/sbsta/08.pdf

38 Revised 1996 IPPC Guidelines for National Greenhouse Gas Inventories, http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.html

39 Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories, http://www.ipcc-nggip.iges.or.jp/public/gp/english/index.html

40 Good Practice Guidance for Land Use, Land-Use Change and Forestry, http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.html

background tables and reference approach) for individual Member States are available on the UNFCCC website[41].

4.3.6. *Data Gap Filling Procedure*

The EC GHG inventory is compiled by using the inventory submissions of the EC Member States. If there are data gaps in Member States' inventory submissions by the 15th March of a reporting year, the following procedure is applied by the ETC/ACC[42] in accordance with the implementing provisions under Council Decision No 280/2004/EC to complete the EC inventory:

If a consistent time series of reported estimates for the relevant source category is available from the Member State for previous years that has not been subject to adjustments under Article 5.2 of the Kyoto Protocol, extrapolation of this time series is used to obtain the emission estimate. As far as CO_2 emissions from the energy sector are concerned, extrapolation of emissions should be based on the percentage change of Eurostat CO_2 emission estimates if appropriate.

If the estimate for the relevant source category was subject to adjustments under Article 5.2 of the Kyoto Protocol in previous years and the Member State has not submitted a revised estimate, the basic adjustment method used by the expert review team as provided in the 'Technical guidance on methodologies for adjustments under Article 5.2 of the Kyoto Protocol 5.2'[43] is used without application of the conservativeness factor.

If a consistent time series of reported estimates for the relevant source category is not available and if the source category has not been subject to adjustments under Article 5. 2 of the Kyoto Protocol, the estimation should be based on the methodological guidance provided in the 'Technical guidance on methodologies for adjustments under Article 5.2 of the Kyoto Protocol' without application of the conservativeness factor.

The Commission prepares the estimates by 31st March of the reporting year, following consultation with the Member State concerned, and communicates the estimates to the other Member States. The Member State concerned shall use the estimates referred to for its national submission to the UNFCCC to ensure consistency between the Community inventory and Member States' inventories.

Data gaps are shown in the Table below.

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41 UNFCCC, National Inventory Submissions 2009 http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/4771.php

42 European Topic Centre on Air and Climate Change

43 As included in FCCC/SBSTA/2003/10/Add.2

Table 4-11 Overview of missing data

Member State	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6
Bulgaria					1990-2007	
Malta					1990-2007	

On the basis of the general approaches mentioned above, it was checked if aluminium production occurs in the above countries, which was not the case. For other PFC emission no emission estimates were prepared because of the lack of data. Therefore no gap filling was made for this GHG inventory submission.

4.4. National Registry

The description of the EC's national registry follows the reporting guidance set down in Decision 15/CMP.1, part II (Reporting of supplementary information under Article 7, paragraph 1, E. National registries) under the Kyoto Protocol. A description of the EC's national registry was provided in the EC initial report[44], which has consequently been updated in 2008. The revised description is provided in detail as Annex 13 to the 2008 EC GHG inventory report[45].

Referring to paragraph 22 of the annex to Decision 15/CMP.1, the following changes have occurred in the Community Registry since the last report:

- The name and contact information of the registry administrator designated by the Party to maintain the national registry: the registry administrator changed from Mr M. P. Carl to Mr Karl Falkenberg.

- No further changes have occurred to the EC's national registry compared to the description provided in the 2008 submission of the NIR.

Publically available information on the EC registry is accessible on http://ec.europa.eu/environment/climat/gge_registry.htm

[44] EEA 2006, The European Community's initial report under the Kyoto Protocol (No 10/2006)

[45] EEA, 2008, Annual European Community greenhouse gas inventory 1990-2006 and inventory report 2008 (6/2008)

5. POLICIES AND MEASURES

Key developments

- Focus on the need to tackle mitigation and adaptation to climate change has increased significantly in the EC since the 4th National Communication.
- The EC has adopted a historic Energy and Climate Package that proposes binding targets for 2020 and an integrated package of policies and measures covering greenhouse gas emissions, renewable energy and energy efficiency.
- Many existing EC-level policies and measures are being strengthened to meet these goals.
- The EC has made a commitment to reduce greenhouse gas emissions by at least 20% compared to 1990 by 2020, with a firm commitment to increase this target to 30% in the event of a satisfactory international agreement being reached.
- The EC has committed to supplying 20 % of total EU gross final energy consumption from renewable sources (including electricity, heat and transport) by 2020, supplemented by a target requiring the share of energy from renewable sources in all forms of transport in 2020 to be at least 10 % of final consumption of energy in transport.
- The EC has committed to a 20 % reduction of total primary energy consumption by 2020, compared to a Business as Usual baseline.
- The EU Emissions Trading Scheme is now into its second phase (2008-2012), strengthened by lessons learned from the first (2005-2007). Further strengthening and expansion is planned for Phase III, including the incorporation of the aviation sector into the scheme (already from 2012).
- Recent developments include also new legislation concerning reduction of GHG emissions from sectors not covered by the EU ETS, carbon capture and storage, emission performance standards for new passenger cars, production of transport fuels and energy-efficient road transport vehicles.
- A successful conclusion to the international climate change negotiations at Copenhagen in December 2009 is a key priority for the EC.

5.1. The Policy Making Process

The most commonly used procedure for Europe to adopt new legislation is the so-called co-decision procedure: both the Council of the European Union (Council of Ministers) and the European Parliament amend, adopt or reject legislation proposed by the Commission. The Parliament and the Council are on an equal footing, although the Parliament has a right of veto.

In the European Community, there are two distinct levels of policies and measures that impact on greenhouse gas emissions:

1. European Community policies that are proposed by the Commission and subsequently approved, amended or rejected by the Council of the European Union and the European Parliament. These common and coordinated policies and measures (CCPM) are applicable to all Member States, though Member States may implement Directives at different points in time.

2. National policies developed and implemented by Member States themselves. As such, these policies and measures are outside the scope of this National Communication.

With regards to the policy making process, there are four key stages:

1. Policy demands are made and articulated. While the impetus or demonstration of the need for a policy can come from a variety of sources, only the Commission has the power to initiate formally a proposal for policy.

2. Policy demands are translated into policy proposals. Within the EC, the initial creation of the policy proposal can only be done formally by the Commission. Once the proposal has been initiated, the Council and the European Parliament, depending on procedure, can amend the proposal. This means that all three institutions can play an active role during translation of policy.

3. Policy proposals must then be formally agreed by both the European Parliament and the Council.

4. Policy proposals are then implemented. While the Commission takes the lead in implementation, it remains the responsibility of individual Member States to implement EC policies at the national level. Failure to do so can invoke infringement proceedings, which are dealt with by the European Court of Justice.

A key step towards the formulation and implementation of any EC policy is to carry out an Impact Assessment[46] of the proposed policy or key policy changes. European Commission Impact Assessment Guidelines set out a number of key steps in the process. The Impact Assessment is carried out by the Directorate General who takes the lead on a particular policy.

There are a number of legal instruments available to the European Community to reach its objectives, with due respect for the subsidiarity principle[47]: Regulations, Directives, Decisions and Recommendations (see fourth National Communication for further detail).

The purpose of this chapter is to report on developments to existing CCPMs presented in the EC's fourth National Communication, as well as detail new EC policies and measures. For each sector there is a summary table of policies and measures followed

[46] EC SEC(2009) 92 Impact Assessment Guidelines: http://ec.europa.eu/governance/impact/docs/key_docs/iag_2009_en.pdf

[47] The principle whereby the Union does not take action (except in the areas which fall within its exclusive competence) unless it is more effective than action taken at national, regional or local level, http://europa.eu/scadplus/glossary/subsidiarity_en.htm

by a description of the policies and measures, where this was not already included in the 4th National Communication. The summary table gives a quantitative estimate of the GHG emission savings due to the policy or measure in 2005 (where appropriate) and expected savings in future years (2010, 2015, 2020). These ex-ante estimates have been produced by the European Commission in individual policy impact assessments and policy appraisals such as the 2003 ECCP review and assume full implementation of the CCPMs. However, estimates are not available for all CCPMs. Some older estimates are also for the EU-15 while more recent estimates are for the EU-27.

In contrast, the estimates of expected GHG emission savings presented in the Projections Chapter 5 are uniquely derived from aggregating MS estimates. This approach is used to achieve consistency with the projections presented in this report which are also an aggregation of MS projections. Two methods are used to assemble Member State estimates of GHG savings from policies and measures. A bottom-up approach aggregates Member State estimates of the impact of individual policies and measures. However, not all Member States quantify the expected impact of (all) their policies. This approach nonetheless provides the best available MS estimate of the impact of existing policies and measures. A top-down approach calculates total savings from policies and measures by taking the difference between Member State projection scenarios. This approach provides the best available MS estimate of the impact of additional policies and measures. The results from both approaches are presented in the projections chapter to provide the best available estimate of the expected total effect of policies and measures. Both methods estimate savings from all measures and therefore include the impact of national measures related to EU CCPMs as well as strictly national policies.

5.1.1. *Monitoring and Evaluation*

The European Commission prepares an annual communication to the European Parliament and to the Council, the "Progress Report", based on the European Community's annual GHG inventory prepared with the help of the European Environment Agency and submitted to the UNFCCC by 15th April each year.

This Progress Report is now required under Decision[48] 280/2004/EC concerning a mechanism for monitoring Community GHG emissions and for implementing the Kyoto Protocol, the "Monitoring Mechanism". The report assesses the actual and projected progress of Member States and the Community towards fulfilling their emission reduction commitments under the UNFCCC and the Kyoto Protocol.

There have been no significant changes to the process since the fourth National Communication but a review of the Monitoring Mechanism is scheduled in the near future. The revised Decision will:

- Further clarify reporting requirements by providing more comprehensive guidance and potentially making use of reporting templates;
- Accommodate the new 2020 Climate and Energy Package;
- Incorporate recommendations from Member States;

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

- Incorporate recommendations from recent studies on:
- Projections methodologies;
- Policies and measures;
- Ex-post policy evaluation;
- Streamlining of reporting with other environmental legislation.

Monitoring and evaluation is also carried out by Commission departments for individual EC policies.

5.1.2. *Overall Policy Context*

The Lisbon Strategy

At the Lisbon summit in March 2000, the EC set out a new strategy to become, within a decade, "the most competitive and dynamic knowledge-based economy in the world, capable of sustainable growth with more and better jobs and greater social cohesion". The "Lisbon Strategy" covered areas including research, education, training, internet access and on-line business.

After initially moderate results, the Lisbon Strategy was simplified and re-launched in 2005, placing greater emphasis on growth and jobs and transferring more ownership of the initiative to Member States via national action plans. The strategy is now making a strong contribution to Europe's economic growth.

On 28th January 2009, the Commission adopted Member State specific reports and recommendations under the Lisbon Growth and Jobs Strategy[49], for endorsement by the Spring European Council. Member States will now agree collectively on the areas each Member State should address with the highest priority to build up the strength of their economies in the medium-term. These will also help ensure the European Economic Recovery Plan is implemented in a way that builds for the future as well as responding to the current economic crisis.

Economic Recovery Plan

An Economic Recovery Plan for growth and jobs was presented by the European Commission in November 2008 and approved by the European Council in December 2008[50]. The Plan is worth around €200 billion, a figure equivalent to approximately 1.5 % of the Gross Domestic Production (GDP) of the EU. Beside other actions, the Recovery Plan supports:

- An intervention of the European Investment Bank of €30 billion in 2009/2010, especially for small and medium-sized enterprises, for renewable energy and for clean transport, with particular attention to the automotive industry's effort to produce more eco-friendly vehicles;

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49 http://ec.europa.eu/growthandjobs/index_en.htm

50 COM (2008) 800 final of 26th November 2006 A European Economic Recovery Plan http://ec.europa.eu/economy_finance/publications/publication13504_en.pdf

- The creation of the 2020 European Fund for Energy, Climate Change and Infrastructure in partnership with national institutional investors;

- An improvement of programmes financed by the European Regional Development Fund and the European Agricultural Fund for Rural Development to strengthen investments in infrastructure as well as energy efficiency and renewable energy in the housing sector;

- The intensification of actions to improve energy efficiency of buildings and energy infrastructure, to promote green products.

In January 2009 as part of the ongoing implementation of the Economic Recovery Plan[51], the Commission mobilised €3.5 billion in 2009-2010 for investment in energy. This fund will focus on two main areas: offshore wind and carbon, capture and storage.

An Offshore Wind Energy Programme of €500 million is proposed to support new large-scale offshore demonstration projects in different Member States. The Programme is to encourage investment that might otherwise be neglected due to barriers such as the technological and logistical complexity of some offshore wind projects, and the need for cross-border infrastructure, as well as the need for further technological development.

The wind industry aims to deliver 12–14 % of European electricity consumption by 2020 and more than one quarter of this can come from offshore applications. By 2030, the contribution of offshore wind should reach up to 15 % of the overall European electricity production[52].

Five projects related to carbon capture and storage will also be supported by the Recovery Plan with €250 million in investment for each one to ensure their launch. The projects will help the EC to take full advantage of its indigenous resources of coal, oil and gas and at the same time to achieve sustainable power generation from those fossil fuels and to reduce greenhouse gas emissions.

These projects will represent a mix of technologies, geological conditions and will take place in different Member States.

European Climate Change Programme

The European Climate Change Programme (ECCP) was established in June 2000 to provide a cohesive framework to identify and develop the necessary elements of an EC strategy to implement the Kyoto Protocol. In autumn 2005, the Commission launched ECCP II as a continued programme for policy preparation and development. This second phase investigated new policy areas such as adaptation, aviation and carbon capture and storage, as well as reviewing and further implementing policies and measures that were the focus of ECCP I. Further information is included in the EC's 4th National Communication.

51 http://europa.eu/rapid/pressReleasesAction.do?reference=IP/09/142

52 Press release European Union, MEMO/09/36,28 January 2009

Energy and Climate Package

On 17th December 2008 the European Parliament agreed on the EC Energy and Climate Package[53], which for the first time provides an integrated and ambitious package of policies and measures to tackle climate change.

The package took substantial development, beginning with a Green Paper[54] in March 2006, followed by a Communication[55] in January 2007, which proposes an integrated package of energy and climate change measures. These included a Strategic Energy Review focusing on both external and internal aspects of EC energy policy built on three core objectives: sustainability, competitiveness and security of supply.

The so-called "20-20-20" Energy and Climate package, adopted by the Commission on 23rd January 2008[56], contains proposals for specific targets for 2020:

- A target to reduce greenhouse gas emissions by at least 20 % compared to 1990 by 2020, with a firm commitment to increase this target to 30 % in the event of a satisfactory international agreement being reached;

- To achieve 20 % of energy from renewable sources by 2020 (as a share of total EU gross final energy consumption), supplemented by a target to achieve a minimum of 10 % renewable transport fuel; and

- A reiteration of the commitment to save 20 % of total primary energy consumption by 2020, compared to a Business as Usual baseline (see section 5.4.4).

The package contains proposals for three new Directives and a Decision covering: renewable energy, the emissions trading scheme, shared efforts of Member States to reduce emissions, and geological storage of carbon dioxide. A Directive on monitoring and reduction of greenhouse gas emission from fuels (adopted on 31st January 2007), and proposals on emissions performance of new passenger cars (adopted on 19th December 2007), although not part of the package, were also negotiated by the institutions in parallel. An overview of the package is given here, with individual legislation detailed in the relevant sectors.

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53 European Parliament texts adopted at the sitting of Wednesday 17th December 2008. http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//NONSGML+TA+20081217+SIT+DOC+WORD+V0//EN&language=EN

54 COM(2006) 105 final of 8th March 2006 – Green Paper, A European Strategy for Sustainable, Competitive and Secure Energy. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2006:0105:FIN:EN:PDF

55 COM(2007) 1 final of 10th January 2007 – An energy policy for Europe. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0001:FIN:EN:PDF
COM (2007) 2 final of 10th January 2007 – Limiting Global Climate Change to 2 degrees Celsius: the way ahead for 2020 and beyond. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0002:FIN:EN:PDF

56 COM(2008) 30 final of 23rd January 2008 – 20 20 by 2020, Europe's climate change opportunity. http://www.energy.eu/directives/com2008_0030en01.pdf

The new Directive on the promotion of the use of energy from renewable sources[57] sets differentiated and legally binding targets for each Member State to reach an overall EU target of a 20 % share of renewable energy in total gross final energy consumption (including electricity, heating and cooling and transport) by 2020. The Directive includes cooperation mechanisms to help Member States to work together to achieve the targets in a cost-effective manner. The Directive also includes a target of a minimum 10% share of renewables in transport, which includes sustainability criteria for biofuels.

Revisions to the existing Directive to improve and extend the Community's greenhouse gas emission trading system[58] contains a number of new aspects for the scheme (see section 5.1.2 for further detail). Key changes mean that from the start of the third phase in 2013 the overall emissions cap will be set at the EU level. The cap will be decreased each year to reach a 21 % cut in 2020 compared to 2005. The Directive also increases the level of auctioning in the system – percentages of allowances to be auctioned vary according to the sector and the risk of carbon leakage[59] but overall more than 50 % of allowances will be auctioned from 2013, and this proportion will increase each year.

A Decision puts in place measures to ensure a shared effort[60] of Member States to reduce greenhouse gas emissions outside the EU ETS to meet the Community's overall greenhouse gas emission reduction commitment of 20 % by 2020. Sectors outside the EU ETS (e.g. transport, buildings, agriculture and waste) will reduce their emissions by an average of 10 % compared to 2005, shared out between Member States according to differences in GDP per capita. The agreement maintains the national targets for Member States, together with a linear legally binding trajectory for the period 2013-2020 with annual monitoring and compliance checks.

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57 Directive 2009/28/EC on the promotion of the use of energy from renewable sources amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0016:0062:EN:PDF

58 Directive 2009/29/EC amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0063:0087:EN:PDF

59 Carbon leakage refers to an increase in GHG emissions in a third country (outside the EU) as a direct result of a cap in emissions in the EU.

60 Decision No 406/2009/EC of the European Parliament and of the Council of 23rd April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0136:0148:EN:PDF

A Directive on geological storage of carbon dioxide[61] provides a legal framework to manage possible environmental risks and liability issues for carbon capture and storage (CCS). Up to 300 million allowances will be included in the new entrants reserve under the EU ETS to stimulate the construction and operation of up to 12 commercial demonstration projects to capture and store carbon dioxide, and for innovative renewable energy demonstration technologies in the EU. (Further detail is included in section 5.4.6.)

The final texts of the Energy and Climate Package were published in June 2009 and it is intended to come into force in all Member States by January 2011.

Second Strategic Energy Review - Securing our Energy Future

The achievement of Europe's ambitious goals will require substantial change in Europe's energy system, with public authorities, energy regulators, infrastructure operators, the energy industry and citizens all actively involved, and tough choices to be made. The EC therefore published a first Strategic Energy Review in 2007 as part of the wider communication on energy and climate.

The Commission published the Second Strategic Energy Review[62] on 13th November 2008 as a further step towards achieving the core energy objectives of sustainability, competitiveness and security of supply.

The Second Strategic Energy Review looks at the challenges that Europe will face between 2020 and 2050 and sets out a five-point EU Energy Security and Solidarity Action Plan, focusing on:

(1) Infrastructure needs and the diversification of energy supplies;

(2) External energy relations;

(3) Oil and gas stocks and crisis response mechanisms;

(4) Energy efficiency; and

(5) Making the best use of the EU's indigenous energy resources.

Specifically the review recognises a number of priorities for development of infrastructure, notably cross-border infrastructures. Examples include the development of a Baltic interconnection plan and a blueprint for a North Sea offshore

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61 Directive 2009/31/EC of the European Parliament and of the Council of 23rd April 2009 on the geological storage of carbon dioxide and amending Council Directive 85/337/EEC, European Parliament and Council Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No 1013/2006 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0114:0135:EN:PDF

62 COM(2008) 781 final of 13th November 2008 – Second Strategic Energy Review, An EU Energy Security and Solidarity Action Plan. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2008:0781:FIN:EN:PDF

grid to interconnect national electricity grids and connect planned offshore wind projects[63].

The mid-term review of the 2006 Energy Efficiency Action Plan in 2009 was also announced, as well as a 2008 Energy Efficiency Package. This package focuses on improvements in the legislation on the energy performance of buildings and on energy labelling and on intensification of the implementation of eco-design and cogeneration Directives (see section 5.4.4). The strengthening of these measures is expected to have a substantial impact on Europe's energy consumption and energy security.

A new Sustainable Energy Financing Initiative is being prepared jointly with the European Investment Bank and other financial organisations, to mobilise large-scale funding from capital markets for investments in energy efficiency as well as renewable energies, clean use of fossil fuels and combined heat and power from renewables in Europe's cities.

The Second Strategic Energy Review also lays the path for a Strategic Energy Technology (SET) Plan.

The EC's agenda for 2020 has set out the essential first steps in the transition to a high-efficiency, low-carbon energy system. The EC will also now look to develop a vision for 2050 and a policy agenda for 2030. The fundamental technological shifts involved in decarbonising the EU electricity supply, ending oil dependence in transport, low energy and positive power buildings, a smart interconnected electricity network will only happen with a coordinated agenda for research and technological development, regulation, investment and infrastructure development.

EU Emissions Trading Scheme

The European Emissions Trading Scheme (EU ETS) is a cornerstone in the fight against climate change in Europe. It is the first international multi-sector trading system for GHG emissions in the world, promoting the reduction of GHG emissions in a cost effective and economically efficient manner.

In October 2003 the European Council and the European Parliament adopted Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading (the Emissions Trading Directive). The Directive introduces a mandatory cap and trade system: an emission ceiling for the whole ETS is set, and the available quantity of the emission allowances is distributed over the installations covered by the system. If an installation emits more than the allowances it has received it has to purchase additional allowances from other participants with excess allowances.

Directive 2003/87/EC distinguishes between the first (pilot) phase, which ran from 1 January from 2005 to 31st December 2007, and subsequent 5-year phases, for which revised rules and procedures are in place to reflect the learning-by-doing part of the first phase. Lessons learned during Phase I and from the review of the Directive, as required by Article 30 of the Directive, led to a revised ETS Directive in December

63 See also First Annual Report by European Coordinator Adamowitsch (http://ec.europa.eu/energy/infrastructure/tent_e/doc/off_shore_wind/2008_off_shore_wind_annual_report_2007_2008_en.pdf), and COM(2008) 768 final of 13th November 2008, Offshore Wind Energy: Actions needed to deliver on the Energy Policy objectives for 2020 and beyond. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2008:0768:FIN:EN:PDF

2008[64]. The revision, amongst many other changes, foresees a longer third trading period, from 2013 to 2020.

The original ETS Directive covering Phases I (2005-2007) and II (2008-2012)

Around 10,500[65] energy-intensive installations across the EU are covered by the Directive.

The Directive requires each Member State to develop a National Allocation Plan (NAP) for each trading phase[66], stating the total quantity of allowances that it intends to allocate for that period (cap) and how it proposes to allocate them. NAPs are developed on the basis of objective and transparent criteria, listed in Annex III of the Directive and of the European Commission's guidance[67] and are subject to approval by the European Commission. Table 5-1 shows an overview of Member State caps for Phase II of the EU ETS, following approval by the European Commission.

64 On 17th December 2008 the European Parliament agreed on the proposal for a Directive amending Directive 2003/87/EC

65 http://ec.europa.eu/environment/climat/emission/citl_en.htm

66 Romania and Bulgaria are only covered by the EU ETS as of the date of their accession, 1st January 2007. A NAP covering the last year of Phase I and a Phase II NAP were developed by these countries.

67 COM (2003) 830 final of 7th January 2004 on Guidance to assist Member States in the implementation of the criteria listed in Annex III to Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC, and on the circumstances under which force majeure is demonstrated http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2003:0830:FIN:en:PDF

Table 5-1 Member State cap under Phase II EU ETS, following approval by European Commission[68]

Member State	Annual Phase II cap 2008-2012 ($MtCO_2$-eq), following approval by European Commission
Austria	30.7
Belgium	58.5
Bulgaria	42.3
Cyprus	5.5
Czech Republic	86.8
Denmark	24.5
Estonia	12.7
Finland	37.6
France	132.8
Germany	453.1
Greece	69.1
Hungary	26.9
Ireland	22.3
Italy	195.8
Latvia	3.4
Lithuania	8.8
Luxembourg	2.5
Malta	2.1
Netherlands	85.8

[68] Adapted from SEC(2008) 2636 of 16.10.2008 – Commission Staff Working Document, Accompanying document to the Communication to the Commission, Progress towards achieving the Kyoto Objectives (required under Article 5 of Decision 280/2004/EC of the European Parliament and of the Council concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol)

Member State	Annual Phase II cap 2008-2012 ($MtCO_2$-eq), following approval by European Commission
Poland	208.5
Portugal	34.8
Romania	75.9
Slovak Republic	32.6
Slovenia	8.3
Spain	152.3
Sweden	22.8
United Kingdom	246.2
EU-27	**2082.6**

Every year each participant is granted a specified number of allowances. The Directive includes three possible allocation methodologies: auctioning, grandfathering (for free, based on historical emissions) and benchmarking (for free, based on performance).

After each year installations must surrender the number of "European Union Allowances" (EUAs) which corresponds to their emissions during that year. Member States are required to ensure that emissions are monitored and reported in accordance with the guidelines elaborated by the Commission[69].

Member States each have a national registry to track the allowances (and project credits) held and surrendered. In case of non-compliance, a penalty must be paid for any emissions in excess of the number of EUAs surrendered. For Phase I the penalty was set at €40/tonneCO_2eq, while for Phase II it is €100/tonneCO_2eq. Payment does not release the operator from the obligation to surrender an amount of allowances equal to the excess emissions (the so-called "make-good provision").

At the European level a Community Independent Transaction Log (CITL)[70] records the issuance, transfer, cancellation, retirement and banking of allowances under the EU ETS. As of 16th October 2008 the connection of the CITL and Member State registries with the UNFCCC International Transaction Log (ITL) was completed.

The revised ETS Directive covering Phase III (2013-2020)

The experiences in the first two trading periods of the EU ETS have led to significant changes for the post-2012 period, agreed in December 2008 by the European Parliament. The main reasons for doing so were the different approaches taken by different Member States, leading to an unequal playing field for participants in

69 The guidelines have been adopted on 29th January 2004 and reviewed on July 2007 taking into account experiences with their application and taking effect from 1 January 2008.

70 http://ec.europa.eu/environment/climat/emission/citl_en.htm

different countries and a very cumbersome process to establish the EU-wide cap through NAPs.

The new Directive[71] is based on the following main changes:

- Establishment of one Europe-wide ETS cap, laid down in the Directive. The cap for Phase III has been set at -21% below 2005 emissions in 2020[72];
- Longer trading periods: Phase III will last 8 years, from 2013 to 2020;
- Expansion of the scope, to include a large part of the chemical industry[73], non-ferrous metals industry, and, by means of a separate legal instrument, the aviation sector (see section 5.5.13 for further details);
- Auctioning is the default allocation methodology meaning that a specific sector will have to acquire its allowances through auctions or on the secondary market;
- Industrial sectors will face a transition to full auctioning starting from 20 % to 70 % in 2020 with a view to reaching full auctioning by 2027. Exemptions for the sectors vulnerable to leakage[74] are provided, since these sectors will receive 100 % of their allowances determined by benchmarks for free across the whole period;
- Free allocation of allowances will be based on ambitious, EU-wide harmonised, ex-ante benchmarks, taking into account the lowest emitting and most energy efficient techniques, substitutes, and alternative production processes;
- 88 % of the auctioning revenues to be distributed over the Member States based on their share of 2005 verified emissions in the EU ETS. The remainder of the revenues will be distributed based on a Member State's per capita GDP and on the basis of early action taken towards Kyoto targets; and
- Opt-out for small installations with emissions less than 25,000 tonnes CO_2/year and below 35 MW capacity.

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71 Directive 2009/29/EC amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0063:0087:EN:PDF

72 This is assuming the EU independent target of -20% of total EU emissions in 2020 compared to 1990 levels. If an international agreement is reach on post-2012 targets, the EU will adopt (under certain conditions) a target of -30 %.

73 CO_2 from petrochemicals and ammonia production, and nitrous oxide from the production of nitric, adipic and glyocalic acid production as specifically mentioned sectors, not only as part of the combustion installations category.

74 In the event that other developed countries and other major emitters of greenhouse gases do not participate in this international agreement, this could lead to an increase in greenhouse gas emissions in third countries where industry would not be subject to comparable carbon constraints ("carbon leakage"), and at the same time could put certain energy-intensive sectors and sub-sectors in the Community which are subject to international competition at an economic disadvantage.

In October 2008 the EU ETS registry architecture was revised[75]. This revision assures the independence of the EU ETS from January 2012 onwards and facilitates the inclusion of aviation activities from 2012 and the ability of the EU ETS to link to other emissions trading systems. Differences in the Phases of the EU ETS are outlined in the table below.

[75] COM (2008) 994 of 8th October 2008 for a standardised and secured system of registries pursuant to Directive 2003/87/EC of the European Parliament and of the Council and Decision No 280/2004/EC of the European Parliament and of the Council. It repeals and replaces the existing Registry Regulation no. 2216/2004/EC
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:271:0003:0040:EN:PDF

Table 5-2 Summary of the main changes over the three trading periods

Element	PHASE I 2005-2007	PHASE II 2008-2012	PHASE III 2013-2020
Scope	~10,500 installations	~10,500 installations	Estimate not available yet
Participants	Refineries, cokes, iron and steel, cement, lime, glass, ceramics, pulp & paper. All large combustion installations larger than 20 MWth (includes electricity sector). Possibility of unilateral opt-in subject to approval by Commission. Possible opt-out of installations subject to approval by Commission.	As in Phase I, with further specification of which combustion installations to include. Member States can unilaterally include other sectors and gases. Some Member States have included N2O emissions from the chemical sector. Small-size (below 3MW) installations are excluded.	As Phase II + parts of the chemical industry, the non-ferrous metals industry and aviation[76]. Possible exclusion of small size installations (<25,000 tonnes of CO_2eq. equivalent and, where they carry out combustion activities, have a rated thermal input below 35MW.
GHGs included	Directive does not say only CO_2, so formally it is all GHGs. In practice, phase I was only CO_2, as no others were opted in	CO_2 Unilateral opt-in of Nitrous Oxide emissions from the chemical sector in some Member States	CO_2, Nitrous Oxide (from nitric acid, adipic acid and glyoxal and glyoxylic production) and Perfluorocarbons (primary aluminium production)
Allocation methodology	Minimum 95% free allocation, possibility to auction remainder; Member States to decide on allocation methodology	Minimum 90% free allocation, possibility to auction remainder; MS to decide on allocation methodology	Auctioning as default allocation method; free allocation only on EU-wide harmonised ex-ante benchmarks
Decision on cap and allocation	Each Member State develops a NAP stating the total quantity of allowances and how to allocate them to participants. NAP to be approved by COM.	As in Phase I, with further guidance from Commission; NAP to be approved by COM.	Allocation methodology and rules are set at the EU level and implemented by Member States by means of National Implementation Measures (NIMs).
Trading period	Three years	Five years	Eight years
Compliance	In-house reductions; Trade in allowances; Purchase of CDM credits.	As in Phase I + purchase of JI/CDM credits (up to limit specified by Member States – most around 10%)	As in Phase II, Purchase of JI/CDM credits up to limit specified by EC (limit will be at least 11%). But new quality requirements for CDM

[76] And some smaller products (e.g. the non-metallic minerals sector).

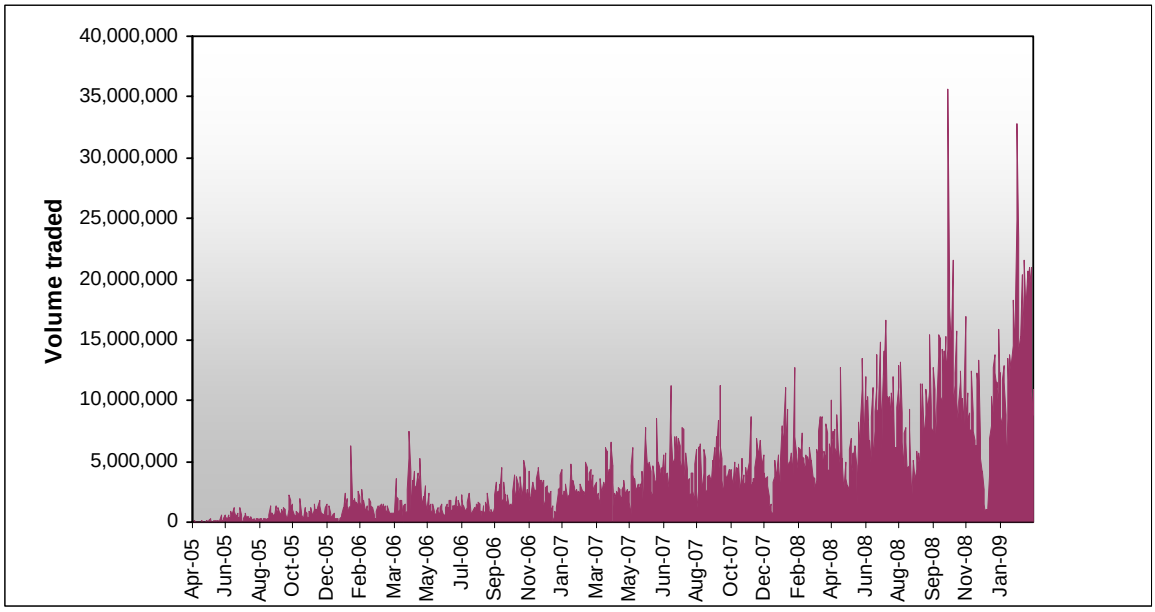
Element	PHASE I 2005-2007	PHASE II 2008-2012	PHASE III 2013-2020
			credits.
Penalty	€40 /tonneCO_2eq + "make-good provision"	€100 /tonneCO_2eq + "make-good provision"	€100 /tonneCO_2eq adjusted in accordance with European Index of Consumer Prices + "make-good provision"

EUA market: prices and volumes

The EU ETS has developed to become the biggest global carbon trading market, both in transaction volume and monetary value.

In 2007 more than two billion EUAs were traded, representing a total market value of €37 billion. Average weekly volume of EUAs traded continues to rise steadily into 2009 (see figure below).

Illustration 5-1 Historic EUA trading volumes (Apr 05 – Mar 09)



Source: Aggregate from European Climate Exchange (http://www.ecx.eu/), Bluenext (http://www.bluenext.eu/) and London Energy Brokers' Association (http://www.leba.org.uk/).

The figure below shows average EUA trading prices for the "most traded EUA contract" at the time, differentiating between EUAs valid for Phase I and Phase II.

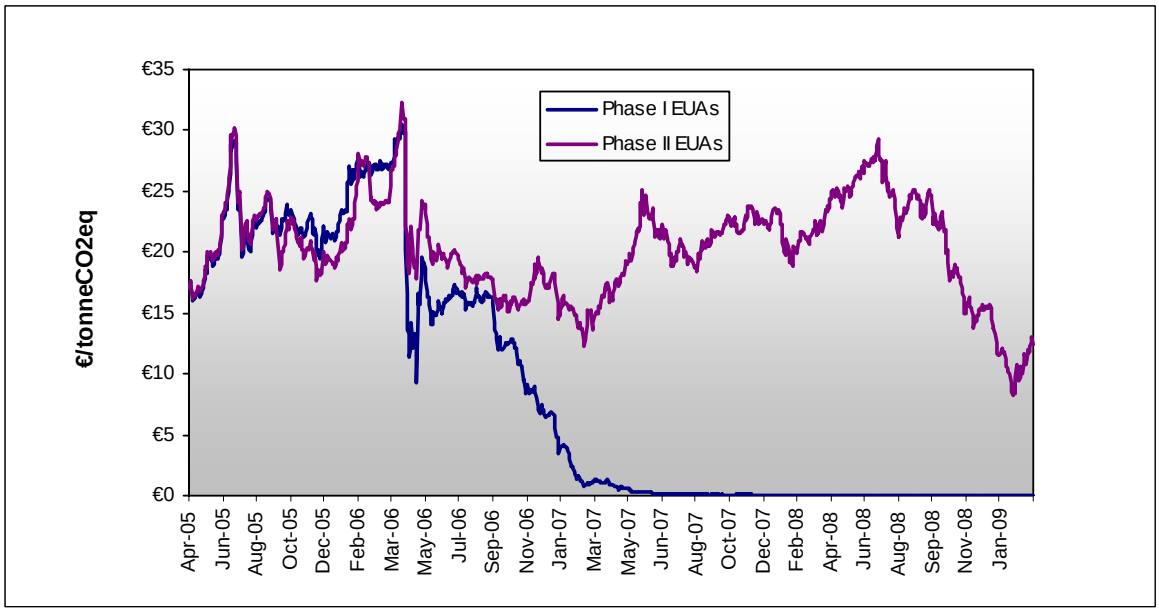
In the first quarter of 2006, once the first verified emissions data was published for participants in the scheme, it became clear to the market that there should be sufficient supply of EUAs in Phase I. As EUAs cannot be banked from one phase to the

next, prices for Phase I EUAs began to drop and, despite a small recovery, declined steadily to the end of Phase I.

However the market price for Phase II EUAs remained strong and the average EUA market price increased to around €20/tCO_{2eq} through 2007.

Phase II itself started strongly in 2008 with average EUA prices rising to around €30/tCO_{2eq}. However, the market has more recently been impacted by the global financial uncertainty and by falling fossil fuel prices and EUA prices remain volatile. As a general trend prices declined through late 2008 to reach about €8/tCO_{2eq} in the first quarter of 2009.

Illustration 5-2 Historic EUA trading price (Apr 05 – Mar 09)



Source: Simple (unweighted) average from European Climate Exchange (http://www.ecx.eu/), Point Carbon (http://www.pointcarbon.com/) and London Energy Brokers' Association (http://www.leba.org.uk/).

Linking the EU ETS to the international carbon market

The EU ETS is linked to the international carbon market in various ways and additional opportunities exist in linking the EU ETS with other national and/or regional emissions trading systems.

In October 2004 the European Parliament and the Council adopted the Directive 101/2004/EC linking the EU ETS with the Kyoto Protocol's project mechanisms. The Directive regulates the use of Joint implementation (JI) and Clean Development Mechanism (CDM) credits by the EU ETS participants[77]. Emission Reduction Units

[77] Directive 2004/101/EC of the European Parliament and of the Council of 27th October 2004 Amending Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community, in respect of the Kyoto Protocol's project mechanisms, Article 1 paragraph 1 and 2.

(ERUs), originated by JI projects, and Certified Emission Reductions (CERs), originated by CDM projects, are converted into EUAs by Member States. Member States must inform the European Commission in their NAPs of the maximum amount of credits that can be used, which must in turn be consistent with the individual Member State's supplementarity obligations under the Kyoto Protocol.

From 2008 every international transfer of an EUA must be accompanied by an Assigned Amount Unit (AAU)[78], to make sure that this is taken into account at the national level for Kyoto accounting.

The use of project credits in Phase III is allowed as follows:

- In existing EU ETS sectors operators can use an amount of credits corresponding to a certain maximum percentage. This percentage will be determined at the EU level and will be at least 11 % of allocation during the period 2008-2012 (minimum 1.5 billion credits).

- New entrants and new sectors can use credits up to an amount corresponding to a certain maximum percentage, again to be determined at the EU level, which will be at least 4.5 % of their verified emissions during the period from 2013 to 2020.

- Aviation operators can use credits up to an amount corresponding to a certain percentage, which will be set at least at 1.5 % of their verified emissions during the period from 2013 to 2020.

- The overall use of credits allowed cannot exceed 50 % of the Europe-wide reductions of the existing sectors over the period 2008 to 2020 and 50 % of the Europe-wide reductions below the 2005 levels of new sectors and aviation over the period 2013 to 2020, to comply with the supplementarity requirement of the Kyoto Protocol (see section 5.2.2).

Linking with external emissions trading schemes

The EC recognises that linking the EU ETS to GHG emission trading schemes in third countries will increase the cost-effectiveness of achieving the EC emission reductions targets[79]. In October 2007 the first such linking was effected by the EC and Norway, Iceland and Liechtenstein. The newly linked systems cover, as of 2008, 30 countries, with the authority to approve NAPs for the 3 new countries resting with the European Free Trade Authority.

In addition, the EC is a founding member of the International Carbon Action Partnership (ICAP) [80] which was set up in October 2007. ICAP is a partnership of 15 governments to provide a forum to share experiences and knowledge among countries and regions that have implemented or are actively pursuing the implementation of carbon markets through mandatory cap and trade systems.

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78 A country-level tradable carbon credit unit under the Kyoto Protocol

79 Directive 2003/87/EC of the European Parliament and of the Council of 13th October 2003 establishing a scheme for a greenhouse gas emission allowance trading within the Community and amending council Directive 96/61/EC. Recital 18.

80 ICAP http://www.icapcarbonaction.com

The EC has stated its priorities for linking of the EU ETS as: environmental effectiveness, economic efficiency, avoidance of leakage and fairness and accessibility[81]. Factors such as impacts on competition impacts on employment and administrative costs are considered important as well.

EC Climate Change Strategy Post-2012

The EC's agreed objective is to limit the average global temperature increase to less than 2°C compared to pre-industrial levels. If current emission trends continue, the 2°C threshold may already be crossed in 2050. Significant adaptation efforts will be required even if global average temperature increase is kept below 2°C.

A successful conclusion to the international climate change negotiations at Copenhagen in December 2009 is therefore a key priority for the EC, and on 28th January 2009 the European Commission published a Communication[82] setting out a strategy towards a new climate change agreement in Copenhagen. The Communication sets out concrete proposals to achieve this goal, addressing three key challenges: targets and actions; financing; and building an effective global carbon market.

To limit global temperature increase to not more than 2°C, developed countries as a group should reduce their emissions by 30 % below 1990 levels in 2020. Globally GHG emissions must be reduced to less than 50 % of 1990 levels by 2050.

Towards this goal, as part of the new Energy and Climate Package (section 5.1.2), the EC has adopted a binding target to reduce emissions by 20 % by 2020 irrespective of whether or not an international climate change agreement is reached, with a firm commitment to increase this effort to a 30 % reduction if such an agreement is secured.

An international agreement must be sufficiently ambitious and comprehensive, providing for comparable reductions by other developed countries, and including appropriate reductions from developing countries.

Developing country emissions are increasing rapidly and, if not addressed, will outweigh developed country efforts to reduce their GHG emissions. Developing countries as a group will need to limit the rise in their emissions through nationally appropriate actions to 15-30 % below business as usual by 2020. This reduction should be on top of reductions that result in the transfer of carbon credits to developed countries. Appropriate actions should include a rapid decrease in emissions from tropical deforestation. By 2020, gross tropical deforestation should be reduced by at least 50 % compared to current levels and by 2030 global forest cover loss should be halted.

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81 SEC(2008) 52 Commission staff working document on Accompanying document to the Proposal for a Directive of the European Parliament and of the Council amending Directive 2003/87/EC so as to improve and extend the EU greenhouse gas emission allowance trading system Impact Assessment - COM(2008) 16 final. http://www.cdep.ro/docs_comisii/IE/CE/2008/SEC_2008_52_EN_DOCUMENTDETRAVAIL_p.pdf

82 COM(2009) 39 final of 28th January 2009 – Towards a comprehensive climate change agreement in Copenhagen

The EC also sets out a number of key elements that should be included in a framework for adaptation that should be included in a Copenhagen agreement (see section 7 for further information):

- The need for all to adapt – support should be provided to the most vulnerable and the poorest; potentially adverse effects should be anticipated early;

- A commitment to systematically integrate adaptation into national strategies of both developed and developing countries;

- Improving the tools to define and implement adaptation strategies.

Significantly increased financial resources will be needed to support the necessary adaptation and mitigation action in developing countries. This should come from domestic sources, from the global carbon market, but also from contributions from developed countries.

Estimates for adaptation costs vary widely. The UNFCCC Secretariat provides an indicative scale of need in developing countries in the order of €23 - 54 billion per year in 2030.

In terms of mitigation, the European Commission estimates that net global incremental investment, both public and private, needs to increase to around €175 billion per year in 2020 to reduce global GHG emissions to a level compatible with the 2°C objective. More than half of this investment will have to be made in developing countries.

Significantly enhanced research, development and demonstration (RD&D) as well as deployment and diffusion of mitigation and adaptation technologies is also needed to support the practical implementation by all countries. A commitment on this should form an integral part of the Copenhagen agreement, working towards at least a doubling of global energy-related RD&D by 2012 and increasing it to four times its current level by 2020. The emphasis of RD&D should be towards safe and sustainable low GHG-emitting technologies, especially renewable energy.

A global carbon market can and should be built by linking domestic emissions trading systems. However, as these systems are domestic climate policy tools of individual countries or regions, such linking should be subject to bilateral arrangement between interested Parties and not negotiated under the UNFCCC. The EC is reaching out to other countries to ensure an OECD-wide market by 2015 and an even broader market by 2020.

The EC would also like to see some reform of the CDM mechanism to ensure that only those projects that deliver real additional reductions and go beyond low cost options are credited. In addition, for advanced developing countries and highly competitive economic sectors, the project based CDM should be phased out in favour of moving to a sectoral carbon market crediting mechanism. Such mechanisms can be an efficient tool to drive development and deployment of low-carbon technologies in developing countries, and pave the way for the development of cap and trade systems.

The EC wishes to ensure that the Copenhagen agreement lays the basis for a long-term international framework that raises overall ambition and increases contributions from both developed and developing countries, guided by scientific knowledge.

A long term vision of emissions reductions to 2050 is needed with a clear path of how to get there. A periodic review of overall progress and the adequacy of commitments and action should form an integral part of a Copenhagen agreement, including a comprehensive review in 2016. On this basis, the global goal should be reassessed and further mid-term commitments, action and financial flows set in line with the latest scientific findings. If, in the context of a comprehensive review of the Copenhagen agreement in 2016, the combined mitigation efforts of developed and developing countries are insufficient, the UN climate change conference should set new national ambition levels for the subsequent commitment period.

5.2. Additional Information Required Under the Kyoto Protocol

The following section contains information new to the 5th National Communication, in accordance with UNFCCC Decision 15/CMP.1, and contains supplementary information required under Article 7 paragraph 2 of the Kyoto Protocol.

5.2.1. *Member State Use of Kyoto Mechanisms*

Member States provided information on their intended use of the Kyoto Mechanisms in 2009 through a questionnaire under the EC mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol (Council Decision 280/2004/EC). For the remaining Member States, information provided previously through the questionnaire or the use of Kyoto Mechanisms as indicated the second NAP under the EU ETS Directive (2003/87/EC) was used.

A number of Member States have allocated resources to use the Kyoto Mechanisms and the details are given in the table below. The contribution of Kyoto Mechanisms by these countries is for the closure of the gaps between greenhouse gas projections and 2010 targets. For the EU-15, the use of flexible Kyoto Mechanisms (including International Emissions Trading, Joint Implementation and the Clean Development Mechanism) amounts to approximately 93.1 Mt CO_2eq per year of the commitment period.

Member States may also undertake activities in relation to Article 3.3 (emissions and removals from forestry activities) and Article 3.4 (emissions and removals from activities including Forest Management, Cropland Management, Grazing Land Management or Revegetation) of the Kyoto Protocol. When including the use of carbon sinks under these articles the total use of Kyoto Mechanisms in the EU-15 rises to 134.3 MtCO_2eq per year.

Table 5-3 Planned use of Kyoto Mechanisms by Member States

Member State	Achievement of Kyoto target planned through domestic action only	Planned use of Flexible Mechanisms at government level	Type of Flexible Mechanisms (IET, CDM, JI)*	Projected emission reduction 2008-12 through the use of Kyoto Mechanisms [Mt CO_2 eq per year]	Bu Allocated Budget at government level [Mio €]	Projected use of flexible mechanisms in total emission target compared to Kyoto base year	Projected use of reductions from sinks under Art. 3.3 and 3.4 [Mt CO_2 eq per year]	Total reduction from Kyoto mechanisms and sinks	Notes
Austria	No	Yes	IET, JI, CDM	9.0	531.0	88%	0.7	9.7	
Belgium	No	Yes	IET, JI, CDM	4.4	252.4	40%		4.4	
Bulgaria	Yes	No	-	-				-	
Cyprus	Not applicable	No	-	-				-	Cyprus and Malta are non-Annex I Parties to the Kyoto Protocol and do not have an emissions target for the period 2008-2012.
Czech Republic	Yes	No	-	-			1.2	1.2	
Denmark	No	Yes	IET, JI, CDM	4.2	152.0	29%	2.2	6.4	
Estonia	Yes	No	-	-				-	
Finland	No	Yes	IET, JI, CDM	1.4	70.0	n/a	0.6	2.0	An additional €30M is allocated for post-2012
France	Yes	No	-	-			4.1	4.1	
Germany	Yes	No	-	-			4.5	4.5	

Member State	Achievement of Kyoto target planned through domestic action only	Planned use of Flexible Mechanisms at government level	Type of Flexible Mechanisms (IET, CDM, JI)*	Projected emission reduction 2008-12 through the use of Kyoto Mechanisms [Mt CO_2 eq per year]	Bu Allocated Budget at government level [Mio €]	Projected use of flexible mechanisms in total emission target compared to Kyoto base year	Projected use of reductions from sinks under Art. 3.3 and 3.4 [Mt CO_2 eq per year]	Total reduction from Kyoto mechanisms and sinks	Notes
Greece	Yes	No	-	-			1.1	1.1	
Hungary	Yes	Yes	IET	-16.5		-238%		-16.5	Hungary is the only country which has reported quantified projections of AAU selling
Ireland	No	Yes	IET, JI, CDM	3.6	290.0	50%	2.2	5.8	
Italy	No	Yes	IET, JI, CDM	17.1	78.8	51%	10.2	27.3	
Latvia	Yes	No	-	-				-	
Lithuania	Yes	No	-	-				-	
Luxembourg	No	Yes	IET, JI, CDM	3.7	330	100%		3.7	Budget depends on inflow of petrol tax subject to fuel sales and is based on a future price of a 2010-EUA traded at the EEX in Leipzig on 31st July 2009. This price is being round 15.00 € per t of CO_2.
Malta	Not applicable	No	-	-				-	See notes for Cyprus

Member State	Achievement of Kyoto target planned through domestic action only	Planned use of Flexible Mechanisms at government level	Type of Flexible Mechanisms (IET, CDM, JI)*	Projected emission reduction 2008-12 through the use of Kyoto Mechanisms [Mt CO_2 eq per year]	Bu Allocated Budget at government level [Mio €]	Projected use of flexible mechanisms in total emission target compared to Kyoto base year	Projected use of reductions from sinks under Art. 3.3 and 3.4 [Mt CO_2 eq per year]	Total reduction from Kyoto mechanisms and sinks	Notes
Netherlands	No	Yes	IET, JI, CDM	13.0	505.8	102%	0.1	13.1	
Poland	Yes	No	-	-			3.0	3.0	
Portugal	No	Yes	IET, JI, CDM	4.8	305.3	30%	4.7	9.5	
Romania	Yes	No	-	-				-	
Slovakia	Yes	No	-	-				-	
Slovenia	No	Yes	IET, JI, CDM	1.0	80	61%	1.3	2.3	Slovenia plans to acquire units either through project mechanisms or on the carbon market but has not yet decided on the exact quantity. The value depends on the actual development of emissions, especially in the transport sector.
Spain	No	Yes	IET, JI, CDM	31.8	408.6	-73%	5.8	36.6	

Member State	Achievement of Kyoto target planned through domestic action only	Planned use of Flexible Mechanisms at government level	Type of Flexible Mechanisms (IET, CDM, JI)*	Projected emission reduction 2008-12 through the use of Kyoto Mechanisms [Mt CO_2 eq per year]	Bu Allocated Budget at government level [Mio €]	Projected use of flexible mechanisms in total emission target compared to Kyoto base year	Projected use of reductions from sinks under Art. 3.3 and 3.4 [Mt CO_2 eq per year]	Total reduction from Kyoto mechanisms and sinks	Notes
Sweden	Yes	No	(JI, CDM)	(2)	38		2.1	2.1	Sweden intends to achieve its Kyoto target without the use of flexible mechanisms but has made the necessary preparations to use them if necessary. Sweden intends to acquire 2 MtCO2-eq/yr through the Swedish CDM/JI programme. This figure has not been considered in the target assessment for Sweden and EU-15.
United Kingdom	Yes	No	-	-			4.0	4.0	
EU-15	**No**	**Yes**	**IET, JI, CDM**	**93.1**	**2962**	**27%**	**42.4**	**134.3**	
EU-27	**No**	**Yes**	**IET, JI, CDM**	**77.6**	**3042**	**n/a**	**47.9**	**124.3**	

Notes: *IET = International Emissions Trading, JI = Joint Implementation, CDM = Clean Development Mechanism

5.2.2.*Supplementarity*

Supplementarity obligations under the Kyoto Protocol require that any international credit purchases by Member States must be in addition to emissions abatement action domestically. Within the EC the term has not been quantitatively defined.

As part of the EU ETS (see section 5.1.2), Member States were required to inform the European Commission in their Phase II NAPs of the maximum amount of JI and/or CDM credits that can be used. This limit was then assessed according to the principle of supplementarity and where appropriate approved or revised by the European Commission. For Phase III an EU-wide limit, yet to be determined, will be set by the Commission.

As indicated in the previous section the total planned use of Kyoto flexible mechanisms amounts to 93.1 $MtCO_2eq$ per year over the commitment period. As a share of the EU-15's target of a -8 % reduction compared to the base year, the planned use of flexible mechanisms to achieve non-domestic reductions accounts for around 2 percentage points (i.e. approximately one-quarter of the reductions).

5.2.3.*Other Policies and Measures Promoting Sustainable Development*

Sustainable development is an overarching objective of the EC set out in the Treaty, governing all the Union's policies and activities. The first EU Sustainable Development Strategy (SDS) was adopted in 2001. In February 2005, the Commission assessed progress made on the strategy and concluded that the situation was deteriorating. In a bid to halt the destructive trends leading to the exploitation of natural resources and environmental degradation, the EU Council adopted a Renewed Strategy in June 2006[83].

The overall aim of the renewed EU SDS is to identify and develop actions to achieve continuous improvement of quality of life both for current and for future generations. This is achieved through the creation of sustainable communities able to manage and use resources efficiently and to tap the ecological and social innovation potential of the economy, ensuring prosperity, environmental protection and social cohesion.

The Strategy addresses seven key challenges:

(1) Climate change and clean energy

(2) Sustainable transport

(3) Sustainable consumption and production

(4) Conservation and management of natural resources

(5) Public health

(6) Social inclusion, demography and migration

(7) Global poverty

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[83] Renewed EU Sustainable Development Strategy, 26th June 2006, http://ec.europa.eu/sustainable/docs/renewed_eu_sds_en.pdf

The renewed strategy recognises that SDS goals can only be met in close partnership with the Member States and hence sets in motion a new process of review and reporting involving the Commission and the Member States.

In 2007, the Commission's first progress report[84] concluded that relatively modest progress has been made on the ground. However, development of policy initiatives at both EC and Member State level is more encouraging, in particular in the field of climate and energy. The EC, Member States, citizen groups, NGOs and business are also increasingly focusing on the same issues and working to meet the same goals.

The EC continues to give priority to Sustainable Development in all areas of policy development and action. At the latest by 2011, the European Council will decide when a comprehensive review of the EU SDS is to be launched.

5.2.4. *Policies and Measures Related to Bunker Fuels*

Pursuant to Article 2, paragraph 2, of the Kyoto Protocol, parties should identify the steps taken to promote and/or implement any decisions by the International Civil Aviation Organization and the International Maritime Organization to limit or reduce GHG emissions not controlled by the Montreal Protocol from aviation and maritime bunker fuels. This information is included in the transport sector, section 5.5.14.

5.2.5. *Minimisation of adverse impacts*

The Kyoto Protocol was adopted in pursuit of the ultimate objective of the Convention, and hence its full implementation by Annex I Parties is intended to contribute to preventing dangerous anthropogenic interference with the climate system. Ambitious mitigation goals are necessary to ascertain a future for all countries.

In striving to develop policies and measures to reduce greenhouse gas emissions, Parties to the Kyoto Protocol should implement those policies and measures in a way such as to minimise adverse effects, including the adverse effects of climate change, effects on international trade, and social, environmental and economic impacts on other Parties, especially developing country Parties identified in article 4, paragraphs 8 and 9 of the Convention.

Adverse impacts on developing countries are reduced if global temperature increase is limited to 2 degrees Celsius, if dependence on fossil fuels decreases, and if Annex I Parties are able to develop low-carbon energy systems and reduce fossil fuel consumption.

The Community actively undertakes a large number of activities to have positive impacts on third countries and their ability to tackle climate change, specifically capacity building and technology transfer activities. These are detailed in section 8.

Other policies and measures have potential positive impacts on third countries. The Clean Development Mechanism (CDM), for example, is a tool designed into the Protocol to share efforts in reducing greenhouse gases, ensuring that investment is

[84] COM(2007) 642 final, 22/10/2007, Progress Report on the Sustainable Development Strategy 2007 http://ec.europa.eu/sustainable/docs/com_2007_642_en.pdf and accompanying Commission Staff Working Document, http://ec.europa.eu/sustainable/docs/sec_2007_1416_en.pdf

made where the money has optimal greenhouse gas reducing effects, thus ensuring minimal impact on the world economy. Moreover, the CDM, with its dual aim of promoting sustainable development and reducing GHG emissions is important for countries with continuing development needs and contributes to technology transfer.

EC policies and measures on the promotion of renewable energies contribute to reduction of dependence on fossil fuels, meeting rural electricity needs, and the improvement of air quality. Similarly EC activities on the promotion of energy efficiency and CHP measures can reduce energy costs and contribute to the improvement of air quality.

Changes to subsidies under the EC Common Agricultural Policy (CAP) now link payments to environmental, food safety and animal welfare standards, not to agricultural production volume. This encourages responsible agricultural practices.

Other EC policies and measures aim to address market imperfections and reflect externalities. For example the EC is making efforts to liberalise the internal energy market. In addition one of the primary aims of the EU Emissions Trading Scheme is to create the right incentives for forward looking low carbon investment decisions by reinforcing a clear, undistorted and long-term carbon price signal. Extending the scheme to the aviation sector will extend this also to this sector.

A small number of EC policies and measures have the potential to have a negative impact on third countries. Where this is identified, the EC strives to implement policies and measures in a way that minimises any negative effects.

Promotion of Biofuels

Promotion of biofuels in the EC has been identified to have potential future negative or less positive impacts related to greenhouse gas emissions or biodiversity. The new EC Renewable Energy Directive (see section 5.4.2), which contains a target of a minimum 10% renewable energy in transport in 2020, therefore establishes specific sustainability criteria for biofuels (Article 17 of the Directive), to ensure that biofuels promoted within the Community do not have negative impacts. Such sustainability criteria include not supporting biofuels from land with high biodiversity value (primary forest and wooded land, protected areas or highly biodiverse grasslands), or from land converted from wetlands, peatlands or continuously forested areas. The EC will also report every two years in respect both of third countries and Member States that are a significant source of biofuels or of raw material for biofuels on national measures taken to respect the sustainability criteria and on broader environmental and social aspects, such as air, water and soil quality and labour conditions. The first report shall be submitted in 2012. The Commission has also been tasked to report on the need for sustainability criteria for broader biomass for energy use and if appropriate propose such criteria.

The EC also has a number of activities and measures aimed at tackling global deforestation, as detailed in the following sections.

Communication on Tropical Deforestation

In October 2008, the Commission unveiled two major initiatives to protect forests worldwide. The first was a Communication[85] setting out the Commission's proposals for tackling tropical deforestation while the second initiative targets a reduction of illegally logged timber imports (see below).

The Communication on tropical deforestation proposes that at the UNFCCC negotiations on the future climate regime, the EC calls for a halt on global forest cover loss by 2030 at the latest and a reduction in gross tropical deforestation by at least 50% by 2020 compared to current levels.

The Commission also proposes to work on the development of a Global Forest Carbon Mechanism, a financial instrument through which developing countries would be rewarded for emissions reductions achieved by reducing deforestation and forest degradation.

The Communication also addresses policies that need to be reinforced in the fields of trade, energy, agriculture, food security and development cooperation to ensure a coherent policy response to address deforestation and forest degradation. The Communication also indicates that at the EC level an appropriate financing scheme is required from 2013 to 2020 to combat deforestation. The total amount of funding will depend on the level of mitigation actions undertaken by developing countries.

Limited Timber Import Legislation

The EC's policy to fight illegal logging and associated trade was defined back in 2003 with the Forest Law Enforcement Governance and Trade (FLEGT) Action Plan[86]. The FLEGT Action Plan consists of three essential elements:

(1) To conclude FLEGT Voluntary Partnership Agreements with timber-producing countries to improve forest governance and transparency in their forest sectors.

(2) To encourage EU Member States to develop and implement public procurement policies that give preference to legally harvested timber and timber products.

(3) To complement these with additional measures to address the problem of illegal logging and associated trade include prevention of the trade in illegally harvested timber, further strengthening of the growing demand for timber from guaranteed legal sources and incentives for timber-producing countries to join FLEGT and improve forest governance.

The objective of the proposed legislation set out by the Commission in October 2008 is to reinforce the measures in the FLEGT Action Plan. The legislative proposal aims to reduce the risk of illegal timber and timber products being placed on the European market for the first time. This encompasses timber and timber products from the

85 Addressing the challenges of deforestation and forest degradation to tackle climate change and biodiversity loss, COM(2008)645 final http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2008:0645:FIN:EN:PDF

86 Council Regulation (EC) No 2173/2005 of 20th December 2005 on the establishment of a FLEGT licensing scheme for imports of timber into the European Community

internal market as well as third countries. The proposal[87] requires timber operators to take concrete steps to minimise the risk of putting illegally harvested timber and timber products on the EU market.

5.2.6. *Legislative Arrangements and Enforcement /Administrative Procedures Relevant to Kyoto Protocol Implementation.*

For the EU-15 Member States, the Kyoto Protocol's compliance procedures will only apply if the EU-15 as a whole misses its 8% reduction target. Should this occur, then each Member State will be held to its target under the EU's burden-sharing agreement, and the EU as a whole will be in non-compliance with its obligation to reach the -8 % target. On top of that, the European Commission can decide to start infringement procedures against EU-15 Member States that miss their targets under the burden-sharing agreement.

The remaining Member States with Kyoto targets (Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia) are bound to their individual targets as set out in the Kyoto Protocol, both under the Kyoto Protocol's non-compliance procedures and under EU law.

Article 226 of the Treaty establishing the European Community (Nice consolidated version) gives the Commission powers to take legal action against a Member State that is not respecting its obligations.

If the Commission considers that there may be an infringement of EU law that warrants the opening of an infringement procedure, it addresses a "Letter of Formal Notice" (first written warning) to the Member State concerned, requesting it to submit its observations by a specified date, usually two months.

In the light of the reply or absence of a reply from the Member State concerned, the Commission may decide to address a "Reasoned Opinion" (second and final written warning) to the Member State. This clearly and definitively sets out the reasons why it considers there to have been an infringement of EU law, and calls upon the Member State to comply within a specified period, usually two months.

If the Member State fails to comply with the Reasoned Opinion, the Commission may decide to bring the case before the Court of Justice. Where the Court of Justice finds that the Treaty has been infringed, the offending Member State is required to take the measures necessary to conform.

Article 228 of the Treaty gives the Commission power to act against a Member State that does not comply with a previous judgement of the European Court of Justice. The article also allows the Commission to ask the Court to impose a financial penalty on the Member State concerned.

Further information on infringement procedures, including recent decisions on breaches of EU law, can be found on the Commission's website[88].

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87 Regulation of the European Parliament and of the Council laying down the obligations of operators who place timber and timber products on the market, COM(2008)644/3
http://ec.europa.eu/environment/forests/pdf/proposal_illegal_logging.pdf

88 http://ec.europa.eu/community_law/infringements/infringements_en.htm

5.3. Cross-sector Policies and Measures

Table 5-4 Summary of cross-sectoral policies and measures

Name of policy or measure	Objective and/or activity affected	GHG affected	Type of instrument	Status	Implementing entity or entities	Estimate of mitigation impact, by gas (for a particular year, not cumulative, in Mt CO_2 equivalents)			
						2005	2010	2015	2020
EU ETS	EU wide emissions trading scheme covering combustion plants >20 MW	CO_2, N_2O, PFCs	Economic	Implemented. First phase (2005-2007). Second phase (2008-2012). Planned third phase (2013-2020).	EC / Member States				ETS cap will lead to a 21 % reduction in emissions in 2020 compared to 2005 levels[89].

[89] This amounts to an approximate reduction of over 0.4 $GtCO_2$ based on verified emissions in 2005 (First Phase). Note the actual reduction will be larger as the scope of the scheme has been expanded in subsequent Phases. The reductions from the EU ETS should not be double counted with other policies, which may also affect the participants either directly or indirectly.

Name of policy or measure	Objective and/or activity affected	GHG affected	Type of instrument	Status	Implementing entity or entities	Estimate of mitigation impact, by gas (for a particular year, not cumulative, in Mt CO_2 equivalents)			
						2005	2010	2015	2020
Taxation of energy products and electricity	EU-wide rules for taxation of energy products used as motor or heating fuel and consumption of electricity	Mainly CO_2	Fiscal	Implemented	EC / Member States				
FP7	Non technical measure for funding research	Mainly CO_2	Research	Implemented	EC				
Competitiveness and Innovation Programme	Non technical measure to remove market barriers and enhance competitiveness of EU companies	Mainly CO_2	Economic / research	Implemented	EC				

Name of policy or measure	Objective and/or activity affected	GHG affected	Type of instrument	Status	Implementing entity or entities	Estimate of mitigation impact, by gas (for a particular year, not cumulative, in Mt CO_2 equivalents)			
						2005	2010	2015	2020
LIFE+	Non technical measure to support the development and implementation of environmental policy	Mainly CO_2	Economic	Implemented	EC				
Structural and Cohesion funds	Non technical measure to strength economic and social cohesion	Mainly CO_2	Economic	Implemented (2000-2006) On-going (2007-2013)	EC/Member States				

5.3.1.*EU Emissions Trading Scheme*

The EU Emissions Trading Scheme is the cornerstone of EC-level policy to reduce emissions from the energy generation and energy intensive industries Details of the scheme, including the design for the future, can be found in section 5.1.2.

5.3.2.*Taxation of Energy Products and Electricity*

Directive 2003/96/EC provides EU-wide rules for taxation of energy products and electricity[90]. The Directive covers all taxes on energy consumption, except for VAT and provides for common taxation rules and common minimum levels of taxation.

The Directive applies to energy products used as motor fuel or heating fuel and electricity. Non-fuel uses of energy and situations when energy serves primarily as a raw material in industrial processing fall out of the scope of the Directive. Electricity is taxed at consumption; fuels used to generate electricity are exempt from taxation.

Based on their typical uses, the most important sectors affected by energy taxation are transport, households, services, agriculture and lighter industrial processes using energy for combustion. Finally, the Directive allows (under certain conditions) for exemptions or reductions to promote renewable sources of energy.

The Commission is currently revising the Energy Taxation Directive to bring it more closely in line with the EU's energy and climate change objectives[91].

5.3.3.*Research and Innovation in Climate and Energy*

There are a number of research programmes related to research and innovation in climate and energy including:

- The Framework Programmes
- The Competitiveness and Innovation Framework Programme
- Life Funding

Further information on these can be found in Section 9.

5.3.4.*Structural and Cohesion Funds*

The EC has always promoted balanced development and strengthened economic and social cohesion by reducing development disparities between its regions. In addition Cohesion Policy funding also has a key role to play in the Community regarding cross-border transnational and interregional cooperation.

The European Council agreed in December 2005 on the budget for the period 2007-2013 and allocated €347 billion (current prices) to the Structural and Cohesion Funds[92], around 30 % of which (€105 billion) is earmarked for environmental aspects.

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90 Directive 2003/96/EC of 27th October 2003 – restructuring the Community framework for the taxation of energy products and electricity

91 COM (2007) 640 final.

The Community Strategic Guidelines, adopted in October 2006, contain the principles and priorities of cohesion policy[93]. Among the priorities, the Strategic Guidelines highlight investments to fight climate change and reach Kyoto targets, appointing as eligible areas for support investment in sustainable energy and transport systems. The Guidelines also list projects to improve energy efficiency and dissemination of low energy intensity development models and the development and use of renewable and alternative technologies as priorities.

In the 2007-2013 programming period the priority themes for funding include:

- €86 billion for Research and technological development, innovation and entrepreneurship, 4 % of which is specifically designated for assistance to SMEs (Small to Medium Enterprises) for the promotion of environmentally-friendly products and production processes;

- €8.7 billion for sustainable energy, of which 7.9 % is designated to wind energy, 12.2 % to solar energy, 20.5 % to biomass energy, 12.5 % to other renewables (hydroelectric and geothermal), and 46.7 % of which is to go towards energy efficiency, co-generation and energy management;

- €50.1 billion for environmental protection and risk prevention (see also section 7 for further information), which includes 12.3 % for promotion of clean urban transport, 12.5 % for waste treatment, 27. 8% for water treatment, and 11.5 % for risk prevention, including natural disasters.

In July 2006 the Council and the European Parliament adopted a package of five regulations[94] on:

- General common principles, rules and standards for the implementation of the three cohesion instruments, the European Regional Development Fund (ERDF), the European Social Fund (ESF) and the Cohesion Fund[95];

- The European Regional Development Fund (ERDF)[96] which aims to promote public and private investments to reduce regional disparities across the EC;

- The European Social Fund (ESF)[97], which focuses on the employment field;

- The Cohesion Fund[98], which contributes to interventions in the field of the environment and trans-European transport networks; and

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92 http://europa.eu/rapid/pressReleasesAction.do?reference=DOC/05/4&format=HTML&aged=0&language=EN&guiLanguage=fr

93 http://ec.europa.eu/regional_policy/sources/docoffic/2007/osc/index_en.htm

94 http://ec.europa.eu/regional_policy/sources/docoffic/official/regulation/newregl0713_en.htm

95 http://ec.europa.eu/regional_policy/sources/docoffic/official/regulation/pdf/2007/general/ce_1083(2006)_en.pdf

96 http://ec.europa.eu/regional_policy/sources/docoffic/official/regulation/pdf/2007/feder/ce_1080(2006)_en.pdf

97 http://ec.europa.eu/regional_policy/sources/docoffic/official/regulation/pdf/2007/fse/ce_1081(2006)_en.pdf

98 http://ec.europa.eu/regional_policy/sources/docoffic/official/regulation/pdf/2007/cohesion/ce_1084(2006)_en.pdf

- The European Grouping of territorial co-operation (EGTC)[99], which aims to facilitate cross-border, transnational and/or inter-regional co-operation between regional and local authorities.

The EU Cohesion Policy overall contributes a great deal to mitigation and adaptation to climate change across the region through the breadth and depth of investments made.

[99] http://ec.europa.eu/regional_policy/sources/docoffic/official/regulation/pdf/2007/gect/ce_1082(2006)_en.pdf

5.4. Energy Sector

Table 5-5 Summary of policies and measures in the energy sector

Name of policy or measure	Objective and/or activity affected	GHG affected	Type of instrument	Status	Implementing entity or entities	Estimate of mitigation impact, by gas (for a particular year, not cumulative, in Mt CO_2 equivalents)			
						2005	2010	2015	2020
Developing the internal market	Liberalising energy supply within gas and electricity markets	CO_2	Regulatory	Number of Directives adopted, implementation ongoing	EC / Member States		80-120[100]		
Renewable Energy[101]									
Promotion of electricity from RES-E (2001)	Increase in renewable electricity to 2010	Mainly CO_2	Regulatory	Implemented	EC / Member States		100-125[102]		
(New) Renewable Energy Directive	Binding 20% target for renewables in total EU gross final energy	Mainly CO_2	Regulatory	Adopted	EC / Member States				600-900[103]

100 Second ECCP progress report April 2003, http://europa.eu.int/comm/environment/climat/pdf/second_eccp_report.pdf

101 All figures under Renewable Energy group of policies refer to estimated savings in EU-15 except from the "New renewable Energy Directive" that is for EU-27

102 Second ECCP progress report April 2003, http://europa.eu.int/comm/environment/climat/pdf/second_eccp_report.pdf

Name of policy or measure	Objective and/or activity affected	GHG affected	Type of instrument	Status	Implementing entity or entities	Estimate of mitigation impact, by gas (for a particular year, not cumulative, in Mt CO_2 equivalents)			
						2005	2010	2015	2020
	consumption in 2020 (electricity, heat and transport)								
Biomass Action Plan	Increase use of biomass for electricity and heat production and transport	Mainly CO_2	Regulatory	Adopted	EC / Member States		36 - 48[104]		
Energy Demand[105]									
Action Plan on Energy Efficiency	Energy Efficiency improvements in a variety of sectors	CO_2	Regulatory Economic	Implemented (ongoing)	EC / Member States				
Directive on energy end-	Remove barriers to and promotion	Mainly CO_2	Regulatory	Implemented (ongoing)	EC / Member States		92[106]		

103 Directive on the promotion of energy from renewable sources – Citizens' Summary http://ec.europa.eu/energy/climate_actions/doc/2008_res_citizens_summary_en.pdf

104 Biomass Action Plan - COM (2005) 628 final, 7.12.2005.

105 All figures under the Energy Demand group of policies refer to estimated savings in EU-15 except from the "Energy Performance of Buildings Dir (recast)" that is for EU-27.

Name of policy or measure	Objective and/or activity affected	GHG affected	Type of instrument	Status	Implementing entity or entities	Estimate of mitigation impact, by gas (for a particular year, not cumulative, in Mt CO_2 equivalents)			
						2005	2010	2015	2020
use efficiency and energy services	of energy efficiency								
Framework Directive Eco-design	Instrument to address environmental performance of energy using products by impacting on product design over entire life-cycle	Mainly CO_2	Regulatory	Implemented	EC / Member States / Industry				200[107]
Cogeneration Directive	Promote high efficiency cogeneration	CO_2	Regulatory	Implemented (ongoing)	EC / Member States		24–42[108]		
Motor	Aid industrial	Mainly	Research	Implemented	EC / Member		30 [109]		

106 Proposal for a Directive of the European Parliament and of the Council on End-Use Energy Efficiency and Energy Services, COM(2003) 739 final

107 Actual savings will depend upon subsequent Directives and self commitments by the industry – Proposal for a directive on Eco design of EuP, COM (2003) 453 final

108 The share of renewable energy in the EU - COM(2004) 366 final, 26.5.2004.

Name of policy or measure	Objective and/or activity affected	GHG affected	Type of instrument	Status	Implementing entity or entities	Estimate of mitigation impact, by gas (for a particular year, not cumulative, in Mt CO_2 equivalents)			
						2005	2010	2015	2020
challenge	companies in improving the energy efficiency of their electric Motor Driven Systems	CO_2			States / Industry				
Labelling Directive	Extension of products that fall under this Directive	Mainly CO_2	Regulatory	Adopted	EC / Member States / Industry		26[110]		
Energy performance of buildings	Improving the energy efficiency of buildings, introduction of energy performance certificates	CO_2	Regulatory	Implementation of the original Directive ongoing. Proposal of recast Directive adopted by the Commission in 2008	EC / Member States		35 - 45[111] (original Directive)		160-210[112] (recast)

109 Proposal for a Directive of the European Parliament and of the Council on End-Use Energy Efficiency and Energy Services, COM(2003) 739 final

110 The figure indicates potential savings from the implementation of Dir 2003/66/EC - does not include the 2008 recast proposal - Second ECCP progress report April 2003, http://europa.eu.int/comm/environment/climat/pdf/second_eccp_report.pdf

Name of policy or measure	Objective and/or activity affected	GHG affected	Type of instrument	Status	Implementing entity or entities	Estimate of mitigation impact, by gas (for a particular year, not cumulative, in Mt CO_2 equivalents)			
						2005	2010	2015	2020
Technology policy									
SET Plan	Greater cooperation to boost R&D in low carbon technologies	Mainly CO_2	Research	Implemented	EC / Member States / Research networks				
Other									
Green Public Procurement	Public procurement as a means to kick-start market for eco-innovative goods	Mainly CO_2	Education / Economic	Implemented	Public sector - EC / Member States		25-40[113]		
CCS Directive	Promote safe geological storage	CO_2	Regulatory	Adopted	EC / Member States				0.875[114]

111 The figure refers to the Directive 2002/91/EC - Second ECCP progress report April 2003, http://europa.eu.int/comm/environment/climat/pdf/second_eccp_report.pdf

112 In the first phase of the ECCP, an emission reduction potential of 30Mt CO_2eq was considered achievable for this sector - Second ECCP progress report April 2003, http://europa.eu.int/comm/environment/climat/pdf/second_eccp_report.pdf

113 http://europa.eu.int/comm/environment/climat/pdf/second_eccp_report.pdf

Name of policy or measure	Objective and/or activity affected	GHG affected	Type of instrument	Status	Implementing entity or entities	Estimate of mitigation impact, by gas (for a particular year, not cumulative, in Mt CO_2 equivalents)			
						2005	2010	2015	2020
	of CO_2.								
Non-GHG policy									
National emissions Ceiling Directive	Limits on pollutants responsible for acidification, eurtrophication, ozone-depletion	Indirect CO_2	Regulatory	Implemented	EC / Member States				
Large Combustion Plant Directive	Emissions standards for NOx, SOx and particulates	Indirect CO_2	Regulatory	Implemented	EC / Member States				

[114] The original figure refers to a cumulative estimate of 7 MtCO2eq by 2020. Assuming that the effect starts in 2012 when the Directive is expected to enter into force, we calculated the annual saving by dividing the 2020 saving by 8 years

5.4.1. *Developing the Internal Market*

Creating a genuine internal market for energy is one of the EC's priority objectives. The existence of a competitive internal energy market is a strategic instrument both in terms of giving European consumers a choice between different companies supplying gas and electricity at reasonable prices, and of making the market accessible for all suppliers.

Some time ago the EC adopted Directives on the full liberalisation of the electricity (Directive 2003/54/EC) and gas markets (Directive 98/30/EC). Increased competition between different energy sources favours more flexible, less capital intensive and smaller scale production methods.

Making the internal energy market a reality will depend above all on having a reliable and coherent energy network in Europe and therefore on infrastructure investment. A truly integrated market will contribute to diversification and thus to security of energy supply. To this end, the Commission put forward the Third Energy Package[115] on 19th September 2007.

Ownership issues

The package provides companies in Member States with two options for separating gas and electricity production from supply provision:

Ownership unbundling: Companies that control both energy generation and transmission would be obliged to sell part of their assets. Investors would be able to keep their participation in the dismantled groups via a system of 'share-splitting', whereby two new shares are offered for each existing share.

Independent System Operator (ISO): Companies involved in energy production and supply would be allowed to retain their network assets, but would lose control over how they are managed. Commercial and investment decisions would be left to an independent company (the ISO), to be designated by national governments and approved by the Commission.

More powers to national regulators and new EC agency

A lack of coherence in the remits of national energy regulators is a hurdle towards a well-functioning EC energy market. The Third Energy Package aims to resolve this by:

- Harmonising and strengthening the powers and duties of national regulators;
- Ensuring that all national regulators are truly independent of industry interests and government intervention; and
- Mandating cooperation between all national regulators.

Co-operation between national transmission system operators for gas and electricity, which currently only takes place on a voluntary basis, will be formalised under the

[115] COM (2007) 0530 Proposal for a Regulation of the European Parliament and of the Council amending Regulation (EC) No 1775/2005 Establishing an Agency for the Cooperation of Energy Regulators [Third Energy Package]

Commission's plans through the establishment of a European Network for Transmission System Operators.

A new European agency is also foreseen in the package to oversee and improve cross-border regulatory cooperation for gas and electricity transmission between Member States.

5.4.2.*Renewable Energy*

Renewable Electricity Directive

A key piece of legislation is the 2001 Directive on the promotion of electricity from renewable energy sources[116]. The Directive sets indicative targets, differentiated by Member State, for renewable electricity consumption in 2010, which in total led to an indicative target for the EU of 22.1 % renewable electricity. The Commission's Progress Report shows that in 2006, the overall contribution of renewables to total electricity consumption in the EU-27 was 15.7 %[117]. Although growth rates of renewable electricity are increasing in the EU, Commission analysis still suggests that the 2010 target will not be reached without significant additional effort.

Renewable Energy Directive and Bioenergy Policy

The new Renewable Energy Directive[118] is one of three Directives adopted as part of the EC's Energy and Climate Package (see section 5.1.2).

Individual Member State targets are based on their share of renewable energy in 2005, plus a flat rate increase of 5 %, plus a GDP-weighted percentage increase, and then moderated to include a bonus for Member States who started their renewable energy development early. The Directive also includes a target of a minimum 10 % share of renewable energy in transport, which can include biofuels, renewable electricity or hydrogen. The current contribution of renewable energy to total final energy consumption in the EU-27 and its Member States, along with the 2020 targets, can be seen in section 3.7.1.

The Directive requires Member States to prepare National Renewable Energy Action Plans by June 2010, which should state sectoral targets (electricity, heating and cooling, and transport) and their policies and measures to achieve these targets. Member States are encouraged to cooperate towards achieving their renewable energy

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116 Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources in the internal electricity market, adopted October 2001: http://eur-lex.europa.eu/pri/en/oj/dat/2001/l_283/l_28320011027en00330040.pdf

117 Figure from COM(2009)192 The Renewable Energy Progress Report: Commission Report in accordance with Article 3 of Directive 2001/77/EC, Article 4(2) of Directive 2003/30/EC and on the implementation of the EU Biomass Action Plan: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2009:0192:FIN:EN:PDF
Figure is based on normalised hydropower following a methodology ifrom Eurostat (which may differ from the methods applied in some Member States)

118 Directive 2009/28/EC on the promotion of the use of energy from renewable sources amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0016:0062:EN:PDF

targets, so that targets can be achieved in the most cost efficient manner. Flexibility measures introduced take the form of "statistical transfers" of renewable energy from one country to another, joint projects between Member States and/or joint support schemes.

The Directive also creates a sustainability regime for biofuels and bioliquids, which includes a minimum GHG threshold which increases over time. Further sustainability provisions, including broader environmental and social aspects and indirect effects of biofuels will be monitored by the Commission.

The Commission estimates that achievement of EU renewable energy targets will cost €13-18 billion per year. This investment will however help to drive down the price of the renewable energy technologies that will form a growing part of global energy supply. The implementation of the Directive is expected to realise savings of 600 to 900 million tonnes of CO_2 emissions per year by 2020[119].

European biomass policy plays a crucial role in any scenario to meet the European target of increasing the share of renewable energies to 20 % by 2020. In December 2005 the Biomass Action Plan[120] set out a series of Community actions aimed at increasing the demand for biomass, improving supply, overcoming technical barriers and developing research. A recent Progress Report and accompanying Staff Working document adopted by the Commission (COM(2009)192), assesses the progress made. The potential for biomass use is around 180 million toe by 2010 and the report shows that around 88 Mtoe biomass was consumed in the EU in 2006.

5.4.3.*EU Emissions Trading Scheme*

All large combustion installations with capacity greater than 20 MWth are included in the ETS. Details, including the design for the future, can be found in section 5.1.2.

5.4.4.*Energy Demand*

Action Plan on Energy Efficiency

The Action Plan on Energy Efficiency is a follow-up to the Commission Communication[121] published in April 1998 on the rational use of energy and the Council resolution on energy efficiency. The Action Plan was adopted in two stages: the first from 2000 to 2006, and the second from 2007 to 2012.

The first stage[122] proposes a target of a 1 % decrease in energy consumption per annum until 2010 over and above that currently envisaged. A wide range of

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119 Directive on the promotion of energy from renewable sources – Citizens' Summary http://ec.europa.eu/energy/climate_actions/doc/2008_res_citizens_summary_en.pdf

120 COM(2005) 628 final of 7th December 2005 "Biomass action plan" http://ec.europa.eu/energy/res/biomass_action_plan/doc/2005_12_07_comm_biomass_action_plan_en.pdf

121 Communication from the Commission of 29th April 1998: Energy Efficiency in the European Community - towards a Strategy for the Rational Use of Energy

122 Communication from the Commission of 2000 to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions - Action Plan to improve energy efficiency in the European Community

instruments were to be used to implement the plan at European and Member State levels. Many of the proposed actions are not mandatory but action needs to be taken on three distinct levels:

- measures to integrate energy efficiency into other Community policies;
- initiatives to strengthen and extend existing policies;
- development of new policies and measures.

The second stage[123] was presented in 2006 and contains a package of priority measures covering a wide range of cost-effective energy efficiency initiatives. These include improved efficiency in energy appliances, buildings, transport and energy generation. Stringent new energy efficiency requirements, promotion of energy services, specific financing mechanisms to support more energy efficient products are proposed.

The objective of the second stage is to control and reduce energy demand and to take targeted action on energy consumption and supply to save 20% of annual consumption of primary energy by 2020, compared to the energy consumption forecasts for 2020 (a target that has been integrated into the new Energy and Climate Package, section 5.1.2). Achieving this goal would lead to annual savings of primary energy by 2020 of around 390 mtoe, equivalent to approximately a 1.5 % energy saving per year, in addition to the estimated annual baseline or "business-as-usual" improvements of 1.8 %.[124]

Between 2007 and 2012, the Plan underlines the importance of minimum energy performance requirements for a wide range of appliances and equipment, and for buildings and energy services. In combination with performance ratings and labelling schemes, minimum performance requirements represent a powerful tool for removing inefficient products from the market, informing consumers of the most efficient products and transforming the market to make it more energy efficient.

The Action Plan proposes targeted instruments to improve the efficiency of both new and existing generation capacity and to reduce transmission and distribution losses.

A comprehensive set of measures for improving energy efficiency in transport is proposed, including ensuring fuel efficiency of cars, developing markets for cleaner vehicles, ensuring proper tyre pressure, improving the efficiency of urban, rail, maritime and aviation transport systems (see section 5.5), and also stressing the importance of behavioural change.

The Action Plan calls for the development and adoption of new – or the strengthening of existing – European Community Directives.

The 2008 Commission Communication 'Energy efficiency: delivering the 20 % target''[125] concluded that "*current energy efficiency legislation alone will not deliver sufficient energy savings to meet the 20 % saving objective*" and that further actions

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123 Communication from the Commission - Action Plan for Energy Efficiency: Realising the Potential

124 Autonomous improvements of 0.85 % annually and the impact of previous Community legislative measures of 0.35 % annually. Annual structural changes of 0.6 % are also estimated.

125 COM(2008) 772 final, of 13/11/2008.

will be necessary. The Commission therefore plans to adopt a new Energy Efficiency Action Plan by the end of 2010.

Directive on Energy End-use Efficiency and Energy Services

The Commission adopted a Directive[126] for energy end-use efficiency and energy services in 2006, with implementation in Member States by 2008. The purpose of the Directive is to make the end use of energy more economic and efficient by:

- Establishing indicative targets, incentives and the institutional, financial and legal frameworks needed to eliminate market barriers and imperfections which prevent efficient end use of energy.

- Requiring Member States to issue national Energy Efficiency Action Plans specifying how they intend to achieve energy savings in energy consumption[127].

- Creating the conditions for the development and promotion of a market for energy services and for the delivery of energy-saving programmes and other measures aimed at improving end-use energy efficiency. Member States must ensure that the public sector adopts measures to improve energy efficiency, inform the public and businesses of the measures adopted and promote the exchange of good practice.

The Directive covers all forms of energy, and applies to providers of energy efficiency measures, energy distributors, distribution system operators and retail energy sales companies as well as to all non-ETS energy users.

The Commission estimates that the Directive could reduce CO_2 emissions by 92 Mt/yr[128] by 2010. Most of the reductions will be achieved using very cost effective investments, i.e. involving no or negative overall costs, and the remaining initiatives will cost less than €20/t CO_2eq[129].

Cogeneration Directive

The European Parliament and the Council adopted on 11th February 2004 Directive 2004/8/EC on the promotion of cogeneration based on a useful heat demand in the internal energy market[130].

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126 Directive 2006/32/EC of the European Parliament and of the Council of 5th April 2006 on energy end-use efficiency and energy services and repealing Council Directive 93/76/EEC

127 For an assessment of national Energy Efficiency Action Plans, please see Commission Staff Working Document, Synthesis of the complete assessment of all 27 National Energy Efficiency Action Plans as required by Directive 2006/32/EC on energy end-use efficiency and energy services. Moving forward together on saving energy. SEC(2009)889, of 26/06/2009.

128 This figure concerns only EU-15. See Proposal for a Directive of the European Parliament and of the Council on energy end-use efficiency and energy services. COM(2003)739, of 10/12/2003.

129 Second ECCP progress report April 2003, http://europa.eu.int/comm/environment/climat/pdf/second_eccp_report.pdf

130 http://europa.eu/scadplus/leg/en/lvb/l27021.htm and http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:052:0050:0060:EN:PDF

This Directive creates a framework for promotion and development of high efficiency cogeneration of heat and power. It does not include targets but urges Member States to carry out analyses of their potential for high efficiency cogeneration and evaluate progress towards increasing the share of this technology.

In the 2006 Action Plan for Energy Efficiency[131] the Commission proposed a number of measures to promote cogeneration in the future: harmonising calculation methods and guarantee of origins, improving metering and establishment of European standards, minimum performance requirements and regulations for district heating and micro cogeneration.

In 2007, as part of implementation of the original Directive the Commission established harmonised efficiency reference values for separate production of electricity and heat[132]. These harmonised values will be reviewed for the first time in February 2011, and every four years thereafter, to take account of technological developments and changes in the distribution of energy sources.

Motor Challenge

Launched in 2003, the Motor Challenge Programme[133] is a European Commission initiative to aid industrial companies to improve the energy efficiency of their electric Motor Driven Systems. The Challenge focuses on compressed air, fan and pump systems, for which it has been demonstrated that a large technical and economic potential for energy savings exists.

The core of the programme is an Action Plan, by which a Challenge Partner commits to undertaking specific measures to reduce energy consumption. The participating company determines which production sites, and which types of systems, are covered by the commitment. The scope of the commitment is flexible, and can be limited to a single shop, or may include all of the company's European production sites.

Companies will receive aid, advice and technical assistance from the Commission and from participating National Energy Agencies to formulate and carry out their Action Plan.

Energy Using Products

The Energy Using Products Directive[134] (EuP) is an initiative to improve the environmental performance of products throughout their life-cycle by encouraging

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131 http://europa.eu/scadplus/leg/en/lvb/l27064.htm and http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2006:0545:FIN:EN:PDF

132 Commission Decision 2007/74/EC of 21st December 2006 establishing harmonised efficiency reference values for separate production of electricity and heat in application of Directive 2004/8/EC of the European Parliament and of the Council.

133 The Motor Challenge: http://re.jrc.ec.europa.eu/energyefficiency/motorchallenge/index.htm

134 Directive 2005/32/EC of the European Parliament and of the Council of 6th July 2005 establishing a framework for the setting of eco-design requirements for energy-using products and amending Council Directive 92/42/EEC and directives 96/57/EC and 2000/55/EC of the European Parliament and of the Council http://ec.europa.eu/enterprise/eco_design/directive_2005_32.pdf

integration of environmental aspects at the earliest stages of their design. Framework Directive for establishing Eco-design requirements for EuP

The eco-design of Energy using Products Directive became law in the EC in August 2005, with transposition by Member States into national law by August 2007. It is the main legal instrument for the EC to address the environmental performance of energy using products. The main objective of the EuP Directive is to bring about improvements in energy efficiency throughout a product's lifecycle, from the mining of the raw material through to recycling at the end-of-life. Its focus is on the design phase and the scope is deliberately broad, covering, in principle, any product which when in use depends on, generates, transfers or measures energy (electricity, fossil fuel or renewable).

The overall impact of the framework Directive will depend on the number of implementing measures adopted, but could become very substantial over time, reaching 200 Mt/yr by the year 2020, when all currently installed equipment has been replaced[135].

The rules for the eco-design of EuPs are consistent across Europe, but take into consideration national variations. Criteria included are water consumption, energy consumption and waste production as well as the extension of product life. Not all EuPs have quantified environmental obligations against them under the Directive. Those that do will be selected based on volume of sales in the EU and their environmental impact at European level.

The Directive is being applied to the following product groups as a matter of priority, with others to follow:

- heating and water heating equipment[136],
- electric motors,
- lighting in the residential and tertiary sectors,
- domestic appliances,
- office equipment in the residential and tertiary sectors,
- consumer electronics,
- HVAC (heating, ventilation and air conditioning) systems.

In 2008, the Commission issued a proposal to recast[137] the Eco-design Directive. The aim of the recast is allow for the inclusion of all energy-*related* products (e.g. windows) as well as energy-using products.

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135 Proposal for a Directive on Eco design of EuP, COM (2003) 453 final

136 Replacing, in some cases, older Directives specific to a certain product group such as Directive 92/42/EEC on Efficiency of new boilers

137 Proposal COM(2008) 399 final for a Directive of the European Parliament and of the Council establishing a framework for the setting of eco-design requirements for energy related products http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2008:0399:FIN:EN:PDF

Labelling Directive

The EuP Directive is expected to increase the effectiveness and synergies of other EC legislation. One such affected Directive is the Energy Labelling Directive[138]. Since the original Directive[139] of 1992, the Energy Labelling Directive has been amended to include further energy using household appliances such as refrigerators and freezers.

In 2008, the Commission submitted a proposal to further extend the scope of this Directive[140] to energy-using products used in the industrial and commercial sectors, as well as other products which have an impact on energy consumption during use.

In addition, the new proposal establishes a harmonised base for public procurement and incentives provided by the EC and the Member States. The product-specific implementing measures will indicate the energy-performance level below which public authorities should not procure or grant incentives. These levels will be set to guarantee net savings for public finances while providing the industry with an EU-wide level-playing field.

Energy Performance of Buildings

The existing Energy Performance of Buildings Directive[141], adopted in 2003 for transposition into Member State law in 2005, is a key piece of legislation to improve the energy performance of buildings in the EU.

The original Directive was expected to be able to reduce emissions by around 220 Mt CO_2eq in total at a cost of less than €20/tonne of CO_2, of which 150 MtCO_2eq would be reduced at no or negative cost (i.e. a cost saving). The emission reduction potential by 2010 is estimated at 35-45 Mt/yr[142].

The Directive obliges Member States to set minimum standards for the energy performance of new buildings and for existing buildings subject to major renovation works. The Directive also includes:

- Criteria for a common methodology for calculating the integrated energy performance of buildings;

- Systems for the energy certification of new and existing buildings and, for public buildings, prominent display of the certificate and other relevant information. Member States shall ensure that, when buildings are constructed, sold or rented out, an energy performance certificate is made available to the owner or by the owner to the prospective buyer or tenant, as the case might be; and

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138 Commission Directive 2003/66/EC (energy labelling of household electric refrigerators, freezers and their combinations)

139 Council Directive 92/75/EEC of 22nd September 1992 on the indication by labelling and standard product information of the consumption of energy and other resources by household appliances

140 Proposal for a Directive (COM/2008/0778 final) of the European Parliament and of the Council on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products

141 Directive 2002/91/EC of the European Parliament and of the Council of 16th December 2002 on the energy performance of buildings

142 Second ECCP progress report April 2003, http://europa.eu.int/comm/environment/climat/pdf/second_eccp_report.pdf

- Regular inspection of boilers and central air-conditioning systems in buildings and an assessment of heating installations in which the boilers are more than 15 years old.

To further strengthen the effectiveness and the impact of this Directive, the original Directive is currently being recast. The recast Directive[143] has a broader scope and helps citizens to improve the energy efficiency of their houses and the construction industry to build better quality buildings. The revision will create a simplified and improved framework for energy savings. The minimum total impact of the options identified as being most beneficial and for which quantification was possible, is: 160 - 210 Mt/year CO_2 savings in 2020[144].

With the proposed changes, energy performance certificates become a real, active energy label for individual houses within the Community. The energy performance indicator of the certificate has to be included in all advertisements for sales or letting, and the certificate along with its energy saving recommendations, have to be part of the sales and letting documentation.

If the Commission proposal is adopted, the specific energy performance requirements will be implemented in national or regional building codes. Their level of ambition should be improved using a specific benchmarking system that is currently under development.

Likewise, the Commission proposal requires Member States to develop plans for increased numbers of low or zero energy and carbon buildings, such as passive houses. The public sector should show a leading example investing in such buildings.

5.4.5. *Technology Policy*

Strategic Energy Technology Plan (SET)

The EC considers speeding up research into low-carbon technologies as key to tackling the twin challenges of climate change and energy-supply security. On 10th January 2007 the European Commission outlined a proposal for a Strategic Energy Technology (SET) Plan as part of its Energy and Climate package proposals. Detailed proposals were tabled by the Commission on 22nd November 2007[145].

The SET Plan improves collaboration between the EC and Member States on low carbon technology research and therefore seeks to build on existing efforts, such as the EC research framework programme (FP7), European technology platforms and the European Institute of Technology.

The SET Plan calls for greater cooperation at European level to boost innovation and proposes the following measures:

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143 Proposal for a Directive of the European Parliament and of the Council on the energy performance of buildings http://ec.europa.eu/energy/strategies/2008/doc/2008_11_ser2/buildings_directive_proposal.pdf

144 Energy performance of buildings – Impact Assessment on the revised Directive SEC(2008) 2864

145 COM(2007) 723 final, of 22nd November 2007 – A European Strategic Energy Technology Plan (SET-Plan) http://ec.europa.eu/energy/res/setplan/doc/com_2007/com_2007_0723.pdf

- European Industrial Initiatives in six areas: wind, solar, bio-energy, nuclear fission, carbon capture and storage (CCS) and electricity grids;
- A European Research Alliance featuring research coordination between universities and specialised institutes;
- Establishment of a high-level Steering Group on Strategic Energy Technologies;
- A new Energy Technology Information System; and
- The organisation in 2009 of a European Energy Technology Summit to agree a financial plan.

5.4.6. *Green Public Procurement*

The EC promotes the use of public procurement in Member States as a means of kick-starting the market for eco-innovative goods and services and achieving its environmental goals in a cost-efficient manner.

Public authority spending in the EU is worth an estimated €2,000 billion per year, around 16 % of EU GDP. Greening public procurement rules at EC and national level can substantially reduce unsustainable production and consumption patterns and could serve to place new environmental technologies on the market.

A 2003 Communication on Integrated Product Policy encouraged Member States to adopt national action plans on Green Public Procurement (GPP) by the end of 2006. In March 2004, the EC adopted two new public procurement Directives, which included provisions regarding integration of environmental considerations into public procurement strategies. The Directives are estimated to have an emission reduction potential of 25-45 Mt CO_2eq per annum, most of which comprises investments that cost less than 20€/tonne CO_2eq[146].

In June 2006, the EC adopted a renewed Sustainable Development Strategy (section 5.2.3), including the goal of bringing the average level of EU GPP up to the standard currently achieved by the best-performing Member States by 2010.

On 16th July 2008, the Commission presented a proposal to set ambitious targets for GPP as part of a broader action plan for 'sustainable consumption and production'.

The draft law also identifies ten priority sectors for the introduction of GPP. These sectors are: construction, food and catering services, transport and transport services, energy, office machinery and computers, clothing, uniforms and other textiles, paper and printing services, furniture, cleaning products and services and health sector equipment.

5.4.7. *Carbon Capture and Storage*

ECCP II, launched in October 2005, set up a Working Group on Carbon and Capture and Geological Storage (CCS) with the mandate to explore this technology as a means of reducing climate change.

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146 Second ECCP progress report April 2003, http://europa.eu.int/comm/environment/climat/pdf/second_eccp_report.pdf

The need for the development of both policy and regulatory frameworks for CCS was stressed by the Working Group and by the European Commission[147].

On 17th December 2008 the European Parliament adopted its resolution on the proposal for a Directive on the geological storage of carbon dioxide and amending Council Directives 85/337/EEC, 96/61/EC, Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC and Regulation (EC) No 1013/2006.

The Directive establishes a legal framework for the environmentally safe geological storage of carbon dioxide, to prevent and eliminate as far as possible negative effects and any risk to the environment and human health.

Members States undertake the selection of storage sites pursuant to the requirements of the Directive and they retain the right to issue storage permits. The Directive defines criteria for the applications procedure, the content of the permits and the conditions for issuing the permits. The European Commission reserves the right to review and pass opinion on draft storage permits.

The Directive defines criteria for monitoring and reporting regimes to verify storage and adequate remediation for any damage or significant irregularities or leakages that may occur.

CCS is also covered under the third phase of the EU ETS. In the context of the new framework for Phase III of the EU ETS the legislation includes several financial incentives for this technology for 2013 onward varying from direct funding to indirect financial mechanisms.

For the purpose of the EU ETS, installations with CCS technology will not be required to return allowances to the extent that the carbon dioxide is stored.

Member States determine the use of revenues generated from the auctioning of allowances. However, the legislation requires that at least 50 % of the revenues generated from the auctioning of allowances is used for specific activities among which is the environmentally safe capture and geological storage of carbon dioxide.

The construction and operation of twelve commercial demonstration projects including geological storage of carbon dioxide as well as the demonstration projects of innovative renewable energy technologies will be stimulated through the creation of a fund equal to €300 million allowances in the new entrants reserve until 31st December 2015.

Preliminary estimates of the impact of the proposed Directive and referred to in the Commission Impact Assessment, indicate that 7 $MtCO_2$ could be stored by 2020, and up to 160 Mt by 2030. This assumes a 20 % reduction in GHG emissions by 2020, provided that CCS obtains private, national and Community support and proves to be an environmentally safe technology. The CO_2 emissions avoided in 2030 could account for some 15 % of the reductions required in the EU[148].

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147 COM (2006) 843 final, of 10th January 2007 – Sustainable power generation from fossil fuels: aiming for near-zero emissions from coal after 2020 http://ec.europa.eu/energy/energy_policy/doc/16_communication_fossil_fuels_en.pdf

148 European Parliament, CCS, text adopted at the sitting of 17 DEC 2008 (P6_TA-PROV (2008) 12-17)

5.4.8. *Non-greenhouse Gases*

The following two Directives aim to introduce measures to improve air quality, but their provisions will also affect emissions of greenhouse gases through control of combustion.

National Emissions Ceiling Directive

Directive 2001/81/EC[149] on National Emission Ceilings for certain pollutants sets upper limits for each Member State for the total emissions in 2010 of the four pollutants responsible for acidification, eutrophication and ground-level ozone pollution (sulphur dioxide, nitrogen oxides, volatile organic compounds and ammonia).

The Directive is currently being amended[150] to set emissions ceilings for 2020 for the four pollutants already regulated as well as for primary emissions of PM2.5. The revision builds upon the evaluation and review of the National Programmes 2002 and 2006, the work performed under the Clean Air for Europe Programme[151], the Thematic Strategy on Air Pollution, and new scientific and technical work. The revision also takes into account (proposals for) the Community legislation for specific source categories, like Euro 5/6, EURO VI, the revision of the IPPC-Directive and the EC's 2020 targets for greenhouse gas emissions and renewable energy.

Large Combustion Plant Directive

The Large Combustion Plant Directive[152] sets emission requirements for Member States for nitrogen oxides, sulphur dioxide and particulates from all power stations with an installed capacity greater than 50 MW. Under the Directive power stations that do not meet the specified emission requirements must either retrofit appropriate pollution control equipment or close. Plants that 'opt out' of meeting the new requirements can operate for a maximum of 20,000 hours after January 2008 and, at the latest, must be shut down by 2015. The Directive is currently being reviewed as part of an overall package of measures to streamline industrial emissions legislation, see section 5.6.4.

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149 Directive 2001/81/EC of 23rd October 2001 on national emission ceilings for certain atmospheric pollutants http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2001:309:0022:0030:EN:PDF, amended from 2007 for inclusion of new Member States http://ec.europa.eu/environment/air/pdf/nec_eu_27.pdf

150 http://ec.europa.eu/environment/air/pollutants/rev_nec_dir.htm

151 http://ec.europa.eu/environment/archives/air/cafe/index.htm

152 Directive 2001/80/EC of the European Union Parliament and the Council on the limitation of emissions of certain pollutants into the air from large combustion plants http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2001:309:0001:0021:EN:PDF

5.5. Transport Sector

Table 5-6 Summary of policies and measures in the transport sector

Name of policy or measure[153]	Objective and/or activity affected	GHG affected	Type of instrument	Status	Implementing entity or entities	Estimate of mitigation impact, by gas (for a particular year, not cumulative, in Mt CO_2 equivalents)			
						2005	2010	2015	2020
Measures to promote renewable energy in transport									
Directive on promotion of biofuels (2003)	Indicative targets for liquid and gaseous biofuels in 2010	Mainly CO_2	Regulatory	Implemented	EC/ Member States		35-40[154]		
Fuel Quality Directive	Review of fuel quality criteria in order to lower their environmental impact	Mainly CO_2	Regulatory	First implemented 1998 – revisions adopted 2009	EC / Member States				62.5[155]

153 Second ECCP progress report April 2003, http://europa.eu.int/comm/environment/climat/pdf/second_eccp_report.pdf

154 Second ECCP progress report April 2003, http://europa.eu.int/comm/environment/climat/pdf/second_eccp_report.pdf

155 Estimate derived from "Questions and answers on the EU strategy to reduce CO_2 emissions from cars, MEMO/07/46." Cumulative estimate of 500 MtCO2eq by 2020. Assuming that the effect of policy starts in 2012, annual emissions saving estimate is calculated by dividing 2020 saving by 8 years.

Name of policy or measure[153]	Objective and/or activity affected	GHG affected	Type of instrument	Status	Implementing entity or entities	Estimate of mitigation impact, by gas (for a particular year, not cumulative, in Mt CO_2 equivalents)			
						2005	2010	2015	2020
(New) Renewable Energy Directive (transport measures)	Binding minimum target for renewable energy in transport in 2020	Mainly CO_2	Regulatory	Adopted	EC / Member States				600-900[156]
Other Measures									
Taxation of energy products and electricity	EU-wide rules for taxation of motor fuels	Mainly CO_2	Fiscal	Implemented	EC / Member States				
Infrastructure charging for heavy goods vehicles	Recover infrastructure costs with the possibility of integrating the external costs of road transport into toll prices	Mainly non-GHG emissions, indirectly CO_2	Fiscal	Implemented	EC / Member States				

156 Note this includes all the savings from the Directive and should not be double counted with e.g. those in section 5.4. Directive on the promotion of energy from renewable sources – Citizens' Summary http://ec.europa.eu/energy/climate_actions/doc/2008_res_citizens_summary_en.pdf

Name of policy or measure[153]	Objective and/or activity affected	GHG affected	Type of instrument	Status	Implementing entity or entities	Estimate of mitigation impact, by gas (for a particular year, not cumulative, in Mt CO_2 equivalents)			
						2005	2010	2015	2020
Voluntary agreements with European, Japanese and Korean car manufacturers	Reduce average CO_2 emissions of newly sold cars to 140 g/km until 2008/2009 (25% reduction compared to levels in the mid-90s)	CO_2	Voluntary agreement	Implemented	EC / manufacturers' associations		75-80[157]		
Strategy for car CO_2 (Regulation setting emission performance requirements for new passenger cars to reduce CO_2 emissions from light-duty vehicles.)	Reduction of emission thresholds, phasing-in requirements, long-term emission targets, eco-innovation and energy efficiency labelling	Mainly CO_2	Regulatory	Adopted	EC/Member States/ Automotive industry				50[158]

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

Name of policy or measure[153]	Objective and/or activity affected	GHG affected	Type of instrument	Status	Implementing entity or entities	Estimate of mitigation impact, by gas (for a particular year, not cumulative, in Mt CO_2 equivalents)			
						2005	2010	2015	2020
EURO 5&6 standards	Minimum standards for air quality pollutants from new cars	Indirect CO_2	Regulatory	Adopted	EC / Member States				
Tyre Labelling	Creating a labelling scheme for tyre parameters such as fuel efficiency and environmental performance	CO_2	Labelling	Adopted	EC / tyre industry				
Rolling Resistance Tyres	Enhancing the environmental performance of tyres by regulating the minimum requirements for tyre rolling	Mainly CO_2	Regulatory	Adopted	EC / tyre industry				

158 The original figure refers to a cumulative estimate of 400 MtCO_2eq by 2020. Assuming that the effect starts in 2012 when the decision is expected to enter into force, we calculated the annual saving by dividing the 2020 saving by 8 years

Name of policy or measure[153]	Objective and/or activity affected	GHG affected	Type of instrument	Status	Implementing entity or entities	Estimate of mitigation impact, by gas (for a particular year, not cumulative, in Mt CO_2 equivalents)			
						2005	2010	2015	2020
	resistance								
Thematic Strategy on Urban Environment	Guidance and measures related to achieving cleaner urban transport	Mainly CO_2	Guidance	Adopted	EC/ Member States				
Directive on the promotion of clean and energy efficient road transport vehicles	Market introduction of clean and energy efficient vehicles through public procurement process	CO_2	Regulatory	Adopted	EC/ Member States				1.9
Freight Logistics Action Plan	Improve efficiency and sustainability of	Mainly CO_2	Guidance and Regulatory	Adopted	EC/ Member States				

Name of policy or measure[153]	Objective and/or activity affected	GHG affected	Type of instrument	Status	Implementing entity or entities	Estimate of mitigation impact, by gas (for a particular year, not cumulative, in Mt CO_2 equivalents)			
						2005	2010	2015	2020
	freight transport								
Aviation EU ETS	Including the aviation sector in the EU ETS scheme	CO_2	Economic	Adopted	EC/ Member States/ Aviation Industry			122[159]	183[160]
Emissions from air conditioning systems in motor vehicles	Reduce emissions of fluorinated gases used in air conditioning systems	HFCs	Regulatory	Adopted	EC / Member States		23[161]		

159 Inclusion of Aviation in the EU Greenhouse Gas Emissions Trading Scheme (EU ETS), Summary of the Impact Assessment, SEC(2006) 1685

160 Inclusion of Aviation in the EU Greenhouse Gas Emissions Trading Scheme (EU ETS), Summary of the Impact Assessment, SEC(2006) 1685

161 The figure refers to the overall impact of the proposed Regulation on certain fluorinated gases COM (2003) 492 final. On the basis of this proposal, two separate legal instruments were adopted simultaneously in 2006: Directive 2006/40/EC relating to emissions from air-conditioning systems in motor vehicles and Regulation 842/2006 on certain fluorinated greenhouse gases, which covers all other applications addressed by the 2003 proposal.

5.5.1. *Measures to Promote Renewable Energy in Transport*

Biofuels Directive

The 2003 Directive on the use of renewable energy in transport[162] set indicative targets for biofuels and other renewable energy used in the transport sector. Member States were able to set their own targets, but indicative targets were set at a 2 % biofuel share by 2005 and 5.75 % by 2010. The EC also allows Member States to apply a total or partial tax exemption for biofuels, according to energy taxation Directive 2003/96/EC[163] and subject to state aid approval from the Commission. Further information is included in the 4th National Communication.

Based on an approximate (life cycle) CO_2 saving of 2 tCO_2/1000 litres of fuel, achievement of the indicative 2010 target is estimated to correspond to an annual CO_2 saving of 35-40 Mt CO_2eq, although the cost is relatively high at approximately €100/tonne saved[164].

The Commission's progress report COM(2009)192 [165] looks at progress made towards achieving the 2010 targets set by Directive 2003/30/EC and shows that in 2007 the use of biofuels in road transport was 2.6% (8.1 Mtoe).

Fuel Quality Directive

An amendment to Directive 98/70/EC, the Fuel Quality Directive[166], on environmental quality requirements for fuel further tightens these requirements for a number of fuel parameters.

The amended Directive introduces a binding target on (fossil) fuel suppliers to reduce life cycle GHG emissions from fuel supplied by 6 % by 2020 as first step, with additional indicative targets totalling 4 %, including 2 % to be achieved by the use of CDM credits for reductions in the fuel supply sector. To facilitate implementation of the target the amended Directive also introduces a mechanism for reporting the life cycle GHG emissions from fuels (including fossil fuel and renewable fuels), which includes crude oil production, refining, distribution and retail as well as fuel combustion.

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162 Directive 2003/30/EC of the European Parliament and of the Council of 8th May 2003 on the promotion of the use of biofuels or other renewable fuels for transport

163 Second ECCP progress report April 2003, http://europa.eu.int/comm/environment/climat/pdf/second_eccp_report.pdf

164 Proposal for a Regulation of the European Parliament and of the Council setting emission performance standards for new passenger cars as part of the Community's integrated approach to reduce CO_2 emissions from light-duty vehicles

165 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2009:0192:FIN:EN:PDF

166 Directive 2009/30/EC of the European Parliament and of the Council of 23rd April 2009 amending Directive 98/70/EC as regards the specification of petrol, diesel and gas-oil and introducing a mechanism to monitor and reduce greenhouse gas emissions and amending Council Directive 1999/32/EC as regards the specification of fuel used by inland waterway vessels and repealing Directive 93/12/EEC http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0088:0113:EN:PDF

In 2012, the Commission will review the potential need for adjustments to the indicative targets in order to assess further possible contributions for reaching a greenhouse gas reduction target up to 10 %.

As the scope of the Directive covers fuel production right through to combustion of the fuel, biofuels will play a key part in achievement of the targets. The Directive therefore incorporates the same sustainability criteria and minimum GHG savings requirements for biofuels as those introduced in the Renewable Energy Directive (see section 5.4.2).

To encourage and enable a more widespread use of ethanol in transport fuels, the Directive will phase in a 10 % blending limit for ethanol in petrol (E10), while continuing the production and supply of 5 % bioethanol (E5) on the market for older cars. For diesel, the maximum biodiesel blend will be increased from the current 5 % to 7 % (B7), with an option to increase that further in the future and allowing Member States to permit higher blends already.

It is estimated that the 1 % annual reduction in GHG emissions from transport fuels over their lifecycle required under the revised Directive will bring a cumulative saving by 2020 equivalent to around 500 million tonnes of CO_2[167].

Renewable Energy Directive

On 17th December 2008, the EC agreed upon the Energy and Climate Package, which includes a Directive on the promotion of renewable energies (see section 5.1.2). As part of the new Directive, a binding target is set for all Member States to achieve a minimum of 10 % renewable energy in land transport by 2020. The target is set on the basis of gross final energy consumption and can be met by biofuels (including hydrogen from renewable sources) as well as renewable electricity. Second-generation biofuels produced from waste, residues, non-food cellulosic material or ligno-cellulosic biomass will count double towards the 10 % target. Renewable electricity consumed in transport will count 2.5 times its input.

In addition, the Directive sets a number of sustainability criteria that must be met for biofuels and bioliquids to count towards the target, including minimum greenhouse gas savings from those biofuels and bioliquids (see section 5.1.2 for further detail).

5.5.2. *Taxation of Energy Products and Electricity*

Directive 2003/96/EC (see section 5.3.2) is particularly important in the transport sector since it provides for common rules for taxation of motor fuels in all modes of transport on the internal market (international maritime and aviation transport are exempt from taxation).

The ongoing revision of the Energy Taxation Directive which intends to give greater consideration to CO_2 emissions will contribute to the objectives of the EU strategy for the internalisation of external costs in transport[168].

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167 Directive 2003/30/EC of the European Parliament and of the Council of 8th May 2003 on the promotion of the use of biofuels or other renewable fuels for transport

168 COM(2008) 435

5.5.3. *Infrastructure Charging for Heavy Goods Vehicles (revised Eurovignette)*

The 2006 reviewed "Eurovignette" Directive[169] amended the 1999 Directive on the charging of heavy goods vehicles for the use of certain infrastructures with a view to establishing a new Community framework for charging for the use of road infrastructure. This makes it possible to improve the efficiency of the road transport system and ensure the proper functioning of the internal market. The Directive lays down rules for the application by Member States of tolls or user charges on roads of the trans-European network and roads in mountainous regions.

From 2012 onwards Directive 2006/38/EC will apply to vehicles weighing between 3.5 and 12 tonnes.

The Directive allows Member States to levy distance-based tolls to recover the cost of construction, maintenance and operation of infrastructure. Within this limit Member States are able to differentiate tolls according to a vehicle's emission category ("EURO" classification) and the level of damage it causes to roads, the place, the time and the amount of congestion. This is a first step to tackle the problems of traffic congestion, including damage to the environment, on the basis of the "user pays" and "polluter pays" principles.

In 2008, the Commission proposed a revision of the Directive (COM(2008) 436 final). The proposal would enable Member States to add an amount which reflects the cost of air pollution and noise pollution caused by traffic to the tolls levied on heavy goods vehicles. During peak periods, it would also allow a mark-up to be calculated on the basis of the cost of congestion imposed upon other vehicles. The amounts would vary with the distance travelled, location and time of use of roads to better reflect these external costs. The proceeds would have to be used by Member States for making transport more sustainable through projects such as research and development on cleaner and more energy efficient vehicles, mitigating the effects of road transport pollution or providing alternative infrastructure capacity for users.

5.5.4. *Strategy for Car CO_2*

The EC agreed that average CO_2 emissions from new passenger cars should not exceed 120 gCO_2 per km by 2012.

As part of the ECCP, the Commission in 2006 carried out a review of the voluntary strategy (see 4th NC for further details), concluding that, given the slower than expected progress to date, the 120 gCO_2/km target would not be met by 2012 without additional measures. For that reason in 2008 the European Parliament voted to adopt a Regulation[170] on CO_2 from cars based on a proposal by the Commission[171] (the Council adopted the Regulation on 6th April 2009).

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169 Directive 2006/38/EC of the European Parliament and of the Council of 17th May 2006 amending Directive 1999/62/EC on the charging of heavy goods vehicles for the use of certain infrastructures

170 Regulation (EC) No 443/2009 of the European Parliament and of the Council of 23rd April 2009 setting emission performance standards for new passenger cars as part of the Community's integrated approach to reduce CO_2 emissions from light-duty vehicles http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0001:0015:EN:PDF

Some key elements of the adopted regulations are as follows:

- Limit value curve: the average emissions from the EU fleet to be achieved by all cars registered in the EU is 130 g/km. A so-called limit value curve sets a guide for higher emissions being allowed from heavier cars rather than lighter cars while preserving the overall fleet average.

- Phasing-in of requirements: in 2012, 65 % of each EU manufacturer's newly registered cars must comply on average with the limit value curve set by the legislation. This will rise to 75 % in 2013, 80 % in 2014, and 100 % from 2015 onwards.

- Excess emissions premium: If the average CO_2 emissions of a manufacturer's fleet exceed its limit value in any year from 2012, the manufacturer has to pay an excess emissions premium of €95 for each car registered. Money raised from the scheme will go into EC funds. Lower penalty payments apply for small excess emissions (until 3g CO_2/km) until 2018.

- Long-term target: a target of 95g/km is specified for the year 2020. The modalities for reaching this target and the aspects of its implementation including the excess emissions premium will be defined in a review to be completed no later than the beginning of 2013.

- Eco-innovations: manufacturers can be granted a maximum of 7g/km of emission credits on average for their fleet if they equip vehicles with innovative technologies, based on independently verified data.

Compared to today's situation, reaching the EC target of average CO_2 emissions from new cars of 120 gCO_2/km by 2012 will deliver 10 % of the reduction effort that is still needed to meet the EC's Kyoto Protocol commitment.

Taking a longer-term perspective, with the gradual renewal of the EU car fleet the Commission calculates that the *cumulative* CO_2 savings by 2020 of reaching the 120 gCO_2/km target in 2012 will be over 400 million tonnes[172].

With regards to car labelling, the Commission will adopt amendments to improve the fuel efficiency labelling Directive 1999/94/EC[173]. The objective is to ensure that information related to the fuel economy and CO_2 emissions of new passenger cars is made available to enable the consumer to make an informed choice. This will be achieved by extending the scope of the labelling scheme, harmonising the design of the label and introducing energy efficiency classes.

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171 Questions and answers on the EU strategy to reduce CO_2 emissions from cars, MEMO/07/46

172 Directive 1999/94/EC of the European Parliament and the Council relating to the availability of consumer information on fuel economy and CO_2 emissions in respect of the marketing of new passenger cars http://ec.europa.eu/environment/air/transport/co2/9994/en.pdf

173 Regulation (EC) No 715/2007 of the European Parliament and of the Council of 20th June 2007 on type approval of motor vehicles with respect to emissions from light passenger and commercial vehicles (Euro 5 and Euro 6) and on access to vehicle repair and maintenance information.

5.5.5.*EURO 5 and 6 Standards*

To limit pollution caused by road vehicles, this Regulation introduces new common minimum requirements for air quality emissions from motor vehicles and their replacement parts (Euro 5 and Euro 6 standards). Air quality emissions limits are set separately for petrol and diesel vehicles.

With regard to the EURO 6 standard, all vehicles equipped with a diesel engine will be required to substantially reduce their emissions of nitrogen oxides as soon as the Euro 6 standard enters into force. For example, NOx emissions from transport vehicles will be capped at 80 mg/km (an additional reduction of more than 50 % compared to the Euro 5 standard). Combined emissions of hydrocarbons and nitrogen oxides from diesel vehicles will also be reduced. These will be capped at, for example, 170 mg/km for cars and other vehicles intended to be used for transport.

Some air pollutant abatement technologies (such as Lean NOx Trap catalysts) could have a negative impact on fuel efficiency and CO_2 emissions, however, others (such as SCR catalysts) and overall improvements in energy design could improve fuel efficiency. It is broadly expected that the impact of the EURO 6 standards will not lead to a change in fuel efficiency[174].

5.5.6.*Emissions from Air Conditioning Systems in Motor Vehicles*

The Directive 2006/40/EC[175] aims to reduce the emissions of fluorinated greenhouse gases used in air conditioning systems in motor vehicles by introducing maximum permissible leak rates for air conditioning systems containing fluorinated greenhouse gases (e.g. HFC-134a), by 2008 and 2009, in new types of vehicles and all new vehicles respectively and eventually by introducing:

- As of 2011: A ban on F-gases with a global warming potential of more than 150 for new car model types designed by automakers. This effectively rules out the use of HFC-134a but would allow less potent HFCs, including HFC-152a, which has a global warming potential of 124 as well as non-HFC refrigerants such as R-744 (carbon dioxide).

- As of 2017: A ban on F-gases with global warming potential of more than 150 for all new cars coming out of factories.

5.5.7.*Tyre Labelling and Minimum Rolling Resistance*

A proposal regarding the energy labelling of tyres[176] was announced in 2008 as part of both the Energy Efficiency Action Plan and the Communication on Greening Transport. The objective is to influence energy demand by promoting the market transformation towards fuel-efficient tyres, also known as low rolling resistance tyres (LRRT).

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174 Commission Staff Working Document - Impact Assessment for Euro 6 emission limits for light duty vehicles http://ec.europa.eu/enterprise/automotive/pagesbackground/pollutant_emission/impact_assessment_euro6.pdf

175 Directive 2006/40/EC of the European Parliament and of the Council of 17th May 2006 relating to emissions from air conditioning systems in motor vehicles

176 Proposal for a Directive of the European Parliament and Council on labelling of tyres with respect to fuel efficiency and other essential parameters, November 2008

The labelling will complement the type approval legislation on tyres that addresses the supply side by means of minimum requirements for tyre manufacturers. The minimum requirements governing tyre performance factors such as rolling resistance, wet grip and external rolling noise are scheduled to take effect by October 2012 and fall under "a Proposed Regulation Concerning Type-Approval Requirements For The General Safety Of Motor Vehicles" [177].

The impact of these regulations could be substantial. Figures from the Impact Assessment identified a savings potential of between 0.56 and 1.51 Mtoe per year depending on the market uptake. For the minimum rolling resistance requirement, a study by TNO estimates that use of LRRT could reduce fuel consumption by 3 % for a given vehicle and thus save on average 0.09 tCO_2/yr and vehicle.

5.5.8. *Thematic Strategy on the Urban Environment*

The EC sets out cooperation measures and guidelines to enable Member States and their local authorities to improve urban environmental management. This strategy is to improve the quality of the urban environment by making cities more attractive and healthier places in which to live, work and invest, and by reducing their adverse environmental impact.

The main measure with regards to transport is the publication of guidelines for sustainable urban transport plans, one of the impacts of which will be to reduce CO_2 emissions from transport. Effective transport planning should embrace both passengers and goods and promote safe and efficient use of less polluting, high-quality modes.

Following the Commission's commitment to the Thematic Strategy on the Urban Environment, a preparatory document on Sustainable Urban Transport Plans[178] was published in 2007. Sustainable Urban Transport Plans comprise a combination of urban mobility management measures and should cover all modes and forms of transport in a relevant geographical area. It addresses vehicle movements and parking, public and private transport, passenger and freight movements and motorised and non-motorised modes.

On 17th December 2008, the EC agreed upon the Energy and Climate Package, which includes a Directive on the promotion of renewable energies (see section 5.1.2). As part of the new Directive, a binding target is set for all Member States to achieve a minimum of 10% renewable energy in land transport by 2020. The target is set on the basis of gross final energy consumption and can be met by biofuels (including hydrogen from renewable sources) as well as renewable electricity. Second-generation biofuels produced from waste, residues, non-food cellulosic material or ligno-cellulosic biomass will count double towards the 10 % target. Renewable electricity consumed in transport will count 2.5 times its input.

In addition, the Directive sets a number of sustainability criteria that must be met for biofuels and bioliquids to count towards the target, including minimum greenhouse gas savings from those biofuels and bioliquids (see section 5.1.2 for further detail).

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177 Proposal for a Regulation of the European Parliament and of the Council concerning type-approval requirements for the general safety of motor vehicles, May 2008

178 Preparatory document on Sustainable Urban Transport Plans http://ec.europa.eu/environment/urban/pdf/transport/2007_sutp_prepdoc.pdf

5.5.9. *Taxation of Energy Products and Electricity*

Directive 2003/96/EC (see section 5.3.2) is particularly important in the transport sector since it provides for common rules for taxation of motor fuels in all modes of transport on the internal market (international maritime and aviation transport are exempt from taxation).

The ongoing revision of the Energy Taxation Directive which intends to give greater consideration to CO_2 emissions will contribute to the objectives of the EU strategy for the internalisation of external costs in transport[179].

5.5.10. *Infrastructure charging for heavy goods vehicles (revised Eurovignette)*

The 2006 reviewed "Eurovignette" Directive[180] amended the 1999 Directive on the charging of heavy goods vehicles for the use of certain infrastructures with a view to establishing a new Community framework for charging for the use of road infrastructure. This makes it possible to improve the efficiency of the road transport system and ensure the proper functioning of the internal market. The Directive lays down rules for the application by Member States of tolls or user charges on roads of the trans-European network and roads in mountainous regions.

From 2012 onwards Directive 2006/38/EC will apply to vehicles weighing between 3.5 and 12 tonnes.

The Directive allows Member States to levy distance-based tolls to recover the cost of construction, maintenance and operation of infrastructure. Within this limit Member States are able to differentiate tolls according to a vehicle's emission category ("EURO" classification) and the level of damage it causes to roads, the place, the time and the amount of congestion. This is a first step to tackle the problems of traffic congestion, including damage to the environment, on the basis of the "user pays" and "polluter pays" principles.

In 2008, the Commission proposed a revision of the Directive (COM(2008) 436 final). The proposal would enable Member States to add an amount which reflects the cost of air pollution and noise pollution caused by traffic to the tolls levied on heavy goods vehicles. During peak periods, it would also allow a mark-up to be calculated on the basis of the cost of congestion imposed upon other vehicles. The amounts would vary with the distance travelled, location and time of use of roads to better reflect these external costs. The proceeds would have to be used by Member States for making transport more sustainable through projects such as research and development on cleaner and more energy efficient vehicles, mitigating the effects of road transport pollution or providing alternative infrastructure capacity for users.

5.5.11. *Public Procurement of Vehicles*

On 21st December 2005 the Commission made a proposal for a Directive on the promotion of clean vehicles through public procurement (COM(2005) 634) to reduce

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179 COM(2008) 435.

180 Directive 2006/38/EC of the European Parliament and of the Council of 17th May 2006 amending Directive 1999/62/EC on the charging of heavy goods vehicles for the use of certain infrastructures

CO_2 emissions from the vehicles covered by public procurement by 29% by 2017, giving a total of 1.9 Mt CO_2 avoided annually[181].

The Council and the European Parliament, in First Reading, supported the objectives, but proposed a broader approach. In that context additional legislative measures on the reduction of CO_2 emissions from cars were announced by the Commission in its Communication on the new Community strategy in this field (COM(2007) 19).

The Directive was proposed in 2007 and subsequently adopted and published on 15th May 2009[182]. Member States shall implement it by 4th December 2010. The Directive extends to all purchases of road transport vehicles, as covered by the public procurement Directives and the public service Regulation.

The Directive requires that purchase decisions take into account energy and environmental impacts linked to the operation of vehicles over their whole lifetime. These lifetime impacts of vehicles shall include at least energy consumption, CO_2 emissions and emissions of the regulated pollutants of NO_x, NMHC and particulate matter. Purchasers may also consider other environmental impacts.

This internalisation of external costs into new vehicle procurements will improve the contribution of the transport sector to the environment, climate and energy policies of the Community by reducing energy consumption, CO_2 emissions and pollutant emissions.

This Directive is expected to result, in the longer term, in a wider deployment of clean and energy efficient vehicles. Increased sales will help reduce costs through economies of scale, resulting in progressive improvement in the energy and environmental performance of the whole vehicle fleet.

5.5.12. *Freight Logistics Action Plan*[183]

In 2006, the European Commission presented a Communication[184] on promoting sustainable mobility through advanced freight transport. In 2007, it adopted a package of measures[185] on logistics, including a Freight Transport Logistics Action Plan[186] and separate proposals for improving the competitiveness of rail freight and boosting maritime and short sea shipping.

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181 Directive on the promotion of clean and energy efficient road transport vehicles, 2005/0283 (COD)

182 Directive 2009/33/EC of 23rd April 2009. Official Journal L120, 15.05.2009, p.5-12

183 Freight Transport Logistics in Europe – the key to sustainable mobility, COM(2006)336 final http://ec.europa.eu/transport/logistics/documentation/highlights/doc/2006_06_28/2006_06_28_communication_en.pdf

184 Communication from the Commission - The EU's freight transport agenda: Boosting the efficiency, integration and sustainability of freight transport in Europe, COM(2007)0606 final

185 Action Plan to keep freight moving http://ec.europa.eu/transport/logistics/freight_logistics_action_plan/doc/memo/memo_logistics_freight_en.pdf

186 All figures refer to EU-15 except from the “Aviation EU ETS” that is for EU-27

The present Freight Logistics Action Plan is one of a series of policy initiatives jointly launched by the European Commission to improve the efficiency and sustainability of freight transport in Europe. It presents a number of short- to medium-term actions that will help Europe address its current and future challenges and ensure a competitive and sustainable freight transport system in Europe.

The Logistics Action Plan places a key focus on measures to facilitate the use of several transport modes in one trip, so-called co-modality, notably by improving connections between the different modes, investing in modern trans-shipment hubs, establishing common European standards on loading units and creating a single transport document for all carriage of goods, irrespective of the mode.

5.5.13. *Inclusion of Aviation in EU Emissions Trading Scheme*

In December 2006 the European Commission adopted a proposal for a Directive to amend the EU ETS Directive 2003/87/EC[187] to include aviation activities in the EU emissions trading scheme. This proposed Directive was formally adopted in November 2008, referred to as Directive 2008/101/EC[188].

The Directive aims to incorporate aviation activities in the EU ETS. The scheme will cover flights between EU airports and all flights arriving at or departing from airports in the Community from 1st January 2012. Aircraft operators will be responsible for complying with the scheme requirements. It is also proposed that the allowance allocation method be harmonised across the EU and that each aircraft operator, including operators from third countries, be administered by one Member State only. For more details on the EU ETS mechanism, refer to Section 5.1.2.

5.5.14. *Steps to Implement Decisions of Relevant International Organisations*

International Civil Aviation Organisation (ICAO)

In September 2005, the European Commission appointed its Representative to ICAO. The main role of the Representative is to:

- follow the work of ICAO;
- increase awareness at ICAO of relevant Community policies and to increase awareness at the Community of relevant developments in ICAO, with a view to promoting a consistent development of activities in the two organisations;
- foster the influence and effectiveness of the Community in the policies of ICAO;
- strengthen the cooperation between EU Member States in ICAO;
- support the Presidency to develop common EC positions.

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187 Directive 2003/87/EC of the European Parliament and of the Council of 13th October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community

188 Directive 2008/101/EC of the European Parliament and of the Council of 19th November 2008 amending Directive 2003/87/EC so as to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community

International Maritime Organisation (IMO)

The EU maintains a continuous dialogue with all the EC shipping and trading partners in the world through the participation of its Member States and the Commission in the IMO. The EU has no status so far in this international organisation, while the Commission has an observer status.

The Commission has a permanent representative to IMO, who follows closely the work of the IMO and takes appropriate initiatives to implement in EU law the instruments/rules agreed at IMO. The presence of the Commission at IMO also increases the awareness of relevant Community policies, ensuring consistencies in the development of activities and measures.

The Commission also plays a key role in the coordination of Member States' positions prior to IMO meetings in Community Competence or Community interests related to maritime safety, maritime security and prevention of pollution caused by shipping. Such ongoing coordination often results in joint EU (MS and Commission) submissions to IMO, confirming the important contribution by the EU in the initiation and development of high international rules and standards.

5.6. Industry Sector

Table 5-7 Summary of policies and measures in the industry sector

Name of policy or measure[189]	Objective and/or activity affected	GHG affected	Type of instrument	Status	Implementing entity or entities	Estimate of mitigation impact, by gas (for a particular year, not cumulative, in Mt CO_2 equivalents)			
						2005	2010	2015	2020
Regulation on certain Fluorinated gases	Improve monitoring and verification, improve containment and apply marketing and use restrictions	HFCs, PFCs, SF_6	Regulatory	Adopted	EC / Member States		23[190]		
IPPC	Integration of pollution issues into permits for plant operation based on BAT	All gases	Regulatory	Adopted	EC / Member States		60-70[191]		

189 All figures on the table are for EU-15

190 The figure refers to the overall impact of the proposed Regulation on certain fluorinated gases COM (2003) 492 final. On the basis of this proposal, two separate legal instruments were adopted simultaneously in 2006: Directive 2006/40/EC relating to emissions from air-conditioning systems in motor vehicles and Regulation 842/2006 on certain fluorinated greenhouse gases, which covers all other applications addressed by the 2003 proposal.

191 The figure refers to Directive 96/61/EC of 24th September 1996 based on a study performed for DG Environment on 'Energy Management and Optimisation in Industry' - Second ECCP progress report April 2003, http://europa.eu.int/comm/environment/climat/pdf/second_eccp_report.pdf

Name of policy or measure[189]	Objective and/or activity affected	GHG affected	Type of instrument	Status	Implementing entity or entities	Estimate of mitigation impact, by gas (for a particular year, not cumulative, in Mt CO_2 equivalents)			
						2005	2010	2015	2020
Proposal for a Directive on industrial emissions	Proposal to combine and streamline existing legislation impacting industrial emissions	All gases	Regulatory	Planned	EC / Member States				

5.6.1.*EU Emissions Trading Scheme*

All combustion installations with capacity greater than 20 MWth are included in the EU ETS, as well as specifically named sectors including: oil refineries, coke ovens, iron and steel plants, and factories making cement, glass, lime, brick, ceramics, and pulp and paper.

Details of the scheme, including the design for the future, can be found in section 5.1.2 – Overall Policy Context.

5.6.2.*Fluorinated Gases*

In 2003, the Commission adopted a proposal[192] for a Regulation on fluorinated greenhouse gases (HFCs, PFCs, and SF_6) covering all main applications aiming at reducing emissions by 23 $MtCO_2eq$ by 2010 (see 4th National Communication for further details).

The containment measures in the 2003 proposal were estimated to have an average cost of around €18 per tonne CO_2eq reduced. The marketing and use restrictions have an average cost less than €1 per tonne CO_2eq[193].

On the basis of the 2003 proposal, in 2006 two separate legal instruments were adopted simultaneously: Directive 2006/40/EC relating to emissions from air-conditioning systems in motor vehicles (see section 5.5.6 for further detail) and Regulation 842/2006 on certain fluorinated greenhouse gases, which covers all other main applications. EC Regulation 842/2006 was adopted in July 2006 and most measures apply in Member States from July 2007.

Under Directive 2006/40/EC measures on car air conditioning systems equivalent to the measures foreseen in the original proposal are incorporated into the type approval system. Regulation 842/2006 aims to reduce emissions of fluorinated greenhouse gases (mainly) in stationary applications through application-specific requirements covering all stages of the life cycle of F-Gases.

5.6.3.*Integrated Pollution Prevention and Control (IPPC)*

In 1996 the EC set common rules for permitting and controlling industrial installations in the Integrated Pollution Prevention and Control (IPPC) Directive[194]. In 2008 the Directive was codified[195].

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192 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2003:0492:FIN:EN:PDF

193 Regulation proposal on certain fluorinated greenhouse gases - COM (2003) 492 final

194 Council Directive 96/61/EC of 24th September 1996 concerning integrated pollution prevention and control

195 Directive 2008/1/EC of the European Parliament and of the Council of 15th January 2008 concerning integrated pollution prevention and control (Codified version) http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32008L0001:EN:NOT

In essence, the IPPC Directive aims to minimise pollution from industrial sources throughout the EU, and has a potential impact on emissions of all GHG, depending on the industrial sector. Operators of industrial installations covered by Annex I of the IPPC Directive are required to obtain an environmental permit from Member State authorities based on best available techniques (BAT). About 52,000 installations are covered by the IPPC Directive across the EU.

New installations, and existing installations subject to "substantial changes", have been required to meet the requirements of the IPPC Directive since 30th October 1999. Other existing installations had to be brought into compliance by 30th October 2007. This was the key deadline for the full implementation of the Directive.

A number of plants are covered by both EU ETS and IPPC legislation. Where this occurs the GHG emissions from the plant are effectively included within the EU ETS and as such ETS installations are not directly subject to the same energy efficiency requirements when obtaining an IPPC permit, however all non-GHG emissions requirements (such as VOCs limits) must be complied with.

5.6.4. *Activity to Streamline Industrial Emissions Legislation*

In December 2007 the Commission proposed a package (a communication[196] and proposed directive[197]) to streamline and improve existing EC policy on industrial emissions[198]. The Proposal for a Directive on industrial emissions would recast seven existing Directives related to industrial emissions into a single clear and coherent legislative instrument.

The recast includes directives relevant to greenhouse gas emissions such as the IPPC Directive (see section 5.6.3), the Large Combustion Plants Directive, and the Waste Incineration Directive (see section 5.9.9) as well as others on solvents emissions and titanium dioxide.

The Commission's proposal will lead to significant benefits to the environment and human health by reducing harmful industrial emissions across the EU, in particular through better application of BAT. For large combustion plants alone the proposed Directive is estimated to achieve net benefits of €7-28 billion per year, including the reduction of premature deaths and years of life lost by 13,000 and 125,000 respectively.

The streamlining of permitting, reporting and monitoring requirements as well as a renewed cooperation with Member States to simplify implementation will lead to a reduction in unnecessary administrative burden estimated between €105 and €255 million per year.

196 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52007DC0843:EN:NOT

197 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52007PC0844:EN:NOT

198 http://ec.europa.eu/environment/air/pollutants/stationary/ippc/proposal.htm

5.7. Agriculture Sector

Table 5-8 Summary of policies and measures in the agriculture sector[199]

Name of policy or measure	Objective and/or activity affected	GHG affected	Type of instrument	Status	Implementing entity or entities	Estimate of mitigation impact, by gas (for a particular year, not cumulative, in Mt CO_2 equivalents)			
						2005	2010	2015	2020
CAP Health Check > Rural development policies > Market Policies	Sustainable agriculture	CO_2, CH_4, N_2O	Regulatory	Adopted	EC/ Member States		60-70[200] 12[201]		
Rural development policy	Measures along 3 main thematic axis	CO_2, CH_4,	Variety of measures	Implemented	EC/ Member States				

199 Figures in the Table refer to EU-15

200 Potential of up to 60-70 from agricultural sinks. From ECCP working group on agriculture and sub-group on carbon sinks related to agricultural soils. Some of potential for bioenergy crops will covered within potential from biofuels, cogeneration from biomass, further promotion of RES-H etc.

201 Potential of 200-600 from bioenergy crops beyond 2010

Name of policy or measure	Objective and/or activity affected	GHG affected	Type of instrument	Status	Implementing entity or entities	Estimate of mitigation impact, by gas (for a particular year, not cumulative, in Mt CO_2 equivalents)			
						2005	2010	2015	2020
		N_2O							
Soil Directive	Soil protection	CO_2, CH_4, N_2O	Regulatory	Proposal adopted by EC and being negotiated through the EU Institutions	EC/ Member States				
Nitrates Directive	Reduced Water pollution and reduced emissions from land by reducing fertilizer use	N_2O	Regulatory	Implemented	EC/ Member States		10[202]		

[202] The first ECCP quantified the potential savings from N_2O emission from soils in the EU-15 at 10 $MtCO_2eq$, by 2010 http://www.eea.europa.eu/publications/eea_report_2008_5/TPReport2008Annexes.pdf

5.7.1.*CAP Health Check*

In November 2007, the Commission announced its intention to streamline and further modernise the EC's Common Agricultural Policy (CAP)[203]. The so-called CAP Health Check builds on the approach, which began with reforms in 2003 (see EC 4th National Communication), to improve the way the policy operates based on experience gathered since 2003.

In May 2008, the European Commission proposed to further modernise, simplify and streamline the CAP and remove certain restrictions on farmers to help them respond to a growing demand for food. The CAP Health Check has further broken the link between direct payments and production and thus allows farmers to follow market signals to the greatest possible extent.

The CAP Health Check[204] targets modifications of three main areas of the CAP:

- Direct aid system
- Market instruments
- Rural development policy

The agricultural sector faces challenges today that were not as pronounced in 2003. These challenges include the increased need for management of production risks, fighting climate change, more efficient management of water, making the most of the opportunities offered by bio-energy and the preservation of biodiversity. Adjusting the CAP to meet these challenges would be costly and hence the Commission is looking at ways of exploiting these opportunities through the Rural Development Policy (see section 5.7.2).

Two key changes to the CAP of particular relevance to the cultivation of crops for bio-energy, and thereby to GHG emissions, are the abolishment of direct payments for energy crop production and the abolishment of set-aside land from 2007. The abolishment of the direct premium paid for the cultivation of energy crops may have a negative impact on bioenergy, while the removal of set-aside brings some land back into cultivation, giving a potentially larger area of land available for energy crop cultivation. However, the removal of the set-aside obligation may also increase CO_2 emissions from soils.

In January 2009, the Council approved Regulation[205] 74/2009 introducing a number of amendments to a previous Regulation concerning the support for rural development

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203 Communication from the Commission: "Preparing for the 'Health Check' of the CAP reform", COM(2007)722 final

204 Commission Proposal on: establishing common rules for direct support schemes for farmers under the common agricultural policy and establishing certain support schemes for farmers, amending Decision 2006/144/EC on the Community strategic guidelines for rural development (programming period 2007 to 2013), amending Regulation (EC) No 1698/2005 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD), on modifications to the common agricultural policy by amending Regulations (EC) No 320/2006, (EC) No 1234/2007, (EC) No 3/2008 and (EC) No […]/2008 http://ec.europa.eu/agriculture/healthcheck/prop_en.pdf

by the European Agricultural Fund for Rural Development. This new Regulation includes an indicative list of measures and operations, as well as their potential effect, related to the latest priorities expressed by the CAP Health Check.

5.7.2.*Rural Development Policy*

The most important rules governing rural development policy for the period 2007 to 2013, as well as the policy measures available to Member States and regions, are set out in Council Regulation (EC) No. 1698/2005[206], last amended by Council Regulation (EC) N° 79/2009.

Under this Regulation, Rural Development Policy for 2007 to 2013 is focused on three thematic axes (see Appendix C – C1 for further details for further details).

Rural development policy measures impact GHG emissions via a number of means, for example: measures to promote renewable energy and energy efficiency in the agriculture sector reduce CO_2 emissions; manure management measures to reduce methane emissions; and practices to reduce fertilizer use have a significant impact on N_2O emissions.

As before 2007, every Member State (or region, in cases where powers are delegated to the regional level) must set out a rural development programme, which specifies how funding will be spent in the period 2007 to 2013. Member States and regions are obliged to spread their rural development funding between all three thematic axes.

Measures that the Commission had in place for the protection of forests against fires are now part of the Rural Development Policy. Forestry measures with respect to protection and rehabilitation are part of Axis 2. Of particular importance for the objective of combating forest dieback is the support for restoring forestry potential in forests damaged by natural disasters and fire, and for introducing preventive actions to maintain the environmental and economical role of these forests.

5.7.3.*Soil Directive*

The Kyoto Protocol highlights that soil is a major carbon store which must be protected and increased where possible. Carbon sequestration in agricultural soils by some land management practices can contribute to mitigating climate change. The ECCP Working Group on Sinks Related to Agricultural Soils estimated this potential at equivalent to 1.5 to 1.7 % of the EC's anthropogenic CO_2 emissions during the first Kyoto commitment period[207].

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205 Council Regulation 74/2009 amending Regulation (EC) 1698/2005 on support for rural development by the European Agricultural Fund for Rural Development http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:030:0100:0111:EN:PDF

206 Council Regulation (EC) No 1698/2005 of 20th September 2005 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD)

207 COM(2006)231 - Soil Thematic Strategy http://ec.europa.eu/environment/soil/pdf/com_2006_0231_en.pdf

The Commission adopted a Soil Thematic Strategy[208] in 2006 to ensure the appropriate level of protection for soils in Europe and capture the full potential of soil as a major carbon store. This consists of a Communication[209], a proposal for a Soil Framework Directive[210] and an Impact Assessment[211].

The proposed Directive introduces a number of common principles and measures for soil protection. These include, for example:

- The establishment of a common framework to protect soil on the basis of the principles of preservation of soil functions, prevention of soil degradation, mitigation of its effects, restoration of degraded soils and integration in other sectoral policies; and

- Identification of areas at risk of erosion, organic matter decline, salinisation, compaction and landslides, and establishment of national programmes of measures. The extent of the areas at risk of these threats needs to be identified.

The benefits of the full implementation of the Directive are in avoiding the costs of soil degradation. The Commission estimates these benefits to amount to €38 billion annually (for the EU-25 – estimate is not available for the EU-27)[212].

5.7.4. *Nitrates Directive*

The Nitrates Directive[213] was adopted in 1991, to reduce water pollution by nitrates from agricultural sources.

Whilst the Nitrates Directive was not specifically designed as greenhouse gas mitigation policy, by reducing the application of nitrogen fertilisers to land, it acts to reduce emissions of N_2O from soils.

208 Thematic Strategy on Soil http://ec.europa.eu/environment/soil/three_en.htm

209 COM(2006)231 - Soil Thematic Strategy http://ec.europa.eu/environment/soil/pdf/com_2006_0231_en.pdf

210 Directive COM(2006) 232 – Directive of the European Parliament and of the Council establishing a framework for the protection of soil and amending Directive 2004/35/EC http://ec.europa.eu/environment/soil/pdf/com_2006_0232_en.pdf

211 SEC(2006) 620 http://ec.europa.eu/environment/soil/pdf/sec_2006_620_en.pdf

212 Thematic Strategy for Soil Protection, Impact assessment, SEC(2006)1165

213 Council Directive (91/676/EEC) concerning the protection of waters against the pollution caused by nitrates from agricultural sources

5.8. Forestry Sector

Table 5-9 Summary of policies and measures in the forestry sector

Name of policy or measure	Objective and/or activity affected	GHG affected	Type of instrument	Status	Implementing entity or entities	Estimate of mitigation impact, by gas (for a particular year, not cumulative, in Mt CO_2 equivalents)			
						2005	2010	2015	2020
Forest Action Plan	Promoting Sustainable and Multi-functional Forestry	Mainly CO_2	Variety of measures	Adopted	EC/ Member States				
Afforestation and reforestation	Support through rural development	Mainly CO_2	Variety of measures	Implemented	EC/ Member States		14[214]		
Forest management	Support through rural development	Mainly CO_2	Variety of measures	Implemented	EC/ Member States		19[214]		

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

5.8.1.*EC Forest Action Plan*

The Forest Action Plan[215] presented in June 2006 builds on the EC's Forestry Strategy[216] adopted in 1998. Although forestry policies are a competence of the Member States, the 1998 Strategy identified the need for a common approach based on the principles of sustainable forest management and underlining the multifunctional role of forests.

In March 2005, the Commission evaluated the implementation of the Forestry Strategy and saw a need for more EC action to enhance the competitiveness of the strong European forestry sector, but taking into consideration the need to balance the economic viability with environmental and social considerations. The new Forest Action Plan develops a common vision of forestry and of the contribution which forests and forestry make to modern society: "Forests for society: long-term multifunctional forestry fulfilling present and future societal needs and supporting forest-related livelihoods".

The Forest Action Plan has a time span of five years (2007-2011) and in accordance with the above vision, formulates the following four main objectives:

- improving long-term competitiveness;
- improving and protecting the environment;
- contributing to the quality of life;
- fostering coordination and communication.

The Action Plan defines a framework of eighteen key actions to protect and promote forestry to be implemented the EC and Member State levels. Actions which specifically act to reduce CO_2 include:

- Facilitating EC compliance with the obligations on climate change mitigation of the UNFCCC and its Kyoto Protocol and encourage adaptation to the effects of climate change; and
- Promotion of forest biomass for energy generation.

5.8.2.*Rural Development Policy*

A number of aspects of the EC Rural Development Policy relate to the forestry sector, in particular measures towards afforestation and forest management (see section 5.7.2 for further detail).

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215 Communication from the Commission to the Council and the European Parliament on an EU Forest Action Plan, COM(2006)302 final http://ec.europa.eu/agriculture/fore/action_plan/com_en.pdf

216 Council Resolution on a forestry strategy for the European Union, 1999/C56/01 http://eur-lex.europa.eu/pri/en/oj/dat/1999/c_056/c_05619990226en00010004.pdf

5.8.3.*Tropical Deforestation Measures*

Activities that the EC is involved in which aim to tackle deforestation outside the EU, and as such impact emissions from third countries, are detailed in section 5.2.5 Minimisation of adverse impacts.

5.9. Waste Sector

Table 5-10 Summary of policies and measures in the waste sector

Name of policy or measure[217]	Objective and/or activity affected	GHG affected	Type of instrument	Status	Implementing entity or entities	Estimate of mitigation impact, by gas (for a particular year, not cumulative, in Mt CO_2 equivalents)			
						2005	2010	2015	2020
Landfill Directive	Amount of waste to landfills as well as methane gas recovery/flaring	CH_4	Regulatory	Implemented	EC / Member States		41[218]		
Waste Framework Directive	Thematic Strategy on the prevention and recycling of waste	CO_2 CH_4	Regulatory	Implemented	EC / Member States				
Directive on management of waste from extractive industries	Reduction of mining waste, appropriate disposal of waste and encouraged	CO_2 CH_4	Regulatory	Implemented	EC / Member States				

[217] Figures on the table refer to EU-15

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

Name of policy or measure[217]	Objective and/or activity affected	GHG affected	Type of instrument	Status	Implementing entity or entities	Estimate of mitigation impact, by gas (for a particular year, not cumulative, in Mt CO_2 equivalents)			
						2005	2010	2015	2020
	recycling								
Revised Directive on Waste Packaging	Waste packaging recovery targets	CO_2 CH_4	Regulatory	Implemented	EC / Member States		3[219]		
Directive on End-of-Life vehicles	Targets for recycling, reuse, recovery of vehicles and their components	CO_2 CH_4 Fluorinated gases	Regulatory	Implemented	EC / Member States				
Directive on waste electrical and electronic equipment (WEEE)	Reuse, recycle and recovery of waste electrical and electronic goods	CO_2 CH_4 Fluorinated gases	Regulatory	Implemented 2002 - Amendments adopted 2008	EC / Member States and Producers		35[220]		

219 Estimate from internal of review of waste packaging recycling by DG Environment 2005.

220 Value in 2011 - Directive on waste electrical and electronic equipment (WEEE), (recast) Impact Assessment, {COM(2008) 810}, {SEC(2008) 2933}

Name of policy or measure[217]	Objective and/or activity affected	GHG affected	Type of instrument	Status	Implementing entity or entities	Estimate of mitigation impact, by gas (for a particular year, not cumulative, in Mt CO_2 equivalents)			
						2005	2010	2015	2020
Green Paper on Biowaste	Proposal with regards to bio-waste management issues	CO_2 CH_4	Regulatory (consultative)	Adopted	EC				
Directives on Batteries	Battery recycling and disposal targets, as well as limitations on certain heavy metals	Indirect CO_2	Regulatory	Adopted	EC / Member States				
Directive on incineration of Waste	Reduce negative impacts of incineration and co-incineration of waste	Indirect CO_2 CH_4	Regulatory	Adopted	EC / Member States				

5.9.1. *Landfill Directive*

The Landfill Directive[221] entered into force in 1999 and required Member State implementation by 2001.

Provisions of the Directive include methane emissions control, in the form of energy production or flaring. No significant changes have been made to the Directive since the 4th National Communication, however in 2007 DG Environment published a study[222] on the implementation of the Landfill Directive.

It is estimated that the Landfill Directive and national initiatives will reduce the emissions from landfill to approximately 65 $MtCO_2eq$ by 2010 and to 28 $MtCO_2eq$ by 2020[223] in the EU-15.

5.9.2. *Waste Framework Directive*

In 2005, the Commission proposed a new strategy on the prevention and recycling of waste. This Thematic Strategy contains a Communication[224], its associated Technical Annex[225] and an Impact Assessment. This was followed in 2006 by a new Waste Framework Directive[226], revising the original Waste Framework Directive[227] of 1975.

Through the Directive, Member States must prohibit the abandonment, dumping or uncontrolled disposal of waste, and must promote waste prevention, recycling and processing for re-use. Key elements of the new Directive are:

- Life-cycle approach: consider the potential of waste to contribute to a more sustainable use of natural resources and raw materials.
- Prevention: Member States are required to develop waste prevention policies focusing on the individuals and businesses responsible for generating the waste.
- Recycling: EC-wide environmental standards on recycling will be adopted to support the development of an EC market for secondary (recycled) materials.
- Incineration: A revision of the IPPC Directive (see section 5.6.3) will be tabled that will set an ambitious benchmark to improve energy recovery from municipal incinerators.

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221 Directive 1999/31/EC of 26th April 1999 on the Landfill of Waste

222 Follow-up study on the implementation of Directive 1999/31/EC on the landfill of waste in EU-25 http://ec.europa.eu/environment/waste/pdf/study/cowi_report.pdf

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

224 Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and The Committee of the Regions - Taking sustainable use of resources forward - A Thematic Strategy on the prevention and recycling of waste, COM/2005/0666 final

225 Technical Annex to COM(2005)0666 final http://ec.europa.eu/environment/waste/pdf/sec_2005_1682_en.pdf

226 Directive 2006/12/EC of the European Parliament and of the Council of 2006 on waste

227 Council Directive 75/442/EEC of 15th July 1975 on waste

Note the measures do not apply to gaseous effluents, or to radioactive waste, mineral waste, animal waste and agricultural waste, wastewater, and decommissioned explosives where these types of waste are subject to specific Community rules.

In 2008, the Waste Framework Directive was further updated to clarify, modernise and streamline its provisions. The revised Directive[228] 2008/98/EC sets the basic concepts and definitions related to waste management, recovery and disposal to strengthen the impact of measures introduced in 2006.

Reduction of waste overall and specifically the diversion of biodegradable waste from landfill reduces methane emissions. Increasing recycling and recovery of waste contributes to the reduction of GHG emissions through energy savings in primary production.

5.9.3.*Directive on Management of Waste from Extractive Industries*

The EC has introduced measures to prevent or minimise any adverse effects on the environment and risks to health resulting from the management of waste from the extractive industries.

In 2006, the Directive[229] on the management of waste from extractive industries was introduced to address this waste stream, which is among the most important in the EU. The Directive applies to waste resulting from the extraction, treatment and storage of mineral resources and the working of quarries. Waste covered by this Directive no longer falls within the scope of the 1999/31/EC Landfill Directive.

In accordance with this Directive, Member States must ensure that waste facility operators draw up a waste management plan, to be reviewed every five years. The objectives of the plan are:

- to prevent or reduce the generation of waste and its negative impact;
- to encourage waste recovery through recycling, re-use or reclaiming;
- to encourage the short and long-term safe disposal of waste.

5.9.4.*Revised Directive on Packaging and Packaging Waste*

The 1994 Directive[230] on Packaging and Packaging Waste was amended in 2004[231]. The revision sets increased and binding targets for recovery and recycling for the current five year implementation phase (2005-2009). The amended targets are:

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228 Directive 2008/98/EC of the European Parliament and of the Council of 19th November 2008 on waste and repealing certain Directives http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:312:0003:0030:EN:PDF

229 Directive 2006/21/EC of the European Parliament and of the Council of 15th March 2006 on the management of waste from extractive industries

230 European Parliament and Council Directive 94/62/EC of 1994 on packaging and packaging waste

231 Directive 94/62/EC on Packaging and Packaging Waste, as amended by Directive 2004/12/EC

- 60 % as a minimum by weight packaging waste to be recovered or incinerated using recovered energy from waste incineration plants.

- A minimum of 55 % and a maximum of 80 % by weight of packaging to be recycled.

Other amendments include the introduction of material-specific targets, and permitting Member States to count incineration towards recovery targets. Increasing recycling rates reduces CO_2 emissions from primary production and methane emissions from landfill.

5.9.5. *Directive on End-of-Life Vehicles*

The original Directive[232] was implemented in 2000 to make vehicle dismantling and recycling more environmentally friendly, to set clear quantified targets for reuse, recycling and recovery of vehicles and their components, and to push producers to manufacture new vehicles with a view to their recyclability. Increasing reuse and recycling reduces CO_2 emissions from primary production and methane emissions from landfill.

Since 2000, the Directive has undergone a series of amendments[233] to keep in line with technical and scientific progress, amending sections and articles on issues such as materials, dismantling procedures and the safe disposal of certain vehicle parts. Currently the fourth adaptation to technical and scientific progress is undergoing stakeholder consultation.

5.9.6. *Directives on Waste Electrical and Electronic Equipment*

The Directive on Waste from Electrical and Electronic Equipment[234] (WEEE) aims to increase the re-use, recycling and recovery of waste from consumer products such as light bulbs, computers, and mobile phones, thereby reducing CO_2 emissions from primary production and methane emissions from landfill. The WEEE Directive is complemented by a Directive on the Restriction of the use of certain Hazardous Substances[235] (RoHS) in electrical and electronic equipment.

In 2008, the Commission made proposals for amendments to both Directives[236], including collection and recycling targets.

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232 Directive 2000/53/EC on end-of-life vehicles

233 Commission Decision 2002/525/EC, Council Decision 2005/673/EC, Council Decision 2008/689/EC, Commission Decision 2005/63/EC, Commission Decision 2005/437/EC, Commission Decision 2005/438/EC, Commission Decision 2003/138/EC, Commission Decision 2001/753/EC, Commission Decision 2002/151/EC, Commission Decision 2005/293/EC,

234 Directive 2002/96/EC of the European Parliament and of the Council of 27th January 2003 on waste electrical and electronic equipment (WEEE)

235 Directive 2002/95/EC of the European Parliament and of the Council of 27th January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment

The potential environmental impacts of WEEE vary depending on the equipment in question. On current trends, GHG emissions from cooling and freezing equipment would be around 35 $MtCO_2eq/yr$ in 2011 (compared to baseline), with a monetised value of the damage having a magnitude of around €1 billion/year - declining each year to low levels by 2020. This decline comes as a CFC-ban in cooling and freezing equipment feeds through to the WEEE stream.[237]

WEEE itself is an economic resource, with material value currently estimated in the order of magnitude of €2 billion a year. The economic costs for society of collection, disposal of and treatment of WEEE are estimated to increase to €5.6 billion a year by 2020.

5.9.7. *Green Paper on Biowaste*

The Green Paper on Biowaste[238] explores options for the further development of the management of biowaste. This is particularly relevant in light of the 2008 revised Waste Framework Directive, which calls upon the Commission to carry out an assessment of the management of biowaste, with a view to submitting a proposal. The Green Paper summarises new research findings in the field, presents core issues for debate, and invites stakeholders to contribute views on how to improve biowaste management as well as the most efficient policy instruments to reach this objective.

5.9.8. *Directive on Batteries*

The use of recycled metals in battery production instead of virgin metals indirectly reduces CO_2 emissions through reduced energy use and reduced mining of the virgin source. As an example, using recycled cadmium and nickel require respectively 46 % and 75 % less primary energy than the extraction and refining of virgin metal. These figures are particularly important given the fact that the primary production of metals is the source of approximately 10 % of global CO_2 emissions.[239]

In 2006, the European Parliament and the EU Council of Ministers agreed on a compromise to revise the 1991 Directive[240] on batteries and accumulators. The new Directive[241] provides for a minimal ban on cadmium and mercury as well as for collecting and recycling targets to be reached by 2016 at the latest.

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236 Directive 2008/34/EC of the European Parliament and of the Council, March 2008 amending Directive 2002/96/EC on waste electrical and electronic equipment (WEEE) and Directive 2008/35/EC of the European Parliament and of the Council, March 2008 amending Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment

237 Directive on waste electrical and electronic equipment (WEEE), (recast) Impact Assessment, {COM(2008) 810}, {SEC(2008) 2933}

238 Green Paper on Biowaste, 2008 http://ec.europa.eu/environment/waste/compost/pdf/green_paper_en.pdf

239 Extended Impact Assessment, directive on batteries, SEC(2003) 1343

240 Council Directive 91/157/EEC on batteries and accumulators containing certain dangerous substances

241 Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directives 91/157/EEC

5.9.9. *Directive on Incineration of Waste*

Directive 2000/76/EC on the incineration of waste came into force on 4th December 2000 to prevent or reduce negative effects on the environment caused by incineration of waste. For further details see 4th National Communication. It is one of the directives that will potential be recast as part of a Directive aimed at streamlining industrial emissions legislation – see section 5.6.4 for further details.

5.10. Effect of Policies and Measures on the Modification of Long-term Trends

The precise impact of policies and measures on the EU-27's long-term emission trends, outlined in section 6, is difficult to isolate. In part as it is based on the sum of MS projections (with somewhat different approaches and assumptions, see section 6.8.7) as well as the impact of other factors, such as energy prices, which also drive changes in longer-term trends.

However, looking at the historic trends from 1990-2007 in national circumstances (see section 3) and historic and projected emissions (1990 – 2020) across different sectors (see section 5.2) some high-level effects can be discerned:

In relation to energy use (excluding transport) primary and final energy consumption grew over the period to 2007, but from the early part of the 2000's consumption appears to have started to plateau. However, over the same time period electricity consumption continued to grow rapidly, although generation has shifted towards a lower carbon intensity fuel mix. EU-27 emissions from energy use have declined gradually from 1990 to 2007, and with existing measures are projected to broadly stabilise to 2020, whilst with additional measures they are expected to decline steadily (see section 6.2.1). This indicates that policies are starting to have a sizeable impact on (particularly end-use) energy efficiency and hence overall consumption itself, and are also strongly driving the shift towards low carbon electricity generation, particularly as a result of new renewables policies.

In transport, the historic trend has been a continued growth in both demand for, and emissions from, transport. With existing measures emissions are expected to stabilise from 2010 onwards and with additional measures gradually decline to 2020 (see section 5.2.1.1). This indicates that policies driving improved vehicle efficiency (particularly the strategy for CO_2 in cars – see section 5.5.4), and to a lesser extent the introduction of biofuels, are expected to more than offset the increase in emissions from the continued increase in demand for transport.

Policies and measures in agriculture, coupled with a decrease in activity already appear to have had a significant effect on historic emissions; driving increased productivity, reduced nitrogen fertiliser production, reductions in livestock numbers, improved manure management, etc. Beyond 2010 emissions are estimated to remain broadly static (under both existing and with additional measures – see 6.2.4), indicating a more limited impact from policies on longer term trends.

Similarly, in the waste sector emissions have declined strongly from the mid 1990s to 2007, in particular, as a result of policies such as the landfill Directive (see section 5.9.1). From 2010 onwards emissions are expected to decline further, although the rate of decrease declines slightly under both the existing and with additional measure scenarios (6.2.5), indicating that the impact of policies on longer-term trends is also gradually declining.

The impact of policies on long-term emission trends in other key sectors, such as marine and aviation (see section 6.2.7), is more difficult to discern. The underlying trend is a continued and rapid increase in emissions from these sectors, but new policy action such as the incorporation of aviation into the EU ETS will likely reduce the rate of this increase. However, not all MSs have reported projections in these sectors and where they have they do not necessarily include the impact of the latest policy changes.

5.11. Results from the Stakeholder Consultations

As part of the stakeholder consultation undertaken during the preparation of the EC 5th NC (see section 2), questions 4 and 5 asked for feedback on issues relevant to EU policies and measures.

The responses to question 4 outlined various examples of other activity on climate change at the European level – two particularly relevant ones are given below.

Other examples of recent European activity on climate change

Biofuels sustainability: A series of activities in the sustainability and certification of bio-energy and liquid biofuels has been created in the EU Member States. These initiatives have simultaneously European and international scope and aim to provide support to the legislative process of promoting renewable energy in the EU, in line with the climate change agenda. The most relevant activities of such nature are the European Centre of Normalization Technical[242] Committee 383 on Sustainable produced biomass for energy applications, the Roundtable on Sustainable Biofuels[243] (RSB), and the International Sustainability and Carbon Certification (ISCC)[244].

Climate change and major cities. The C40 global climate group[245] is a partnership of the world's largest cities committed to tackling climate change, given the disproportionate role cities play in energy consumption and responsibility for greenhouse gas emissions. EU cities include Athens, Berlin, London, Madrid, Paris, Rome and Warsaw. Examples of activity include the Mayor of London's pledge to reduce London's CO_2 emissions by 60 % on 1990 levels by 2025 via initiatives such as the Building Energy Efficiency Programme (BEEP)[246]. This aims to reduce emissions in public buildings with financing based entirely out of projected cost-savings from reduced energy consumption, and to eventually extend it to major private sector landlords of commercial buildings through the Better Building Partnership. This type of initiative is highly replicable in other cities and is also being explored by other C40 members, supported by extensive cooperation and knowledge sharing.

Finally, the responses to question 5 highlighted a range of views on the recent progress of EU climate policy. Whilst these were largely positive, particularly with respect to the recent Energy and Climate package (see section 5.1.2), they also raised some concerns and indicated areas where stakeholders felt further action is needed.

Key points from the responses are summarized below:

- The new 2020 targets for EU GHG emissions reductions were welcomed, but concern was expressed that these are not sufficient to meet the deeper cuts recommended by the IPCC to ensure stabilization of atmospheric emissions at

450ppm. In addition, concerns were raised about the potential for large-scale use of external credits and its impact on domestic action to reduce emissions.

- Similarly, the new 2020 renewable energy targets were seen as a major step forward, but it was highlighted that the onus is now on Member States to ensure that sufficient and timely policy mechanisms are put in place to ensure these are met.

- There was acknowledgement of the new actions taken to address transport emissions such as the new CO_2 targets for road vehicles and incorporation of aviation under the EU-ETS. However, there was a view that action needs to be integrated within a strong overarching strategy for reducing EU transport emissions.

- The EU was praised for acting as a global front-runner on commitments for future emissions reductions. However, it was emphasized that there is now a need to bring all major emitters and economic players on board under a global agreement, to help address concerns about competitiveness and the need for a level playing field.

Continued and additional activity on mitigation was welcomed. However, stakeholders emphasised that there was strong need for rapid and increasing action on adaptation (building on the framework created by the EU Adaptation White Paper - see section 7.3.1) given the potential for significant negative impacts in sectors such as agriculture and employment. The potential for positive employment impacts as part of the transformation to a low-carbon economy was also mentioned, although it was highlighted that there is still a need to manage and address the social implications of this during the transition.

5.12. Policies and Measures No Longer in Place

Since the 4th NC the following policies and measures are no longer in place include:

- A specific aid for energy crops which was introduced as part of the 2003 CAP reform.

6. PROJECTIONS AND THE TOTAL EFFECT OF POLICIES AND MEASURES

Key developments

- Under the Kyoto Protocol, the EU-15 has adopted a target to reduce emissions by 8 % on average between 2008 and 2012, compared to base-year emissions. Emissions of GHG in the EU-15 are projected to be 7.5 % below base year emissions in 2010 (existing measures reduce emissions to 320 Mt against base year emissions of 4266 Mt). The implementation of additional measures is projected to reduce EU-15 emissions to 9.2 % below base year emissions (additional measures reduce emissions by a further 73 Mt against base year emissions) in 2010. EU-15 emissions, considering the expected impact of domestic policies and measures, are therefore projected to be 1.2 percentage points below the Kyoto target in 2010.

- Member States' intended use of flexible mechanisms is expected to increase the projected emission rights for the EU-15 in the commitment period by a *further* 2.2 % (93 Mt) against base year emissions to 94.2 %, while use of carbon sinks is expected to increase this *further* by 1.0 % (42 Mt) to 95.2 % against base year emissions. In addition the acquisition of emission credits stemming from the flexible mechanisms by the EU ETS operators is expected to increase the projected emission rights in the commitment period by a *further* 1.4 % (61.2 Mt) to 96.6 % against base year emissions.

Illustration 6-1 Greenhouse gas emissions and projections in the EU-15 (excluding LULUCF) for the 'with existing measures and 'with additional measures' scenarios

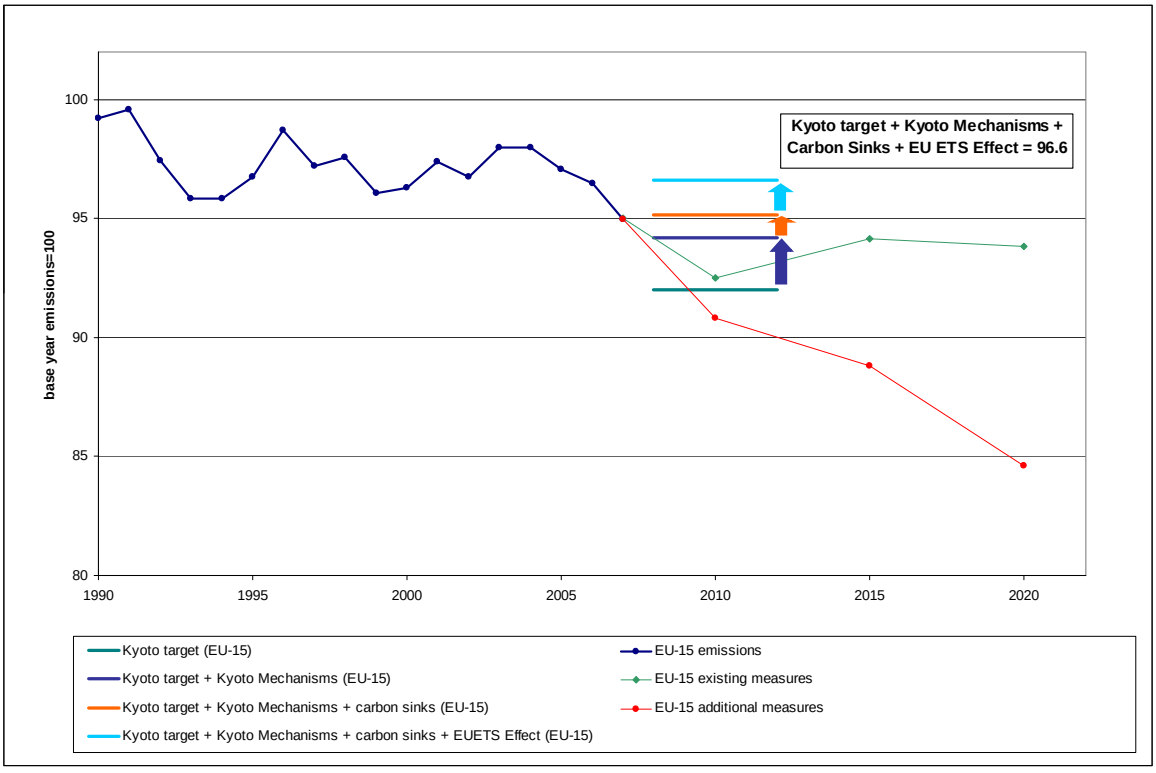
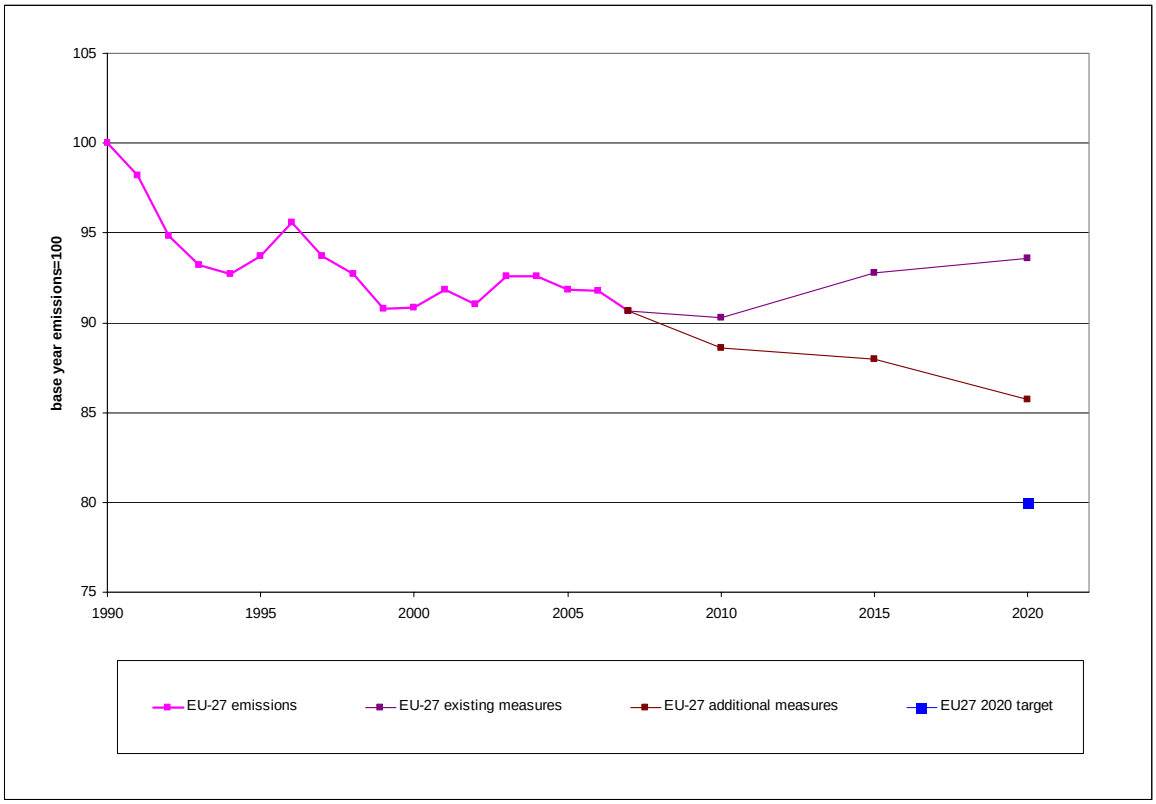


Illustration 6-2 Greenhouse gas emissions and projections in the EU-27 (excluding LULUCF) for the 'with existing measures and 'with additional measures' scenarios



Note: The index on the vertical axis refers to the base year for the EU-15, that is 1990 emissions for CO_2, CH_4 and N_2O and 1995 emissions for the F gases (with the exception of Austria, France and Italy where the base year for F gases is 1990). This means that the value for 1990 is not exactly 100 for the EU-15. As the EU-27 does not have a collective Kyoto target and therefore no collective base year, the index on the vertical axis refers to 1990 emissions for the EU-27.

Key developments (continued)

- Considering Member States' intended use of Kyoto mechanisms and carbon sinks, in addition to the effect of domestic measures, the EU-15 is expected to overshoot its target by 5.8 percentage points in 2010 (with emissions projected to be 3677 Mt).

- Emissions of GHG in the EU-27 are projected to be 9.7 % below 1990 levels in 2010 as a result of implemented measures and 11.4 % below 1990 levels in 2010 when planned measures are also considered.

- At the time of writing the 4th National Communication (NC), the EU had 25 members. Comparing like for like, EU-25 emission projections for 2010 including all measures and Kyoto mechanisms in 2010 have increased by 0.4 % from the 4th to the 5th NC projections.

- EU-27 emissions are currently projected to be 6.4 % below 1990 levels in 2020 under the 'with existing measures' scenario and 14.3 % below 1990

levels under the 'with additional measures' scenario, compared to the EU's target to reduce emissions by 20 % compared to 1990. However, most Member States (16) have not yet accounted for the EU's 2020 Climate and Energy Package in their projections estimates.

- 20 Member States have not considered the impact of the financial crisis in their latest projections estimates.

6.1. Introduction

This section presents projections of GHG for three scenarios: "with existing measures", "with additional measures" and "without measures", split by sector, by gas and aggregated for the EU-15 and EU-27. Projections are presented for 2010, 2015 and 2020, relative to the latest available, actual inventory data, as included in Section 4. All emissions and projections are displayed in CO_2 equivalents and excluding emissions or removals from Land Use, Land Use Change and Forestry (LULUCF), unless otherwise stated. Projections of emissions related to fuel sold to ships and aircraft engaged in international transport are memo items in the CRF Tables (see Section 4.3.5) and not included in the totals reported in this section. Projections of selected indirect greenhouse gases are provided.

In this section, ex-ante estimates of the total effect of all national policies implemented/adopted and planned are presented. The savings from policies and measures presented here are based on projections and estimates of policies and measures by the Member States. The estimates therefore include the impact of national measures related to EU CCPMs as well as strictly national policies. The figures presented in Section 5 are ex-ante estimates of the effect of individual EU-level initiated policies, and do not therefore correspond to the numbers in this chapter. The section also contains information on supplementarity related to mechanisms under Article 6, 12 and 17, of the Kyoto Protocol and an explanation of the methodology used to generate the projections. Finally, Appendix D contains detailed inventory and projections data tables, split by sector and gas and Appendix E contains an overview of Member State projection methodologies.

Information presented in this section for the EU-15 and EU-27 is an aggregation of individual Member State information[242]. As such, it is not always possible to present detailed and consistent information at the EU level. For instance, few MS (7[243]) have factored in the potential impact of the current financial crisis in their projections. As a result MS assumptions for GDP growth in 2010 vary from –2.6 % to 8 %. International oil price assumptions for 2010 also vary considerably from 7 to 84 € per GJ. Further information is provided in Section 6.8.7. Further analysis of projections will also be required when updated projections become available from all Member States.

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242 As reported to the European Commission between 15th March and 15th May 2009 under the EU's Monitoring Mechanism Decision 280/2004/EC. For individual sources, see EEA (2009), GHG Trends and Projections in Europe. Updated information was not made available for Hungary and Poland within this period and is therefore taken from older submissions, as reported in EEA (2008), GHG Trends and Projections Europe EEA Report No 5/2008:.

243 Belgium, Czech Republic, Spain, Greece, Italy, Ireland and Lithuania.

6.1.1. *With Existing Measures Projection*

The 'with existing measures' (WEM) projection represents a business as usual scenario where only policies and measures that have been adopted or already implemented are considered. All EU-27 Member States that submitted 2009 projections reported WEM projection scenarios. For Member States that did not submit new projections in 2009[244], the most recent projections data available was used. Some Member States did not submit the complete sectoral break down of the projections. In this case, a consistent methodology was followed to gap fill missing data.

6.1.2. *With Additional Measures Projection*

The 'with additional measures' (WAM) projection represents a scenario where all planned measures are considered to be fully and timely implemented. The WAM projections are therefore lower than the WEM projections. Relative to the WEM scenario for which all Member States reported their projections, less Member States reported a 'with additional measures' scenario[245]. In this case, in order to compile an aggregated data set for the EU-15 and EU-27, the data was gap filled by using WEM projections.

6.1.3. *Without Measures Projection*

Only 7 of the EU-27 Member States reported a 'without measures' projection in their latest submissions. An alternative method has therefore been used to estimate a 'without measures' projection for the EU-15 and EU-27, making use of individual Member State projections and estimates of policy impact. This is discussed further in Section 6.4.

6.2. Projections by Sector

EU-15 and EU-27 projections for 2010, 2015 and 2020 are presented below, excluding Kyoto Mechanisms and carbon sinks for each sector.

The figures below illustrate the expected impact of all policies implemented and planned by Member States, including national measures to implement EU wide policies and measures as well as other national policies and measures.

In the "with existing measures" scenario, emissions of GHG in the EU-15 are projected to be 6.8 % (-289 Mt) below 1990 levels in 2010. The emission reduction each sector accounts for varies greatly between the sectors, with the energy sector driving the trend. The most significant portion of absolute emission reductions from 1990 to 2010 is expected to derive from the energy (-249 Mt), followed by the waste (-79 Mt) and industrial processes (-64 Mt) sectors. Emissions from the transport sector are expected to increase dramatically (+162 Mt).

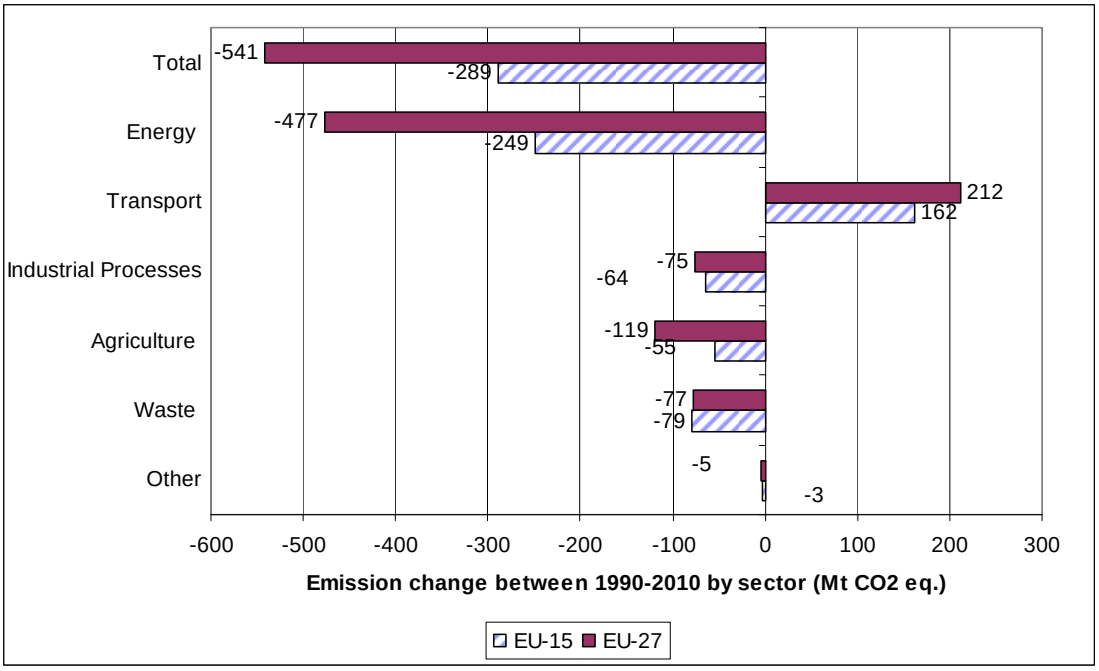
In the "with existing measures" scenario, emissions of GHG in the EU-27 are projected to be 9.7 % (-541 Mt) below 1990 levels in 2010. Similar to the EU-15, the proportion each sector contributes to the overall emission change varies greatly between the sectors. The most significant portion of absolute emission reductions from 1990 to 2010 are expected to derive from the energy (-477 Mt),

[244] Hungary and Poland

[245] Denmark, Netherlands, United Kingdom, Lithuania and Poland

agriculture (-119 Mt), and waste (-77 Mt) sectors. Conversely, emissions from the transport sector are expected to increase dramatically (+212 Mt).

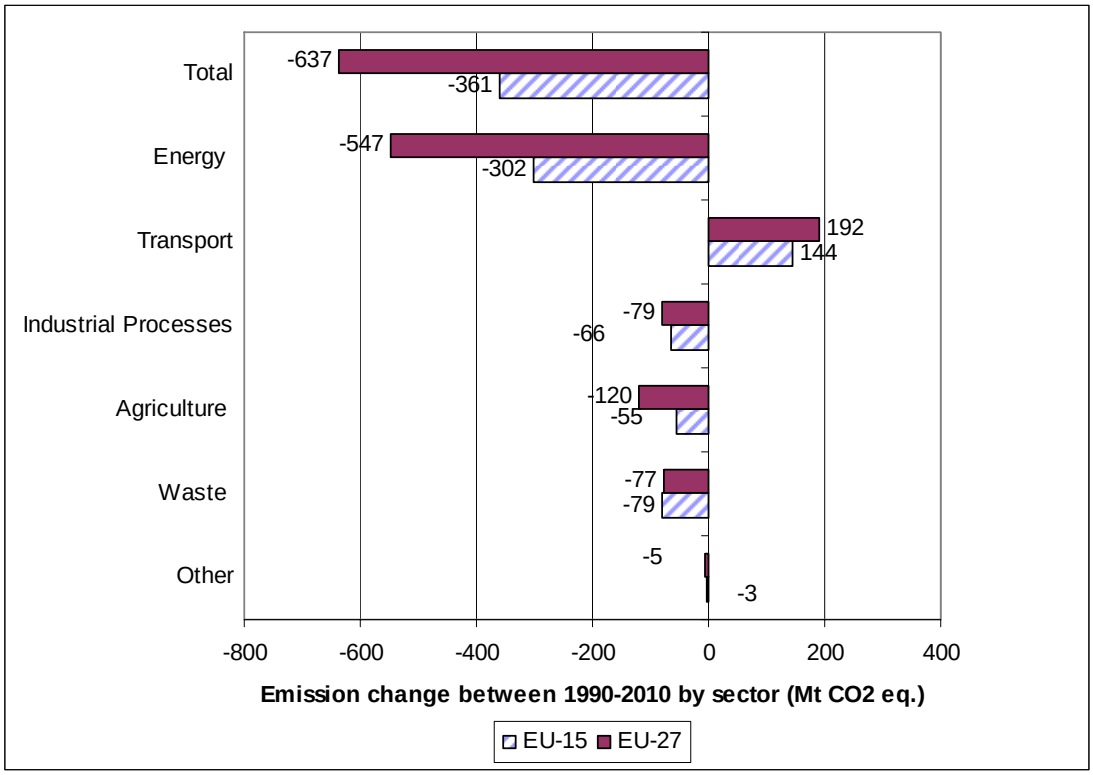
Illustration 6-3 Projected absolute change in greenhouse gas emissions (excluding LULUCF) by sector for the 'with existing measures' scenario, 1990-2010



In the “with additional measures” scenario, emissions of GHG in the EU-15 are projected to be 8.5 % (-361 Mt) below 1990 levels in 2010. The emission reduction each sector accounts for varies greatly between the sectors, with the energy sector driving the trend. The most significant portion of absolute emission reductions from 1990 to 2010 is expected to derive from the energy (-302 Mt), followed by the waste (-79 Mt) and industrial processes (-66 Mt) sectors. Emissions from the transport sector are expected to increase dramatically (+144 Mt).

In the “with additional measures” scenario, emissions of GHG in the EU-27 are projected to be 11.4% (-637 Mt) below 1990 levels in 2010. Similar to the EU-15, the proportion each sector contributes to the overall emission change varies greatly between the sectors. The most significant portion of absolute emission reductions from 1990 to 2010 are expected to derive from the energy (-547 Mt), agriculture (-120 Mt) and the industrial processes (-79 Mt) sectors. Conversely, emissions from the transport sector are expected to increase dramatically (+192 Mt).

Illustration 6-4 Projected absolute change in greenhouse gas emissions (excluding LULUCF) by sector for the 'with additional measures' scenario, 1990-2010



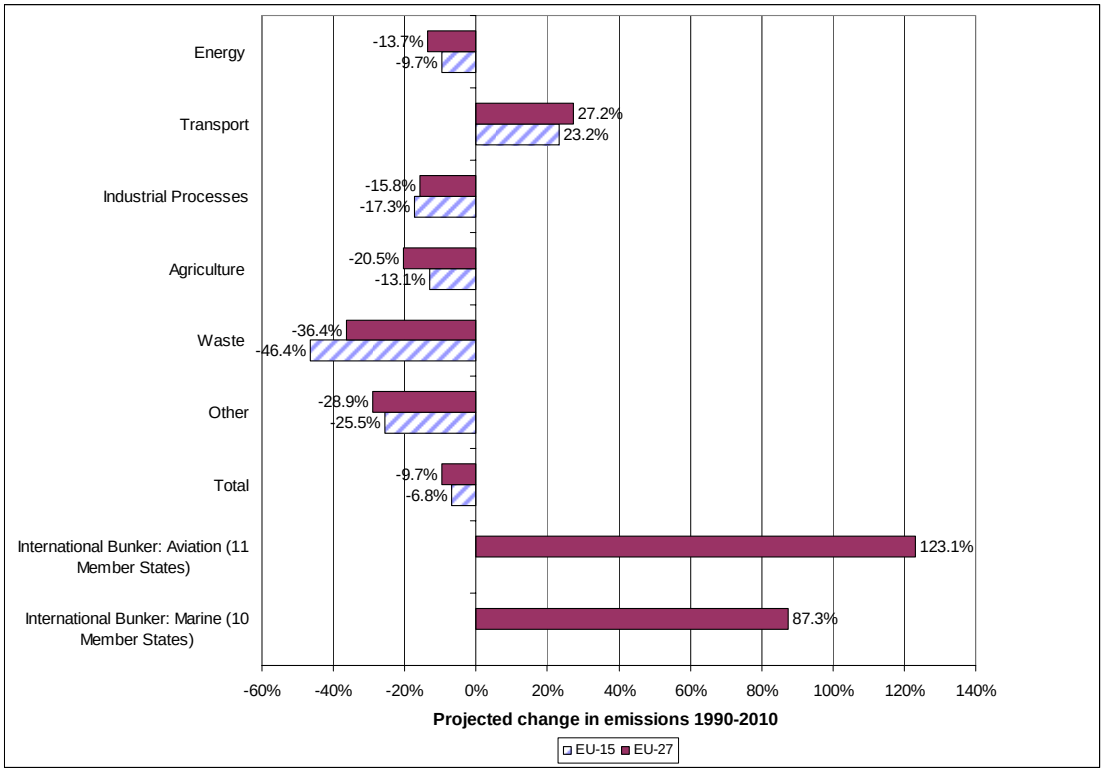
Common factors driving historic trends and projections are discussed in more detail in Section 3 National Circumstances, Section 4 GHG Inventory and in the national inventory and projections reports of individual Member States. Policies and measures expected to influence emissions in each sector are also discussed in detail in Section 5.

Non-EU-15 Member States experienced considerable reductions in GHG emissions throughout the 1990s due to rapid economic restructuring, decreased industrial activity and fuel switching. More recently, emissions have started to increase as these economies have begun to grow, resulting in an increased demand for energy, with more waste generated and increased road transport. With most countries having joined the EU in 2004 (Bulgaria and Romania in 2007), implementation of key EU climate change mitigation policies has been delayed in these countries but is likely to have a strong influence on the emissions intensity of activities in these countries going forward.

2010 projections for almost all sectors represent a dramatic decrease from latest year emissions (2007), particularly when compared with the pace of change up to the latest year. It is expected that this reduction will only be realized through policies recently implemented and coming to fruition in the short term. In addition, projections in most sectors show a slow down in the pace of emission reductions, a stabilization or even an increase in emissions in the post-Kyoto period. This illustrates the need for further policies and measures to achieve the EU's 2020 objectives or a post-2012 agreement. It should be noted however that

most Member States (16[246]) have not yet accounted for the EU's 2020 Climate and Energy Package in the projections estimates presented in this section.

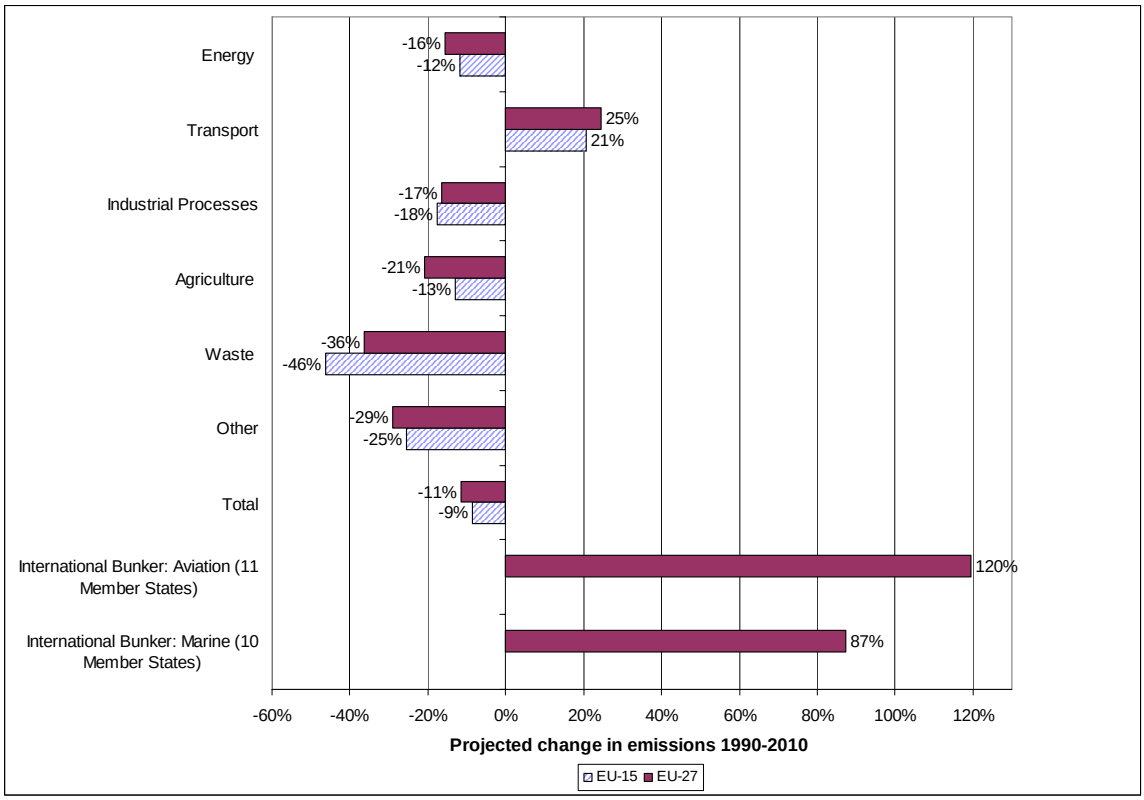
Illustration 6-5 Projected change in greenhouse gas emissions (excluding LULUCF) by sector for the 'with existing measures' scenario, 1990-2010



Notes: Aviation projections available from 10 countries only (Denmark, Czech Republic, Germany, Greece, Netherlands, Spain, Sweden, United Kingdom, Lithuania, Estonia and Malta). Maritime projections available from 10 countries only (Denmark, Germany, Greece, Netherlands, Spain, Sweden, United Kingdom, Lithuania, Estonia and Malta). Projections for Lithuania are available for the year 2010 only but have been gap-filled for 2015 and 2020.

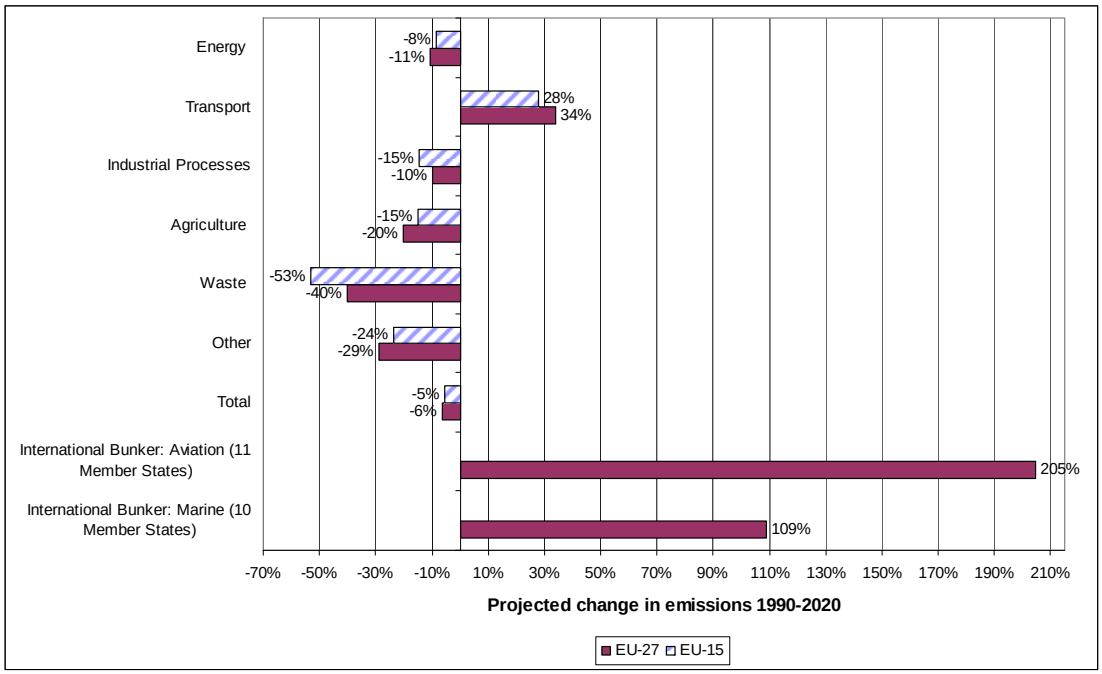
246 Only Belgium, Cyprus, the Czech Republic, Finland, Greece, Germany, Ireland, Italy, Luxembourg, Portugal and Romania report that the Package has been accounted for, to some extent, in their projections.

Illustration 6-6 Projected change in greenhouse gas emissions (excluding LULUCF) by sector for the 'with additional measures' scenario, 1990-2010



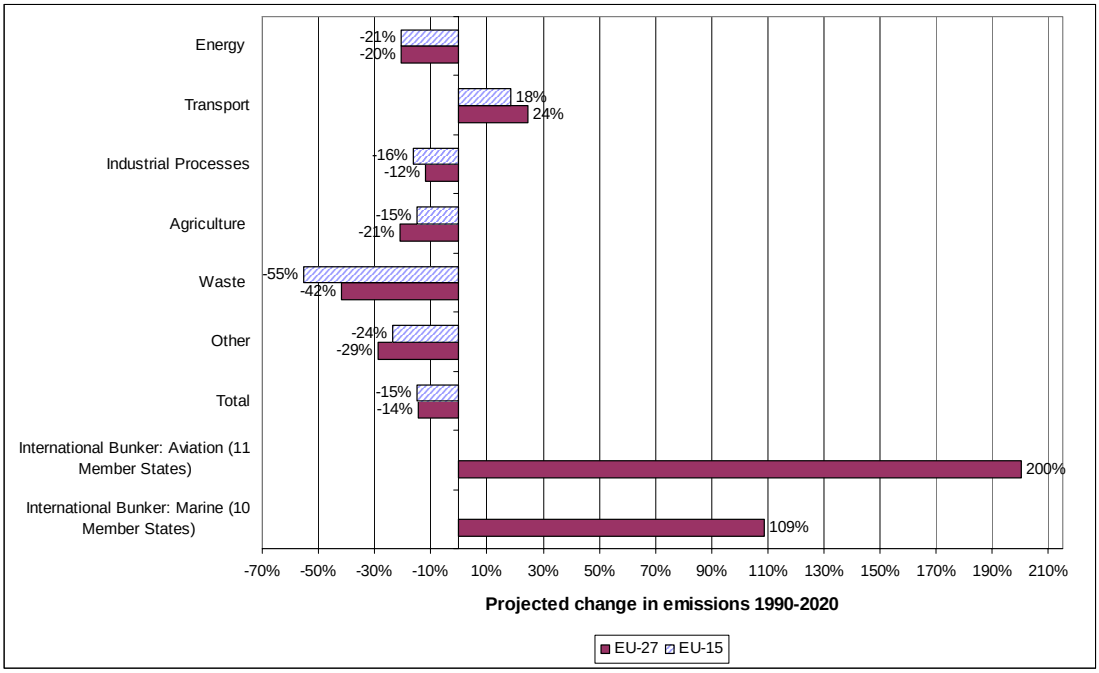
Notes: Aviation projections available from 10 countries only (Denmark, Czech Republic, Germany, Greece, Netherlands, Spain, Sweden, United Kingdom, Lithuania, Estonia and Malta). Maritime projections available from 10 countries only (Denmark, Germany, Greece, Netherlands, Spain, Sweden, United Kingdom, Lithuania, Estonia and Malta). Projections for Lithuania are available for the year 2010 only but have been gap-filled for 2015 and 2020.

Illustration 6-7 - Projected change in greenhouse gas emissions (excluding LULUCF) by sector for the 'with existing measures' scenario, 1990-2020



Notes: Aviation projections available from 11 countries only (Denmark, Czech Republic, Germany, Greece, Netherlands, Spain, Sweden, United Kingdom, Lithuania, Estonia and Malta). Maritime projections available from 10 countries only (Denmark, Germany, Greece, Netherlands, Spain, Sweden, United Kingdom, Lithuania, Estonia and Malta). Projections for Lithuania was available for the year 2010 only but have been gap-filled for 2015 and 2020.

Illustration 6-8 Projected change in greenhouse gas emissions (excluding LULUCF) by sector for the 'with additional measures' scenario, 1990-2020



Notes: Aviation projections available from 11 countries only (Denmark, Czech Republic, Germany, Greece, Netherlands, Spain, Sweden, United Kingdom, Lithuania, Estonia and Malta). Maritime projections available from 10 countries only (Denmark, Germany, Greece, Netherlands, Spain, Sweden, United Kingdom, Lithuania, Estonia and Malta). Projections for Lithuania was available for the year 2010 only but have been gap-filled for 2015 and 2020.

6.2.1.*Energy*

The figure below shows the greenhouse gas emissions and projections from the energy sector excluding transport.

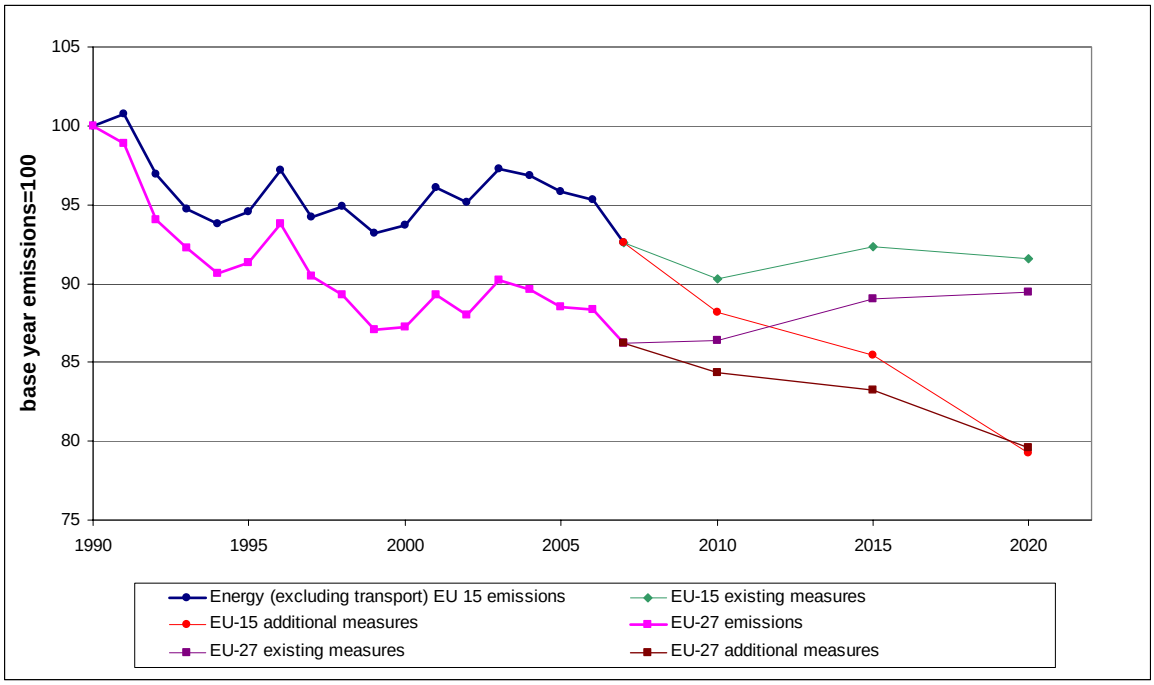
EU-15 and EU-27 GHG emissions from the energy sector show a gradual downward trend from 1990 to the present day. Projections for the sector demonstrate MS expectations that emissions from the sector will stabilise through use of existing measures in the EU-15, although during 2010-2020 an increase is expected in the EU-27. Significant decreases in emissions from the sector up to 2020 are dependent on the implementation of planned additional measures. The figure shows that emissions are projected to continue to decrease, reaching 11.8% below 1990 levels by 2010, 14.5 % by 2015 and 20.7 % by 2020 for the EU-15 with additional measures and 15.6 % below 1990 levels by 2010, 16.8 % by 2015 and 20.4 % by 2020 in EU-27 with additional policies and measures in place.

For the EU-15 and EU-27, emissions have fallen since 1990 mainly due to fuel switching to gas (also reducing CH_4 emissions from coal mining), increased energy and technical efficiency, decreases in fuel combustion in manufacturing industries and construction and restructuring of industry in the new Member States. In part, such reductions have been counteracted by increased housing stock and growth in the services sector, resulting in increased demand for energy services in buildings and homes, and in particular strong growth in demand for

electricity to provide these. In addition, recent economic growth in the new Member States has begun to increase demand for energy services.

The following measures driven by the EU and Member State policies have contributed to emissions reductions to date and will continue to do so up to 2020: renewables, nuclear energy, EU ETS and energy efficiency policy. Between 2007 and 2010, the following Member States' energy emissions are projected to fall most with existing measures: Estonia (-33 %), Spain (-11 %), Czech Republic (-9 %) and the United Kingdom (-8 %). However, the majority of Member States expect energy emissions to increase, with the following Member States' energy emissions projected to rise most: Lithuania (+107 %), Bulgaria (+25 %), Romania (+25 %) and Latvia (+23 %).

Illustration 6-9 Greenhouse gas emissions and projections in the energy sector (excluding transport) 'with existing measures' and 'with additional measures' scenarios



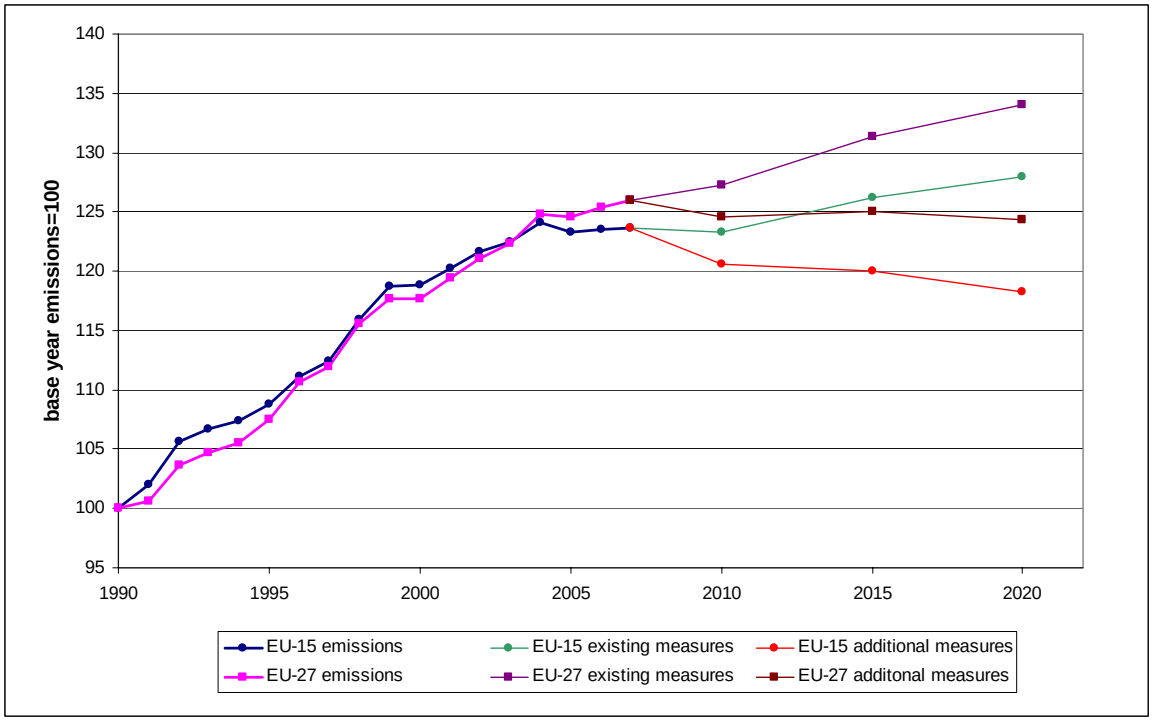
Notes: The index on the vertical axis refers to the base year for the EU-15, that is 1990 emissions for CO_2, CH_4 and N_2O.As the EU-27 does not have a collective Kyoto target and therefore no collective base year, the index on the vertical axis refers to 1990 emissions for the EU-27.

6.2.2.*Transport*

Of all sectors, the transport sector caused the largest increase in greenhouse gas emissions between 1990 and 2007 and is the only sector expected to experience an increase in EU emissions between 1990 and 2010 under the existing measures scenario. The figure below shows that with additional policies and measures in place emissions are projected to decrease relative to 2007, while remaining considerably higher than 1990 emissions. Emissions reach 21 % above 1990 levels by 2010, and subsequently 20 % by 2015 and 18 % by 2020 for the EU-15 with additional measures and 25 % above 1990 levels by 2010 and 2015 and 24 % by 2020 in EU-27. In most Member States, the projected increase of emissions from transport 'with existing measures' is mainly due to continued growth in transport volumes (passenger and freight) and the trend towards larger vehicles. A significant slow down in emissions from the sector up to 2020 is forecast

through implementation of additional measures aimed at shifting to less carbon intensive modes of transport and increased energy efficiency (see Section 5.5).

Illustration 6-10 Greenhouse gas emissions and projections in the transport sector 'with existing measures' and 'with additional measures' scenarios



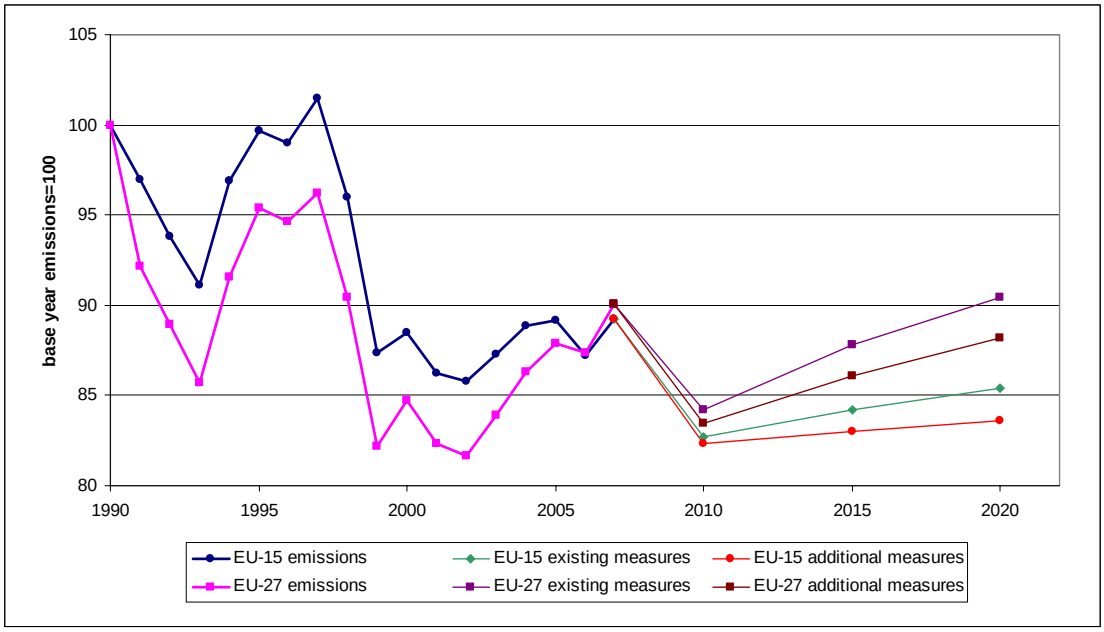
Notes: The index on the vertical axis refers to the base year for the EU-15,that is 1990 emissions for CO_2, CH_4 and N_2O. As the EU-27 does not have a collective Kyoto target and therefore no collective base year, the index on the vertical axis refers to 1990 emissions for the EU-27.

6.2.3.*Industrial Processes*

EU-15 and EU-27 GHG emissions from the industrial processes sector have decreased considerably since their peak in 1997. However emissions from the sector have been on a general upward trend in the past five years. Despite this, Member States expect emissions from the sector to decrease sharply by 2010, through use of existing and additional measures. Emissions post-2010 are however expected to rise once again in both the EU-15 and EU-27 despite currently planned measures. The figure shows that emissions are projected to reach 18 % below 1990 levels by 2010, 17 % in 2015 and 16 % by 2020 for the EU-15 with additional measures and 17 % below 1990 levels by 2010, 14 % by 2015 and 12 % by 2020 in EU-27 with additional policies and measures in place.

Fluctuations in industrial process emissions have been driven both by economic conditions (affecting activity levels) and in some cases EU or national regulation (affecting efficiency) e.g. phasing out of the adipic acid and nitric acid fertiliser plants has occurred in some countries while abatement technology has been fitted in other adipic acid plants. A key driver of this is the inclusion of some industrial process emitters in the EU ETS.

Illustration 6-11 Greenhouse gas emissions and projections in the industrial processes sector 'with existing measures' and 'with additional measures' scenarios

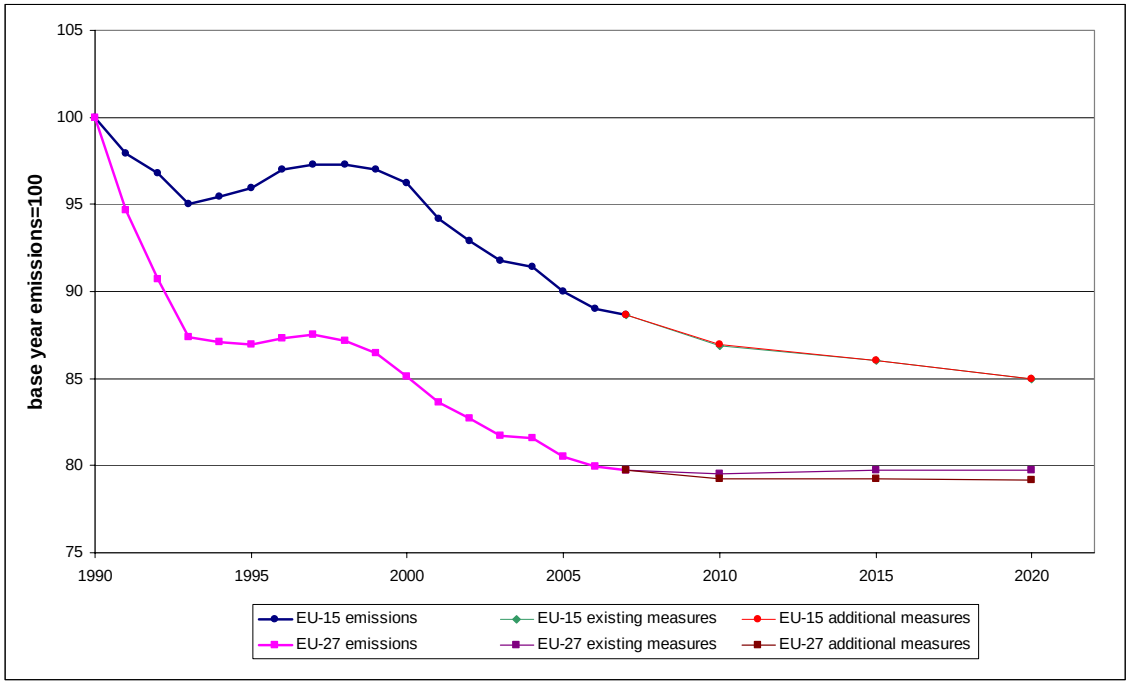


Notes: The index on the vertical axis refers to the base year for the EU-15, that is 1990 emissions for CO_2, CH_4 and N_2O and 1995 emissions for the F gases (with the exception of Austria, France and Italy where the base year for F gases is 1990). This means that the value for 1990 is not exactly 100 for the EU-15. As the EU-27 does not have a collective Kyoto target and therefore no collective base year, the index on the vertical axis refers to 1990 emissions for the EU-27.

6.2.4.*Agriculture*

EU-15 and EU-27 GHG emissions from the agricultural sector have shown a steady decrease over the past 10 years. Changes in agricultural policy and farming subsidies have driven increased productivity, reduced livestock, reduced emissions from agricultural soils, reduced nitrogen fertiliser production and use and improved manure management. EU-15 emissions from the sector are expected to decrease slowly up to 2020. EU-27 emissions are expected to decrease slightly to 2010 then stabilise at this level to 2020. The difference in the trend is likely to be driven by restructuring and recovery in the economies of the more recently acceded Member States. The figure shows that emissions are projected to reach 13 % below 1990 levels by 2010, 14 % by 2015 and 15 % by 2020 for the EU-15 with additional measures and 21 % below 1990 levels by 2010, 2015 and 2020 in EU-27 with additional policies and measures in place. Most Member States (20) have not factored in to their projections estimates of the impact of the current economic recession and subsequent recovery. In both the EU-15 and the EU-27, there is little difference between the 'existing measures' and 'additional measures' scenarios.

Illustration 6-12 Greenhouse gas emissions and projections in the agriculture sector 'with existing measures' and 'with additional measures' scenarios



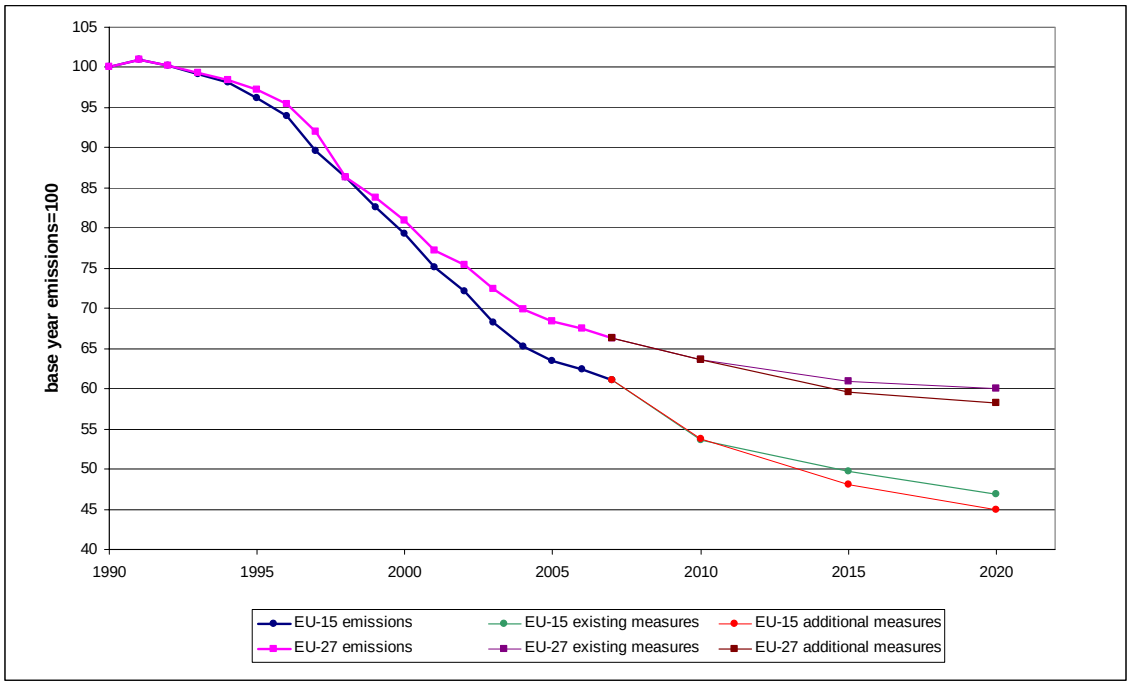
Notes: The index on the vertical axis refers to the base year for the EU-15,that is 1990 emissions for CO_2, CH_4 and N_2O. As the EU-27 does not have a collective Kyoto target and therefore no collective base year, the index on the vertical axis refers to 1990 emissions for the EU-27.

The difference in the EU-15 and EU-27 projections for 'with existing measures' and 'additional measures' is not significant enough to be well visible on the graph.

6.2.5.*Waste*

EU-15 and EU-27 GHG emissions from the waste sector have shown a steady and sharp decrease over the past 20 years. EU-15 and EU-27 emissions from the sector are expected to decrease even more sharply by 2010 and to decrease further by 2020. In both the EU-15 and the EU-27, planned additional measures are shown to have only a modest impact after 2010. The figure below, shows that emissions are projected to continue to decrease, reaching 46 % below 1990 levels by 2010, 52 % by 2015 and 55 % by 2020 for the EU-15 with additional measures and 36 % below 1990 levels by 2010, 41 % by 2015 and 42 % by 2020 in EU-27 with additional policies and measures in place. Past and future emission decreases can largely be attributed to successful waste legislation e.g. increased recycling, bans on landfill deposit, landfill taxes and methane recovery from treated wastewater and landfill. In particular, the Landfill Directive (see Section 5.9.1) has established objectives for the progressive reduction of biodegradable waste to landfill by 25 % within five years of Member State implementation of the Directive, 50 % within eight years, and by 65 % within fifteen years, compared to 1995 levels.

Illustration 6-13 Greenhouse gas emissions and projections in the waste sector 'with existing measures' and 'with additional measures' scenarios



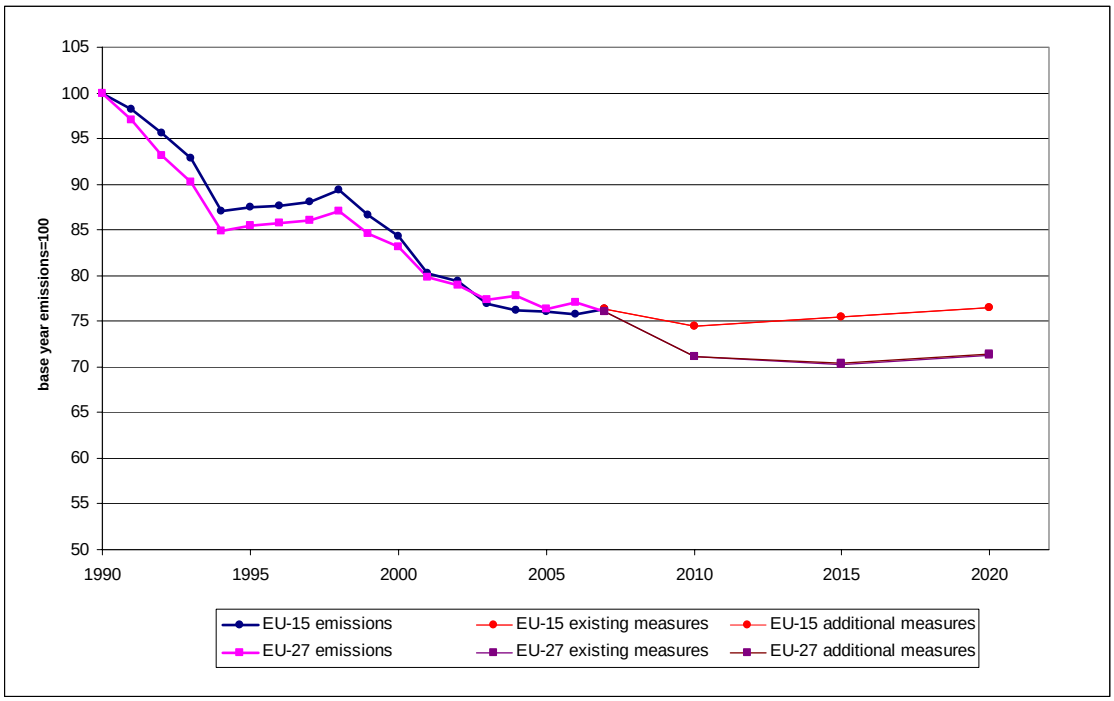
Notes: The index on the vertical axis refers to the base year for the EU-15, that is 1990 emissions for CO_2, CH_4 and N_2O. As the EU-27 does not have a collective Kyoto target and therefore no collective base year, the index on the vertical axis refers to 1990 emissions for the EU-27.

6.2.6. *Other*

The 'Other' sector is the sum of emissions from Common Reporting Format (CRF) sectors 3 (Solvent and Other Product Use) and 7 (Other)[247]. The contribution to the overall emissions from this sector has historically been very small, accounting for 0.2% of the total EU-27 GHG emissions in 2007. EU-15 and EU-27 GHG emissions from 'other' sources have shown a steady and sharp decrease over the past 20 years. MS projections indicate a sharp decrease in EU-15 and EU-27 emissions from the sector by 2010. By 2015, the trend continues in the EU-27 although the decrease is slower whilst emissions increase slightly in the EU-15. Both in the EU-15 and EU-27 emissions increase between 2015-2020. In both the EU-15 and the EU-27, there is little difference between the 'existing measures' and 'additional measures' projections. The figure shows that emissions are projected to continue to decrease, reaching 25.5 % below 1990 levels by 2010, 24.5 % by 2015 and 23.5 % by 2020 for the EU-15 with additional measures and 29 % below 1990 levels by 2010, 30 % by 2015 and 29 % by 2020 in EU-27 with additional policies and measures in place.

247 For the Netherlands, projection for Sector 7 was disregarded due to inconsistency with the 2007 inventory data available for this sector.

Illustration 6-14 Greenhouse gas emissions and projections in the 'other' sector 'with existing measures' and 'with additional measures' scenarios



Notes: The index on the vertical axis refers to the base year for the EU-15, that is 1990 emissions for CO_2, CH_4 and N_2O and 1995 emissions for the F gases (with the exception of Austria, France and Italy where the base year for F gases is 1990). This means that the value for 1990 is not exactly 100 for the EU-15. As the EU-27 does not have a collective Kyoto target and therefore no collective base year, the index on the vertical axis refers to 1990 emissions for the EU-27. At both the EU-15 and the EU-27 level, there is very little difference between the 'existing measures' and 'additional measures' projections. The difference is not visible on the graph.

6.2.7. *Aviation and Maritime Bunker Fuels*

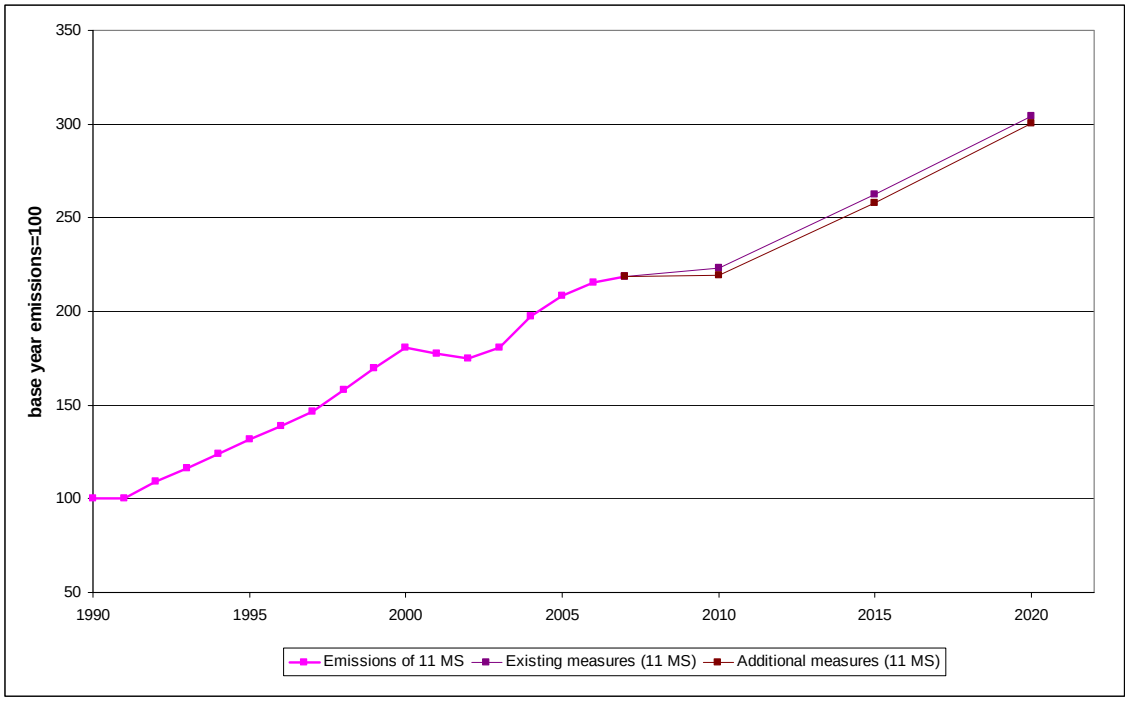
Projections of emissions from international bunker fuels are available for the following Member States *only*: Denmark, Germany, Greece, Netherlands, Spain, Sweden, United Kingdom, Czech Republic (aviation only), Estonia, Lithuania[248] and Malta. This group of countries does however account for 66 % and 68 % of the EU-27's total emissions in 2007 from aviation and maritime bunker fuels, respectively.

The figure below shows the trend in emissions and projections for the aviation sector for the 11 MS for which data is available, from 1990 to 2020. The data shows that the rapid increase in emissions experienced to date is projected to continue up to 2020, although the increase is considerably slower up to the Kyoto commitment period. The figure shows that emissions are projected to continue to increase, reaching 120 % above 1990 levels by 2010, 158 % by 2015 and 200 % by 2020 with additional measures for the 11 Member States that provided projections. There is little differentiation between the existing measures and additional measures projections. It is unlikely however that MS projections

248 Lithuania only submitted projections for 2010 but the data has been gap-filled for 2015 and 2020.

account for the impact of including aviation in the EU ETS from 2012 or the impact of the current recession.

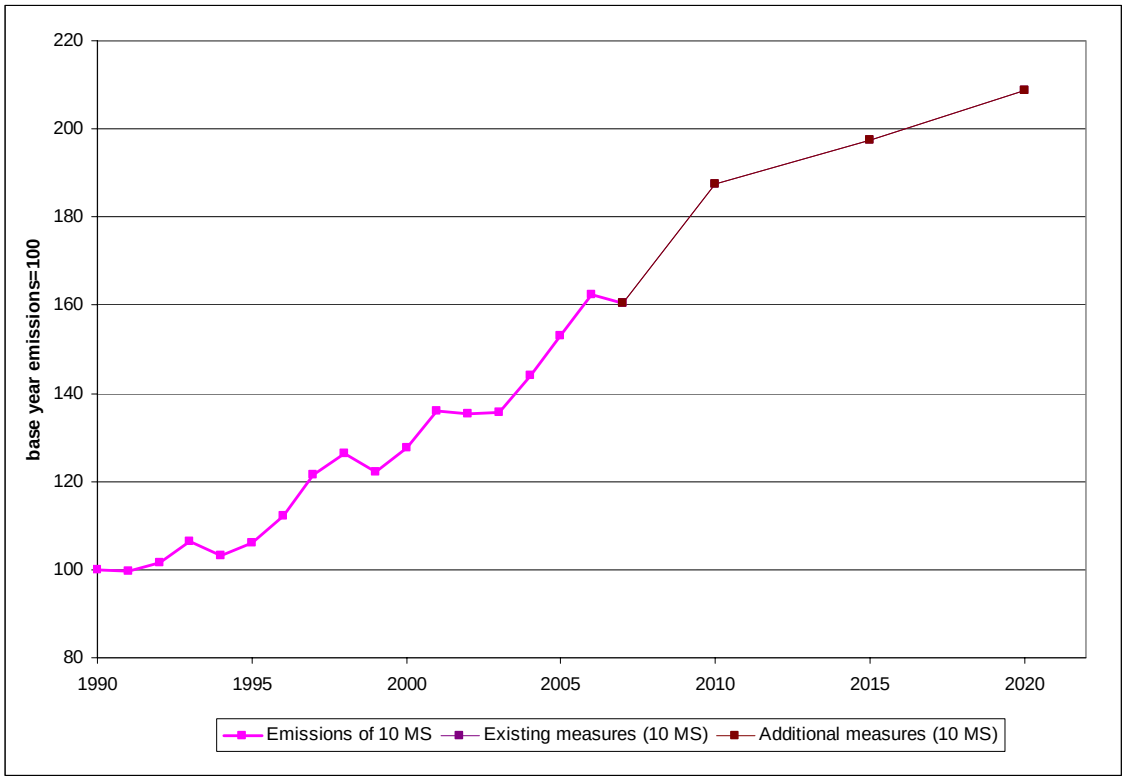
Illustration 6-15 Greenhouse gas emissions and projections in the international bunkers - aviation sector 'with existing measures' and 'with additional measures' scenarios



Notes: The index on the vertical axis refers to the base year for the EU-15, that is 1990 emissions for CO_2, CH_4 and N_2O. As the EU-27 does not have a collective Kyoto target and therefore no collective base year, the index on the vertical axis refers to 1990 emissions for the EU-27. Aviation projections available from 11 countries only (Denmark, Czech Republic, Germany, Greece, Netherlands, Spain, Sweden, United Kingdom, Lithuania, Estonia and Malta). Projections for Lithuania are available for the year 2010 only but have been gap-filled.

The figure below shows the trend in emissions and projections for the maritime sector for the 10 Member States for which data is available, from 1990 to 2020. The data shows that Member States expect a significant increase in emissions up to the Kyoto commitment period, with a slower increase in emissions thereafter to 2020. The figure shows that emissions are projected to continue to increase, reaching 87 % above 1990 levels by 2010, 97 % by 2015 and 108 % by 2020 with additional measures for the 10 Member States that provided projections.

Illustration 6-16 Greenhouse gas emissions and projections in the international bunkers - maritime sector 'with existing measures' and 'with additional measures' scenarios



Notes: The index on the vertical axis refers to the base year for the EU-15,that is 1990 emissions for CO_2, CH_4 and N_2O. As the EU-27 does not have a collective Kyoto target and therefore no collective base year, the index on the vertical axis refers to 1990 emissions for the EU-27. Maritime projections available from 10 countries only (Denmark, Germany, Greece, Netherlands, Spain, Sweden, United Kingdom, Lithuania, Estonia and Malta). Projections for Lithuania are available for the year 2010 only but have been gap-filled for 2015 and 2020.

There is no difference between the projections for the WEM and WAM scenarios. The line for WEM is therefore not visible on the above graph.

6.2.8. *Land Use Land Use Change and Forestry*

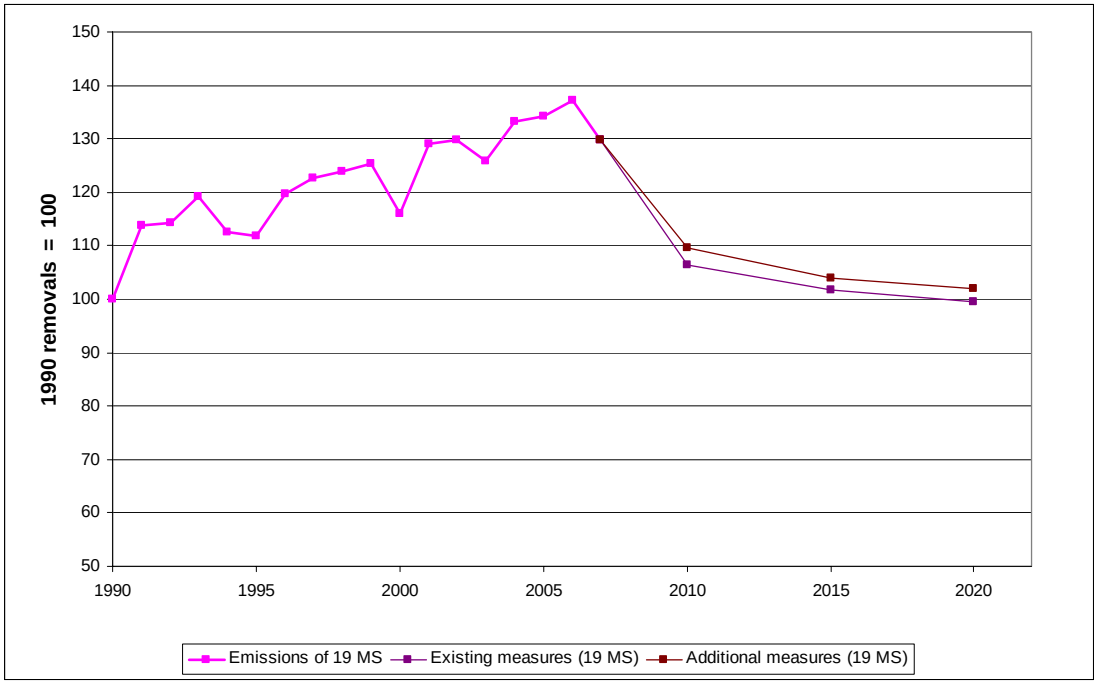
Projected emissions/removals for the land use, land use change and forestry (LULUCF) sector are available for the following Member States *only*: Austria, Finland, France, Greece, Ireland, Netherlands, Portugal, Spain, Sweden, UK, Cyprus, Czech Republic, Estonia, Latvia, Lithuania, Malta, Romania, Slovakia and Slovenia. This group of countries accounted for 65 % of the EU-27's net LULUCF removals in 2007.

The figure below shows the trend in net removals from LULUCF for the 19 Member States for which data is available, from 1990 to 2020[249]. Net removals from LULUCF generally increased to 2007. However, MS generally expect removals to decrease rapidly up to 2020. The decline in LULUCF activity between 2007-2010 is greatest in Finland, Estonia and Latvia[250]. Although Greece, Ireland, Netherlands, Portugal, Spain, the UK, Cyprus, the Czech Republic, Romania and Slovakia expect LULUCF activities to result in an increase in net removals beyond 2007 levels in 2010, this is not enough to compensate for the Member States that project a significant decline. The figure shows that net removals for the 19 MS are projected to remain higher than 1990 levels until 2015 in both scenarios but decline thereafter in the "with existing measures" scenario. In general removals decrease rapidly compared to the upward trend from 1990-2007, although the decline slows down between 2015 and 2020. In 2020, the projected removals are just above the 1990 level 'with additional measures' and slightly lower 'with existing measures' for the 19 countries that reported LULUCF projections. The precipitous decline in removals in certain Member States requires further investigation to determine the underlying reasons for the trend.

[249] Data was available for Hungary and Poland from their 2007 submission, but is not included here. This is due to significant discrepancies between LULUCF emissions reported in the 2005 inventory used for the 2007 submission and emissions reported in the latest 2007 inventory.

[250] The projections reports submitted by these Member States do not indicate reasons for the decline in their LULUCF activity. The decline in LULUCF activity, presented in Illustration 5-12 is driven by these Member States.

Illustration 6-17 Net greenhouse gas removals in the LULUCF sector, 'with existing measures' and 'with additional measures' scenarios



Notes: LULUCF projections available from 19 countries only (Austria, Finland, France, Greece, Ireland, Netherlands, Portugal, Spain, Sweden, UK, Cyprus, Czech Republic, Estonia, Latvia, Lithuania, Malta, Romania, Slovakia and Slovenia). Corresponding inventory data is shown. Projections for Portugal and Slovenia are available for the year 2010 only but have been gap-filled for 2015 and 2020.

In contrast to other graphs in this section, this graph illustrates the change in net removals from 1990-2020. Increased net removals result in a reduction in overall GHG emissions, while a reduction in net removals results in an increase in overall GHG emissions.

Intended Use of Carbon Sinks

The UNFCCC and EU-burden sharing targets are calculated based reductions in greenhouse gas emissions excluding net emission removals from LULUCF activities. However, in addition to reducing or limiting emissions of greenhouse gases, Member States can make use of carbon sinks covered by Article 3.3 and Article 3.4 of the Protocol.

- Article 3.3 (afforestation, reforestation and deforestation) on lands that have been subject to direct, human-induced conversion from a forested to a non-forested states, or vice versa

- Article 3.4 (forest management, cropland management, grazing land management and revegetation) on lands that have not undergone conversion since 1990, but are otherwise subject to a specific land use.

Parties must account for net emissions or removals for each activity during the commitment period by issuing RMUs (removal units) in the case of GHG removals from carbon sinks (e.g. afforestation) or cancelling Kyoto units in the case of net

GHG emissions from carbon sinks. LULUCF activities can therefore be used to compensate emissions from other sources in determining compliance with targets. Thirteen EU-15 Member States intend to use carbon sinks. However, the projected total amount of CO_2 to be removed between 2008 and 2012 is relatively small at 42.4 Mt CO_2 per year in total for EU-15 Member States. For the EU-27, the total intended use of sinks is 47.9 Mt CO_2 per year.

6.3. Projections by Gas

The figures below illustrate the expected change in emissions from individual GHG between 1990 and 2020 under the "with existing measures" and "with additional measures" scenarios.

The overall change in GHG emissions (excluding LULUCF) between 1990-2010, under the "with existing measures" scenario, is –287 Mt and –539 Mt in the EU-15 and EU-27 respectively. Reductions in CO_2 emissions are expected to contribute most to overall reductions, the absolute reduction of CO_2 between 1990-2010 is -54 Mt in the EU-15 and –223 Mt in the EU-27. Reductions in CH_4 emissions are –155 Mt for the EU-15 and –203 Mt for the EU-27. Reductions in N_2O emissions are –95 Mt for the EU-15 and –134 Mt for the EU-27. F-gases are the only gases expected to increase between 1990 and 2010 or 2020. However, the absolute contribution of F-gases to overall emissions is less significant: the projected growth in F-gas emissions are +17 Mt in the EU-15 and +20 Mt in the EU-27 between 1990-2010.

The overall change in GHG emissions (excluding LULUCF) between 1990-2010, under the "with additional measures" scenario, is –360 Mt and –635 Mt in the EU-15 and EU-27 respectively[251]. Reductions in CO_2 emissions are expected to contribute most to overall reductions, the absolute reduction of CO_2 between 1990-2010 is -125 Mt in the EU-15 and –314 Mt in the EU-27. Reductions in CH_4 emissions are –155 Mt for the EU-15 and –204 Mt for the EU-27. Reductions in N_2O emissions are –95 Mt for the EU-15 and –135 Mt for the EU-27. F-gases are the only gases expected to increase between 1990 and 2010 or 2020. However, the absolute contribution of F-gases to overall emissions is less significant: the projected growth in F-gas emissions are +15 Mt in the EU-15 and +19 Mt in the EU-27 between 1990-2010.

Appendix D contains detailed inventory and projections data tables, including overall EU-15 and EU-27 projections split by gas and sector and projections for each of the key sectors for the EU-15 and EU-27, also split by gas. Gap-filling was required in a number of cases to enable this detailed disaggregation to be produced for the EU-15 and EU-27 using MS projections which are not always fully disaggregated. Further information on the gap-filling methodology is provided in Section 6.8.5.

[251] The discrepancy between these numbers and the total change in by sector arises due to the fact that the by sector estimate does not include Sector 7 from the Netherlands. This is further explained in 6.2.6.

Illustration 6-18 Projected change in greenhouse gas emissions (excluding LULUCF) by gas for the 'with existing measures' scenario, 1990-2010

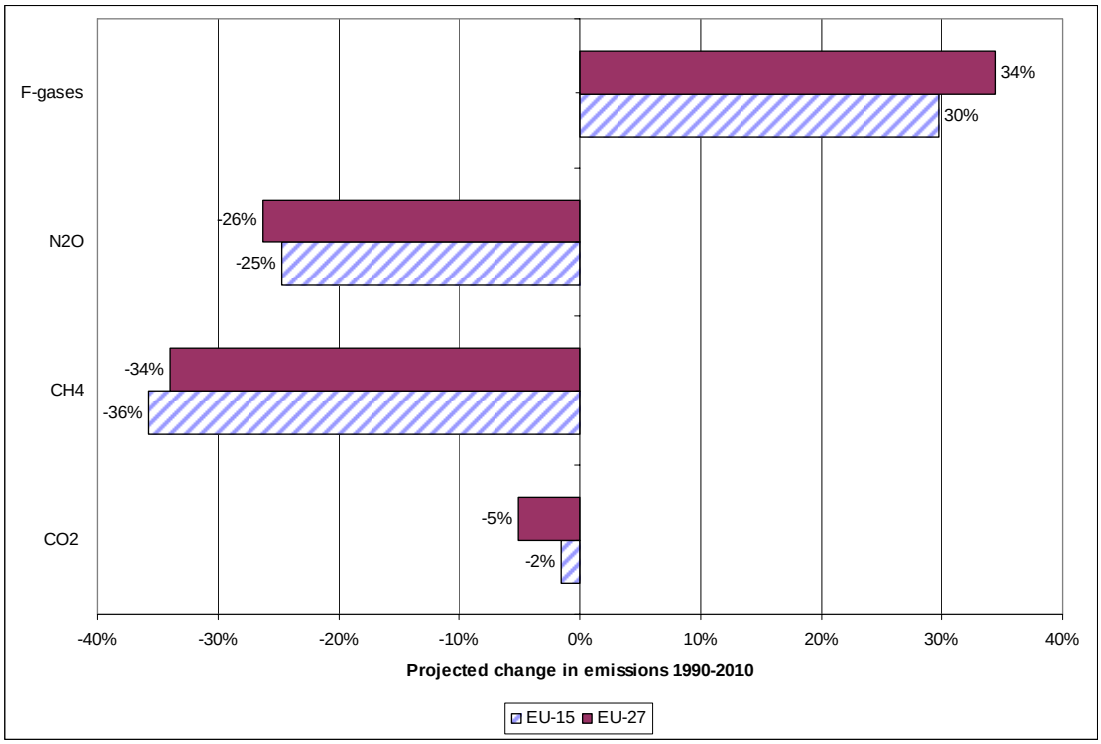


Illustration 6-19 Projected change in greenhouse gas emissions (excluding LULUCF) by gas for the 'with additional measures' scenario, 1990-2010

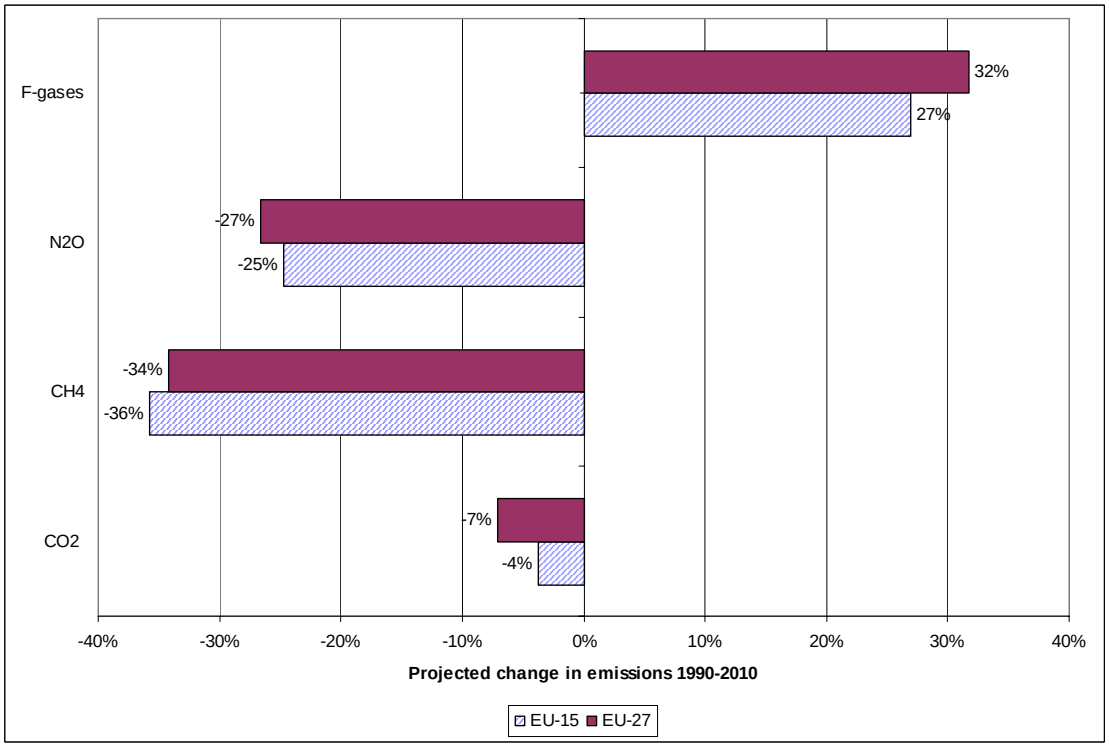


Illustration 6-20 Projected change in greenhouse gas emissions (excluding LULUCF) by gas for the 'with existing measures' scenario, 1990-2020

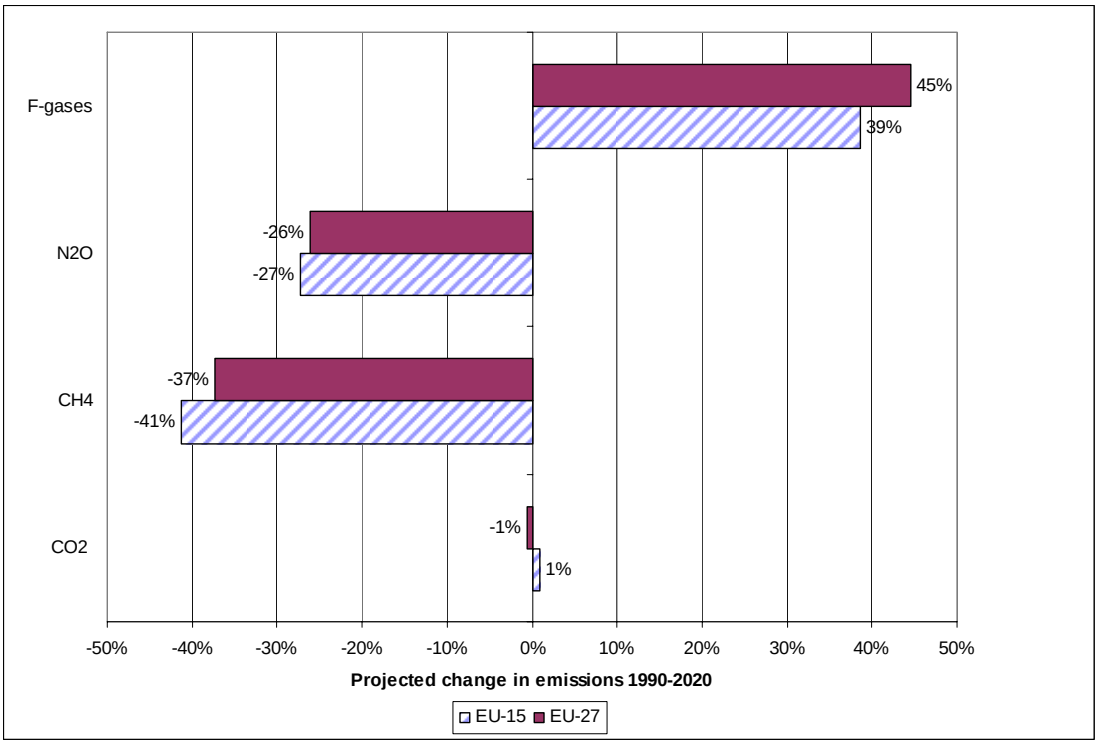
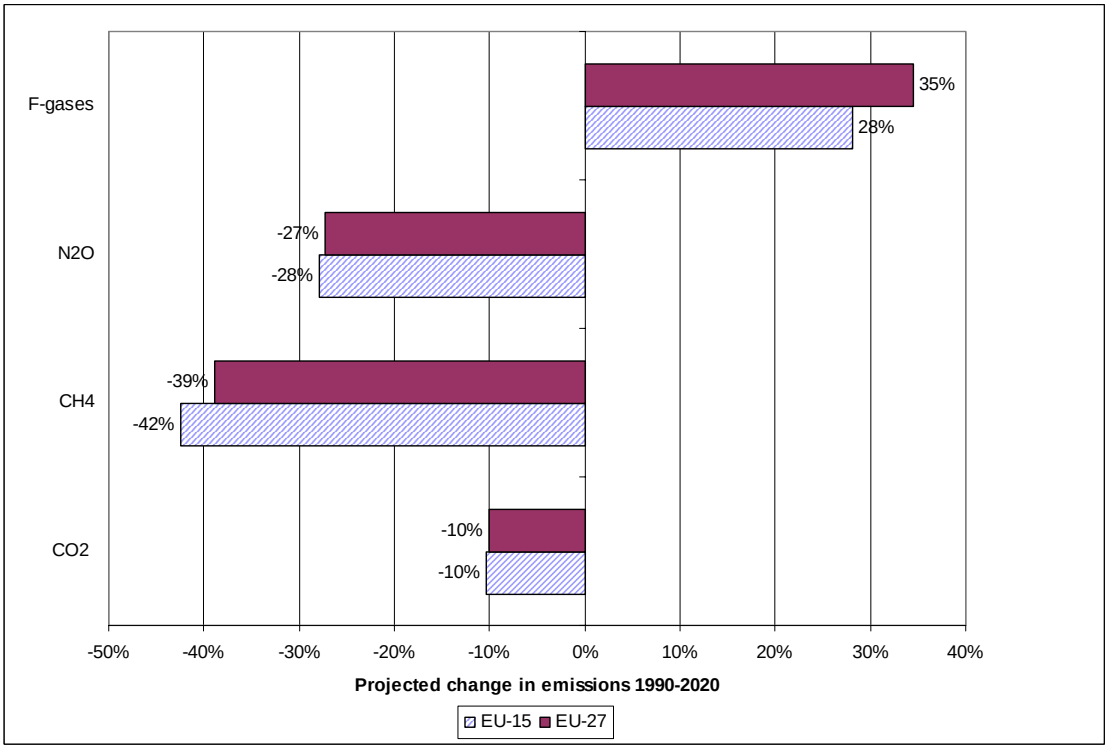


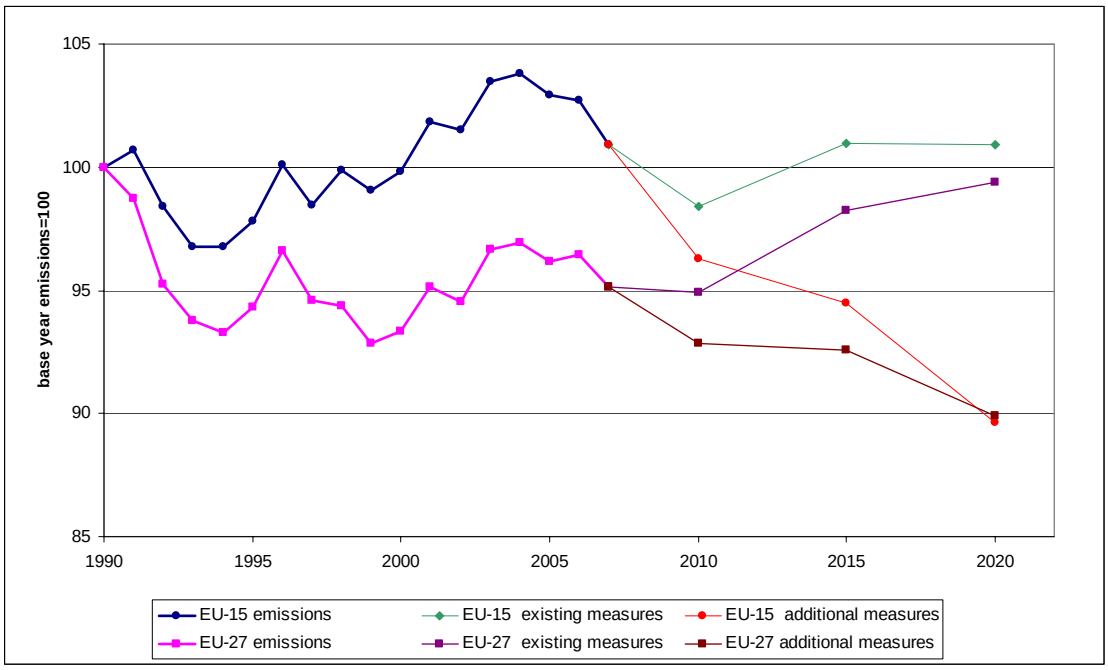
Illustration 6-21 Projected change in greenhouse gas emissions (excluding LULUCF) by gas for the 'with additional measures' scenario, 1990-2020



6.3.1. *CO_2 Emissions*

The figure below shows CO_2 emissions and projections for the 'with existing measures' and 'with additional' measures scenarios. CO_2 emissions in both the EU-15 and EU-27 have fluctuated considerably from year to year since 1990. EU-15 CO_2 emissions have been on a general upward trend since 1994 but have begun to decrease since 2004. EU-27 CO_2 emissions have remained below 1990 levels, despite increases from 1999 onwards. Emissions decreases experienced in the early 1990s resulted from fuel switching to natural gas. Increases have been driven by increased road transport and increased energy demand for buildings, particularly in the EU-15 but also more recently in the newer Member States. The impact of such increases has however been greatly mitigated by policy driven efficiency improvements in energy end-use (see Section 5.4.4) and increased deployment of low carbon power generation. Nonetheless, the 'with additional measures' projections for both the EU-15 and EU-27 are ambitious given the rate of change realized in recent years. The largest reductions in absolute terms between 2007 and 2010 are expected to come from Germany (-57 Mt CO_2), Spain (-47 Mt CO_2) and the UK (-40 Mt CO_2) while the largest increase in emissions over the same period is projected by Romania (+23 Mt CO_2).

Illustration 6-22 CO_2 emissions and projections (excluding LULUCF) 'with existing measures' and 'with additional measures'



Notes: The index on the vertical axis refers to the base year for the EU-15, that is 1990 emissions for CO_2. This means that the value for 1990 is not exactly 100 for the EU-15. As the EU-27 does not have a collective Kyoto target and therefore no collective base year, the index on the vertical axis refers to 1990 emissions for the EU-27.

6.4. Without Measures Projection

Only 7 of the EU-27 Member States reported a 'without measures' projection in their latest submissions. An alternative method has therefore been used to estimate a 'without measures' projection for the EU-15 and EU-27, making use of individual Member State projections and estimates of policy impact.

The ‘without measures’ projections presented in the figure below for the years 2010, 2015 and 2020 are derived by adding the total effect of implemented policies and measures to the ‘with existing measures’ projection scenario for each year.

The limitations of this method are:

- The effect of policies and measures used are estimates provided by individual Member States. These estimates are incomplete as not all Member States quantify the impact of all policies and measures. Estimates are therefore likely to be an underestimate of the total impact of policies and measures.

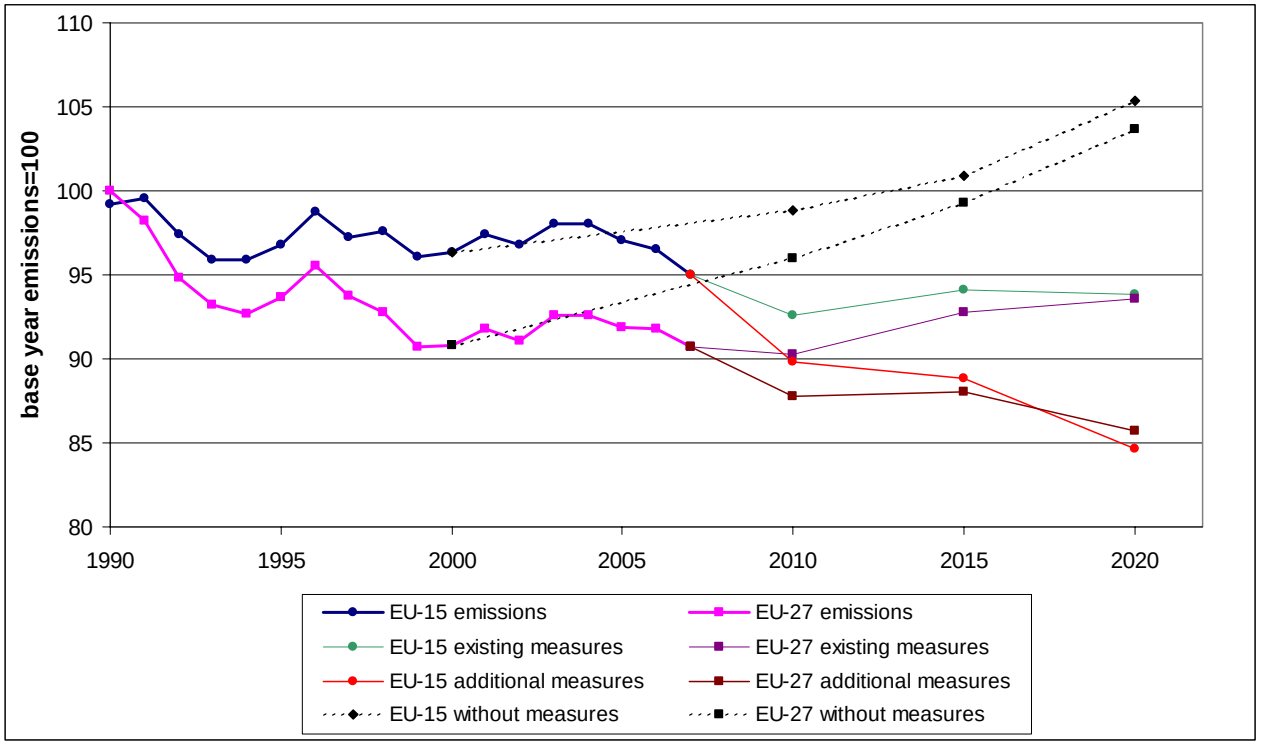
- A starting year of 2000 is chosen in line with the launch of the first European Climate Change Programme. However, the policies for which estimates are provided may have been implemented by Member States in any given year before or after the year 2000.

- Interactions between policies and measures may not be accounted for since individual policy estimates are aggregated together.

- 2000 inventory data is used as a starting point for the WOM scenario. Data for the scenario is then interpolated from this point to the calculated WOM estimates for the years 2010, 2015 and 2020. The method does not therefore estimate the situation in the absence of policies and measures in the interpolated years.

Nonetheless, the method does illustrate to some extent a conservative estimate of the total impact of policies and measures in the EU. This is considered preferable to a simple extrapolation of historic trends given difficulties with choosing a single starting year for the EU.

Illustration 6-23 Greenhouse gas emissions and projections (excluding LULUCF) including a 'without measures' scenario, 1990 – 2020



Notes: The index on the vertical axis refers to the base year for the EU-15, that is 1990 emissions for CO_2, CH_4 and N_2O and 1995 emissions for the F gases (with the exception of Austria, France and Italy where the base year for F gases is 1990). This means that the value for 1990 is not exactly 100 for the EU-15. As the EU-27 does not have a collective Kyoto target and therefore no collective base year, the index on the vertical axis refers to 1990 emissions for the EU-27.

Sources: Member State inventory and projections data, as submitted to the European Commission until 15th May 2009 (for individual sources, see EEA (2009), EEA Report: GHG Trends and Projections across Europe). EEA (2009), Policies and Measures database, 9th September 2009 extract, http://www.eea.europa.eu/themes/climate/pam-database

6.5. Projections of Indirect GHG

The UNFCCC guidelines for National Communications (1999) state that parties may provide projections of indirect GHG carbon monoxide (CO), nitrogen oxides (NO_x), non-methane volatile organic compounds (NMVOC) and sulphur oxides (SO_2). 2010 projections for nitrogen oxides (NO_x), non-methane volatile organic compounds (NMVOC) and sulphur oxides (SO_2) are available in the context of reporting under the National Emission Ceilings Directive[252] (NECD) and are presented below.

EU-27 'with existing measures' scenario projections presented in the table below are based on aggregated data reported by the individual Member States. The emission ceilings shown are the aggregated EU-27 emission ceilings defined in Annex I and Annex II of the NECD.

2010 emission ceilings for NO_x and NMVOCs have proven to be the most difficult of the four ceilings for many Member States to meet, mostly due to sharp increases in NO_x and NMVOCs from the transport and solvents sector respectively.

Table 6-1 Sum of EU Member State projections compared with EU-27 emission ceilings as defined in Annex I and Annex II of the NECD

GAS	WEM projections (Kt)	Annex I emission ceilings (Kt)	Difference from WEM (%)	Annex II emission ceilings (Kt)	Difference from WEM (%)
NOx	9525	9003	6 %	8180	16 %
NMVOC	7960	8848	-10 %	7585	5 %
SO_2	5752	8297	-31 %	7832	-27 %

Source: EEA[253]

6.6. Assessment of Aggregate Effects of Policies and Measures

In order to ensure consistency with the aggregated Member State projections presented in this section, estimates of the total effect of policies and measures are

252 Directive 2001/81/EC of the European Parliament and the Council on National Emission Ceilings for certain pollutants (NEC Directive) sets upper limits for each Member State for the total emissions in 2010 of the four pollutants responsible for acidification, eutrophication and ground-level ozone pollution (sulphur dioxide, nitrogen oxides, volatile organic compounds and ammonia), but leaves it largely to the Member States to decide which measures – on top of Community legislation for specific source categories - to take in order to comply. The NEC Directive has been amended as part of the accession of new Member States. A consolidated NEC Directive for the EU 27 includes the entire Community as of 1st January 2007.
http://ec.europa.eu/environment/air/pollutants/ceilings.htm

253 EEA (2009), EEA Technical report: NEC Directive Status Report 2008 (Reporting by the Member States under Directive 2001/81/EC of the European Parliament and of the Council of 23rd October 2001 on national emission ceilings for certain atmospheric pollutants).

also based on an aggregation of the latest available Member State estimates of the impact of individual national policies and measures.

This includes the impact of **both** EC-level and non-EC initiated policies and measures (implemented/adopted and planned). In contrast to other parties NCs, the contribution of EC-level policies only to the total effect of policies is highlighted separately in Section 5, given that the focus of this NC is on EC level activity.

Two methods can be used and compared to quantify GHG savings from existing and additional policies and measures at an aggregated level. Due to the difference in methodologies, they provide different estimates of savings from the policies and measures. There are advantages and disadvantages to both methods.

6.6.1. *Bottom-up Approach and Top-down Approach*

The bottom-up approach estimates total savings from policies and measures by aggregating the expected savings from individual policies and measures. Member States report the savings from their 'existing measures' (EM) and 'additional measures' (AM) separately. Member States do not quantify the impact of all policies and measures. Estimates of the total effect of policies and measure (bottom-up approach) are therefore an underestimate of the total impact of policies and measures.

Where possible, therefore, the total effect of policies has also been estimated by subtracting national WOM, WEM and WAM projections. The top-down estimates total savings from policies and measures by taking the difference between different projection scenarios of total GHG emissions prepared by the Member States. The details of the three different scenarios are described in Section 6.1.1 (WEM), Section 6.1.2 (WAM), and Section 6.4 (WOM).

Savings from the existing and additional PAMs are therefore calculated as follows:

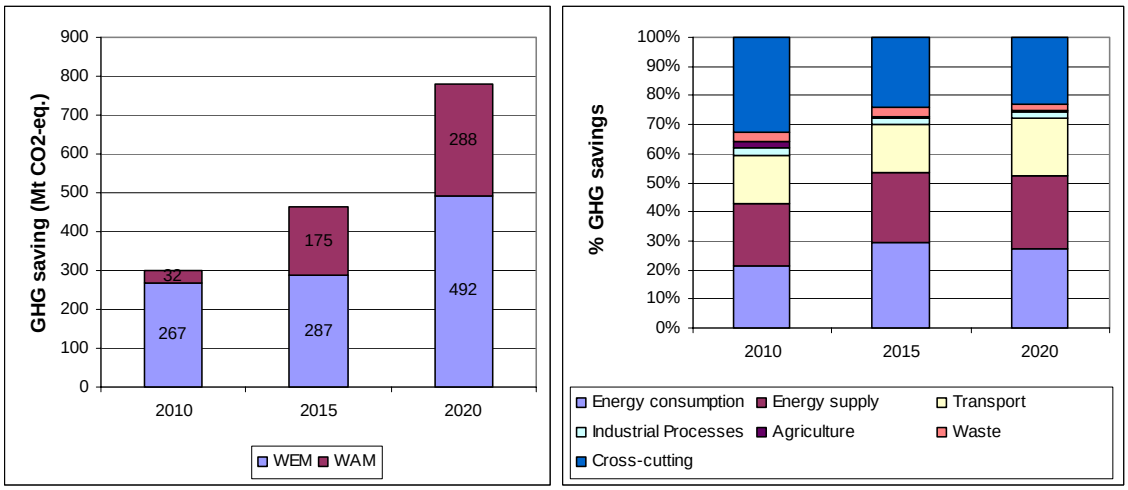
Savings from EM = WOM scenario – WEM scenario. This method underestimates savings from existing PAMs at EU level because only about half of the Member States provide a WOM projection.

Savings from AM = WEM scenario – WAM scenario

However, this results in an underestimate of savings from the existing measures as only ten Member States have provided a WOM projection.

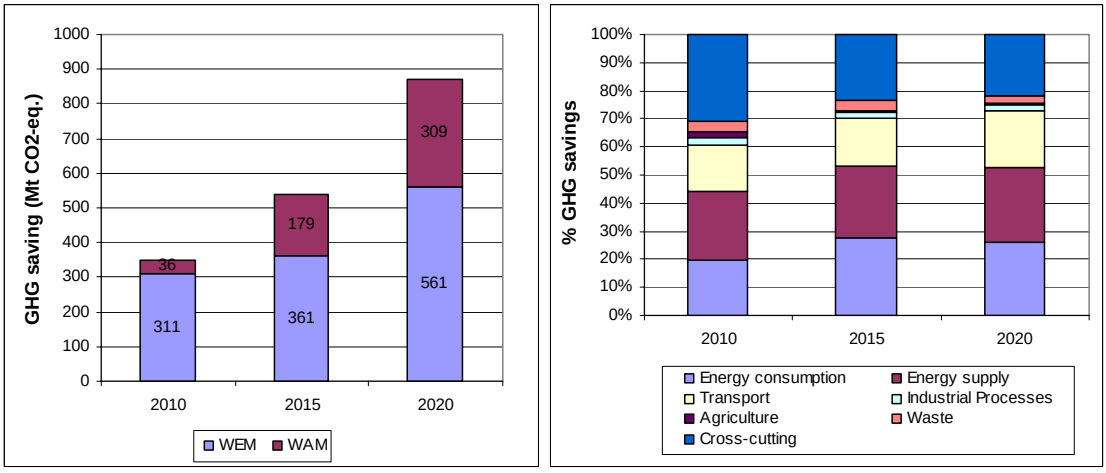
The two figures below present the total effect of policies and measures for the EU-15 and EU-27 respectively, as derived from an aggregation of Member State estimates of the impact of individual policies and measures (bottom-up approach). In the bottom-up method, the estimated impacts for sectors such as the energy and industrial process sectors are underestimated since some of the savings are covered under the 'cross-cutting' policies which include the EU ETS and IPCC.

Illustration 6-24 Total effect of policies and measures (bottom up approach), EU-15



Source: EEA (2009), Policies and Measures database, 9th September extract, http://www.eea.europa.eu/themes/climate/pam-database

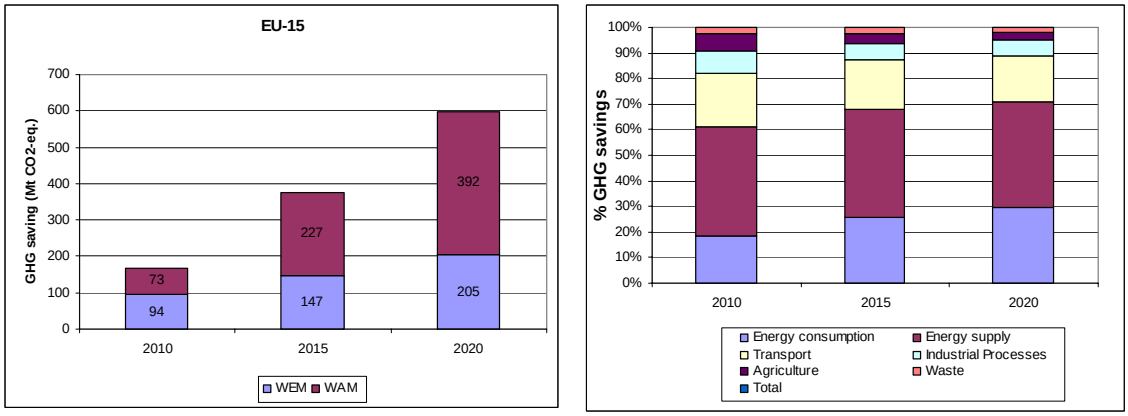
Illustration 6-25 Total effect of policies and measures (bottom up approach), EU-27



Source: EEA (2009), Policies and Measures database, 9th September 2009 extract, http://www.eea.europa.eu/themes/climate/pam-database

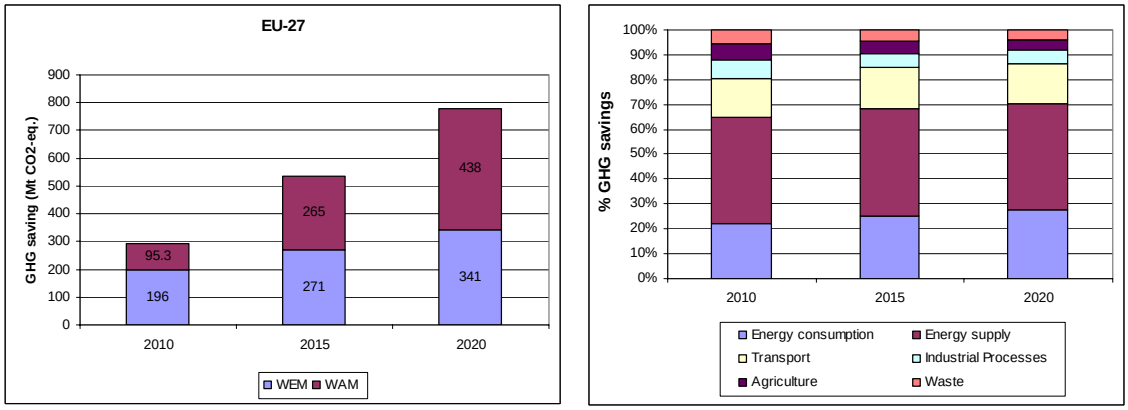
The next figure below presents an estimate of the total impact of policies and measures derived by subtracting national WOM, WEM and WAM projections (top-down approach). The bottom-up approach in the previous figures indicates that EU-27 emissions will be reduced by 5.6 % in 2010 and by 10.1 % in 2020 compared to 1990 emissions as a result of implemented measures. For additional measures, the bottom-up approach tends to underestimate the emission reductions. The estimated impact of the measures is 0.6 % in 2010 and 5.6 % in 2020. Using the top down method, for the EU-27, the emission reductions from these implemented measures are 3.5% in 2010 and by 6.1 % in 2020 compared to 1990 emissions. For additional measures, the estimated impact using the top down method is 1.7 % in 2010 and 7.9 % in 2020. The difference in the estimates by using the two methods is explained in Section 6.6.1.

Illustration 6-26 Total effect of policies and measures (top down approach) EU-15



Source: Member State inventory and projections data, as submitted to the European Commission until 15th May 2009 (for individual sources, see EEA (2009), EEA Report: GHG Trends and Projections across Europe).

Illustration 6-27 Total effect of policies and measures (top down approach) EU-27



Source: Member State inventory and projections data, as submitted to the European Commission until 15th May 2009 (for individual sources, see EEA (2009), EEA Report: GHG Trends and Projections across Europe).

Table 6-2 indicates the proportion of Member State estimated policy savings for the EU-27 that are attributable to the Common and Co-ordinated Policies and Measures (CCPM) of the EU calculated by using the reported savings from the bottom-up method (described in detail in Section 5).

Table 6-2 Portion of Member State policy savings attributable to the CCPM(%), EU-27

Year	WEM	WAM
2010	82%	36%
2015	75%	71%
2020	76%	66%

Source: EEA (2009), Policies and Measures database, 9th September extract, http://www.eea.europa.eu/themes/climate/pam-database

6.7. Supplementarity Relating to Mechanisms under Article 6, 12 and 17 of the Kyoto Protocol

According to the Kyoto Protocol reporting guidelines, each Annex I Party shall provide information on how its use of the Kyoto Protocol mechanisms is supplemental to domestic action, and how its domestic action thus constitutes a significant element of the effort made to meet its quantified limitation and reduction commitments under Article 3, paragraph 1, in accordance with the provisions of decision 5/CP.6. Eleven Member States[254] expect that they will, in part, rely on the Kyoto mechanisms to bridge the projected gap between domestic emissions and their burden-sharing targets.

6.7.1. *Intended Use of Flexible Mechanisms*

Section 5.2.1 contains detailed information on Member States' intended use of flexible mechanisms of the Kyoto Protocol (i.e. Joint Implementation, Clean Development Mechanism, International Emissions Trading). EU-15 Member States intend to use credits generated from flexible mechanisms to meet their individual targets totalling 93.1 Mt CO_2-eq per year over the commitment period. Of the EU-12 MSs, only Slovenia and Hungary intends to use flexible mechanisms. Most Member States in the EU-27 intend to use the flexible mechanisms to increase their emission rights, Hungary is the only Member State that has reported quantified projections for selling assigned amount units (AAUs).

This results in a total intended use of 77.6 Mt CO_2-eq per year for the EU-27. These figures include only governmental use of flexible mechanisms. Additional reductions may occur as a result of EU ETS operator purchase of project credits (see Section 6.7.2).

Table 6-3 indicates that Member State intended use of flexible mechanisms in both the EU-15 and EU-27 is indeed projected to be supplemental to domestic action as demonstrated through savings projected to result from implemented and planned policies and measures during the Kyoto commitment period.

[254] Belgium, Denmark, Finland, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain. Austria also relies on Kyoto mechanisms to reach the target; at present however the use of Kyoto mechanisms as currently planned and emission removals from carbon sink activities will not suffice to meet their target. Slovenia is the only EU-12 Member States which anticipates that it will need to use the Kyoto mechanisms to meet its target.

As a share of the EU-15's target of an -8 % reduction compared to the base year, the planned use of flexible mechanisms to achieve non-domestic reductions accounts for around 2.2 percentage points (i.e. approximately one-quarter of the reductions).

Table 6-3 Projected annual balance between policy impacts in 2010 and flexible mechanisms during 2008-2012 (Mt)

	Estimated effect of policies (bottom-up)			Estimated effect of policies (top-down)			Intended use of flexible mechanisms
	WEM	WAM	Total	WEM	WAM	Total	
EU-15	267	32	299	94	73	167	93.1
EU-27	311	36	347	196	95	291	77.6

6.7.2. *The EU ETS Effect*

The 'EU ETS effect' is an estimate of the net transfer of Kyoto units by EU ETS operators to comply with their cap (difference between projected ETS emissions and the ETS cap). Twelve of the EU-15 Member States (excluding France, Greece and Portugal) reported projections of EU ETS emissions for 2008-2012. For France, Greece and Portugal gap filling was applied by assuming that projections in the ETS sectors were equal to allowed emissions under the National Allocation Plan for the period 2008-2012.

Based on these projections, it is estimated that to comply with their obligations, ETS operators in the EU-15 would need to acquire about 61 million units (EUA, ERUs or CERs). This is therefore added to the number of Kyoto units Member States expect to purchase at government level, and represents about 1.4 % of the EU-15 base-year emissions. The EU ETS effect is presented in Illustration 6-1 and explained in greater detail in the EEA's 2009 Greenhouse gas emission trends and projections in Europe report.

6.8. Methodology Used for GHG Emissions Projections Presented in this Report

Information presented in this section for the EU-15 and EU-27 is an aggregation of individual Member State information[255].

Detailed descriptions of the methodologies used to generate individual Member State projections, as well as sensitivity analysis, uncertainty analysis and assumptions are presented in individual Member State National Communications and are not replicated in detail in the EC's National Communication. Appendix E does however contain a summary of Member State modelling approaches and quality assurance procedures

[255] As reported to the European Commission between 15th March and 15th May 2009 under the EU's Monitoring Mechanism Decision 280/2004/EC Article 3.2. For individual sources, see EEA (2009), EEA Report: GHG Trends and Projections in Europe. Updated information was not made available for Hungary and Poland within this period and is therefore taken from older submissions, as reported in EEA (2008), GHG Trends and Projections in Europe EEA Report No 5/2008.

including sensitivity and uncertainty analysis where available. Section 6.8.7 also contains an analysis of the consistency of key assumptions used by Member States to generate their projections.

Reporting of projections and related information for the EU is dependent upon the timely submission of relevant data from Member States. The approach used to aggregate Member State projections is detailed below.

6.8.1. *Starting Year for Projections*

The UNFCCC guidelines for National Communications (1999) indicate that the starting point for the 'with existing measures' and 'with additional measures' projections should be the last year of inventory data (i.e. 2007 for the 5th National Communication). The starting point for EU projections is variable due to the aggregation of Member State projections.

Member States present projections relative to historic data; it may be assumed that the latest year of historic data presented is the starting point for the projections. This so-called 'reference year' for projections presented by each Member State is detailed in Table 6-4. Many Member States have been unable to use the 2007 inventory data as the starting point to generated projections due to the cut off date used to prepare the EC's 5th National Communication (15th May 2009).

Table 6-4 Projections reference year presented by Member States

Member State	Reference year
Bulgaria	2000
Hungary	2001
Austria, Germany, Latvia, Poland, Portugal, Sweden	2005
Belgium, Denmark, Estonia, Finland, France, Luxembourg, Netherlands, Romania, Slovakia, Spain, United Kingdom	2006
Cyprus, Czech Republic, Greece, Ireland, Italy, Lithuania, Malta, Slovenia	2007

EU-15 and EU-27 aggregated projections for the 'with existing measures' and 'with additional measures' scenarios are however presented relative to the latest inventory data available, as reported in 2009.

The UNFCCC guidelines for National Communications (1999) indicate that the starting point for the 'without measures' scenario should be 1995 or an earlier year. As a 'without measures' was provided for 10 Member States only, an alternative methodology has been used to generate a 'without measures' projection for the EU, as described in Section 6.4. The year 2000 was chosen as the starting year for this scenario since the European Commission launched its first Climate Change Programme in that year. The approach makes use of Member State estimates of the impact of policies and measures for the years 2010, 2015 and 2020 and may therefore also reflect policies that were introduced prior to 2000.

6.8.2. *Projections Adjustment: Starting Year*

In order to correct for any inconsistencies between projected emissions reported by Member States and the latest available inventory data, Member States' projected emissions have been adjusted at a sectoral level where the deviation between the total emission (excluding LULUCF) for the reference year and the latest available inventory data for that year is more than 3 %. The adjustment ensures that the relative progress between the reference year and the year for which projections are reported remains constant. For Member States where this applies, the proportion that the emission deviates by is calculated for each sector and applied to the reported projection by using the formula illustrated below. The adjustment has, been applied only to the German and Bulgarian projections.

Illustration 6-28 Projections adjustment method

$$\text{Projection}_{\text{adjusted}} = \text{Projection}_{\text{submission}} \times \frac{\text{Emissions reference year}_{\text{GHG inventory}}}{\text{Emissions reference year}_{\text{submission}}}$$

Where:

Projection $_{\text{adjusted}}$ = as used in this chapter where the deviation between reference year emissions and latest available inventory data is greater than 3%.

Projection $_{\text{submission}}$ = as reported by the country in its most recent submission.

Emissions reference year $_{\text{submission}}$ = as reported with the latest available projections.

Emissions reference year $_{\text{GHG inventory}}$ = as reported in:

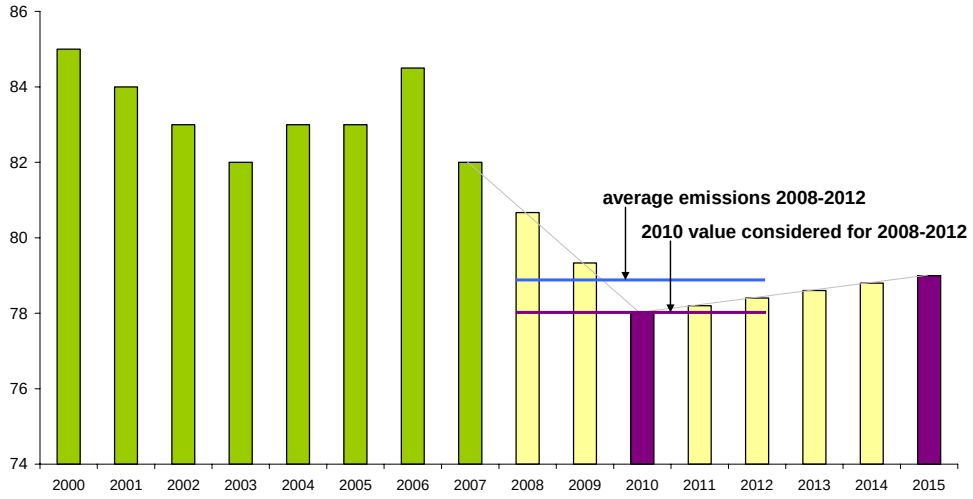
- the review report of the initial report under the Kyoto Protocol if the reference year selected is the Kyoto base year;
- the 2009 greenhouse gas inventory submitted to UNFCCC, if the reference year selected is not the Kyoto base year.

6.8.3.*Projections Adjustment: 2010 vs 2008-2012*

Some Member States present projections for the average of the Kyoto commitment period 2008-2012 while others present projections for the year 2010 specifically. Where Member States have provided projections for the average of the years 2008-2012, GHG projection totals have been calculated for the year 2010. This has been done by using the latest 2007 inventory, average projection reported for the years 2008-2012 and the projection for the year 2015. This adjustment has been carried out for the overall projections, by sector projections, by gas projections and the by gas by sector projections in Appendix D. 2010 emissions were calculated based on this formula:

$$2010 = \frac{Average(2008-2012) - 0.2\,x(2007) - 0.12\,x(2015)}{0.68}$$

Illustration 6-29 Difference between 2010 projections and average 2008-2012 projections



6.8.4.*Policies Included in the Projections Scenarios*

EU-15 and EU-27 projections presented in this section are aggregated from individual Member States submissions. Projections for the 'with existing measures' and 'with additional measures' scenarios therefore include a variety of measures depending on the status of implementation of EU initiated policies in different Member States and programmes of measures developed independently in individual Member States. Measures included in the EU 'with existing measures' and 'with additional measures' scenarios are not therefore indicated in this section.

6.8.5.*Completeness of Projections*

Not all Member States provide projections by gas for each of the key source sectors.

Projections for the year 2030 and projections for the Forestry sector are not reported by most Member States. Member States do not report projections of carbon monoxide

under any European or international legal obligations. It has not therefore been possible to present this information at the EU level.

Projected removals from LULUCF and projected emissions from international bunker fuels are available for only a selection of Member States (19 and 11 respectively). It has not therefore been possible to present projections for the EU-15 or EU-27. Projections have however been aggregated for those Member States for which data is available and presented relative to inventory data for the same group of Member States.

Gap-filling has been carried out where minor gaps exist in the projections reported by Member States. The following methods were used to gap-fill:

- Where a 'with additional measures' projection has not been provided, the 'with additional measures' projection has been gap filled with the 'with existing measures' projection, to enable an EU level 'with additional measures' projection to be produced.

- Where a sectoral or gas breakdown is available for one scenario and unavailable for another, the available proportions from the former are applied to the national total of the latter.

- Where total projections are provided but no gas or sectoral breakdown is provided, the relevant breakdowns from 2007 inventory data are applied to the projections national total to generate gas and sector breakdowns.

'Without measures' projections are available for 10 Member States only. An alternative approach was therefore used to generate EU level projections for this scenario. The methodology used is described in Section 6.4.

6.8.6.*Completeness of Estimates of Policy Impacts*

Member State estimates of the impact of individual policies and measures that are used in Section 6.6. This data source was chosen in preference to EU estimates to ensure consistency with Member States projections presented in this section. EU estimates of the impact of EU initiate policies are provided in Section 5.

It should be noted, however, that these estimates are incomplete as not all Member States quantify the impact of all policies and measures. Estimates are therefore likely to be an underestimate of the total impact of policies and measures. Where possible, therefore, the total effect of policies has also been derived by subtracting national WOM, WEM and WAM projections. This approach is also limited as very few Member States provide a WOM scenario.

6.8.7.*Consistency of Assumptions for Projections*

It is difficult to immediately compare and differentiate inconsistencies across some Member State projections. In particular, fundamentally different modelling approaches such as bottom-up cost optimization, top-down macroeconometric or CGE (computable general equilibrium), or combinations of approaches (within the same model or within different sectors) have been used. A summary of Member State methodologies is provided in Section 4.

However, it is possible to draw some high-level conclusions around the consistency of key underlying assumptions that are applied throughout the various models. Some of the principal assumptions used by Member States in their modelling of emission projections are reported in Table 6-5 below.

The easiest parameter to consider for consistency is that of international oil price since this is a global parameter and therefore common to all MS. It is clear from MS reporting that there is considerable variability in projected oil price. Forecasting oil prices out to 2020 is highly uncertain; however the degree of variability across MS for which data was available is large. Mean oil price across these data is around €21/GJ, with upper and lower bounds of €84 and €7/GJ respectively and a standard deviation of €23/GJ. Depending on the modelling approach used it follows that differences in oil price will affect the energy consumption in each MS and therefore emission projections.

Gross Domestic Product growth rate is an important driver of emissions projections, however comparing MS reported values for consistency is difficult due to genuine differences in economic projections. In addition, the data resolution (reporting values for 2010 and then 2015) for this exercise makes it difficult to consider which nations have included the affects of the current global economic downturn in their projections. Communications with MS during the compilation of the EEA Trends and Projections report identified which MS had included the impacts of the global downturn in their emission projections. Those confirming they had included this impact are: Belgium, Czech Republic, Finland, Greece, Ireland and Italy. Intuitively those MS that included the economic effects of the downturn could be expected to show a low growth rate in 2010 compared to higher growth in 2015 assuming the downturn has passed. This profile is shown by Ireland, however the same is true for Lithuania, Portugal, Slovakia and the United Kingdom. The remaining MS shown in the table below report stable growth rates across the reporting period. Since we do not know how including the impacts of the recession would have affected emissions projections for those MS that have not done so previously, we cannot conclude how large an inconsistency this represents. However, based on the profiles considered here it appears that including its affects might not show as strongly in the GDP growth rate for 2015 relative to 2010.

Calculating the change in energy demand per capita in each MS over the period 2010 to 2020 provides an interesting metric with which to infer energy efficiency projections in different MS. The metric ranges from an increase in energy demand of 27 % (Lithuania) to a decrease of 7 % (United Kingdom) across the MS and on average shows an increase of 7 %.

Climatological parameters (represented in the form of Heating Degree Days - HDDs) appear to have been applied consistently across the MS for values are reported. Most MS assume a stable value for the reporting time period and considering the states of Latvia, Estonia[256] and Finland, which share borders around the north-eastern Baltic sea, HDD values appear very consistent (less than 10% difference between maximum and minimum values across these states).

This simple analysis shows that there appear to be some fundamental differences in the underlying parameters assumed by EU MS for emission projection modelling. However the analysis does not show the extent to which MS projections and therefore the EU aggregate projection are affected by the variation in MS assumptions. In some

[256] We have assume that values reported in 2015 and 2020 are typographical errors

cases this variation is legitimate and leads to projections that more accurately reflect expected changes in key emission drivers (e.g. as a result of differing levels of economic growth in different MS). In other cases MS choice of varying assumptions may lead to projections which do not consider those key drivers in a consistent way e.g. whether the impact of the economic crisis is taken into account or what is assumed for international oil price. As a result, the EU is unable to report on the key assumptions underlying the EU aggregated projections.

Further work should be carried to assess the impact of inconsistent assumptions with a view to providing guidance to MS in future aimed at improving the consistency of assumptions.

Table 6-5 MS assumptions for emissions projection modelling

Member State	Gross Domestic Product growth Rate			International oil prices			Heating Degree Days			Change in energy demand per capita
	Annual growth rate (%)			€ per GJ (Gigajoule)			Annual HDD			%
	2010	2015	2020	2010	2015	2020	2010	2015	2020	2010 - 2020
Austria	2.5	2.3	2.3	14.9	14.9	14.9	3,245	3,187	3,133	13%
Belgium	3.0	2.5	3.5	7.3	7.8	8.2	3,570	3,570	3,570	-3%
Bulgaria	n/a	n/a	n/a	n/a	n/a	n/a	-	-	-	n/a
Cyprus	n/a	n/a	n/a	n/a	n/a	n/a	-	-	-	n/a
Czech Republic	3.0	2.5	3.5	7.3	7.8	8.2	3,570	3,570	3,570	-3%
Denmark	n/a	n/a	n/a	51.3	43.6	44.9	-	-	-	n/a
Estonia	6.8	4.7	2.7	8.3	8.3	8.6	4,444	4	4	12%
Finland	4.0	2.2	2.0	10.4	10.0	10.6	4,489	4,418	4,347	15%
France	2.1	2.1	2.1	9.8	9.8	9.8	n/a	n/a	n/a	-13%
Germany	2.1	1.7	1.6	7.2	7.3	8.1	-	-	-	-2%
Greece	2.6	2.5	2.5	8.63	8.99	11.13	1,269	1,269	1,269	17%
Hungary	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Ireland	2.8	5.2	4.7	10.8	12.3	12.9	na	na	na	4%
Italy	1.6	1.7	1.7	49.9	52.9	55.0	-	-	-	9%
Latvia	8.0	5.5	5.0	n/a	n/a	n/a	4,184	4,184	4,184	23%
Lithuania	-2.6	4.5	4.5	23.4	24.4	25.5	4,176	4,176	4,176	27%
Luxembourg	2.7	5.3	4.4	n/a	n/a	n/a	-	-	-	-2%

Member State	Gross Domestic Product growth Rate			International oil prices			Heating Degree Days			Change in energy demand per capita
	Annual growth rate (%)			€ per GJ (Gigajoule)			Annual HDD			%
	2010	2015	2020	2010	2015	2020	2010	2015	2020	2010 - 2020
Malta	2.5	2.9	2.7	n/a	n/a	n/a	-	-	-	10%
Netherlands	n/a	n/a	n/a	n/a	n/a	n/a	-	-	-	n/a
Poland	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Portugal	1.7	1.9	2.1	8.0	8.4	8.8	1,268	1,268	1,268	16%
Romania	n/a	n/a	n/a	n/a	n/a	n/a	-	-	-	n/a
Slovakia	6.5	6.3	4.7	n/a	n/a	n/a	-	-	-	15%
Slovenia	4.6	3.4	2.0	7.17	6.65	6.98	3,053	3,053	3,053	11%
Spain	4.6	2.8	3.0	n/a	n/a	n/a	-	-	-	5.5%
Sweden	2.6	2.6	2.3	84.0	84.0	84.0	100	100	100	-2%
United Kingdom	1.3	2.4	2.3	41.0	42.6	44.2	93	93	93	-7%

Source: MS reporting to the EEA based on the Monitoring Mechanism

7. VULNERABILITY ASSESSMENT, CLIMATE CHANGE IMPACTS AND ADAPTATION MEASURES

Key Developments

- Since the 4th National Communication, there has been much progress on assessing the impacts of climate change and developing adaptation policy in Europe.

- The Fourth Assessment Report (4AR) of Intergovernmental Panel on Climate Change (IPCC) issued in 2007 provided conclusive evidence that climate change is caused by anthropogenic emissions of greenhouse gases and provided new impetus to climate change research and policy development in Europe. European researchers have made a significant contribution to this effort by supporting the process and providing new scientific evidence that has fed into the assessment.

- Since the IPCC 4AR publication, greater rates of change have been observed. The 2008 report by the European Environment Agency (EEA), the EC Joint Research Centre (JRC-IES) and the World Health Organisation Europe has provided new evidence that climate change will have significant implications across Europe. A number of new research programmes are being funded to improve our understanding of adaptation[257].

- The EC has adopted a more coordinated approach on policy development and published a White Paper in April 2009 to define the policy direction of the EC in the forthcoming years. The EC is currently working on the design of an Adaptation Framework to reduce the EU's vulnerability to the impacts of climate change. This framework will complement and strengthen the actions taken by the EU Member States.

- The EC has advanced a number of initiatives to support developing countries in their efforts to adapt to climate change. For instance, the Global Climate Change Alliance, launched in 2007 to deepen cooperation between the EC and developing countries, renews the EC's commitment to mainstream climate change into development cooperation and provides technical and financial support for adaptation primarily in the Least Developed Countries (LDCs) and Small Island Developing States (SIDS).

- The European Commission is developing a European "Clearing house" of the most up-to-date and state-of-the-art information - an IT tool and database on climate change impacts, vulnerability and best practices on adaptation.

7.1. Overview

Both public and political recognition of the need to take urgent action to combat climate change has emerged in recent years. The EC has shown global leadership on climate change and is committed to maintain this role. Reducing emissions of

257 See section 9 for further details.

greenhouse gases is of paramount importance to avoid dangerous climate change. The EC also recognises that some impacts are unavoidable because of past emissions and Europe must take action to understand these impacts, develop adaptation responses and assist developing countries in strengthening their capacity to cope.

Since the 4th National Communication, research on the impacts of climate change, vulnerability and adaptation options has become a high priority for Europe. The development of a more coordinated approach for identifying appropriate adaptation responses in Europe and assisting the most vulnerable countries in coping with climate change has been a major focus of work over the past four years. Some of the key developments are highlighted at the start of this section.

Adaptation is already taking place in the EU. Since the publication of the EU 4th NC in 2006, the European Community and its Member States have significantly increased the number of actions for coping with the impacts of climate change at international, national, local levels and across sectors:

- International cooperation on adaptation has been strengthened to assist the most vulnerable countries around the globe in coping with climate change.

- New research has provided new insights into the impacts of climate change to Europe and potential adaptation responses.

- More specific plans have been incorporated into European and national policies for a number of sectors of the economy - for example the Water Framework Directive (2000/60/EC)[258] to improve water quality, the Floods Directive (2007/60/EC)[259] aimed at reducing damage from floods and the European Commission's Communication on Water Scarcity and Droughts (COM/2007/0414 final)[260].

- A more proactive risk management approach has replaced reactive disaster relief and important lessons have been learnt from past extreme climate events. A prominent example is the implementation in several countries of early warning systems for heatwaves.

- National action plans are being developed for identifying country-level responses to adaptation (for example in Denmark, Finland, France, Germany, Hungary, Netherlands, Spain, Sweden and the United Kingdom).

- Regions and local governments within the European Member States are also developing adaptation strategies.

However, the EC recognises that an increased effort is required to reduce the vulnerability of different regions of the EU and mainstream adaptation in EC policies, as well as assist developing countries in coping with climate change. The EC is therefore developing actions on both fronts through an Adaptation Framework, which will provide an integrated and coordinated approach at the EC level, and strengthening international cooperation on adaptation through the Global Climate Change Alliance and a number of new initiatives aimed at developing countries.

258 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32000L0060:EN:NOT

259 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32007L0060:EN:NOT

260 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52007DC0414:EN:NOT

The following sections outline some of the main findings on vulnerability, impacts and adaptation and some of the key current and planned activities that have been developed since the 4th National Communication.

7.2. Expected Impacts of Climate Change In Europe and Vulnerability Assessment

Significant changes in climate and its impacts are already visible in Europe. Increasing temperatures, changing precipitation, rising sea level, more intense and frequent extreme weather events and melting glaciers, ice sheets and Arctic sea ice are some of the challenges for Europe already triggered by climate change.

Recent observations in Europe show that temperature has increased more than the global average. Precipitation has increased in northern Europe and decreased in some parts of southern Europe. Hot extremes have become more frequent and more intense, whilst cold extremes have decreased over the past 50 years.

Climate scenarios indicate that significant warming is expected in the coming decades, which is likely to be significant in winter in the north of Europe and in summer in southern and central Europe. Mean annual precipitation is projected to increase in the north and decrease in the south with significant effects on crop suitability and productivity throughout Europe. Even if emissions of greenhouse gases stop today, these changes would continue for many decades, and in the case of sea level for centuries as a result of past emissions of greenhouse gases.

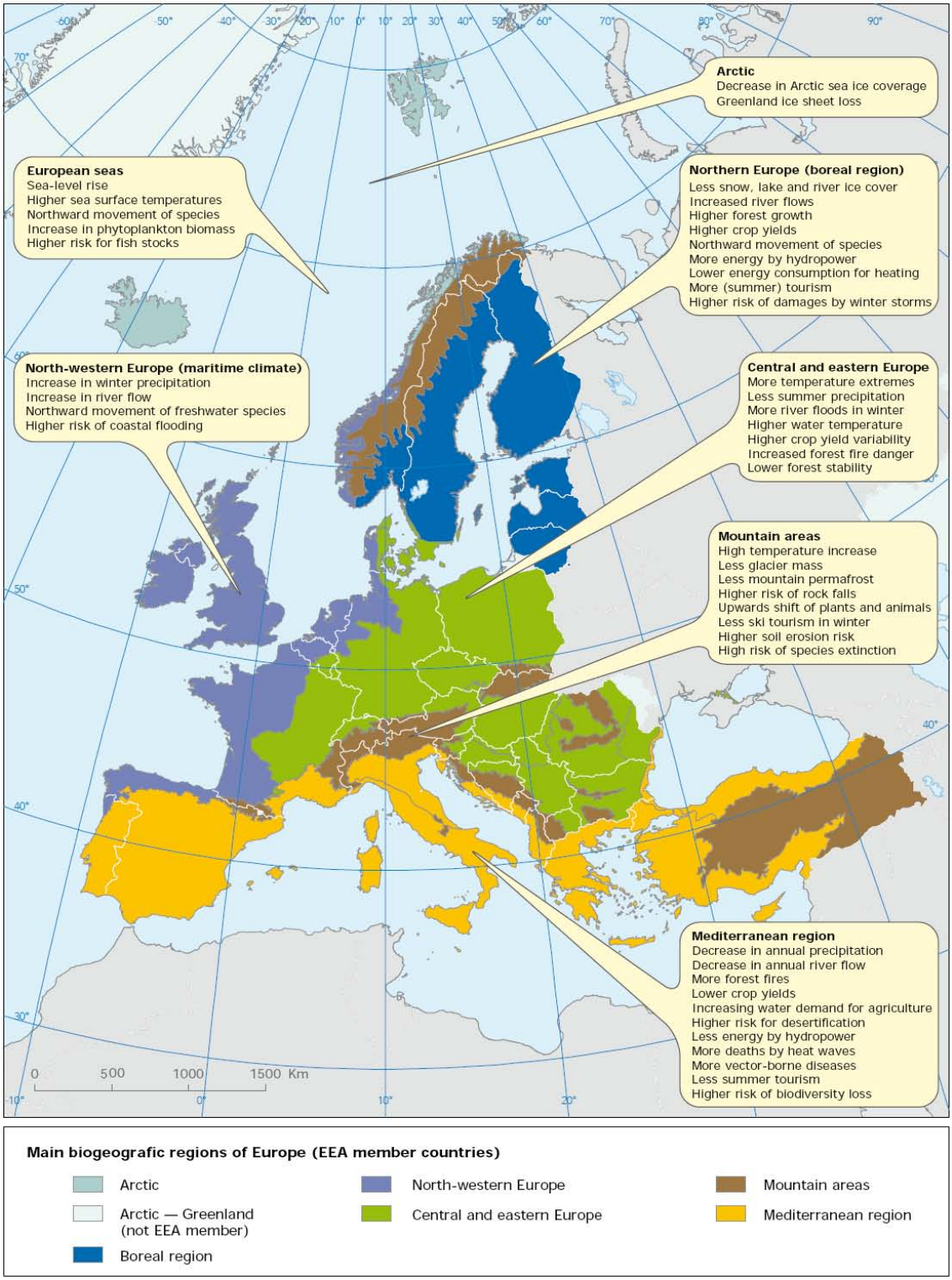
As a result, climate change will amplify the regional differences of Europe's natural resources and assets. Many regions and sectors across Europe are vulnerable to climate change but the impacts vary widely across regions and sectors in Europe. Northern and some western regions of Europe may experience beneficial impacts, particularly within agriculture, for some period of time. Other regions, including south-eastern Europe, the Mediterranean and central European regions are the most vulnerable to climate change. Considerable adverse impacts are projected to occur on natural and human systems that are already under pressure from other drivers, such as land use. Some of the most vulnerable regions in Europe are described in the figure below.

Projected climatic changes will affect all sectors of the economy, including crop yields, soil fertility, forest health and productivity, marine ecosystems, biodiversity, supply and demand of energy, infrastructure, water resources and human heath. The changes in the climate will therefore have economic implications for the Member States of the EU. Early preventive actions bring clear economic, environmental and social benefits by anticipating potential impacts and minimising threats to natural and human systems.

7.2.1. *Observed and Projected Patterns of Climate Change across the EU*

Research at EC level has advanced considerably since the 4th National Communication, and has provided a significant contribution to the IPCC assessments (for more information see section 9). In 2008 a report by European Environment Agency (EEA), the EC Joint Research Centre (JRC-IES) and the World Health Organisation Europe showed that greater rates of change have been observed since the IPCC 4AR and that the projected trends will have impacts across Europe.

Illustration - 7-1 Key past and projected impacts and effects on sectors for the main biogeographic regions of Europe



Source: Impacts of Europe's changing climate - 2008 indicator-based assessment. EEA Report No 4/2008, JRC Reference Report No JRC47756

The EEA report follows a previous effort published by the EEA in 2004 and covers about 40 indicators compared to 22 in 2004[261]. The report also identifies key challenges that need to be addressed to enable Europe to understand fully the implications of climate change and adapt successfully. Some of these key challenges are summarised below.

Key challenges for successful adaptation in Europe

Improved monitoring and reporting

More spatially detailed information is needed to develop adequate adaptation strategies in Europe. The availability of observed and projected data and information on climate change impacts across Europe has improved in recent decades but the availability of data differs considerably between regions. Improved monitoring and reporting could be achieved through:

- A more coordinated approach and Europe-wide monitoring programmes of climate change indicators.
- A European agreement on the definition of key climate change indicators, including extreme weather events (for example 'floods' and 'droughts') and on operational ways of tracking impacts through multiple sectors.

Improved attribution methods for impact assessments

There is a need to improve our ability to detect climate change signals from other (e.g. societal) factors and separate anthropogenic forcing from natural forcing for different climate change variables.

Improved understanding of socio-economic and institutional aspects of vulnerability and adaptation

A better understanding of the socio-economic and institutional aspects of vulnerability and adaptation, including costs and benefits, is urgently needed. Very few studies have assessed the effectiveness of adaptation measures for different time horizons.

Improved and coordinated scenario analysis of impacts and vulnerability

Regular interaction is needed between the climate modelling community and the user community that analyse impacts, vulnerability and adaptation to develop climate change scenarios appropriate for the development of regional and local adaptation measures. European research projects could adopt the same contrasting set of climate scenarios for global development and make use of regional climate projections as they become available. Research on climate-change impacts both in the medium term (decades) and long term (centuries) is needed.

[261] Impacts of Europe's changing climate -2008 indicator-based assessment. EEA Report No 4/2008, JRC Reference Report No JRC47756

More information on good practices and avoiding mal-adaptation[262]

A number of issues surrounding adaptation need to be further explored, including:

- Understanding how to mainstream adaptation into policies across sectors, particularly with regard to water management, energy supply, biodiversity protection, health and agriculture
- Good practices to address the cross-sector and transboundary nature of adaptation
- Understanding of mal-adaptation
- Assessment of adaptation costs across all sectors.

Future activities should also consider European neighbouring countries and overseas territories.

Develop information exchange mechanisms

The increasing amount of data and information on climate change impacts, vulnerability and adaptation could be made available through the establishment of a European "Clearing house". The information could include data on observed and projected climate changes, information on vulnerable systems, indicators, tools for impacts assessments, and good practice adaptation measures.

Source: Impacts of Europe's changing climate -2008 indicator-based assessment. EEA Report No 4/2008, JRC Reference Report No JRC47756

Observed and projected changes include[262,]

Temperature

- Global mean temperature has increased by 0.8 °C compared with pre-industrial times[263]; Europe has experienced greater warming than the global average[264].
- This trend is predicted to continue: projections suggest temperature increases between 1 and 5.5°C by the end of the century– an increase higher than the projected global warming of 1.8 – 4°C.

262 Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 23-78, 7-22

263 For land and oceans, and by 1.0 °C land alone

264 1.0°C land and oceans and 1.2 °C land alone

Extreme events

- In Europe, more frequent and intense hot extremes and a decreasing number of cold extremes have occurred over the past 50 years and this trend is projected to continue.

- There is no clear trend in the observed frequency and intensity of storms. The strength of the heaviest storms is projected to increase, whilst the frequency will be slightly lower.

- Several major droughts in recent decades have occurred in Europe. Examples of severe droughts include drought in Cyprus in 2008, which led to an almost complete failure of crops; the severe spring drought of 2007 across much of the EU; the 2005 drought in the Iberian Peninsula and the drought associated with the summer 2003 heat wave, which is estimated to have caused EUR 1012 billion[265]. Climate projections indicate an increase in droughts particularly in southern Europe.

- Flooding and storm damage events have occurred frequently in Europe in recent years. Among those causing significant damage and deaths have been Winter storm Emma in 2008 which resulted in 14 fatalities, the 2007 floods in the United Kingdom which ranked within the top 10 costliest natural disasters world wide that year, resulting in 5 deaths, and Winter storm Erwin in 2005 which resulted in overall losses of US$5,800m[266].

- Economic losses from recent floods are substantial: the estimated losses in central Europe in 2002 were EUR 17.4 billion. Economic costs of coastal flooding (assuming no adaptation) are estimated in the range of EUR 12-18 billion per year for Europe in 2080. Floods are projected to occur more frequently in many regions, particularly in winter and spring.

Precipitation

- Changes in precipitation show more spatially variable trends across Europe. Annual precipitation has increased in northern Europe by 10 to 40 % and decreased up to 20 % in some parts of southern Europe during the 20th century.

- Mean annual precipitation is projected to increase in northern Europe and decrease in the south.

Sea-level rise

- Global mean sea-level rise has increased to 3.1 mm/year over the past 15 years, compared with 1.7 mm/year in the 20th century. Sea-level rise varies across European seas.

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265 SEC(2007) 849 COMMISSION STAFF WORKING DOCUMENT Accompanying the GREEN PAPER Adapting to climate change in Europe – options for EU action COM(2007)354 final

266 Munich Re: NatCen Database. National Disasters 2005: 10 costliest Natural Disasters by overall loses. http://www.munichre.com/en/ts/geo_risks/natcatservice/annual_statistics/default.aspx

- The IPCC Fourth Assessment Report estimates an increase in sea level rise of up to 0.59 m by 2100 but this may be too low, due to rapid changes occurring at an increasing rate at the poles

Cryosphere

The reduction in Arctic sea ice has accelerated and reached a record low in September 2007 of about half the normal minimum in the 1950s. It is predicted that Arctic sea ice may disappear completely during the height of the melting season. This will create positive feedbacks that will further increase climate change.

- European glaciers in the Alps have lost two thirds of their volume since 1850 and their retreat has accelerated over the last few decades. This trend is expected to continue, causing damages to infrastructure, changes in river flows, freshwater supply, irrigation and power generation.

- Mountain permafrost is decreasing. Melting permafrost is expected to contribute to increasing the destabilisation of mountain rock-walls, the frequency of rock falls and cause maintenance problems in high-mountain infrastructure.

7.2.2.*Impacts of Climate Change in the EU*

Recent work has emerged on the potential impacts and economic effects of climate change in Europe[267, 268]. These studies show the projected changes in climate (including extremes), compounded by other environmental changes and socio-economic development. Many of the climate change impacts are projected to lead to economic costs ('losses'), though there will also be some economic benefits (gains). These studies also show a strong distributional pattern of effects predicted across Europe, with a significant trend towards more negative potential effects in south-eastern Europe and the Mediterranean. In northern and western Europe a more complex balance between negative and positive effects is projected for moderate levels of climate change.

Some of the key impacts on Europe are described below.

- Human Health: More than 70,000 excess deaths were reported in 12 European countries during the 2003 heatwaveHeatwaves are expected to become more common, the mortality risk increases by between 0.2 and 5.5 % for every 1 °C increase in temperature above a location-specific threshold. Vector-borne diseases are expected to increase in the near future as insects move to higher altitudes and latitudes. Any benefits from reduced cold-related mortality will be outweighed by heatwaves, vector and food-borne diseases, without adaptation.

- Animal and plant health: Changing weather patterns has resulted in significant differences for plant and animal species in Europe in recent years, with further behaviour and health changes predicted in the coming years. Key changes have already been seen in plant and animal species: the length of the growing season

267 PESETA (2008) Projections of economic impacts of climate change in sectors of Europe based on bottom-up analysis - Coastal Systems: Adaptation Assessment Results; Julie A. Richards & Prof Robert J. Nicholls

268 EEA 2007. Climate change and water adaptation issues. EEA Technical report 2/2007. 114 pp. European Environment Agency, Copenhagen. Available at: http://reports.eea.europa.eu/technical_report_2007_2/en/eea_technical_report_2_2007.pdf

of several agricultural crops has increased at northern latitudes, favouring the introduction of new species that were not previously suitable, but there has been a shortening of the growing season locally in the south. In the future, some species will benefit from changing environmental conditions; however these changes will be beyond the adaptive capacity of many other species. Projections suggest that between one fifth and one third of European species could be at increased risk of extinction if global mean temperatures rise more than 2 to 3 °C above pre-industrial levels[269,270].

- Agriculture: The length of the growing season of several agricultural crops has increased at northern latitudes, favouring the introduction of new species which could provide opportunities in this sector. However the shortening of growing season in southerly latitudes continues. The variability of crop yields has increased due to extreme climatic events. Increases in water demand for agriculture (by 50–70 %) has occurred mainly in Mediterranean and is projected to continue here. This is likely to result in increased competition for water resources between sectors and uses.

- Ecosystems and forestry: By the late 21st century, plant species are projected to have shifted several hundred kilometres north, forests will contract in the south and expand in the north. The rate of this change, exacerbated by landscape fragmentation, may be too great for many species to adapt and 60 % of mountain plant species may face extinction. Climate change will lead to substantial shifts in vegetation distribution in forest locations; drought and warm winters increase pest populations weakening forests. Projected temperature rises will lead to an increase of forest fires.

- Soil: Information on the impacts of climate change on soil and the various related feedbacks is very limited and there is a need to establish appropriate monitoring schemes. Changes in the bio-physical nature of soil are likely due to rising temperatures, changing precipitation intensity and frequency and more severe droughts leading to a substantial increase in CO_2 emissions.

- Water resources: Increased temperatures of lakes and rivers (by 1–3 °C during the 20th century) have resulted in decreases in ice cover on lakes and rivers by 12 days on average in the last century in Europe. These changes can be at least partly attributed to climate change. Lake and river surface water temperatures are projected to increase further with increasing air temperatures and significant effects on water quality.

- Marine environment and fisheries: Climate change impacts will be severe on marine ecosystems. Climate change is expected to result in a number of changes in the abiotic (i.e. sea level, temperature, acidity, salinity, thermohaline circulation, stratification, light) and biotic (i.e. primary production, food webs, etc) conditions of the sea. Impacts include more frequent coastal flooding, to increased acidification of the marine environment and changes in distributions of fish stocks.

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269 IPCC, 2007. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Parry, M. L.; Canziani, O. F.; Palutikof, J. P.; van der Linden, P. J. and Hanson, C. E. (eds.), Cambridge University Press, Cambridge, UK.

270 ovejoy, T. and Hannah, L., 2005. Climate change and biodiversity. Yale University Press. London, UK.

- A separate study[271] on behalf of the European Commission DG Environment, looked at the impacts of climate change and employment. The first part of the study examines the potential consequences for employment of global warming in Europe - which have already begun and will continue. The main finding is that even moderate climate change will affect economic activity and employment in Europe, with some regions and economic sectors being particularly vulnerable. Increased warming will be likely to have very damaging consequences. In relation to this, climate change policies to help mitigate and adapt to the effects of climate change will have a small net (potentially positive) effect on employment. However, there are likely to be major distributional effects across different industries and regions of Europe that will need to be addressed to reduce social impacts.

7.3. Adaptation Measures and EC Level Actions on Adaptation

In recent years, the EC has adopted a more coordinated approach to integrate adaptation in all relevant EC policies whilst increasing awareness and ensuring the full involvement of all administrations and civil society.

Due to the regional variability and severity of climate impact, most adaptation measures will be taken at national, regional or local level. However, adaptation can be supported and strengthened by an integrated approach at EC level. The EC has an important role to play to:

- ensure that the most vulnerable regions of the EU will be able to adapt;
- address impacts of climate change that transcends the boundaries of individual countries (e.g. river and sea basins and bio-geographic regions);
- facilitate adaptation in sectors (e.g. agriculture, water, biodiversity, fisheries, and energy networks) that are closely integrated at EC level through the single market and common policies.

The European Commission believes that climate change should be mainstreamed in all policy areas and development activities. Over the last few years, the European Union has made significant progress in incorporating climate change adaptation in development policy and programmes and in a number of policy areas, such as flooding and coastal zone management.

7.3.1. *Towards an EU Framework for Action: Climate Change Adaptation White Paper*

A White Paper on Adapting to Climate Change: Towards an EU framework for action was published in April 2009[272] – signifying the intention of the EC to lay out policy and propose action on climate change adaptation.

The White Paper was the result of a process, which started in 2007 triggered by concerns about the impacts of climate change within the EU and the need to define a

[271] ETUC (2007) Climate Change and employment: Impact on employment in the European Union-25 of climate change and CO_2 emission reduction measures by 2030 http://www.etuc.org/a/3676

[272] http://ec.europa.eu/environment/climat/adaptation/pdf/com_2009_147_en.pdf

strategic approach to climate change. A Green Paper on Adaptation[273], adopted on 29th June 2007, set out the risks climate change poses to Europe and made recommendations for how adaptation should take place at the European, national and local levels. The Green Paper built on the EC Climate Change Programme, which developed all the necessary elements of a EC strategy to implement the Kyoto Protocol.

The steps that led to the development of the White Paper and the EC integrated approach on adaptation are outlined below.

Step 1. Green Paper "Adapting to climate change in Europe– options for EU action"

The Green Paper "Adapting to climate change in Europe – options for EU action" outlined the risks climate change poses to Europe and made recommendations for how adaptation should take place at the European, national and local levels. The Green Paper outlined four areas for adaptation action:

(1) Early action in the EC - integrating adaptation into existing legislation, funding programmes and new policies in a variety of policy areas such as agriculture, rural development, industry and services, energy, transport, health, water, fisheries and ecosystems.

(2) Integrating adaptation into external EC actions by promoting adaptation to climate change with all third countries by sharing adaptation policies between partners, with trade agreements used to promote green technologies and investment.

(3) Reducing uncertainty by expanding the knowledge base through integrated climate research to base practical adaptation actions and measures on sound, scientific, technical and socio-economic information.

(4) Involving European society, business and the public sector in the preparation of coordinated and comprehensive adaptation strategies by means of dialogue between affected parties, civil society and the EC.

Step 2- Public Debate

A public debate on adaptation was launched on 3rd July 2007. All interested parties came together to discuss the Green Paper, expressing concerns and suggesting changes and improvements. The public debate included public consultation, a web-based consultation, four regional workshops and a stakeholder conference. The extensive consultation identified priority areas for actions, including[274]:

- Environmental impacts - water management (including methods for tackling water shortages, water quality, flooding), biodiversity and ecosystems.

- Social impacts - health and diseases, infrastructure resilience, food security, social equity, migration.

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[273] COM/2007/0354 final http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52007DC0354:EN:NOT

[274] Results of the stakeholder consultation can be found at http://ec.europa.eu/environment/climat/adaptation/stakeholder_consultation.htm

- Economic impacts - agriculture and energy infrastructure.

The consultation suggested that the EC should also develop a clear and strong strategic framework for adaptation across all sectors, address cross-border issues and coordinate action across Europe.

Step 3 – White Paper and the EC integrated approach to adaptation

The White Paper on Adaptation to Climate Change was published in April 2009. The White Paper sets the scope of the *EU Adaptation Framework*, which aims to:

- complement and reinforce Member States actions, particularly through existing funding channels, the provision of accurate climate information and appropriate guidance;

- ensure that adaptation is integrated in important EC policy areas;

- promote solidarity between countries and regions.

The main objective of the EU Adaptation Framework is to strengthen the EU's resilience to the impact of climate change.

The White Paper adopts a phased approach. Phase 1 (2009-2012) will focus on four pillars of action and lay the groundwork for the preparation of a more comprehensive adaptation strategy to be implemented during Phase 2 commencing in 2012.

Phase 1 has four pillars of action:

- Building a solid knowledge base for the EU on the impacts and consequences of climate change. Sound data is vital in the development of climate policy. Uncertainties remain particularly as regards the availability of accurate and detailed forecasts on the impacts of climate change at regional and local levels and on the costs and benefits of adaptation measures. Strengthening the knowledge base will be a key part of the EU's Adaptation Strategy. A first step will be to establish a Clearing-house Mechanism (CHM) as an IT tool and database for exchanging information on climate change impacts, vulnerabilities and best practices. The Clearing-house Mechanism is expected to be operational by 2011.

- Integrating adaptation into EU key policy areas**.** In view of the projected impacts on key sectors, adaptation strategies will need to be prepared outlining the necessary actions in each sector. The second pillar focuses on the integration of adaptation into sectoral policies at European level to reduce, the vulnerability of sectors such as: agriculture, forests, biodiversity, fisheries, energy, transport, water and health.

- Employing a combination of policy instruments. There is a need to further consider a combination of policy measures and examine the potential use of funding measures*,* market-based instruments, guidelines and public-private partnerships to ensure effective delivery of adaptation. There is scope for improving the uptake of adaptation action by Member States and for targeting better the use of available financial resources and instruments to encourage this. The recently adopted European Economic Recovery Plan (EERP) contains a number of proposals relating to climate change investments. Consideration should be given to the role of specialised Market Based Instruments (MBIs) and

public-private partnerships should be encouraged with a view to the sharing of investment, risk, reward and responsibilities between the public and private sector in the delivery of adaptation action.

- Strengthening international co-operation on adaptation. The EU is committed to working with third countries to improve their resilience and capacity to adapt to climate change. In this context efforts will be stepped-up to mainstream adaptation into all of the EU's external policies. The White Paper will support the Commission's Communication for Copenhagen (COP 15, December 2009)[275].

To support cooperation on adaptation, the European Commission intends to set up an Impact and Adaptation Steering Group (IASG). This group will be composed of representatives from the EU Member States involved in the formulation of national and regional adaptation programmes and will consult with representatives from civil society and the scientific community. The IASG will provide a coordinated approach to building the evidence base on the impacts of climate change, assessing the risks of climate change for the EU, the scope for increasing climate resilience and costing risks and opportunities.

Health and social policies

- Develop guidelines and surveillance mechanisms on the health impacts of climate change by 2011.
- Step up existing animal disease surveillance and control systems.
- Assess the impacts of climate change and adaptation policies on employment and on the well-being of vulnerable social groups.

Agriculture and forests

- Ensure that measures for adaptation and water management are embedded in rural development national strategies and programmes for 2007-2013.
- Consider how adaptation can be integrated into the three strands of rural development and give adequate support for sustainable production including how the CAP contributes to the efficient use of water in agriculture.
- Examine the capacity of the Farm Advisory System to reinforce training, knowledge and adoption of new technologies that facilitate adaptation.
- Update forestry strategy and launch debate on options for an EC approach on forest protection and forest information systems.

[275] Communication from the commission to the European parliament, the council, the European economic and social committee and the committee of the regions "Towards a comprehensive climate change agreement in Copenhagen" and translations (January 2009)

Biodiversity, ecosystems and water

- Explore the possibilities to improve policies and develop measures which address biodiversity loss and climate change in an integrated manner to fully exploit co-benefits and avoid ecosystem feedbacks that accelerate global warming.
- co-benefits and avoid ecosystem feedbacks that accelerate global warming.
- Develop guidelines and a set of tools (guidance and exchange of best practices) by the end of 2009 to ensure that the River Basin Management Plans (RBMP) are climate-proofed.
- Ensure that climate change is taken into account in the implementation of the Floods Directive.
- Assess the need for further measures to enhance water efficiency in agriculture, households and buildings.
- Explore the potential for policies and measures to boost ecosystem storage capacity for water in Europe.
- Draft guidelines by 2010 on dealing with the impact of climate change on the management of Natura 2000 sites.

Coastal and marine areas

- Ensure that adaptation in coastal and marine areas is taken into account in the framework of the Integrated Maritime Policy, in the implementation of the Marine Strategy Framework Directive and in the reform of the Common Fisheries Policy.
- Develop European guidelines on adaptation in coastal and marine areas.

Production systems and physical infrastructure

- Develop methodologies for climate-proofing infrastructure projects and consider how these could be incorporated into existing guidelines.
- Assess the feasibility of incorporating climate impacts into construction standards.
- Develop guidelines by 2011 to ensure that climate impacts are taken into account in the EIA and SEA Directives and explore the possibility of making climate impact assessment a condition for public and private investment.

7.3.2.*Mainstreaming Adaptation through the Cohesion Policy*

Initiatives at the regional level to address climate change adaptation (as well as mitigation) are also supported by the European Cohesion Policy. This aims at reducing the disparities between the regions in the European Union. Through its financial instrument – the European Regional Development Fund (ERDF) - the European Union supports territorial cooperation among Member States, their regions and cities by funding joint projects in specific areas (see section 4.3.3 for further information).

Risk prevention and mitigation, and adaptation to climate change are identified as priority areas for investment. 30 % of the total Structural Funds for 2007-2013 have been allocated to the environment, equating to approximately €105 billion.

The European Territorial Cooperation (ETC) objective is an example of activities that through the promotion of economic and social cohesion continue to make a significant contribution in support of climate change adaptation at the regional level. The ETC provides funding for regional and local public authorities of Europe, Switzerland and Norway to promote cross-border, transnational and interregional cooperation and stimulate exchange of experience, know-how and good practice.

A large number of projects funded under the European Territorial Cooperation objectives include climate change adaptation and risk prevention, with funding used to develop projects relating to flooding, forest fires, and climate change amongst other topics. Some examples of projects funded under ETC are described below.

Examples of the Cohesion Policy's contribution to climate change adaptation and risk prevention

The goals of the projects funded under the European Territorial Cooperation (ETC) objective of the Cohesion policy are broad and often cover several sectors and regions of the EU. The main approach is to integrate climate change factors into other social and environmental goals. Some examples of programmes that include climate change adaptation, amongst other social and environmental objectives, are:

- Flood Prevention on the River Tisza, Hungary. Seven flood reservoirs and dikes are planned for construction between 2007 and 2013. One flood plain has already been co-financed between 2000-2006.
- Sustainable Development of Floodplains[1] (SDF), which has contributed to the redevelopment of historical floodplains.
- The 'INCENDI' project addresses forest fire prevention amongst nine Mediterranean regions, all of which are Interreg IIIC partners, including Tuscany, Languedoc-Roussillion, Sardinia and Corsica. The project involved assessing and sharing expertise, local experimentation projects and mainstreaming results.
- Network Mountain Forest: Protecting Europe's Mountain Forests'[2] in Eastern Europe, aimed at improving risk prevention in mountain forests.
- The Siproci[3] project, aimed at improving local and regional response to disasters through transboundary collaboration in Europe.
- The Alpine Space Programme[4] which aims, as one of its key objectives, to assist regions in coping with the expected increase of natural hazards due to the impacts of climate change.
- Baltic Sea Region Programme[5], which promotes a sustainable management of the sea resources and protect the marine environment.
- APADTCLIMA, which aims to raise awareness of the real consequences of climate change amongst civil society and promote measures to adapt.

1 http://www.sdfproject.nl/portal/alias__Rainbow/lang__en-US/tabID__1/DesktopDefault.aspx
2 http://www.schabl.at/nmf
3 http://www.siproci.net
4 http://www.alpine-space.eu/about-the-programme/priorities-thematic-fields/environment-and-risk-prevention/
5 http://eu.baltic.net/Programme_document.98.html

Adaptation activities at the regional level are also supported through the LEADER programme. This initiative is financed by EU structural funds and is designed to help rural actors consider the long-term potential of their local region, which is highly important given that 56 % of the population of the 27 member states live in rural areas. The programme encourages local actors to pursue development opportunities in

a cooperative fashion. Climate change programmes come under the remit of LEADER through the Community Strategic Guidelines for rural development. Within this, actions on adaptation have been undertaken.

7.3.3. *Mainstreaming Climate Change Adaptation in Sectoral Policy*

Adaptation within the EU is being increasingly integrated across sectors. For example, the Floods Directive (2000/60/EC)[276] on the assessment and management of flood risks establishes a framework for the assessment and management of flood risks and the reduction of adverse consequences associated with floods for human health, the environment, cultural heritage and economic activity in the Community.

The Directive requires EU Member States to assess whether water courses and coastlines are at risk from flooding. Where this is the case, the extent of the flood must be mapped and action taken to protect humans and assets at risk. The Directive also emphasises the role of public input in this process.

Adaptation to climate change is also being integrated in coastal zone and marine management. The EU Integrated Maritime Policy (COM (2007)575[277]) provides a comprehensive framework for addressing maritime activities from a cross-sectoral perspective, facilitating the integration of adaptation efforts for coastal and marine areas into specific policies.

The Marine Strategy Framework Directive contains a clear regulatory framework for adaptation to climate change, by requiring that the objective by 2020 is that ecosystems " function fully and to maintain their resilience to human-induced environmental change". The Directive can facilitate adaptation by ensuring that climate change considerations are incorporated into marine strategies and by providing a mechanism for regular updating to take account of new information.

Adaptation to climate change is a priority theme for the further promotion of Integrated Coastal Zone Management (ICZM). The Recommendation 2002/413/EC[278] concerning the implementation of Integrated Coastal Zone Management in Europe stipulates that Member States should adopt a strategic approach to the management of coastal zones based on “recognition of the threat to coastal zones posed by climate change and of the dangers entailed by the rise in sea level and the increasing frequency and violence of storms’[279].

Some projects have been carried out to strengthen the collaboration and cooperation of MS across boundaries on adaptation issues. Eurosion[280], the Safecoast project, in the North Sea, or the recently launched OURCOAST project are good examples of this. The OURCOAST project is a €1 million initiative to build up a database of coastal planning and management practices in Europe, with a key focus on adaptation to risks and climate change.

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276 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32007L0060:EN:NOT

277 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0575:FIN:EN:PDF

278 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2002:148:0024:0027:EN:PDF

279 Chapter 1 (b) of the Directive 2002/413/EC

280 http://www.eurosion.org/

A systematic consideration of anticipated climate change impacts in the further elaboration of integrated coastal zone management will be essential for making adaptation efforts in relation to the coasts. The Commission envisages proposing to start to assess options for a follow-up instrument to the 2002 Recommendation on ICZM as from 2010, where the issue of adaptation to climate change will be a major theme.

Together with the Integrated Coastal Zone Management (ICZM), Maritime Spatial Planning can play an important role in adaptation in maritime areas and coastal waters as stated in the Communication "Roadmap for Maritime Spatial Planning"[281]. The Roadmap mentions that climate change "can cause a shift in economic activities in maritime areas and to alter marine ecosystems" and adds that Maritime Spatial Planning can play a role in cost-efficient adaptation to the impact of climate change". Maritime spatial planning is seen as essential part of an overall integrated, ecosystem based management approach and allows in general for better planning the use of maritime space or maritime activities. Related tools are needed to facilitate the adaptation to changes in the environment produced by climate change and, thus, to give confidence to investors.

The reformed Common Fisheries Policy, currently under consultation (Green Paper on the Reform of the Common Fisheries Policy[282]), will take climate change issues into account from the adaptation and mitigation angles. The addresses climate change adaptation from the fisheries angle. The new Common Fisheries Policy has to play a role in facilitating climate change adaptation efforts concerning impacts in the marine environment.

Finally, Disaster Risk Reduction (DRR) is intricately linked to climate change adaptation. The European Commission published Communication COM (2009)82 on a 'Community approach on the prevention of natural and man-made disasters'[283]. This communication sets out an overall European approach to the prevention of disasters, identifying areas for action and specific measures for disaster prevention in the short term. The external dimension of DRR is covered by the EU Strategy for supporting disaster risk reduction in developing countries (described below in section 6.4.3).

7.3.4. *Integrating Adaptation into Environment Impact and Strategic Environmental Assessment*

The assessment of climate factors is an important consideration within both the Environmental Impact Assessment and Strategic Environmental Assessment processes. Directive 85/337/EEC[284] of 27th June 1985 on the assessment of the effects of certain public and private projects on the environment, amended by Directive 97/11/EC[285], ensures that the environmental implications of projects are identified and mitigated before planning consent is given. The Directive contributes to the integration of climate change adaptation concerns into the planning, development and monitoring of a project. Public engagement is encouraged and the public will be informed of the outcome of the process.

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281 COM (2008) 791

282 COM (2009) 163 of 22.04.2009

283 http://ec.europa.eu/environment/civil/pdfdocs/com_2009_82en.pdf

284 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31985L0337:EN:HTML

285 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31997L0011:EN:NOT

Similarly, Directive 2001/42/EC[286] of the European Parliament and of the Council of 27th June 2001 on the assessment of the effects of certain plans and programmes on the environment, known as the Strategic Environmental Assessment (SEA) Directive, ensures that climate change adaptation is integrated at a higher policy level by assessing climate change impacts on a policy.

7.3.5. *Evidence Base for Policy Making*

Research is key for effective adaptation, as practical adaptation actions and measures must be based on sound, scientific, technical and socio-economic information. This has been recognised by the EC and the level of spending on impacts and vulnerability assessment and adaptation has increased significantly since the 4th NC.

The European Community is one of the main actors driving forward the climate science as testified by the vast amount of research activities. European research is supported mainly through the Framework Programmes for Research and Technological Development. The EC is funding research on the scientific, technical and socioeconomic aspects of human-induced climate change, its potential impacts and options for adaptation and mitigation not only in Europe, but also in cooperation with third countries, including developing countries. Research funded under the 6th Research Framework Programmes, as well as those envisaged under the current 7th Research Framework Programme focuses around the following elements:

- Quantification of climate change feedbacks in Europe and beyond
- Regional climate change projections, aiming at local-scale information
- Quantification of climate change impacts on vulnerable ecosystems, and key economic sectors.
- Climate change and human health in Europe and beyond
- Coupling between climate and economic models
- Feasibility and related costs of adaptation and mitigation policies and measures in Europe and beyond
- Assessment of the effectiveness and risks of novel options to combat climate change
- Sustainable bio-diverse and value added options in international agriculture, including ability to cope with abiotic stress (e.g. temperature, salinity, water scarcity)
- Renewable energy and energy efficiency

A large number of research projects have been funded in several different areas. Details on climate change research funded under the EC Framework Programmes can be found in section 9. Some examples of projects on impacts, vulnerability and adaptation funded over the last few years under the EC 6th and the 7th Framework Programmes are described in Appendix F-F1.

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286 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32001L0042:EN:NOT

In addition, there have been a large number of new research programmes commissioned at the Joint Research Centre, which provides scientific and technical support to the development and implementation of EC policies. Two of the largest include:

- ICPA-EEI (Integrated Climate Policy Assessment: emissions and environmental impacts)[287]

This project will develop integrated global emission inventories of greenhouse gases and of air pollutants. It will study a broad range of environmental effects of such emissions, today and in the future, applying atmospheric and climate models and blending them with global environmental data sets. Some of the main areas the project will focus on include: vulnerability and adaptation in selected world regions to the multiple risks of climate change and looking at impacts of climate change mitigation and adaptation policies on the European and global climate and environment.

- ICPA Impacts (Integrated climate policy assessment: scenarios and economic impacts)

The goal of this action is to produce integrated assessments of climate change mitigation and adaptation options. It will focus on techno-economic analyses and greenhouse gas abatement scenarios at EC and global scale. The economic impact of alternative policies will be analysed, including that of implementation modalities and mitigation costs.

The EC has also provided funding for research aimed at answering key policy questions and supporting the development of EC policy in the short term. These include:

- 'Adaptation to Climate Change in the Agricultural Sector'[288] undertaken in 2007 to carry out an assessment of the impacts and risks of climate change on farming activities, and the potential adaptation options to increase the resilience of the agriculture sector to climate change.

- 'Preparations for the establishment of European Climate Change Impacts and Adaptation Clearing-house – Sharing of good practice in the EC Reference' began in 2008. This project scopes out the preparations for the establishment of a web-based European Clearing-house enhancing information structuring and sharing on climate change impacts and adaptation measures. It is intended that this clearing-house contains the most up-to-date and state-of-the-art information, which is both easily accessible and useful for Member States. To do so efficiently, a standardised and harmonised reporting framework would be needed, including a European wide agreement on definitions and key adaptation indicators.

- 'Preliminary assessment and roadmap for the elaboration of climate change vulnerability indicators at regional level' started in 2009 and aims to explore the feasibility of developing EC-wide climate change vulnerability indicators. Initial work will focus on literature review and interviews with the Commission to investigate different methodological approaches and data availability to result in an initial dataset and vulnerability map.

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287 http://ccu.jrc.ec.europa.eu/24003.php

288 http://ec.europa.eu/agriculture/analysis/external/climate/index_en.htm

- Design of Guidelines for the Elaboration of Regional Climate Change Adaptation Strategies. The aim of this study was to produce an inventory of existing regional adaptation strategies in the EC and develop guidance to assist the regions of the EC in formulating adaptation strategies. The study was carried out in 2009.

The European Parliament also funded studies to address climate change issues in both water use and fisheries:

- Climate change-induced water stress and its impacts on natural and managed ecosystems.

- Climate Change and European Fisheries.

Some projects funded over the last few years have focussed on regional climate modelling and impact assessment and have produced high-resolution maps[289] representing the projected changes in climate variables, such as mean temperature and precipitation, and projected impacts, e.g. agricultural yields, conditions for tourism, cold- and heat-related mortality and biodiversity losses. These maps illustrate what can be expected in Europe by the end of the century, according to the IPCC scenario (SRES A2). The maps span a series of conditions and include maps on:

i. precipitation and temperature in Europe;

ii. agriculture impacts;

iii. tourism;

iv. river discharge;

v. extinction in plant communities, and,

vi. flooded areas for sea levels in the absence of dykes.

The European Environment Agency has also had a significant role in carrying out extensive EC-funded research on climate change in recent years. Among the key reports relevant to adaptation, vulnerability and impacts in current programme of work includes methodologies to calculate the costs of climate change impacts and adaptation to climate change and analysis of climate change and sectoral adaptation issues, including overviews of countries' adaptation actions. Recent reports and briefings published by the EEA include:

- Vulnerability and adaptation to climate change in Europe[290]

- Climate Change and River Flooding in Europe[291]

- Impacts of Europe's changing climate - 2008 indicator-based assessment[292]

- Climate change: the cost of inaction and the cost of adaptation[293]

289 See for example the IPCA-EEI (Integrated Climate Policy Assessment: Emissions and Environmental Impacts) http://ccu.jrc.ec.europa.eu/clm_sci.php

290 http://www.eea.europa.eu/publications/technical_report_2005_1207_144937

291 http://www.eea.europa.eu/publications/briefing_2005_1

292 http://www.eea.europa.eu/publications/eea_report_2008_4/

- Climate change and water adaptation issues[294]

7.4. EC International Co-operation on Climate Change Impacts and Adaptation

7.4.1. *International Co-operation on Climate Change in Context*

The European Community has provided support on climate change to developing countries since the 1990s. The EC recognises that adaptation is a complex challenge that needs to be addressed through action that crosses international borders and territories. Coherence of policies and mainstreaming of adaptation in policies and cooperation programmes is therefore imperative.

It is with this recognition that decisive action has been taken by the EC to integrate climate change adaptation into development cooperation with the adoption of the EU Action Plan on Climate Change and Development (2004 to 2008)[295]. The aim of the Action Plan was to assist 'EU Partner countries' (developing countries) meet the challenges posed by climate change through supporting them to implement the UNFCCC and the Kyoto Protocol.

The Action Plan was adopted in November 2004 by the General Affairs and External Relations Council and encompassed five strategic objectives[296]:

i. Raising the policy profile of climate change: measures include putting climate change on the agenda of high-level consultations under EC development cooperation agreements; preparing country- or region-specific briefs on climate change; promoting exchange programmes between the EC and partner countries to foster mutual understanding.

ii. Support for adaptation: measures include supporting partner countries in preparing vulnerability and adaptation assessments and national adaptation programmes of action (NAPAs) for least developed countries; developing guidelines for integrating climate change into development programmes – including measures to avoid mal-adaptation – based on consultation with all stakeholders; supporting capacity-building in developing country institutions to prepare for and reduce the impact of climate change-related disasters.

iii. Support for mitigation and low greenhouse gas (GHG) development paths: measures include supporting pilot projects to strengthen the links between government ministries and the research community; supporting partner countries to carry out research on low-carbon technologies and further develop local mitigation technologies; supporting capacity-building for developing countries' participation in the Kyoto Protocol's Clean Development Mechanism (CDM).

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293 http://www.eea.europa.eu/publications/technical_report_2007_13

294 http://www.eea.europa.eu/publications/technical_report_2007_2

295 http://ec.europa.eu/environment/climat/pdf/eccp/impactsadaptation/developmentcoop.pdf

296 EU Action against climate change, Working with developing countries to tackle climate change, 2007 http://ec.europa.eu/environment/climat/pdf/brochures/asia_en.pdf

iv. Capacity development: measures include: building individual and institutional capacity in impact prediction and vulnerability assessment; identifying ways to support improved coordination between developing countries to prepare for climate change negotiations; establishing knowledge banks to disseminate information and provide training for action on climate change.

v. Monitoring and evaluation of the Action Plan: measures include regular discussions on implementation of the Plan and encouragement of feedback from stakeholders, and preparation of a biannual evaluation report and updating of the Plan.

In 2007 a review of the progress of the Action Plan in 2007 concluded that integrating climate change systematically in the context of development cooperation had not yet been adequately addressed by EU donors and that enhanced efforts were necessary to make progress in this area.

With the launch in 2007 of the Global Climate Change Alliance the European Commission renewed its commitment to integrate climate change into its cooperation programmes with third countries. The implementation of the Action Plan has been given new impetus by the creation of the GCCA (see below section 6.4.2.2) of which it forms a core element.

EU external support on climate change involves a number of Directorates General (DG) of the European Commission. EU external support aims to ensure progress towards the MDGs and that sustainable development policies and poverty alleviation strategies in developing countries take climate change adaptation into account. The main DGs of the EC that are responsible for programming and delivery of such external cooperation activities include:

- DG ENV (The DG for Environment)
- DG DEV (The DG for Development)
- DG AIDCO (The EuropeAid Cooperation Office)
- DG RELEX (The DG for External Relations)
- DG REGIO (The DG for Regional Policy)
- DG ECHO (The Humanitarian Aid Department)
- DG ELARG (DG for Enlargement of the EU)
- DG RTD (DG for Research and Technology Development)

DG DEV and DG RELEX are responsible for programming climate related assistance for developing countries through respective financial instruments (For DG DEV both the EU budget and the European Development Fund and for DG RELEX the EU budget). Based on this programming responsibility for the implementation of these programmes funded under the EU budget and European Development Fund is held by DG AIDCO. Depending on the thematic area, some initiatives are also implemented and/or (co-)funded by DG ENV, DG RELEX, DG REGIO and DG ECHO. DG ELARG undertakes a number of activities in candidate countries and potential candidates, which also covers environmental issues such as climate change, for example the IPA (Instrument for Pre-Accession), see section 7.2.1. DG RTD has initiated policy

dialogues on scientific and technological cooperation with most regions and major countries in the world and is actively involved in supporting research collaborations relevant to mitigation and adaptation to climate change, not only in Europe but other parts of the globe.

7.4.2. *Distribution of External Support for Climate Change Vulnerability, Impacts and Adaptation Activities*

The financial contribution in the EU for climate change adaptation activities in developing countries has increased significantly over the last few years.

The increase in funding and the greater level of detail in recording the resources directed to climate change adaptation reflects the recognition of its growing importance in the EC's agenda. For more detail on the EC's financial contributions to climate change vulnerability, impacts and adaptation activities please refer to section 8.

A comprehensive list of all activities that have been undertaken in the past, as well as those currently being implemented and planned for in the future is outside the scope of this document. The 12 most prominent activities are listed below and described in more detail in the following sections. The activities listed in this section cover a wide spectrum of climate related domains and include capacity building, technical assistance, high-level policy dialogue, as well as activities in support to the UNFCCC commitments. These activities have a strong emphasis on climate change adaptation and include elements of impacts and vulnerability assessments, adaptation actions and cooperation, as indicated in Table 6-1. However, the scope of these activities varies significantly and is often not limited to adaptation but also involves mitigation, disaster risk reduction and other climate change and development objectives. In addition to development aid supported activities there is a substantial number of international scientific collaborations relevant to climate change issues. More information on science and technology relevant to climate change is given in chapter 8.

<u>Past activities</u>

(1) `Climate Change Capacity Development (C3D) - Technical Assistance for Strengthening and Training Developing Countries

(2) `BASIC (Building and Supporting Institutional Capacity) Project

<u>Current activities</u>

(3) Global Climate Change Alliance (GCCA)

(4) Advancing Capacity, Partnerships and Knowledge to Support Climate Change Adaptation in Africa and Asia (ACCCA)

(5) Support to the Nairobi Work Programme on impacts, vulnerability and adaptation to climate change

(6) DIPECHO Programme (Disaster Preparedness ECHO)

(7) Support to the Consultative Group on International Agriculture Research (CGIAR)

(8) Regional Environmental Network for Accession (RENA)

(9) EC-ACP Natural Disaster Facility

Planned

(10) Global Climate Financing Mechanism (GCFM)

(11) Supporting National Assessments of Post-2012 Proposals for Climate Protection on Sustainable Development (SNAPP 2012)

(12) Capacity Development for Adaptation to Climate Change & GHG Mitigation in Non-Annex I Countries (C3D+)

Table 6-1 Prominent EC adaptation policy activities and sub-thematic areas

Activity	Adaptation sub-thematic area(s) addressed			
	Assessment of impacts	**Vulnerability**	**Adaptation Actions**	**Cooperation**
Past				
C3D	X	X		
BASIC Project	X	X	X	X
Current				
GCCA		X		X
ACCCA	X	X		X
Nairobi Work Programme	X	X	X	X
DIPECHO projects	X	X	X	
CGIAR	X	X	X	
RENA			X	X
EC-ACP Natural Disaster Facility		X	X	
Planned				
GCFM			X	X
SNAPP 2012				X
C3D+			X	X

7.4.2.1. Past Activities

Climate Change Capacity Development (C3D) - Technical Assistance for Strengthening and Training Developing Countries.

C3D[297] is a Capacity Building programme, of which the EC is a major supporter. The programme is managed by United Nations Institute for Training and Research

[297] EuropeAid Financial Contributions to UN Funds, Programmes and Specialized Agencies in 2006: http://ec.europa.eu/environment/climat/pdf/brochures/asia_en.pdf

(UNITAR) and helps developing countries respond to the impacts of climate change. A South-South training and capacity building partnership has been developed by the programme, involving institutes in Senegal, South Africa and Sri Lanka. Each institute trains local and regional stakeholders as well as each other.

This global programme commenced in 2003 and is due to terminate in 2009. A final report of the programme is currently being prepared.

While the EC is the main donor (US$ 2.8m), the project is co-funded by Danida (US$ 150k), Irish Aid (US$ 900k), the Swiss Agency for Environment (US$ 250k) and the Swiss Federal Office for the Environment (US$ 225k).

Building and Supporting Institutional Capacity (BASIC)

BASIC[298] was a highly successful capacity building project, which ran from late 2004-2007. This project aimed to strengthen and enhance institutional capacity on climate change for Brazil, South Africa, India and China. The driver of the BASIC project was that too often international climate policy has tended to be internationally determined and based on top-down approaches. This project aimed to ensure that country circumstances and particular challenges were the informers to future climate change policy. The project was commissioned to a multi-national project team, called the BASIC network and linked over 40 individuals from 25 research and policy institutions.

The current SNAPP 2012 (Supporting National Assessments of Post-2012 Proposals for Climate Protection on Sustainable Development) project, described in section 6.4.2.3, builds on the achievements of the BASIC project.

7.4.2.2. Current Activities

Global Climate Change Alliance

The Global Climate Change Alliance (GCCA)[299] was first called for in the Commission's Green Paper of 29th June 2007 entitled "Adapting to climate change in Europe – options for EU action" (DG Environment). Currently in the implementation stage, the initiative recognizes that low-income countries are most at risk from climate change and aims to mainstream adaptation to climate change and risk reduction into development co-operation. The GCCA is a significant step towards the implementation of the EC Action Plan on Climate Change and Development (2004) and will promote a political dialogue between developing countries and the EU. To facilitate the process of dialogue and defining concrete support activities in the target countries a GCCA support facility was established in 2009. The first phase was initiated in 2008 and will run until 2010.

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298 http://ec.europa.eu/europeaid/who/partners/international-organisations/documents/ec-un_statistics_2006_en.pdf
http://ec.europa.eu/environment/climat/pdf/brochures/asia_en.pdf,
http://www.basic-project.net/

299 lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0354:FIN:EN:PDF
http://www.europarl.europa.eu/sides/getDoc.do?type=REPORT&reference=A6-2008-0366&language=EN
http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+CRE+20081020+ITEM-020+DOC+XML+V0//EN&language=EN
DG DEV (2009) EU 5th National Communications – Input DG DEV, B2-D Brussels.

The main purpose of the GCCA is to deepen dialogue and step up cooperation between the EU and the developing countries that are most vulnerable to climate change. They are the ones who are hit earliest and hardest by the effects of climate change and have the least capacity to react, typically Least Developed Countries (LDCs) and Small Island Developing States (SIDS).

The Specific purposes of the GCCA are:

(1) Political Dialogue: The GCCA shall act as a platform for political dialogue between the EU, LDCs and SIDS on climate change, at the global, regional and national levels. At the political level the GCCA regional dialogue resulted in the endorsement of three Joint Declarations on climate change between the EU and the Caribbean (in March 2008), the Pacific (October 2008) and Africa (November 2008). The current state of implementation is described in italics below.

(2) Co-operation**:** The GCCA will, as a priority, provide concrete support for adaptation and – where beneficial for the achievement of poverty reduction objectives - mitigation measures and for the integration of climate change into poverty reduction strategies. Overall, five priority areas for cooperation are proposed:

a. Adapting to the effects of climate change without prejudice to achieving the Millennium Development Goals.

b. Promoting disaster risk reduction.

c. Reducing emissions from deforestation.

d. Enhancing participation in the global carbon market through the Clean Development Mechanism (CDM).

e. Integrating climate change into poverty reduction efforts.

Under the first implementation phase of the GCCA, 15 countries have been identified as priority countries eligible for support including Cambodia, Maldives, Tanzania, Vanuatu; Bangladesh, Belize, Guyana, Jamaica, Mali, Madagascar, Mauritius, Mozambique, Rwanda, Senegal and Seychelles. Financial support for approximately 10 countries should be confirmed in 2010 following consultations with the country partners. The list above is not exhaustive and could be expanded in light of available resources.

For the selected partner countries, special attention will be paid to set up innovative and comprehensive ways to deal with climate change, for example through general or sectoral budget support. Regular coordination takes place with comparable efforts such as the World Bank's Pilot Programme for Climate Resilience (PPCR).

State of implementation of the GCCA Political Dialogue

AFRICA AND THE EUROPEAN UNION JOINT EFFORTS AGAINST CLIMATE CHANGE AND ENVIRONMENTAL DEGRADATION

The Africa-EU Declaration on Climate Change, adopted in Addis on 1 December 2008, highlights the common concerns of both Africa and Europe for global warming and their common interest for an ambitious post-Kyoto international agreement. Africa has been identified by experts as one of the most vulnerable regions to climate change and climate variability, while contributing very little to global warming. The Declaration represents the first deliverable under the Africa-EU Partnership on Climate Change and proves that Africa and Europe have similar concerns on climate change. It builds on the results of the African Environment Ministers Conference on Climate Change of November 2008 and is an important milestone towards common approaches, enhanced cooperation and ambitious targets for a post-Kyoto climate change agreement.

The EU is assisting and supporting the African region in its adaptation and mitigation efforts, predominantly through the Global Climate Change Alliance, in order to improve political dialogue and promote cooperation through the exchange of experiences between the European Union and African countries.

EU AND CARIFORUM WORKING TOGETHER ON CLIMATE

The Caribbean Forum (CARIFORUM) - EU Declaration on Climate Change and Energy was adopted in 2008. In the Declaration, the EU Global Climate Change Alliance (GCCA) was identified as a vehicle for political dialogue and cooperation on climate, support for the international negotiations on climate change agreement and effective measures at national and regional level.

Through the Declaration Heads of State and Government of CARIFORUM and the EU have appointed a joint CARIFORUM-EU technical group at the regional level to ensure the following priorities:

i. Support for the implementation of the Caribbean Regional Climate Change Strategy;

ii. Inventory of existing critical facilities to assess the vulnerability of key infrastructure and economic sectors to climate change, particularly in the agriculture, biodiversity, forestry, fisheries, tourism, health and water resources management sectors;

iii. Improved management of the region's natural resources, by way of the creation of an enabling environment for the sustainable development of agricultural productivity and the promotion of agricultural diversification.

EU AND PIFS JOIN UP ACT AGAINST CLIMATE CHANGE

The Pacific Islands Forum (PIFs) and the EU endorsed in November 2008 a joint Declaration that outline their common concerns for global warming and their common interest for an ambitious post-2012 international agreement. The document establishes a common framework for action on climate change in the Pacific and represents an important building block towards joined up approaches and ambitious targets for greenhouse gases emissions reductions.

The Global Climate Change Alliance is identified as a mechanism for improving political dialogue and promoting the exchange of experiences between the European Union and Pacific Islands and as a mechanism designed to increase their capacity to adapt to climate change and pursue sustainable development strategies.

In order to provide meaningful support to the objectives and actions identified in the three Declarations -as further strengthened by the adoption in May 2009 of the Joint ACP-EU Declaration on Climate Change and Development at the level of the Joint ACP-EC Council of Ministers- the EC has designed in 2009 a comprehensive GCCA regional support programme in Africa, the Caribbean and the Pacific.

Advancing Capacity, Partnerships and Knowledge to Support Climate Change Adaptation in Africa and Asia (ACCCA)

This programme[300] is creating a geographically diverse set of adaptation schemes to address climate risks in developing countries. It is supporting adaptation decisions in African and Asian countries through partnerships between stakeholders and scientific communities. The programme aims to reduce climate change vulnerabilities while promoting sustainable development. Stakeholder forums are being held to facilitate identification and prioritisation of climate risks, knowledge of risks and assessment of proposed adaptation responses.

Grants have been allocated to 10 of the 14 pilot actions short-listed at the June 2007 project launch workshop - more pilot action teams have been invited to participate in ACCCA since (including 9 from Africa). Technical meetings have been held to make progress in areas such as describing baseline vulnerability, drawing on initial prototypes of climate areas to determine which are of interest for planning adaptation. Other outcomes of these meetings include developing participatory risk-communication strategies for pilot actions.

A Technical Expert Team serves as an advisory resource for pilot projects.

Support to the Nairobi Work programme

The Nairobi Work Programme spans 5 years (2005-2010) and is implemented by Parties, intergovernmental and non-governmental organisations, the private sector, communities and other stakeholders, to assist all and especially least developed countries (LDC) and small island developing states (SIDS) to better understand the impacts of climate change and their vulnerability and to make informed decisions about their adaptation actions.

The EC has been supportive of the Nairobi Work Programme, which has been assessed by all parties as a very useful tool at the service of adaptation action.

[300] http://www.acccaproject.org/rubrique.php3?id_rubrique=21, EuropeAid Financial Contributions to UN Funds, Programmes and Specialized Agencies in 2005, http://ec.europa.eu/europeaid/who/partners/international-organisations/documents/the_ec-un_statistics_for_2005_en.pdf, http://ec.europa.eu/environment/climat/pdf/brochures/asia_en.pdf

Disaster Preparedness DIPECHO

DIPECHO[301] is the primary channel used by the EC to provide major financial support to developing countries to help them prepare for and respond to disasters. These include those linked to extreme weather and climate change.

On average, 16 % of humanitarian relief provided by DG ECHO outside of European borders is a response to sudden-onset natural disasters. This helps the most vulnerable populations in disaster prone regions and funds relief for natural disasters such as floods, hurricanes, storms. Projects implemented under DIPECHO support adaptation to climate change through training, capacity-building, awareness-raising, establishment or improvement of local early-warning systems and contingency-planning. Projects are often simple and community-owned, enabling communities at risk to prepare for and save their own lives and livelihoods during disasters.

The programme, which was initiated in 1996 and is now in its implementation stage, has expanded in recent years. DIPECHO now covers six disaster prone regions including the Caribbean, Central America, South America, Central Asia, South Asia and South East Asia. The EC has provided € 120 million to the programme since 1996. The EC's contribution is increasing each year - from € 8 million in 1998 to € 19.5 million in 2007.

This support channel is temporary - the EC aim to integrate disaster risk reduction into long-term development projects and national policies rather than just humanitarian aid operations as it has done historically. The EC-ACP Natural Disaster Facility (described below) has been set up with the purpose of preventing and reducing the effects of natural disasters in ACP countries.

Support to the Consultative Group on International Agricultural Research (CGIAR**)**

The CGIAR[302] is a strategic alliance of members, partners and international agricultural centres that mobilises science to benefit the poor. The main goal of the CGIAR is to achieve sustainable food security and reduce poverty in developing countries through scientific research and research-related activities in the fields of agriculture, forestry, fisheries, policy, and environment. The impacts of climate change on agriculture and the implication for marginalised communities around the world are some of the issues that the CGIAR strive to address. In recent years, CGIAR scientists have progressed significantly in determining what specific consequences rural people, especially the poor, can expect to face at specific locations as a result of climate change during the coming decades.

The European Union has been involved in the CGIAR since its beginning in 1971 and is the largest contributor. EC resources are allocated to a defined number of CGIAR projects that are generally co-funded by several donors. Moreover, through the European Initiative for Agriculture Research for Development (EIARD) constant emphasis is placed on connecting the activities of the international research centres more strongly to the national research centres in developing countries.

Regional Environmental Network for Accession (RENA)

301 http://ec.europa.eu/echo/aid/dipecho_en.htm

302 http://www.cgiar.org/index.html

The Regional Environmental Network for Accession (RENA)[303] aims to tackle environmental challenges and provide a forum for the experiences and best practices between the participating countries. One of the objectives of RENA is to provide support for capacity building through workshops, training and exchange programmes, as well as facilitate the preparation of adaptation strategies (see section 7.2.1 and 10.2.11).

EC-ACP Natural Disaster Facility

The EC aims to integrate disaster risk reduction into long-term development strategies projects and national policies. To this end, the 9th European Development Fund (EDF) established the EC-ACP (Africa, Caribbean, Pacific) Natural Disaster Facility[304] (NDF). Under the ACP Secretariat, the NDF coordinates with regional ACP bodies to enhance capacity in the areas of disaster prevention and preparedness. Ongoing work is focussing on preventative initiatives, dissemination of information, and strengthening research and management skills of ACP States.. Under the 10th EDF the NDF's budget has been increased to € 180 million.

7.4.2.3. Planned Activities

The Global Climate Financing Mechanism (GCFM) - an option for meeting urgent and immediate climate-related needs

Early action makes adaptation and the transition towards a low carbon economy smoother. The EC has been exploring the possibility and proposed in its January 2009 EC Communication 'Towards a comprehensive climate change agreement in Copenhagen' to develop a frontloading mechanism to rapidly deliver substantial funding in favour of the most vulnerable and poorest developing countries. This would be a bridging initiative in the transition period between 2010 and the full-scale implementation of the new financial architecture of the post-2012 agreement on climate change. Based on the issuance of bonds, the proposed Global Climate Financing Mechanism (GCFM) would allow early spending on priority climate-related actions. These funds would in particular allow for an immediate reaction to urgent adaptation needs with a high return such as disaster risk reduction. A share of the funds raised could also support mitigation activities, in particular, those that generate synergies between mitigation and adaptation such as reducing emissions from deforestation. The GCFM aims at raising around €1 billion per year for the period 2010-2014, provided that Member States make appropriate pledges.

Similar to the International Finance Facility for Immunization (IFFIm[305]), the GCFM would frontload finance through capital markets based on donors' guarantees of repayments at a later stage. Specific areas of adaptation where the use of frontloaded funding can be highly cost-effective include the following:

- Disaster risk management and prevention;

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303 The beneficiaries countries of RENA are Albania, Bosnia and Herzegovina, Croatia, the Republic of Macedonia, Montenegro and Serbia as well as Kosovo and Turkey

304 http://www.acpsec.org/en/pahd/sp_bradley_washington_02-07_e.htm
http://www.environmental-finance.com/onlinews/1127ect.html

305 The International Finance Facility for Immunisation (IFFIm) was created to accelerate the availability and predictability of funds for immunisation (see also: http://www.iff-immunisation.org/index.html).

- Agriculture, including changes in agricultural practices (e.g. reduced or no tillage, etc); changes in crop mix; increase of storage for irrigation; improved soil management and erosion control; marketing systems;

- Water, including ensuring safe water supply; water reuse technologies; increased integrated basin management; storage for irrigation and hydropower; protection of groundwater and improving recharge; rainwater harvesting; water policy reform and creation of incentives for efficient water use (mitigation and adaptation synergy);

- Health, increased geographical coverage of malaria projects and vector monitoring; increased funding for clean water supply and sanitation to prevent the spread of diseases, especially after floods (expected to increase in frequency and intensity);

- Sustainable natural resource management, ecosystems management, including sustainable land management; coastal zone management; protection of coral reefs; addressing livelihoods of fishery communities affected by climate change.

Other related EC support to counter natural disasters effects

The European Commission (EC) has provided €24.5 million in funding as the first donor for the Global Index Insurance Facility (GIIF) Trust Fund. This 7-year project aims to mitigate weather and catastrophic risks in ACP states through the application of index insurance. The GIIF will be managed by the International Finance Corporation (IFC) – part of the World Bank and follows the conclusion of a Financing Agreement between the EC and the ACP Group of States on 21st December 2007.

Supporting National Assessments of Post-2012 Proposals for Climate Protection on Sustainable Development (SNAPP 2012)

The SNAPP 2012[306] project builds on the BASIC (capacity building) project of 2004-2007 to support Brazil, South Africa, India and China to assess the pros and cons of various proposals for a post-2012 international climate change regime against national priorities and sustainable development goals. The SNAPP 2012 project will hold national workshops focusing primarily on supporting key proposals from developing countries concerning climate change policy and frameworks of the future.

An international dialogue aims to bring together the outcomes of these workshops into one comprehensive proposal capable of meeting the ultimate objective of the UNFCCC in a way that appeals to developing countries. The expected results include a better collective understanding and decisive action by the partner countries leading to a proposal for contributing to a post 2012 framework.

WWF India will act as the main coordinator on behalf of the project and its partners. The partner organisations of the BASIC project (2004-2007) will be participants in the SNAPP 2012 project.

The Climate Change Capacity Development + (C3D+)

306 http://www.wwfindia.org/about_wwf/what_we_do/cc_e/ccp/snapp/ http://www.ids.ac.uk/go/research-teams/vulnerability-team/research-themes/climate-change/themes/international-policy

The C3D+[307] project is currently in the final stage of approval by the EC and is due to commence in 2010. The first project meeting will be organised to take place in Poznan, Poland in December 2009. The CD3+ project aims to involve 6 training centres and will cover around 30 developing countries. A training programme on climate change related issues will reinforce the network of training in developing countries.

7.4.3.*Disaster Risk Reduction (DRR)*

Effective Disaster Risk Reduction can reduce the loss of life and property. Studies suggest benefits in terms of prevented or reduced disaster impacts of two to four dollars for each dollar invested in DRR.

Disasters can be avoided by addressing the root causes of people's vulnerability and increasing their capacity to cope. In this way, risks can be reduced and impacts limited. In recent years, the focus has moved from mainly responding to disasters to implementing comprehensive DRR approaches based on the *Hyogo Framework for Action 2005-2015: Building the resilience of nations and communities to disaster*. The Commission fully supports its implementation.

In an increasing effort to coordinate action, the EC has finalised a package covering aspects of DRR within and beyond the EU, addressing appropriate links between the external cooperation and internal action dimensions. The external dimension of DRR is covered in the EC Communication "EU Strategy for supporting disaster risk reduction in developing countries" whereas the internal dimension is envisaged in the EC Communication "A Community approach in the prevention of natural and man-made disasters" (see section 6.3.3).

One of the Strategy's main purposes is to provide a comprehensive and coherent policy framework for programming relevant thematic/geographic funding sources, including the European Development Fund (EDF) and instruments of the EC general budget[308]. Individual DRR allocations are set out in Country and Regional Strategy Papers for all developing regions, intra-ACP programmes, Drought Preparedness and DIPECHO programmes in the humanitarian aid context, and in thematic programmes on food security and environment/natural resources.

Under the 10th EDF, € 180 million are allocated to DRR, with an emphasis on capacity-building for DRR through the strengthening of national and regional institutions. More information on EDF funding can be found in section 7.2.3. This programme also contributes to the DRR component of the Global Climate Change Alliance, including adaptation of agricultural systems, ensuring synergies between climate change adaptation and disaster prevention. Several international research collaborations addressed this area with Mediterranean Partner Countries and other regions.

7.4.4.*Policy Coherence for Development and Climate Change*

Policies other than development cooperation have a strong impact on developing countries. The EC concept of Policy Coherence for Development (PCD) aims to build synergies between those policies and development objectives. This in turn will increase the effectiveness of development aid. Against the backdrop of the EU

307 http://www.c3d-unitar.org/

308 Instruments for: i) development cooperation, ii) humanitarian aid, iii) stability, iv) European Neighbourhood and Partnership.

commitment to substantially increase official development assistance, the importance of ensuring that these resources are not rendered inefficient or wasted by policy incoherence, is even greater.

Climate Change in the EC 2007 Report on Policy Coherence for Development[309]

Whilst climate change is affecting all countries, developing countries and the poorest populations will be hit earliest and hardest. Hence, all efforts deployed under the ambitious EC climate policy described in section 5, will directly or indirectly benefit these countries:

- The positive spill-over effects of scientific research programmes and investments in appropriate technologies will also indirectly benefit partner countries.

- The development of biofuel policies at international level could have both positive impacts on developing countries in their capacity as producers and negative impacts if sustainability criteria are not observed, (see section 5.2.5).

- Further improvements are required regarding the integration of climate change concerns into the policy dialogue with developing countries as well as into development cooperation programmes. The Global Climate Change Alliance (GCCA) between the EU and its developing partners, particularly the LDCs and other vulnerable developing countries, will be an important step in this direction.

309 http://ec.europa.eu/development/icenter/repository/Publication_Coherence_DEF_en.pdf

8. FINANCIAL RESOURCES AND TRANSFER OF TECHNOLOGY

Key developments

- Since the 4th National Communication, more accurate and representative categories have been used to provide a clearer picture of the level of financial contributions dedicated to climate change, with increased use of the Rio Markers to identify the climate change element in projects.

- EC financial contributions[310] related to climate change projects in developing countries have steadily increased from €160 million in 2004 to €318 million in 2007[311].

- The importance of climate change adaptation has continuously grown, as indicated by the increasing number of programmes and activities dealing with this issue – such as the Global Climate Change Alliance.

- There are a number of new EC initiatives and instruments to support this increased focus on climate change, such as the Global Energy Efficiency and Renewable Energy Fund (GEEREF), the Global Climate Change Alliance (GGCA) and the EU-ACP Energy Facility, the latter has a different scope but contributes equally significantly to the fight against climate change.

- Climate change has taken a more prominent role within the (7th) European Research Framework Programme, with a number of initiatives and projects having the specific objective of assisting developing countries with climate change related issues.

8.1. Introduction – European Community Objectives for Climate Change in the Context of Development Co-operation

The European Union reconfirmed in 2008 its role as the world leader in terms of overall development financing (on all issues not just climate change related): it increased its spending by 8 % reaching almost €50 billion, an all-time high in current prices[312].

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310 Source: European Commission - DG AIDCO project database. It was not possible to identify the climate change related component of funding from other DGs relevant to non-Annex 1 Parties. In particular theses figures do not include support to candidate countries and Balkans. Details on the calculation method is given in part. 7.3.

311 These figures include funds directed to three (Russia, Ukraine and Turkey) Annex I countries (UNFCCC), where an EU instrument covers both non-Annex 1 and Annex 1 countries. For 2004, this amounts to €3.95m, for 2005 it amounts to €2.8m, for 2006 it amounts to €4.3m and for 2007, it amounts to €22m..

312 EU ODA levels 2008. Annual progress report 2009 on financing for development: Commission Staff Working Document SEC(2009) 444 of 8.4.2009

The European Community is strongly committed to assisting developing countries in the fight against poverty and the achievement of the UN Millennium Development Goals. Combating climate change forms an integral part of this agenda. In recent years specific cooperation on climate change has been strengthened significantly across a range of different frameworks.

Achieving the Millennium Development Goals will require substantial investment to adapt to climate change. For the Least Developed Countries (LDCs), the United Nations Framework Convention on Climate Change (UNFCCC) established the Least Developed Countries Fund to prepare National Adaptation Programmes of Action (NAPAs) that describe the priority adaptation activities to be funded. In the context of the EU Global Climate Change Alliance (GCCA) support to non-LDCs for implementing climate related policies via sectoral budget support has been mentioned as an option. These activities generally fall within categories that are receiving overseas development assistance (ODA) funding: e.g. irrigation and water management, flood protection, developing drought-resistant crops and reforestation. The UNFCCC Secretariat estimates that adaptation costs in all developing countries could range from €23 billion to €54 billion per year in 2030. Further study of the economics of climate adaptation is required, but the needs are large in comparison with the present size of ODA. Future climate aid will compete with other internationally agreed development objectives.

The Communication 'Stepping up international climate finance: A European blueprint for the Copenhagen deal' an EC policy paper, adopted on 10th September 2009 presents a blueprint for scaling up international finance to help developing countries combat climate change. It recognises that the financing issue is central to prospects for reaching an ambitious agreement in Copenhagen. According to the European Commission estimates by 2020 developing countries are likely to face annual costs of around €100 billion to mitigate their greenhouse gas emissions and adapt to the impacts of climate change. Much of the finance needed will have to come from domestic sources and an expanded international carbon market, but international public financing of some €22-50 billion a year is also likely to be necessary. The Commission proposes that industrialised nations and economically more advanced developing countries should provide this public financing in line with their responsibility for emissions and ability to pay. Within this overall framework between 2010-2012, fast-start financing will be needed for adaptation, mitigation, research and capacity building in developing countries in the range of €5 to 7 billion per year (with adaptation estimated at 2-3 billion mainly to increase knowledge on likely impact of climate change, integrating adaptation into national development strategies and financing priority investments i.e. from the NAPAs).

In 2004 the EC underlined its commitment to help developing countries tackle climate change by adopting a Strategy and Action Plan on Climate Change in the Context of Development Cooperation[313] for the period up to 2008, which is described in section 6.4.2.

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http://ec.europa.eu/development/icenter/repository/COMM_NATIVE_SEC_2009_0444_4_EN_AUTRE_DOCUMENT_TRAVAIL_SERVICE-Where-does-the-EU-go-from-Doha.pdf

313 COM(2003)85 final, Communication from the Commission to the Council and the European Parliament, Climate Change in the Context of Development Cooperation http://ec.europa.eu/development/icenter/repository/env_cc_com_2003_85_en.pdf

Alongside dedicated project and programmes the EC aims to address climate change adaptation and mitigation as crosscutting issues in its external cooperation, exploiting synergies with, and building on long standing commitments and efforts to promote environmental integration. This has been a clear policy objective since the adoption of the EC Action Plan on Climate Change in the context of Development Cooperation and has been reaffirmed ever since in key policy documents and recent initiatives, such as the Global Climate Change Alliance.

Significant efforts are currently directed at the ongoing Mid-term Review of EC country strategies for Asia and Latin America, which offer opportunities to strengthen consideration of climate aspects in the policy dialogue, country diagnosis and response strategies that underpin the programming and delivery of external assistance. General and sector specific guidance has been developed to support greater uptake of climate change during programming and further downstream in the formulation and implementation of operations.

In this context; climate risks screening methodologies at the level of country programmes and for projects are being tested in a selected number of EC cooperation countries with a view to scaling up application in a near future. An ambitious programme of training seminars on environmental integration for staff involved in the delivery of EC external cooperation (including a very large proportion of staff from partner countries), but also open to other development partners has been running since 2005 and in this framework emphasis on climate aspects will be considerably strengthened from 2008.

8.2. EC Key Financial Instruments to Support Climate Change Activities Worldwide

Since the publication of the 4th National Communication, climate change has become a key priority for the EC and the increasing number of financial contributions related specifically to climate change activities reflect this. In addition, the EC has developed a greater level of detail in recording the resources directed to climate change; this enables a more in-depth analysis of such resources, as well as implementing monitoring tools to identify those programmes and activities which are particularly successful. This chapter focuses specifically on the EC commitment to supporting non-Annex I countries[314], taking into account the relevant activities coordinated at the EC level.

The financial resources reported in this chapter come directly from the budget of the EC and the European Development Fund (EDF)[315], and are separate from Member States' contributions which are reported in their corresponding National Communications. All financial figures are expressed in current prices.

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314 Some EC funding instruments covered in this chapter also cover Annex 1 countries, such as the Instrument for Pre-Accession (IPA) which covers climate change projects in Croatia and Turkey, and European Neighbourhood and Partnership Instrument (ENPI) which covers climate change projects in Russia, Ukraine and Turkey.

315 The European Development Fund receives funding from the Member States, and is subject to its own financial rules and is managed by the European Commission. AIDCO project database covers projects funding by EC and EDF, but not bilateral Member States' contributions.

8.2.1. *Candidate Countries and Potential Candidates*

Whilst this chapter focuses on funding allocated to non-Annex 1 countries, some candidate and potential candidate countries to the EU are also non-Annex 1 countries[316] which are therefore covered by the Instrument for Pre-accession Assistance (IPA). This instrument includes a wide range of interventions in South East Europe including climate change. The average annual allocation for the Western Balkans under IPA for the period 2007-2011 is approximately €800 million[317]. This is by far the highest per capita amount provided by the EC to any region in the world (around €30 annually). The IPA offers support through its five components: Transition Assistance and Institution Building, Cross-Border Cooperation (CBC), Regional Development, Human Resources Development and Rural Development. Priorities for funding are agreed within the framework of multi-annual strategies, which are developed on the basis of consultations between beneficiaries and the European Commission, and from which individual programmes or projects are then supported. The IPA (2007-2013) replaces the 2000-2006 pre-accession instruments, including:

- Phare, the scope of which supported the implementation of the acquis communautaire in the form of institution building and related investments, investments in economic and social cohesion and cross-border cooperation;
- ISPA, which was the precursor of the Cohesion Fund and deals with environment and transport infrastructure;
- SAPARD, the precursor of Rural Development plans, dealing with Common Agricultural Policy acquis and Rural development;
- Turkey pre-accession, with the same scope as Phare;
- CARDS, which covered the Western Balkans, providing Community assistance to the countries of South-Eastern Europe (2000-2006), supporting the reconstruction process in the Western Balkans.

In 2007, the Commission adopted a Decision[318] regarding a horizontal programme on the Energy Efficiency Finance Facility for Albania, Bosnia and Herzegovina, Croatia, Montenegro, Serbia including Kosovo[319], Turkey and the FYR of Macedonia under the IPA Transition Assistance and Institution Building Component. The maximum contribution to this initiative is €34.7 million financed through the main EU budget. This programme will financially assist the IPA countries to promote investments in energy efficiency and renewable energy generation in order to improve the energy performance of the building and industry sectors offering opportunities for the highest savings in energy and reduction in CO_2 emissions.

The IPA contributes funding to the working group on climate change of the Regional Environmental Network for Accession countries (RENA), to be launched in 2010. RENA is aimed at Albania, Bosnia and Herzegovina, Croatia, the former Yugoslav Republic of

316 Non-Annex 1 countries in this category include Albania, Bosnia and Herzegovina, Montenegro, Serbia, Kosovo and FYR Macedonia: http://unfccc.int/parties_and_observers/parties/non_annex_i/items/2833.php

317 MEMO/08/144, 5th March 2008 - Financial assistance to the Western Balkans – Donor cooperation - Fact sheet for the Commission Communication: "Western Balkans: enhancing the European perspective" See IP 378

318 COM(2007)6376 on 18/12/2007

319 Under UNSCR1244/99

Macedonia, Montenegro, Serbia, Kosovo and Turkey with an EC contribution of €5,900,000 from 2010-2012. Its objective is to enhance regional cooperation in the Western Balkans and Turkey in the field of environment in the prospect of accession to the European Union. RENA will build on the results achieved so far by the Regional Environmental Reconstruction Programme (REReP), which will end in 2009. One of the Working Groups will focus on capacity building, information exchange and ad hoc assistance in relation to the implementation by RENA beneficiaries of EU requirements on Climate Change and particularly the following aspects:

- EU/national/regional policies on Climate Change, post-2012 regime, elements of the EU's climate policy initiated through the European Climate Change Programme (ECCP) and GHG monitoring and reporting requirements;
- Creation of inventories, implementation of Monitoring Mechanism Decision (280/2004/EC), including institutional arrangements and resources needed, preparation of reports on emission inventories and emission projections;
- Development of adaptation strategies;
- Establishment of Emission Trading Schemes (ETSs).

8.2.2. *Bilateral Contributions Related to the Implementation of the Convention*

The EC implements climate change programmes and projects around the world. It delivers support through regional and country-specific approaches across a variety of sectors; there are climate change related activities ongoing in almost all the countries in which there are EC development cooperation activities.

For each of the relevant regions, the most significant regional programme is described in the following sections. These programmes are not explicitly climate change related, but rather are the instrument through which a significant amount of resources are dedicated to climate change. Details on the method used for calculation are provided in section 7.3.

8.2.3. *Africa, Caribbean and the Pacific (ACP)*

The Commission finances most of its development programmes for African[320], Caribbean[321] and Pacific[322] partner countries through the European Development Fund

[320] Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo (Republic of), Congo (Democratic Republic of), Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea-Bissau, Guinea, Ivory Coast, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, São Tomé & Príncipe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia and Zimbabwe

[321] Antigua & Barbuda, Bahamas, Barbados, Belize, Dominica, Dominican Republic, Grenada, Guyana, Haiti, Jamaica, Saint Kitts & Nevis, Saint Lucia, Saint-Vincent and the Grenadines, Suriname and Trinidad & Tobago

[322] Cook Islands, Fiji, Kiribati, Marshall Islands, Micronesia, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu

(EDF). A heading has been reserved for the Fund in the Community budget since 1993, following a request by the European Parliament. The Commission has repeatedly asked for it to be included in the overall EU budget. However, the European Council of December 2005 decided that the geographical cooperation granted to the ACP States (except South Africa) and OCTs should continue to be funded by the EDF for the period 2008-2013. It is funded by the Member States according to a specific contribution key, is subject to its own financial rules and is managed by a specific committee. Each EDF is concluded for a multi-annual period and is implemented within the framework of an international agreement guiding the relations between the European Community and the partner countries; two EDFs cover the reporting period for the 5th National Communication and future commitments:

- Ninth EDF: 2000-2007 (Cotonou Agreement, 2000-2020)
- Tenth EDF: 2008-2013 (Cotonou Agreement, revised in Luxembourg, 2005) The EDF consists of grants managed by the Commission and risk capital and (concessional) loans managed by the European Investment Bank (EIB) under the "Investment Facility". The Cotonou Agreement signed in June 2000 streamlined the EDF and introduced a system of rolling programming, making for greater flexibility and giving the ACP States greater responsibility.

The ninth EDF was allocated €13.8 billion for 2000-2007. To this initial amount were added uncommitted funds from previous EDFs and unspent funds released at the end of projects funded from the EDF (so-called "decommitted funds"). At the end of 2007, the funds committed under the 9th EDF amounted to €17.9 billion. The tenth EDF (2008-2013) has been allocated €22.682 billion. In addition to managing part of the EDF's resources under the investment facility, the EIB will contribute up to €2 billion from its own resources for the period covered by the tenth EDF.

Geographical cooperation with the ACP under the EDF is complemented by development aid provided by the Community's general budget and by bilateral cooperation and contributions from individual Member States to multilateral development cooperation.

For the period between 2004 and 2007, €394 million were allocated to climate change related projects in the ACP zone, of which €327m from the EDF[323]. For the ACP region, the most important EDF programme which co-finances projects that deliver energy services to poor rural areas is the ACP-EU Energy Facility[324], launched in 2007.

The ACP-EU Energy Facility is a contribution under the EU Energy Initiative to increase access to energy services for the poor. The Facility[325] was approved by the joint ACP-EU Council of Ministers in June 2005, with an amount of €220million. The main activity of the Facility is to co-finance projects that deliver energy services to poor rural areas. Four key principles underpin the Facility:

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323 Remaining €67 million were from the budget, mainly through Environment and Food Security budget Lines

324 http://ec.europa.eu/europeaid/where/acp/regional-cooperation/energy/index_en.htm

325 Communication from the Commission to the Council and the European Parliament on the future development of the EU Energy Initiative and the modalities for the establishment of an Energy Facility for ACP countries http://eurlex.europa.eu/smartapi/cgi/sga_doc?smartapi!celexplus!prod!DocNumber&lg=en&type_doc=COMfinal&an_doc=2004&nu_doc=711

1. Governance: The Energy Facility targets in particular ACP countries which pursue or are firmly resolved to create a sound national energy policy, based on good governance principles. The Facility helps countries to establish their institutional and regulatory framework and to attract additional financial resources for public-private partnerships.

2. Ownership: The Energy Facility is to be fully demand driven. It will be an instrument to support and deepen the involvement of actors in ACP countries in the design and implementation of energy policies.

3. Flexibility: Maximum impact is sought by offering creative combinations of grants with other sources of financing. The Facility is open to joint financing with Member States, other international financing institutions such as the European Investment Bank and private sector investments via public-private partnerships.

4. Innovation: The Facility is intended to offer innovative responses to the challenge of providing sustainable energy services to the poorest areas. Projects can include electrifying rural areas, improving the efficiency of households' cooking and promoting sustainable energy generation through bio-mass, small hydro-electric plants and wind turbines.

The EC has identified three Priority Activity Areas to be funded under the Energy Facility:

1. Delivery of energy services: The largest financial contribution from the Facility is designed to improve rural people's access to modern energy services, particularly in Africa. Priority is given to people in unserved areas. Proposals must ensure the economic, social and environmental sustainability of the investment.

2. Creating an enabling environment: Where governance conditions are not in place for delivery-oriented intervention in the field, up to 20 % of the Facility supports the development of an enabling environment for the energy sector based on good governance principles. The Facility facilitates the implementation of sound national energy policies and strategies, improves the institutional, legal and regulatory framework, strengthens the capacity of key stakeholders, and improves monitoring and evaluation capacity.

3. Supporting future large-scale investment programmes: Up to 20 % of the Facility resources is devoted to preparatory activities required to facilitate future large-scale investment plans for cross-border interconnections, grid extensions and rural distribution, preparing them for financing by international finance institutions.

The Energy Facility was mainly implemented through a €198 million Call for Proposals which was launched in June 2006. Out of 307 proposals received, 74 projects have been contracted by the end of 2008 for a total amount of €196 million from the Energy Facility, with a total project cost of €430 million.

The main activities performed through Energy Facility projects can be classified into three different groups: (1) energy production, transformation and distribution, (2) extension of existing electricity grids and (3) "soft" activities such as governance, capacity building or feasibility studies. This classification is based upon the main

activity of the project, but it should be highlighted that all projects include capacity building activities.

The sources of energy used for electricity generation were mainly renewable energies (77 % of the projects). Only one project using exclusively fossil fuels was funded. In total, €81 million of commitments have been marked has climate change related under the Energy Facility, as support to enhance use of renewable energies or increase energy efficiency.

8.2.4.*Overseas Countries and Territories*

The EC is also contributing financial resources to climate change related activities to climate change related projects in Overseas Countries and Territories[326] (OCTs) through the EDF. €28 million were allocated to climate change related projects between 2004 and 2007 in the OCT region mainly on energy, sustainable development and preservation of natural areas.

8.2.5.*Asia*

The main programmes for Asian[327] countries were the Technical Assistance for the Commonwealth of Independent States (TACIS) and the Asian and Latin America (ALA) Regulation until 2006. These were replaced by the Development Cooperation Instrument (DCI) from 2007 to 2013, as the main instrument through which the EC commits financial resources to climate change related projects in Asia. The overall goal of the DCI instrument is the eradication of poverty in partner countries and regions in the context of sustainable development, including pursuit of the Millennium Development Goals. €134 million were allocated to climate change related projects between 2004 and 2007. Most of the programmes related to climate change are implemented on a national basis following the main challenges of the countries, such as deforestation in South East Asia, Energy in China, Environmental integration and governance in Central Asia. The SWITCH Programme, launched in 2007, works through calls for proposals all over Asia to promote sustainable production and consumption.

8.2.6.*Latin America*

The Development Cooperation's (DCI) geographic programmes also cover Latin America, replacing the ALA programme for developing countries in Latin America. The Regional Cooperation Programmes cover the whole of the region of Latin America[328]. The fields concerned include education, SME development, local government,

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326 Aruba, Bermuda, British Virgin Islands, Netherland Antilles, Anguilla, Cayman islands, Turks & Caicos islands, Montserrat, New Caledonia, Polynesie Française, Wallis & Futuna, Pitcairn, British Indian Ocean Territory, Mayotte, St Pierre & Miquelon, Greenland, British Antarctic Territory, Falkland islands, South Georgian and South Sandwich Islands, St Helena, Terres Australes et Antarctiques Françaises

327 Afghanistan, Bangladesh, Bhutan, Cambodia, China, India, Indonesia, Kazakhstan, Kyrgyzstan, Laos, Malaysia, Maldives, Mongolia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Tajikistan, Thailand, Turkmenistan, Uzbekistan and Vietnam

328 Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay and Venezuela

information technologies and social cohesion. They aim to reinforce ties with the EU through the exchange of experiences and the creation of networks. €118 million were allocated on climate change related activities between 2004 and 2007, with a particular focus on sustainable forest management.

A key programme is the Euro-Solar Programme, aiming to reduce poverty, allowing remote rural communities currently without access to electricity, to benefit from renewable electric energy. Approved in May 2006 and extended in December 2008, the Programme's total budget amounts to €35.8 million, of which €6.9 million will be provided by the Programme's eight beneficiary countries.

A specific study on climate change issues, the "Review of the Economics of Climate Change in South America", was approved in December 2008 for twelve-month duration and an EC contribution of €500,000 to make an economic analysis of the impacts of climate change in selected countries of South America in the areas of mitigation and adaptation of selected sectors.

8.2.7. *European Union's Southern and Eastern Neighbours*

The European Neighbourhood and Partnership Instrument (ENPI) has been operational since 1st January 2007. The ENPI is the main source of funding for the 17 partner countries[329]. The ENPI replaces the co-operation programmes TACIS for the Eastern European[330] Neighbours and MEDA for the Mediterranean Partner Countries. The ENPI provides continuity with enlarged objectives of the former TACIS and MEDA programmes. The main purpose is to create an area of shared values, stability and prosperity, enhanced co-operation and deeper economic and regional integration by covering a wide range of co-operation areas. For the period between 2004 and 2007, €120 million were allocated to climate change related activities, with a focus on the energy sector.

8.3. Provision of 'New and Additional' Resources

The growing importance of climate change is evident through the EC's increasing contributions to climate change activities internationally over the reporting period. Since the 4th National Communication, it has been possible to clearly identify the climate change component and corresponding financial contributions of such activities with greater accuracy than before, therefore the figures are a more precise reflection of contributions related to climate change activities.

Since the 4th NC, some new and additional resources have been made available under the EC Thematic Budget Lines. The Environment and Natural Resources Thematic Programme (ENRTP), including Energy, have been allocated an amount of €450 million for 2007-2010 (+ €400 million foreseen for 2011-2013) - this amount being more than twice, annually, the resources allocated to environment under previous thematic budget lines (2000-2006). The allocation per sector within the ENRTP also shows a positive trend as regards the most climate change sensitive sectors with around 67 % of commitments (around €85 million annually) for 2007-2010 on Forests, Energy and actions explicitly targeting Climate Change - compared with the 52 % (around €25 million annually) on the same issues during the 2002-2006 period.

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329 Algeria, Armenia, Azerbaijan, Belarus, Egypt, Georgia, Israel, Jordan, Lebanon, Libya, Moldova, Morocco, Occupied Palestinian Territory, Russia, Syria, Tunisia and the Ukraine

330 Includes Russia and the Ukraine, which are Annex I countries

The ENRTP 2007-2010 also comprises two new important initiatives, Global Climate Change Alliance (GCCA) and the Global Energy Efficiency and Renewable Energy Fund (GEEREF), specifically targeting Climate Change. More information on future commitments and these two measures can be found in sections 7.5 and 8.6.4.

The increasing trend as regards climate change is also demonstrated by the increased importance given to energy efficiency and renewable energies within the energy sector of cooperation. Whereas during 2002-2005 period, the commitments in the field of renewable energy end energy efficiency remained quite low, an important effort has been made since 2006 - notably due to the Energy Facility for ACP states.

Table 8-1 below shows the financial resources in category headings most relevant to climate change. The figures shown are wholly directed to climate change. In order to avoid double counting, projects that could have been classified under more than one category have been attributed to the category most relevant to the project objective.

The EC is able to report more accurately on the financial resources attributed to climate change due to the increased and consistent use of the Organisation for Economic Co-operation and Development's Rio Markers[331] for biodiversity (1), climate change (2) and desertification (3). The Directives on the use of the Rio Markers provide concise definitions to be used.

The Rio Marker "Climate Change" is particularly relevant and the criteria for eligibility are that a project contributes to:

- The mitigation of climate change by limiting anthropogenic emissions of GHGs, including gases regulated by the Montreal Protocol; or
- The protection and/or enhancement of GHG sinks and reservoirs; or
- The integration of climate change concerns with the recipient countries' development objectives through institution building, capacity development, strengthening the regulatory and policy framework, or research; or
- Developing countries' efforts to meet their obligations under the Convention

A further feature of the Rio Markers is the Develop Assistance Committee[332] policy marker system, which enables increased accuracy when calculating financial expenditure towards climate change, as it allows a different weighting[333] to be given to the total project value depending on how significant the climate change objective is. The use of this procedure is also consistent with the EC's reporting for the Bonn Declaration[334]. Some climate change adaptation programmes have also been included

331 Reporting Directives for the Creditor Reporting System – Addendum Rio Markers – 2004 http://news.global-mechanism.org/u/nrd.php?p=uid_$llid$_115469_223_61

332 http://www.oecd.org/about/0,3347,en_2649_33721_1_1_1_1_1,00.html

333 Climate change related projects aim to achieve one of the criteria of the DAC directives either directly and explicitly (principal) or indirectly (significant). A weighting factor of 0.4 was used to calculate the financial contributions of "significant" projects whereas "principal" projects are accounted for using their entire project value.

334 Bonn Declaration on Learning for Work, Citizenship and Sustainability formulated in 2004 http://unesdoc.unesco.org/images/0014/001405/140586m.pdf

in this table – even if there are not yet concerned by the Rio Markers definition. Only programmes clearly linked to adaptation to already identified consequences of climate change has been taken into account. The "adaptation specific" category should be considered as an attempt from the EC services to better identify adaptation actions, while a more systematic methodology is under development with the OECD. To avoid double counting, projects with positive impacts both on adaptation and mitigation (for example in agriculture, forestry or biodiversity management) has not been included under "adaptation specific". Therefore, support to adaptation is considerably higher than the one under "adaptation specific" category.

Using the same categories[335] as the EC to classify climate change projects, resources are directed to climate change activities in the following areas:

- Agriculture
- Protection of biodiversity and protected areas[336]
- Capacity building
- Promotion of energy efficiency and conservation
- Forestry
- Support to Kyoto mechanisms including CDM
- Pollution control
- Promotion of renewable energy technologies
- Waste management
- Awareness raising
- Adaptation specific[337]
- Multi-sectoral[338]

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335 Categories are used internally within EuropeAid for internal reporting purposes

336 Primary objective is mitigation, providing carbon sinks, however it also has a secondary adaptation element, including support to management of protected areas such as forests, mangroves and coastal areas.

337 Adaptation specific category includes some of the EC funded programmes with specific objectives on climate change adaptation within the following sectors: disaster risk reduction, policy support, water use and sanitation, research and rural development & food security. OECD guidelines for Rio Makers do not include adaptation and no other guidelines exist on adaptation for the EC to use, so this category should be considered as is an attempt to identify the adaptation element.

338 This category includes environmental projects and programmes that are not solely focusing on climate change alone but on a number of environmental issues including climate change, and support to environmental NGOs and ministries.

8.3.1. *Identifying Financial Resources Relevant to Climate Change*

Based on these categories, it is possible to produce an overview of those resources specific to climate change, in Table 8-1 below. Financial contributions to climate change projects have steadily risen between 2004 and 2007, reflected by total figures rising from €160 million in 2004 to €318 million in 2007.

Table 8-1 Financial Resources relevant to climate change

Official Development Aid[339] million €)	**2004**	**2005**	**2006**	**2007**
Agriculture	14	9.88	13.92	9.43
Biodiversity/Protected Areas	51.43	50.88	56.28	6.66
Capacity building[340]	1.58	2.05	4.15	10.96
Energy Efficiency	5.37	2.72	31.27	42.97
Forestry	60.21	52.42	48.02	24.01
Support to Kyoto / CDM	0.47	2.31	1.00	4.80
Pollution control	7.00	0.00	6.19	1.48
Renewable energies	3.48	14.64	41.75	145.45
Waste Management	6.33	0.92	1.93	8.31
Awareness Raising	0.71	0.36	0.82	0.04
Others / Multi-sectoral	5.67	4.05	9.51	29.14
Adaptation Specific	4.00	23.66	17.38	35.04
Total[341]	**160.24**	**163.89**	**232.22**	**318.30**

The figures in Table 8-1 reveal some key trends:

- EC financial commitments follow specific programming cycles, which can explain the year-by-year variability of figures for specific categories or regions. One such example is the funding committed via the EU-ACP Energy facility, which improves the access to energy for the poor in African Caribbean and Pacific

339 All figures provided are commitments rather than disbursements

340 Capacity for adaptation. This category is based on those project classifications within DG AIDCO's database.

341 These figures include funds directed to two (Russia and Ukraine) Annex I countries (UNFCCC)), where an EU instrument covers both non-Annex 1 and Annex 1 countries. For 2004, this amounts to €3.95 million, for 2005 it amounts to €2.8 million, for 2006 it amounts to €4.3 million and for 2007, it amounts to €22 million.

countries and is financing many energy efficiency and renewable energy activities, having a large impact on the 2007 figures.

- The categories to which the European Community contributes most are: biodiversity and protected areas, renewable energies, energy efficiencies, forestry and adaptation specific activities.

- Climate change adaptation in developing countries has risen in importance in the EC's agenda and has been an area of growing activity, a trend reflected by a rise in financial contributions from €4 million in 2004 to €35 million in 2007[342].

8.3.2. *Summary of Bilateral Contributions*

Table 8-2 below, summarises total financial commitment for bilateral contributions related to the implementation of the Convention for five regions, excluding candidate countries and potential candidates[343]. A more detailed breakdown of these figures, per country, within each region is available in Appendix G-G1. The EC also runs a number of programmes or initiatives that cover more than one region, which are classified as "Global".

[342] Adaptation activities included in these figures are not directly comparable with all projects, policies and programmes named in Chapter 6, as Chapter 6 also includes intra-EU activities, and planned activities beyond 2007.

[343] It is not possible to breakdown the separate, climate change related elements of funding to these countries.

Table 8-2 Summary table of financial resources for five regions[344]

Total			Mitigation & Adaptation
Year	**Region**	**Number of projects**	**Total value projects (million €)[345]**
2004	ACP	17	26.3
	Asia	32	78.9
	Latin America	22	20.1
	Neighbourhood	13	26.6
	OCT	1	2.8
	Global	2	5.5
2004	**Total 2004**	**87**	**160.2**
2005	ACP	50	98.9
	Asia	30	22.8
	Latin America	9	19.2
	Neighbourhood	5	5.0
	OCT	2	2.9
	Global	8	15.0
2005	**Total 2005**	**104**	**163.9**
2006	ACP	64	106.8
	Asia	19	13.8
	Latin America	30	65.8
	Neighbourhood	14	21.9
	OCT	1	5.2

344 These figures include funds directed to two (Russia, Ukraine and Turkey) Annex I countries (UNFCCC)), where an EU instrument covers both non-Annex 1 and Annex 1 countries. For 2004, this amounts to €3.95 million, for 2005 it amounts to €2.8 million, for 2006 it amounts to €4.3 million and for 2007, it amounts to €22 million

345 Total figures do not sum due to rounding

Total			Mitigation & Adaptation
Year	**Region**	**Number of projects**	**Total value projects (million €)**[345]
	Global	14	18.7
2006	**Total 2006**	**142**	**232.2**
2007	ACP	88	162.5
	Asia	11	18.4
	Latin America	4	12.4
	Neighbourhood	10	66.2
	OCT	3	17.0
	Global	11	41.8
2007	**Total 2007**	**127**	**318.3**

Increasing levels of funding are allocated in the latter part of the reporting period, reflecting the fact that relevant climate change activities and projects have been identified and funding approved. There is an ongoing trend of steadily increasing levels of funding allocated within the ACP region over time.

Appendix G-G1 provides the further breakdown of the nature of the resources summarised in Table 8-2, illustrating the size and number of climate change projects on an annual basis from 2004-2007 in each of the five regions ACP, Asia, OCT, Latin America and Neighbourhood, respectively.

In addition, in December 2007, the EC agreed to provide €24.5 million to the Global Index Insurance Facility (GIIF) Trust Fund. This 60 month project aims to mitigate weather and catastrophic risks in ACP states through the application of index insurance. The budget allocated for the first phase of the facility is € 12 million (EU ACP Natural Disaster Facility).

8.3.3.*Resources Allocated in 2008*

A significant amount of bilateral funding has been approved and allocated to climate change related projects in developing countries in 2008. Table 8-3 excludes funding allocated to Accession countries, which is outlined separately in section 7.2.1, as it is not possible to identify the climate change element of these figures for inclusion. The table indicates that there is a significant amount of funding allocated in 2008 to climate change activities in developing countries:

Table 8-3 Allocated funding for 2008 climate change activities

Total			Mitigation & Adaptation
Year	**Region**	**Number of projects**	**Total value projects (million €)** [346]
2008	ACP	47	114.1
2008	Asia	28	114.4
2008	Latin America	21	42.4
2008	Neighbourhood[347]	23	163.5
2008	OCT	1	2.0
2008	Global	23	74.2
2008	**TOTAL**	**143**	**510.6**

8.4. Provision of Financial Resources to Multilateral Institutions and Programmes

In addition to bilateral and multilateral contributions, and whilst the European Community does not contribute directly to the Global Environment Fund (GEF), the EC also provides parallel co-financing for some climate change related projects funded by the Global Environment Facility (GEF). One such example is a 2004 project in Vietnam, "*Support for Forest Sector Development*", which benefitted from a €3 million grant. €2 million of this grant went towards supporting the Vietnam Conservation Trust Fund. This project was implemented via the World Bank.

In addition, the Adaptation Fund was established in 2007 to support developing countries that lack resources to cope with adapting to and mitigating climate change and to be financed mainly from a share of Clean Development Mechanism (CDM) revenues. There have been no EC contributions to date; more detailed information on Member State contributions can be found in their National Communication.

The European Community contributes to multi-lateral institutions and programmes for climate change activities in developing countries. These contributions are shown below in

Table 8-4 below. It has been possible to identify the climate change element of funding projects and programmes more accurately than in previous National Communications due to enhanced data management by the EC; as a result the figures are more accurate and reflect more adequately the proportion of contributions

[346] These totals are indicative only as they do not include all the projects for 2008 that are planned, foreseen or yet to be processed.

[347] This figure includes €70m committed to a budget support programme in the Ukraine (Annex I country) – "Support to the implementation of Ukraine's strategy in the area of energy efficiency and renewable sources of energy"

relevant to climate change[348]. *This explains why some figures, such as the European Community's contributions to UNDP, appear lower than the figures which were reported in the European Community's 4th National Communication*.

Table 8-4 Financial contributions to multilateral institutions and programmes

Institution or programme	Contribution (million €)			
	2004	2005	2006	2007
Multilateral Institutions				
CIFOR	0.00	0.00	0.00	2.00
EBRD	0.00	1.57	13.74	0.00
FAO	0.00	1.21	6.85	14.48
IUCN	0.00	0.00	0.24	0.00
OECD	0.00	0.00	0.00	0.20
UN RISD	0.00	1.43	1.45	0.00
UNDP	30.00	11.48	1.07	4.00
UNEP	2.40	1.64	3.52	19.00
IEA	0.40	0.40	0.40	0.40
UNFCCC	0.55	0.95	2.15	4.25
UNICEF	0.00	0.00	1.78	0.00
UNOPS	0.00	0.00	9.90	0.00
WB	16.10	3.00	3.42	6.48
Multilateral scientific, technological and training				
1. WWF	1.83	1.53	3.50	1.55

8.5. Future Commitments

Beyond these initial figures available for 2008, there are a number of significant activities that the EC has already planned for beyond 2008. To reflect the EC's

[348] These figures do not take into account programmes that have been committed but not contracted at the time of writing.

commitment to climate change support for developing countries, the EC has announced that climate change will be a priority in the upcoming Country Strategy Papers mid-term review exercise in 2009-2010. This will contribute to redirect strategies to ensure that climate change becomes more prominent in the 2007-2010 programming cycle.

The Global Climate Change Alliance (GCCA) became operational in 2008 and is already a key element of the EU's external development action in the area of climate change, providing a platform for dialogue and exchange as well as practical cooperation between the EU and those developing countries that are most vulnerable to climate change, in particular the least developed countries (LDCs) and small island developing states (SIDS), as outlined in chapter 6.

The European Commission has earmarked €70 million in additional funding from the Environment and Natural Resources Thematic Programme (ENRTP) over the period 2008-2010 to start up the GCCA and finance country interventions. A significant share of existing geographic and thematic funding will also serve the objective of the initiative. Around €30 million of ENRTP funds are expected to contribute to REDD. Under the 10th EDF 'intra-ACP' regional funding of €40 million is allocated to the implementation of the GCCA at regional level in Africa, the Caribbean and Pacific and with a strong focus on adaptation and capacity building. This is in addition to €180 million allocated for the implementation of the EU strategy for supporting Disaster Risk Reduction in the ACP. The Commission also appealed to the EU Member States to contribute resources to the GCCA.[349] The GCCA was discussed with the EU Member States, who endorsed its objectives, indicating that support should be complementary to existing initiatives. The European Council of June 2008 called for the effective implementation of the GCCA and invited the Commission to consider innovative means of financing.[350]

There are a number of future commitments mentioned throughout this report, namely in sections 7.4.2.3 and 9.1.3 which cover relevant future commitments on climate change activities both within and beyond the EU which will benefit from EC funding. Further information on future financial commitments relating to financial instruments already covered in this chapter are described in earlier sections 7.2.1, 7.2.3 and 7.3.

A replenishment of the ACP-EU Energy Facility has been decided under the 10th European Development Fund for the period of 2009-2013. Endowed with €200 Million, it will focus on improving access to safe and sustainable energy services in rural and peri-urban areas. The new Energy Facility will also contribute to the fight against climate change by emphasizing the use of renewable energy sources and energy efficiency measures and by taking into account impacts of climate change on energy systems. The new Facility would start being implemented by the end of 2009.

Following the 5th Summit between Heads of State and Government of the EU and Latin American and Caribbean countries and the subsequent Lima Declaration in May 2008, the European Commission foresees to encourage bi-regional cooperation between Latin America and the European Union on climate change issues (exchange of experiences, strengthen institutional capacities, etc.). The EUrocLIMA Initiative is planned to start beginning of 2010 with an EC contribution of €5 million. The Initiative envisages to focus on improving the knowledge of the decision-makers and the

349 Sweden is contributing € 5.5 million in 2008. Czech Republic is contributed €1.2 million. Other MS expressed interest to support the GCCA.

350 See Council Conclusions on GCCA of 20th November 2007.

scientific community on problems and consequences of climate change, particularly in view of integrating these issues into sustainable development strategies.

The European Commission also plans to establish the Latin America Investment Facility (LAIF) through the DCI. The LAIF will focus on energy, environment and transport investment, contributing to cleaner transport infrastructure, improved energy efficiency and energy savings, the use of renewal energy, low-carbon production and of climate change adaptation technologies. It will also provide support to SME development and to social sector infrastructures. The LAIF will operate by providing financial non-refundable contributions to support loans to partner countries from the European Investment Bank (EIB) and other European, multilateral and national, development finance institutions and will encourage the beneficiary governments and public institutions to carry out essential investments in the relevant sectors. The contribution of the Commission to the LAIF will be decided annually. For the year 2009, the Commission will allocate a budget of €10.85 million.

8.6. Activities Related to the Transfer of Technology

Technology Transfer (TT) in the context of climate change is defined as: "A broad set of processes covering the flows of know-how, experience and equipment for mitigating and adapting to climate change among different stakeholders." More specifically, the transfer and development of technology activities can be hard or soft in nature. These categorisations are defined in the Technology Transfer Framework[351] as:

- "soft" technologies: capacity-building, information networks, training and research.

- "hard" technologies: equipment to control, reduce or prevent anthropogenic emissions of greenhouse gases in the energy, transport, forestry, agriculture, and industry sectors, to enhance removals by sinks, and to facilitate adaptation.

The framework also lists five themes for technology transfer, enabling more precise identification of projects that are of relevance:

1. Technology needs and needs assessments
2. Technology information
3. Enabling environments
4. Capacity-building
5. Mechanisms for technology transfer

8.6.1. *Overview of EC Funded Technology Transfer Initiatives and Programmes*

All development aid cooperation projects in the field of climate change, and described in the previous section, involve technology transfer activities as defined by the technology transfer framework. It is in most case impossible, within a given programme, to get a breakdown of the technology transfer activities and related

[351] Technology Transfer Framework: http://unfccc.int/ttclear/jsp/Framework.jsp

financial resources; therefore, all development cooperation programmes have been considered as technology transfer in the following section.

In addition to these, there are a number of other climate change activities involving technology transfer funded by the EC, most notably in the area of research. The following section provides an overview of such programmes.

EC Framework Programmes

The 7th Framework Programme for research and technological development (FP7) remains the most important EC financial mechanism to support research on climate change and the development of energy technologies, including cooperation with non-EU countries, with resources for research in support to TT and capacity building with third countries. Many specific FP instruments are developed to promote and support international cooperation including on climate change technologies and are described in more detail in chapter 9.

The main component of FP7, running between 2007 and 2013, is the €32.4 billion "Cooperation[352]" programme, which is divided into research themes, one of which is called "Environment (including climate change)": with a total budget of €1.89 billion, it will be the cornerstone of environmental research in Europe but will also expand to developing countries, as a number of projects under FP7 are specifically targeted at these countries.

Strategic Energy Technology Plan

The Strategic Energy Technology (SET) Plan provides a blueprint for Europe to develop a world-class portfolio of affordable, clean, efficient and low emission energy technologies. It puts forward a vision of Europe investing and working collectively to develop and facilitate a global market take-up of such technologies, with European industry leading the way. SET Plan also includes a substantial international cooperation dimension with industrialised, emerging and developing countries that should create new opportunities for cooperation between the EU and international partners.

Near-zero Emissions Power Generation Technology through Carbon Dioxide Capture and Storage

The EU and China committed to cooperate on Carbon Dioxide Capture and Storage (CCS) in the framework of the "Near-zero Emissions Power Generation Technology through Carbon Dioxide Capture and Storage" programme (NZEC). This cooperation aims at demonstrating the CCS technology in China to enable deployment from 2020. The EU-China NZEC was launched in 2005 and is part of the wider EU-China Partnership on Climate Change. Phase 1 of NZEC (R&D) is currently being executed under the umbrella of an EU-China Memorandum of Understanding. Several FP6 and FP7 research projects support the implementation of Phase 1 to be completed at the end of 2009. The next two phases will follow: PHASE II (site selection and design of plant) and PHASE III (construction and operation of the plant).

European Energy Technology Platforms

The European Energy Technology Platforms (ETPs) were set up to define, at European level, common strategic research agendas which should mobilise a critical mass of

[352] Dedicated to research cooperation

national and European public and private resources. The ETPs also represent a forum for discussion and exchange views on R&D cooperation with international partners. There are 6 ETPs in non-nuclear energy (PV, SmartGrids, Biofuels, Zero-emission fossil fuel plants, Solar Thermal, Wind) and one Sustainable Nuclear Energy Technology Platform (SNETP).

ITER

The Joint International R&D project ITER translates the political will into a large scale concrete international instrument pooling resources from different key international partners. ITER is a joint international research and development project that aims to demonstrate the scientific and technical feasibility of fusion power. The partners in the project are the EC, represented by EURATOM, Japan, the China, India, the Republic of Korea, the Russian Federation and the USA.

$C0_2$ Coach

The COACH project aims at establishing broad cooperation between China and the EU in the field of CCS . It will prepare the ground for implementation in China of large-scale poly-generation energy facilities with options for coal based electric power generation as well as production of hydrogen and synthetic fuels. For these facilities, CO_2 capture and geological storage (including use for enhanced oil or gas recovery) constitute an inherent and decisive prerequisite.

More information about projects can be found on the CORDIS[353] website, an information space for European Research and Development (R&D) and exploitation of European R&D results. Examples of projects under the environment theme of the EC FP6 and FP7 relevant to non-Annex I countries regarding technology transfer for climate change activities also include[354]:

- TETRIS (Technology Transfer and Investment Risk in International Emission Trading),
- ADAM (Adaptation and Mitigation Strategies: Supporting European Climate Policy),
- GAINS-ASIA (Greenhouse Gas and Air Pollution Interactions and Synergies),
- TOCSIN (Technology-Oriented Cooperation and Strategies in India and China: Reinforcing the EU dialogue with Developing Countries on Climate Change Mitigation),
- ClimateCost (Full Costs of Climate Change) (see 9.2.4 for further information),
- HighNoon (Impacts of Himalayan glaciers retreat and monsoon pattern change on the water resources in Northern India, and adaptation strategies),
- Climate for Culture (Development and application of methodologies, technologies models and tools for damage assessment, monitoring and adaptation to climate change impacts).

353 http://cordis.europa.eu/home_en.html

354 A catalogue of EC funded research projects since 2003 is available via http://ec.europa.eu/research/environment/pdf/cop-15.pdf

8.6.2.*Financial Resources Dedicated to the Transfer of Technology*

Funding for technology transfer in climate change has more than doubled by the end of the reporting period, from €160 million in 2004 to €318 million in 2007. Table 7-5 below indicates that the majority of resources are directed to soft technology transfer activities over the reporting period, which includes capacity building: €552 million compared to €219 million on hard technologies. It may appear that there is a trend from these figures in a shift towards hard technology transfer, as the figures are now higher than soft transfer of technology for 2007 from a much lower base in 2004, however, this is mainly due to resources committed via the Energy Facility.

Table 7-5 and subsequent graphs demonstrate the significant increased level of financial resources dedicated to the transfer of hard and soft technologies related to climate change in developing countries.

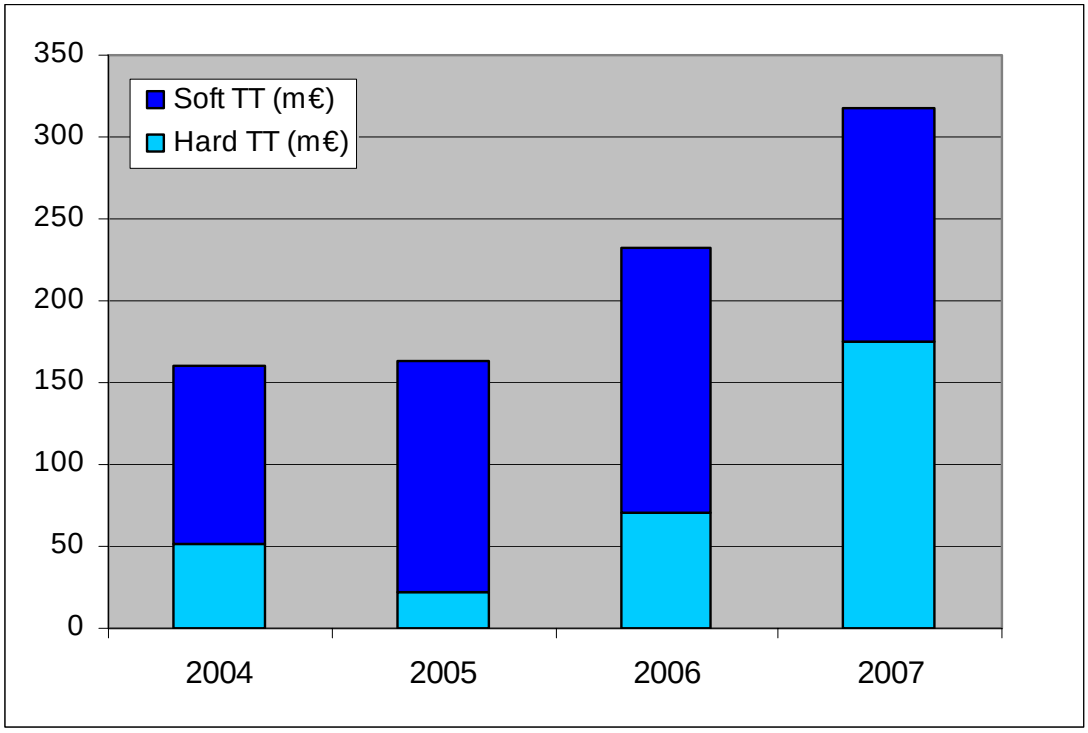
Table 8-5 Projects that facilitate the transfer of either hard or soft technology related to climate change[355]

Year	Region	Hard TT (million €)	Soft TT (million €)	Total TT (million €)
2004	ACP	5,3	21,0	26,3
	ASIA	17,8	61,1	78,9
	LATIN AMERICA	11,4	8,7	20,1
	NEIGHBOURHOOD	14,9	11,7	26,6
	OCT	2,8	0,0	2,8
	GLOBAL	0,0	5,5	5,5
	TOTAL	**52,2**	**107,9**	**160,2**
2005	ACP	15,5	83,4	98,9
	ASIA	1,8	21,0	22,8
	LATIN AMERICA	0,2	19,0	19,2
	NEIGHBOURHOOD	2,0	3,0	5
	OCT	2,1	0,8	2,9
	GLOBAL	0,0	15,0	15
	TOTAL	**21,6**	**142,2**	**163,9**
2006	ACP	13,4	93,5	106,8
	ASIA	2,1	11,7	13,8
	LATIN AMERICA	30,2	35,6	65,8
	NEIGHBOURHOOD	17,8	4,1	21,9
	OCT	5,2	0,0	5,2

[355] All projects funded by DG AIDCO are considered as technology transfer projects; the database covers development cooperation projects funded in the following five regions: Latin America, Asia, ACP, Neighbourhood and OCT. Note that Neighbourhood region also contains two non Annex-1 countries where technology transfer projects have been funded (Russia and Ukraine); for 2004, this amounts to €3.95 million (Hard: €3.35 million Soft: €0.6 million), for 2005 it amounts to €2.8 million (Hard: €2.6 million, Soft: €0.2 million), for 2006 it amounts to €4.3 million (Hard: €4 million, Soft: €0.3 million) and for 2007, it amounts to €22 million (Hard).

Year	Region	Hard TT (million €)	Soft TT (million €)	Total TT (million €)
	GLOBAL	2,3	16,4	18,7
	TOTAL	**71,1**	**161,2**	**232,2**
2007	ACP	80,7	81,8	162,5
	ASIA	0,4	18,0	18,4
	LATIN AMERICA	0,0	12,4	12,4
	NEIGHBOURHOOD	50,0	16,2	66,2
	OCT	4,8	12,2	17
	GLOBAL	39,5	2,3	41,8
	TOTAL	**175,4**	**142,9**	**318,3**

Illustration 8-1 Distribution of hard and soft technology transfer (TT) - 2004 to 2007



8.6.3.*Promoting International Co-operation in the Private Sector*

The European Community is undertaking a number of activities to involve the private sector in projects and programmes relating to the transfer of technologies to mitigate and adapt to climate change. There are number of projects between 2004 and 2007 that aim to promote or encourage private sector involvement, ranging in size and geographical location, including one project with an EC contribution of over €23 million, the EU-China CDM Facilitation Project. This provides training and capacity building programme on the Clean Development Mechanism (for more details see Appendix G – G2). This project is part of the China-EU Climate Change Partnership that was signed in 2005 (see details in section 10.3.15).

Appendix G – G2 presents a selection of twelve such initiatives, describing in more detail the range of activities carried out in the ACP, Asia, Latin America and Neighbourhood regions.

In addition to the above mentioned initiatives, the EC is interested in analysis of sectoral approaches, best described as "cooperative sectoral approaches and sector specific activities"[356]. These have emerged as a promising tool to motivate developing countries and industry to reduce greenhouse gas emissions (GHG) in key economic sectors. Energy intensive industries (aluminium, cement and steel), are a particularly attractive focus for sectoral approaches as they account for a considerable proportion of GHG emissions. Sectoral approaches can also help developing countries meet their responsibilities for financing sustainable development and technology transfer. Therefore, the EC is currently running a study with a budget of €1.9 million from 2008-2010 being undertaken with industries and governments in China, Brazil and Mexico to analyse their performance with the aim of seeing whether sectoral approaches are viable.

8.6.4.*Innovative Instruments to Engage the Private Sector*

In addition to providing financial assistance directly to projects that have the objective to promote private sector involvement, the European Community has launched an innovative pilot instrument to involve the private sector. The Global Energy Efficiency and Renewable Energy Fund[357] (GEEREF), launched in 2007, is focused on energy efficiency and renewable energy projects in developing countries and economies in transition. GEEREF invests in regionally-orientated investment schemes and prioritises small investments below €10 million.

In December 2008, The GEEREF Investment Committee gave preliminary approval to investments totalling €22 million in two commercial renewable energy investment funds, one focusing on projects in sub-Saharan and southern Africa and the other in Asia with a primary focus on India. Both funds will invest equity in renewable energy projects such as wind energy generation, small hydro-electric generation, biomass and methane recovery. In the regions where the two funds operate, there is a lack of equity investment available through the market for these types of projects. It is

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356 Bali Action Plan, Decision CP13, page 2 http://unfccc.int/files/meetings/cop_13/application/pdf/cp_bali_action.pdf

357 Communication from the Commission to the Council and European Parliament, Mobilising public and private finance towards global access to climate-friendly, affordable and secure energy services: The Global Energy Efficiency and Renewable Energy Fund http://ec.europa.eu/environment/jrec/pdf/com_2006_583_en.pdf

envisaged that GEEREF will invest in regional sub-funds for the African, Caribbean and Pacific (ACP) region, Neighbourhood, Latin America and Asia. Together the European Commission, Germany and Norway have committed about €110 million to the GEEREF over the period 2007-2011, the majority of which is provided by EC contributions. It is envisaged that further financing from other public and private sources will be forthcoming. In 2007, the EC contributed €5 million towards a support facility for the GEEREF and a further €25 million in form of grants.

8.6.5. *Technology Transfer Success Stories*

Each climate change project funded by DG AIDCO to non-Annex I countries contains a considerable technology transfer element and there are hundreds of individual projects being undertaken across all regions which have technology transfer as a key element to the projects, covering adaptation and mitigation. In order to assess the performance of technology transfer projects, the Results Orientated Monitoring (ROM) database[358] is used to assess the projects against five key criteria: relevance, efficiency, sustainability, effectiveness and impact. Each of these criteria are graded according to the following scale:

- A – Excellent
- B – Minor problems
- C – Some problems which require actions
- D – Major problems which require serious actions

Appendix G-G3 outlines a selection of twelve of the successful technology transfer projects undertaken in each region, assessed with ROM evaluation scores[359]. This includes examples, such as the Regional Solar Programme in West Africa, providing renewable energy as water sanitation, which benefits from €65 million from 2006-2010. As many of the projects are ongoing, it has not been possible to quantify the impacts on GHG emissions or sinks for the 5th National Communication.

[358] DG AIDCO evaluates the success of their projects using Result Orientated Monitoring

[359] Projects highlighted usually score a combination of A and B scores.

9. RESEARCH AND SYSTEMATIC OBSERVATION

Key developments

Since the 4th National Communication (2006), there have been key developments in climate change research at the EC level, particularly in the 7th Framework Programme (FP7) for Research and Technological Development which started in 2007:

- The total budget of FP7 amounts to € 50.52 billion over the period (2007-2013) which represents an increase of 65 % compared to FP6 budget in average annual terms. The structure of FP7 is larger and more integrated, with four main areas – "Cooperation", "People", "Ideas", and "Capacities" (with a fifth, Euratom €2.75 billion, dedicated to nuclear research). Sustainable development has been mainstreamed as a component and objective of all EC research.

- The main area, "Cooperation" (64 % of FP7 budget), consists of ten themes, comprising "Environment (including climate change)"[360]which is granted €1.89 billion over the period 2007-2013 and of which 14% funded climate focused research projects since 2007.The 6th Framework Program "Global Change and ecosystems" theme was allocated € 853 million of which 19 % funded climate focused research projects over the period 2003-2006.

- Within FP7's environmental research theme, new activities are supported in the fields of environment and health, environmental technologies, sustainable development and Earth observation.

- Research projects funded in themes such as Space and Global Monitoring for Environment and Security (GMES), Energy, Transport, Agriculture and Fisheries in the "Cooperation" component of FP7 contribute to research on the climate system, the understanding of the impacts of climate change and the identification of options for mitigation and adaption. Additional climate relevant research projects are granted in the "People", "Ideas", and "Capacities" components of FP7. Since 2003, expenditures on climate research in the EC Framework Programme are estimated to nearly €570 million.

- Research projects funded in the areas of GMES (€1.43 billion in FP7), Energy (€2.35 billion), Transport (€4.16 billion), Agriculture and Fisheries (€1.93 billion) are instrumental to supporting research relevant to the implementation of mitigation and adaptation measures including the development of relevant technologies.

- The European Union has adopted a strategic plan to accelerate the development and deployment of cost-effective low carbon technologies through joint strategic planning and a more effective implementation of programmes.

- The European Strategy Forum for Research Infrastructures (ESFRI) has been developing an "open method of coordination" between different countries to discuss the long term vision at European level and to support the development of

[360] Under FP6, climate change research was funded mainly under the thematic sub-priority area "global change and ecosystems".

a European Research infrastructure policy, and in this context published two roadmaps (2006 and 2008).

- Under FP7, a new tool - known as Joint Technology Initiatives (JTIs)[361] – that combines private sector investment and/or national and European public funding has been introduced.

- In FP7, international cooperation has been mainstreamed, with any third country researcher or institution being able to participate in FP7 calls. In addition, under the cooperation programme, there are projects dedicated specifically to international cooperation.

- Climate research undertaken in the EC Joint Research Centre (total budget of €1.75 billion in FP7) provided support EC climate change policies and enhancement of scientific knowledge on climate change.

- Last, the European Research Council (ERC) has been established, with the aim of encouraging groundbreaking science proposed by leading researchers themselves. ERC, which will effectively work as a national research council at the EC level, will also take responsibility for project implementation.

9.1. General Policy on Research, Systematic Observation, and Provision of Environmental Information

The EC has a long and distinguished history of research in the field of climate change. Research is supported by the EC mainly through the Framework Programmes (FPs) for Research and Technological Development. Climate change research has been in these programmes since the 1980s; an early focus was on the stratosphere and on the ozone layer in particular, while in the 1990s research concentrated on the carbon cycle.

Since then climate change research has increased in size and complexity and growing funds have been allocated to it under the various Framework Programmes. Under FP6 (running from 2003-2006)[362], €853 million supported 280 projects in the “Global Change and Ecosystems” sub-programme[363]. Amongst the ten activities included in this sub-programme, research on climate change benefitted from 19 % of the budgetary allocation. Under FP7[364], running from 2007-2013, funding for climate change research remains important and other themes than "environment (including climate change)" increasingly contribute to climate change research and to research relevant to the implementation of mitigation and adaptation options, in particular technological developments. This is discussed in section 9.1.1.

Systematic observation

The EC has also developed considerable experience and technical know-how in the design, production and operation of Earth Observing (EO) tools over the past few decades. The main activities undertaken by the EC for the observation of essential

361 The dedicated structures implementing the JTIs are independent legal entities, with a dedicated budget and staff. The European Commission is a founding member of each JTI and enjoys a veto right on a number of pre-defined items.

362 http://ec.europa.eu/research/fp6/index_en.cfm

363 http://ec.europa.eu/research/environment/pdf/global_change_ecosystem.pdf

364 http://cordis.europa.eu/fp7/

climate variables (atmospheric, oceanic and terrestrial) are presented in the following sections. Most of these activities aim to implement the Global Earth Observation System of Systems (GEOSS) (see section below). For this reason, most of the information included in section 9.3 was drawn from the report that the European Community submitted to the UNFCCC in November 2008 on EC actions regarding global climate observing systems[365]. Under both FP6 and FP7, significant resources have been devoted to research on Earth observation, related to GEO and GEOSS activities[366].

The EC is one of the world's leading players in the advancement of EO technologies and related environmental applications. EC remote-sensing satellites cover all of the Earth's climatic zones, and European ground-based, air-based and ocean-based monitoring devices provide high quality observation data for multiple uses, such as urban planning, adaptation to climate change, disaster reduction, disease control and humanitarian relief.

The European Commission is a member of the Group on Earth Observation (GEO). GEO is a voluntary partnership of governments and international organizations, including 74 governments and the European Commission, plus 51 intergovernmental, international, and regional organizations with a mandate in earth observation or related issues recognized as Participating Organizations[367]. On 16th February 2005, at a summit hosted by the European Commission in Brussels, over 50 countries and 40 international and scientific organizations signed up to create the Global Earth Observation System of Systems (GEOSS). GEOSS aims to bring together all available information on the state of the global environment, consolidating existing data from disparate sources.

Other EU research programmes

In addition to the FPs, the EC supports climate change-related research through other programmes, such as LIFE and the Competitiveness and Innovation Framework Programme (CIP) (see section 9.1.2 for further details).

EC-funded research activities aim to assess both the causes and the impacts of climate change, from a bio-physical and socio-economic perspective. In addition, a number of projects are to identify effective strategies to reduce greenhouse gas emissions (particularly in the energy and transport sectors) and to adapt to the impacts of climate change.

Contributions to other non-EU research programmes

Although the main focus of research activity is on the EU, a considerable number of EC-funded research activities address climate change impacts and adaptation options in vulnerable ecosystems and regions outside Europe as described in chapters 7 and 8 respectively. Earth observation projects have been funded, in particular to contribute

365 European Commission (2008) Commission Staff Working Document – report to the UNFCCC on European Community actions regarding global climate observing systems - SEC2008(2927)final.

366 Further details of the projects can be found at http://cordis.europa.eu/fp7/dc/index.cfm#searchform and http://cordis.europa.eu/fp6/projects.htm

367 The EC provides financial support to the GEO Secretariat (600,000 EUR for 2008). In addition, the EC is actively involved in the all four GEO committees.

to the implementation of the Global Earth Observation System of Systems (GEOSS) (see section 9.3).

EC research has significantly contributed to the advancement of climate change science, particularly within the IPCC process[368]. The findings of this research have informed international policy making on climate change and have supported the development of EC climate change policies and strategies. The IPCC process has also contributed to the identification of research priorities and knowledge gaps to be addressed in FP7 calls for proposals, as reported in a European Commission Staff working document[369]. In 2008 the DG RTD of the European Commission also established a dedicated Commission Inter-Service Group on IPCC activities. The EC has also made some direct contributions to the IPCC, for example, DG ENV provided €0.2 million to help support the preparation of the 4th Assessment Report, participation of developing countries to IPCC meetings and communication activities. DG AIDCO have also provided funding (€1 million) for outreach activities.

With respect to the international ESSP (Earth System Science Partnership)[370] research programmes on climate change, the EC does not contribute directly to its funding (contributions are made directly by Member States). However, the EC does contribute indirectly via research projects funded under the Framework Programmes which are endorsed by the ESSP under one its four branches (see table below) and the International Group of Funding Agencies for Global Change Research (IGFA).

368 For instance, the findings of numerous studies published as part of EC-funded research activities on climate change were included in the IPCC's Fourth Assessment Report (FAR) http://www.ipcc.ch/ipccreports/assessments-reports.htm

369 http://ec.europa.eu/research/environment/pdf/commission_working_doc.pdf

370 http://www.essp.org/

Table 9-1 EC representation by endorsed projects within the ESSP components

ESSP Organisation Branch	Total number of endorsed research projects per Organization	Number of endorsed research projects co-funded by the EC	EC co-funded Projects ID
WCRP (World Climate Research Programme)[371]	25	3	RAMI, AMMA, CLARIS-LPB
IGBP (International Geosphere-Biosphere Programme) [372]	128	25	ACCENT, SPACC, ENVIFISH, NATFISH, SARDYN, BASIN, RUBICODE, RETPEC, CAVES, SENSOR, REDD-ALERT, AMMA, EUCAARI, WATCH, ICED, CARBOOCEAN, EPOCA, ECOMADR, ELME, GTOS, ENCORA, SPICOSA, Sustainable North-Sea Coastal region, Erasmus Mundus Joint Master in Water and Coastal Management, ELOISE
IHDP (International Human Dimensions Programme)[373]	11	6	COST, GLOGOV, GOVERNAT, REFGOV, FAVAIA, PLUREL
DIVERSITAS[374]	7		

In some cases, projects co-funded by the EC make up for more than 50 % of the total, for example, IHDP Projects.

371 http://wcrp.wmo.int/wcrp-index.html
372 http://www.igbp.net/
373 http://www.ihdp.org/
374 http://www.diversitas-international.org/

Overview of programmes and budget allocation

The table below provides an overview of EC research funding across FP6, FP7 and other programmes (described further in subsequent sections) with estimates of allocated budget. It should be noted that reported budget estimates depend on the label identifying expenditure on climate research within the research programme budgets. For example, the FP7 theme environment (including climate change) is estimated to devote 14 % of its budget since 2007 to climate related research and research activities in other themes will include some climate research as well. A differentiation can be made between:

- Climate change research contributing to the understanding of the climate system, the knowledge on impacts of climate change and the identification of options for climate change adaptation and mitigation including the relevant costs quantifications;

- Research contributing to the development and implementation of climate change mitigation and adaptation options. This latter research includes sustainable technology development in the energy, transport, agriculture and fisheries sectors.

Table 8-2 contains a bottom-up estimate of the expenditure on projects within a number of programmes addressing climate change research as described above.

Table 9-2 Summary of EC research programmes and budgets

Programme / Institution	Areas	Themes / Topics	Budget (allocated during period) € million**	Estimate of climate change research related funding € million*
6th Framework Programme (2003-2006)[375]	All (excluding Euratom)		17,500	**339** (from 72 FP6 funded projects)
	Thematic priorities	Sustainable development, global change and ecosystems	2,300	
		Sustainable energy systems	890	
		Sustainable surface transport	670	
		Global change and ecosystems	853	
		Other includes: Life sciences, genomics and biotechnology for health; Advanced genomics and its applications for health; Combating major diseases; Information society technologies; Nanotechnologies and nanosciences, knowledge-based multifunctional materials and new production processes and devices; Aeronautics and space; Food quality and safety; Citizens and governance in a knowledge-based society	10,109	
	Specific activities covering a wider field of research	Includes: Policy support and anticipating scientific and technological needs; Horizontal research activities involving SMEs; Specific measures in support of international cooperation	1,409	n/a
	Non-nuclear activities of the Joint Research Centre		835	

375 http://cordis.europa.eu/fp6/budget.htm

Programme / Institution	Areas	Themes / Topics	Budget (allocated during period) € million**	Estimate of climate change research related funding € million*
	Structuring the European Research Area	Includes: Research and innovation; Human resources; Research infrastructures; Science and society	2,854	24 (Research Infrastructures) 65 (Marie Curie Actions)
	Strengthening the foundations of the European Research Area	Includes: Support for the coordination of activities; Support for the coherent development of policies	347	n/a
Euratom Framework Programme (2003-2006)		Includes: Priority thematic areas of research (Controlled thermonuclear fusion; Management of radioactive waste; Radiation protection); Other activities in the field of nuclear technologies and safety; Nuclear activities of the Joint Research Centre (JRC)	1,230	n/a
7th Framework Programme (2007-2013)[376]	All (excluding Euratom)		50,521	**228** (from 62 FP7 projects funded to-June 2009)
	Cooperation	All *(includes Specific International Cooperation Actions – mainstreamed into all themes below)*	32,413	
		Energy	2,350	
		Environment (including climate change)	1,890	
		Transport (including aeronautics)	4,160	

376 http://cordis.europa.eu/fp7/budget_en.html

Programme / Institution	Areas	Themes / Topics	Budget (allocated during period) € million**	Estimate of climate change research related funding € million*
		Other themes includes: Health; Food, agriculture and fisheries, and biotechnology; Information and Communication Technologies; Nanosciences, nanotechnologies, materials and new production technologies; Socio-economic sciences and the humanities; Space; Security	24,013	
	Ideas	European Research Council	7,510	
	Capacities	Research Infrastructures; Research for the benefit of SMEs; Regions of Knowledge; Research Potential; Science in Society; Coherent development of research policies; Activities of International Co-operation	4,097	
	People	Marie Curie Actions	4,750	57 (Marie Curie Actions)
	Non-nuclear actions of the Joint Research Centre		1,751	n/a
Euratom for nuclear research and training activities (2007-2013)			2,751	n/a
LIFE (1992-2006)	Environment Policy Development & Implementation of EC policy and legislation		1,800	

Programme / Institution	Areas	Themes / Topics	Budget (allocated during period) € million**	Estimate of climate change research related funding € million*
LIFE + (2007-2013)	Environment policy and governance	Various areas including priority climate change areas such as: Implementation of EC commitments under the UNFCCC and the Kyoto Protocol; Development of a post-2012 strategy and implementation programme; Mitigation of the impacts of climate change on the European economy, society, and nature; Development and implementation of market-based instruments to achieve a cost-efficient emission reduction for the period after 2012.	2,140	24 Million (from 22 projects funded under the 2007 and 2008 calls for proposal
	Nature and biodiversity			n/a
	Information and communication			
Competitiveness and Innovation Framework programme (CIP) (2007-2013)	All		3,630	n/a
	Intelligent Energy Europe (IEE)	Fostering energy efficiency and rational use of energy sources	730	
		Promoting new and renewable energy sources and energy diversification		
		Promoting energy efficiency and new energy sources in transport		

Programme / Institution	Areas	Themes / Topics	Budget (allocated during period) € million**	Estimate of climate change research related funding € million*
	Entrepreneurship and Innovation Programme (EIP)	Eco-innovation	430	
		Other	1,740	
	Information Communication Technologies, policy support programme		730	
Environmental Technologies Action Plan (2007-2013)			195	n/a

Note: * Climate change research contributing to the understanding of the climate system, the knowledge on impacts of climate change and the identification of options for climate change adaptation and mitigation including the relevant costs quantifications.

** Numbers may not add due to rounding.

9.1.1. *Framework Programme for Research and Technological Development*

With a total budget of €50.52 billion (excluding Euratom research[377]), the 7th Framework Programme (FP7) runs from 2007 to 2013. The budget represents an increase of 65 % compared to FP6 budget in average annual terms. FP7 comprises four components defining EC research funding structure:

- Cooperation: the €32.4 billion programme fosters collaboration between industry, academia, research centres and public authorities throughout the EU and beyond. The Cooperation programme is sub-divided into ten distinct themes, which include Environment (including climate change) (€1.89 billion), Energy (€2.35 billion), Space and Global Monitoring of Environment and Security (GMES) (€1.43 billion), Agriculture and Fisheries (€1.93 billion) and Transport (€4.16 billion) and which includes notably the development of greener technologies. The programme is implemented through calls for proposals by the Commission;

- Ideas: the objective of the €7.51 billion programme is to reinforce European research and improve the attractiveness of Europe for the best researchers from both European and third countries, as well as for industrial research investment. For its implementation, a European Research Council (ERC) has been established by the European Commission under this specific programme;

- People: the People programme aims at supporting the consolidation of the European Research Area (ERA) through the strengthening of the human potential in research in Europe. It is implemented through a set of Marie Curie Actions, targeting researchers at all stages of their career. There is no thematic limitation: projects from all scientific area can be funded. The overall budget is of €4.7 billion, representing a 50 % average annual increase over the FP6.

- Capacities: the €4.10 billion programme, is to optimise the use and development of research infrastructures, while enhancing the innovative capacities of SMEs to benefit from research. An additional objective is to bring Europe closer, and enhance cooperation at all levels. Some EC funded research infrastructures are specific or strongly relevant to climate change-related research. Under FP6, the level of the EC contribution was about €24 million. Under FP7, the funding has, over the period 2007-2009, increased by approximately 50% and key research infrastructures for climate change have been included in the ESFRI roadmap[378].

The “Cooperation” programme is the main area of FP7. Funding activities on climate change research as defined above are estimated to respectively €339 million over the period 2003-2006 (FP6) and €228 million from 2007 to June 2009 under FP7. Research projects respond to calls for proposals on the sub-activities in the environment area.

- Pressures on the environment and climate, including: the functioning of the climate system; changes in atmospheric composition and water cycle; global and regional interactions between climate and atmosphere, land surface, ice and the ocean, and adaptation and mitigation measures;

- Environment and health, including: the interaction of environmental stressors – and the identification of the associated sources - with human health; bio-monitoring research for environment related health; and quantification and

377 Under the Euratom Treaty, the European Commission will continue to support civil nuclear research, through a separate FP7 with duration five years (2007-2011).

378 http://cordis.europa.eu/esfri/

cost-benefit analysis of environmental health risks and indicators for prevention strategies; and

- Natural hazards, including: the improvement of forecasting and integrated vulnerability and risk assessments for disasters related to climate, and their impact; and the development of early warning systems and the improvement of prevention, mitigation and management strategies.

The "Earth observation and assessment tools" activity comprises the following sub-activities:

- Earth and ocean observation systems and monitoring methods for the environment and sustainable development; and

- Forecasting methods and assessment tools for sustainable development taking into account differing scales of observation.

Catalogues gathering the synopses of EC-funded projects in the area of climate research are regularly published by the Commission[379]. The latest update was prepared for the 15th Conference of the Parties to the UNFCCC (2009) and published as *European Research Framework Programme: Research on climate change*[380].

Within FP7's "Cooperation" area, research contributing to the development and implementation of mitigation options is funded under the "Energy" theme. This focuses on sustainable energy solutions to reduce GHG emissions, including renewable energy technologies, clean coal technologies, smart energy networks, energy efficiency and savings.

Under the "Cooperation" area, research contributing to the development and implementation of mitigation and adaptation options is carried out under the following themes as well: "Transport (including aeronautics)" and "Information and Communication Technologies (ICT)". With a budget of €4.2 billion, the "Transport" theme includes, among its activities, the reduction of GHG emissions from both air transport and surface transport. Elements of the Food, Agriculture, Fisheries and Biotechnology Theme support research into sustainable agriculture and abiotic stress resistance relevant to climate change adaptation, among others. Finally, with a budget of €9 billion, the ICT theme encompasses research on intelligent ICT-based transportation systems, as well as on solutions to prevent or reduce vulnerability and to mitigate the consequences of natural disasters.

Under FP7, a new tool - known as JTIs[381] – has been introduced. JTIs combine private sector investment and/or national and European public funding, including grant funding from FP7, but with the EC contribution not exceeding 50% of total costs. This new tool has been proposed to implement the Strategic Research Agendas[382] (SRAs) of a limited number of European Technology Platforms (ETPs), which are industry-led initiatives

379 For the 2005 catalogue see: http://ec.europa.eu/research/environment/pdf/european_research_climate_change_en.pdf

380 For the 2009 catalogue: http://ec.europa.eu/research/environment/pdf/cop-15.pdf

381 The dedicated structures implementing the JTIs are independent legal entities, with a dedicated budget and staff. The European Commission is a founding member of each JTI and enjoys a veto right on a number of pre-defined items..

382 Under each Technology Platform, stakeholders get together to define, and subsequently implement, a Strategic Research Agenda, in which research priorities and goals are specified.

operating under the coordination of DG Research and of a dedicated Commission Inter-Service Group. Currently, 36 ETPs have been established, including on environmental technologies aimed to reduce GHG emissions, such as the ETP for Zero Emissions Fossil Fuel Power Plants, the ETP for hydrogen and fuel cell Platform and the ETPs for photovoltaics, wind energy and biofuels.

Within the "Capacities" area, support to existing research infrastructures (RI), essential for climate change research, is provided through integrating activities. Support to ICT-based e-infrastructures is also implemented. The preparatory phase of five RI of pan-European interest have started following their inclusion in the ESFRI roadmap: ICOS, EURO-ARGO, EMSO, IAGOS and AURORA BOREALIS[383]. All together the EC contribution is more than €40 million for existing and new RI and could further increase until the end of FP7.

In addition, "Joint Programming" has been proposed as a new mechanism for Member States to agree on a common vision, to develop and implement a Strategic Research Agenda for a specific area. The criteria for the identification of specific areas show that Joint Programming could be very relevant to climate change-related research.

The 'People' area of FP7 is focused around the 'Marie Curie Actions[384]' (under FP6 they were part of the Specific area dedicated to structuring the European Research Area). These actions have developed significantly in orientation over time, from a pure mobility fellowships programme to a programme dedicated to stimulating researchers' career development. The available funding in FP7 represents a 50 % annual increase over FP6. Under FP6 over 100 individual researchers received support from Marie Curie individual actions to carry out a climate change related project, with a total EC contribution of over €17 million. The Marie Curie host-driven actions in FP6 comprised 41 projects tackling climate change, with the total EC contribution of over €48 million. The projects involved participation of 118 institutions and were aimed mainly at training of researchers and transfer of knowledge activities. The vast majority of the research projects belonged to the environment thematic panel, but it is of note that other scientific areas such as economy and sociology were already pointing to this direction under FP6. The hosting institutions welcoming researchers were mainly located in UK, Germany, France, a tendency that has been further confirmed with the first climate change projects under FP7.

In FP7, under the People programme, Marie Curie actions have already provided support to 362 individual researchers at all stages of their career. This threefold increase in the number of individual researchers devoting themselves to climate change related projects is accompanied by a widening of the research areas involved, with fellows from the life sciences and mathematic panels currently carrying out a climate change project. So far the EC contribution for supporting individual fellows is of over €20 million, with UK, France and Germany being the most frequent hosting countries. Research on climate change was supported as well through 16 host-driven FP7 Marie Curie projects, with the EC contribution of over €37 million.

The 'Marie Curie Actions' have been particularly successful in responding to the needs of Europe's scientific community in terms of training, mobility and career development. This has been demonstrated by a demand in terms of highly ranked applications that in most actions extensively surpassed the available financial support.

The Marie Curie actions are implemented under five main themes:

[383] ftp://ftp.cordis.europa.eu/pub/esfri/docs/esfri_roadmap_2008_update_20090123.pdf

[384] http://cordis.europa.eu/fp7/people/home_en.html

- Initial training of researchers to improve mostly young researchers' career perspectives in both public and private sectors
- Life-long training and career development
- Industry-academia pathways and partnerships
- International dimension of EU and non-EU researchers
- Specific actions' to support removing obstacles to mobility and enhancing the career perspectives of researchers in Europe.

Within the Framework Programme, the Joint Research Centre[385] (JRC) is the research "arm" of the European Commission (formally, it is a Directorate-General of the Commission itself). It provides scientific and technical support to the development and implementation of EC policies, and it serves the interests of the Member States as a reference centre for science and technology issues. JRC's research in support of EC climate change policy focuses on five areas: mitigation; adaptation; scenario modelling; monitoring and verification; and civil society perspectives. In particular, JRC climate change research aims to determine costs and benefits (both in monetary and non monetary terms) of mitigation and adaptation policies. Along with the benefits from the reduction in climate change risks, other factors are considered, including increased energy security and reductions in air pollution. Under the 7th Framework Programme, JRC has a budget of €1.75 billion to carry out direct non-nuclear research in four broad policy areas: "Prosperity in a knowledge-intensive society"; "Solidarity and responsible resource management" (including climate change); "Security and freedom"; and "Europe as a world partner".

9.1.2. *Other Relevant Programmes*

As discussed in the previous sections, climate change-related research is funded primarily through the Framework Programmes. There are, however, other programmes supporting research on issues related to climate change mitigation and adaptation. Among these programmes, the most important ones are LIFE and the Competitiveness and Innovation Framework Programme (CIP).

LIFE

LIFE[386] is the EC programme devoted to supporting the development and implementation of EC environmental policy and legislation. Between 1992 and 2006, 2,751 projects were funded under this programme, with a total budget of €1.8 billion.

In June 2007, Regulation No 614/2007[387] established the LIFE+ programme, which was allocated a budget of €2.14 billion for the period 2007-2013. As of April 2009, only expenditure in EU-27 countries is eligible, although the future participation of certain third countries is possible if supplementary appropriations are received. The LIFE+ programme comprises three components: Nature & Biodiversity; Environment Policy & Governance; and Information & Communication. Within the Environment Policy & Governance component of LIFE+, climate change has been identified as one of the key issues.

A call for proposals is issued every year by the EC for LIFE+ projects. Under the first two calls (2007 and 2008), seventy-four projects were selected for funding under the LIFE+

385 http://www.jrc.it
386 http://ec.europa.eu/environment/life/
387 http://eur-lex.europa.eu/JOHtml.do?uri=OJ:L:2007:149:SOM:EN:HTML

component Environment Policy & Governance. With twenty-two projects (and a budget of €24 million), climate change was the second most targeted priority area within this component.

In addition, a number of projects tackling awareness of climate change related issues have been selected for funding under the Information & Communication component of LIFE+. Further information on awareness raising can be found in section 10.3.

Competitiveness and Innovation Framework Programme (CIP)

The Competitiveness and Innovation Framework Programme (CIP)[388] runs from 2007 to 2013 with a budget of €3.6 billion. This programme aims to enhance the competitiveness of European companies, particularly small and medium enterprises (SMEs), by supporting innovation and promoting energy efficiency and new renewable energy sources in all sectors, including transport.

The CIP is divided into three operational programmes, the latter two of which are of most relevance to energy and climate change:

- Information Communication Technologies, Policy Support Programme (ICT PSP) with a budget of €730 million;
- Entrepreneurship and Innovation Programme (EIP) with a budget of €2.17 billion, including €430 million for eco-innovation;
- Intelligent Energy Europe (IEE)[389] finances actions related to removing non-technological barriers to energy efficiency and renewable energy including capacity building, awareness, networking, education, training (see section 10.2.2 for an example of the latter), creating a more favourable business environment and including making EU sustainable energy policy better understood and implemented in Europe's cities and regions. The programme has a total budget (for a period 2003-2013) of €730 million.

The Executive Agency for Competitiveness and Innovation (EACI) administers IEE on behalf of the European Commission and in close cooperation with DG TREN. Projects have included: energy efficiency (in buildings, industry and products); renewable energy sources (electricity, biofuels, heating and cooling, domestic and small scale applications); and energy in transport (alternative fuels and clean vehicles, energy efficient transport, capacity-building in transport) as well as the integrated initiatives (e.g. sustainable energy communities, bio-business, intelligent energy education). The predecessor programmes of IEE were SAVE[390] (1991-2000) and ALTENER[391] (1993-2002) described in more detail in the 4th National Communication.

Environmental Technologies Action Plan

Eco-innovation is at the heart of the Environmental Technologies Action Plan[392] under CIP, which was adopted by the European Commission in January 2004 to boost innovation, growth and sustainable development in Europe. In particular, the plan bridges the gap between R&D and the market place for eco-friendly products, technologies, services, processes and management methods across Europe. For the period 2007-2013, €195 million has been allocated to support eco-innovation.

388 http://ec.europa.eu/cip/index_en.htm
389 http://ec.europa.eu/energy/intelligent/index_en.html
390 http://www.managenergy.net/indexes/I31.htm
391 http://www.managenergy.net/indexes/I356.htm
392 http://ec.europa.eu/environment/etap/index_en.html

In 2008, four priority areas were identified for such projects: recycling materials; buildings and construction; the food and drink sector; and greening business and smart purchasing.

European Strategic Energy Technology Plan

In November 2007 the European Commission launched the European Strategic Energy Technology Plan (SET-Plan)[393], to strengthen industrial research and innovation (particularly on low-carbon technologies), by aligning European, national and industrial activities; and to ensure greater cooperation among energy research organizations and improved planning for energy infrastructure and systems, through the creation of a European Energy Research Alliance.

9.1.3. *International Cooperation*

International cooperation is an integral feature of the Framework Programmes, ranging from large-scale international collaboration efforts to increased researcher mobility. The "Global Change and Ecosystems" programme was the thematic programme with the highest third country participation in FP6, with more than €37 million that went to fund third country participants in European research teams.

Under FP7, there are various projects, falling under the category of **"Specific International Cooperation Actions"** (SICAs, the successors of the specific international research collaborations under the INCO Programme in previous European Research Framework Programmes), dedicated specifically to international cooperation, with a geographical focus on developing countries. Under FP7, these are mainstreamed into all thematic programmes within the Specific Programme ´Cooperation´. The INCO Programme supported research cooperation contextualized to the socio-economic and environmental settings of developing countries, emerging economies and neighbouring countries. In FP6, it invested almost €100 million into of environmental research mobilizing teams from Europe and partner countries to similar degrees into partnerships. SICAs address research problems of mutual interest and benefit between the EU and international cooperation partner countries (ICPC). Under the first two FP 7 calls (2007 and 2008), a number of climate change-related projects have been funded, including research on the health impacts of climate change-induced droughts and desertification and on the development of sustainable energy systems.

Climate change-related SICAs projects have been funded under FP6 and FP7. However, several Integrated Projects not specifically focusing on the international cooperation dimension have a strong cooperation component. Two examples of projects funded under FP6 and FP7 illustrate this fact.

The first is the project called A Europe-South America network for climate change assessment and impact studies in La Plata Basin (CLARIS LPB)[394]. A SICA with a budget of €4.3 million (of which €3.4 million is from FP7), this project, which started in October 2008 and will continue until September 2012, aims to predict the regional climate change impacts on La Plata Basin (LPB) in South America. Another aim of CLARIS LPB is the design of adaptation strategies for land-use, agriculture, rural development, hydropower production, river transportation, water resources and ecological systems in wetlands.

With a budget of €36.2 million (of which €12.9 million from FP6), the integrated project African monsoon multidisciplinary analysis (AMMA)[395], which started in January 2005 and

393 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0723:FIN:EN:PDF

394 http://www.claris-eu.org

395 http://amma.mediasfrance.org/

ends in February 2010, is to develop strategies to reduce the socioeconomic impacts of climate variability and especially of changes in the West African Monsoon (WAM). In particular, AMMA aims to improve the ability to predict the WAM and its impacts on intra-seasonal to decadal timescales, the consequences of climate change on WAM variability and its impacts.

In addition, a number of cooperation projects related to climate change are funded by DG AIDCO. Under its environmental programme, DG AIDCO supports developing countries in their efforts to integrate an environmental dimension into their development processes. Several climate change initiatives are supported under this programme. Two interesting examples of projects related to climate change funded by DG AIDCO are C3D[396] and ACCA[397] (Advancing capacity to support Climate Change Action), which are described in sections 7.4.2.1 and 7.4.2.2, respectively.

9.1.4. *Provision of Environmental Information*

The European Environment Agency[398] (EEA) is an agency of the EC in charge of providing sound and independent information on the environment in Europe. Its mandate is to help the Community, the Member States and its other non-EC members make informed decisions about improving the environment, integrating environmental considerations into economic policies and moving towards sustainability. In addition, the EEA is in charge of coordinating the European environment information and observation network. The EEA, with the support of the European Centre on Air and Climate Change[399] (ETC/ACC), provides data, indicators, assessment and projection of climate change mitigation efforts (including greenhouse gas emission trends, projections, policies and measures) and on climate change impacts and adaptation actions in Europe.

9.2. Research

9.2.1. *Cross-Cutting Research*

A number of projects have been funded by the EC with the aim of strengthening the links between researchers, policy-makers and the general public. Two examples of these projects are provided below.

With a budget of €791,000 (of which €718,000 from FP7), the project European network engaging civil society in low carbon scenarios (ENCI-LOWCARB), which started in January 2009 and will last until June 2011, aims to engage civil society in research on low carbon scenarios. This will be achieved by:

- creating a European network, composed by Civil Society Organizations and research institutes, related to the so-called Factor four[400];
- elaborating two national studies (France and Germany) based on the confrontation between climate policies of low carbon scenarios and civil society organizations (social acceptability); and
- disseminating the results to the wider public.

396 http://www.c3d-unitar.org/

397 http://www.acccaproject.org/accca/

398 http://www.eea.europa.eu/

399 ETC/ACC is a consortium of European institutes led by the Netherlands Environmental Assessment Agency (PBL).

400 Factor four is a concept that refers to a hypothetical fourfold increase in resource productivity, through the doubling of wealth and the halving of resource consumption.

With a budget of €11.2 million (fully funded under FP6), the Network of Excellence Atmospheric composition change: A European network (ACCENT)[401], which started in March 2004 and will last until December 2009, aims mainly to:

- promote a common EC strategy for research on atmospheric composition change;
- develop and maintain durable means of communication and collaboration within the European scientific community working on this topic; and
- optimise two-way interactions with policy-makers and the general public.
- Integration will be achieved by creating common facilities and activities, including dedicated interactive web portals, databases, training and education opportunities, and an interface with the general public.

9.2.2. *Climate Systems Studies and Modelling*

The EC has supported climate change research since the 1980s, particularly under the FPs. This research has contributed to improving the understanding of climate systems and processes, thanks to the development and use of increasingly advanced climate modelling tools. Given the complexity of the issue and the growing need for climate data and models to inform and support the EC policy-making process on climate change, significant funds have been allocated to climate systems studies and modelling under both FP6 and FP7.

A wide spectrum of projects are being funded in this area, ranging from studies of past climate changes and of Earth system interactions to operational forecasting, modelling and climate observation systems. A sample of EC projects that have been funded in this area is provided below (additional relevant projects are discussed in section 9.3 on systematic observation and global climate observation).

A major challenge for the climate research community is the development of comprehensive Earth system models capable of simulating natural climate variability and human-induced climate changes. For this reason, , in addition to research projects on climate modelling such as ENSEMBLES[402] and COMBINE[403] forty-four European partners (including university departments, research centres, meteorological services, computer centres and industrial partners from fifteen different countries) have agreed to create a European Network for Earth System Modelling (ENES). With a budget of €7.6 million, the Research Infrastructure project InfraStructure for the European Network for Earth System Modelling (IS-ENES)[404], which started at the beginning of 2009 and will last until the beginning of 2013, to foster:

- the integration of the European climate and Earth system modelling community;
- the development of Earth System Models for the understanding of climate change;
- high-end simulations enabling the better understanding and prediction of future climate change; and
- the application of Earth system model simulations to better predict and understand future climate change impacts.

401 http://www.accent-network.org/
402 http://www.ensembles-eu.org
403 http://www.combine-project.eu
404 http://www.enes.org/IS-ENES.429.0.html

The issue of trade-offs between air quality and climate change policies has received strong attention within the research projects funded by the European Commission. Two interesting examples of projects funded under FP7 are CITYZEN[405] and MEGAPOLI[406]. These two projects aim to model the relationship between air pollution hot spots caused by megacities and climate change[407]. In particular, the MEGAPOLI project, which started in October 2008 and which will last until September 2011 (with a budget of over €5 million, of which €3.4 million is from FP7) aims to:

- assess impacts of megacities and large air-pollution hot-spots on local, regional and global air quality;
- quantify feedbacks among megacity air quality, local and regional climate, and global climate change; and
- develop improved integrated tools for prediction of air pollution in megacities.

Another relevant example is the FP-6 funded project called European Integrated Project on Aerosol Cloud Climate and Air Quality Interactions (EUCAARI)[408]. With a budget of almost €15 million (€10 million from FP6), this project, which started in January 2007 and will last until December 2010, to:

- reduce the current uncertainty on the impact of aerosol particles on climate by 50%;
- quantify the relationship between anthropogenic aerosol particles and regional air quality and the side effects of EC air quality directives on global and regional climate; and
- provide tools for future quantifications for different stakeholders.

9.2.3. *Impacts of Climate Change*

Several projects have been funded by the EC to identify and assess the bio-physical impacts of climate change. Some of these projects focus on the impacts of climate change on specific environmental media (such as water - see examples below) and processes, while others aim to assess the impacts on specific regions. Part of these projects also includes an analysis of the socio-economic consequences and implications of climate change (for dedicated projects on this, see section 9.2.4). A sample of EC projects on the impacts of climate change is provided below.

With a budget of €8.6 million (of which €6.5 million from FP7), the project called Assessment of climate change and impacts on the quantity and quality of water (ACQWA), runs from 2008 to 2013 and is to assess the impacts of a changing climate on the quantity and quality of water in mountain regions. Modelling techniques will be used to project the influence of climatic change on the major determinants of river discharge at various time and space scales. Attention will also be devoted to the interactions

405 https://wiki.met.no/cityzen/start

406 The full name of the project is: “Megacities: emissions, urban, regional and global atmospheric pollution and climate effects, and integrated tools for assessment and mitigation”.

407 The linkages between air pollution and climate change were also investigated by JRC in the Global Air Pollution and Climate Change (GAPCC) project. In support of the 4th IPCC Assessment Report, JRC organised an international comparison of global atmospheric models to calculate the effects of air pollution control strategies and climate change on surface ozone by 2030.

408 http://www.atm.helsinki.fi/eucaari/

between land use/land cover changes, and changing or conflicting water resource demands.

With a budget of €9.7 million (of which €6.5 million from FP7), the project called European Project on Ocean Acidification (EPOCA)[409], which started in May 2008 and will last until April 2012, aims to fill the numerous gaps in our understanding of the effects and implications of ocean acidification, which is both a consequence and an indicator of climate change. In particular, this project will document the changes in ocean chemistry and biogeography across space and time and determine the sensitivity of marine organisms, communities and ecosystems to ocean acidification.

As mentioned above, a number of projects focus on the impacts of climate change on specific areas. For instance, with a budget of almost €13.7 million (of which €10 million from FP6), the project called Climate change and impact research: the Mediterranean environment (CIRCE)[410], which started in April 2007 and will last until March 2011, aims to understand how climate will change in the Mediterranean area and to assess the resulting impacts. In particular, the main objectives of the project are:

- to predict and to quantify physical impacts of climate change in the Mediterranean area;
- to evaluate the consequences of climate change for the society and the economy of the populations located in the Mediterranean area;
- to develop an integrated approach to understand combined effects of climate change; and
- to identify adaptation and mitigation strategies in collaboration with regional stakeholders.

9.2.4. *Socio-economic Research*

The projects discussed in the previous section focus on the bio-physical impacts of climate change. Some of these projects also include an analysis of the socio-economic implications and consequences of such impacts. In addition, a number of EC-funded projects, a sample of which is presented below, are concerned primarily with the socio-economic dimension and impacts of climate change. The scope of these projects is very broad, ranging from the impacts of climate change on human health to the economic impacts on specific sectors of the economy, such as agriculture and tourism. Some of these projects also aim to identify potential mitigation and adaptation options (for dedicated projects on mitigation and adaptation technologies, see section 9.2.5).

Among the projects that aim to assess the economic impacts of climate change, an interesting example is CLIMATECOST. With a budget of €4.6 million (of which €3.5 million from FP7), this project, which started in January 2009 and will last until August 2011, aims to assess the full economic costs of climate change. In particular, the project aims mainly to:

- identify and develop consistent climate change and socio-economic scenarios, including mitigation scenarios;
- quantify (both from a physical and economic perspective) the costs of inaction for these scenarios;

409 http://epoca-project.eu

410 http://www.circeproject.eu

- update the cost figures for GHG emission reductions under medium and long-term reduction targets and/or stabilization goals;

- quantify (both in physical and monetary terms) the ancillary air quality benefits of GHG emission reduction measures, in Europe as well as in other regions.

A number of projects deal with the impacts of climate change on specific sectors of the economy. JRC, for instance, is conducting research to assess the impacts of climate change on the agriculture sectors. In particular, the project called Influence on European Agriculture (Crop / Production Forecasts/ Estimates and Climate Change Impact on Agriculture) aims to analyze the changes in basic conditions for agricultural production, such as the growing season length and water availability, due to climate variability and its changes. In particular, JRC is developing and applying tools to assess the impacts of climate change on crop nutrient and water requirements.

Another set of projects is concerned with the impacts of climate change on human health. With a budget of €15.3 million (of which €11.5 million from FP6), the project called Emerging Diseases in a changing European Environment (EDEN)[411], which lasted from November 2004 until October 2009, aimed to increase preparedness by developing and coordinating at European level a set of generic investigative methods, tools and skills within a common scientific framework. A range of diseases (including both diseases already present in Europe and others that existed in the past and might re-emerge, such as malaria) were selected for investigation. EDEN, which integrated research between forty-two leading institutes from twenty-three countries, was organized into a series of vertical sub-projects linked by a series of integrative activities, including:

- biodiversity monitoring;

- environmental change detection;

- disease modelling;

- remote sensing and image interpretation; and

- information and communication.

A last project to mention is the "Study on the economics of climate change adaptation in EU coastal areas"[412] (May 2009) which was recently conducted by the Commission in the framework of the series of "Socio-economic studies in the field of Maritime Affairs". The study provides insights in the state-of-play and financial dimension of the actions, plans and policies undertaken to prepare Europe's coastal zones as well as the outermost regions for the effects of climate change.

Furthermore, this study compares the different climate change adaptation aspects from an empirical perspective with results drawn from dedicated scientific literature. The study includes 23 specific reports for each of the 22 coastal Member States and the Outermost Regions. A comprehensive compilation of documentation on climate change adaptation in coastal and marine areas can be found in a CIRCA library, including specific information for each coastal Member State and the Outermost Regions.

9.2.5. *Mitigation and Adaptation Technologies and Strategies*

The EC funds numerous projects to identify and compare different climate change mitigation and adaptation technologies and options. A set of projects focuses on

411 http://www.eden-fp6project.net

412 http://ec.europa.eu/maritimeaffairs/climate_change_en.html

technologies and strategies to reduce GHG emissions from specific economic sectors, such as energy and transport, while another group of projects aims to identify strategies and technology solutions to adapt to the impacts of climate change. A sample of this broad range of projects is presented below.

As suggested by the name, the project called Adaptation and Mitigation Strategies: Supporting European climate policy (ADAM)[413] combined research both on mitigation and on adaptation to climate change. This is described in more detail in Appendix F-F1.

Among the projects concerned with the development and commercialization of technologies to reduce GHG emissions from the energy sector, the project called CO_2 enhanced separation and recovery (CESAR)[414], with a budget of €6.7 million (of which €4 million is from FP7), aims to develop a low-cost post-combustion CO_2 capture technology to provide economically feasible solutions for both existing and new power plants. In particular, this project, which started in February 2008 and will last until June 2011, aims to decrease the cost of capture down to €15 /tCO_2, building on the findings of a previous FP6 funded project named CASTOR.

Another example of a project in this area is the Active Solar Initiative, which started in January 2009 and will last until December 2011, with a budget of €3.8 million (of which €2.9 million from FP7). The goals of the project include:

- prototyping and verification of a new, low-cost photovoltaic technology;
- the development and verification of cost-efficient manufacturing techniques; and
- the dissemination of knowledge among European manufacturers.

The project will also lay the groundwork for the next generation of Active Solar technology that will enable a drastic additional increase in residential solar generation efficiency through use of the highly efficient multi-junction cells in flat, fixed rooftop-mounted panels.

Another set of projects focuses on technologies to reduce GHG emissions from the transport sector. With a budget of €11.9 million (of which €8 million from FP7), the project called Technologies enhancement for clean combustion in aero-engines (TECC-AE), which started in July 2008 and will last until June 2012, aims to improve technologies for reducing GHG emissions from aviation transport.

With a budget of €6.5 million (of which €3.6 million from FP7), the project called Energy Efficient Vehicles for Road Transport (EE-VERT), which started in January 2009 and will last until December 2011, aims to develop strategies in conventional vehicles, also applicable to hybrids, for overall energy management (thermal and electrical) to reduce fuel consumption and CO_2 emissions. The need for the strategies to guarantee power supply to safety-related systems will also be considered.

In addition to collaborative research projects the Clean Sky Joint Technology Initiative will develop breakthrough technologies to significantly reduce the impact of air transport on the environment. The JTI is part of the aviation industry's goal to achieve a 50 % reduction of CO_2 emissions through drastic reduction of fuel consumption. The Commission will provide €800 million in funding from FP7 to the JTI, and this amount will be matched in kind by industry.

413 http://www.adamproject.eu

414 http://www.CO_2cesar.eu/

Examples of key recent reports[415]

- *Russ, P., T. Wiesenthal, D. van Regemorter, and J.C. Ciscar. 2007. "Global Climate Policy Scenarios for 2030 and beyond – Analysis of Greenhouse Gas Emission Reduction Pathway Scenarios with the POLES and GEM-E3 models". JRC Reference Reports.*
- *European Environment Agency (EEA)/Joint Research Centre (JRC)/World Health Organization (WHO). 2008. "Impacts of Europe's changing climate – 2008 indicator-based assessment". EEA Report No 4/2008.*
- *European Environment Agency (EEA). 2007. "Climate change: the cost of inaction and the cost of adaptation". Technical report No 13/2007.*
- *European Environment Agency (EEA). 2009. "EEA Signals 2009 – Key Environmental Issues Facing Europe". EEA Signals 2009/3.*

9.3. Systematic Observation and Global Climate Observation

Under both FP6 and FP7, significant resources have been devoted to research on Earth observation, related to GEO and GEOSS activities[416].

Examples of FP6 funded research includes: ESONET[417] (European Seas Observatory), a network of excellence that aims to promote the implementation and the management at the European-scale of a network of long-term multidisciplinary observatories in European seas; and the already cited AMMA[418] (see paragraph 8.1.4) which aims to improve our ability to predict the West African Monsoon in the Sahel region.

In FP7, Earth Observation research will contribute to the implementation of GEOSS, through four building blocks:

- integration of EC activities within GEO, with a project on the monitoring of the carbon cycle at the global level and a contribution to a global biodiversity observation system;
- cross-cutting research activities relevant to GEO with a research topic on environment and health;
- emerging earth observation activities, with projects monitoring the ocean interior, seafloor, and sub-seafloor, and participating in the development of a Global Soil Observing System; and
- developing capacity building activities in the domain of earth observation in the EC and in developing countries, with several projects working on a georesource information system for Africa, improving observing systems for water resource management, and GEONETCast applications for developing countries.

415 Please note that this list is not meant to be exhaustive.

416 Further details of the projects can be found at http://cordis.europa.eu/fp7/dc/index.cfm#searchform and http://cordis.europa.eu/fp6/projects.htm

417 http://www.abdn.ac.uk/ecosystem/esonet/

418 http://amma.mediasfrance.org/

The 2007 FP7 call covered all Social Benefit Areas foreseen in the GEOSS 10-Year implementation plan, while the 2008 call was issued with the objective of starting to build the Initial GEOSS Common Infrastructure.

Research and developing activities for the GMES initiative - formerly known as Global Monitoring for Environment and Security (GMES) initiative - will play a key role in furthering Earth observation activities, as the main contribution of the EC to GEO.

Under this initiative, the EC is putting in place operational services to produce long time series, consistent data sets for climate derived from observations and their re-analysis. The GMES services are currently being developed as large R&D projects under FP6 and FP7 (e.g., MERSEA[419], GEOLAND[420], GEMS[421]) that seek to involve existing capacities in the EC and promote their cooperation. Truly operational services are expected to be available from 2011-14 onwards.

The GMES services are arranged on the basis of earth components, namely land, ocean ("marine") and atmosphere. The global component of the land service will strive to provide information on terrestrial Essential Climate Variables (ECVs), natural CO_2 stock and budget as well as fire impact due to burned biomass. The atmosphere service addresses the themes climate forcing, air quality and UV radiation and will inter alia seek to assure the delivery of data services related to greenhouse gases, reactive gases and aerosols based on a global and a European ensemble model. Lastly, the marine service provides better information on the 3D state and dynamics of the global ocean through observational data sets re-analysed in state of the art models and it will seek to establish an accurate long-term record of the ocean for climate purposes.

Across all GMES Earth compartments, re-analysis efforts are planned that will help to provide consistent time series of climate observations. The aim of GMES is therefore to coordinate and consolidate EC efforts for Earth observation both in space and with in-situ infrastructures in Europe, also with regard to the participation in the international arena.

The GMES observation infrastructure will draw upon existing capacities in Europe. For space observations, these include research and operational missions provided by EUMETSAT, ESA, as well as EU Member States.

- EUMETSAT[422] is making a significant contribution to operational climate variable monitoring (the Meteosat programme (MSG; MTG), the EUMETSAT Polar Satellites (EPS) with for example, the IASI, GOME-2 and GRAS instruments, cooperation on Jason altimetry missions). For operational retrieval of geophysical parameters from satellite data, EUMETSAT operates several satellite application facilities (SAFs), e.g., Climate Monitoring SAF, Ocean and Sea Ice SAF, Land Surface Analysis SAF, Ozone SAF, etc. EUMETSAT will report its contribution to GCOS ECVs in detail separately and via the national report to be submitted by Germany.

- ESA[423] will report its detailed contribution via the CEOS report. Besides ESA R&D satellites (e.g., ENVISAT), ESA is developing dedicated missions for the purpose of GMES: the Sentinels 1 to 5, partially financed through FP7 are devised on the basis of user requirements and scope of the GMES services, including global monitoring of climate variables.

419 http://www.mersea.eu.org/
420 http://www.gmes-geoland.info/
421 http://gems.ecmwf.int/about.jsp
422 http://www.eumetsat.int/Home/index.htm
423 http://www.esa.int/esaCP/index.html

With regard to in-situ data required by GMES, the services will rely on data observed by public bodies in the EU Member States. At the moment these data are often obtained in the frame of research activities or as contributions to international networks. Data will also be used from data exchange in the frame of international networks e.g., through the GEOSS. To consolidate the EC efforts for the purpose of operational services, the EC will be mainly focused on a better coordination within Europe, on the filling of existing gaps in observation capacities as well as encouraging a transfer of priority networks to operational status. For a future operational GMES programme, planning activities will have to address which observation infrastructures will receive support from EC resources. The criteria will depend on the available resources. GMES operational costs are to be evaluated in the period 2009-2010.

Important efforts are been undertaken to ensure that ECV (Essential Climate Variable) activities adhere to the GCOS climate monitoring principles: under the GMES initiative, satellite missions are being developed to meet the continuity demand for space-based observations in the atmospheric, oceanic and terrestrial domains. The missions involve repeat launches of instruments and to ensure continuity to the extent possible with earlier missions such as that of ENVISAT.

International data centres are being strengthened for all the ECVs: all envisaged GMES services that target ECVs are providing NRT or historical data to users. Further, the FP7 project NESIS[424] attempts to promote the uptake of ICT solutions by public authorities in providing information for the monitoring and reporting of environmental impacts and threats. The running of data centres should then be technologically a simpler task.

The provision of key information on the environment is an essential element for policy makers in developing countries. The European Commission in collaboration with EUMETSAT has been supporting several initiatives related to the collection, exchange and/or use of observations of the ECVs to promote capacity-building activities in least developed countries and countries with economies in transition: PUMA and its follow-up AMESD (African Monitoring of the Environment for Sustainable Development)[425], had such positive results that, in the Maputo Declaration[426] the signatories[427] requested the extension of the EC GMES programme to Africa and the financing of this GMESAfrica by the 10th European Development Fund (EDF10).

In December 2007, the Portuguese Presidency provided an answer to this request with a conference entitled “Space for Development: the case of GMES and Africa”; it tabled a common EU-AU Lisbon GMES Declaration and started the Lisbon GMES Process, which ought to provide by January 2010 an overview of the African Earth Observation needs. JRC, the GMES-bureau and DG Development have been working on terms of reference for the drafting of an action plan on GMES and Africa Partnership.

A further project on capacity building for Earth observation systems is CARBOAFRICA[428], which strengthens the capacity to understand global change process. The FP7 projects AMFIC (Air quality monitoring and forecasting in China)[429], DRAGONESS (DRAGON in support of harmonizing EC and Chinese marine monitoring for Environment and Security System)[430], MONRUK (Monitoring the marine environment in Russia, Ukraine and Kazakhstan using satellite synthetic aperture radar)[431] and VGT4-Africa (Distribution of

424 http://www.nesis.eu/
425 http://www.amesd-project.org/
426 http://www.acpsec.org/summits/maputo/maputo_declaration_en.html
427 AUC, ACP-SEC, African RECs and WMO
428 http://www.carboafrica.net/index_en.asp
429 http://www.knmi.nl/samenw/amfic/
430 http://ec.europa.eu/enterprise/space_research/pdf/dragoness.pdf
431 http://monruk.nersc.no/

vegetation data in Africa through EUMETCAST[432])[433] all address international cooperation with transition and developing countries and include some climate-relevant parameters.

The Commission should look at what needs to be done to support provision of essential climate data by Europe through co-ordination between GMES, ESA, EUMETSAT & the other key European players. As a result JRC has completed a report[434] which forms the scientific background to the Commission response to the respective councils.

9.3.1. *Atmospheric Essential Climate Variables*

Past Actions

EARLINET (European Aerosol Research Lidar Network to Establish an Aerosol Climatology)[435] was funded by the Commission to build a comprehensive statistical database of the distribution of aerosols across the European continent.

The goals of the CREATE[436] and DAEDALUS[437] projects were to advise on the optimum use of aerosol in-situ, ground-based and satellite remote sensing data to: deliver data and information to the users, make proposals for aerosol monitoring as part of the European capacity, and develop the methodologies necessary for delivering operational aerosol products.

Existing Actions

The actual main contribution to atmospheric ECVs relates to the World Meteorological Organization (WMO) which sponsored the Global Atmosphere Watch Network. JRC hosts the GAW World Data Centre for aerosols[438]. The GAW is seen as the core of the global climate observing systems (GCOS) for the atmospheric essential climate variables (ECVs), including “Aerosol Properties”. The GAW aerosol program prescribes five core measurements: multi-wavelength optical depth; mass in two size fractions; major chemical components in two size fractions; light scattering coefficient and light absorption coefficient to be made at all stations, with measurements of additional aerosol properties recommended for key ‘global’ stations.

The activities of the EMEP[439] measurement network and that of the GAW aerosol network are well coordinated and considerable progress has been made in the harmonisation and integration of the measurements, data reporting and data quality analysis.

Since late 2007 a much simplified data submission protocol has functioned with data being sent first to the EMEP chemical coordinating centre and from there on to the GAW data centre.

AirBase[440] is the public air quality database system of the EEA and its network EIONET, which contains air quality monitoring data and information (SO2, TSP, PM10, PM2.5, black smoke, O3, NO2, NOx, CO, Pb, Hg, Cd, Ni, As, Benzene) about all countries from the EU, the EEA member and other cooperating countries.

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432 http://www.eumetsat.int/HOME/Main/What_We_Do/EUMETCast/index.htm

433 http://www.vgt4africa.org/

434 Authors: Belward, Dowell & Wilson. Commissioned under Annexe E of AA JRC N. 30977-2008-06 NFP ISP BE with DG ENTR

435 http://www.earlinet.org

436 http://tarantula.nilu.no/projects/ccc/create

437 http://www-loa.univ-lille1.fr/Daedalus

438 http://wdca.jrc.it

439 http://www.emep.int

440 http://www.eea.europa.eu/themes/air/airbase

Improvements to the Global Climate Observing System are provided by AEROCOM[441], a global aerosol model intercomparison, which found that an ensemble of state of the art models were calculating widely varying fractions of the total global annual average Aerosol Optical Depth due to water vapour associated with the aerosol. This large uncertainty makes difficult to use models to evaluate the impact of anthropogenic aerosol precursor emissions. Concurrent in-situ observations of aerosol composition and optical properties under controlled humidity conditions, together with observation of aerosol hydroscopic growth rates, such as those made within the EUSAAR[442] network, provide the observational base to reduce these uncertainties. EUSAAR is partly funding the operation of 20 stations of which 6 are global atmosphere watch stations.

The Commission Decision of 17th July 2000[443] established EPER, the European Pollutant Emission Register[444], which provides annual inventories of a number of pollutants (including greenhouse gas emissions and removals) from a large number of individual industrial facilities. It will be replaced in the autumn of 2009 by the E-PRTR which will cover more than 91 substances emitted from 65 sectors of activity and will include data updated annually from 2007 onwards.

GEOMON (Global Earth Observation and Monitoring)[445] is a project which has the overall goal to sustain and analyze European ground-based observations of atmospheric composition, complementary with satellite measurements, to quantify and understand the ongoing changes. It is a first step to build a future integrated pan-European Atmospheric Observing System dealing with systematic observations of long-lived greenhouse gases, reactive gases, aerosols, and stratospheric ozone. This will lay the foundations for a EC contribution to GEOSS[446] and optimize the EC strategy of environmental monitoring in the field of atmospheric composition observations.

The ESFRI[447] preparatory phase ICOS (Integrated Carbon Observation System)[448] aims to build an infrastructure for coordinated, integrated, long-term high-quality observational data of the greenhouse balance of Europe and of the adjacent key regions of Siberia and Africa. Consisting of a centre for co-ordination, calibration and data handling in conjunction with networks of atmospheric and ecosystem observations, ICOS is designed to create the scientific backbone for a better understanding and quantification of greenhouse gas sources and sinks and their feedback with climate change.

The IMECC[449] project aims to build the infrastructure for a coordinated, calibrated and accessible dataset for characterizing the function of the European terrestrial biosphere and the carbon balance of Europe. IMECC will improve the comparability of atmospheric and ecosystem measurements of greenhouse gases and isotopic composition so that measurements made by diverse and widespread research programs can be reliably combined. It will also provide a web-based tool to calculate the impact of proposed measurements on knowledge of the European carbon cycle, tying European terrestrial data into emerging remotely-sensed datasets on atmospheric composition. IMECC will develop a transfer standard between European atmospheric measurements and satellite measurements using ground-based remote sensing.

The EARLINET-ASOS coordinated action is a continuation of EARLINET described above.

441 http://nansen.ipsl.jussieu.fr/AEROCOM
442 http://www.eusaar.net
443 http://eper.ec.europa.eu/eper/documents/comission_17072000.pdf
444 http://eper.eea.europa.eu/eper/
445 http://www.geomon.eu
446 http://www.earthobservations.org/geoss.shtml
447 http://cordis.europa.eu/esfri/
448 http://icos-infrastructure.ipsl.jussieu.fr
449 http://imecc.ipsl.jussieu.fr/

To ensure availability of past and future data and metadata records of the satellite measurements for the atmospheric ECVs the EC FP6 GEMS[450] project (Global and regional Earth-system (Atmosphere) Monitoring using Satellite and in-situ data) re-analyses the greenhouse-gas, aerosol, ozone and surface radiation ECVs, and of the associated meteorological ECVs for the period from 2003 onwards. GEMS is developing new EC operational capabilities for comprehensive monitoring and forecasting systems (medium-range & short-range air-chemistry forecasts) for trace atmospheric constituents important for climate and air quality through much improved exploitation of satellite data. The systems will provide the basis for value-added data and information services to be developed as part of the EC Global Monitoring for Environment and Security (*GMES*) initiative. The GEMS project will produce global retrospective analyses of the atmospheric dynamics and composition for the troposphere & stratosphere, and will be able to assess the impact of changes both on global & regional scale, examining extremes as well as means. The project involves 32 organisations from 13 countries. GEMS began in 2005 and was funded until beginning of 2009; the overall cost was of €17.45 million, of which €12.45 million funded by FP6.

In addition to the re-analyses themselves, a number of climate data records based on satellite data retrievals for the composition ECVs are being developed in the ESA GMES Service Element project PROMOTE[451]. These activities will most likely continue in the EC FP7 project MACC[452], which provides the pilot core GMES Atmospheric Service.

Ozone web[453] provides hourly near-real-time information on ozone pollution across Europe by interpolating data from more than 700 air quality measurement stations across Europe delivered by EIONET members.

9.3.2. *Oceanic Essential Climate Variables*

International Initiatives

A range of initiative are currently in place including:

ACOBAR (Acoustic Technology for observing the interior of the Arctic Ocean)[454] will contribute to filling gaps in the global ocean observing system and thereby support the development of GEOSS. This EC project will develop an observing system for the interior of the Arctic Ocean based on underwater acoustic methods (tomography, data transmission and communication to/from underwater platforms, and navigation of gliders) offering alternative methods the ARGO system, which cannot be used in ice-covered seas. ACOBAR will implement field experiments with acoustic sources and receivers in the Fram Strait and the Arctic Ocean basin.

The HERMIONE[455] project is designed to make a major advance in the knowledge of the functioning of deep-sea ecosystems and their role in the climate system. This will be achieved through a highly interdisciplinary approach that will integrate biodiversity, specific adaptations and biological capacity in the context of a wide range of highly vulnerable deep-sea habitats. Gaining this understanding is crucial, because the deep sea is now being affected by climate change and can possibly feedback on the global climate through the release of large quantities of greenhouse gases, include gas hydrates stored on the continental margins.

450 http://gems.ecmwf.int
451 http://www.gse-promote.org
452 http://www.ecmwf.int/about/special_projects/robertson_GEMS-MACC/index.html
453 http://www.eea.europa.eu/maps/ozone/welcome
454 http://acobar.nersc.no/
455 http://www.eu-hermione.net

The EURO-ARGO[456] array is the European component of a worldwide in-situ global ocean observing system (international ARGO program); it is based on about 800 autonomous battery powered floats, of which about 250 are targeted as a sustained European contribution to the global network. The data are transmitted in real time by satellite to data centres for processing, management, and distribution. An estimated €6.3 million per year are required for this. Following its inclusion in the ESFRI roadmap, an ongoing preparatory phase aims to design in particular the legal, financial and governance frames as well as the sustainable funding.

The Ice2sea program see the cooperation between European and international partners to reduce the big uncertainty highlighted by a recent IPCC report about projections of future sea-level rise due to continental ice melting. The objective of the project is to understand the key processes that will lead to loss of continental ice to improve the reliability of sea-level rise projections. Target studies are being undertaken in mountain glacier systems and ice caps (e.g. Svalbard), and in ice sheets in both polar regions (Greenland and Antarctica).

The project THOR (Thermohaline Overturning - at Risk?)[457], coordinated by University of Hamburg (Germany) aims to contribute to GMES, to Global Observing Systems such as the GOOS, and to the International Polar Year (IPY). It will establish an operational system that will monitor and forecast the development of the North Atlantic THC on decadal time scales and access its stability and the risk of a breakdown in a changing climate. The project started in December 2008 the project is still in execution and will be funded by FP7 until November 2012 with a sum of €9.3 million in a total cost of €13.0 million.

The INCOFISH[458] project under FP6 (2005-2008) with 35 partners from four continents has, among others, developed methodology for mass production of distribution maps of fish and other marine organisms and how distribution patterns are likely to change in response to climate change.

The CENSOR[459] project involving partners from Argentina, Chile and Peru together with their European peers has investigated ENSO dynamics and effects of climate change on the resources off the Pacific side of South America as well as socio-economic effects on coastal populations.

EMODNET (European Marine Observation and Data Network) aims to reduce operational costs for those who use marine data, increase competition amongst users of marine data and reduce uncertainty in knowledge of the seas and oceans. Five substantial preparatory actions are underway to assemble data layers for hydrography (water depth, coastline), geology (sediments, strata), biology (species biodiversity) and chemistry (contamination) at a sea-basin level from distributed national bodies in order to already provide a service to users and at the same time allow a more accurate assessment to be made of the feasibility and cost of setting up a better and sustainable infrastructure.

9.3.2.1. Other pan-European initiatives

These include:

EMSO[460] (European Multidisciplinary Sea floor Observation) is an ESFRI preparatory phase, launched in 2008 for 4 years with the main objective of establishing the legal and

456 http://www.euro-argo.eu
457 http://www.ifm.zmaw.de/forschung/regionale/projekte/thor/
458 www.incofish.org and www.aquamaps.org
459 www.censor.name
460 http://www.esonet-emso.org/

governance framework for the new research infrastructure serving scientists and other stakeholders in Europe and outside Europe for long-term deep water observation and investigation. This framework will enable the deployment of the research infrastructure and its long-term management. The project is closely associated to the FP6 Network of Excellence ESONET.

GlobColour[461] is a service which distributes global L3 data sets of chlorophyll concentration, water leaving radiances, diffuse attenuation coefficient, coloured dissolved and detrital organic materials, total suspended matter or particulate backscattering coefficient, turbidity index, quality indicators. Distribution of other products is planned (e.g., transparency, heated marine layer), or considered.

JRC Ocean Colour Portal[462] includes a decadal time-series of chlorophyll and ocean colour ECVs, the datasets have pan-European and global scales with a resolution of 2km. The presented archive is maintained with the strictest attentions to the quality and validation of the data presented in accordance with those required for re-analyzed climate data records.

MARCOAST[463] (and former Coastwatch) – ESA GMES Service Element is the ocean colour upstream service addressing a wide range of pan-European and regional downstream service providers requirements.

EU research Initiatives in Specific Geographical Regions

A sample of these in different regions includes:

Bay of Biscay**:** IFREMER[464] provides series of Chla, mineral SPM (Suspended Particulate Matter), attenuation of diffuse descending light, derived from satellite radiance since 1998. The resulting maps are provided to a large community of users (260 registered) through four internet servers covering the western European continental shelf. These servers also present other oceanographic variables, and many in situ measurements of chlorophyll, SPM, SST (CORIOLIS).

Mediterranean Sea, developed by the Italian CNR (National Research Council) is the Mediterranean ocean colour SeaWiFS data both in real time (1 hour from the satellite pass) and delayed time (3 days for ancillary data integration) within the MFS[465] (Mediterranean Forecasting System) and ADRICOSM[466] (Adriatic sea integrated coastal areas and river basin management system).

Northeast Atlantic: Plymouth Marine Laboratory and University of Dundee provide local reception, near-real-time and archived/delayed mode regional products (Ocean colour products, radiance, visibility, attenuation, frontal analyses, inherent optical properties (IOPs), primary production, harmful algal bloom likelihood) for the Northeast Atlantic, North Sea, Celtic Sea, Iberian Peninsula, Bay of Biscay, western Mediterranean and Baltic Sea. Products are currently used for physics-ecosystem model comparisons. Global NRT coverage of regions of interest (e.g., Southern Ocean south of Chile and Tasmania, Northern Indian Ocean, Tanzania) courtesy of ESA and NASA subscriptions. PML also operates an ocean colour/optical cal/val site in the western English Channel.

461 http://www.globcolour.info
462 http://oceancolour.jrc.ec.europa.eu
463 http://gmes-marcoast.com
464 http://www.ifremer.fr/anglais/
465 http://gnoo.bo.ingv.it/mfs/indicators_old.htm
466 http://gnoo.bo.ingv.it/adricosm

9.3.2.2. GCOS Implementation Plan467Initiatives

These include:

CARBOOCEAN[468] follows the recommendation of action O17 on the implementation of a programme for measuring surface pCO_2: the aim is to reduce the present uncertainties in the quantification of net annual air-sea CO_2 fluxes by a factor of 2 for the world ocean and by a factor of 4 for the Atlantic Ocean. The project is coordinated by University of Bergen (Norway) and started in 2005. It is still in execution and is funded by the 6th FP (€14.5 million on a cost of €19.27 million) till the end of 2009.

The development of a capability for systematic measurement of biogeochemical and ecological ECVs is recommended by action O30 and implemented by the already cited project ARGO[469]: recently, about 60 floats have also been fitted with O^2 sensors, for the benefit of the biogeochemical community (Argo Oxygen Program[470]). Bio-optical sensors are now also being developed with a reduced size which is compatible for implementation on the Argo floats;

As well as ARGO, the project HYPOX[471], has the same objective of action O30: founded by EC for the period 2009-2012, it is about monitoring oxygen depletion and associated processes in aquatic systems that differ in oxygen status or sensitivity towards change: open ocean, oxic with high sensitivity to global warming (Arctic), semi-enclosed with permanent anoxia (Black Sea, Baltic Sea) and seasonally or locally anoxic land-locked systems (fjords, lagoons, lakes) subject to eutrophication. The capacity to monitor oxygen depletion globally will be improved by implementing reliable long-term sensors to different platforms for in situ monitoring.

In line with actions O36 and O37 the MyOcean GMES[472] project support data rescue projects and implement regional, specialized and global data and analysis centres; it succeeds MERSEA[473] (FP6) and is currently under negotiation. Many of the satellite datasets derived, as well as the subsequent assimilation of these into operational models, will be tailored on a regional basis. This will facilitate the implementation of specific algorithms and parameterization which have a regionally varying dimension. For example in the case of the Ocean Colour activities there will be regional processing centres for the Baltic, Northeast Atlantic, Bay of Biscay and Mediterranean as well as a systematic processing of all ECVs at the global scale as well.

Moreover MyOcean GMES also includes the aims of activities O24, O41 and O40 to develop plans and pilot projects for the production of global products based on data assimilation into models for all possible ECVs, including undertaking pilot projects of reanalysis of ocean data. The project includes the operational assimilation of the satellite data streams in model and forecasting systems at both European and global scale.

9.3.3.*Terrestrial Essential Climate Variables*

There are numerous ongoing initiatives both at the EC level and in the Member States, which contribute to international research promoting the generation and archival of satellite derived terrestrial ECVs. Some examples are described below.

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467 http://www.wmo.int/pages/prog/gcos/Publications/gcos-92.pdf
468 http://www.carboocean.org
469 http://www.argo.net/
470 http://www.ioccg.org/groups/Oxygen_Argo_whitepaper_15feb07_r.pdf
471 http://www.hypox.net/
472 http://www.mercator-ocean.fr/html/mercator/collaborations/myocean_en.html
473 http://www.mersea.eu.org/

EU research Initiatives in Specific Geographical Regions

CARBO-North[474] aims at quantifying the carbon budget in Northern Russia across temporal and spatial scales. Dedicated climate models will provide requested variables and time slices as input to ecosystem studies. Detailed monitoring, mapping and analyses of vegetation, soil and permafrost will be conducted to assess the sensitivity of climate model output to a suite of land cover, ground and permafrost schemes. Results are used for integrated ecosystem modelling, calculation of net radiative effects and assessment of the sensitivity of climate model predictions to transient environmental changes. The institute responsible for carrying out the project is Stockholm University (Sweden). The project is in execution (Start Date: 2006-11-01; End Date: 2010-04-30) and costs €3.62 million, of which €3.1 million funded by FP6.

Pan-European and International Initiatives

A completed project in the field of terrestrial ECV observations is CarboEurope[475] which had the objective to understand, quantify and predict the terrestrial carbon balance of Europe and the uncertainty at local, regional and continental scale. The increase in spatial and temporal resolution of the observational and modeling program will allow for the first time a consistent application of a multiple constraint approach of bottom-up and top-down estimates to determine the terrestrial carbon balance of Europe with the geographical patterns and variability of sources and sinks. The project coordinated by Max-Planck-Institut Für Biogeochemie (Germany), started in 2004 and was completed at the end of 2008; funding by the 6th FP was of €16.31 million on a total cost of €23.66 million.

e-SOTER[476], which is the Regional pilot platform funded by FP7 which gives the EC contribution to the Global Soil Observing System. Soil and land information are often inaccessible, incomplete, or out of date. e-SOTER addresses the felt need for a global soil and terrain database. It will deliver a web-based regional pilot platform with data, methodology, and applications, using remote sensing to validate, augment and extend existing data.

JRC FAPAR[477] provides access to 10 years of FAPAR datasets at medium resolution over the globe (i.e. 1km- 2km) and delivers global products at various resolutions (0.5 degrees to 5 degrees). The retrieval algorithm is physically based and the validation has been made against ground based measurements. The space instrument is SeaWiFS for the historical dataset.

Projects of the European Space Agency (ESA) which contribute to international work on terrestrial ECVs are:

- MERIS Level 2 products[478] demonstration FAPAR products processed at the ESA G-POD facility using the JRC algorithm of which allow continuity of the above data sets;

- ESA GlobCarbon[479] (Global Land Products for Carbon Model Assimilation), a consortium led by the Flemish Institute for Technological Research (VITO) which produced the FAPAR product derived from the surface reflectance values for the individual instruments, adopting average LAI values estimated across all sensors;

474 http://www.carbonorth.net
475 http://www.carboeurope.org
476 http://www.esoter.net
477 http://fapar.jrc.ec.europa
478 http://envisat.esa.int/level3/meris
479 http://geofront.vgt.vito.be

- EUMETSAT LandSaf[480], the Land Surface Analysis Satellite Applications Facility which has the objective to increase benefit from EUMETSAT Satellite (MSG and EPS) data related to land, land-atmosphere interaction, biospheric applications;

- CYCLOPES[481] (POSTEL, France), a project funded by EC/FP5, provides global mapping at 1km resolution of biogeophysical variables (leaf area index, the fraction of absorbed PAR, the fraction of vegetation cover, and albedo) derived from data acquired by VEGETATION sensor over the period 1999 – 2003;

- ESA GlobCOVER[482], launched in 2004 is now evolving to an international collaboration between ESA, FAO, UNEP, JRC, IGBP and GOFC-GOLD; it intends to complement and update other existing comparable global products, such as the global land cover map for the year 2000 (GLC 2000) with a resolution of 1 km produced by the JRC, producing a global land-cover map for the year 2005, using as its main source of data the fine resolution (300 m) mode data from MERIS sensor on-board ENVISAT satellite, acquired over the full year 2005.

The EC contributes to change and improve the terrestrial elements of global climate observing system through the development of a sustained GMES Atmospheric Service. In addition to the activities for the atmospheric ECVs reported above, the service will include near real time analysis and re-analysis of the ECV fire disturbance. A first set of re-analyses is being provided by the already cited projects GEMS[450] (FP6) for the period from 2003 onwards, and MACC (FP7) which provides the pilot core GMES Atmospheric Service.

In addition, the Water Information System for Europe (WISE) coordinated by EEA is providing online information on water quality across Europe. Water quantity (river discharge) will be implemented in WISE in 2009[483].

The CORINE database also aims to ensure availability of past and future data and metadata records of the satellite measurements for land-cover (1990, 2000 and 2006); it is coordinated by EEA and is currently being updated[484].The update cycle shall be sustained under the GMES program.

9.3.4.*Additional Information*

The EEA collects and presents indicators that are similar to the GCOS essential climate variables (e.g. glaciers, Arctic sea ice, snow cover, SST, river discharge). These are included in the 'climate change indicator report 2008', also mentioned in section 7, a joint activity of EEA, JRC and WHO[485]. The report contains (about 40) indicators in the following categories: atmosphere and climate, glaciers, snow and ice (cryosphere), marine systems and biodiversity, water quantity, freshwater quality and biodiversity, terrestrial ecosystems and biodiversity, soil, agriculture and forestry, and human health. Furthermore, all indicators will be included in the EEA's indicator management system (IMS) which will allow easier access to underlying data. So far the EEA maintains two

480 http://landsaf.meteo.pt

481 http://postel.mediasfrance.org/en/BIOGEOPHYSICAL-PRODUCTS/Leaf-Area-Index---LAI/CYCLOPES-Project

482 http://ionia1.esrin.esa.int/index.asp

483 http://www.eea.europa.eu/themes/water

484 http://dataservice.eea.europa.eu/map/clc_download
http://dataservice.eea.europa.eu/atlas/viewdata/viewpub.asp?id=1
http://www.eea.europa.eu/themes/landuse/eea-activities

485 http://www.eea.europa.eu/themes/climate/reports

core set indicators on climate change (global and European temperature and greenhouse gas concentrations)[486].

[486] http://themes.eea.europa.eu/IMS/CSI

10. EDUCATION, TRAINING AND PUBLIC AWARENESS

Key developments

- Major developments that have occurred in the EC since the 4th National Communication include:
- Public awareness campaigns on climate change:
- Climate Change Campaign (2006-2009)
- Sustainable Energy Europe Campaign (2005-2011)
- Climate Action Programme (2007-2009)
- Covenant of Mayors on energy and climate (2008 onwards)
- New Lifelong Learning Programme (2007-2012) with an increasing number of education and training projects related to climate change
- Eurobarometer survey on Europeans' attitudes towards climate change (2008)
- Eco Agents website for children (2008 onwards)
- Development of a large range of online resources and tools to raise public awareness and educate on climate change

10.1. Introduction

In the European Union, education and training are the responsibility of the Member States. The Member States' 5th National Communications report on details of education and training activities at the national level. Nevertheless, the European Commission supports the Member States' activities under different programmes and actions. Therefore, the EC 5th National Communication reports not only on public awareness activities, but also on education and training activities at the EC level. It also reports on the activities of the European Commission under the Amended New Delhi Work Programme[487].

In comparison to the 4th National Communication this chapter features a number of changes to the structure and content to reflect best practices:

- Activities grouped by area of focus: education and training in one section and public awareness in another section
- Separate sub-sections covering international cooperation activities
- Use of tables to detail specific projects (project, focus, target, short description)
- Report on EC level activities including examples of best practices in the Member States on education and training

[487] Article.6 of the Convention (COP decisions 11/CP8, 7/CP10, 9/CP13).

- Since the 4th National Communication the EC has developed a significant amount of new and improved activities related to education, training and public awareness on climate change.

- In its efforts to raise public awareness and educate on climate change, the EC has also developed a large range of new websites and tools targeting either the general public or specific audiences (e.g. children, youth, and teachers).

10.1.1. *Amended New Delhi Work Programme*

- EC efforts to implement the Amended New Delhi Work Programme include:

- A dedicated EC focal point on Article 6 has been assigned in DG Environment.

- Participation (including preparation activities) in the Art 6 EC Expert Group. The expert group's programme for 2009 involves:

- Helping to prepare the UNFCCC European Regional Workshop on Art 6 good practices held in Stockholm 18-20th of May. Sweden hosted the Regional Workshop as part of its EU presidency programme. The plenary sessions of the workshop were web-streamed.

- Showcasing a selection of the good practices submitted to the Stockholm workshop in a summary document uploaded on CC:iNet and through side event(s) to be held during the Copenhagen conference.

- Preparing the EC position for the intermediate review of the Amended New Delhi Work Program in 2010.

- Proposing EU input on Art 6 for inclusion in the Copenhagen agreement.

10.2. Education and Training

10.2.1. *Introduction*

In the European Union, responsibility for education and training policy lies with Member States. The European Community's role is to support the improvement of national systems through complementary EU level tools, mutual learning, exchange of good practices and financial support. Examples of the European Community's actions on education and training as well as examples of support to Member States initiatives are described in this section.

10.2.2. *European Programmes Supporting Education and Training on Climate Change*

Lifelong Learning Programme

The EU Member States and the EC have in recent years strengthened their political cooperation through the Education and Training 2010 work programme (2002-2010). This work programme is the framework for cooperation between the Member States and between the Member States and the EC. The work programme was reviewed and updated in 2008.[488] The general aim is the modernisation of education and training systems in cooperation with the Member States to reflect topics that are essential for society in the 21st century, including the climate change issue.

[488] http://ec.europa.eu/education/lifelong-learning-policy/doc/com865_en.pdf

In addition, the European Strategy for Sustainable Development adopted in 2001 and renewed in 2006[489] recognises the important role that education and training should play in achieving the objectives of sustainable development. The work programme and the sustainable development strategy provide a coherent policy framework for Education for Sustainable Development (ESD) at European level.

The work programme and the sustainable development strategy provide a coherent policy framework for Education for Sustainable Development (ESD) at European level. ESD is a strategic priority for the Education and Culture DG and climate change is one of the many issues covered under this framework.

The European Commission has integrated its various educational and training initiatives under a single umbrella, the Lifelong Learning Programme managed by the Education and Culture DG. With a significant budget of nearly €7 billion for 2007 to 2013, the new programme replaces previous education, vocational training and e-Learning programmes, which ended in 2006. There are four sub-programmes focusing on different stages of education and training and continuing previous programmes:

- Comenius for schools,
- Erasmus for higher education,
- Leonardo da Vinci for vocational education and training, and
- Grundtvig for adult education.

Although climate change is not set as a priority for the Lifelong Learning Programme, a variety of education and training projects on climate change are supported under the four pillars of the programme, and especially under the Comenius and Leonardo da Vinci programmes.

The Comenius programme supports different activities: mobility of individuals (students and teachers), schools partnerships, multilateral projects and multilateral networks. Numerous Comenius School Partnerships work on topics related to environmental questions, climate change and sustainable development; these themes are very popular among schools. Comenius also funds a small number of projects on climate change in the field of teacher training.

Leonardo da Vinci is the action programme to implement the European Community's vocational training policy, supporting and supplementing action taken by the Member States. The programme works with different project types: training placements for learners and trainees, mobility for vocational education and training, project-partnerships for the transfer of innovation in vocational education and training, project-partnerships for the development of innovation in vocational education and training and thematic networks.

A series of projects supported by the Lifelong Learning Programme related to climate change is given in Appendix H-H1.

Intelligent Energy Europe Programme - ManagEnergy Initiative

ManagEnergy[490] is an initiative of the European Commission DG for Energy and Transport under the Intelligent Energy Europe Programme. It supports the work of actors working on energy efficiency and renewable energies at the local and regional level. It was

489 See http://ec.europa.eu/environment/eussd/

490 www.managenergy.net

launched in 2002 following requests for improved communication and information on locally relevant energy issues. The available tools aim at sharing best practice and improving networking. They include training, workshops and online events targeting local stakeholders for sustainable energy and managers of local and regional energy agencies. ManagEnergy also offers free internet broadcast facilities[491] including more than 1000 individual video presentations, speeches and interviews on topical energy matters.

Since 2005, ManagEnergy has placed an increasing emphasis on education. For example, the KidsCorner website[492] features energy and transport pages including games, downloads, animations, videos, statistics, photos and other teaching resources aimed at 7-11 year olds, 12-16 year olds and their teachers in 26 languages.

In an effort to help young children understand many of the issues behind climate change, the EC's Intelligent Energy Europe programme has supported a number of decentralized, practical, grass roots schemes that teach energy education in primary schools all over Europe. The projects bring together local experts on energy efficiency and the children's own teachers to run entertaining and in informative classes on energy saving issues. A series of projects is given in Appendix H-H2.

The Intelligent Energy Europe programme also supports a number of training programmes across Europe and in developing countries with a contribution up to 50 %-75 % of the budget. The main training areas are energy savings, building certification, renewable energy technologies, biofuels and sustainable transport. Trainings or capacity building programmes typically target a variety of actors including local authorities, energy agencies, energy businesses, building professionals, and building owners. A series of projects is given in Appendix H-H2.

10.2.3. *European Institute of Innovation and Technology*

The European Institute of Innovation and technology (EIT) was created in 2009 to support new ways of creating and promoting innovation in Europe. The EIT will enhance the integration of actors from all three sides of the knowledge triangle, thereby allowing knowledge to circulate freely and for new ideas to be generated. It will help to unlock Europe's innovation potential by pooling together its most excellent resources, allowing innovative businesses, research organizations and higher education institutions to interact in new ways and to exploit fully their creative potential. Sustainable energy and Climate change mitigation and adaptation are amongst EIT's priorities.

10.2.4. *The School Corner on the Climate Change Campaign Website (2006-2009)*

The website of the DG ENV Climate Change Campaign (full description of the Climate Change Campaign below)[493] includes a school corner. This features various activities and information including a quiz, short videos, a carbon calculator, students' guide to climate change and teaching materials.

10.2.5. *The Kids Section under the Climate Action Campaign Website (2007-2009)*

Children and young people are one of the targets of the Climate Action Campaign (see full description below). A section of the campaign website is dedicated to 'What kids can

491 www.managenergy.tv

492 http://www.managenergy.net/kidscorner/index.html

493 http://ec.europa.eu/environment/climat/campaign/schools/getcreative_en.htm

do'. It provides links to European initiatives to educate children on climate change and broader environmental issues, including:

- **'Become an eco agent'** website of the European Environment Agency[494].
- **Environment for young Europeans** website of DG Environment[495]. On this website children can discover by themselves or together with their friends and classmates what the environment is and what is happening to it. It focuses on four themes: air, water, waste and nature.
- The ManagEnergy Kids Corner[496]

10.2.6. *Publications*

DG Environment publishes a brochure for young people (15-18) explaining climate change and EU action to combat it. This was updated in 2009 and will be available in 22 languages. DG Environment also publishes two stories on climate change as part of its 'Tom and Lila' series of stories for children. One, available in 20 languages, deals with climate change in general; the other focuses on clean air and transport and is available in 22 languages.

DG Environment contributes to the Europa Diary, an educational tool targeting school students of age 15-18. The diary contains the basics of what the EU offers young citizens, covering a range of their specific concerns including climate change. It is accompanied by a teachers' guide. The Europa Diary and the teachers' guide are available in all EU languages. There is growing demand for the diary; over 2.8 million copies of the 2008-9 edition were printed.

DG Environment has contributed to three editions of the diary (2006-7, 2007-8, 2008-9) and contributions to the fourth are in preparation. These contributions cover various environmental topics including climate change. The 2009-2010 edition also includes a section on renewable energy sources next to the climate change pages.

10.2.7. *ACCENT - Atmospheric Composition Change, the European Network of Excellence*[497]

ACCENT is a network of excellence on atmospheric composition change funded by the European Commission (and described in section 9.2.1). The Education and Training task within this aims specifically to bring attention to the wide scientific issues tackled in ACCENT via education and training, and to provide individuals and/or teams with diverse skills and competences. This is achieved by an educational and training programme aiming at specified target groups within the scientific community, and a global (virtual) network for young scientists.

10.2.8. *EC RELEX Family Training Programmes*

The Directorate General for External Relations (DG RELEX) runs training programmes for newcomers in the Commission Delegations in third countries during the annual Green Week conference each June (see 9.3.10). Climate change issues are covered in the training programme.

494 http://ecoagents.eea.europa.eu/
495 http://ec.europa.eu/environment/youth/index_en.html
496 http://managenergy.net/kidscorner/
497 http://www.accent-network.org/farcry_accent/

Since 2005 DG AIDCO has implemented a seminar programme on environment integration in EC external cooperation targeting desk officers and project managers both at Headquarters and Delegations, as well as staff from partner governments involved in the delivery of EC cooperation and also open to other development partners and NGOs. The programme is to strengthen knowledge on concepts and rationale as well as on practical tools and methods to address environmental aspects in the different phases of the cycle of operations. It focuses on the upstream phases of programming, identification and formulation and the main aid-delivery modalities: Projects, sector programmes, general budget support. Emphasis on climate aspects within the standard seminar format has increased progressively since 2007. More than 100 such seminars and online modules have been delivered so far in Brussels and overseas with a total participation of some 1500 staff from the EC, partner countries and development partners. Building staff capacities has been one key objective in the Greener AIDCO Plan adopted in 2007.

10.2.9. *Dissemination of Innovative Practices in Education and Training*

The EC is also working towards the dissemination of innovative practices on education for sustainable development. In 2008, an inventory of innovative practices in education for sustainable development[498] was presented by the Education and Culture DG. Climate change was one thematic focus in the report. The objective of the inventory is to identify innovative projects not only on environment but on integrative solutions. The inventory identified several best practices under the theme of climate change including:

- OKOLOG – Ecologisation school network (started in 1996) - Austria[499]
- Sustainable Universities - sustainability award contest (started in 2007) – Austria[500]
- Sustainable Tourism - developing a sustainable development curriculum for bachelor degrees in tourism and recreation management (2007-2008) - Belgium
- EnviWiki – Online Environmental Encyclopaedia for schools and universities (started in 2005) – Czech Republic[501]
- Transfer 21 programme – High school programme focused on interdisciplinary learning (2004-2008) - Germany[502]
- EkoSkola – Eco-Schools (started in 2002) - Malta[503]

2009 is the European year for creativity and innovation. Throughout the year the EC supports and coordinates Member States activities in this area and climate change initiatives are part of it. The objective of the EC is to disseminate good practices on creativity and innovation in Europe and beyond.

498 http://ec.europa.eu/education/more-information/doc/sustdev_en.pdf
499 http://www.oekolog.at
500 http://www.umweltbildung.at
501 http://www.enviwiki.cz/
502 http://www.transfer-21.de
503 http://www.ekoskolamalta.com/

10.2.10. *European Environment Agency (EEA) Initiatives on Education and Training on Climate Change*

The EEA is creating special web-based education materials and strengthening communication with younger audiences by communicating the EEA's main messages through various outputs suitable for children and for broader education purposes[504]. EEA activities on education include activities at school level, involving teacher networks, as well as education in a broader sense, e.g. life long learning. Various products and events are used to communicate climate change and other environmental topics in a creative and educational manner.

The main actions of the EEA in education and training on climate change are:

- Eco Agents[505] as the EEA educational 'flagship' targeting children. Launched in April 2008, Eco Agents is a website for children delivered in a form of comic strip. It includes downloadable quizzes on climate change among others, and a library of related links. The target audience is 9-12 year old children across Europe. Eco Agents is available in 24 languages. So far, over 76,000 visitors have been registered.

- EEA and Eco Schools collaboration. In October 2007, the EEA and the Eco Schools network organised a workshop to develop educational environmental material on climate change, biodiversity and sustainable lifestyle. The target audience is teachers for 9-14 year old children across Europe. The process is ongoing.

- Danish Film Institute. Successful and ongoing collaboration has been established with the Danish Film Institute in Copenhagen. Two joint events on climate change have been organised so far:

- Autumn 2007: Screening of 'The March of the Penguins' combined with an EEA lecture in collaboration with Copenhagen University.

- Winter 2008: Climate Event. A well-visited one day event aimed at climate change high school teachers, combining EEA lectures, topic related movies and lectures on climate change as an educational topic.

- Since 2006 the EEA has participated in *kulturnatten* (Culture Night), an annual local event. It is a one-day event, where cultural institutions (museums, governmental buildings, etc.) are open to the public. In 2008 over 60,000 kulturnat-passes were sold and the EEA welcomed 4000 visitors at its premises. A diverse programme communicated environmental messages, and included theatre plays, environmental quizzes and interactive games, live music, organic/CO2 friendly food, art exhibitions, scientific experiments, street attractions.

10.2.11. *International Cooperation on Education and Training*

The EC is involved intensively in international activities related to education and training on climate change and sustainable development in general including:

- The United Nations Economic Commission for Europe (UNECE) strategy for education for sustainable development whose objective is to incorporate key themes of sustainable development in all education systems. Climate Change is

504 EEA, EEA Strategy 2009-2013 - Multi-annual Work Programme, February 2009. http://www.eea.europa.eu/publications/eea-strategy-2009852013-multi-annual-work-programme

505 http://ecoagents.eea.europa.eu/

covered under the education for sustainable development strategy under the environmental protection key theme. The Education and Culture DG participates in the annual UNECE steering committee meetings.

- Under the UN decade of ESD (2005-2014), a conference was organised by the German presidency of the Council of the EU in 2007 on Europe's contribution to ESD.

- The EC collaborates with the UNESCO on ESD (e.g. world conference on ESD in 2009).

- Close collaboration with the OECD through participation in OECD workshops and support to its eco/sustainable schools programme.

- The EEA is also involved in international education and training initiatives on climate change including:

- Linking up information to relevant educational processes (e.g. UN Decade for Education on Sustainable Development, UNECE ESD strategy, the EU Education & Training 2010 work programme)

- Participating in international events

Some education and training initiatives supported by the Intelligent Energy Europe programme focus on international cooperation with developing countries (see examples in Appendix H – H3).

The EC is also working internationally to help partner countries tackle climate change. Examples of projects on climate change capacity building supported by the EC - DG AIDCO - in third countries include:

- Advancing Capacity, Partnerships and Knowledge to Support Climate Change Adaptation in Africa and Asia (ACCCA). Budget: €1.4 million (see section 7.4.2.2 for further details).

- Climate Change Capacity Development (C3D) - Technical Assistance for Strengthening and Training Developing Countries (Asia and Africa). Budget: €1.5 million (see section 7.4.2.1 for further details).

- Capacity Building related to Multilateral Environmental Agreements (MEA) in ACP countries. Budget: €19.5 million.

- Local Governments' backing for the development and implementation of a global and comprehensive post-2012 climate change agreement. Budget: €0.9 million

- Addressing Climate Change in the Middle East and North Africa (MENA). Budget: €1.5 million

- Capacity Development for Adaptation to Climate Change & GHG Mitigation in Non Annex I Countries. Budget: €2.5 million

- Seminars on climate change are also organised under the Technical Assistance and Information Exchange (TAIEX)[506] of DG Enlargement. TAIEX helps countries with regard to the approximation, application and enforcement of EC legislation. It is largely demand driven and contributes to the delivery of appropriate tailor-

[506] http://taiex.ec.europa.eu/

made expertise to address problems at short notice. The beneficiaries of TAIEX assistance include public and private sectors which have a role to play in the beneficiary countries in the transposition, implementation and enforcement of EU legislation. Beneficiary countries include: Bulgaria, Romania, Croatia, former Yugoslav Republic of Macedonia and Turkey; Turkish Cypriot community in the northern part of Cyprus; Albania, Bosnia and Herzegovina, Montenegro, Serbia and Kosovo under UNSCR 1244, Algeria, Armenia, Azerbaijan, Belarus, Egypt, Georgia, Israel, Jordan, Lebanon, Libya, Moldova, Morocco, the Palestinian Authority, Syria, Tunisia, Ukraine and Russia.

- RENA (Regional Environmental Network for Accession) programme for candidate countries and potential candidates is a €5.9 million project, which will start in 2010. RENA is the main regional cooperation tool for environmental protection in South Eastern Europe, promoting coherence and synergy between regional activities, as well as supporting progress towards EU standards. It has a large geographical and thematic scope bringing under its umbrella a number of activities previously carried out under various policy and financial instruments. It is conceived for addressing evolving geopolitical (process of accession to EU) and environmental circumstances (including climate change).

10.3. Public Awareness

10.3.1. *Introduction*

Since the previous national communication, many different initiatives have been carried out in Europe to raise public awareness of climate change, both at the European and Member State levels. Ambitious campaigns have been organised by the European Commission, new tools developed (e.g. carbon footprint calculator), innovative events organised, competitions launched to identify best practices, networks set up to share and spread best practices, and new information packages made available via different media (e.g. leaflets, online, video, TV). International cooperation on climate change public awareness has also been strengthened.

10.3.2. *Climate Change Section of DG Environment Website*

DG Environment's public website contains a substantial section on climate change which plays an important role in the Commission's information and awareness-raising activities on the issue. The climate pages provide detailed information on domestic EU policies and measures for mitigation and adaptation as well as on the EU's positions on the international climate negotiations. The climate section received an average of 335,000 page views per month between October 2008 and March 2009.

10.3.3. *Publications*

While the Commission seeks to minimise the production of printed materials for environmental reasons, publications such as brochures and fact sheets nevertheless continue to play a significant part in the Commission’s efforts to inform the public and raise awareness about environmental issues.

DG Environment has produced a series of public brochures entitled “EU action on climate change” highlighting various aspects of EU domestic and international climate change policy. These are regularly updated and all are available in English, French, Spanish, German, Italian and Polish. Some are published in further languages, including the UN languages Arabic, Chinese and Russian. As well as on paper, all brochures are available for download from the DG Environment website and from the EU Bookshop. A short fact

sheet on climate change for the general public is also available. This was updated in 2009 and will be published in 22 languages.

As part of its “Europe on the move” series of brochures for a broad public, DG COMM has published a brochure entitled “Combating climate change” which is available in all EU languages on paper and for download from the Commission's website.

The DG for Energy and Transport (TREN) and EACI, the Executive Agency for Competitiveness and Innovation (running the Intelligent Energy - Europe programme), have published a total of nine brochures (TREN: 5 and EACI: 4) on energy efficiency and renewable energy sources with strong links to climate change. DG TREN's publications are available in a minimum of six languages (EN, FR, ES, DE, IT and PL); those of EACI are published in English, French and German. PDF versions of these titles are available for download from the respective websites as well as from the EU Bookshop.

10.3.4. *Video Productions*

Video productions form an integral part of the European Commission's communication and awareness-raising activities.

DG Environment produces 10-12 video news releases per year on a range of environmental issues including climate change. These videos, of 8-10 minutes length, are used in whole or part by many television stations and typically reach an audience of at least 7.5 million viewers in Europe. They can also be viewed online at www.tvlink.org.

Between 2005 and mid-2009, 13 such videos were produced by DG Environment on various aspects of climate change and EU policy to address it.

Over the same period DG TREN together with EACI produced 20 video news releases and clips on energy issues and energy policy action of relevance to the fight against climate change (TREN: 12 and EACI 8). Videos are available from websites for download and streaming, and most of them are also available on DVD.

In 2009 DG COMM produced an updated version of the "Green Catalogue", which contains a wide selection of over 100 VNRs and info-clips produced by the Commission services and which is on-line since mid July. Links are available from both the Commission’s Climate Action website and the Press-room page on the EUROPA website. 2000 DVDs of the catalogue will be described to journalists at Climate Action events and at COP 15 Commission channel on Green TV is also being updated with short "EUtube"-like clips. Green TV works closely with a series of social networks. See http://www.green.tv/european_commission

10.3.5. *Climate Change Campaign (2006-2009)*

In May 2006 the European Commission launched its “You control climate change” public awareness raising campaign on climate change. The campaign aims to give people a sense of responsibility with practical tips on how small changes to daily habits can achieve collectively significant reductions in GHG emissions.

The campaign used a wide variety of supports to reach a broad public, especially young people. The campaign website, available in 21 language versions, was the cornerstone of the campaign and the place where all the resources and information were available.[507] Other supports included videos, publications, advertising (TV, cinema, newspaper, online, outdoor), posters, applications (screen saver, carbon calculator), game (Living together!), news articles, and video podcasts.

[507] http://ec.europa.eu/environment/climat/campaign/index_en.htm

The campaign was carried out in 3 phases from 2006 to 2009, with a budget of approximately €7.2 million

As the campaign wound down in 2009, DG Environment provided its delegation offices in the EU Member States with a travelling exhibition about EU action on climate change for use at public events. The exhibition is available in all EU languages.

10.3.6. *Sustainable Energy Europe Campaign (2005-2011)*

The objectives of the Sustainable Energy Europe Campaign 2005-2011[508] are to:

- Spread best practice to ensure a strong level of public awareness, understanding and support.
- Stimulate the necessary trends towards an increase in private investments in sustainable energy technologies.
- Build alliances among sustainable energy stakeholders, thereby creating a platform for new joint ideas and actions.

In the campaign, the Energy and Transport DG works in collaboration with two types of partners:

- Campaign Partners/Partnerships are public and private organisations that run exemplary projects and programmes. Their proposals are evaluated by the European Commission as a condition for being selected as partners. The purpose is to establish a European network for exchange of experience and the spreading of best practices among campaign partners. By May 2009, about 2,400 applications had been evaluated and 659 partnerships approved.
- Campaign Associates are major umbrella and network organisations involving sustainable energy actors who are able to offer a range of multiple actions through their communication channels. Their objective is to steer, in cooperation with the Commission, the campaign's strategy, manage special initiatives within the campaign, and also recruit partners. By May 2009, 105 associates had been recruited covering different types of organizations.

The campaign includes three types of events:

- Sustainable Energy Days aiming at the general public at local level. Sustainable Energy Days are organised by municipalities, regions and other stakeholders throughout Europe. The types of activities may vary, but normally include one or more of the following: guided visits and tours; educational activities and programmes, and exhibitions and fairs. Over 150 Sustainable Energy Days take place each year.
- Other events aimed at energy stakeholders – These events are organised during the year in the Member States and they cover more specific activities targeted at specialists, businesses and decision-makers. These events are seen as networking opportunities for stakeholders.
- The biggest event of the campaign is the Sustainable Energy Week, which ran for the third time in February 2009. It is also the world's most important series of events on sustainable energy. 146 conferences in 51 European cities, involving more than 36,000 attendees were held in 2009. Besides, the Week took place in

[508] http://www.sustenergy.org

1,400 hypermarkets in six countries, with excellent commercial results for the organisers (sales increases in excess of 124 % for energy efficient light bulbs, for instance). The basic idea is to provide a framework for various stakeholders, including campaign associates, to organise their own events during one week.

- The campaign organisation has set up support functions and developed tools to support the implementation of the Campaign including:

- A range of promotional and communication tools to be used by Campaign associates and partners (tools for the Energy Days, visual identity and promotional toolbox)

- The Campaign website (www.sustenergy.net)

- Media actions (press releases, press corner of the website, TV-Link, videos)

- Publications, brochures and newsletters

10.3.7. *Climate Action Campaign: Energy for a Changing World (2007-2009)*

Energy and climate change has been a communication priority of the European Commission since 2007. DG Communication (DG COMM) has since then led a project team including DG TREN, DG ENV, DG RELEX, DG AGRI, DG COMP, DG ENTR and the EEA. The purpose of the project team is to maximise communication impact by ensuring consistency of messages and coordinating communication activities among the different Commission departments involved.

As such a communication priority, extra efforts are invested by DG Communication to maximise the efforts of the other DGs on the issue of climate change.

The "Climate Action – Energy for a changing world" campaign launched in 2007 resulted from a political need to bring together energy and climate change under a single and coordinated communication campaign following the Commission's proposal of the Energy and Climate Change package in January 2007. The campaign developed in three stages:

- **2007**: set up of the campaign (with no budget), focusing on media oriented activities and ensuring coordination among main communication actors, DG ENV, DG TREN, as well as with the main communication tools, particularly Representations in the Member States.

- **2008**: actual launch of the campaign in terms of producing outputs, targeting the general public. DG Communication contracted an external company to organize five big events, including melting ice cubes[509] and carbon footprints[510], over the year and produce promotional material (budget of about €1 million in DG COMM). The "Climate Action" website (http://ec.europa.eu/climateaction) was created to provide citizen friendly information from various sources in a single place with a unified "look-and-feel", including the subsection on behavioural advice 'Your action counts'.

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509 Exhibition presenting two ice cubes melting at a different pace, the first ice-block (which melts very slowly) representing a world in which action has been taken following EC proposals, whereas the second one melts rapidly and dramatically diminishes, with the results known (floods, etc, also represented).

510 Hostesses dressed up as footprints under the motto 'Watch your CO_2 footprint'.

- **2009**: the last year of the campaign focusing particularly on young people (budget of about €3 million in DG COMM and €5 million in the Commission Representations in the Member States). The 2009 campaign, which still uses high visibility events like the melting ice cubes, makes a particular effort to involve youth through their favourite pastimes and communication tools: television and internet. It includes:

- A multimedia project ("Click a tree" campaign) based on a viral clip to be seeded in social networks, blogs, etc; a TV spot; a campaign website, a tree planting campaign and a prize winning game for 'tree planters'.

- The "Play to Stop. Europe for Climate" campaign with MTV, launched in July 2009 and structured around a series of 3 concerts in 3 target countries' capitals (Stockholm, Budapest and Copenhagen). The concert will be web-streamed and a 47 min TV special will be recorded for each concert (involving the artists, young 'ambassadors' and politicians), which would also be promoted through a TV spot on MTV. The campaign also includes 'ambassadors' (artists, actors, footballers, etc) who help in passing the message on. A dedicated website provides information on the EU Climate Change action, invitations to a competition to win entry to the concerts and to upload text and video messages about climate change, and to watch the concerts and TV specials in live streaming.

10.3.8. *Covenant of Mayors – Cities and Regions Leading Climate Change Mitigation through Local Sustainability Energy*

The Covenant of Mayors was launched by the European Commissioner for energy in 2008[511]. It consists of formal commitments by city councils or equivalent local authorities to go beyond the objectives set by the EU for 2020, reducing the CO_2 emissions in their respective territories by more than 20 %, through the implementation of a Sustainable Energy Action Plan (SEAP), which is made public and submitted to the European Commission. The cities also commit to foster citizen participation and to report regularly on progress in achieving the goals set. Finally, they accept termination of their involvement in the Covenant in case of non-compliance.

The European Commission provides for coordination and evaluation facilities through the creation of a Covenant of Mayors Office (COMO), technical assistance through the Commission's Joint Research Centre and project development facilities to smooth financing of investment projects through the European Investment Bank. In addition, actions related to the Covenant of Mayors are priority in the Intelligent Energy –Europe programme. New support lines, both for Europe and for other countries, are at present under consideration. Ongoing negotiations with third parties are resulting in commitments by regions and other institutions to provide financial and technical support to smaller cities, allowing them to be in a position to join the Covenant. Other services such as the provision of guidelines and the creation of a system for benchmarking excellence are planned, due for delivery during 2009.

As of 1 May 2009, 496 cities and regions from Europe and beyond had signed up to the Covenant, involving more than 100 million citizens. This figure is increasing constantly. With the present number of cities, a conservative estimate of the potential CO_2 emission reduction would be in excess of 110 million tons of CO_2 a year by 2020, or approximately 600 million tons in the period from 2010 to 2020.

511 www.eumayors.eu

10.3.9. *The European Mobility Week Campaign*

European Mobility Week[512] is an annual initiative coordinated by the three European city networks, Eurocities, Climate Alliance and Energie-Cités, with the support of the European Commission (DG Environment). European Mobility Week started in 2002 and aims to encourage citizens to change their travel behaviour by shifting to more sustainable modes of transport. From 16th to 22nd September each year, local authorities all over Europe and beyond organise public awareness raising activities and launch new, permanent infrastructure measures which contribute to improving sustainable mobility. Many organise car-free days as part of the week's activities. In 2008 just over 2,000 towns and cities with a combined population of almost 220 million people took part in EMW. EMW is also organised in countries beyond the European Union, including China.

Climate change was the theme of EMW in 2006, in support of the launch of the Commission's Climate Change awareness campaign, and again in 2009. The 2009 campaign theme – "Improving City Climates" – underlines the importance of efforts of towns and cities in effectively tackling climate change via measures promoting sustainable mobility.

10.3.10. *Green Week*[513]

Green Week, held each year in June, is the biggest annual conference dedicated to European environment policy. Organised by the European Commission (DG Environment), Green Week is open to the public and aims to raise awareness of environmental issues as well as to facilitate solutions through discussion and sharing of experience and good practice among those professionally involved in environmental protection. Green Week typically attracts some 3,000-3,500 participants from Europe and beyond from national, regional and local government, European and multilateral institutions, business and industry, environmental NGOs, the scientific community and academia.

Green Week took climate change as its theme in 2005, under the slogan "Get to grips with climate change", and again in 2009, under the title "Act and adapt". Green Week 2009 comprised more than 35 discussion sessions looking at prospects for the Copenhagen agreement and at various aspects of the challenges of mitigation and adaptation. In connection with Green Week in 2005 three video news releases on various aspects of climate change and in 2009 two such videos were distributed to TV stations. In other years Green Week has included several sessions on climate change even when this has not been the main theme of the event.

10.3.11. *The European Business Awards for the Environment*

The European Business Awards for the Environment initiative was launched by DG Environment in 1987 to reward and promote European companies that set an example by successfully bringing together innovation, economic viability and protection of the environment. Only winners of national awards can apply - this rule ensures that companies winning the European award are truly 'best of the best'. The awards are given in four categories - management, product, process and international co-operation. 125 companies from 24 European countries participated in the 2008 edition.

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512 http://www.mobilityweek.eu/

513 http://ec.europa.eu/environment/greenweek/home.html

10.3.12. *Opinion Surveys*

In 2008, the EC and the European Parliament carried out a survey of "Europeans' attitudes towards climate change". The results of this survey were published in September 2008 in a Special Eurobarometer Report[514], analysed at the EU level and by country. Where applicable, different socio-demographic variables - such as respondents' gender, age, education, occupation and political orientation - have been used to take the analysis further. In addition, key variables were used in the analysis to gain deeper insight into citizens' views on climate change: respondents' subjective level of information and their perception of the seriousness of climate change. The main results from the survey include:

- Climate change is an issue of major concern to Europeans.
- The proportion of citizens that feel poorly informed about the subject remains significant.
- Attitudes seem to be predominantly optimistic regarding the evolution of the problem: most citizens think that the process is stoppable.
- A clear majority (61 %) confirm that they have taken some kind of action in this cause.
- Europeans clearly think that corporations and industry, citizens themselves, national governments and the EU are not doing enough to fight climate change.

A second survey on "Europeans' attitudes towards climate change"[515] was published in July 2009. Among the main conclusions are the following:

- Climate change is still seen as one of the top three most serious problems facing the world today, though the seriousness of this issue (as with many other world problems) has declined in the face of the economic downturn, which dominates public opinion (and perceived concerns).
- The proportion of respondents who believe that fighting climate change can have a positive effect on the European economy has increased from 56 % in spring 2008 to 62 % in January-February 2009.

10.3.13. *Grants Programmes*[516]

DG Environment has run a programme of operating grants for European environmental NGOs since 1999. NGOs are awarded yearly grants based on the work programmes presented in their applications. The activities in the work programmes should be in line with the priorities of the 6th Environment Action Programme, one of them being climate change. Activities in relation to education, training and public awareness on climate change (among other activities) can therefore be co-funded under this programme, although it does not exclusively target such activities.

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514 Special Eurobarometer 300, Europeans' attitudes towards climate change, September 2008.

515 Special Eurobarometer 313, Europeans' attitudes towards climate change, July 2009

516 http://ec.europa.eu/environment/ngos/index_en.htm

10.3.14. *European Environment Agency (EEA) Initiatives on Public Awareness on Climate Change*

The EEA's communication strategy puts an increased effort in reaching out to the general public with its environmental messages, hereby acknowledging the importance of each citizen's impact on the environment and climate change. The EEA produces specifically targeted products for the general public, including reports, briefings, indicators, maps, data, animations and videos. Selected EEA products are translated into all EEA member countries' languages.

- The EEA website is the central communication tool to the public and other stakeholders with a section on climate change[517]. The EEA leverages its environmental message by producing targeted EEA products aimed at specific audiences.

- Since 2007, the EEA publishes green tips on its homepage.[518] About 50 of them relate to climate change.

- In 2009, web articles were established as a new online product. They are targeted at the informed public, in particular web readers who typically look for bite-sized information.

- Animations and videos[519] on climate change are available on the EEA website.

- EEA Signals[520] is the central EEA product targeting the general public. It is an annual publication profiling key environmental stories, including climate change. EEA Signals is available as a paper copy as well as web articles.

- In 2007, the documentary 'Our Arctic Challenge' was produced[521]. A pre-premiere was organised at the EEA premises with his Royal Highness Crown Prince Frederik of Denmark, the diplomatic corps in Denmark and the winners of the Arctic Team Challenge 2007. The documentary won the audience award for the "Best documentary feature" at the Oxford International Film Festival in 2008.

- Until 2007, EPAEDIA[522] was the EEA's environmental encyclopaedia which offered news and information to the general public in a simple and fun way. It contained different levels of information to cater for differing degrees of interest in the environmental issue.

10.3.15. *International Cooperation on Public Awareness*

Communication outside the EU is largely decentralised through the Commission Delegations. DG RELEX is responsible for the administration of the Commission Delegations in third countries (more than 120). At the beginning of 2008, Climate change was signalled as a priority theme for delegations in their overall communication activities. DG RELEX established a dedicated web page from where Delegations can download presentations etc. DG RELEX also supports public awareness programmes on climate change in the third countries. A list of projects is given in Appendix H – H4.

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517 http://www.eea.europa.eu/themes/climate

518 http://www.eea.europa.eu/green-tips/

519 http://www.eea.europa.eu/multimedia

520 http://www.eea.europa.eu/publications/signals-2009

521 http://www.eea.europa.eu/multimedia/introduction-of-the-film-our-arctic-challenge/view

522 http://epaedia.eea.europa.eu/index.php.

In 2007, the theme of the "European Development Days" event was 'Will climate change development?'[523]. The event included activities to raise media and public awareness about climate change and development. Adapting to climate change was one of the four themes of the 2009 European Development Days, held in Stockholm on 22-24 October.

In the context of the EU-China Climate Change Partnership established in 2005, the EU and China have launched a number of joint public awareness raising and training projects, including the following:

- EU-China CDM facilitation project (see section 8.6.3)

- An EU exhibition on climate change in 2008[524]: Roaming exhibition organised by the Delegation of the European Commission to China and targeting the general public throughout China.

The EU is also working internationally to help partner countries tackle climate change. Awareness-raising projects supported by the EC - DG AIDCO - in third countries include:

- Morocco (2004), Renforcement des capacités nationales en matière d'éducation et de sensibilisation à l'environnement dans les domaines de la biodiversité, des changements climatiques et de la desertification. Budget: €706,000.

- Global (2005), Climate Change and Poverty Reduction: Building Awareness and Promoting Action. Budget:€360,000.

- Africa (2006), L'information Environnementale corporative au service des grands défis régionaux d'Afrique. Budget: € 371,000.

- Global (2006), Challenges for sustainable development in the South - News reporting, opinion building and media training regarding climate change, biodiversity, food security and the extractive industries. Budget: €671,000.

- Afghanistan(2007), National Environmental Visibility Event in Afghanistan. Budget: €100,000.

- Global (2008), The Climate Change Media Partnership (CCMP): Developing World Media Capacity- Building on the Post 2012 Climate Change Negotiations and the Clean Development Mechanism. Budget: €768,000.

- Global (2008), IPCC Dissemination of results / Understanding the findings of the IPCC Fourth Assessment Report "Climate Change 2007" - Integrating climate change adaptation and mitigation in development planning. Budget: €1 million.

- India (2008)Climate Change Awareness Programme. Budget: €8.5million

- Asia (2009-2010) SwitchAsia network facility.

523 http://ec.europa.eu/development/services/events/EDD2007/homepage_en.htm

524 http://www.delchn.ec.europa.eu/climate_change.htm

11. APPENDICES

Appendix A - Summary GHG emissions inventory tables for the EU-15

A1 EU-15, 1990

Summary 1.A Summary report for National Greenhouse Gas Inventories (IPCC Table 7A)

(Sheet 1 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		Net CO_2 emissions/removals	CH_4	N_2O	$HFCs^{(1)}$		$PFCs^{(1)}$		SF_6		NO_x	CO	NMVOC	SO_2
					P	A	P	A	P	A				
		(Gg)			CO_2 equivalent (Gg)						(Gg)			
Total National Emissions and Removals		**3,137,561.92**	**20,740.59**	**1,249.83**	**965.02**	**28,013.65**	**106.81**	**16,824.70**	**2.34**	**0.46**	**13,448.34**	**52,273.09**	**15,877.49**	**16,463.84**
1. Energy		**3,130,761.92**	**4,561.14**	**97.23**							**13,065.19**	**47,336.72**	**9,002.26**	**15,922.49**
A. Fuel Combustion	Reference Approach [2]	3,119,422.48												
	Sectoral Approach [2]	3,111,335.73	860.21	96.90							13,028.24	47,199.01	7,594.30	15,573.55
1. Energy Industries		1,151,379.53	41.23	30.47							2,883.49	521.08	55.82	10,223.23
2. Manufacturing Industries and Construction		612,761.21	61.55	22.48							1,854.10	3,748.73	136.94	2,872.31
3. Transport		688,170.13	206.91	19.92							6,818.05	32,185.26	5,874.70	765.20
4. Other Sectors		637,798.09	538.68	21.84							1,358.04	10,308.40	1,320.25	1,628.79
5. Other		21,226.77	11.85	2.19							114.55	435.53	206.60	84.02
B. Fugitive Emissions from Fuels		19,426.19	3,700.92	0.33							36.95	137.70	1,407.96	348.93
1. Solid Fuels		2,074.39	2,206.31	0.01							3.22	76.71	17.79	64.48
2. Oil and Natural Gas		17,351.80	1,494.61	0.31							33.74	61.00	1,390.17	284.46
2. Industrial Processes		**215,299.79**	**34.81**	**324.71**	**965.02**	**28,013.65**	**106.81**	**16,824.70**	**2.34**	**0.46**	**182.06**	**2,886.19**	**803.05**	**514.26**
A. Mineral Products		109,705.56	1.16	IE,NA,NE,NO							32.91	18.85	109.77	76.90
B. Chemical Industry		27,819.97	26.39	324.45	NA,NE,NO	C,NA,NE,NO	NA,NE,NO	C,NA,NE,NO	C,NA,NE,NO	C,NA,NE,NO	111.99	169.49	392.39	262.18
C. Metal Production		77,419.59	5.00	0.04				13,341.03		0.07	20.04	2,678.36	19.87	96.85
D. Other Production [3]		72.98	0.24	0.21							15.62	12.58	246.65	77.56
E. Production of Halocarbons and SF_6						27,458.66		2,898.36		0.08				
F. Consumption of Halocarbons and SF_6					965.02	554.99	106.81	585.31	2.34	0.30				
G. Other		281.69	2.01	0.01	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	0.01	1.50	6.91	34.37	0.77

Note: **A** = Actual emissions based on Tier 2 approach of the IPCC Guidelines.
P = Potential emissions based on Tier 1 approach of the IPCC Guidelines.

(Sheet 2 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs [1]		PFCs [1]		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
3. Solvent and Other Product Use	**9,530.74**		**13.52**							**NA,NO,NE**	**NA,NO,NE**	**4,172.59**	**NA,NO,NE**
4. Agriculture		**8,597.71**	**768.88**							**146.94**	**752.36**	**595.36**	**4.41**
A. Enteric Fermentation		6,373.04											
B. Manure Management		2,116.55	78.76									327.99	
C. Rice Cultivation		104.08										0.13	
D. Agricultural Soils [4]		-31.80	689.35									177.43	
E. Prescribed Burning of Savannas		NA,NE,NO	NA,NE,NO							NO,NE	NO,NE	NO,NE	
F. Field Burning of Agricultural Residues		35.84	0.77							27.96	752.36	88.86	4.41
G. Other		NA,NO	NA,NE,NO							118.98	NA,NO	0.94	0.00
5. Land Use, Land-Use Change and Forestry	[5] **-222,684.76**	**93.94**	**13.29**							**24.25**	**830.16**	**1,217.29**	**1.45**
A. Forest Land	[5] -302,550.27	61.17	0.86							17.26	583.96	63.15	
B. Cropland	[5] 73,117.05	10.92	12.09							2.71	95.57	NA,NE,NO	
C. Grassland	[5] -14,708.10	11.12	0.08							2.76	97.23	IE,NA,NE,NO	
D. Wetlands	[5] 3,979.47	5.03	0.20							0.10	3.55	NA,NE,NO	
E. Settlements	[5] 18,021.02	5.53	0.04							1.37	48.36	NA,NE,NO	
F. Other Land	[5] 1,257.42	0.17	0.00							0.04	1.49	NA,NE,NO	
G. Other	[5] -1,801.35	NA,NE,NO	0.02							NA,NE,NO	NA,NE,NO	1,154.14	1.45
6. Waste	**4,654.23**	**7,453.00**	**32.20**							**29.90**	**467.66**	**86.95**	**21.23**
A. Solid Waste Disposal on Land	[6] 218.47	6,811.50	0.05							0.90	28.05	48.29	0.79
B. Waste-water Handling		600.79	30.87							NA,NE,NO	NA,NE,NO	3.71	
C. Waste Incineration	[6] 4,435.76	22.72	0.85							25.10	437.68	26.47	16.27
D. Other	NA,NO	17.98	0.43							3.91	1.93	8.49	4.17
7. Other ***(please specify)*** [7]	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**
Other non-specified	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO

(Sheet 3 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs		PFCs		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
Memo Items: [8]													
International Bunkers	**164,047.68**	**5.05**	**5.81**							**1,448.15**	**222.55**	**72.91**	**922.44**
Aviation	61,228.32	1.25	1.64							227.13	108.81	25.96	15.22
Marine	102,819.36	3.80	4.18							1,221.01	113.73	46.95	907.22
Multilateral Operations	**0.05**	**0.00**	**0.00**							**0.00**	**0.00**	**0.00**	**0.00**
CO_2 Emissions from Biomass	**155,138.80**												

[1] The emissions of HFCs and PFCs are to be expressed as CO_2 equivalent emissions. Data on disaggregated emissions of HFCs and PFCs are to be provided in Table 2(II) of this common reporting format.

[2] For verification purposes, countries are asked to report the results of their calculations using the Reference approach and to explain any differences with the Sectoral approach in the documentation box to Table 1.A.(c). For estimating national total emissions, the results from the Sectoral approach should be used, where possible.

[3] Other Production includes Pulp and Paper and Food and Drink Production.

[4] Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

[5] For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

[6] CO_2 from source categories Solid Waste Disposal on Land and Waste Incineration should only be included if it stems from non-biogenic or inorganic waste streams. Only emissions from Waste Incineration Without Energy Recovery are to be reported in the Waste sector, whereas emissions from Incineration With Energy Recovery are to be reported in the Energy sector.

[7] If reporting any country-specific source category under sector "7. Other", detailed explanations should be provided in Chapter 9: Other (CRF sector 7) of the NIR.

[8] Countries are asked to report emissions from international aviation and marine bunkers and multilateral operations, as well as CO_2 emissions from biomass, under Memo Items. These emissions should not be included in the national total emissions from the energy sector. Amounts of biomass used as fuel are included in the national energy consumption but the corresponding CO_2 emissions are not included in the national total as it is assumed that the biomass is produced in a sustainable manner. If the biomass is harvested at an unsustainable rate, net CO_2 emissions are accounted for as a loss of biomass stocks in the Land Use, Land-use Change and Forestry sector.

A 2 EU-15 1991
Summary 1.A Summary report for National Greenhouse Gas Inventories (IPCC Table 7A)

(Sheet 1 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	$HFCs^{(1)}$		$PFCs^{(1)}$		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
Total National Emissions and Removals	**3,122,085.42**	**20,585.45**	**1,235.30**	**1,089.95**	**27,699.45**	**137.38**	**15,411.15**	**2.40**	**0.47**	**13,389.74**	**50,562.50**	**15,229.71**	**14,984.29**
1. Energy	**3,163,904.51**	**4,509.93**	**99.27**							**13,027.67**	**45,614.92**	**8,573.36**	**14,550.90**
A. Fuel Combustion — Reference Approach [2]	3,146,503.45												
Sectoral Approach [2]	3,144,412.94	854.64	98.94							12,993.12	45,456.11	7,228.34	14,261.49
1. Energy Industries	1,156,707.29	41.34	31.33							2,855.75	496.48	56.28	9,680.02
2. Manufacturing Industries and Construction	591,531.86	58.77	21.71							1,816.42	3,485.04	132.86	2,507.45
3. Transport	701,915.74	195.94	21.51							6,841.66	31,200.71	5,529.01	739.90
4. Other Sectors	677,075.04	550.83	22.34							1,381.94	9,952.91	1,368.89	1,280.57
5. Other	17,183.01	7.76	2.05							97.36	320.96	141.29	53.55
B. Fugitive Emissions from Fuels	19,491.58	3,655.29	0.33							34.55	158.82	1,345.02	289.41
1. Solid Fuels	1,913.54	2,155.33	0.01							2.54	68.29	15.29	24.33
2. Oil and Natural Gas	17,578.04	1,499.96	0.32							32.01	90.53	1,329.74	265.08
2. Industrial Processes	**205,630.63**	**33.94**	**323.63**	**1,089.95**	**27,699.45**	**137.38**	**15,411.15**	**2.40**	**0.47**	**164.09**	**2,753.23**	**768.78**	**408.33**
A. Mineral Products	104,546.19	0.96	IE,NA,NE,NO							31.74	17.66	107.00	58.98
B. Chemical Industry	27,216.46	26.19	323.36	NA,NE,NO	C,NA,NE,NO	NA,NE,NO	C,NA,NE,NO	C,NA,NE,NO	C,NA,NE,NO	96.23	160.00	367.37	211.97
C. Metal Production	73,443.75	4.51	0.03				11,944.20		0.07	18.99	2,556.76	19.00	71.11
D. Other Production [3]	49.68	0.26	0.23							15.86	12.73	242.98	63.58
E. Production of Halocarbons and SF_6					27,115.60		2,830.52		0.07				
F. Consumption of Halocarbons and SF_6				1,089.95	583.85	137.38	636.42	2.40	0.32				
G. Other	374.56	2.02	0.01	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	0.01	1.28	6.08	32.44	2.69

Note: **A** = Actual emissions based on Tier 2 approach of the IPCC Guidelines.
P = Potential emissions based on Tier 1 approach of the IPCC Guidelines.

(Sheet 2 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs [1]		PFCs [1]		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
3. Solvent and Other Product Use	**9,398.64**		**13.12**							**NA,NO,NE**	**NA,NO,NE**	**4,054.53**	**NA,NO,NE**
4. Agriculture		**8,414.44**	**753.62**							**137.75**	**745.05**	**545.43**	**4.62**
A. Enteric Fermentation		6,236.45											
B. Manure Management		2,071.94	77.29									287.07	
C. Rice Cultivation		100.99										0.13	
D. Agricultural Soils [4]		-30.43	675.60									169.12	
E. Prescribed Burning of Savannas		NA,NE,NO	NA,NE,NO							NO,NE	NO,NE	NO,NE	
F. Field Burning of Agricultural Residues		35.50	0.73							26.36	745.05	88.25	4.62
G. Other		NA,NO	NA,NE,NO							111.39	NA,NO	0.86	0.00
5. Land Use, Land-Use Change and Forestry	[5] **-261,399.13**	**95.71**	**13.07**							**23.19**	**812.81**	**1,189.64**	**0.30**
A. Forest Land	[5] -341,579.07	60.81	0.67							15.69	548.77	56.32	
B. Cropland	[5] 72,144.61	11.86	12.05							2.95	103.79	NA,NE,NO	
C. Grassland	[5] -14,500.80	12.52	0.09							3.11	109.46	IE,NA,NE,NO	
D. Wetlands	[5] 3,775.51	5.00	0.20							0.07	2.48	NA,NE,NO	
E. Settlements	[5] 17,632.06	5.24	0.04							1.30	45.85	NA,NE,NO	
F. Other Land	[5] 1,504.07	0.28	0.00							0.07	2.46	NA,NE,NO	
G. Other	[5] -375.50	NA,NE,NO	0.02							NA,NE,NO	NA,NE,NO	1,133.33	0.30
6. Waste	**4,550.76**	**7,531.44**	**32.59**							**37.04**	**636.49**	**97.97**	**20.13**
A. Solid Waste Disposal on Land	[6] 266.64	6,890.98	0.06							1.09	31.72	49.98	0.97
B. Waste-water Handling		586.75	30.95							NA,NE,NO	NA,NE,NO	3.83	
C. Waste Incineration	[6] 4,284.12	30.35	1.05							32.34	603.14	34.25	15.78
D. Other	NA,NO	23.36	0.52							3.60	1.62	9.91	3.39
7. Other ***(please specify)*** [7]	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**
Other non-specified	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO

(Sheet 3 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs		PFCs		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
Memo Items: [8]													
International Bunkers	**163,435.56**	**4.78**	**5.78**							**1,406.76**	**214.67**	**70.53**	**886.51**
Aviation	61,383.15	1.16	1.63							226.18	106.77	24.75	15.92
Marine	102,052.41	3.61	4.16							1,180.58	107.91	45.78	870.59
Multilateral Operations	**0.05**	**0.00**	**0.00**							**0.00**	**0.00**	**0.00**	**0.00**
CO_2 Emissions from Biomass	**165,038.06**												

[1] The emissions of HFCs and PFCs are to be expressed as CO_2 equivalent emissions. Data on disaggregated emissions of HFCs and PFCs are to be provided in Table 2(II) of this common reporting format.

[2] For verification purposes, countries are asked to report the results of their calculations using the Reference approach and to explain any differences with the Sectoral approach in the documentation box to Table 1.A.(c). For estimating national total emissions, the results from the Sectoral approach should be used, where possible.

[3] Other Production includes Pulp and Paper and Food and Drink Production.

[4] Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

[5] For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

[6] CO_2 from source categories Solid Waste Disposal on Land and Waste Incineration should only be included if it stems from non-biogenic or inorganic waste streams. Only emissions from Waste Incineration Without Energy Recovery are to be reported in the Waste sector, whereas emissions from Incineration With Energy Recovery are to be reported in the Energy sector.

[7] If reporting any country-specific source category under sector "7. Other", detailed explanations should be provided in Chapter 9: Other (CRF sector 7) of the NIR.

[8] Countries are asked to report emissions from international aviation and marine bunkers and multilateral operations, as well as CO_2 emissions from biomass, under Memo Items. These emissions should not be included in the national total emissions from the energy sector. Amounts of biomass used as fuel are included in the national energy consumption but the corresponding CO_2 emissions are not included in the national total as it is assumed that the biomass is produced in a sustainable manner. If the biomass is harvested at an unsustainable rate, net CO_2 emissions are accounted for as a loss of biomass stocks in the Land Use, Land-use Change and Forestry sector.

A 3 EU-15, 1992
Summary 1.A Summary report for National Greenhouse Gas Inventories (IPCC Table 7A)

(Sheet 1 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs[1]		PFCs[1]		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
Total National Emissions and Removals	**3,050,511.63**	**20,284.77**	**1,212.41**	**1,416.05**	**29,146.12**	**175.53**	**13,217.35**	**2.49**	**0.51**	**13,071.81**	**48,264.61**	**14,831.53**	**13,700.66**
1. Energy	**3,095,250.07**	**4,345.84**	**99.02**							**12,741.79**	**43,809.99**	**8,328.22**	**13,311.42**
A. Fuel Combustion — Reference Approach[2]	3,065,906.90												
A. Fuel Combustion — Sectoral Approach[2]	3,075,741.36	802.79	98.68							12,707.81	43,684.50	7,011.58	13,028.33
1. Energy Industries	1,120,285.80	40.01	30.78							2,639.28	473.64	55.91	8,908.64
2. Manufacturing Industries and Construction	566,427.70	55.54	21.24							1,730.26	3,426.24	130.12	2,275.39
3. Transport	726,429.87	194.74	23.27							6,903.97	30,620.79	5,460.04	757.51
4. Other Sectors	647,603.70	507.15	21.43							1,342.57	8,898.77	1,272.92	1,051.19
5. Other	14,994.30	5.34	1.97							91.72	265.07	92.59	35.60
B. Fugitive Emissions from Fuels	19,508.71	3,543.05	0.34							33.98	125.49	1,316.65	283.10
1. Solid Fuels	1,655.39	2,010.95	0.01							2.15	60.83	12.80	22.44
2. Oil and Natural Gas	17,853.32	1,532.10	0.33							31.83	64.66	1,303.84	260.66
2. Industrial Processes	**197,034.71**	**34.37**	**313.25**	**1,416.05**	**29,146.12**	**175.53**	**13,217.35**	**2.49**	**0.51**	**146.46**	**2,548.92**	**763.81**	**365.29**
A. Mineral Products	102,894.83	0.88	IE,NA,NE,NO							28.52	17.46	104.04	57.05
B. Chemical Industry	26,347.90	26.97	312.97	NA,NE,NO	C,NA,NE,NO	NA,NE,NO	C,NA,NE,NO	C,NA,NE,NO	C,NA,NE,NO	83.77	153.89	364.64	186.71
C. Metal Production	67,337.43	4.26	0.03				9,677.89		0.07	17.94	2,359.64	18.57	67.27
D. Other Production[3]	54.42	0.26	0.23							15.18	12.67	246.05	51.67
E. Production of Halocarbons and SF_6					28,370.10		2,850.25		0.08				
F. Consumption of Halocarbons and SF_6				1,416.05	776.03	175.53	689.21	2.49	0.34				
G. Other	400.13	2.00	0.02	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	0.01	1.05	5.25	30.51	2.60

Note: **A** = Actual emissions based on Tier 2 approach of the IPCC Guidelines.
P = Potential emissions based on Tier 1 approach of the IPCC Guidelines.

EU-15, 1992 Summary 1.A Summary report for National Greenhouse Gas Inventories (IPCC Table 7A)

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs [1]		PFCs [1]		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
3. Solvent and Other Product Use	**9,081.10**		**13.00**							NA,NO,NE	NA,NO,NE	**3,922.61**	NA,NO,NE
4. Agriculture		**8,354.34**	**741.63**							**130.41**	**649.54**	**532.69**	**4.41**
A. Enteric Fermentation		6,172.55											
B. Manure Management		2,081.85	75.67									281.83	
C. Rice Cultivation		99.43										0.08	
D. Agricultural Soils [4]		-30.45	665.32									170.62	
E. Prescribed Burning of Savannas		NA,NE,NO	NA,NE,NO							NO,NE	NO,NE	NO,NE	
F. Field Burning of Agricultural Residues		30.95	0.64							23.27	649.54	79.25	4.41
G. Other		NA,NO	NA,NE,NO							107.14	NA,NO	0.91	0.00
5. Land Use, Land-Use Change and Forestry	[5] **-255,448.49**	**82.81**	**12.78**							**19.83**	**693.00**	**1,187.82**	**0.46**
A. Forest Land	[5] -332,261.81	48.49	0.52							12.52	435.85	55.32	
B. Cropland	[5] 68,911.69	11.49	11.90							2.85	100.50	NA,NE,NO	
C. Grassland	[5] -14,532.30	12.12	0.08							3.01	105.93	IE,NA,NE,NO	
D. Wetlands	[5] 3,823.86	5.21	0.21							0.07	2.49	NA,NE,NO	
E. Settlements	[5] 17,681.91	5.23	0.03							1.30	45.75	NA,NE,NO	
F. Other Land	[5] 1,514.32	0.28	0.00							0.07	2.49	NA,NE,NO	
G. Other	[5] -586.16	NA,NE,NO	0.02							NA,NE,NO	NA,NE,NO	1,132.50	0.46
6. Waste	**4,594.23**	**7,467.42**	**32.73**							**33.32**	**563.16**	**96.38**	**19.09**
A. Solid Waste Disposal on Land	[6] 306.55	6,830.22	0.07							1.26	34.49	50.52	1.11
B. Waste-water Handling		582.86	31.08							NA,NE,NO	NA,NE,NO	3.74	
C. Waste Incineration	[6] 4,287.68	26.61	0.96							28.77	527.35	30.79	15.37
D. Other	NA,NO	27.73	0.61							3.29	1.32	11.33	2.61
7. Other *(please specify)* [7]	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**
Other non-specified	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO

EU-15, 1992 Summary 1.A Summary report for National Greenhouse Gas Inventories (IPCC Table 7A)

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs		PFCs		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)				(Gg)					
Memo Items: [8]													
International Bunkers	**169,853.40**	**4.87**	**5.95**							**1,450.45**	**223.47**	**72.75**	**875.73**
Aviation	66,806.43	1.22	1.79							249.36	114.45	26.44	18.60
Marine	103,046.97	3.65	4.16							1,201.09	109.02	46.31	857.13
Multilateral Operations	**0.05**	**0.00**	**0.00**							**0.00**	**0.00**	**0.00**	**0.00**
CO_2 Emissions from Biomass	**164,882.83**												

[1] The emissions of HFCs and PFCs are to be expressed as CO_2 equivalent emissions. Data on disaggregated emissions of HFCs and PFCs are to be provided in Table 2(II) of this common reporting format.

[2] For verification purposes, countries are asked to report the results of their calculations using the Reference approach and to explain any differences with the Sectoral approach in the documentation box to Table 1.A.(c). For estimating national total emissions, the results from the Sectoral approach should be used, where possible.

[3] Other Production includes Pulp and Paper and Food and Drink Production.

[4] Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

[5] For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

[6] CO_2 from source categories Solid Waste Disposal on Land and Waste Incineration should only be included if it stems from non-biogenic or inorganic waste streams. Only emissions from Waste Incineration Without Energy Recovery are to be reported in the Waste sector, whereas emissions from Incineration With Energy Recovery are to be reported in the Energy sector.

[7] If reporting any country-specific source category under sector "7. Other", detailed explanations should be provided in Chapter 9: Other (CRF sector 7) of the NIR.

[8] Countries are asked to report emissions from international aviation and marine bunkers and multilateral operations, as well as CO_2 emissions from biomass, under Memo Items. These emissions should not be included in the national total emissions from the energy sector. Amounts of biomass used as fuel are included in the national energy consumption but the corresponding CO_2 emissions are not included in the national total as it is assumed that the biomass is produced in a sustainable manner. If the biomass is harvested at an unsustainable rate, net CO_2 emissions are accounted for as a loss of biomass stocks in the Land Use, Land-use Change and Forestry sector.

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Summary 1.A Summary report for National Greenhouse Gas Inventories (IPCC Table 7A)

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	$HFCs^{(1)}$		$PFCs^{(1)}$		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
Total National Emissions and Removals	**3,003,864.90**	**20,148.93**	**1,169.87**	**5,595.78**	**31,467.57**	**219.14**	**12,297.12**	**2.66**	**0.55**	**12,488.37**	**45,998.71**	**14,174.82**	**12,468.36**
1. Energy	**3,048,182.61**	**4,284.06**	**99.43**							**12,190.66**	**41,846.49**	**7,832.00**	**12,118.76**
A. Fuel Combustion — Reference Approach [2]	3,014,918.21												
Sectoral Approach [2]	3,027,913.76	777.80	99.07							12,145.31	41,727.18	6,622.20	11,810.33
1. Energy Industries	1,072,428.17	41.91	29.39							2,380.27	454.05	54.04	7,994.78
2. Manufacturing Industries and Construction	548,856.64	54.06	20.28							1,626.75	3,559.16	122.92	2,071.38
3. Transport	733,718.25	185.38	25.81							6,703.33	28,838.71	5,144.87	752.12
4. Other Sectors	659,148.42	492.71	21.62							1,348.61	8,646.61	1,237.56	968.03
5. Other	13,762.28	3.74	1.96							86.34	228.65	62.81	24.00
B. Fugitive Emissions from Fuels	20,268.85	3,506.26	0.36							45.35	119.31	1,209.80	308.43
1. Solid Fuels	1,532.59	1,963.01	0.01							1.85	52.71	9.96	16.80
2. Oil and Natural Gas	18,736.27	1,543.25	0.35							43.50	66.60	1,199.84	291.63
2. Industrial Processes	**190,595.93**	**33.42**	**294.24**	**5,595.78**	**31,467.57**	**219.14**	**12,297.12**	**2.66**	**0.55**	**124.07**	**2,404.17**	**756.72**	**328.54**
A. Mineral Products	99,210.78	0.74	IE,NA,NE,NO							24.48	17.15	99.65	50.73
B. Chemical Industry	25,512.18	25.86	293.96	NA,NE,NO	C,NA,NE,NO	NA,NE,NO	C,NA,NE,NO	C,NA,NE,NO	C,NA,NE,NO	67.59	163.64	368.31	168.01
C. Metal Production	65,484.57	4.61	0.03				8,500.34		0.08	15.85	2,206.03	18.11	60.33
D. Other Production [3]	50.63	0.27	0.23							15.31	12.93	242.08	46.96
E. Production of Halocarbons and SF_6					28,223.37		3,019.00		0.08				
F. Consumption of Halocarbons and SF_6				5,595.78	3,244.20	219.14	777.79	2.66	0.38				
G. Other	337.77	1.94	0.01	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	0.01	0.83	4.42	28.58	2.51

Note: **A** = Actual emissions based on Tier 2 approach of the IPCC Guidelines.
P = Potential emissions based on Tier 1 approach of the IPCC Guidelines.

EU-15, 1993 Summary 1.A Summary report for National Greenhouse Gas Inventories (IPCC Table 7A)

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs [1]		PFCs [1]		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
3. Solvent and Other Product Use	**8,779.53**		**12.75**							**NA,NO,NE**	**NA,NO,NE**	**3,799.47**	**NA,NO,NE**
4. Agriculture		**8,356.28**	**717.72**							**120.77**	**497.39**	**520.72**	**4.57**
A. Enteric Fermentation		6,160.83											
B. Manure Management		2,104.45	75.09									281.74	
C. Rice Cultivation		97.56										0.05	
D. Agricultural Soils [4]		-30.28	642.14									173.28	
E. Prescribed Burning of Savannas		NA,NE,NO	NA,NE,NO							NO,NE	NO,NE	NO,NE	
F. Field Burning of Agricultural Residues		23.71	0.49							17.61	497.39	64.80	4.57
G. Other		NA,NO	NA,NE,NO							103.16	NA,NO	0.84	0.00
5. Land Use, Land-Use Change and Forestry	[5] **-248,113.75**	**81.85**	**12.96**							**19.57**	**683.28**	**1,167.84**	**0.90**
A. Forest Land	[5] -328,266.12	48.05	0.49							12.42	431.65	55.97	
B. Cropland	[5] 70,318.43	11.26	12.11							2.80	98.54	NA,NE,NO	
C. Grassland	[5] -11,751.32	11.70	0.08							2.90	102.29	IE,NA,NE,NO	
D. Wetlands	[5] 3,862.63	5.31	0.22							0.07	2.51	NA,NE,NO	
E. Settlements	[5] 16,546.48	5.24	0.04							1.30	45.88	NA,NE,NO	
F. Other Land	[5] 1,528.86	0.28	0.00							0.07	2.41	NA,NE,NO	
G. Other	[5] -352.70	NA,NE,NO	0.02							NA,NE,NO	NA,NE,NO	1,111.87	0.90
6. Waste	**4,420.56**	**7,393.32**	**32.78**							**33.31**	**567.39**	**98.08**	**15.60**
A. Solid Waste Disposal on Land	[6] 296.21	6,757.42	0.07							1.22	33.57	50.25	1.08
B. Waste-water Handling		577.72	31.03							NA,NE,NO	NA,NE,NO	3.91	
C. Waste Incineration	[6] 4,124.35	26.39	0.98							29.10	532.81	31.17	12.69
D. Other	NA,NO	31.79	0.70							2.99	1.01	12.75	1.83
7. Other *(please specify)* [7]	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**
Other non-specified	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO

EU-15, 1993 Summary 1.A Summary report for National Greenhouse Gas Inventories (IPCC Table 7A)

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs		PFCs		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
Memo Items: [8]													
International Bunkers	**177,719.89**	**5.09**	**6.27**							**1,501.57**	**232.22**	**74.33**	**937.33**
Aviation	70,838.06	1.21	1.90							265.89	121.52	27.43	18.62
Marine	106,881.83	3.88	4.37							1,235.68	110.70	46.91	918.71
Multilateral Operations	**0.32**	**0.00**	**0.00**							**0.00**	**0.00**	**0.00**	**0.00**
CO_2 Emissions from Biomass	**168,966.92**												

[1] The emissions of HFCs and PFCs are to be expressed as CO_2 equivalent emissions. Data on disaggregated emissions of HFCs and PFCs are to be provided in Table 2(II) of this common reporting format.

[2] For verification purposes, countries are asked to report the results of their calculations using the Reference approach and to explain any differences with the Sectoral approach in the documentation box to Table 1.A.(c). For estimating national total emissions, the results from the Sectoral approach should be used, where possible.

[3] Other Production includes Pulp and Paper and Food and Drink Production.

[4] Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

[5] For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

[6] CO_2 from source categories Solid Waste Disposal on Land and Waste Incineration should only be included if it stems from non-biogenic or inorganic waste streams. Only emissions from Waste Incineration Without Energy Recovery are to be reported in the Waste sector, whereas emissions from Incineration With Energy Recovery are to be reported in the Energy sector.

[7] If reporting any country-specific source category under sector "7. Other", detailed explanations should be provided in Chapter 9: Other (CRF sector 7) of the NIR.

[8] Countries are asked to report emissions from international aviation and marine bunkers and multilateral operations, as well as CO_2 emissions from biomass, under Memo Items. These emissions should not be included in the national total emissions from the energy sector. Amounts of biomass used as fuel are included in the national energy consumption but the corresponding CO_2 emissions are not included in the national total as it is assumed that the biomass is produced in a sustainable manner. If the biomass is harvested at an unsustainable rate, net CO_2 emissions are accounted for as a loss of biomass stocks in the Land Use, Land-use Change and Forestry sector.

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Summary 1.A Summary report for National Greenhouse Gas Inventories (IPCC Table 7A)

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs[1]		PFCs[1]		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
Total National Emissions and Removals	**2,995,174.32**	**19,700.79**	**1,192.06**	**9,823.35**	**35,725.21**	**282.51**	**11,574.92**	**2.83**	**0.60**	**12,173.18**	**43,462.44**	**13,459.74**	**11,254.75**
1. Energy	**3,036,678.85**	**3,813.24**	**102.41**							**11,880.49**	**38,920.49**	**7,286.85**	**10,906.60**
A. Fuel Combustion — Reference Approach[2]	3,006,600.63												
A. Fuel Combustion — Sectoral Approach[2]	3,015,759.49	716.80	102.05							11,844.42	38,819.71	6,114.42	10,636.72
1. Energy Industries	1,080,342.17	47.02	29.60							2,286.67	495.61	55.57	7,196.78
2. Manufacturing Industries and Construction	559,689.60	56.01	20.64							1,631.44	3,704.26	125.18	1,890.25
3. Transport	737,226.02	175.41	29.15							6,523.66	26,631.31	4,774.28	721.07
4. Other Sectors	625,331.05	436.19	20.76							1,320.66	7,801.73	1,120.58	812.52
5. Other	13,170.65	2.18	1.90							81.99	186.80	38.81	16.11
B. Fugitive Emissions from Fuels	20,919.36	3,096.44	0.36							36.08	100.78	1,172.44	269.87
1. Solid Fuels	1,838.30	1,590.44	0.01							1.92	49.61	8.65	15.55
2. Oil and Natural Gas	19,081.06	1,506.00	0.34							34.15	51.18	1,163.78	254.32
2. Industrial Processes	**202,902.62**	**35.67**	**307.92**	**9,823.35**	**35,725.21**	**282.51**	**11,574.92**	**2.83**	**0.60**	**121.23**	**2,707.47**	**756.22**	**330.12**
A. Mineral Products	104,472.08	0.83	IE,NA,NE,NO							22.72	17.68	101.45	52.52
B. Chemical Industry	27,598.67	27.82	307.63	NA,NE,NO	C,NA,NE,NO	NA,NE,NO	C,NA,NE,NO	C,NA,NE,NO	C,NA,NE,NO	65.72	173.34	363.51	171.05
C. Metal Production	70,449.74	4.77	0.04				7,443.99		0.08	16.55	2,500.64	18.64	63.63
D. Other Production[3]	29.79	0.26	0.23							15.54	12.05	245.97	41.33
E. Production of Halocarbons and SF_6					30,837.94		3,327.66		0.09				
F. Consumption of Halocarbons and SF_6				9,823.35	4,887.28	282.51	803.27	2.83	0.41				
G. Other	352.33	1.98	0.01	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	0.03	0.70	3.77	26.65	1.59

Note: **A** = Actual emissions based on Tier 2 approach of the IPCC Guidelines.
P = Potential emissions based on Tier 1 approach of the IPCC Guidelines.

EU-15, 1994 Summary 1.A Summary report for National Greenhouse Gas Inventories (IPCC Table 7A)

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs [1]		PFCs[1]		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
3. Solvent and Other Product Use	**8,102.91**		**12.40**							**NA,NO,NE**	**NA,NO,NE**	**3,559.73**	**NA,NO,NE**
4. Agriculture		**8,369.80**	**722.54**							**117.96**	**489.35**	**519.55**	**4.44**
A. Enteric Fermentation		6,162.98											
B. Manure Management		2,108.01	75.91									271.42	
C. Rice Cultivation		106.07										0.10	
D. Agricultural Soils[4]		-30.59	646.13									184.11	
E. Prescribed Burning of Savannas		NA,NE,NO	NA,NE,NO							NO,NE	NO,NE	NO,NE	
F. Field Burning of Agricultural Residues		23.33	0.49							17.79	489.35	62.89	4.43
G. Other		NA,NO	NA,NE,NO							100.17	NA,NO	1.03	0.00
5. Land Use, Land-Use Change and Forestry	[5] **-256,775.09**	**180.62**	**13.42**							**22.93**	**801.82**	**1,241.06**	**0.48**
A. Forest Land	[5] -337,341.19	63.38	0.62							16.21	565.25	57.61	
B. Cropland	[5] 69,328.02	10.43	12.45							2.59	91.26	NA,NE,NO	
C. Grassland	[5] -10,646.09	10.77	0.07							2.67	94.12	IE,NA,NE,NO	
D. Wetlands	[5] 3,903.54	5.48	0.22							0.07	2.52	NA,NE,NO	
E. Settlements	[5] 16,636.52	5.28	0.04							1.31	46.23	NA,NE,NO	
F. Other Land	[5] 1,498.89	0.28	0.00							0.07	2.44	NA,NE,NO	
G. Other	[5] -154.76	85.00	0.02							NA,NE,NO	NA,NE,NO	1,183.45	0.48
6. Waste	**4,265.03**	**7,301.46**	**33.37**							**30.56**	**543.31**	**96.32**	**13.11**
A. Solid Waste Disposal on Land	[6] 239.97	6,662.65	0.06							0.99	28.76	49.13	0.87
B. Waste-water Handling		576.48	31.48							NA,NE,NO	NA,NE,NO	3.59	
C. Waste Incineration	[6] 4,025.06	24.13	0.94							26.89	513.84	30.30	11.14
D. Other	NA,NO	38.20	0.89							2.68	0.71	13.31	1.10
7. Other *(please specify)* [7]	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**
Other non-specified	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs		PFCs		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)				(Gg)					
Memo Items: [8]													
International Bunkers	**178,350.05**	**4.98**	**6.43**							**1,504.60**	**242.41**	**74.88**	**907.47**
Aviation	74,727.49	1.22	2.00							283.68	128.08	28.59	20.88
Marine	103,622.56	3.76	4.42							1,220.91	114.33	46.29	886.58
Multilateral Operations	**0.32**	**0.00**	**0.00**							**0.00**	**0.00**	**0.00**	**0.00**
CO_2 Emissions from Biomass	**168,681.14**												

[1] The emissions of HFCs and PFCs are to be expressed as CO_2 equivalent emissions. Data on disaggregated emissions of HFCs and PFCs are to be provided in Table 2(II) of this common reporting format.

[2] For verification purposes, countries are asked to report the results of their calculations using the Reference approach and to explain any differences with the Sectoral approach in the documentation box to Table 1.A.(c). For estimating national total emissions, the results from the Sectoral approach should be used, where possible.

[3] Other Production includes Pulp and Paper and Food and Drink Production.

[4] Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

[5] For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

[6] CO_2 from source categories Solid Waste Disposal on Land and Waste Incineration should only be included if it stems from non-biogenic or inorganic waste streams. Only emissions from Waste Incineration Without Energy Recovery are to be reported in the Waste sector, whereas emissions from Incineration With Energy Recovery are to be reported in the Energy sector.

[7] If reporting any country-specific source category under sector "7. Other", detailed explanations should be provided in Chapter 9: Other (CRF sector 7) of the NIR.

[8] Countries are asked to report emissions from international aviation and marine bunkers and multilateral operations, as well as CO_2 emissions from biomass, under Memo Items. These emissions should not be included in the national total emissions from the energy sector. Amounts of biomass used as fuel are included in the national energy consumption but the corresponding CO_2 emissions are not included in the national total as it is assumed that the biomass is produced in a sustainable manner. If the biomass is harvested at an unsustainable rate, net CO_2 emissions are accounted for as a loss of biomass stocks in the Land Use, Land-use Change and Forestry sector.

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	$HFCs^{(1)}$		$PFCs^{(1)}$		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
Total National Emissions and Removals	**3,023,502.28**	**19,580.31**	**1,195.66**	**18,706.01**	**41,291.94**	**411.21**	**10,949.57**	**651.28**	**0.65**	**11,869.91**	**41,592.63**	**12,940.84**	**9,940.57**
1. Energy	**3,065,410.67**	**3,796.75**	**106.27**							**11,568.33**	**36,992.08**	**6,836.10**	**9,595.96**
A. Fuel Combustion — Reference Approach [2]	3,044,692.44												
A. Fuel Combustion — Sectoral Approach [2]	3,043,873.69	702.32	105.93							11,533.22	36,879.24	5,783.31	9,340.27
1. Energy Industries	1,089,721.91	52.15	29.75							2,204.80	467.28	59.57	6,362.89
2. Manufacturing Industries and Construction	559,977.93	54.94	20.82							1,588.57	3,648.79	125.04	1,677.45
3. Transport	746,260.40	167.30	33.05							6,326.85	25,097.69	4,464.69	608.83
4. Other Sectors	635,700.45	426.61	20.59							1,330.80	7,499.67	1,119.17	678.25
5. Other	12,212.99	1.32	1.72							82.20	165.81	14.84	12.85
B. Fugitive Emissions from Fuels	21,536.98	3,094.43	0.34							35.11	112.84	1,052.79	255.69
1. Solid Fuels	1,866.46	1,650.58	0.01							1.80	49.54	8.28	11.98
2. Oil and Natural Gas	19,670.52	1,443.85	0.33							33.31	63.30	1,044.51	243.71
2. Industrial Processes	**208,515.81**	**33.77**	**303.88**	**18,706.01**	**41,291.94**	**411.21**	**10,949.57**	**651.28**	**0.65**	**129.68**	**2,876.75**	**697.84**	**328.41**
A. Mineral Products	108,312.10	0.84	IE,NA,NE,NO							33.08	17.40	105.81	53.63
B. Chemical Industry	28,983.19	25.85	303.59	NA,NO	C,NA,NO	NA,NO	C,NA,NO	C,NA,NO	C,NA,NO	63.73	179.58	309.82	189.18
C. Metal Production	70,880.01	4.80	0.03				7,059.71		0.08	16.57	2,664.20	18.49	47.87
D. Other Production [3]	22.80	0.27	0.23							15.91	12.82	239.01	37.41
E. Production of Halocarbons and SF_6					32,864.47		2,814.47		0.10				
F. Consumption of Halocarbons and SF_6				18,706.01	8,427.46	411.21	1,075.39	651.28	0.44				
G. Other	317.71	2.01	0.02	NA,NE,NO	NA,NO	NA,NO	NA,NO	NA,NO	0.03	0.39	2.76	24.71	0.31

Note: **A** = Actual emissions based on Tier 2 approach of the IPCC Guidelines.
P = Potential emissions based on Tier 1 approach of the IPCC Guidelines.

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs [1]		PFCs[1]		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
3. Solvent and Other Product Use	**8,214.70**		**12.25**							**NA,NO,NE**	**NA,NO,NE**	**3,533.27**	**NA,NO,NE**
4. Agriculture		**8,404.56**	**727.14**							**121.54**	**469.63**	**518.85**	**4.26**
A. Enteric Fermentation		6,180.54											
B. Manure Management		2,128.61	76.35									270.82	
C. Rice Cultivation		103.65										0.09	
D. Agricultural Soils[4]		-30.63	650.31									186.47	
E. Prescribed Burning of Savannas		NA,NE,NO	NA,NE,NO							NO,NE	NO,NE	NO,NE	
F. Field Burning of Agricultural Residues		22.39	0.48							17.18	469.63	60.44	4.26
G. Other		NA,NO	NA,NE,NO							104.36	NA,NO	1.04	0.00
5. Land Use, Land-Use Change and Forestry	[5] **-262,552.65**	**177.68**	**12.97**							**20.04**	**697.77**	**1,260.43**	**0.39**
A. Forest Land	[5] -344,241.78	50.42	0.52							13.34	461.72	60.33	
B. Cropland	[5] 71,050.08	10.49	12.08							2.61	91.75	NA,NE,NO	
C. Grassland	[5] -10,742.52	10.67	0.07							2.65	93.27	IE,NA,NE,NO	
D. Wetlands	[5] 3,919.24	5.57	0.23							0.07	2.52	NA,NE,NO	
E. Settlements	[5] 16,526.52	5.27	0.04							1.31	46.13	NA,NE,NO	
F. Other Land	[5] 1,402.07	0.27	0.00							0.07	2.39	NA,NE,NO	
G. Other	[5] -466.25	95.00	0.02							NA,NE,NO	NA,NE,NO	1,200.10	0.39
6. Waste	**3,913.75**	**7,167.54**	**33.15**							**30.31**	**556.40**	**94.34**	**11.56**
A. Solid Waste Disposal on Land	[6] 99.89	6,523.42	0.02							0.42	17.45	45.70	0.36
B. Waste-water Handling		574.75	31.06							0.00	0.00	3.57	
C. Waste Incineration	[6] 3,813.86	24.94	0.96							27.52	538.54	31.20	10.93
D. Other	NA,NO	44.44	1.10							2.38	0.40	13.87	0.26
7. Other *(please specify)*[7]	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**
Other non-specified	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO

Note: All footnotes for this table are given at the end of the table on sheet 3.

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs		PFCs		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)				(Gg)					
Memo Items: [8]													
International Bunkers	**184,216.73**	**5.20**	**6.37**							**1,568.39**	**252.21**	**77.94**	**925.99**
Aviation	79,044.74	1.29	2.10							298.75	132.10	29.75	17.60
Marine	105,171.98	3.91	4.27							1,269.64	120.11	48.19	908.38
Multilateral Operations	**0.32**	**0.00**	**0.00**							**0.00**	**0.00**	**0.00**	**0.00**
CO_2 Emissions from Biomass	**171,849.07**												

[1] The emissions of HFCs and PFCs are to be expressed as CO_2 equivalent emissions. Data on disaggregated emissions of HFCs and PFCs are to be provided in Table 2(II) of this common reporting format.

[2] For verification purposes, countries are asked to report the results of their calculations using the Reference approach and to explain any differences with the Sectoral approach in the documentation box to Table 1.A.(c). For estimating national total emissions, the results from the Sectoral approach should be used, where possible.

[3] Other Production includes Pulp and Paper and Food and Drink Production.

[4] Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

[5] For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

[6] CO_2 from source categories Solid Waste Disposal on Land and Waste Incineration should only be included if it stems from non-biogenic or inorganic waste streams. Only emissions from Waste Incineration Without Energy Recovery are to be reported in the Waste sector, whereas emissions from Incineration With Energy Recovery are to be reported in the Energy sector.

[7] If reporting any country-specific source category under sector "7. Other", detailed explanations should be provided in Chapter 9: Other (CRF sector 7) of the NIR.

[8] Countries are asked to report emissions from international aviation and marine bunkers and multilateral operations, as well as CO_2 emissions from biomass, under Memo Items. These emissions should not be included in the national total emissions from the energy sector. Amounts of biomass used as fuel are included in the national energy consumption but the corresponding CO_2 emissions are not included in the national total as it is assumed that the biomass is produced in a sustainable manner. If the biomass is harvested at an unsustainable rate, net CO_2 emissions are accounted for as a loss of biomass stocks in the Land Use, Land-use Change and Forestry sector.

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES		Net CO_2 emissions/removals	CH_4	N_2O	$HFCs^{(1)}$		$PFCs^{(1)}$		SF_6		NO_x	CO	NMVOC	SO_2
					P	A	P	A	P	A				
		(Gg)			CO_2 equivalent (Gg)						(Gg)			
Total National Emissions and Removals		**3,080,030.21**	**19,319.09**	**1,211.11**	**29,126.07**	**47,133.43**	**574.98**	**10,504.33**	**673.80**	**0.64**	**11,610.25**	**40,007.85**	**12,440.82**	**8,913.93**
1. Energy		**3,152,056.35**	**3,675.55**	**107.29**							**11,332.63**	**35,907.69**	**6,550.91**	**8,631.57**
A. Fuel Combustion	Reference Approach [2]	3,140,972.95												
	Sectoral Approach [2]	3,130,207.86	723.13	106.94							11,300.70	35,789.01	5,562.18	8,382.46
1. Energy Industries		1,105,023.46	57.61	30.88							2,141.34	464.16	60.24	5,700.17
2. Manufacturing Industries and Construction		551,654.04	54.98	20.14							1,508.16	3,553.72	123.99	1,465.86
3. Transport		762,985.53	161.70	32.72							6,205.79	24,008.80	4,216.33	529.92
4. Other Sectors		699,592.42	447.89	21.52							1,375.50	7,622.10	1,150.02	674.56
5. Other		10,952.42	0.96	1.69							69.91	140.23	11.60	11.94
B. Fugitive Emissions from Fuels		21,848.49	2,952.42	0.35							31.93	118.69	988.73	249.11
1. Solid Fuels		1,986.71	1,524.39	0.01							1.76	48.86	8.06	12.60
2. Oil and Natural Gas		19,861.78	1,428.03	0.34							30.17	69.83	980.66	236.51
2. Industrial Processes		**199,417.13**	**32.55**	**308.82**	**29,126.07**	**47,133.43**	**574.98**	**10,504.33**	**673.80**	**0.64**	**107.61**	**2,466.68**	**673.00**	**268.25**
A. Mineral Products		104,306.38	0.78	IE,NA,NE,NO							30.48	17.48	104.64	56.52
B. Chemical Industry		28,850.16	25.04	308.54	NA,NO	C,NA,NO	NA,NO	C,NA,NO	C,NA,NO	C,NA,NO	44.66	178.15	290.50	125.30
C. Metal Production		65,885.93	4.50	0.04				6,674.07		0.09	16.47	2,256.29	16.75	49.10
D. Other Production [3]		49.75	0.26	0.23							15.69	12.77	242.23	37.03
E. Production of Halocarbons and SF_6						34,073.46		2,573.63		0.09				
F. Consumption of Halocarbons and SF_6					29,126.07	13,059.97	574.98	1,256.62	673.80	0.43				
G. Other		324.91	1.96	0.02	NA,NE,NO	NA,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	0.03	0.31	1.98	18.88	0.29

Note: **A** = Actual emissions based on Tier 2 approach of the IPCC Guidelines.
P = Potential emissions based on Tier 1 approach of the IPCC Guidelines.

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs [1]		PFCs [1]		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
3. Solvent and Other Product Use	**8,214.70**		**12.25**							NA,NO,NE	NA,NO,NE	**3,533.27**	NA,NO,NE
4. Agriculture		**8,404.56**	**727.14**							**121.54**	**469.63**	**518.85**	**4.26**
A. Enteric Fermentation		6,180.54											
B. Manure Management		2,128.61	76.35									270.82	
C. Rice Cultivation		103.65										0.09	
D. Agricultural Soils [4]		-30.63	650.31									186.47	
E. Prescribed Burning of Savannas		NA,NE,NO	NA,NE,NO							NO,NE	NO,NE	NO,NE	
F. Field Burning of Agricultural Residues		22.39	0.48							17.18	469.63	60.44	4.26
G. Other		NA,NO	NA,NE,NO							104.36	NA,NO	1.04	0.00
5. Land Use, Land-Use Change and Forestry	[5] **-262,552.65**	**177.68**	**12.97**							**20.04**	**697.77**	**1,260.43**	**0.39**
A. Forest Land	[5] -344,241.78	50.42	0.52							13.34	461.72	60.33	
B. Cropland	[5] 71,050.08	10.49	12.08							2.61	91.75	NA,NE,NO	
C. Grassland	[5] -10,742.52	10.67	0.07							2.65	93.27	IE,NA,NE,NO	
D. Wetlands	[5] 3,919.24	5.57	0.23							0.07	2.52	NA,NE,NO	
E. Settlements	[5] 16,526.52	5.27	0.04							1.31	46.13	NA,NE,NO	
F. Other Land	[5] 1,402.07	0.27	0.00							0.07	2.39	NA,NE,NO	
G. Other	[5] -466.25	95.00	0.02							NA,NE,NO	NA,NE,NO	1,200.10	0.39
6. Waste	**3,913.75**	**7,167.54**	**33.15**							**30.31**	**556.40**	**94.34**	**11.56**
A. Solid Waste Disposal on Land	[6] 99.89	6,523.42	0.02							0.42	17.45	45.70	0.36
B. Waste-water Handling		574.75	31.06							0.00	0.00	3.57	
C. Waste Incineration	[6] 3,813.86	24.94	0.96							27.52	538.54	31.20	10.93
D. Other	NA,NO	44.44	1.10							2.38	0.40	13.87	0.26
7. Other *(please specify)* [7]	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**
Other non-specified	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs [1]		PFCs [1]		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
3. Solvent and Other Product Use	**8,158.10**		**12.49**							**NA,NO,NE**	**NA,NO,NE**	**3,493.39**	**NA,NO,NE**
4. Agriculture		**8,470.47**	**736.92**							**125.52**	**501.22**	**499.16**	**4.57**
A. Enteric Fermentation		6,231.82											
B. Manure Management		2,133.24	76.80									272.61	
C. Rice Cultivation		112.13										0.11	
D. Agricultural Soils [4]		-30.61	659.61									160.90	
E. Prescribed Burning of Savannas		NA,NE,NO	NA,NE,NO							NO,NE	NO,NE	NO,NE	
F. Field Burning of Agricultural Residues		23.89	0.51							18.51	501.22	64.72	4.57
G. Other		NA,NO	NA,NE,NO							107.01	NA,NO	0.82	0.00
5. Land Use, Land-Use Change and Forestry	[5] **-283,407.33**	**162.01**	**12.13**							**17.11**	**595.68**	**1,132.17**	**0.32**
A. Forest Land	[5] -362,947.98	38.46	0.43							10.14	350.01	46.18	
B. Cropland	[5] 70,348.09	10.88	11.33							2.70	95.19	NA,NE,NO	
C. Grassland	[5] -13,043.88	11.29	0.08							2.80	98.68	IE,NA,NE,NO	
D. Wetlands	[5] 3,968.59	5.75	0.23							0.07	2.53	NA,NE,NO	
E. Settlements	[5] 17,697.43	5.35	0.04							1.33	46.85	NA,NE,NO	
F. Other Land	[5] 1,341.34	0.28	0.00							0.07	2.41	NA,NE,NO	
G. Other	[5] -770.92	90.00	0.02							NA,NE,NO	NA,NE,NO	1,085.99	0.32
6. Waste	**3,805.95**	**6,978.51**	**33.45**							**27.38**	**536.58**	**92.19**	**9.22**
A. Solid Waste Disposal on Land	[6] 67.18	6,343.05	0.02							0.28	14.45	44.46	0.24
B. Waste-water Handling		561.29	31.20							0.00	0.00	3.47	
C. Waste Incineration	[6] 3,738.77	24.13	0.91							25.49	521.86	29.97	8.66
D. Other	NA,NO	50.04	1.33							1.60	0.27	14.30	0.31
7. Other *(please specify)* [7]	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**
Other non-specified	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES		Net CO_2 emissions/removals	CH_4	N_2O	$HFCs^{(1)}$		$PFCs^{(1)}$		SF_6		NO_x	CO	NMVOC	SO_2
					P	A	P	A	P	A				
		(Gg)			CO_2 equivalent (Gg)						(Gg)			
Total National Emissions and Removals		**3,024,636.30**	**18,783.44**	**1,207.22**	**40,854.94**	**53,170.98**	**825.39**	**9,515.42**	**698.28**	**0.57**	**11,208.85**	**38,061.73**	**12,230.39**	**8,162.51**
1. Energy		**3,087,989.73**	**3,526.02**	**106.94**							**10,930.33**	**33,604.73**	**6,161.21**	**7,874.28**
A. Fuel Combustion	Reference Approach [2]	3,074,000.32												
	Sectoral Approach [2]	3,067,209.26	684.79	106.60							10,905.93	33,511.86	5,174.94	7,629.79
1. Energy Industries		1,069,829.58	56.95	29.37							1,968.61	397.88	54.99	5,175.46
2. Manufacturing Industries and Construction		561,892.07	56.89	20.60							1,516.12	3,623.91	123.81	1,467.06
3. Transport		772,039.33	150.98	34.25							6,014.40	22,087.70	3,917.06	375.41
4. Other Sectors		652,907.95	419.11	20.72							1,335.03	7,276.45	1,067.74	600.23
5. Other		10,540.32	0.86	1.67							71.78	125.92	11.34	11.63
B. Fugitive Emissions from Fuels		20,780.47	2,841.23	0.34							24.39	92.88	986.27	244.49
1. Solid Fuels		1,864.97	1,469.01	0.01							1.58	48.79	7.95	12.51
2. Oil and Natural Gas		18,915.51	1,372.22	0.33							22.82	44.09	978.32	231.98
2. Industrial Processes		**208,506.35**	**31.56**	**298.52**	**40,854.94**	**53,170.98**	**825.39**	**9,515.42**	**698.28**	**0.57**	**108.91**	**2,669.02**	**661.69**	**275.57**
A. Mineral Products		107,331.62	0.79	IE,NA,NE,NO							30.01	15.92	105.35	54.36
B. Chemical Industry		29,087.11	23.82	298.22	NA,NO	C,NA,NO	NA,NO	C,NA,NO	C,NA,NO	C,NA,NO	44.60	175.55	272.77	126.23
C. Metal Production		71,740.35	4.71	0.04				6,484.86		0.08	17.34	2,460.48	18.83	53.20
D. Other Production [3]		48.70	0.28	0.25							16.62	13.59	246.16	34.21
E. Production of Halocarbons and SF_6						36,630.01		1,552.01		0.03				
F. Consumption of Halocarbons and SF_6					40,854.94	16,540.97	825.39	1,478.54	698.28	0.43				
G. Other		298.57	1.96	0.02	NA,NE,NO	NA,NO	NA,NO	NA,NO	NA,NO	0.03	0.34	3.48	18.57	7.57

Note: **A** = Actual emissions based on Tier 2 approach of the IPCC Guidelines.
P = Potential emissions based on Tier 1 approach of the IPCC Guidelines.

EU-15, 1997 Summary 1.A Summary report for National Greenhouse Gas Inventories (IPCC Table 7A)

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs [1]		PFCs [1]		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
3. Solvent and Other Product Use	**8,289.87**		**12.26**							**NA,NO,NE**	**NA,NO,NE**	**3,524.14**	**NA,NO,NE**
4. Agriculture		**8,430.47**	**743.33**							**124.96**	**545.49**	**516.29**	**5.06**
A. Enteric Fermentation		6,163.29											
B. Manure Management		2,157.95	77.04									269.90	
C. Rice Cultivation		113.83										0.11	
D. Agricultural Soils [4]		-30.59	665.77									174.18	
E. Prescribed Burning of Savannas		NA,NE,NO	NA,NE,NO							NO,NE	NO,NE	NO,NE	
F. Field Burning of Agricultural Residues		26.00	0.53							19.17	545.49	71.14	5.06
G. Other		NA,NO	NA,NE,NO							105.78	NA,NO	0.95	0.00
5. Land Use, Land-Use Change and Forestry	[5] **-283,396.37**	**152.81**	**12.21**							**18.58**	**645.03**	**1,273.34**	**0.65**
A. Forest Land	[5] -363,644.13	44.98	0.49							11.83	407.18	55.20	
B. Cropland	[5] 69,846.09	10.36	11.35							2.57	90.63	NA,NE,NO	
C. Grassland	[5] -9,381.61	10.84	0.07							2.69	94.70	IE,NA,NE,NO	
D. Wetlands	[5] 4,007.50	5.93	0.24							0.07	2.53	NA,NE,NO	
E. Settlements	[5] 16,490.72	5.43	0.04							1.35	47.55	NA,NE,NO	
F. Other Land	[5] 1,320.58	0.28	0.00							0.07	2.45	NA,NE,NO	
G. Other	[5] -2,035.51	75.00	0.02							NA,NE,NO	NA,NE,NO	1,218.15	0.65
6. Waste	**3,246.71**	**6,642.57**	**33.95**							**26.07**	**597.46**	**93.72**	**6.94**
A. Solid Waste Disposal on Land	[6] 54.30	6,006.50	0.01							0.23	13.05	42.24	0.20
B. Waste-water Handling		559.86	31.70							NA,NE,NO	NA,NE,NO	3.87	
C. Waste Incineration	[6] 3,192.41	23.17	0.91							25.01	584.27	32.83	6.12
D. Other	NA,NO	53.04	1.32							0.83	0.14	14.77	0.62
7. Other *(please specify)* [7]	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**
Other non-specified	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO

EU-15, 1997 Summary 1.A Summary report for National Greenhouse Gas Inventories (IPCC Table 7A)

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs		PFCs		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
Memo Items: [8]													
International Bunkers	**210,171.35**	**5.60**	**7.68**							**1,810.96**	**271.67**	**89.21**	**1,071.04**
Aviation	88,063.35	1.39	2.34							336.00	144.45	31.81	20.98
Marine	122,108.00	4.21	5.34							1,474.96	127.22	57.40	1,050.06
Multilateral Operations	**0.32**	**0.00**	**0.00**							**0.00**	**0.00**	**0.00**	**0.00**
CO_2 Emissions from Biomass	**187,689.90**												

[1] The emissions of HFCs and PFCs are to be expressed as CO_2 equivalent emissions. Data on disaggregated emissions of HFCs and PFCs are to be provided in Table 2(II) of this common reporting format.

[2] For verification purposes, countries are asked to report the results of their calculations using the Reference approach and to explain any differences with the Sectoral approach in the documentation box to Table 1.A.(c). For estimating national total emissions, the results from the Sectoral approach should be used, where possible.

[3] Other Production includes Pulp and Paper and Food and Drink Production.

[4] Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

[5] For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

[6] CO_2 from source categories Solid Waste Disposal on Land and Waste Incineration should only be included if it stems from non-biogenic or inorganic waste streams. Only emissions from Waste Incineration Without Energy Recovery are to be reported in the Waste sector, whereas emissions from Incineration With Energy Recovery are to be reported in the Energy sector.

[7] If reporting any country-specific source category under sector "7. Other", detailed explanations should be provided in Chapter 9: Other (CRF sector 7) of the NIR.

[8] Countries are asked to report emissions from international aviation and marine bunkers and multilateral operations, as well as CO_2 emissions from biomass, under Memo Items. These emissions should not be included in the national total emissions from the energy sector. Amounts of biomass used as fuel are included in the national energy consumption but the corresponding CO_2 emissions are not included in the national total as it is assumed that the biomass is produced in a sustainable manner. If the biomass is harvested at an unsustainable rate, net CO_2 emissions are accounted for as a loss of biomass stocks in the Land Use, Land-use Change and Forestry sector.

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Summary 1.A Summary report for National Greenhouse Gas Inventories (IPCC Table 7A)

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES		Net CO_2 emissions/removals	CH_4	N_2O	HFCs[1]		PFCs[1]		SF_6		NO_x	CO	NMVOC	SO_2
					P	A	P	A	P	A				
		(Gg)			CO_2 equivalent (Gg)						(Gg)			
Total National Emissions and Removals		**3,076,549.42**	**18,324.97**	**1,142.68**	**57,947.67**	**54,095.09**	**912.57**	**8,865.11**	**721.81**	**0.54**	**11,038.53**	**36,409.74**	**11,806.39**	**7,622.77**
1. Energy		**3,134,491.30**	**3,320.08**	**108.99**							**10,726.44**	**32,032.59**	**5,822.10**	**7,337.47**
A. Fuel Combustion	Reference Approach[2]	3,134,284.36												
	Sectoral Approach[2]	3,114,636.66	671.28	108.66							10,700.00	31,940.90	4,901.41	7,083.54
1. Energy Industries		1,103,456.70	59.77	30.43							1,891.96	424.73	53.79	4,899.15
2. Manufacturing Industries and Construction		551,497.47	56.83	20.23							1,470.52	3,567.54	124.77	1,245.30
3. Transport		795,915.03	143.89	35.90							5,942.13	20,771.64	3,658.61	384.60
4. Other Sectors		653,616.45	409.93	20.55							1,333.69	7,056.17	1,053.60	545.11
5. Other		10,151.01	0.85	1.55							61.71	120.82	10.63	9.38
B. Fugitive Emissions from Fuels		19,854.64	2,648.80	0.33							26.44	91.69	920.69	253.93
1. Solid Fuels		1,512.38	1,279.37	0.01							1.45	48.16	7.62	10.53
2. Oil and Natural Gas		18,342.26	1,369.43	0.32							24.98	43.52	913.07	243.40
2. Industrial Processes		**209,351.61**	**29.80**	**230.94**	**57,947.67**	**54,095.09**	**912.57**	**8,865.11**	**721.81**	**0.54**	**142.37**	**2,588.06**	**647.96**	**273.44**
A. Mineral Products		109,462.59	0.80	IE,NA,NE,NO							68.26	14.56	112.44	58.15
B. Chemical Industry		30,216.56	22.24	230.65	NA,NO	C,NA,NO	NA,NO	C,NA,NO	C,NA,NO	C,NA,NO	40.78	161.64	247.68	133.39
C. Metal Production		69,320.41	4.62	0.03				6,429.82		0.09	17.07	2,396.29	20.40	50.69
D. Other Production[3]		41.69	0.27	0.24							16.11	13.42	244.54	30.95
E. Production of Halocarbons and SF_6						33,375.69		1,033.84		0.01				
F. Consumption of Halocarbons and SF_6					57,947.67	20,719.39	912.57	1,401.45	721.81	0.41				
G. Other		310.37	1.86	0.02	NA,NE,NO	NA,NO	NA,NO	NA,NO	NA,NO	0.03	0.15	2.15	22.91	0.26

Note: **A** = Actual emissions based on Tier 2 approach of the IPCC Guidelines.
P = Potential emissions based on Tier 1 approach of the IPCC Guidelines.

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs [1]		PFCs [1]		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
3. Solvent and Other Product Use	**8,420.66**		**12.41**							NA,NO,NE	NA,NO,NE	**3,559.32**	NA,NO,NE
4. Agriculture		**8,438.12**	**742.72**							**125.44**	**484.16**	**502.13**	**4.43**
A. Enteric Fermentation		6,152.96											
B. Manure Management		2,183.61	77.58									271.30	
C. Rice Cultivation		109.13										0.11	
D. Agricultural Soils [4]		-30.66	664.65									166.99	
E. Prescribed Burning of Savannas		NA,NE,NO	NA,NE,NO							NO,NE	NO,NE	NO,NE	
F. Field Burning of Agricultural Residues		23.07	0.49							17.53	484.16	62.86	4.43
G. Other		NA,NO	NA,NE,NO							107.91	NA,NO	0.87	0.00
5. Land Use, Land-Use Change and Forestry	[5] **-278,782.98**	**151.07**	**13.34**							**20.73**	**721.77**	**1,183.62**	**0.67**
A. Forest Land	[5] -360,665.58	52.49	0.54							13.82	478.62	55.40	
B. Cropland	[5] 70,196.37	10.61	12.41							2.64	92.82	NA,NE,NO	
C. Grassland	[5] -8,308.23	11.18	0.08							2.78	97.79	IE,NA,NE,NO	
D. Wetlands	[5] 4,033.45	6.09	0.25							0.07	2.62	NA,NE,NO	
E. Settlements	[5] 16,717.64	5.51	0.04							1.37	48.25	NA,NE,NO	
F. Other Land	[5] 1,100.88	0.19	0.00							0.05	1.67	NA,NE,NO	
G. Other	[5] -1,857.50	65.00	0.02							NA,NE,NO	NA,NE,NO	1,128.22	0.67
6. Waste	**3,068.82**	**6,385.90**	**34.28**							**23.54**	**583.16**	**91.25**	**6.75**
A. Solid Waste Disposal on Land	[6] 48.65	5,753.97	0.01							0.21	12.30	40.98	0.18
B. Waste-water Handling		555.83	31.79							0.00	0.00	3.56	
C. Waste Incineration	[6] 3,020.17	22.29	0.95							23.28	570.84	31.90	6.04
D. Other	NA,NO	53.82	1.52							0.06	0.01	14.81	0.53
7. Other *(please specify)* [7]	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**
Other non-specified	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs		PFCs		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
Memo Items: [8]													
International Bunkers	**222,957.51**	**5.92**	**8.14**							**1,938.91**	**289.11**	**95.70**	**1,166.90**
Aviation	95,093.00	1.45	2.53							365.51	154.60	33.96	22.83
Marine	127,864.51	4.47	5.61							1,573.40	134.51	61.73	1,144.07
Multilateral Operations	**0.32**	**0.00**	**0.00**							**0.00**	**0.00**	**0.00**	**0.00**
CO_2 Emissions from Biomass	**190,773.64**												

[1] The emissions of HFCs and PFCs are to be expressed as CO_2 equivalent emissions. Data on disaggregated emissions of HFCs and PFCs are to be provided in Table 2(II) of this common reporting format.

[2] For verification purposes, countries are asked to report the results of their calculations using the Reference approach and to explain any differences with the Sectoral approach in the documentation box to Table 1.A.(c). For estimating national total emissions, the results from the Sectoral approach should be used, where possible.

[3] Other Production includes Pulp and Paper and Food and Drink Production.

[4] Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

[5] For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

[6] CO_2 from source categories Solid Waste Disposal on Land and Waste Incineration should only be included if it stems from non-biogenic or inorganic waste streams. Only emissions from Waste Incineration Without Energy Recovery are to be reported in the Waste sector, whereas emissions from Incineration With Energy Recovery are to be reported in the Energy sector.

[7] If reporting any country-specific source category under sector "7. Other", detailed explanations should be provided in Chapter 9: Other (CRF sector 7) of the NIR.

[8] Countries are asked to report emissions from international aviation and marine bunkers and multilateral operations, as well as CO_2 emissions from biomass, under Memo Items. These emissions should not be included in the national total emissions from the energy sector. Amounts of biomass used as fuel are included in the national energy consumption but the corresponding CO_2 emissions are not included in the national total as it is assumed that the biomass is produced in a sustainable manner. If the biomass is harvested at an unsustainable rate, net CO_2 emissions are accounted for as a loss of biomass stocks in the Land Use, Land-use Change and Forestry sector.

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Summary 1.A Summary report for National Greenhouse Gas Inventories (IPCC Table 7A)

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES		Net CO_2 emissions/removals	CH_4	N_2O	HFCs[1]		PFCs[1]		SF_6		NO_x	CO	NMVOC	SO_2
					P	A	P	A	P	A				
		(Gg)			CO_2 equivalent (Gg)						(Gg)			
Total National Emissions and Removals		**3,036,911.33**	**17,912.83**	**1,076.77**	**72,436.41**	**47,113.67**	**1,342.32**	**8,682.74**	**868.13**	**0.45**	**10,761.01**	**34,027.62**	**11,332.97**	**6,756.04**
1. Energy		**3,110,912.14**	**3,242.99**	**109.01**							**10,453.15**	**29,921.67**	**5,381.03**	**6,485.12**
A. Fuel Combustion	Reference Approach [2]	3,085,770.29												
	Sectoral Approach [2]	3,092,550.45	649.66	108.61							10,428.15	29,847.58	4,536.84	6,267.10
1. Energy Industries		1,082,585.79	58.64	29.16							1,791.72	421.68	54.34	4,318.36
2. Manufacturing Industries and Construction		546,546.54	55.92	20.04							1,448.75	3,431.34	124.84	1,097.16
3. Transport		815,321.31	132.94	37.35							5,792.45	18,975.89	3,331.92	359.04
4. Other Sectors		638,513.01	401.36	20.58							1,334.88	6,896.36	1,016.08	483.03
5. Other		9,583.80	0.80	1.48							60.36	122.30	9.67	9.50
B. Fugitive Emissions from Fuels		18,361.69	2,593.33	0.40							25.00	74.09	844.19	218.01
1. Solid Fuels		1,434.72	1,274.74	0.01							1.36	39.20	7.12	9.00
2. Oil and Natural Gas		16,926.97	1,318.59	0.39							23.63	34.90	837.07	209.01
2. Industrial Processes		**205,895.57**	**28.98**	**168.47**	**72,436.41**	**47,113.67**	**1,342.32**	**8,682.74**	**868.13**	**0.45**	**136.95**	**2,442.40**	**603.21**	**260.82**
A. Mineral Products		110,692.89	0.66	IE,NA,NE,NO							65.61	12.81	110.66	56.18
B. Chemical Industry		29,040.24	21.54	168.17	NA,NO	C,NA,NO	NA,NO	C,NA,NO	C,NA,NO	C,NA,NO	38.05	154.17	209.96	114.06
C. Metal Production		65,800.49	4.61	0.03				6,246.71		0.09	16.63	2,258.72	19.45	52.03
D. Other Production [3]		51.79	0.28	0.24							16.34	13.34	245.53	28.04
E. Production of Halocarbons and SF_6						23,062.36		697.89		0.01				
F. Consumption of Halocarbons and SF_6					72,436.41	24,051.30	1,342.32	1,738.14	868.13	0.32				
G. Other		310.16	1.89	0.03	NA,NE,NO	NA,NO	NA,NO	NA,NO	NA,NO	0.03	0.33	3.35	17.60	10.52

Note: **A** = Actual emissions based on Tier 2 approach of the IPCC Guidelines.
P = Potential emissions based on Tier 1 approach of the IPCC Guidelines.

EU-15, 1999 Summary 1.A Summary report for National Greenhouse Gas Inventories (IPCC Table 7A)

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs [1]		PFCs [1]		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
3. Solvent and Other Product Use	**8,420.66**		**12.41**							**NA,NO,NE**	**NA,NO,NE**	**3,559.32**	**NA,NO,NE**
4. Agriculture		**8,438.12**	**742.72**							**125.44**	**484.16**	**502.13**	**4.43**
A. Enteric Fermentation		6,152.96											
B. Manure Management		2,183.61	77.58									271.30	
C. Rice Cultivation		109.13										0.11	
D. Agricultural Soils [4]		-30.66	664.65									166.99	
E. Prescribed Burning of Savannas		NA,NE,NO	NA,NE,NO							NO,NE	NO,NE	NO,NE	
F. Field Burning of Agricultural Residues		23.07	0.49							17.53	484.16	62.86	4.43
G. Other		NA,NO	NA,NE,NO							107.91	NA,NO	0.87	0.00
5. Land Use, Land-Use Change and Forestry	[5] **-278,782.98**	**151.07**	**13.34**							**20.73**	**721.77**	**1,183.62**	**0.67**
A. Forest Land	[5] -360,665.58	52.49	0.54							13.82	478.62	55.40	
B. Cropland	[5] 70,196.37	10.61	12.41							2.64	92.82	NA,NE,NO	
C. Grassland	[5] -8,308.23	11.18	0.08							2.78	97.79	IE,NA,NE,NO	
D. Wetlands	[5] 4,033.45	6.09	0.25							0.07	2.62	NA,NE,NO	
E. Settlements	[5] 16,717.64	5.51	0.04							1.37	48.25	NA,NE,NO	
F. Other Land	[5] 1,100.88	0.19	0.00							0.05	1.67	NA,NE,NO	
G. Other	[5] -1,857.50	65.00	0.02							NA,NE,NO	NA,NE,NO	1,128.22	0.67
6. Waste	**3,068.82**	**6,385.90**	**34.28**							**23.54**	**583.16**	**91.25**	**6.75**
A. Solid Waste Disposal on Land	[6] 48.65	5,753.97	0.01							0.21	12.30	40.98	0.18
B. Waste-water Handling		555.83	31.79							0.00	0.00	3.56	
C. Waste Incineration	[6] 3,020.17	22.29	0.95							23.28	570.84	31.90	6.04
D. Other	NA,NO	53.82	1.52							0.06	0.01	14.81	0.53
7. Other *(please specify)* [7]	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**
Other non-specified	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs		PFCs		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
Memo Items: [8]													
International Bunkers	**222,957.51**	**5.92**	**8.14**							**1,938.91**	**289.11**	**95.70**	**1,166.90**
Aviation	95,093.00	1.45	2.53							365.51	154.60	33.96	22.83
Marine	127,864.51	4.47	5.61							1,573.40	134.51	61.73	1,144.07
Multilateral Operations	**0.32**	**0.00**	**0.00**							**0.00**	**0.00**	**0.00**	**0.00**
CO_2 Emissions from Biomass	**190,773.64**												

[1] The emissions of HFCs and PFCs are to be expressed as CO_2 equivalent emissions. Data on disaggregated emissions of HFCs and PFCs are to be provided in Table 2(II) of this common reporting format.

[2] For verification purposes, countries are asked to report the results of their calculations using the Reference approach and to explain any differences with the Sectoral approach in the documentation box to Table 1.A.(c). For estimating national total emissions, the results from the Sectoral approach should be used, where possible.

[3] Other Production includes Pulp and Paper and Food and Drink Production.

[4] Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

[5] For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

[6] CO_2 from source categories Solid Waste Disposal on Land and Waste Incineration should only be included if it stems from non-biogenic or inorganic waste streams. Only emissions from Waste Incineration Without Energy Recovery are to be reported in the Waste sector, whereas emissions from Incineration With Energy Recovery are to be reported in the Energy sector.

[7] If reporting any country-specific source category under sector "7. Other", detailed explanations should be provided in Chapter 9: Other (CRF sector 7) of the NIR.

[8] Countries are asked to report emissions from international aviation and marine bunkers and multilateral operations, as well as CO_2 emissions from biomass, under Memo Items. These emissions should not be included in the national total emissions from the energy sector. Amounts of biomass used as fuel are included in the national energy consumption but the corresponding CO_2 emissions are not included in the national total as it is assumed that the biomass is produced in a sustainable manner. If the biomass is harvested at an unsustainable rate, net CO_2 emissions are accounted for as a loss of biomass stocks in the Land Use, Land-use Change and Forestry sector.

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Summary 1.A Summary report for National Greenhouse Gas Inventories (IPCC Table 7A)

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs[1]		PFCs[1]		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
Total National Emissions and Removals	**3,087,180.37**	**17,417.07**	**1,066.28**	**87,598.66**	**46,187.56**	**1,726.18**	**7,278.98**	**899.16**	**0.45**	**10,494.19**	**31,691.08**	**10,631.29**	**6,071.75**
1. Energy	**3,129,049.23**	**3,067.67**	**110.15**							**10,146.76**	**27,322.85**	**4,839.31**	**5,779.36**
A. Fuel Combustion — Reference Approach [2]	3,105,486.26												
A. Fuel Combustion — Sectoral Approach [2]	3,110,794.28	608.20	109.75							10,127.90	27,243.88	4,028.73	5,568.77
1. Energy Industries	1,111,268.50	56.43	29.98							1,823.72	448.52	54.87	3,874.99
2. Manufacturing Industries and Construction	550,965.20	56.66	20.16							1,399.68	3,442.23	127.36	965.67
3. Transport	816,324.34	119.58	37.88							5,546.48	16,642.19	2,881.98	270.47
4. Other Sectors	623,555.84	374.80	20.32							1,302.25	6,608.88	955.84	448.65
5. Other	8,680.40	0.73	1.41							55.77	102.06	8.68	9.00
B. Fugitive Emissions from Fuels	18,254.96	2,459.47	0.40							18.87	78.98	810.57	210.59
1. Solid Fuels	1,463.40	1,174.91	0.01							1.35	40.41	6.93	8.26
2. Oil and Natural Gas	16,791.56	1,284.57	0.39							17.51	38.57	803.65	202.33
2. Industrial Processes	**213,790.97**	**28.59**	**164.44**	**87,598.66**	**46,187.56**	**1,726.18**	**7,278.98**	**899.16**	**0.45**	**175.25**	**2,601.33**	**605.98**	**282.33**
A. Mineral Products	113,070.83	0.66	IE,NA,NE,NO							65.88	14.51	116.20	63.63
B. Chemical Industry	30,516.55	21.03	164.12	NA,NO	C,NA,NO	NA,NO	C,NA,NO	C,NA,NO	C,NA,NO	40.15	172.37	195.61	107.30
C. Metal Production	69,816.70	4.72	0.03				4,575.13		0.12	51.24	2,397.75	24.99	84.19
D. Other Production [3]	49.41	0.31	0.27							17.32	14.25	250.20	26.81
E. Production of Halocarbons and SF_6					17,368.54		678.41		0.01				
F. Consumption of Halocarbons and SF_6				87,598.66	28,819.03	1,726.18	2,025.44	899.16	0.30				
G. Other	337.47	1.86	0.02	NA,NE,NO	NA,NO	NA,NO	NA,NO	NA,NO	0.03	0.65	2.44	18.97	0.39

Note: **A** = Actual emissions based on Tier 2 approach of the IPCC Guidelines.
P = Potential emissions based on Tier 1 approach of the IPCC Guidelines.

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs [1]		PFCs [1]		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
3. Solvent and Other Product Use	**7,987.16**		**11.58**							**NA,NO,NE**	**NA,NO,NE**	**3,363.33**	**NA,NO,NE**
4. Agriculture		**8,351.37**	**734.26**							**128.45**	**454.21**	**499.61**	**4.14**
A. Enteric Fermentation		6,080.51											
B. Manure Management		2,177.69	76.04									265.69	
C. Rice Cultivation		101.52										0.10	
D. Agricultural Soils [4]		-30.01	657.83									174.04	
E. Prescribed Burning of Savannas		NA,NE,NO	NA,NE,NO							NO,NE	NO,NE	NO,NE	
F. Field Burning of Agricultural Residues		21.65	0.39							13.96	454.21	58.89	4.14
G. Other		NA,NO	NA,NE,NO							114.50	NA,NO	0.90	0.00
5. Land Use, Land-Use Change and Forestry	[5] **-266,355.90**	**144.89**	**10.94**							**21.56**	**751.86**	**1,235.48**	**0.65**
A. Forest Land	[5] -348,618.58	56.63	0.58							14.78	513.10	57.38	
B. Cropland	[5] 64,788.61	10.20	9.97							2.53	89.26	NA,NE,NO	
C. Grassland	[5] -4,256.59	11.05	0.08							2.74	96.60	IE,NA,NE,NO	
D. Wetlands	[5] 4,096.86	6.26	0.25							0.07	2.53	NA,NE,NO	
E. Settlements	[5] 17,715.45	5.53	0.04							1.37	48.35	NA,NE,NO	
F. Other Land	[5] 1,146.23	0.23	0.00							0.06	2.01	NA,NE,NO	
G. Other	[5] -1,227.88	55.00	0.02							NA,NE,NO	NA,NE,NO	1,178.10	0.65
6. Waste	**2,708.91**	**5,824.56**	**34.91**							**22.18**	**560.83**	**87.58**	**5.26**
A. Solid Waste Disposal on Land	[6] 26.55	5,228.00	0.01							0.12	9.94	37.43	0.10
B. Waste-water Handling		510.46	32.04							0.00	0.00	3.36	
C. Waste Incineration	[6] 2,682.36	21.67	0.94							22.01	550.85	29.42	5.14
D. Other	NA,NO	64.42	1.92							0.05	0.04	17.37	0.02
7. Other *(please specify)* [7]	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**
Other non-specified	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs		PFCs		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)				(Gg)					
Memo Items: [8]													
International Bunkers	**237,551.68**	**6.18**	**8.64**							**1,964.18**	**261.79**	**92.37**	**1,181.52**
Aviation	108,848.57	1.46	3.44							404.60	129.00	31.98	23.80
Marine	128,703.11	4.72	5.19							1,559.58	132.80	60.39	1,157.72
Multilateral Operations	**0.32**	**0.00**	**0.00**							**0.00**	**0.00**	**0.00**	**0.00**
CO_2 Emissions from Biomass	**199,702.60**												

[1] The emissions of HFCs and PFCs are to be expressed as CO_2 equivalent emissions. Data on disaggregated emissions of HFCs and PFCs are to be provided in Table 2(II) of this common reporting format.

[2] For verification purposes, countries are asked to report the results of their calculations using the Reference approach and to explain any differences with the Sectoral approach in the documentation box to Table 1.A.(c). For estimating national total emissions, the results from the Sectoral approach should be used, where possible.

[3] Other Production includes Pulp and Paper and Food and Drink Production.

[4] Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

[5] For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

[6] CO_2 from source categories Solid Waste Disposal on Land and Waste Incineration should only be included if it stems from non-biogenic or inorganic waste streams. Only emissions from Waste Incineration Without Energy Recovery are to be reported in the Waste sector, whereas emissions from Incineration With Energy Recovery are to be reported in the Energy sector.

[7] If reporting any country-specific source category under sector "7. Other", detailed explanations should be provided in Chapter 9: Other (CRF sector 7) of the NIR.

[8] Countries are asked to report emissions from international aviation and marine bunkers and multilateral operations, as well as CO_2 emissions from biomass, under Memo Items. These emissions should not be included in the national total emissions from the energy sector. Amounts of biomass used as fuel are included in the national energy consumption but the corresponding CO_2 emissions are not included in the national total as it is assumed that the biomass is produced in a sustainable manner. If the biomass is harvested at an unsustainable rate, net CO_2 emissions are accounted for as a loss of biomass stocks in the Land Use, Land-use Change and Forestry sector.

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Summary 1.A Summary report for National Greenhouse Gas Inventories (IPCC Table 7A)

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs[1]		PFCs[1]		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
Total National Emissions and Removals	**3,135,270.69**	**16,835.46**	**1,043.36**	**106,381.24**	**44,388.87**	**1,918.05**	**6,491.02**	**920.03**	**0.43**	**10,278.89**	**29,885.13**	**10,152.94**	**5,806.68**
1. Energy	**3,202,851.52**	**2,897.68**	**112.33**							**9,954.04**	**25,798.52**	**4,528.47**	**5,528.76**
A. Fuel Combustion — Reference Approach [2]	3,178,630.37												
A. Fuel Combustion — Sectoral Approach [2]	3,184,536.67	591.26	111.94							9,934.71	25,730.16	3,746.73	5,332.76
1. Energy Industries	1,135,487.56	58.52	30.94							1,804.81	451.19	53.46	3,645.01
2. Manufacturing Industries and Construction	548,362.93	56.10	20.35							1,386.95	3,293.43	127.47	960.00
3. Transport	825,736.87	111.55	38.28							5,358.21	15,311.95	2,637.12	264.81
4. Other Sectors	667,363.32	364.41	21.08							1,337.19	6,581.16	921.16	454.57
5. Other	7,586.00	0.68	1.28							47.54	92.43	7.52	8.36
B. Fugitive Emissions from Fuels	18,314.85	2,306.42	0.39							19.33	68.36	781.74	196.01
1. Solid Fuels	1,393.76	1,013.37	0.01							1.29	27.65	6.77	8.97
2. Oil and Natural Gas	16,921.09	1,293.05	0.38							18.04	40.72	774.97	187.04
2. Industrial Processes	**208,874.78**	**27.92**	**163.08**	**106,381.24**	**44,388.87**	**1,918.05**	**6,491.02**	**920.03**	**0.43**	**161.67**	**2,446.77**	**595.01**	**267.08**
A. Mineral Products	111,191.28	0.69	IE,NA,NE,NO							59.25	14.64	117.83	59.26
B. Chemical Industry	29,897.05	20.69	162.76	NA,NO	C,NA,NO	NA,NO	C,NA,NO	C,NA,NO	C,NA,NO	35.96	173.30	185.14	101.96
C. Metal Production	67,408.93	4.38	0.03				3,920.84		0.12	48.70	2,241.71	22.79	81.90
D. Other Production [3]	43.25	0.31	0.27							17.28	14.82	254.66	23.83
E. Production of Halocarbons and SF_6					10,908.44		662.26		0.00				
F. Consumption of Halocarbons and SF_6				106,381.24	33,480.43	1,918.05	1,907.93	920.03	0.27				
G. Other	334.25	1.85	0.02	NA,NE,NO	NA,NO	NA,NO	NA,NO	NA,NO	0.03	0.48	2.30	14.59	0.13

Note: **A** = Actual emissions based on Tier 2 approach of the IPCC Guidelines.
P = Potential emissions based on Tier 1 approach of the IPCC Guidelines.

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs [1]		PFCs [1]		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
3. Solvent and Other Product Use	**7,691.32**		**10.73**							**NA,NO,NE**	**NA,NO,NE**	**3,235.80**	**NA,NO,NE**
4. Agriculture		**8,309.81**	**709.54**							**122.55**	**468.09**	**499.62**	**4.30**
A. Enteric Fermentation		6,028.10											
B. Manure Management		2,186.53	76.49									270.84	
C. Rice Cultivation		102.81										0.10	
D. Agricultural Soils [4]		-29.95	632.70									166.76	
E. Prescribed Burning of Savannas		NA,NE,NO	NA,NE,NO							NO,NE	NO,NE	NO,NE	
F. Field Burning of Agricultural Residues		22.31	0.35							12.53	468.09	60.98	4.30
G. Other		NA,NO	NA,NE,NO							110.02	NA,NO	0.93	0.00
5. Land Use, Land-Use Change and Forestry	[5] **-286,834.77**	**122.62**	**12.45**							**17.02**	**594.04**	**1,207.47**	**0.43**
A. Forest Land	[5] -378,284.78	40.02	0.45							10.40	361.20	54.62	
B. Cropland	[5] 70,477.78	9.86	11.43							2.45	86.31	NA,NE,NO	
C. Grassland	[5] -4,843.30	10.69	0.07							2.66	93.49	IE,NA,NE,NO	
D. Wetlands	[5] 5,407.65	6.29	0.25							0.08	2.70	NA,NE,NO	
E. Settlements	[5] 18,649.72	5.55	0.04							1.38	48.59	NA,NE,NO	
F. Other Land	[5] 1,601.90	0.20	0.00							0.05	1.75	NA,NE,NO	
G. Other	[5] 156.26	50.00	0.21							NA,NE,NO	NA,NE,NO	1,152.85	0.43
6. Waste	**2,687.85**	**5,477.43**	**35.24**							**23.62**	**577.70**	**86.58**	**6.11**
A. Solid Waste Disposal on Land	[6] 26.49	4,906.40	0.01							0.12	9.63	35.50	0.10
B. Waste-water Handling		483.26	32.24							0.00	0.00	3.25	
C. Waste Incineration	[6] 2,661.36	21.76	0.95							23.08	567.93	29.59	5.95
D. Other	NA,NO	66.01	2.03							0.42	0.14	18.24	0.06
7. Other ***(please specify)*** [7]	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**
Other non-specified	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs		PFCs		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
Memo Items: [8]													
International Bunkers	**241,060.37**	**6.35**	**8.65**							**1,972.75**	**256.93**	**93.30**	**1,206.39**
Aviation	107,415.87	1.41	3.41							396.56	126.11	31.38	24.35
Marine	133,644.50	4.94	5.24							1,576.19	130.81	61.92	1,182.03
Multilateral Operations	**0.76**	**0.00**	**0.00**							**0.01**	**0.00**	**0.00**	**0.00**
CO_2 Emissions from Biomass	**206,856.07**												

[1] The emissions of HFCs and PFCs are to be expressed as CO_2 equivalent emissions. Data on disaggregated emissions of HFCs and PFCs are to be provided in Table 2(II) of this common reporting format.

[2] For verification purposes, countries are asked to report the results of their calculations using the Reference approach and to explain any differences with the Sectoral approach in the documentation box to Table 1.A.(c). For estimating national total emissions, the results from the Sectoral approach should be used, where possible.

[3] Other Production includes Pulp and Paper and Food and Drink Production.

[4] Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

[5] For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

[6] CO_2 from source categories Solid Waste Disposal on Land and Waste Incineration should only be included if it stems from non-biogenic or inorganic waste streams. Only emissions from Waste Incineration Without Energy Recovery are to be reported in the Waste sector, whereas emissions from Incineration With Energy Recovery are to be reported in the Energy sector.

[7] If reporting any country-specific source category under sector "7. Other", detailed explanations should be provided in Chapter 9: Other (CRF sector 7) of the NIR.

[8] Countries are asked to report emissions from international aviation and marine bunkers and multilateral operations, as well as CO_2 emissions from biomass, under Memo Items. These emissions should not be included in the national total emissions from the energy sector. Amounts of biomass used as fuel are included in the national energy consumption but the corresponding CO_2 emissions are not included in the national total as it is assumed that the biomass is produced in a sustainable manner. If the biomass is harvested at an unsustainable rate, net CO_2 emissions are accounted for as a loss of biomass stocks in the Land Use, Land-use Change and Forestry sector.

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES		Net CO_2 emissions/removals	CH_4	N_2O	HFCs[1]		PFCs[1]		SF_6		NO_x	CO	NMVOC	SO_2
					P	A	P	A	P	A				
		(Gg)			CO_2 equivalent (Gg)						(Gg)			
Total National Emissions and Removals		**3,135,270.69**	**16,835.46**	**1,043.36**	**106,381.24**	**44,388.87**	**1,918.05**	**6,491.02**	**920.03**	**0.43**	**10,278.89**	**29,885.13**	**10,152.94**	**5,806.68**
1. Energy		**3,202,851.52**	**2,897.68**	**112.33**							**9,954.04**	**25,798.52**	**4,528.47**	**5,528.76**
A. Fuel Combustion	Reference Approach[2]	3,178,630.37												
	Sectoral Approach[2]	3,184,536.67	591.26	111.94							9,934.71	25,730.16	3,746.73	5,332.76
1. Energy Industries		1,135,487.56	58.52	30.94							1,804.81	451.19	53.46	3,645.01
2. Manufacturing Industries and Construction		548,362.93	56.10	20.35							1,386.95	3,293.43	127.47	960.00
3. Transport		825,736.87	111.55	38.28							5,358.21	15,311.95	2,637.12	264.81
4. Other Sectors		667,363.32	364.41	21.08							1,337.19	6,581.16	921.16	454.57
5. Other		7,586.00	0.68	1.28							47.54	92.43	7.52	8.36
B. Fugitive Emissions from Fuels		18,314.85	2,306.42	0.39							19.33	68.36	781.74	196.01
1. Solid Fuels		1,393.76	1,013.37	0.01							1.29	27.65	6.77	8.97
2. Oil and Natural Gas		16,921.09	1,293.05	0.38							18.04	40.72	774.97	187.04
2. Industrial Processes		**208,874.78**	**27.92**	**163.08**	**106,381.24**	**44,388.87**	**1,918.05**	**6,491.02**	**920.03**	**0.43**	**161.67**	**2,446.77**	**595.01**	**267.08**
A. Mineral Products		111,191.28	0.69	IE,NA,NE,NO							59.25	14.64	117.83	59.26
B. Chemical Industry		29,897.05	20.69	162.76	NA,NO	C,NA,NO	NA,NO	C,NA,NO	C,NA,NO	C,NA,NO	35.96	173.30	185.14	101.96
C. Metal Production		67,408.93	4.38	0.03				3,920.84		0.12	48.70	2,241.71	22.79	81.90
D. Other Production[3]		43.25	0.31	0.27							17.28	14.82	254.66	23.83
E. Production of Halocarbons and SF_6						10,908.44		662.26		0.00				
F. Consumption of Halocarbons and SF_6					106,381.24	33,480.43	1,918.05	1,907.93	920.03	0.27				
G. Other		334.25	1.85	0.02	NA,NE,NO	NA,NO	NA,NO	NA,NO	NA,NO	0.03	0.48	2.30	14.59	0.13

Note: **A** = Actual emissions based on Tier 2 approach of the IPCC Guidelines.
P = Potential emissions based on Tier 1 approach of the IPCC Guidelines.

EU-15, 2002 Summary 1.A Summary report for National Greenhouse Gas Inventories (IPCC Table 7A)

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs [1]		PFCs[1]		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
3. Solvent and Other Product Use	**7,691.32**		**10.73**							**NA,NO,NE**	**NA,NO,NE**	**3,235.80**	**NA,NO,NE**
4. Agriculture		**8,309.81**	**709.54**							**122.55**	**468.09**	**499.62**	**4.30**
A. Enteric Fermentation		6,028.10											
B. Manure Management		2,186.53	76.49									270.84	
C. Rice Cultivation		102.81										0.10	
D. Agricultural Soils[4]		-29.95	632.70									166.76	
E. Prescribed Burning of Savannas		NA,NE,NO	NA,NE,NO							NO,NE	NO,NE	NO,NE	
F. Field Burning of Agricultural Residues		22.31	0.35							12.53	468.09	60.98	4.30
G. Other		NA,NO	NA,NE,NO							110.02	NA,NO	0.93	0.00
5. Land Use, Land-Use Change and Forestry	[5] **-286,834.77**	**122.62**	**12.45**							**17.02**	**594.04**	**1,207.47**	**0.43**
A. Forest Land	[5] -378,284.78	40.02	0.45							10.40	361.20	54.62	
B. Cropland	[5] 70,477.78	9.86	11.43							2.45	86.31	NA,NE,NO	
C. Grassland	[5] -4,843.30	10.69	0.07							2.66	93.49	IE,NA,NE,NO	
D. Wetlands	[5] 5,407.65	6.29	0.25							0.08	2.70	NA,NE,NO	
E. Settlements	[5] 18,649.72	5.55	0.04							1.38	48.59	NA,NE,NO	
F. Other Land	[5] 1,601.90	0.20	0.00							0.05	1.75	NA,NE,NO	
G. Other	[5] 156.26	50.00	0.21							NA,NE,NO	NA,NE,NO	1,152.85	0.43
6. Waste	**2,687.85**	**5,477.43**	**35.24**							**23.62**	**577.70**	**86.58**	**6.11**
A. Solid Waste Disposal on Land	[6] 26.49	4,906.40	0.01							0.12	9.63	35.50	0.10
B. Waste-water Handling		483.26	32.24							0.00	0.00	3.25	
C. Waste Incineration	[6] 2,661.36	21.76	0.95							23.08	567.93	29.59	5.95
D. Other	NA,NO	66.01	2.03							0.42	0.14	18.24	0.06
7. Other ***(please specify)*** [7]	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**
Other non-specified	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO

EU-15, 2002 Summary 1.A Summary report for National Greenhouse Gas Inventories (IPCC Table 7A)

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs		PFCs		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
Memo Items: [8]													
International Bunkers	**241,060.37**	**6.35**	**8.65**							**1,972.75**	**256.93**	**93.30**	**1,206.39**
Aviation	107,415.87	1.41	3.41							396.56	126.11	31.38	24.35
Marine	133,644.50	4.94	5.24							1,576.19	130.81	61.92	1,182.03
Multilateral Operations	**0.76**	**0.00**	**0.00**							**0.01**	**0.00**	**0.00**	**0.00**
CO_2 Emissions from Biomass	**206,856.07**												

[1] The emissions of HFCs and PFCs are to be expressed as CO_2 equivalent emissions. Data on disaggregated emissions of HFCs and PFCs are to be provided in Table 2(II) of this common reporting format.

[2] For verification purposes, countries are asked to report the results of their calculations using the Reference approach and to explain any differences with the Sectoral approach in the documentation box to Table 1.A.(c). For estimating national total emissions, the results from the Sectoral approach should be used, where possible.

[3] Other Production includes Pulp and Paper and Food and Drink Production.

[4] Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

[5] For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

[6] CO_2 from source categories Solid Waste Disposal on Land and Waste Incineration should only be included if it stems from non-biogenic or inorganic waste streams. Only emissions from Waste Incineration Without Energy Recovery are to be reported in the Waste sector, whereas emissions from Incineration With Energy Recovery are to be reported in the Energy sector.

[7] If reporting any country-specific source category under sector "7. Other", detailed explanations should be provided in Chapter 9: Other (CRF sector 7) of the NIR.

[8] Countries are asked to report emissions from international aviation and marine bunkers and multilateral operations, as well as CO_2 emissions from biomass, under Memo Items. These emissions should not be included in the national total emissions from the energy sector. Amounts of biomass used as fuel are included in the national energy consumption but the corresponding CO_2 emissions are not included in the national total as it is assumed that the biomass is produced in a sustainable manner. If the biomass is harvested at an unsustainable rate, net CO_2 emissions are accounted for as a loss of biomass stocks in the Land Use, Land-use Change and Forestry sector.

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Summary 1.A Summary report for National Greenhouse Gas Inventories (IPCC Table 7A)

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs[1]		PFCs[1]		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
Total National Emissions and Removals	**3,155,688.35**	**15,784.81**	**1,010.69**	**137,071.05**	**49,780.89**	**2,028.09**	**6,642.60**	**1,005.26**	**0.37**	**9,915.98**	**27,186.18**	**9,734.93**	**5,096.01**
1. Energy	**3,254,129.32**	**2,570.33**	**113.14**							**9,597.68**	**22,887.12**	**3,901.37**	**4,826.56**
A. Fuel Combustion — Reference Approach[2]	3,252,344.98												
A. Fuel Combustion — Sectoral Approach[2]	3,235,665.63	550.23	112.78							9,574.74	22,830.19	3,218.26	4,655.60
1. Energy Industries	1,193,415.69	60.51	31.90							1,894.46	486.03	57.29	3,340.73
2. Manufacturing Industries and Construction	541,569.01	55.46	20.27							1,383.25	3,307.31	132.15	712.51
3. Transport	841,858.87	94.43	38.38							4,950.69	12,836.17	2,166.88	223.37
4. Other Sectors	650,998.65	339.18	20.84							1,303.58	6,113.52	854.68	372.93
5. Other	7,823.42	0.65	1.39							42.76	87.16	7.26	6.06
B. Fugitive Emissions from Fuels	18,463.69	2,020.10	0.36							22.95	56.93	683.11	170.97
1. Solid Fuels	1,407.35	823.90	0.01							1.18	24.72	5.90	8.14
2. Oil and Natural Gas	17,056.34	1,196.20	0.35							21.77	32.21	677.21	162.83
2. Industrial Processes	**212,554.98**	**29.49**	**149.78**	**137,071.05**	**49,780.89**	**2,028.09**	**6,642.60**	**1,005.26**	**0.37**	**150.46**	**2,364.59**	**561.28**	**259.31**
A. Mineral Products	113,039.21	0.69	IE,NA,NE,NO							55.13	14.00	110.37	60.79
B. Chemical Industry	30,382.66	22.24	149.46	NA,NO	C,NA,NO	NA,NO	C,NA,NO	C,NA,NO	C,NA,NO	31.33	128.23	169.57	88.34
C. Metal Production	68,758.80	4.38	0.03				3,965.04		0.11	46.12	2,204.00	21.50	82.28
D. Other Production[3]	46.53	0.32	0.28							17.52	15.32	248.07	21.53
E. Production of Halocarbons and SF_6					7,894.00		747.99		0.01				
F. Consumption of Halocarbons and SF_6				137,071.05	41,886.60	2,028.09	1,929.57	1,005.26	0.23				
G. Other	327.78	1.85	0.02	NA,NE,NO	NA,NO	NA,NO	NA,NO	NA,NO	0.02	0.36	3.03	11.77	6.37

Note: **A** = Actual emissions based on Tier 2 approach of the IPCC Guidelines.
P = Potential emissions based on Tier 1 approach of the IPCC Guidelines.

EU-15, 2003 Summary 1.A Summary report for National Greenhouse Gas Inventories (IPCC Table 7A)

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs [1]		PFCs [1]		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
3. Solvent and Other Product Use	**7,372.81**		**10.25**							**NA,NO,NE**	**NA,NO,NE**	**3,101.19**	**NA,NO,NE**
4. Agriculture		**8,126.89**	**689.81**							**120.18**	**523.16**	**535.66**	**4.94**
A. Enteric Fermentation		5,875.20											
B. Manure Management		2,147.55	73.06									264.46	
C. Rice Cultivation		109.11										0.10	
D. Agricultural Soils [4]		-29.90	616.37									200.71	
E. Prescribed Burning of Savannas		NA,NE,NO	NA,NE,NO							NO,NE	NO,NE	NO,NE	
F. Field Burning of Agricultural Residues		24.93	0.38							13.56	523.16	69.38	4.94
G. Other		NA,NO	NA,NE,NO							106.62	NA,NO	1.01	0.00
5. Land Use, Land-Use Change and Forestry	[5] **-321,062.42**	**143.90**	**12.27**							**25.28**	**870.85**	**1,550.61**	**0.96**
A. Forest Land	[5] -373,595.75	66.51	0.70							18.70	639.07	75.01	
B. Cropland	[5] 66,726.06	9.93	11.01							2.47	86.84	NA,NE,NO	
C. Grassland	[5] -40,545.26	10.45	0.07							2.59	91.28	IE,NA,NE,NO	
D. Wetlands	[5] 5,426.84	6.19	0.25							0.08	2.72	NA,NE,NO	
E. Settlements	[5] 18,812.79	5.55	0.04							1.38	48.56	NA,NE,NO	
F. Other Land	[5] 1,709.59	0.27	0.00							0.07	2.37	NA,NE,NO	
G. Other	[5] 403.32	45.00	0.21							NA,NE,NO	NA,NE,NO	1,475.60	0.96
6. Waste	**2,693.65**	**4,914.21**	**35.43**							**22.37**	**540.47**	**84.82**	**4.25**
A. Solid Waste Disposal on Land	[6] 15.88	4,339.13	0.01							0.08	8.98	31.67	0.06
B. Waste-water Handling		483.67	32.23							NA,NE,NO	NA,NE,NO	3.35	
C. Waste Incineration	[6] 2,677.77	21.23	0.95							22.24	531.45	29.13	4.16
D. Other	NA,NO	70.17	2.25							0.05	0.04	20.68	0.03
7. Other ***(please specify)*** [7]	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**
Other non-specified	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO

EU-15, 2003 Summary 1.A Summary report for National Greenhouse Gas Inventories (IPCC Table 7A)

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs		PFCs		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
Memo Items: [8]													
International Bunkers	**248,503.28**	**6.50**	**9.90**							**2,029.40**	**260.38**	**94.96**	**1,280.95**
Aviation	108,891.32	1.42	3.43							394.39	126.16	31.38	24.13
Marine	139,611.96	5.07	6.47							1,635.01	134.22	63.58	1,256.82
Multilateral Operations	**0.76**	**0.00**	**0.00**							**0.01**	**0.00**	**0.00**	**0.00**
CO_2 Emissions from Biomass	**221,432.97**												

[1] The emissions of HFCs and PFCs are to be expressed as CO_2 equivalent emissions. Data on disaggregated emissions of HFCs and PFCs are to be provided in Table 2(II) of this common reporting format.

[2] For verification purposes, countries are asked to report the results of their calculations using the Reference approach and to explain any differences with the Sectoral approach in the documentation box to Table 1.A.(c). For estimating national total emissions, the results from the Sectoral approach should be used, where possible.

[3] Other Production includes Pulp and Paper and Food and Drink Production.

[4] Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

[5] For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

[6] CO_2 from source categories Solid Waste Disposal on Land and Waste Incineration should only be included if it stems from non-biogenic or inorganic waste streams. Only emissions from Waste Incineration Without Energy Recovery are to be reported in the Waste sector, whereas emissions from Incineration With Energy Recovery are to be reported in the Energy sector.

[7] If reporting any country-specific source category under sector "7. Other", detailed explanations should be provided in Chapter 9: Other (CRF sector 7) of the NIR.

[8] Countries are asked to report emissions from international aviation and marine bunkers and multilateral operations, as well as CO_2 emissions from biomass, under Memo Items. These emissions should not be included in the national total emissions from the energy sector. Amounts of biomass used as fuel are included in the national energy consumption but the corresponding CO_2 emissions are not included in the national total as it is assumed that the biomass is produced in a sustainable manner. If the biomass is harvested at an unsustainable rate, net CO_2 emissions are accounted for as a loss of biomass stocks in the Land Use, Land-use Change and Forestry sector.

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Summary 1.A Summary report for National Greenhouse Gas Inventories (IPCC Table 7A)

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs[1]		PFCs[1]		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
Total National Emissions and Removals	**3,135,270.69**	**16,835.46**	**1,043.36**	**106,381.24**	**44,388.87**	**1,918.05**	**6,491.02**	**920.03**	**0.43**	**10,278.89**	**29,885.13**	**10,152.94**	**5,806.68**
1. Energy	**3,202,851.52**	**2,897.68**	**112.33**							**9,954.04**	**25,798.52**	**4,528.47**	**5,528.76**
A. Fuel Combustion — Reference Approach[2]	3,178,630.37												
A. Fuel Combustion — Sectoral Approach[2]	3,184,536.67	591.26	111.94							9,934.71	25,730.16	3,746.73	5,332.76
1. Energy Industries	1,135,487.56	58.52	30.94							1,804.81	451.19	53.46	3,645.01
2. Manufacturing Industries and Construction	548,362.93	56.10	20.35							1,386.95	3,293.43	127.47	960.00
3. Transport	825,736.87	111.55	38.28							5,358.21	15,311.95	2,637.12	264.81
4. Other Sectors	667,363.32	364.41	21.08							1,337.19	6,581.16	921.16	454.57
5. Other	7,586.00	0.68	1.28							47.54	92.43	7.52	8.36
B. Fugitive Emissions from Fuels	18,314.85	2,306.42	0.39							19.33	68.36	781.74	196.01
1. Solid Fuels	1,393.76	1,013.37	0.01							1.29	27.65	6.77	8.97
2. Oil and Natural Gas	16,921.09	1,293.05	0.38							18.04	40.72	774.97	187.04
2. Industrial Processes	**208,874.78**	**27.92**	**163.08**	**106,381.24**	**44,388.87**	**1,918.05**	**6,491.02**	**920.03**	**0.43**	**161.67**	**2,446.77**	**595.01**	**267.08**
A. Mineral Products	111,191.28	0.69	IE,NA,NE,NO							59.25	14.64	117.83	59.26
B. Chemical Industry	29,897.05	20.69	162.76	NA,NO	C,NA,NO	NA,NO	C,NA,NO	C,NA,NO	C,NA,NO	35.96	173.30	185.14	101.96
C. Metal Production	67,408.93	4.38	0.03				3,920.84		0.12	48.70	2,241.71	22.79	81.90
D. Other Production[3]	43.25	0.31	0.27							17.28	14.82	254.66	23.83
E. Production of Halocarbons and SF_6					10,908.44		662.26		0.00				
F. Consumption of Halocarbons and SF_6				106,381.24	33,480.43	1,918.05	1,907.93	920.03	0.27				
G. Other	334.25	1.85	0.02	NA,NE,NO	NA,NO	NA,NO	NA,NO	NA,NO	0.03	0.48	2.30	14.59	0.13

Note: **A** = Actual emissions based on Tier 2 approach of the IPCC Guidelines.
P = Potential emissions based on Tier 1 approach of the IPCC Guidelines.

EU-15, 2004 Summary 1.A Summary report for National Greenhouse Gas Inventories (IPCC Table 7A)

(Sheet 2 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs [1]		PFCs[1]		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
3. Solvent and Other Product Use	**7,691.32**		**10.73**							**NA,NO,NE**	**NA,NO,NE**	**3,235.80**	**NA,NO,NE**
4. Agriculture		**8,309.81**	**709.54**							**122.55**	**468.09**	**499.62**	**4.30**
A. Enteric Fermentation		6,028.10											
B. Manure Management		2,186.53	76.49									270.84	
C. Rice Cultivation		102.81										0.10	
D. Agricultural Soils[4]		-29.95	632.70									166.76	
E. Prescribed Burning of Savannas		NA,NE,NO	NA,NE,NO							NO,NE	NO,NE	NO,NE	
F. Field Burning of Agricultural Residues		22.31	0.35							12.53	468.09	60.98	4.30
G. Other		NA,NO	NA,NE,NO							110.02	NA,NO	0.93	0.00
5. Land Use, Land-Use Change and Forestry	[5] **-286,834.77**	**122.62**	**12.45**							**17.02**	**594.04**	**1,207.47**	**0.43**
A. Forest Land	[5] -378,284.78	40.02	0.45							10.40	361.20	54.62	
B. Cropland	[5] 70,477.78	9.86	11.43							2.45	86.31	NA,NE,NO	
C. Grassland	[5] -4,843.30	10.69	0.07							2.66	93.49	IE,NA,NE,NO	
D. Wetlands	[5] 5,407.65	6.29	0.25							0.08	2.70	NA,NE,NO	
E. Settlements	[5] 18,649.72	5.55	0.04							1.38	48.59	NA,NE,NO	
F. Other Land	[5] 1,601.90	0.20	0.00							0.05	1.75	NA,NE,NO	
G. Other	[5] 156.26	50.00	0.21							NA,NE,NO	NA,NE,NO	1,152.85	0.43
6. Waste	**2,687.85**	**5,477.43**	**35.24**							**23.62**	**577.70**	**86.58**	**6.11**
A. Solid Waste Disposal on Land	[6] 26.49	4,906.40	0.01							0.12	9.63	35.50	0.10
B. Waste-water Handling		483.26	32.24							0.00	0.00	3.25	
C. Waste Incineration	[6] 2,661.36	21.76	0.95							23.08	567.93	29.59	5.95
D. Other	NA,NO	66.01	2.03							0.42	0.14	18.24	0.06
7. Other *(please specify)*[7]	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**
Other non-specified	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO

EU-15, 2004 Summary 1.A Summary report for National Greenhouse Gas Inventories (IPCC Table 7A)

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs		PFCs		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)				(Gg)					
Memo Items: [8]													
International Bunkers	**265,647.42**	**6.77**	**10.52**							**2,129.72**	**276.08**	**100.23**	**1,357.61**
Aviation	117,398.72	1.51	3.71							422.99	136.26	33.76	26.38
Marine	148,248.70	5.26	6.81							1,706.73	139.82	66.47	1,331.23
Multilateral Operations	**0.76**	**0.00**	**0.00**							**0.01**	**0.00**	**0.00**	**0.00**
CO_2 Emissions from Biomass	**236,871.17**												

[1] The emissions of HFCs and PFCs are to be expressed as CO_2 equivalent emissions. Data on disaggregated emissions of HFCs and PFCs are to be provided in Table 2(II) of this common reporting format.

[2] For verification purposes, countries are asked to report the results of their calculations using the Reference approach and to explain any differences with the Sectoral approach in the documentation box to Table 1.A.(c). For estimating national total emissions, the results from the Sectoral approach should be used, where possible.

[3] Other Production includes Pulp and Paper and Food and Drink Production.

[4] Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

[5] For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

[6] CO_2 from source categories Solid Waste Disposal on Land and Waste Incineration should only be included if it stems from non-biogenic or inorganic waste streams. Only emissions from Waste Incineration Without Energy Recovery are to be reported in the Waste sector, whereas emissions from Incineration With Energy Recovery are to be reported in the Energy sector.

[7] If reporting any country-specific source category under sector "7. Other", detailed explanations should be provided in Chapter 9: Other (CRF sector 7) of the NIR.

[8] Countries are asked to report emissions from international aviation and marine bunkers and multilateral operations, as well as CO_2 emissions from biomass, under Memo Items. These emissions should not be included in the national total emissions from the energy sector. Amounts of biomass used as fuel are included in the national energy consumption but the corresponding CO_2 emissions are not included in the national total as it is assumed that the biomass is produced in a sustainable manner. If the biomass is harvested at an unsustainable rate, net CO_2 emissions are accounted for as a loss of biomass stocks in the Land Use, Land-use Change and Forestry sector.

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES		Net CO_2 emissions/removals	CH_4	N_2O	$HFCs^{(1)}$		$PFCs^{(1)}$		SF_6		NO_x	CO	NMVOC	SO_2
					P	A	P	A	P	A				
		(Gg)			CO_2 equivalent (Gg)						(Gg)			
Total National Emissions and Removals		**3,156,423.84**	**14,943.71**	**995.26**	**161,219.76**	**53,422.96**	**1,868.30**	**4,053.18**	**1,083.15**	**0.38**	**9,441.90**	**24,120.44**	**8,875.00**	**4,561.67**
1. Energy		**3,230,636.80**	**2,273.14**	**112.06**							**9,133.66**	**19,901.26**	**3,319.30**	**4,300.71**
A. Fuel Combustion	Reference Approach [2]	3,236,716.49												
	Sectoral Approach [2]	3,212,299.21	521.02	111.68							9,108.31	19,847.91	2,698.01	4,113.24
1. Energy Industries		1,195,673.95	61.33	31.66							1,871.55	492.63	53.77	2,906.30
2. Manufacturing Industries and Construction		527,804.69	55.76	20.69							1,398.09	3,239.02	135.49	668.84
3. Transport		848,403.58	78.19	37.23							4,540.31	10,282.74	1,708.98	195.26
4. Other Sectors		632,512.40	325.04	20.77							1,242.74	5,725.94	790.59	336.11
5. Other		7,904.59	0.69	1.34							55.63	107.58	9.17	6.74
B. Fugitive Emissions from Fuels		18,337.59	1,752.12	0.38							25.35	53.35	621.29	187.47
1. Solid Fuels		1,342.57	589.88	0.01							1.16	20.66	6.40	8.53
2. Oil and Natural Gas		16,995.02	1,162.24	0.37							24.19	32.69	614.89	178.94
2. Industrial Processes		**218,175.44**	**30.66**	**151.37**	**161,219.76**	**53,422.96**	**1,868.30**	**4,053.18**	**1,083.15**	**0.38**	**149.66**	**2,554.76**	**534.12**	**253.16**
A. Mineral Products		115,801.70	0.62	IE,NA,NE,NO							51.75	16.00	98.20	59.99
B. Chemical Industry		31,783.99	21.04	151.04	NA,NO	C,NA,NO	NA,NO	C,NA,NO	C,NA,NO	C,NA,NO	33.56	119.39	147.43	85.74
C. Metal Production		70,170.87	6.92	0.03				1,835.51		0.12	44.99	2,398.99	22.07	84.08
D. Other Production [3]		33.89	0.32	0.28							19.02	15.38	255.65	16.46
E. Production of Halocarbons and SF_6						4,715.42		475.50		0.00				
F. Consumption of Halocarbons and SF_6					161,219.76	48,704.06	1,868.30	1,742.17	1,083.15	0.23				
G. Other		384.99	1.76	0.02	NA,NE,NO	NA,NO	NA,NO	NA,NO	NA,NO	0.02	0.34	5.00	10.76	6.88

Note: **A** = Actual emissions based on Tier 2 approach of the IPCC Guidelines.
P = Potential emissions based on Tier 1 approach of the IPCC Guidelines.

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs [1]		PFCs[1]		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
3. Solvent and Other Product Use	**7,423.33**		**9.71**							**NA,NO,NE**	**NA,NO,NE**	**3,122.01**	**NA,NO,NE**
4. Agriculture		**8,002.27**	**674.00**							**114.30**	**343.41**	**486.96**	**2.99**
A. Enteric Fermentation		5,761.02											
B. Manure Management		2,146.49	72.24									263.33	
C. Rice Cultivation		108.35										0.09	
D. Agricultural Soils[4]		-29.96	601.49									178.90	
E. Prescribed Burning of Savannas		NA,NO	NA,NO							NO,NE	NO,NE	NO,NE	
F. Field Burning of Agricultural Residues		16.37	0.26							9.54	343.41	43.69	2.99
G. Other		NA,NO	NA,NE,NO							104.75	NA,NO	0.96	0.00
5. Land Use, Land-Use Change and Forestry	[5] **-302,467.83**	**126.13**	**11.90**							**20.65**	**720.30**	**1,327.42**	**0.39**
A. Forest Land	[5] -391,059.70	53.89	0.58							14.19	492.80	58.68	
B. Cropland	[5] 65,588.78	10.00	10.74							2.48	87.47	NA,NE,NO	
C. Grassland	[5] -2,994.57	10.30	0.07							2.56	90.26	IE,NA,NE,NO	
D. Wetlands	[5] 5,453.55	6.54	0.27							0.07	2.51	NA,NE,NO	
E. Settlements	[5] 18,432.72	5.22	0.03							1.30	45.72	NA,NE,NO	
F. Other Land	[5] 1,480.97	0.18	0.00							0.04	1.53	NA,NE,NO	
G. Other	[5] 630.42	40.00	0.21							NA,NE,NO	NA,NE,NO	1,268.74	0.39
6. Waste	**2,656.10**	**4,511.51**	**36.22**							**23.63**	**600.71**	**85.18**	**4.42**
A. Solid Waste Disposal on Land	[6] 13.59	3,936.51	0.01							0.08	8.07	29.67	0.05
B. Waste-water Handling		481.05	32.59							NA,NE,NO	NA,NE,NO	3.52	
C. Waste Incineration	[6] 2,642.51	23.71	0.98							23.50	592.59	31.97	4.35
D. Other	NA,NO	70.23	2.65							0.05	0.04	20.02	0.02
7. Other *(please specify)* [7]	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**
Other non-specified	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs		PFCs		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
Memo Items: [8]													
International Bunkers	**278,696.92**	**6.95**	**10.88**							**2,136.92**	**278.28**	**103.43**	**1,368.51**
Aviation	123,010.55	1.57	3.88							437.81	143.58	36.61	27.05
Marine	155,686.37	5.38	7.00							1,699.11	134.70	66.82	1,341.45
Multilateral Operations	**1.78**	**0.00**	**0.00**							**0.01**	**0.00**	**0.00**	**0.00**
CO_2 Emissions from Biomass	**244,969.88**												

[1] The emissions of HFCs and PFCs are to be expressed as CO_2 equivalent emissions. Data on disaggregated emissions of HFCs and PFCs are to be provided in Table 2(II) of this common reporting format.

[2] For verification purposes, countries are asked to report the results of their calculations using the Reference approach and to explain any differences with the Sectoral approach in the documentation box to Table 1.A.(c). For estimating national total emissions, the results from the Sectoral approach should be used, where possible.

[3] Other Production includes Pulp and Paper and Food and Drink Production.

[4] Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

[5] For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

[6] CO_2 from source categories Solid Waste Disposal on Land and Waste Incineration should only be included if it stems from non-biogenic or inorganic waste streams. Only emissions from Waste Incineration Without Energy Recovery are to be reported in the Waste sector, whereas emissions from Incineration With Energy Recovery are to be reported in the Energy sector.

[7] If reporting any country-specific source category under sector "7. Other", detailed explanations should be provided in Chapter 9: Other (CRF sector 7) of the NIR.

[8] Countries are asked to report emissions from international aviation and marine bunkers and multilateral operations, as well as CO_2 emissions from biomass, under Memo Items. These emissions should not be included in the national total emissions from the energy sector. Amounts of biomass used as fuel are included in the national energy consumption but the corresponding CO_2 emissions are not included in the national total as it is assumed that the biomass is produced in a sustainable manner. If the biomass is harvested at an unsustainable rate, net CO_2 emissions are accounted for as a loss of biomass stocks in the Land Use, Land-use Change and Forestry sector.

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Summary 1.A Summary report for National Greenhouse Gas Inventories (IPCC Table 7A)

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES		Net CO_2 emissions/removals	CH_4	N_2O	HFCs[1]		PFCs[1]		SF_6		NO_x	CO	NMVOC	SO_2
					P	A	P	A	P	A				
		(Gg)			CO_2 equivalent (Gg)						(Gg)			
Total National Emissions and Removals		**3,157,670.87**	**14,697.49**	**950.45**	**170,105.64**	**54,237.35**	**1,789.06**	**3,614.11**	**1,179.07**	**0.39**	**9,141.32**	**23,083.34**	**8,703.77**	**4,353.63**
1. Energy		**3,221,246.66**	**2,138.32**	**112.90**							**8,834.55**	**18,949.77**	**3,039.96**	**4,090.08**
A. Fuel Combustion	Reference Approach [2]	3,210,430.36												
	Sectoral Approach [2]	3,202,790.75	511.15	112.54							8,807.27	18,889.46	2,443.23	3,908.62
1. Energy Industries		1,195,430.97	58.15	31.91							1,813.02	494.38	54.31	2,710.84
2. Manufacturing Industries and Construction		529,660.58	55.03	21.14							1,372.71	3,340.90	136.69	650.90
3. Transport		849,915.01	73.57	37.55							4,371.22	9,269.30	1,483.56	210.46
4. Other Sectors		620,362.57	323.78	20.57							1,201.18	5,690.93	760.88	329.61
5. Other		7,421.61	0.61	1.36							49.14	93.95	7.79	6.81
B. Fugitive Emissions from Fuels		18,455.91	1,627.17	0.36							27.28	60.31	596.73	181.47
1. Solid Fuels		1,393.04	530.03	0.01							1.20	24.48	6.34	8.58
2. Oil and Natural Gas		17,062.87	1,097.14	0.35							26.08	35.83	590.39	172.88
2. Industrial Processes		**220,749.70**	**30.52**	**116.94**	**170,105.64**	**54,237.35**	**1,789.06**	**3,614.11**	**1,179.07**	**0.39**	**148.00**	**2,405.75**	**536.77**	**255.28**
A. Mineral Products		117,464.55	0.92	IE,NA,NE,NO							52.82	16.41	106.73	61.18
B. Chemical Industry		30,997.19	20.05	116.61	NA,NO	C,NA,NO	NA,NO	C,NA,NO	C,NA,NO	C,NA,NO	28.12	128.58	134.61	88.61
C. Metal Production		71,898.14	7.45	0.03				1,568.43		0.14	46.56	2,240.69	21.73	82.51
D. Other Production [3]		20.13	0.32	0.28							20.15	15.65	263.24	15.98
E. Production of Halocarbons and SF_6						2,577.47		345.13		0.01				
F. Consumption of Halocarbons and SF_6					170,105.64	51,656.59	1,789.06	1,700.56	1,179.07	0.23				
G. Other		369.70	1.79	0.02	NA,NE,NO	NA,NO	NA,NE,NO	NA,NO	NA,NO	0.02	0.35	4.41	10.45	7.00

Note: **A** = Actual emissions based on Tier 2 approach of the IPCC Guidelines.
P = Potential emissions based on Tier 1 approach of the IPCC Guidelines.

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs [1]		PFCs [1]		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
3. Solvent and Other Product Use	**7,333.70**		**9.89**							**NA,NO,NE**	**NA,NO,NE**	**3,100.32**	**NA,NO,NE**
4. Agriculture		**7,979.65**	**662.10**							**115.60**	**420.33**	**501.62**	**3.84**
A. Enteric Fermentation		5,716.49											
B. Manure Management		2,163.58	71.13									258.89	
C. Rice Cultivation		109.29										0.10	
D. Agricultural Soils [4]		-29.75	590.67									186.72	
E. Prescribed Burning of Savannas		NA,NO	NA,NO							NO,NE	NO,NE	NO,NE	
F. Field Burning of Agricultural Residues		20.04	0.31							11.19	420.33	54.90	3.84
G. Other		NA,NO	NA,NE,NO							104.41	NA,NO	1.02	0.00
5. Land Use, Land-Use Change and Forestry	[5] **-294,337.65**	**129.37**	**12.29**							**21.03**	**738.23**	**1,440.28**	**0.22**
A. Forest Land	[5] -395,583.28	58.44	0.61							14.65	513.30	59.39	
B. Cropland	[5] 66,429.01	9.88	11.10							2.45	86.44	NA,NE,NO	
C. Grassland	[5] 1,480.34	10.09	0.07							2.50	88.20	IE,NA,NE,NO	
D. Wetlands	[5] 4,672.66	6.52	0.26							0.07	2.61	NA,NE,NO	
E. Settlements	[5] 27,062.66	5.28	0.04							1.31	46.16	NA,NE,NO	
F. Other Land	[5] 1,378.61	0.17	0.00							0.04	1.52	NA,NE,NO	
G. Other	[5] 222.35	39.00	0.20							NA,NE,NO	NA,NE,NO	1,380.89	0.22
6. Waste	**2,678.46**	**4,419.64**	**36.33**							**22.14**	**569.27**	**84.82**	**4.20**
A. Solid Waste Disposal on Land	[6] 13.29	3,840.05	0.00							0.07	7.60	28.76	0.05
B. Waste-water Handling		484.99	32.79							NA,NE,NO	NA,NE,NO	3.54	
C. Waste Incineration	[6] 2,665.17	22.47	0.96							22.02	561.62	30.83	4.13
D. Other	NA,NO	72.13	2.57							0.04	0.04	21.69	0.02
7. Other *(please specify)* [7]	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**
Other non-specified	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs		PFCs		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
Memo Items: [8]													
International Bunkers	**293,890.22**	**7.29**	**11.65**							**2,287.68**	**296.82**	**110.02**	**1,426.51**
Aviation	128,201.05	1.60	4.04							456.89	150.34	38.30	30.01
Marine	165,689.17	5.69	7.61							1,830.80	146.48	71.72	1,396.50
Multilateral Operations	**2.73**	**0.00**	**0.00**							**0.02**	**0.00**	**0.00**	**0.00**
CO_2 Emissions from Biomass	**260,415.03**												

[1] The emissions of HFCs and PFCs are to be expressed as CO_2 equivalent emissions. Data on disaggregated emissions of HFCs and PFCs are to be provided in Table 2(II) of this common reporting format.

[2] For verification purposes, countries are asked to report the results of their calculations using the Reference approach and to explain any differences with the Sectoral approach in the documentation box to Table 1.A.(c). For estimating national total emissions, the results from the Sectoral approach should be used, where possible.

[3] Other Production includes Pulp and Paper and Food and Drink Production.

[4] Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

[5] For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

[6] CO_2 from source categories Solid Waste Disposal on Land and Waste Incineration should only be included if it stems from non-biogenic or inorganic waste streams. Only emissions from Waste Incineration Without Energy Recovery are to be reported in the Waste sector, whereas emissions from Incineration With Energy Recovery are to be reported in the Energy sector.

[7] If reporting any country-specific source category under sector "7. Other", detailed explanations should be provided in Chapter 9: Other (CRF sector 7) of the NIR.

[8] Countries are asked to report emissions from international aviation and marine bunkers and multilateral operations, as well as CO_2 emissions from biomass, under Memo Items. These emissions should not be included in the national total emissions from the energy sector. Amounts of biomass used as fuel are included in the national energy consumption but the corresponding CO_2 emissions are not included in the national total as it is assumed that the biomass is produced in a sustainable manner. If the biomass is harvested at an unsustainable rate, net CO_2 emissions are accounted for as a loss of biomass stocks in the Land Use, Land-use Change and Forestry sector.

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES		Net CO_2 emissions/removals	CH_4	N_2O	HFCs[1]		PFCs[1]		SF_6		NO_x	CO	NMVOC	SO_2
					P	A	P	A	P	A				
		(Gg)			CO_2 equivalent (Gg)						(Gg)			
Total National Emissions and Removals		**3,125,915.64**	**14,521.00**	**943.54**	**178,931.66**	**56,635.24**	**1,725.10**	**3,349.11**	**1,214.56**	**0.39**	**8,812.29**	**22,082.63**	**8,205.16**	**4,163.46**
1. Energy		**3,155,622.00**	**2,036.45**	**111.77**							**8,511.49**	**18,156.76**	**2,868.34**	**3,898.02**
A. Fuel Combustion	Reference Approach[2]	3,166,984.77												
	Sectoral Approach[2]	3,137,251.89	514.49	111.43							8,487.79	18,095.64	2,289.91	3,723.16
1. Energy Industries		1,207,863.92	56.45	31.85							1,760.21	505.72	53.43	2,571.16
2. Manufacturing Industries and Construction		517,244.44	56.72	21.02							1,354.22	3,346.86	135.36	650.08
3. Transport		850,892.12	68.88	37.56							4,206.17	8,451.24	1,361.63	209.46
4. Other Sectors		553,577.21	331.89	19.70							1,118.38	5,704.99	732.18	285.96
5. Other		7,674.21	0.54	1.31							48.80	86.83	7.31	6.50
B. Fugitive Emissions from Fuels		18,370.11	1,521.96	0.34							23.69	61.12	578.43	174.86
1. Solid Fuels		1,397.00	435.99	0.01							1.08	24.47	6.12	10.52
2. Oil and Natural Gas		16,973.11	1,085.97	0.33							22.62	36.65	572.32	164.34
2. Industrial Processes		**225,787.47**	**31.63**	**118.34**	**178,931.66**	**56,635.24**	**1,725.10**	**3,349.11**	**1,214.56**	**0.39**	**150.19**	**2,325.02**	**523.10**	**256.52**
A. Mineral Products		119,297.86	0.97	IE,NA,NE,NO							54.56	15.29	100.27	60.51
B. Chemical Industry		32,307.41	20.85	118.01	NA,NO	C,NA,NO	NA,NO	C,NA,NO	C,NA,NO	C,NA,NO	28.89	128.37	128.06	90.16
C. Metal Production		73,837.02	7.73	0.03				1,429.86		0.13	46.05	2,161.39	20.56	84.63
D. Other Production[3]		29.46	0.32	0.28							20.37	15.63	263.76	14.67
E. Production of Halocarbons and SF_6						1,831.99		322.40		C,NA,NO				
F. Consumption of Halocarbons and SF_6					178,931.66	54,792.90	1,725.10	1,596.85	1,214.56	0.25				
G. Other		315.72	1.76	0.02	NA,NE,NO	NA,NO	NA,NE,NO	NA,NO	NA,NO	0.01	0.32	4.34	10.45	6.54

Note: **A** = Actual emissions based on Tier 2 approach of the IPCC Guidelines.
P = Potential emissions based on Tier 1 approach of the IPCC Guidelines.

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs [1]		PFCs[1]		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)						(Gg)			
3. Solvent and Other Product Use	**7,281.64**		**10.28**							**NA,NO,NE**	**NA,NO,NE**	**3,078.07**	**NA,NO,NE**
4. Agriculture		**8,011.73**	**655.60**							**111.79**	**420.51**	**480.06**	**3.84**
A. Enteric Fermentation		5,738.05											
B. Manure Management		2,170.11	71.80									263.30	
C. Rice Cultivation		113.26										0.11	
D. Agricultural Soils[4]		-29.74	583.49									160.72	
E. Prescribed Burning of Savannas		NA,NO	NA,NO							NO,NE	NO,NE	NO,NE	
F. Field Burning of Agricultural Residues		20.04	0.31							11.20	420.51	55.00	3.84
G. Other		NA,NO	NA,NE,NO							100.59	NA,NO	0.93	0.00
5. Land Use, Land-Use Change and Forestry	[5] **-265,232.53**	**115.89**	**10.91**							**18.04**	**632.45**	**1,170.57**	**1.02**
A. Forest Land	[5] -355,121.98	46.19	0.56							11.68	408.57	60.45	
B. Cropland	[5] 62,838.72	9.69	9.79							2.41	84.83	NA,NE,NO	
C. Grassland	[5] -4,999.68	10.12	0.07							2.51	88.52	IE,NA,NE,NO	
D. Wetlands	[5] 4,776.69	6.41	0.26							0.07	2.62	NA,NE,NO	
E. Settlements	[5] 27,286.11	5.31	0.04							1.32	46.43	NA,NE,NO	
F. Other Land	[5] 1,368.76	0.17	0.00							0.04	1.49	NA,NE,NO	
G. Other	[5] -1,381.14	38.00	0.20							NA,NE,NO	NA,NE,NO	1,110.12	1.02
6. Waste	**2,457.05**	**4,325.31**	**36.64**							**20.79**	**547.87**	**85.01**	**4.05**
A. Solid Waste Disposal on Land	[6] 12.53	3,744.15	0.00							0.07	7.10	28.28	0.05
B. Waste-water Handling		485.56	33.02							NA,NE,NO	NA,NE,NO	4.37	
C. Waste Incineration	[6] 2,444.52	21.59	0.94							20.69	540.73	29.96	3.98
D. Other	NA,NO	74.01	2.67							0.03	0.04	22.40	0.02
7. Other *(please specify)*[7]	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**NA,NO**
Other non-specified	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO

EU-15, 2007 Summary 1.A Summary report for National Greenhouse Gas Inventories (IPCC Table 7A)

(Sheet 3 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs		PFCs		SF_6		NO_x	CO	NMVOC	SO_2
				P	A	P	A	P	A				
	(Gg)			CO_2 equivalent (Gg)				(Gg)					
Memo Items: [8]													
International Bunkers	**298,759.91**	**7.33**	**12.40**							**2,374.68**	**306.59**	**111.94**	**1,439.74**
Aviation	131,574.31	1.57	4.19							468.78	152.79	37.65	29.95
Marine	167,185.60	5.76	8.21							1,905.90	153.80	74.29	1,409.79
Multilateral Operations	**1.96**	**0.00**	**0.00**							**0.01**	**0.00**	**0.00**	**0.00**
CO_2 Emissions from Biomass	**272,338.63**												

[1] The emissions of HFCs and PFCs are to be expressed as CO_2 equivalent emissions. Data on disaggregated emissions of HFCs and PFCs are to be provided in Table 2(II) of this common reporting format.

[2] For verification purposes, countries are asked to report the results of their calculations using the Reference approach and to explain any differences with the Sectoral approach in the documentation box to Table 1.A.(c). For estimating national total emissions, the results from the Sectoral approach should be used, where possible.

[3] Other Production includes Pulp and Paper and Food and Drink Production.

[4] Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

[5] For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

[6] CO_2 from source categories Solid Waste Disposal on Land and Waste Incineration should only be included if it stems from non-biogenic or inorganic waste streams. Only emissions from Waste Incineration Without Energy Recovery are to be reported in the Waste sector, whereas emissions from Incineration With Energy Recovery are to be reported in the Energy sector.

[7] If reporting any country-specific source category under sector "7. Other", detailed explanations should be provided in Chapter 9: Other (CRF sector 7) of the NIR.

[8] Countries are asked to report emissions from international aviation and marine bunkers and multilateral operations, as well as CO_2 emissions from biomass, under Memo Items. These emissions should not be included in the national total emissions from the energy sector. Amounts of biomass used as fuel are included in the national energy consumption but the corresponding CO_2 emissions are not included in the national total as it is assumed that the biomass is produced in a sustainable manner. If the biomass is harvested at an unsustainable rate, net CO_2 emissions are accounted for as a loss of biomass stocks in the Land Use, Land-use Change and Forestry sector.

Appendix B - Summary GHG emissions inventory tables for the EU-27

B1 EU-27 CO_2

EU-27 Gg CO_2 (sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
1. Energy	4,082,929	4,055,927	3,916,277	3,864,062	3,824,064	3,859,716	3,972,000	3,874,633	3,868,586	3,811,419
A. Fuel Combustion (Sectoral Approach)	4,063,176	4,036,119	3,896,418	3,843,452	3,802,800	3,837,810	3,949,793	3,853,502	3,848,374	3,792,687
1. Energy Industries	1,671,555	1,647,646	1,570,564	1,509,300	1,507,824	1,505,568	1,533,211	1,481,579	1,496,492	1,455,439
2. Manufacturing Industries and Construction	810,513	766,727	723,789	716,237	719,082	735,444	734,357	728,313	697,240	680,918
3. Transport	767,494	772,167	795,300	802,963	808,259	822,283	846,941	856,932	884,233	900,809
4. Other Sectors	787,890	828,264	788,460	797,435	750,669	759,317	821,368	773,308	757,425	743,208
5. Other	25,723	21,316	18,306	17,517	16,966	15,199	13,916	13,369	12,984	12,313
B. Fugitive Emissions from Fuels	19,753	19,808	19,859	20,610	21,264	21,906	22,207	21,130	20,212	18,732
1. Solid Fuels	2,181	2,011	1,779	1,645	1,943	1,986	2,102	1,987	1,627	1,551
2. Oil and Natural Gas	17,572	17,797	18,080	18,965	19,321	19,919	20,105	19,143	18,584	17,181
2. Industrial Processes	299,959	270,109	258,370	246,868	264,422	276,130	264,784	274,151	269,493	259,621
A. Mineral Products	146,706	134,289	129,649	123,861	131,743	137,258	132,757	136,266	137,293	137,999
B. Chemical Industry	40,530	37,788	35,847	34,312	37,554	40,541	40,751	39,089	38,462	36,959
C. Metal Production	112,368	97,608	92,420	88,307	94,744	97,991	90,902	98,449	93,387	84,300
D. Other Production	73	50	54	51	30	23	50	49	42	52
E. Production of Halocarbons and SF_6	0	0	0	0	0	0	0	0	0	0
F. Consumption of Halocarbons and SF_6	0	0	0	0	0	0	0	0	0	0
G. Other	282	375	400	338	352	318	325	299	310	310
3. Solvent and Other Product Use	11,403	11,081	10,471	10,075	9,354	9,441	9,429	9,554	9,687	9,425
4. Agriculture	0	0	0	0	0	0	0	0	0	0
A. Enteric Fermentation	0	0	0	0	0	0	0	0	0	0
B. Manure Management	0	0	0	0	0	0	0	0	0	0
C. Rice Cultivation	0	0	0	0	0	0	0	0	0	0
D. Agricultural Soils	0	0	0	0	0	0	0	0	0	0
E. Prescribed Burning of Savannas	0	0	0	0	0	0	0	0	0	0
F. Field Burning of Agricultural Residues	0	0	0	0	0	0	0	0	0	0

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
G. Other	0	0	0	0	0	0	0	0	0	0
5. Land-Use, Land-Use Change and Forestry	-342,705	-399,577	-399,635	-388,035	-393,295	-395,658	-412,726	-409,966	-410,638	-415,704
A. Forest Land	-441,468	-496,849	-492,576	-483,634	-487,978	-491,349	-505,082	-503,468	-505,807	-514,138
B. Cropland	89,798	87,176	83,260	83,898	81,637	82,900	82,017	82,847	81,627	83,125
C. Grassland	-14,161	-14,192	-14,197	-11,760	-10,802	-11,077	-14,625	-10,711	-9,050	-7,145
D. Wetlands	7,454	7,259	7,311	7,342	7,406	7,431	7,493	7,541	7,582	7,633
E. Settlements	17,900	17,459	17,537	16,473	16,502	16,366	17,556	16,345	16,620	16,827
F. Other Land	-523	-130	-453	-82	24	463	615	-546	193	169
G. Other	-1,704	-300	-517	-272	-84	-392	-700	-1,974	-1,803	-2,174
6. Waste	5,247	5,498	5,565	5,386	5,243	4,901	4,802	4,232	4,139	3,820
A. Solid Waste Disposal on Land	218	267	307	296	240	100	67	54	49	45
B. Waste-water Handling	0	0	0	0	0	0	0	0	0	0
C. Waste Incineration	5,028	5,231	5,258	5,090	5,003	4,802	4,734	4,177	4,090	3,775
D. Other	0	0	0	0	0	0	0	0	0	0
7. Other	0	0	0	0	0	0	0	0	0	0
Total CO_2 Emissions including net CO_2 from LULUCF	4,056,832	3,943,038	3,791,049	3,738,356	3,709,789	3,754,531	3,838,289	3,752,604	3,741,267	3,668,580
Total CO_2 Emissions excluding net CO_2 from LULUCF	4,399,537	4,342,615	4,190,684	4,126,391	4,103,084	4,150,189	4,251,015	4,162,569	4,151,905	4,084,285
Memo Items:										
International Bunkers	174,137	171,357	178,053	184,830	185,803	191,557	202,920	217,201	230,148	231,516
Aviation	65,584	64,992	70,319	74,628	78,735	83,178	87,618	91,631	98,711	106,298
Marine	108,553	106,365	107,734	110,202	107,068	108,379	115,302	125,570	131,437	125,219
Multilateral Operations	0	0	0	0	0	0	0	0	0	0
CO_2 Emissions from Biomass	176,660	186,721	188,341	205,149	205,848	222,174	233,430	237,156	239,436	246,565

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2000	2001	2002	2003	2004	2005	2006	2007
1. Energy	3,820,926	3,908,315	3,880,763	3,970,140	3,972,165	3,935,159	3,938,439	3,873,568
A. Fuel Combustion (Sectoral Approach)	3,802,244	3,889,522	3,861,881	3,951,177	3,953,428	3,916,321	3,919,489	3,854,724
1. Energy Industries	1,486,559	1,519,837	1,541,206	1,583,085	1,574,246	1,569,881	1,578,083	1,597,434
2. Manufacturing Industries and Construction	684,585	676,866	653,382	667,887	658,697	645,737	644,751	634,491
3. Transport	900,859	914,170	926,892	937,019	955,894	955,343	961,138	966,032
4. Other Sectors	718,765	768,412	730,337	753,192	753,945	734,886	725,933	646,823
5. Other	11,475	10,237	10,063	9,994	10,646	10,474	9,584	9,944
B. Fugitive Emissions from Fuels	18,683	18,793	18,882	18,963	18,737	18,838	18,951	18,844
1. Solid Fuels	1,580	1,528	1,530	1,565	1,855	1,507	1,572	1,583
2. Oil and Natural Gas	17,102	17,265	17,352	17,398	16,882	17,331	17,378	17,260
2. Industrial Processes	271,740	263,340	264,664	269,832	279,997	283,750	291,856	300,904
A. Mineral Products	140,273	137,255	136,745	138,384	144,195	144,732	148,593	153,911
B. Chemical Industry	40,464	39,298	37,823	40,146	41,547	42,561	41,171	43,363
C. Metal Production	90,616	86,410	89,718	90,927	93,875	94,944	100,558	102,328
D. Other Production	49	43	32	47	42	34	20	30
E. Production of Halocarbons and SF_6	0	0	0	0	0	0	0	0
F. Consumption of Halocarbons and SF_6	0	0	0	0	0	0	0	0
G. Other	337	334	346	328	339	1,479	1,514	1,272
3. Solvent and Other Product Use	9,318	8,988	8,886	8,717	8,776	8,794	8,637	8,576
4. Agriculture	0	0	0	0	0	0	0	0
A. Enteric Fermentation	0	0	0	0	0	0	0	0
B. Manure Management	0	0	0	0	0	0	0	0
C. Rice Cultivation	0	0	0	0	0	0	0	0
D. Agricultural Soils	0	0	0	0	0	0	0	0
E. Prescribed Burning of Savannas	0	0	0	0	0	0	0	0
F. Field Burning of Agricultural Residues	0	0	0	0	0	0	0	0
G. Other	0	0	0	0	0	0	0	0
5. Land-Use, Land-Use Change and Forestry	-391,687	-426,389	-435,823	-459,227	-445,037	-448,120	-448,781	-415,678
A. Forest Land	-487,147	-528,802	-539,218	-523,139	-543,032	-548,007	-560,823	-515,695

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2000	2001	2002	2003	2004	2005	2006	2007
B. Cropland	78,502	80,741	77,925	77,764	76,339	75,519	75,617	71,832
C. Grassland	-5,755	-7,010	-3,507	-43,354	-6,599	-4,618	-110	-7,104
D. Wetlands	7,695	9,010	8,964	9,069	9,062	9,146	8,399	8,496
E. Settlements	17,562	18,478	18,429	18,706	17,644	18,294	26,882	26,910
F. Other Land	-1,355	1,005	945	1,299	773	906	1,023	1,264
G. Other	-1,190	189	640	428	777	639	231	-1,381
6. Waste	3,796	3,758	3,746	3,657	3,467	3,847	4,169	3,610
A. Solid Waste Disposal on Land	27	26	14	16	14	14	13	13
B. Waste-water Handling	0	0	0	0	0	0	0	0
C. Waste Incineration	3,770	3,731	3,733	3,641	3,454	3,833	4,155	3,597
D. Other	0	0	0	0	0	0	0	0
7. Other	0	0	0	0	0	0	0	0
Total CO_2 Emissions including net CO_2 from LULUCF	3,714,093	3,758,011	3,722,237	3,793,117	3,819,367	3,783,429	3,794,320	3,770,979
Total CO_2 Emissions excluding net CO_2 from LULUCF	4,105,781	4,184,401	4,158,060	4,252,345	4,264,404	4,231,549	4,243,101	4,186,657
Memo Items:								
International Bunkers	244,150	248,150	252,714	258,907	276,187	289,591	305,566	310,859
Aviation	112,867	111,479	109,420	113,341	121,991	128,073	133,670	137,360
Marine	131,284	136,671	143,293	145,566	154,196	161,518	171,896	173,499
Multilateral Operations	0	1	1	1	1	2	3	2
CO_2 Emissions from Biomass	247,727	254,074	260,221	278,092	298,130	310,598	325,710	338,152

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Total Emissions	601,589	587,896	570,665	561,187	548,465	547,120	541,149	525,090	505,049	494,008
1. Energy	158,794	152,117	144,753	143,317	132,386	133,491	131,271	123,509	116,144	112,574
A. Fuel Combustion (Sectoral Approach)	24,313	24,277	23,105	23,529	21,704	22,111	22,781	21,100	20,007	19,510
1. Energy Industries	1,060	1,050	1,007	1,042	1,145	1,238	1,359	1,341	1,396	1,362
2. Manufacturing Industries and Construction	1,803	1,697	1,623	1,628	1,645	1,643	1,685	1,666	1,624	1,588
3. Transport	4,769	4,513	4,454	4,265	4,076	3,938	3,853	3,600	3,438	3,170
4. Other Sectors	16,387	16,805	15,866	16,474	14,751	15,223	15,823	14,432	13,493	13,335
5. Other	294	211	154	119	88	69	62	61	56	54
B. Fugitive Emissions from Fuels	134,482	127,840	121,647	119,788	110,681	111,380	108,490	102,410	96,137	93,064
1. Solid Fuels	75,544	72,087	68,099	66,586	59,093	60,337	57,624	55,288	49,384	48,184
2. Oil and Natural Gas	58,938	55,753	53,549	53,202	51,588	51,043	50,866	47,122	46,753	44,880
2. Industrial Processes	1,333	1,235	1,190	1,185	1,306	1,315	1,264	1,257	1,165	1,083
A. Mineral Products	27	23	21	18	20	21	20	20	21	18
B. Chemical Industry	788	771	769	760	843	836	811	800	741	700
C. Metal Production	465	390	350	357	392	406	382	386	354	318
D. Other Production	0	0	0	0	0	0	0	0	0	0
E. Production of Halocarbons and SF_6	0	0	0	0	0	0	0	0	0	0
F. Consumption of Halocarbons and SF_6	0	0	0	0	0	0	0	0	0	0
G. Other	47	45	45	44	45	46	46	45	43	41
3. Solvent and Other Product Use	0	0	0	0	0	0	0	0	0	0
4. Agriculture	241,762	233,133	225,087	218,855	216,800	216,407	216,888	215,487	215,131	213,577
A. Enteric Fermentation	180,770	173,733	167,018	161,834	160,016	159,391	159,828	158,003	157,323	156,234
B. Manure Management	58,353	56,866	55,765	54,901	54,527	54,812	54,687	54,986	55,497	55,149
C. Rice Cultivation	2,376	2,255	2,168	2,114	2,262	2,214	2,403	2,438	2,338	2,256
D. Agricultural Soils	-668	-639	-639	-636	-642	-643	-643	-642	-644	-634
E. Prescribed Burning of Savannas	0	0	0	0	0	0	0	0	0	0
F. Field Burning of Agricultural Residues	931	918	775	641	637	632	613	703	617	573
G. Other	0	0	0	0	0	0	0	0	0	0
5. Land-Use, Land-Use Change and Forestry	4,295	4,304	4,083	4,050	6,142	6,088	5,800	5,649	5,590	5,181

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
A. Forest Land	1,454	1,411	1,194	1,162	1,492	1,220	1,002	1,171	1,301	1,031
B. Cropland	229	249	241	236	219	220	228	218	223	219
C. Grassland	236	265	257	248	229	228	238	229	236	229
D. Wetlands	2,256	2,263	2,275	2,287	2,301	2,309	2,323	2,336	2,346	2,363
E. Settlements	116	110	110	110	111	111	112	114	116	116
F. Other Land	4	6	6	6	6	6	6	6	4	4
G. Other	0	0	0	0	1,785	1,995	1,890	1,575	1,365	1,218
6. Waste	195,406	197,108	195,552	193,780	191,830	189,820	185,926	179,187	167,020	161,593
A. Solid Waste Disposal on Land	174,830	176,862	175,770	174,363	172,490	170,397	166,768	159,931	147,825	142,618
B. Waste-water Handling	19,719	19,116	18,639	18,192	18,027	17,960	17,595	17,646	17,591	17,222
C. Waste Incineration	477	637	559	554	507	524	507	487	468	517
D. Other	380	493	585	671	806	939	1,057	1,123	1,136	1,236
7. Other	0	0	0	0	0	0	0	0	0	0
Memo Items:										
International Bunkers	120	111	113	116	114	119	120	127	135	134
Aviation	33	30	31	31	31	33	34	35	36	37
Marine	87	81	82	85	83	86	86	93	98	97
Multilateral Operations	0	0	0	0	0	0	0	0	0	0
CO_2 Emissions from Biomass	0	0	0	0	0	0	0	0	0	0

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2000	2001	2002	2003	2004	2005	2006	2007
Total Emissions	480,791	466,211	456,782	446,250	433,106	426,204	421,700	416,322
1. Energy	108,825	104,356	101,210	97,524	92,774	90,065	87,685	84,205
A. Fuel Combustion (Sectoral Approach)	18,057	17,795	16,750	16,836	16,801	16,695	16,882	16,510
1. Energy Industries	1,313	1,362	1,390	1,408	1,444	1,443	1,376	1,344
2. Manufacturing Industries and Construction	1,621	1,597	1,558	1,589	1,626	1,602	1,580	1,625
3. Transport	2,862	2,700	2,504	2,341	2,170	1,997	1,901	1,798
4. Other Sectors	12,211	12,088	11,246	11,453	11,508	11,603	11,980	11,700
5. Other	50	48	51	44	52	50	46	43
B. Fugitive Emissions from Fuels	90,768	86,561	84,460	80,689	75,973	73,370	70,803	67,695
1. Solid Fuels	46,179	41,934	40,317	37,076	33,402	30,885	29,734	26,880
2. Oil and Natural Gas	44,589	44,627	44,143	43,612	42,571	42,485	41,069	40,815
2. Industrial Processes	1,163	1,108	1,050	1,187	1,215	1,222	1,228	1,253
A. Mineral Products	19	20	19	19	19	18	24	25
B. Chemical Industry	740	717	673	775	794	783	752	769
C. Metal Production	358	327	314	347	358	378	408	415
D. Other Production	0	0	0	0	0	0	0	0
E. Production of Halocarbons and SF_6	0	0	0	0	0	0	0	0
F. Consumption of Halocarbons and SF_6	0	0	0	0	0	0	0	0
G. Other	39	39	38	39	37	37	38	37
3. Solvent and Other Product Use	0	0	0	0	0	0	0	0
4. Agriculture	210,019	208,136	205,993	204,744	202,295	201,443	201,454	201,981
A. Enteric Fermentation	153,326	151,444	149,116	148,133	145,991	145,371	144,722	145,182
B. Manure Management	54,583	54,497	54,801	54,316	53,958	53,967	54,523	54,498
C. Rice Cultivation	2,177	2,203	2,268	2,350	2,460	2,332	2,357	2,457
D. Agricultural Soils	-630	-629	-627	-628	-628	-629	-625	-625
E. Prescribed Burning of Savannas	0	0	0	0	0	0	0	0
F. Field Burning of Agricultural Residues	562	621	435	574	514	401	477	469
G. Other	0	0	0	0	0	0	0	0
5. Land-Use, Land-Use Change and Forestry	5,503	5,022	5,069	5,552	4,967	5,193	5,329	5,079
A. Forest Land	1,394	1,017	1,121	1,616	1,079	1,331	1,467	1,233

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2000	2001	2002	2003	2004	2005	2006	2007
B. Cropland	214	207	200	208	209	210	207	204
C. Grassland	233	226	210	222	217	218	216	216
D. Wetlands	2,386	2,402	2,410	2,438	2,466	2,481	2,506	2,513
E. Settlements	116	117	117	117	110	110	111	111
F. Other Land	5	4	3	6	4	4	4	4
G. Other	1,155	1,050	1,008	945	882	840	819	798
6. Waste	155,281	147,589	143,459	137,243	131,857	128,280	126,003	123,803
A. Solid Waste Disposal on Land	138,090	131,059	126,689	119,706	114,109	111,158	108,886	106,628
B. Waste-water Handling	15,376	14,678	14,817	15,588	15,671	15,105	15,067	15,095
C. Waste Incineration	455	457	471	446	553	498	472	453
D. Other	1,359	1,394	1,482	1,503	1,524	1,519	1,578	1,627
7. Other	0	0	0	0	0	0	0	0
Memo Items:								
International Bunkers	141	147	147	151	157	162	169	170
Aviation	37	38	37	38	42	41	42	42
Marine	104	109	110	113	116	120	127	128
Multilateral Operations	0	0	0	0	0	0	0	0
CO_2 Emissions from Biomass	0	0	0	0	0	0	0	0

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EU-27 - Gg N_2O (sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Total Emissions	512,591	484,828	466,169	447,393	453,804	454,829	459,533	457,628	434,318	411,497
1. Energy	35,683	36,029	35,684	35,958	36,804	38,305	38,999	38,922	39,604	39,573
A. Fuel Combustion (Sectoral Approach)	35,581	35,928	35,579	35,846	36,693	38,199	38,891	38,817	39,500	39,448
1. Energy Industries	11,647	11,855	11,591	11,117	11,162	11,152	11,569	11,043	11,328	10,843
2. Manufacturing Industries and Construction	7,936	7,609	7,373	7,118	7,179	7,294	7,130	7,216	6,972	6,837
3. Transport	7,459	7,825	8,332	9,150	10,226	11,646	11,770	12,485	13,322	13,903
4. Other Sectors	7,826	7,968	7,643	7,824	7,507	7,547	7,872	7,528	7,364	7,371
5. Other	713	669	639	637	620	560	550	545	514	494
B. Fugitive Emissions from Fuels	102	102	105	112	111	106	109	105	103	124
1. Solid Fuels	4	3	3	3	4	4	3	3	3	3
2. Oil and Natural Gas	98	98	102	109	107	102	105	102	100	122
2. Industrial Processes	117,916	112,004	108,763	102,814	108,093	107,901	110,547	106,020	83,403	63,189
A. Mineral Products	0	0	0	0	0	0	0	0	0	0
B. Chemical Industry	117,834	111,920	108,678	102,727	108,006	107,813	110,459	105,926	83,311	63,095
C. Metal Production	13	10	10	10	11	11	11	12	11	10
D. Other Production	0	0	0	0	0	0	0	0	0	0
E. Production of Halocarbons and SF_6	0	0	0	0	0	0	0	0	0	0
F. Consumption of Halocarbons and SF_6	0	0	0	0	0	0	0	0	0	0
G. Other	3	3	5	4	5	5	6	6	6	8
3. Solvent and Other Product Use	4,839	4,682	4,648	4,581	4,435	4,440	4,507	4,417	4,462	4,303
4. Agriculture	337,714	315,642	300,671	287,597	287,748	287,669	289,128	291,826	289,909	287,453
A. Enteric Fermentation	0	0	0	0	0	0	0	0	0	0
B. Manure Management	43,438	42,138	39,949	37,851	37,508	37,313	36,901	36,938	36,863	36,271
C. Rice Cultivation	0	0	0	0	0	0	0	0	0	0
D. Agricultural Soils	293,964	273,205	260,469	249,533	250,027	250,143	252,017	254,660	252,839	250,985
E. Prescribed Burning of Savannas	0	0	0	0	0	0	0	0	0	0
F. Field Burning of Agricultural Residues	312	299	253	213	212	213	210	228	207	198
G. Other	0	0	0	0	0	0	0	0	0	0
5. Land-Use, Land-Use Change and Forestry	4,186	4,112	4,029	4,076	4,220	4,076	3,818	3,842	4,191	4,134

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
A. Forest Land	304	241	203	187	229	199	173	194	208	180
B. Cropland	3,769	3,756	3,709	3,772	3,875	3,761	3,524	3,528	3,860	3,831
C. Grassland	24	27	26	25	23	23	24	23	24	23
D. Wetlands	69	70	72	73	74	75	77	79	80	81
E. Settlements	11	11	11	11	11	11	11	11	11	11
F. Other Land	0	1	1	1	1	1	1	1	0	0
G. Other	7	7	7	7	7	7	7	7	7	7
6. Waste	12,254	12,358	12,375	12,367	12,504	12,439	12,533	12,601	12,749	12,846
A. Solid Waste Disposal on Land	0	0	0	0	0	0	0	0	0	0
B. Waste-water Handling	11,783	11,792	11,804	11,765	11,854	11,701	11,738	11,859	11,928	11,936
C. Waste Incineration	320	382	356	361	352	382	372	317	339	366
D. Other	135	165	192	220	280	348	418	421	478	540
7. Other	0	0	0	0	0	0	0	0	0	0
Memo Items:										
International Bunkers	1,954	1,888	1,942	2,036	2,114	2,081	2,302	2,477	2,622	2,459
Aviation	577	565	611	645	686	718	756	790	850	917
Marine	1,377	1,323	1,331	1,391	1,428	1,364	1,546	1,687	1,772	1,542
Multilateral Operations	0	0	0	0	0	0	0	0	0	0
CO_2 Emissions from Biomass	0	0	0	0	0	0	0	0	0	0

EU-27 - Gg N_2O (sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2000	2001	2002	2003	2004	2005	2006	2007
Total Emissions	409,013	402,951	391,660	390,664	394,348	389,031	375,323	373,866
1. Energy	39,882	40,671	40,544	41,208	41,443	41,197	41,586	41,309
A. Fuel Combustion (Sectoral Approach)	39,759	40,550	40,426	41,097	41,328	41,079	41,475	41,204
1. Energy Industries	11,094	11,463	11,547	11,790	11,706	11,715	11,850	11,884
2. Manufacturing Industries and Construction	6,865	6,917	6,829	6,908	6,954	7,008	7,158	7,122
3. Transport	14,057	14,251	14,366	14,475	14,644	14,392	14,550	14,689
4. Other Sectors	7,270	7,485	7,259	7,462	7,532	7,515	7,464	7,073
5. Other	474	433	425	463	491	449	453	437
B. Fugitive Emissions from Fuels	123	121	118	111	115	118	112	105
1. Solid Fuels	3	3	3	3	4	3	3	3
2. Oil and Natural Gas	120	118	115	108	111	116	109	102
2. Industrial Processes	65,214	64,612	56,786	59,667	61,203	61,908	50,345	51,355
A. Mineral Products	0	0	0	0	0	0	0	0
B. Chemical Industry	65,114	64,514	56,691	59,565	61,102	61,783	50,216	51,226
C. Metal Production	10	8	6	8	9	32	36	37
D. Other Production	0	0	0	0	0	0	0	0
E. Production of Halocarbons and SF_6	0	0	0	0	0	0	0	0
F. Consumption of Halocarbons and SF_6	0	0	0	0	0	0	0	0
G. Other	6	6	6	6	6	6	6	6
3. Solvent and Other Product Use	4,184	3,967	3,937	3,857	3,848	3,610	3,876	3,786
4. Agriculture	283,177	276,675	273,410	268,810	270,551	264,995	262,025	260,235
A. Enteric Fermentation	0	0	0	0	0	0	0	0
B. Manure Management	35,096	34,964	34,511	33,707	33,191	33,179	33,051	33,116
C. Rice Cultivation	0	0	0	0	0	0	0	0
D. Agricultural Soils	247,916	241,544	238,785	234,963	237,231	231,711	228,854	227,003
E. Prescribed Burning of Savannas	0	0	0	0	0	0	0	0
F. Field Burning of Agricultural Residues	165	167	115	140	128	105	119	116
G. Other	0	0	0	0	0	0	0	0
5. Land-Use, Land-Use Change and Forestry	3,447	3,909	3,697	3,859	3,746	3,741	3,865	3,441
A. Forest Land	221	177	194	260	182	221	236	221

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2000	2001	2002	2003	2004	2005	2006	2007
B. Cropland	3,102	3,551	3,324	3,420	3,375	3,338	3,449	3,042
C. Grassland	24	23	22	23	27	22	22	22
D. Wetlands	82	82	81	81	86	85	85	83
E. Settlements	11	12	12	12	11	11	11	11
F. Other Land	0	0	0	1	0	0	0	0
G. Other	7	64	64	64	64	64	61	61
6. Waste	13,109	13,117	13,286	13,262	13,557	13,579	13,625	13,739
A. Solid Waste Disposal on Land	0	0	0	0	0	0	0	0
B. Waste-water Handling	12,048	12,111	12,133	12,164	12,284	12,329	12,391	12,465
C. Waste Incineration	455	365	458	366	472	379	365	363
D. Other	603	639	694	731	799	869	868	909
7. Other	0	0	0	0	0	0	0	0
Memo Items:								
International Bunkers	2,774	2,817	3,126	3,208	3,407	3,537	3,786	4,025
Aviation	1,142	1,128	1,115	1,144	1,242	1,301	1,356	1,406
Marine	1,632	1,689	2,011	2,064	2,165	2,236	2,429	2,619
Multilateral Operations	0	0	0	0	0	0	0	0
CO_2 Emissions from Biomass	0	0	0	0	0	0	0	0

B4 EU-27 F-gases

EU27 - Gg F-gases (sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Emissions of HFCs - CO_2 equivalent (Gg)	**28,014**	**27,699**	**29,146**	**31,468**	**35,729**	**41,394**	**47,510**	**53,907**	**55,421**	**48,218**
2 B Chemical Industry	0	0	0	0	0	0	0	0	0	0
2 C Metal Production	0	0	0	0	0	0	0	0	0	0
2 E Production of Halocarbons and SF_6	27,459	27,116	28,370	28,223	30,838	32,864	34,073	36,630	33,376	23,062
2 F Consumption of Halocarbons and SF_6	555	584	776	3,244	4,892	8,530	13,437	17,277	22,045	25,155
Emissions of PFCs - CO_2 equivalent (Gg)	**19,740**	**18,156**	**15,196**	**14,259**	**13,638**	**13,542**	**12,947**	**10,546**	**9,901**	**9,669**
2 B Chemical Industry	0	0	0	0	0	0	0	0	0	0
2 C Metal Production	16,257	14,690	11,656	10,462	9,508	9,652	9,111	7,507	7,434	7,184
2 E Production of Halocarbons and SF_6	2,898	2,831	2,850	3,019	3,328	2,814	2,574	1,552	1,034	698
2 F Consumption of Halocarbons and SF_6	585	636	689	778	803	1,076	1,262	1,487	1,433	1,787
Emissions of SF_6 - CO_2 equivalent (Gg)	**11,035**	**11,477**	**12,302**	**13,219**	**14,584**	**15,660**	**15,490**	**13,860**	**13,061**	**11,029**
2 B Chemical Industry	0	0	0	0	0	0	0	0	0	0
2 C Metal Production	72	74	74	76	81	85	93	84	88	93
2 E Production of Halocarbons and SF_6	1,815	1,729	1,896	1,829	2,188	2,358	2,198	599	339	136
2 F Consumption of Halocarbons and SF_6	7,224	7,705	8,359	9,291	9,856	10,652	10,399	10,565	9,876	7,917

EU27 - Gg F-gases (sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2000	2001	2002	2003	2004	2005	2006	2007
Emissions of HFCs - CO_2 equivalent (Gg)	**47,556**	**46,415**	**49,033**	**53,306**	**54,438**	**58,521**	**59,816**	**63,111**
2 B Chemical Industry	0	0	0	0	0	0	0	0
2 C Metal Production	0	0	0	0	1	3	3	10
2 E Production of Halocarbons and SF_6	17,369	10,908	8,995	7,894	5,350	4,715	2,577	1,832
2 F Consumption of Halocarbons and SF_6	30,187	35,507	40,037	45,412	49,087	53,802	57,235	61,269
Emissions of PFCs - CO_2 equivalent (Gg)	**8,278**	**7,522**	**9,309**	**7,748**	**6,376**	**5,246**	**4,669**	**4,391**
2 B Chemical Industry	0	0	0	0	0	0	0	0
2 C Metal Production	5,553	4,912	6,952	5,024	3,724	2,999	2,583	2,433
2 E Production of Halocarbons and SF_6	678	662	489	748	785	475	345	322
2 F Consumption of Halocarbons and SF_6	2,047	1,948	1,869	1,983	1,873	1,775	1,748	1,644
Emissions of SF_6 - CO_2 equivalent (Gg)	**11,108**	**10,547**	**9,580**	**9,252**	**9,299**	**9,336**	**9,751**	**9,543**
2 B Chemical Industry	0	0	0	0	0	0	0	0
2 C Metal Production	117	125	122	114	114	120	136	125
2 E Production of Halocarbons and SF_6	143	100	120	155	117	117	125	0

B5 EU-27 Total GHGs

EU27 GHG- Gg – Summary (sheet 1 of 2)

GREENHOUSE GAS EMISSIONS	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
CO_2 emissions including net CO2 from LULUCF	4,056,832	3,943,038	3,791,049	3,738,356	3,709,789	3,754,531	3,838,289	3,752,604	3,741,267	3,668,580
CO_2 emissions excluding net CO2 from LULUCF	4,399,537	4,342,615	4,190,684	4,126,391	4,103,084	4,150,189	4,251,015	4,162,569	4,151,905	4,084,285
CH_4	601,589	587,896	570,665	561,187	548,465	547,120	541,149	525,090	505,049	494,008
CH_4 (without LUCF)	597,294	583,593	566,582	557,137	542,323	541,032	535,349	519,441	499,459	488,827
N_2O	512,591	484,828	466,169	447,393	453,804	454,829	459,533	457,628	434,318	411,497
N_2O (without LUCF)	508,406	480,716	462,140	443,317	449,584	450,753	455,715	453,786	430,127	407,363
HFCs	28,014	27,699	29,146	31,468	35,729	41,394	47,510	53,907	55,421	48,218
PFCs	19,740	18,156	15,196	14,259	13,638	13,542	12,947	10,546	9,901	9,669
SF_6	11,035	11,477	12,302	13,219	14,584	15,660	15,490	13,860	13,061	11,029
Total (including net CO_2 from LULUCF)	5,229,801	5,073,095	4,884,527	4,805,882	4,776,009	4,827,077	4,914,786	4,813,446	4,758,434	4,642,876
Total (excluding net CO_2 from LULUCF)	5,572,506	5,472,672	5,284,162	5,193,917	5,169,304	5,222,735	5,327,511	5,223,411	5,169,072	5,058,580
Total (without LULUCF)	**5,564,025**	**5,464,256**	**5,276,050**	**5,185,790**	**5,158,942**	**5,212,571**	**5,318,026**	**5,214,109**	**5,159,874**	**5,049,390**

GREENHOUSE GAS SOURCE AND SINK	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
1. Energy	4,277,406	4,244,074	4,096,713	4,043,337	3,993,254	4,031,512	4,142,270	4,037,064	4,024,333	3,963,565
2. Industrial Processes	477,995	440,681	424,968	409,812	437,774	455,942	452,542	459,742	432,444	392,808
3. Solvent and Other Product Use	16,242	15,763	15,119	14,656	13,788	13,881	13,937	13,970	14,149	13,728
4. Agriculture	579,476	548,775	525,757	506,452	504,548	504,075	506,016	507,313	505,040	501,030
5. Land-Use Change and Forestry	-334,225	-391,161	-391,523	-379,909	-382,933	-385,494	-403,108	-400,474	-400,857	-406,390
6. Waste	212,906	214,964	213,492	211,533	209,577	207,160	203,261	196,020	183,907	178,259
7. Other	0	0	0	0	0	0	0	0	0	0
Total (with LUCF)	5,229,801	5,073,095	4,884,527	4,805,882	4,776,009	4,827,077	4,914,918	4,813,635	4,759,017	4,643,001
Total (without LUCF)	5,564,025	5,464,256	5,276,050	5,185,790	5,158,942	5,212,571	5,318,026	5,214,109	5,159,874	5,049,390

EU27 GHG- Gg – Summary (sheet 2 of 2)

GREENHOUSE GAS EMISSIONS	2000	2001	2002	2003	2004	2005	2006	2007
CO_2 emissions including net CO2 from LULUCF	3,714,093	3,758,011	3,722,237	3,793,117	3,819,367	3,783,429	3,794,320	3,770,979
CO_2 emissions excluding net CO2 from LULUCF	4,105,781	4,184,401	4,158,060	4,252,345	4,264,404	4,231,549	4,243,101	4,186,657
CH_4	480,791	466,211	456,782	446,250	433,106	426,204	421,700	416,322
CH_4 (without LUCF)	475,288	461,189	451,713	440,698	428,140	421,010	416,371	411,243
N_2O	409,013	402,951	391,660	390,664	394,348	389,031	375,323	373,866
N_2O (without LUCF)	405,566	399,042	387,963	386,805	390,601	385,289	371,457	370,425
HFCs	47,556	46,415	49,033	53,306	54,438	58,521	59,816	63,111
PFCs	8,278	7,522	9,309	7,748	6,376	5,246	4,669	4,391
SF_6	11,108	10,547	9,580	9,252	9,299	9,336	9,751	9,543
Total (including net CO_2 from LULUCF)	4,670,838	4,691,658	4,638,600	4,700,337	4,716,935	4,671,767	4,665,579	4,638,213
Total (excluding net CO_2 from LULUCF)	5,062,526	5,118,048	5,074,423	5,159,565	5,161,972	5,119,887	5,114,359	5,053,891
Total (without LULUCF)	**5,053,576**	**5,109,116**	**5,065,657**	**5,150,154**	**5,153,259**	**5,110,952**	**5,105,165**	**5,045,371**

GREENHOUSE GAS SOURCE AND SINK	2000	2001	2002	2003	2004	2005	2006	2007
1. Energy	3,969,634	4,053,342	4,022,517	4,108,873	4,106,381	4,066,421	4,067,711	3,999,083
2. Industrial Processes	405,059	393,545	390,423	400,991	412,528	419,983	417,664	430,558
3. Solvent and Other Product Use	13,502	12,955	12,823	12,574	12,624	12,405	12,513	12,362
4. Agriculture	493,196	484,810	479,403	473,554	472,846	466,438	463,479	462,217
5. Land-Use Change and Forestry	-382,737	-417,458	-427,058	-449,817	-436,324	-439,186	-439,586	-407,158
6. Waste	172,186	164,464	160,492	154,161	148,881	145,706	143,797	141,152
7. Other	0	0	0	0	0	0	0	0
Total (with LUCF)	4,670,838	4,691,658	4,638,600	4,700,337	4,716,935	4,671,767	4,665,579	4,638,213
Total (without LUCF)	5,053,576	5,109,116	5,065,657	5,150,154	5,153,259	5,110,952	5,105,165	5,045,371

Appendix C - Further information: Policies and measures

C1 Summary of Rural Development Policy Actions

RD Measures	Actions	Potential
Axis 1:		
Modernisation of agricultural holdings	Investments in energy-efficient equipment and buildings Investments for on-farm use of renewable energies	Potential for energy savings and reduction of CO_2 emissions
	Plantation of multi-annual energy crops (e.g., miscanthus, short rotation coppice)	Contribution to biomass-based energies that can replace GHG emission-intensive fossil fuels
	Support to investments in biogas plants (using animal manure)	Potential for reductions of CH_4 emissions
	Investments in manure management storage facilities Investments in equipment for better application of fertiliser (spreader, precision farming)	Potential for reductions of CH_4 and N_2O emissions
Training	Targeted training to climate change issues or inclusion in the training programmes	Better farmers' knowledge about main flows of GHG emissions of farm activities and mitigation measures
Improvement in the economic value of forests	Improving the wood production (e.g.: thinning, changes in the tree species composition)	Substitution of fossil fuels or high energy content material as steal or concrete
Adding value of forestry products	Development of new products, processes and technologies to use wood	Increasing of the use of low-value timber, small-sized wood and wood residues for energy production.

RD Measures	Actions	Potential
Axis 2:		
Agri-environmental measures	Reduction of fertilisers use Conversion of arable land to permanent pastures Maintenance of permanent fallows areas Extensification of livestock (such as reduction stocking density) Soil conservation techniques (minimum, no-tillage) maintenance of green cover Organic farming	Agri-environmental measures hold an important potential to stimulate adoption of targeted or climate-relevant measures to reduce CH_4 and N_2O emissions, reduce carbon losses and enhance carbon sinks
Non-productive investments	Planting of hedgerows (under measure)	
First afforestation of agricultural land	Support to the establishments of forests on lands in other uses	Promote carbon sequestration in afforested land and provide renewable energy and materials in the future
First afforestation of non agricultural land		
Forest-environment	Forest management enhancing carbon sink pool of forests: continuous forest cover, special regeneration systems, Tree species composition	Promote carbon sinks in and enhance adaptation of forests
Restoring forestry potential and prevention actions	Forest fire prevention actions	Recover potential for carbon sequestration / avoid CO_2 emissions (in case of forest fires)
Non-productive investments	Changing the tree species composition for environmental reason	Promote the transformation to more resilient forest stand type

RD Measures	Actions	Potential
Axis 3:		
Diversification into non-agricultural activities	Support to biogas plants on farm Support to biomass plants for local production of renewable energy (electricity and heating)	These measures contribute to reduction of CO_2 emissions by the provision of biomass-based energies that replace CO_2 emission-intensive energies
Support for business creation and development (micro-enterprises)	Building renewable energy infrastructure	
Basic services for the economy and rural population	Installations of renewable energies for local energy provision	

Appendix D - Projection data tables

Table 1- Summary of GHG emission projections for EU 15 countries by sector, excluding LULUCF (Mt CO_2 eq)

SECTOR	BY	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Energy (excluding transport)	NA	2558	2577	2479	2423	2399	2418	2486	2409	2428	2383	2397	2459
Transport	NA	699	713	738	746	750	760	777	786	810	830	831	840
Industrial Processes	NA	372	361	349	339	361	371	369	378	357	325	330	321
Agriculture	NA	419	410	405	398	400	402	406	407	407	406	403	394
Waste	NA	171	173	172	170	168	165	161	153	148	141	136	129
Other	NA	14	13	13	13	12	12	12	12	12	12	12	11
Total	**4266**	**4233**	**4247**	**4157**	**4089**	**4089**	**4128**	**4210**	**4146**	**4163**	**4098**	**4108**	**4154**
Marine	NA	104	103	104	108	105	107	114	124	130	124	130	135
Aviation	NA	62	62	67	71	75	80	84	89	96	104	110	109

SECTOR	2002	2003	2004	2005	2006	2007	2010		2015		2020	
							WEM	WAM	WEM	WAM	WEM	WAM
Energy (excluding transport)	2434	2487	2477	2452	2438	2369	2309	2256	2363	2186	2342	2027
Transport	850	856	867	862	863	864	861	843	882	839	894	827
Industrial Processes	320	325	331	332	325	332	308	307	314	309	318	311
Agriculture	389	385	383	377	373	371	364	364	360	361	356	356
Waste	123	117	112	109	107	105	92	92	85	82	80	77
Other	11	11	10	10	10	10	10	10	10	10	10	10
Total	**4127**	**4180**	**4180**	**4141**	**4116**	**4052**	**3946**	**3873**	**4015**	**3789**	**4002**	**3610**
Marine	140	142	150	158	168	170	138	138	145	145	154	154
Aviation	106	110	119	124	129	133	93	91	109	107	127	125

Table - 2 Summary of GHG emission projections for EU 27 countries by sector (Mt CO2 eq)

SECTOR	BY	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Energy (excluding transport)	3498	3460	3289	3227	3171	3194	3280	3164	3123	3046	3052	3122	3498
Transport	780	785	808	816	823	838	863	873	901	918	918	931	780
Industrial Processes	478	441	425	410	438	456	453	460	432	393	405	394	478
Agriculture	579	549	526	506	505	504	506	507	505	501	493	485	579
Waste	213	215	213	212	210	207	203	196	184	178	172	164	213
Other	16	16	15	15	14	14	14	14	14	14	14	13	16
Total	**5564**	**5464**	**5276**	**5186**	**5159**	**5213**	**5318**	**5214**	**5160**	**5049**	**5054**	**5109**	**5564**
Marine	75	75	77	80	78	80	84	91	95	92	96	102	75
Aviation	42	42	46	49	52	56	58	62	67	71	76	75	42

SECTOR	2002	2003	2004	2005	2006	2007	2010		2015		2020	
							WEM	WAM	WEM	WAM	WEM	WAM
Energy (excluding transport)	3079	3155	3134	3095	3090	3017	3020	2951	3113	2910	3128	2784
Transport	944	954	973	972	978	983	992	971	1024	975	1045	970
Industrial Processes	390	401	413	420	418	431	403	399	420	412	432	422
Agriculture	479	474	473	466	463	462	461	459	462	459	462	459
Waste	160	154	149	146	144	141	135	135	130	127	128	124
Other	13	13	13	12	13	12	12	12	11	11	12	12
Total	**5066**	**5150**	**5153**	**5111**	**5105**	**5045**	**5024**	**4929**	**5161**	**4896**	**5208**	**4771**
Marine	102	102	108	115	122	121	141	141	149	149	157	157
Aviation	74	76	83	88	91	92	1	92	110	109	128	126

Table - 3 Summary of GHG emission projections for EU 15 countries by gas (Mt CO_2 eq)

GAS	BY	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
CO2	NA	3360	3383	3306	3252	3252	3286	3363	3308	3355	3328	3354	3422
CH4	NA	436	432	426	423	414	411	406	394	385	376	366	354
N2O	NA	387	383	376	363	370	371	375	374	354	334	331	323
F-gases	NA	56	54	55	57	62	68	73	76	76	67	64	61
Total	**4266**	**4239**	**4253**	**4162**	**4095**	**4097**	**4136**	**4218**	**4153**	**4170**	**4104**	**4114**	**4160**
GAS	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2010**		**2015**		**2020**		
							WEM	**WAM**	**WEM**	**WAM**	**WEM**	**WAM**	
CO2	3411	3477	3488	3459	3452	3391	3306	3235	3393	3176	3391	3013	
CH4	344	331	320	314	309	305	279	279	266	262	255	249	
N2O	315	313	314	309	295	292	289	288	280	278	279	276	
F-gases	64	65	65	66	67	69	72	71	77	73	77	71	
Total	**4134**	**4187**	**4187**	**4148**	**4122**	**4058**	**3946**	**3873**	**4015**	**3789**	**4002**	**3610**	

Table - 4 Summary of GHG emission projections for EU 27 countries by gas (Mt CO_2 eq)

GAS	BY	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
CO2	NA	4400	4343	4191	4126	4103	4150	4251	4163	4152	4084	4106	4184
CH4	NA	602	588	571	561	548	547	541	525	505	494	481	466
N2O	NA	513	485	466	447	454	455	460	458	434	411	409	403
F-gases	NA	59	57	57	59	64	71	76	78	78	69	67	64
Total	**NA**	**5573**	**5473**	**5284**	**5194**	**5169**	**5223**	**5328**	**5224**	**5170**	**5059**	**5063**	**5118**

GAS	2002	2003	2004	2005	2006	2007	2010		2015		2020		
							WEM	WAM	WEM	WAM	WEM	WAM	
CO2	4158	4252	4264	4232	4243	4187	4176	4086	4322	4072	4373	3956	
CH4	457	446	433	426	422	416	395	393	383	376	375	366	
N2O	392	391	394	389	375	374	374	373	372	368	376	370	
F-gases	68	70	70	73	74	77	79	77	84	80	85	79	
Total	**5074**	**5160**	**5162**	**5120**	**5114**	**5054**	**5024**	**4929**	**5161**	**4896**	**5208**	**4771**	

Table - 5 Summary of GHG emission projections for EU 15 countries by sector and by gas for the "with existing measures" scenario (Mt CO_2 eq)

Sector	CO2			CH4			N2O			F-gases		
	2010	2015	2020	2010	2015	2020	2010	2015	2020	2010	2015	2020
Energy (excl. transport)	2243	2300	2281	41	38	34	23	23	23	0	0	0
Transport	846	867	881	1	1	1	16	15	15	0	0	0
Industrial processes	209	217	220	0	0	0	27	19	20	72	77	77
Waste	3	3	3	77	70	65	11	12	12	0	0	0
Agriculture	0	0	0	157	155	153	206	205	203	0	0	0
Other	5	5	5	1	1	1	6	6	6	0	0	0
Total	**3306**	**3393**	**3391**	**279**	**266**	**255**	**289**	**280**	**279**	**72**	**77**	**77**

Table - 6 Summary of GHG emission projections for EU 15 countries by sector and by gas for the "with additional measures" scenario (Mt CO_2 eq)

Sector	CO2			CH4			N2O			F-gases		
	2010	2015	2020	2010	2015	2020	2010	2015	2020	2010	2015	2020
Energy (excl. transport)	2192	2128	1974	41	37	32	22	22	21	0	0	0
Transport	826	823	811	1	1	1	15	15	15	0	0	0
Industrial processes	209	217	220	0	0	0	27	19	20	71	73	71
Waste	3	3	3	77	67	62	11	12	12	0	0	0
Agriculture	0	0	0	157	155	153	207	205	203	0	0	0
Other	5	5	5	1	1	1	6	6	6	0	0	0
Total	**3235**	**3176**	**3013**	**279**	**262**	**249**	**288**	**278**	**276**	**71**	**73**	**71**

Table 7 - Summary of GHG emission projections for EU 27 countries by sector and by gas for the "with existing measures" scenario (Mt CO_2 eq)

Sector	CO2			CH4			N2O			F-gases		
	2010	2015	2020	2010	2015	2020	2010	2015	2020	2010	2015	2020
Energy (excl. transport)	2910	3005	3023	81	79	76	27	28	28	0	0	0
Transport	974	1006	1027	2	2	1	19	18	18	0	0	0
Industrial processes	282	299	308	1	1	1	41	36	38	79	84	85
Waste	5	6	8	117	110	105	14	14	15	0	0	0
Agriculture	0	0	0	193	192	190	267	270	271	0	0	0
Other	6	6	6	1	1	1	6	6	6	0	0	0
Total	**4176**	**4322**	**4373**	**395**	**383**	**375**	**374**	**372**	**376**	**79**	**84**	**85**

Table - 8 Summary of GHG emission projections for EU 27 countries by sector and by gas for the "with additional measures" scenario (Mt CO_2 eq)

Sector	CO2			CH4			N2O			F-gases		
	2010	2015	2020	2010	2015	2020	2010	2015	2020	2010	2015	2020
Energy (excl. transport)	2844	2808	2687	80	76	73	26	26	25	0	0	0
Transport	951	956	951	2	1	1	18	18	18	0	0	0
Industrial processes	279	295	304	1	1	1	41	35	37	77	80	79
Waste	5	6	8	117	106	101	14	15	15	0	0	0
Agriculture	0	0	0	193	190	189	267	268	269	0	0	0
Other	6	6	6	1	1	1	6	6	6	0	0	0
Total	**4086**	**4072**	**3956**	**393**	**376**	**366**	**373**	**368**	**370**	**77**	**80**	**79**

Appendix E - Summary of Member State projections methodologies

MS	Description Projections Methodology	QA/QC Activities
Austria	Projections are calculated based on models, sectoral forecasts (mainly activity data) and other projected parameters. Emission projections are generally calculated applying the same methodologies as for the national GHG inventory. These are reported in Austria's National Inventory Report 2009. The emission projections are based on the following sectoral forecasts: • Energy Forecast, based on the National Energy Balance of Statistics Austria and on a macro-economic model of the Austrian Institute of Economic Research (WIFO 2007a), supported by calculations with the bottom-up models BALMOREL, LEAP (AEA) and ERNSTL (EEG). • Transport Forecast, based on a bottom-up, national transport model GLOBEMI (Technical University of Graz). • Forecast of emissions from industrial processes, of solvent emissions and emissions of fluorinated gases are based on expert judgements of the Umweltbundesamt. • Agricultural Forecast, based on the PASMA model of the Austrian Institute of Economical Research (SINABELL & SCHMID 2005) and expert consultations with the Agricultural Research and Education Centre, Gumpenstein (PÖLLINGER 2005, 2008). • Waste Forecast, based on the forecast of quantity of waste deposited and wastewater handled of the Umweltbundesamt.	A questionnaire has been used for checking input data regarding the most important data quality requirements. The project strategy includes several data consistency checks. A fixed input form has been used for each sector. In general, data quality checks similar to the management system of the Austrian Air Emission Inventory have been performed in each sector. Often the person who is responsible for the sectoral emission is identical to the person who is responsible for the Inventory, and some sectors use emission methods based on the verified inventory methods. An output data check has been carried out by comparing the results of the sectors in detail and checking the plausibility of the emission trends. The report also presents sensitivity assessments for specific sectors, analysing increase and decrease of key factors such as gas price, electricity demand etc or combination of key factors. The variation of the chosen input parameters in the sensitivity analysis can be seen as an indicator of the overall uncertainty caused by changed input data.

MS	Description Projections Methodology	QA/QC Activities
Belgium	Projections are the sum of regional bottom-up projections which are calibrated on the regional energy balances. The bottom-up approach starts from the demand side and the consumption needs of different sectors. The calculations of the projections are based on the following models: • MARKAL aims to supply energy services at minimum loss of surplus by making decisions on equipment investment and operation energy supply and trade. The model can take into account price effects, policies, supply curves and different technologies to transform primary resources into energy services. • EPM explains energy consumptions and GHG emissions from activity variables and containing a detailed representation of emission sources and the main factors of the evolution of energy demand. • EBEEPM studies energy demand and atmospheric emissions from stationary sources (residential, tertiary, industry and energy sector). • TREMOVE studies the effects of different transport and environmental policies on the emissions of the transport sector (maritime not included).	As a first sensitivity analysis (of the WEM scenario) the compiled regional projections are compared with national projections calculated with the econometric model HERMES. In other words this is a comparison of the technological bottom-up approach with the macro-economic top-down approach. Furthermore sensitivity analyses are performed for some other important parameters such as number of degree-days, nuclear phase out, etc. without however taking indirect effects into account.
Bulgaria	The projections were made using the ETS verified electricity emissions from 2005 to 2008 in relation to the projections for the electricity production of the Electricity Authority of Cyprus to project the GHG emissions up-to 2020. Since the 2008 ETS verified report for electricity production shows a difference of approximately 30% when compared without the set-aside.	Information not available
Cyprus	The projections were made using the ETS verified electricity emissions from 2005 to 2008 in relation to the projections for the electricity production of the Electricity Authority of Cyprus to project the GHG emissions up-to 2020. Since the 2008 ETS verified report for electricity production shows a difference of approximately 30% when compared without the set-aside.	Information not available
Czech Republic	The largest source of greenhouse gas emissions in the Czech Republic are energy processes. Therefore, the projections of emissions were largely calculated using a complex EFOM/ENV energy management model. This model requires as input the technological database, database of fuels, energies and demand for energy. The projection of the population number is based on the CSO publication “Projection of the Population of the Czech Republic until 2050 (publication code No. 4020-03)“. In terms of Economic Growth, there exists no official long-term prospect prediction of GDP trend. In view of current economic crisis, this projection holds a lot of uncertainties. Economic development is a dominant factor influencing results of the projection. In this situation, a sensitivity analysis of the projections would be most beneficial in terms of economic development as the influence of other factor will be significantly lower.	In view of current economic crisis, this projection holds a lot of uncertainties. Economic development is a dominant factor influencing results of the projection. Possible development varies from fast recovery from crisis to further crash and economic recession over several years. In this situation, a sensitivity analysis of the projections would be most beneficial in terms of economic development as the influence of other factor will be significantly lower.

MS	Description Projections Methodology	QA/QC Activities
Denmark	The emissions are projected to 2025 using basic scenarios together with the expected results of individual policy measures. Official Danish forecasts of activity rates are used in the models for those sectors for which the forecasts are available, i.e. the latest official forecast from the Danish Energy Agency.	The projections models are based on the same structure and methodology as the Danish emission inventories in order to ensure consistency. In the referenced Technical Report No. 703, 2009 "Projection of Greenhouse Gas Emissions 2007 to 2025" consistency checks of sums etc. have been performed by NERI. With NERI also being responsible for providing Denmark's annual GHG inventories, consistency with historic emissions is obtained. Other institutions being responsible for some of the activity data projection (in particular the Danish Energy Agency providing the energy projections) have many years of experience with projection work and fine tuning and validation of models etc. Occasionally historic trends have been compared with projections from the past. Taking into account unpredictable inter annual variations in temperature, net electricity imports (primarily due to unpredictable variations in precipitation in Norway and Sweden) and inventory time series recalculations due new knowledge about emission factors etc., the trends projected in the past coincide pretty well with historic trends.
Estonia	These projections are based on the use on energy supply development model NEEDS (or NEEDS/TIMES). The development work was carried out as an Integrated Project under the EU 6th Framework Programme addresses Priority 6.1: Sustainable Energy Systems and, more specifically, Sub-priority 6.1.3.2.5: Socio-economic tools and concepts for energy strategy. The main objective of the elaboration of the NEEDS was to evaluate the full costs and benefits of energy policies and of future energy systems, both at the level of individual countries and for the enlarged EU as a whole. This huge amount of work, related to the development of the model of a large region and a numbers of countries inside it had to give a tool for projection of and planning of the energy supply development as in the EU as whole so in each member country as well. The tool selected for this modelling is the Integrated MARKAL-EFOM System (TIMES). A long-term time horizon (2050, by 5-year step) is used to support the definition of long term strategies, taking into account different standards of energy devices and technologies development. The main source for the base-year of all countries of the model is the Eurostat database. The section “Energy and Environment” of this database provides all the energy flows for the base- year (2006), as well as the installed capacities for power plants and import/export figures. Methodological consistency with other important global energy modelling efforts (US-EIA) is maintained using the VEDA database system for the NEEDS/TIMES national and Pan-European models.	At the given state of the development of the NEEDS/TIMES model of the pan EU energy supply development model one of possible ways for the sensitivity analysis of a country model is to compare the differences of the electricity production and the CO2 emission in 2020 depending on the electricity generated by different renewable energy sources.

MS	Description Projections Methodology	QA/QC Activities
Finland	The projections reported are based on the background calculations of the long-term climate and energy strategy for Finland. The baseline scenario is the basis for WM projections and the objective scenario for WAM projections. The key starting points for the projections are the development of national economy and its structure, population, energy prices in the world markets, the price of emission allowances in the baseline scenario and the development of the technology as well as various sector-specific issues.	The P&M-report has been prepared by an inter-ministerial working group including members from all relevant ministries and Statistics Finland. The projections were prepared for the long-term climate and energy strategy. More information on the strategy preparation can be found in p.8 of the report.
France	References 1 to 4 describe the energy scenario and economical parameters. The methodology is described in the report made by CITEPA for the MEEDDAT; WEM includes all measures decided before 1st January 2008 and WAM includes all WEM and measures decide	QA/DC activities have been carried out in all the process of development of projections. Our reference year is 2006. the methodology used for projection does not take into account all the detailed activities considered in the yearly emission inventory.
Germany	For the scenario development, an energy system model is deployed, with the help of which the results of detailed (and in part, model-based) sectoral analyses are consolidated to a consistent and comprehensive data set for the energy-economic development.	Inventory data is subject to quality controls as prescribed in article 12 as well as to documentation and archiving. Several ministries and agencies are involved.
Greece	The two main models used are TIMES / MARKAL in combination with WASP IV and COSTPLUS for the energy sector simulates the energy market, and spreadsheet models for the non-energy sectors in which future changes in activity data are derived from statistical analysis and emissions factors based on the IPCC guidelines.	Information not available
Ireland	The projections for Ireland are, underpinned by SEI's energy forecasts which are based on the Credit Crunch scenario from the ESRI's 2008 Medium-Term Review. This assumes a recession in the short term (2008-2009) but that the economy reverts back to where it otherwise would have been by 2020. Since these energy forecasts were prepared the economic outlook has deteriorated even further than anticipated. As a result an Economic Shock has been discussed as part of a sensitivity analysis. The Economic Shock was applied to two scenarios used to develop the Emissions projections. • With Measures is based on the Baseline energy forecast and includes existing policies and measures. • With Additional Measures includes existing measures and planned policies and measures and is based on the White Paper energy forecast. For Agriculture The methodology used to develop emissions projections for both CH4 and N2O are consistent with those employed in compiling the greenhouse gas inventory.	It is most likely that the actual out-turn for future emissions of greenhouse gas emissions is best reflected in the Economic Shock analysis given the deterioration in the economic outlook in recent months. It is unlikely that the extent of the economic down-turn will be limited to a 0.5% contraction in GDP in 2008 and 2009 (which is the basis for ESRI's Credit Crunch scenario and hence the With Measures and With Additional Measures scenarios) but that a deeper recession is now underway. As more up-to-date economic analysis and energy forecasts become available, the EPA will update emissions projections accordingly.

MS	Description Projections Methodology	QA/QC Activities
Italy	The scenarios of greenhouse gas emissions from the combustion of energy sources are drawn from the Markal model. MARKAL provides energy services at minimum loss of surplus by making decisions on equipment investment and operation energy supply and trade. The evolution trend is based on a continuation of recent trends in the Italian economy and energy. The update consist in the use of 2007 final data and 2008 preliminary energy consumption data as an additional input to the model, with the objective to improve reliability of its results.	MS provided an uncertainty analysis. It is stated that QC procedures are also undertaken on the calculations of uncertainties in order to confirm the correctness of the estimates and that there is sufficient documentation to duplicate the analysis. The assumptions on which uncertainty estimations are based are documented for each category.
Latvia	Projections are based on a long-term macroeconomic projection for the time period 2000 – 2020. This projection is the basis for modelling of further development, GHG emissions and CO2 removals in the main economic sectors. The long-term macroeconomic projection is drawn up on the basis of long-term macroeconomic projections developed by the Ministry of Economics. MARKAL is a generic model used to estimate projections in the energy sector and COPERT III model is used in the transport sector.	Information provided in Latvian
Lithuania	GHG emission projections are based on the basic economic growth and forecast of basic energy demand scenarios.	The data used for projections of GHG emissions and corresponding calculations were checked and verified in accordance with the QA/QC plan aimed at improving transparency, consistency, comparability, completeness, and confidence in the national inventory of emissions estimates (see National GHG emissions inventory report 2008)
Luxembourg	The method for estimating GHG emission levels up to 2020 is making use of information on demographic, transport and housing developments in Luxembourg. Assumptions on future physical production in the various energy and industrial sectors is another input for the modelling tool used EPM (Energy/Emissions Projection Model) developed by the company ECONOTEC. However, neither GDP growth nor carbon or energy prices have been taken into account while preparing the projections.	Consequently, without explicit use of either GDP or energy and carbon prices, no sensitivity analysis could have been performed so far on the projections.
Malta	The projections for Energy industries have been developed in collaboration with the state-owned utility Enemalta Corporation and take 2007 as the starting point. Projections on transport have been developed on the basis of historic trends in the period 1990 to 2007 using regression analysis. Qualitative and quantitative information on the different policies and measures was obtained directly from the entities responsible for implementing the measures and from a number of public documents which have been duly referenced.	To validate the GHG emissions projection thus obtained, it was compared to a projected trend based on a linear extrapolation of historic emissions for this sub-sector (1990 –2000). The deviation between the two projections was found to be minimal.

MS	Description Projections Methodology	QA/QC Activities
Netherlands	Emissions associated with two socio-economic scenarios ('Strong Europe' and 'Global Economy') are projected by the Netherlands for three different policy variants ('without measures' (WOM), 'with measures' (WM) and 'with additional measures' (WAM)) and years. However, the 2010 WAM projections had to be equalised with the WM values since both of them showed higher emissions levels than in the WM variant. While both scenarios reflect a world with broad international cooperation, they differ in their orientations. In the 'Strong Europe' scenario, international cooperation is coupled to public responsibility. European institutions are reformed and the EU grows into a stronger economic and political block. The United States becomes part of a worldwide climate coalition pursuing successful policies which make extensive use of the Kyoto mechanisms. The public responsibility orientation is expressed through relatively even income distribution, greater social security and investments in education and research. A reasonable rate of economic growth is achieved mainly due to the larger markets. Annual average growth in GDP between 2002 and 2020 is at 1.7 %. 'Global Economy' is oriented sharply towards international trade but little political cooperation. A strong emphasis on the personal responsibility of citizens and corporations results in relatively high economic growth and material welfare. Population growth is highest in the 'Global Economy' scenario. Environmental awareness is not translated into strong regulations and international climate policies fail over the longer term, although in Western Europe climate policy remains strong until 2020. GDP grows by 2.7 % per year between 2002 and 2020.	Information not available
Portugal	The projections for energy consumption and other sources of GHG for 2005-2020 are built on national macroeconomic scenarios with the evolution of the global and sectoral growth, GDP and Gross Value Added (GVA) respectively, housing, services and the needs of passengers and products mobility expansion. These prospective scenarios, developed by the Department of Prospective, Planning and International Relations (DPP), originate needs for goods and energy that will be supported towards the energy and industrial systems that simultaneously generate GHG emissions. These projections are coherent with the methodology used in the Portuguese National Inventory (APA, 2007) and, therefore, with the IPCC guidelines.	In order to consider the main sources of uncertainty associated with the modelling the sensitivity analysis was focused on the factors that have more impact in the energy sector: hydro potential for the production of electricity and primary energy prices. In the case of the primary energy prices, for the sensitivity analysis, the high scenario was based on the work of the International and of the USA Energy Agencies, which was validated by national experts. The prices for natural gas and coal assuming the relation among crude oil and other fossil fuels' prices equivalent to the scenario Hugh Growth defines in World Energy Outlook 2007 from International Energy Agency.

MS	Description Projections Methodology	QA/QC Activities
Romania	The projections are based on calculations carried out using the ENPEP (Energy and Power Evaluation Program) programs package, developed by Argonne National laboratory of US Department of Energy (DOE) and distributed to Romania by the International Atomic Energy Agency (IAEA). The main modules used for the GHG projections preparation are: • MAED (Model for Analyses of Energy Demand) – forecasts the energy demand considering the information on the macroeconomic indicators trend, etc. • ELECTRIC – determines the electricity power plants development programme considering the Romanian Government's adopted policies on renewable energy resources use, on ensuring the energy security, on technological evolution and on international market fuel prices. • BALANCE – determines the demand-supply energy equilibrium for each analyzed year. • IMPACTS – estimates, for the energetic system determined using the BALANCE module and for the electro-energetic system determined using the ELECTRIC module, the impact on atmosphere, water, soil, the impact of the specific waste, the impact on materials and labour needed for the installations construction and exploitation, the impact on related employees risk and health. In order to allow the use of the modules package, a national energy balance has been prepared considering the available or imported primary energy resources.	A sensitivity analysis has been conducted for a complete characterisation of the solution for the development of the energy sector and the GHG emission projections. The analysis evaluated the effects of variation of different key parameters (technical or economic) on the adopted solution: electricity consumption, fuel prices, price of un-delivered energy, value of safety indicator and value of new groups investments.
Slovakia	The optimization model MESSAGE was used to develop projections, in all three options (WOM, WEM and WAM), of CO2 emissions from the energy sector, combustion and transformation of fossil fuels. Emission projections in other sectors (e.g. agriculture, transport, etc.) were prepared based on development of macro-economic parameters and available expert analysis on production. We have also used specific forecasts and GHG emission projections as prepared directly by some of the major emitting companies.	Results of sensitivity analysis indicate possible impact of the EU ETS (the price of allowances) and increasing share of renewable energy sources in the energy balance of the SR have been followed by modelling the WEM and WAM scenarios. There is urgent need to diversify import of primary energy sources and to decrease our dependency on their imports by higher share of domestic RES (namely biomass).

MS	Description Projections Methodology	QA/QC Activities
Spain	The projections are based on the methodology developed by AEMA and the EPA.	To verify and store results they have developed a tool called EmiPro. The employed model shows improvements compared to the versions used for the calculation of projections for the 4th NC to the UN as well as submissions to the EC in previous years. Internally there are better quality controls and adjustments of input data with other national organisations. Beyond, a sectoral sensitivity analysis and an uncertainty analysis related to the WEM scenario based on the sensitivity analysis have been performed.
Sweden	Projections of greenhouse gas emissions in Sweden have been produces for the years 2010, 2015 and 2020. The projections are based on the policies and measures approved by the Swedish parliament up to the year 2008, which means that it is a projection "with existing measures". When producing the projections, model-based calculations and to some extent expert evaluations are used. The projections can be mainly regarded as a consequential analysis of the assumptions that have been made, all of which are characterised by uncertainty. The method for estimating the projections is mainly developed for a medium-term or a long-term projections, which means that the projection for 2010 does not take into consideration variations on a short-term basis. The decision on the premises and assumptions used in the projection was made in June 2008, therefore before the economic downturn that occurred in the autumn of 2008.	In addition to the projections, two sensitivity scenarios have been estimated for the energy and transport sector, and one scenario has been estimated for the agricultural sector. A projection with "additional measures" is also reported, although the measures are probably not needed to reach Sweden's commitment according to the Kyoto Protocol.

MS	Description Projections Methodology	QA/QC Activities
United Kingdom	The projections are based on the following models and assumptions: • The DECC Energy Model is a partial equilibrium model linked to a linear optimizing model of the electricity generating sector. It is primarily a top down model based around econometrically estimated relationships between energy demand, economic activity (income) and energy prices, and an optimizing model for the electricity supply industry. The projections provide a view of possible future levels of CO2 emissions and composition of energy demand based on different scenarios for economic growth and world energy prices. The updated energy projections provide a with measures central baseline projection. • Non-CO2 greenhouse gas projections have been calculated using a bespoke projections system which complements the national inventory system. The projections system includes spreadsheets to pre-process data, and to feed the projections database which is linked to the national GHG emissions database. This projections system calculates emissions based on forecast activity statistics, emissions factors and various other sector specific assumptions for each of the main sources of emissions. Greenhouse gas emission projections are disaggregated by sector and are calculated for each year from 2005 to 2050. These are then aggregated to provide an estimate of total projected emissions. • Land use change emission estimates are from a model developed by the Centre for Ecology and Hydrology under contract to DECC. The model uses land use data derived from periodic surveys, supplemented by an annual census of agricultural land uses. The model is based on continuation of current patterns of land use change taking account of plans to expand the residential sector. It is combined with information on soil carbon density and dynamics to estimate annual gains and losses associated with the transitions involved. • Key assumptions for the projections are economic growth and a range of fossil fuel prices. Economic growth is consistent with the latest UK Treasury forecasts published in the Budget and fossil fuel price assumptions are provided through analysis by government. Other assumptions such as population and household forecasts are provided by National Statistical Office and Government Actuarial Service.	Information not available

Appendix F - Further information: Vulnerability Assessment, Climate Change Impacts And Adaptation Measures

F1 Sample of impacts, vulnerability and adaptation research funded under the EC Framework Programme since the 4th National Communication[525]

	6th Framework Programme (2002 – 2006)	7th Framework Programme (2007 – 2013)
Assessment of Impacts	Future climate projections - **ENSEMBLES.** This UK-led project brings together 70 partners from the EU, Switzerland, Australia and the US, with EC funding of €15 million. The project aims to develop and test a prediction system for climate change, simultaneously using several models, and to quantify and reduce uncertainty in the representation of feedbacks in the Earth system. Work packages are divided into sections including ones on impacts and vulnerability. Developing Arctic Modelling and Observing Capabilities for Long-term Environmental Studies – **DAMOCLES.** This project aims to carry out an observation and assessment of Arctic sea ice cover and its reduction due to global warming. In studying key interactions between the Arctic's ocean, atmosphere and ice cover. The EC is providing funding of €16.5 million for the Project, which will analyse model predictions on sea-ice cover and explore the timing of these changes, and the regional and global effects of such changes. DAMOCLES represents the integrated efforts of 45 European research institutions including 10 SMEs (Small and Medium Enterprises) distributed among 12 European countries, and coordinated with the USA, Russia, Canada and Japan.	**CIRCE** focuses on the prediction of climate change impacts in the Mediterranean basin and evaluates the consequences of such impacts for the society and economy. The **CIRCLE-ERANET** provides climate impact analysis by networking and aligning national research programs in 19 European countries, with the final aim to implement a European Research Area in the field of climate change. The **EDEN** research project is studying how changes in European environment and ecosystems, whether caused by altered human activity patterns or changes in climate, can influence the spatial and temporal distribution and dynamics of pathogenic agents. The project contributed to the establishment of the European Centre for Disease Prevention and Control, with the aim to create a European Environment and Epidemiology network to monitor environmental change and its effects on infectious diseases. The **MICRODIS** integrated project addresses health and socio-economic impacts of extreme events in order to strengthen prevention, mitigation and preparedness strategies.

525 This table is a sample of the impacts, vulnerability and adaptation research funded by the EC Framework Programme. For more information on the past and current activities of the Joint Research Centre (JRC) see: http://ccu.jrc.ec.europa.eu/home.php#. For more information on the support provided by JRC to EU climate change policy see: http://ccu.jrc.ec.europa.eu/doc/2287_07-EUR21855en.pdf. For more information on the European Research Framework Programme see: http://ec.europa.eu/research/environment/pdf/cop-15.pdf. Details can be found at http://cordis.europa.eu/fp6/dc/index.cfm?fuseaction=UserSite.FP6HomePage for projects funded under the 6th Framework Programme and http://cordis.europa.eu/fp7/ for projects funded under the 7th Framework Programme.

	6th Framework Programme (2002 – 2006)	7th Framework Programme (2007 – 2013)
	The **PESETA** project was designed to make a multi-sectoral assessment of the impacts of climate change in Europe for the 2011-2040 and 2071-2100 time horizons and focused on the impacts of climate change on the following sectors: Coastal systems, Energy demand, Human health, Agriculture, Tourism, and Floods. For each of these sectoral categories, a corresponding sectoral-based study was developed. It provided estimates of the cost of climate change impacts in a range of economic sectors in Europe. It was based on a consistent set of climate change scenarios linked to appropriate impact models.	**ClimateCost**. The objectives of this study are to advance knowledge on the full economic costs of climate change, through the following tasks: • To identify and develop consistent climate change and socio-economic scenarios; • To quantify in physical terms, and economic costs, the costs of inaction for these scenarios; • To asses the physical effects and economic damages of a number of the most important major catastrophic events and major socially contingent effects. • To update the mitigation costs of GHG emission reductions for medium and long-term reduction targets/ stabilisation goals.
Vulnerability	Water and global change – **WATCH.** The WATCH project aims to analyse, quantify and predict the components of the current and future global water cycles and the state of related water resources. It will also clarify the overall vulnerability of global water resources related to the main societal and economic sectors. With EC funding of €10 million, WATCH brings together the hydrological, water resources and climate communities and involves 25 partners from 14 European countries as well as from India, China, South Africa, Brazil and Israel.	**EURO-LIMPACS** focuses on pressures and drivers of aquatic ecosystem change such as land-use, nutrients, pollution, and examines their interaction with climate change in order to better understand and manage the ecological consequences of these interactions.
Adaptation	Adaptation and mitigation strategies – **ADAM.** ADAM aims to assess the costs and effectiveness of impact mitigation and adaptation policies to achieve a tolerable transition to a world that is no more than 2ºC warmer than in the pre-industrial era. The project will provide a better understanding of the complementarities, trade-offs and distinctions that exist between adaptation and mitigation policies in the EC and internationally and assess emerging adaptation strategies for Europe. With EC funding of €12.9 million, the project is also drawing up a portfolio of longer term strategy options to adapt to and mitigate climate change. Some 26 partners from 12 European countries, China and India are participating. It runs from 2006 to 2009.	**Climate change impacts and adaptation strategies in water policies**. The aim is to study European and international adaptation measures and strategies related to climate change impacts and how these are taken into account in water policies. The project should bring together scientific and policy experiences on the existing and/or missing links between climate change and water management. Forecasting societies adaptive capacities to *climate change* (**FUTURESOC**). This interdisciplinary project addresses a key gap in the knowledge of global assessments concerning the likely consequences of future *climate change* on future human wellbeing. More information about the determinants

	6th Framework Programme (2002 – 2006)	7th Framework Programme (2007 – 2013)
		of future adaptive capacity is necessary for setting policy priorities today: Should the significant funds allocated for *adaptation* be invested in enhancing existing infrastructure or currently practiced agricultural strategies (some of which may not be tenable under future climates), or should they invest alternatively in enhancing human empowerment through education and health which in consequence will enable affected societies to better cope with whatever challenges the future will bring?
Cooperation	The **NOAH** project. Also known as the International Flood Warning and Information System (FLIWAS), the NOAH project sets up an innovative mechanism for management and transmission of vital reliable information rapidly, before and during crisis situations caused by flooding. This German-Dutch experiment, focused on the Rhine, could be reproduced in all regions subject to flooding.	The **CLARIS** project strengthens the collaboration between Europe and South America in assessing climate change impacts and developing common research strategies in the subtropical region of South America at different scales (local-regional-continental).

Appendix G - Further information: Financial Resources and Transfer Of Technology

G1 Bilateral contributions related to the implementation of the Convention (€ million)

Africa, Caribbean and Pacific				Mitigation						Adaptation		
Year	Country	Total value of projects (€ million)	Number of projects	Energy	Transport	Forestry	Agriculture	Waste management	Industry	Capacity building	Coastal zone management	Other vulnerability assessments
2004	Dem. Rep. Congo	2.8	2			x		x				
	Ghana	6.5	1							x	x	
	Guinea Bissau	0.3	1			x						
	Kenya	0.2	1	x						x		
	Malawi	9.7	2			x	x			x		
	Mali	0.2	1			x						
	Mauritania	0.5	1					x	x			
	Reg - Africa	1.7	1				x			x		
	Reg – West Africa	1.8	1				x			x		x
	Somalia	0.1	2				x					
	Reg - Pacific	2.3	3					x		x	x	
2005	Angola	1.0	2			x						
	Burkina Faso	0.5	2				x			x		
	Burundi	0.7	1				x					
	Cameroon	2.1	2			x	x					
	Congo	1.7	1			x				x		
	Dem. Rep. Congo	6.2	2			x						
	Eritrea	1.0	1	x								
	Ethiopia	2.7	1			x						
	Kenya	6.1	3							x	x	x
	Liberia	1.8	1			x						
	Mali	0.9	2			x	x			x		
	Madagascar	3.4	3			x	x			x		x

Africa, Caribbean and Pacific				Mitigation						Adaptation		
Year	Country	Total value of projects (€ million)	Number of projects	Energy	Transport	Forestry	Agriculture	Waste management	Industry	Capacity building	Coastal zone management	Other vulnerability assessments
	Mauritanie	0.6	1				x					
	Malawi	0.5	1			x						
	Mozambique	0.1	1									x
	Namibia	0.3	1							x	x	
	Nigeria	0.2	1									x
	Reg - Africa	6.0	3			x	x					
	Reg - Central Africa	42.7	6			x		x				x
	Reg - West. Africa	3.0	2			x						x
	Rwanda	0.2	1	x								
	Senegal	0.2	1				x					
	Seychelles	0.3	1									x
	Somalia	0.1	1				x			x		
	Tanzania	1.8	3	x								x
	Dominican Rep.	0.5	1	x								
	Jamaica	0.4	1	x								
	Haiti	0.5	1				x			x		x
	Fiji	1.0	1									x
	Reg - Pacific	11.4	1	x								
	All ACP	1.0	1									x
2006	Angola	5.0	2			x						
	Benin	2.3	2			x				x		
	Burkina Faso	3.1	7				x	x				
	Cameroon	1.0	1			x						
	Central African Rep.	2.6	2	x						x		
	Chad	7.1	2			x						
	Congo	1.2	1			x						

Africa, Caribbean and Pacific				Mitigation						Adaptation		
Year	Country	Total value of projects (€ million)	Number of projects	Energy	Transport	Forestry	Agriculture	Waste management	Industry	Capacity building	Coastal zone management	Other vulnerability assessments
	Eritrea	0.7	1	x								
	Guinea Bissau	1.0	1							x		
	Kenya	11.4	5				x					x
	Madagascar	0.5	1			x						
	Mauritius	2.6	1	x								
	Mozambique	0.3	1			x				x		
	Namibia	0.7	2									x
	Reg - Africa	35.1	7			x	x			x		x
	Reg - West. Africa	5.5	1	x								
	Senegal	0.3	1					x				
	Sierra Leone	4.2	2			x						
	Sudan	1.0	4			x					x	
	Tanzania	1.1	3			x					x	x
	Zambia	0.5	2				x					
	Zimbabwe	2.1	3				x					
	Haiti	0.7	1				x					
	Jamaica	2.1	1	x								
	Reg - Caribbean	4.3	3			x					x	x
	St. Vincent & the Grenadines	0.3	2	x								x
	Suriname	0.6	1							x		
	Micronesia	0.3	1							x	x	
	Palau	0.3	1	x								
	All ACP	8.8	2	x		x						
2007	Benin	0.8	1	x						x		
	Burkina Faso	2.5	2	x								
	Burundi	0.7	2				x					x

Africa, Caribbean and Pacific				Mitigation						Adaptation		
Year	Country	Total value of projects (€ million)	Number of projects	Energy	Transport	Forestry	Agriculture	Waste management	Industry	Capacity building	Coastal zone management	Other vulnerability assessments
	Cameroon	2.7	1	x								
	Cape Verde	6.2	2	x				x				
	Chad	0.1	2				x			x		
	Dem. Rep. Congo	6.9	5	x		x	x			x		
	Ethiopia	1.7	2	x								
	Ghana	1.5	1	x								
	Guinea (Conakry)	0.4	1	x								
	Guinea Bissau	1.5	1								x	
	Kenya	5.1	5	x								x
	Madagascar	14.0	7	x								
	Malawi	1.8	1	x								
	Mauritania	1.8	3	x								
	Mauritius	3.5	1	x								
	Mozambique	5.5	4	x						x		
	Namibia	0.9	1	x								
	Nigeria	0.2	1	x								
	Reg - Africa	0.1	1	x								
	Reg - South. Africa	1.6	1	x								
	Reg - West. Africa	6.6	4	x								x
	Rwanda	9.8	2	x								
	Senegal	2.6	1	x								
	Sierra Leone	1.0	1							x		
	Somalia	5.2	2	x								x
	Sudan	0.4	1				x			x		x
	Swaziland	0.5	2									
	Tanzania	7.0	3	x		x	x					
	Uganda	2.4	1	x								

Africa, Caribbean and Pacific				Mitigation						Adaptation		
Year	Country	Total value of projects (€ million)	Number of projects	Energy	Transport	Forestry	Agriculture	Waste management	Industry	Capacity building	Coastal zone management	Other vulnerability assessments
	Zambia	4.0	1	x								
	Zimbabwe	0.5	1	x		x	x			x		
	Belize	0.1	1	x								
	Dominica	1.5	1	x								
	Dominican Rep.	7.6	3	x								x
	Guyana	6.8	1									x
	Jamaica	11.2	2	x				x				
	Reg - Caribbean	1.4	2	x								
	St. Vincent & the Grenadines	0.2	1	x								
	Cook Islands	0.4	1									x
	Kiribati	0.9	1								x	x
	Reg - Pacific	5	2	x								x
	Tonga	0.8	1							x		x
	Vanuatu	2.2	4	x								
	All ACP	24.8	4			x				x		x

Asia				Mitigation						Adaptation		
Year	Country	Total value of projects (€ million)	Number of projects	Energy	Transport	Forestry	Agriculture	Waste management	Industry	Capacity building	Coastal zone management	Other vulnerability assessments
2004	Afghanistan	1.7	2									x
	Bangladesh	0.3	1									x
	Cambodia	1.3	1			x						
	China	40.6	5				x	x		x	x	
	India	0.8	3	x				x				x
	Indonesia	17.6	2			x						
	Malaysia	0.4	2	x						x		
	Nepal	0.4	3	x		x						x
	Pakistan	0.6	2									x
	Philippines	1.7	2			x		x				
	Reg - Asia	9.7	5			x				x	x	
	Sri Lanka	0.4	1				x					
	Thailand	0.4	1							x		
	Vietnam	3.0	2			x						
2005	Afghanistan	0.8	1			x						
	Bangladesh	3.6	1									X
	China	2.3	1							x		
	India	1.0	5			x		x				X
	Indonesia	2.1	3			x		x				
	Laos	0.3	1		x	x						
	Maldives	5.6	1									X
	Philippines	0.5	2			x				x		
	Reg - Asia	1.0	3	x						x		X
	Reg - Central Asia	0.6	1							x		
	Sri Lanka	1.5	4			x						X
	Thailand	2.2	4	x				x				X

Asia				Mitigation						Adaptation		
Year	Country	Total value of projects (€ million)	Number of projects	Energy	Transport	Forestry	Agriculture	Waste management	Industry	Capacity building	Coastal zone management	Other vulnerability assessments
	Takikistan	1.3	2	X		X		x				
	Vietnam	0.1	1									X
2006	China	0.3	1	x								
	India	2.6	7	x					x	x		x
	Indonesia	0.8	1			x						
	Kazakhstan	2.2	2					x				
	Mongolia	0.3	1				x			x		
	Pakistan	0.3	1									x
	Reg - Asia	2.5	2			x						x
	Sri Lanka	4.0	1									x
	Tajikistan	0.3	1				x					
	Vietnam	0.6	2					x		x		
2007	Afghanistan	2.0	2							x		
	Mongolia	4.0	1				x					
	Nepal	0.8	2									x
	North Korea	0.8	2			x	x					
	Reg - Asia	10.6	2	x						x		
	Thailand	0.2	2	x						x		

OCT				Mitigation						Adaptation		
Year	**Country**	**Total Project Value (million €)**	**Number of projects**	**Energy**	**Transport**	**Forestry**	**Agriculture**	**Waste management**	**Industry**	**Capacity building**	**Coastal zone management**	**Other vulnerability assessments**
2004	Aruba	2.8	1		x						x	
2005	Reg - British OCT	0.8	1								x	
	St Pierre & Miquelon	2.1	1					x			x	
2006	Reg - French OCT	5.2	1	x					x			
2007	Mayotte	8.2	1			x						x
	Netherlands Antilles	7.8	1								x	x
	Reg - British OCT	1.0	1								x	

Latin America				Mitigation						Adaptation		
Year	**Country**	**Total value of projects (€ million) ***	**Number of projects**	**Energy**	**Transport**	**Forestry**	**Agriculture**	**Waste management**	**Industry**	**Capacity building**	**Coastal zone management**	**Other vulnerability assessments**
2004	Argentina	1.5	1			x						
	Brazil	6.1	6			x						
	Ecuador	0.3	1									x
	El Salvador	1.1	1			x						
	Honduras	1.6	1			x				x		
	Nicaragua	1.3	5				x			x		x
	Peru	4.6	3			x						x
	Reg - Latin America	3.2	3			x						x
	Venezuela	0.3	1			x						x
2005	Brazil	6.9	2			x						
	Colombia	0.3	1	x								
	Nicaragua	0.3	1				x					
	Paraguay	0.1	1			x				x		
	Peru	1.1	1			x				x		
	Reg - Central America	10.2	2			x						x
	Reg - Latin America	0.3	1	x								
2006	Argentina	0.3	1			x						
	Brazil	3.1	2			x				x		
	Chile	3.8	2	x			x					
	Colombia	6.0	3			x						
	Ecuador	0.5	1			x				x		
	Honduras	11.1	2			x				x	x	
	Mexico	0.4	1			x						
	Nicaragua	2.9	6			x	x			x		x

Latin America				Mitigation						Adaptation		
Year	**Country**	**Total value of projects (€ million) ***	**Number of projects**	**Energy**	**Transport**	**Forestry**	**Agriculture**	**Waste management**	**Industry**	**Capacity building**	**Coastal zone management**	**Other vulnerability assessments**
	Paraguay	0.1	1							x		
	Peru	3.0	3			x						
	Reg - Latin America	34.0	7	x		x	x		x	x		
	Reg - South America	0.7	1			x						
2007	Bolivia	8.5	2				x					
	Chile	1.1	1			x						
	Reg - Latin America	2.8	1			x						

Neighbourhood[526]				Mitigation						Adaptation		
Year	**Country**	**Total value of projects (€ million)**	**Number of projects**	**Energy**	**Transport**	**Forestry**	**Agriculture**	**Waste management**	**Industry**	**Capacity building**	**Coastal zone management**	**Other vulnerability assessments**
2004	Armenia	0.4	1	x								
	Georgia	0.0	1			x						
	Jordan	0.5	1			x						
	Lebanon	0.0	1			x						
	Morocco	12.4	4	x				x		x		
	Reg - ENPI South / MEDA	0.4	2	x						x	x	
	Russia	2.6	2	x						x		
	Ukraine	1.4	1	x								
2005	Belarus	0.6	1							x		x
	Georgia	1.6	1	x								
	Russia	0.1	1			x				x		
	Ukraine	2.7	2	x			x					
2006	Algeria	0.6	1			x	x					
	Egypt	5.5	7	x	x			x	x	x		
	Morocco	0.7	1					x				
	Reg - ENPI East	10.8	3	x			x			x		
	Russia	4.3	2	x		x						
2007	Azerbaijan	14.0	1	x					x			
	Belarus	2.0	1	x								
	Morocco	1.2	1				x					
	Reg - ENPI East	8.4	2	x		x				x		
	Reg - ENPI South / MEDA	5.4	3	x							x	x
	Tunisia	13.2	1	x								
	Ukraine	22.0	1	x					x			

526 Russia and Ukraine are Annex I countries

G2 Promoting international cooperation in the private sector

ACP

Project title	**Development Support for a new fuel, substituting charcoal, based on biomass from household waste collected in the Rugenge sector in Kigali, 2005[527].**
Project duration	36 months (2006-2009)
EC contribution to Project budget	€0.15 million
Main proposer	Ingénieurs Sans Frontières and Ingénieurs Assistance Internationale Belgium
Main objectives and brief project description	• Contribute to socio-economic improvements in the town of Kigali, by means of improved waste management and waste value attribution • Develop and distribute simple and appropriate technologies which can easily be replicated • Avoid deforestation • Make available to the wider population more affordable cooking and heating fuels. **Technology Transfer Element**: During this project, private sector parties will be able to increase their revenue streams as well as improve their management and organisational capacities. This initiative aims to build the local capacity for the development and production of alternative fuel based on biomass collected from household organic waste. This new fuel would contribute towards reducing charcoal use, bringing significant improvements in the areas of health, gender equality and sanitation. This project also provides financial and specific technological knowledge support for local engineering and mechanical companies.

527 Original Project Title: Appui au développement d'une filière de production d'un nouveau combustible, substitut de qualité au charbon de bois, à partir de la fraction biomasse issue des résidus ménagers collectés dans le secteur de Rugenge à Kigali - 2005

Project title	**Community-based Natural Resource Management (CBNRM) Enterprise Support - 2005**
Project duration	48 months (2007-2011)
EC contribution to Project budget	€0.75 million
Main proposer	Consortium of Namibian governmental agencies
Main objectives and brief project description	Namibia's CBNRM Programme seeks to improve the quality of life of rural Namibians by empowering people to care for their natural resources and to derive benefits from these resources. The CBNRM Programme is: A natural resource management and conservation programme - it promotes wise and sustainable management of natural resources, and encourages biodiversity conservation by creating the necessary conditions for sustainable use. A rural development programme - it seeks to devolve rights and responsibilities over wildlife and tourism to rural communities, thereby creating opportunities for enterprise development and income generation. **Technology Transfer Element**: An empowerment and capacity-building programme- it encourages and assists communities and their local institutions to develop the skills and experience to sustainable develop and pro-actively pilot their own futures.

Project title	**Village Tree Enterprise project, Region West Africa – 2005**
Project duration	60 months
EC contribution to Project budget	€2.4 million
Main proposer	UN Food and Agriculture Organisation
Main objectives and brief project description	**Technology Transfer Element**: This project helps villagers analyse and develop options for income generation sustainable management of forest resources, building on their existing knowledge of resources and markets. It puts the local people at the centre of this process, facilitating strategic alliances and forging market linkages, bringing together local organisations rooted in the community and key government agencies with mandates covering natural resources, rural development, private sector activation and promotion of gender equality. Community owned enterprise development plans are an intermediate output, and the project will provide support to implement these plans, to optimise the long term 'survival rate' for small-scale community-based enterprises.

Project title	**Mobilisation and reinforcement of the capacity of SME's involved in forest related products in Central Africa, 2005[528].**
Project duration	36 months
EC contribution to Project budget	€3 million
Main proposer	The food and agriculture organization of the United Nations
Main objectives and brief project description	This project aims to build the private sector capacity if small and medium enterprises that are active in the forestry sector and forest related products and services. **Technology Transfer Element**: The project specifically aims to strengthen companies along six thematic lines: • Improved knowledge sharing to allow better decision making for investments. This especially relates to local resource knowledge and evaluation. • Improved packaging techniques to improve exportability of products, which in turn is likely to benefit the local employment opportunities. • Increased productivity and associated reduced production costs to enable companies to provide a continuous supply of products of good quality, which is important for private sector development. • Improved management and organisational skills to lead to better market analysis and interpretation. Further benefits to be achieved with increased use of certification process for forest products. • Additional institutional support to be provided to both the public and private sector on topics such as certifications, permits, law in order to avoid possible obstacles for commercial development. • Facilitated access to credit, capital and machinery.

[528] Original Project Title: Mobilisation et renforcement des capacités des petites et moyennes entreprises impliquées dans les filières des produits forestiers non ligneux en Afrique Centrale - 2005

Project title	**Installation of a steam engine powered generation set at Charter Sawmill - Zimbabwe**
Project duration	24 months
EC contribution to Project budget	€0.5 million
Main proposer	Borders Timbers Limited
Main objectives and brief project description	The project proposes to purchase and install a suitable steam engine powered generator to run off of the existing boilers installed at Charter Sawmill. The heat source for the boilers is waste wood and sawdust that is produced within the sawmill itself. There is a surplus quantity of wood waste produced in the process that is currently incinerated to waste. This wood waste is a renewable resource. The steam engine aims to harness this renewable waste heat and produce electricity from it that can be utilised by the surrounding rural community through an interconnection with the grid.

Asia

Project title	**Capacity building on business opportunities for CDM projects in China - 2004**
Project duration	20 months
EC contribution to Project budget	€0.18 million
Main proposer	CIRPS - University Of Rome "La Sapienza" – Italy In partnership with: GEI - Global Environmental Institute – China IST - Instituto Superior Tecnico – Portugal HELIO International – France
Main objectives and brief project description	**Technology Transfer Element**: This project aims to deliver local level capacity building activities in carbon trading for private stakeholders in China. It aims to meet the objectives of the Pro Eco programme with the achievement of high environmental standards and the facilitation of local implementation of international environmental agreements in the context of GHG. Through the exchange of good practices, policies, systems and technologies for GHG emissions reduction, the co-operation between countries of the EU and China can be strengthened. The thematic priority of this capacity building programme is addressing GHG, developing awareness of the private sector, local institutions and NGO's dealing with environmental issues, particularly in urban areas and in carbon trading system (Project Purpose). The project aims to improve access to know-how and international assistance of Chinese stakeholders. The project aims to gather information into an accessible medium including a database and handbook, combining the DNA (national Chinese authority) data, Chinese experience and EU know-how, experience and expertise. A series of training/workshop/seminars aimed at capacity building of interested private sector and conducted in full cooperation with the DNA are planned for promotion of CDM and using the carbon trading system.

Project title	**EU-China CDM Facilitation Project – 2005**
Project duration	36 months
EC contribution to Project budget	€23.5 million
Main proposer	The Project Partners Swedish Environmental Research Institute (IVL), Sweden; Policy Research Centre for Environment and Economy (PRCEE) of the Ministry of Environmental Protection (MEP), China; DEVELOPMENT Solutions, China; TÜV Rheinland, Germany; CDM Project Management Centre (CDM-PMC) of the National Development and Reform Commission (NDRC), China; Research Centre of Urban Development and Environment of the China Academy of Social Sciences (CASS), China.
Main objectives and brief project description	The project will strengthen the Clean Development Mechanism (CDM) as a central pillar within China's path to sustainable development. Until January 2010, the focus will be on China's policy and regulatory regime and quality management for CDM development. It will bring together a wide range of stakeholders at public and private sector levels involved in CDM projects. On the national level, the project will assess effectiveness of technology transfer through CDM, and analyse CDM market development. The consortium implementing the project has finished a needs assessment and also established an inventory of all CDM capacity building projects in China. This project implements one of the seven first joint activities of the EU-China Rolling Work Plan on Climate Change agreed in October 2006. The EU-China CDM Facilitation Project is being implemented by Chinese and European partners and associates with grants from the European Commission and is the largest European-funded project addressing CDM-related activities in China. **Technology Transfer Element**: Specific objectives include: • Strengthening the capacity of China's Designated National Authority (DNA), the National and Regional CDM Centres, and Chinese Organisations applying for Designated Operational Entity (DOE) status; • Introduction of European and International Standard in Quality Management of the CDM development process; • Increasing awareness of CDM opportunities and enhance the CDM framework conditions in the

Project title	EU-China CDM Facilitation Project - 2005
	Chinese CDM market.
Project title	**Microfinance & Renewable Energy: Using microfinance to increase access to Renewable Energy in rural areas - China 2006**
Project duration	24 months
EC contribution to Project budget	€0.27 million
Main proposer	Chinese government
Main objectives and brief project description	The project's main objective is to speed up the adoption of these RES technologies by providing local farmers with access to the financing necessary for biogas installations and household modifications. This financing will reach a total of 8 villages. In the case of the 3 sponsored-villages, the financing will supplement the un-subsidized costs. In the 5 other villages, it will cover the entire amount. In those 8 villages, it is expected that a total of 400 households will benefit from this financing. Another 32 villages will be involved as part of a road show where waste management will be the focus point. The following results will be met: • Rural households' revenues will increase and their living conditions will improve. • Farmers have access to a financing scheme to invest in biogas installations. • Farmers will have significantly decreased their commercial energy and kerosene budget. • Health risks linked to breathing in wood and coal smoke will be reduced in Tong Wei County. • Tong Wei rural households are more aware of environmental protection issues and the environmental and economic potential of RE. • Tong Wei farmers develop new crops with higher market prices and increase crop yield through the application of treated biogas waste fertilizer. • A microfinance delivery network in Tong Wei rural villages has been developed in an area not previously served. • Capacities are strengthened (including partner, microfinance human, financial, and institutional capacities) through the transfer of competences.

Project title	**Capacity building of Thai food industries on ''Carbon footprint labelling'' to promote the development of low-carbon trade between EU and Thailand for climate change mitigation – 2007**
Project duration	5 months
EC contribution to Project budget	€0.2 million
Main proposer	Kasetsart University, Thailand King Mongkut's University of Technology Thonburi, Thailand Institut National de la Recherche Agronomique, France University of Santiago de Compostela, Spain University of Surrey, United Kingdom
Main objectives and brief project description	The food sector is of a particular interest in this project because it is one of the key strategic industries contributing significantly to foreign revenue and providing numerous job opportunities, both directly and indirectly to the food sector to Thailand. Having recognized the importance of maintaining the exporting markets of Thai foods in EU as well as other countries that may require products with carbon label in the near future, it is critical for the Thai food industry to acquire the knowledge on carbon labels both in principle, methodology and practice. The carbon footprint can be used as an environmental management tool to evaluate the carbon profile of food products so as to derive management strategies to reduce the carbon footprint (i.e. reduction of energy use as well as cost savings). **Technology Transfer Element**: Specific objectives include: • To transfer the knowledge on carbon footprint measurement standards as well as their applications in food products from EU to Thailand to enhance the knowledge and practical experiences of local experts as well as to build up the local capacity in competiveness of Thai food industry • To provide technical supports to three demonstration projects to conduct the carbon footprint analysis and management of 3 food products. This will build capacity to anticipate the demand of products with carbon label to facilitate the development of low-carbon economy between Thailand and EU • To disseminate the knowledge and practical experiences on Carbon Footprint & Carbon Label to wider audiences by writing and distributing a guidebook on *"Carbon footprinting & labelling"*.

Latin America

Project title	**Forest livelihoods for the poor : certification, market development and an enabling economic and policy environment for sustainable forestry in Central America – Region Central America - 2005**
Project duration	36 months
EC contribution to Project budget	€2.2 million
Main proposer	Just World Partners (JWP)
Main objectives and brief project description	Overall objective: improved livelihoods and reduces vulnerability in participating countries through the sustainable use of forest resource. Project purpose: improved structures and processes relating to the socially, economically and environmentally sound use of forest resources. The following results are expected: • 15 forests Enterprises per country strengthened • National and regional structures strengthened • improved and diversified production of forest products by rural communities • a more enabling economic and policy environment for small forest enterprise development • market entry facilitated

Project title	**Improving the productivity of SME's in the industrial forestry sector, 2004 Argentina[529].**
Project duration	48 months
EC contribution to Project budget	€3.8 million
Main proposer	Secretaria de Agricultura, Ganadería, Pesca y Alimentos. (SAGPyA)
Main objectives and brief project description	**Technology Transfer Element**: This Project aims to provide the technical assistance, capacity building and equipment needed to improve the competitiveness, environmental performance and skills base of companies operating in the forestry sector. These objectives are all targeting an improvement of the standing of Argentinean companies in the international market and are complemented by a certification scheme. In order to achieve these objectives, the following measures were put in place: • Improve the competitiveness of the small and medium enterprises. • Strengthening of relevant institutions and technological centers. • Developing the professional bodies and associations. • Implementation of a certification system for forest products and the encouragement of sustainable practices.

529 Original Project Title: Mejora de la Productividad de las PMEs del Sector Forestal Industrial – 2004 Argentina

Neighbourhood

Project title	**Pro-diversity Business in the steppe zones of the Eurasia region – 2006**
Project duration	30 months
EC contribution to Project budget	€0.6 million
Main proposer	The European Community, represented by the Commission of the European Communities, is the Contracting Authority
Main objectives and brief project description	During the initial project phase, an assessment of the biodiversity and small business environment in each country will be carried out. The aim will be to identify regions of high natural value land where SMEs show the potential and interest in creating a so-called “Pro-Biodiversity Business”. The relevant national sectors and designated sites will be defined, and a list of potential pro-biodiversity SMEs created through consulting the relevant commercial registers. In the first six months of 2009, a pro-biodiversity integrated investment platform for all project steppe areas will be elaborated to devise the most effective way to channel investments towards SMEs. The project will develop indicators of net ecological benefit to help measure and track potential investments that could be made in steppe ecosystem based SMEs. Towards the second half of 2009, two to three integrated investment studies will be carried out from two or three of the six project sites resulting in the production of SME and upstream secondary and tertiary business plans. The end goal of the project will be to put in place a structure and procedures through which SMEs can be engaged in delivering economically viable biodiversity conservation activities in the Eurasian Steppes. **Technology Transfer Element**: The project seeks to put in place a structure and procedures through which SMEs can be engaged in delivering economically viable biodiversity conservation activities in the Eurasian Steppes. Working in close collaboration with the EC TACIS EuroSteppe project "Sustainable Integrated Land-use of the Eurasian Steppes", the aim is to identify financial structures and instruments that will provide the market mechanism necessary for long-term sustainability of the selected SMEs in the steppe ecosystem.

G3 Technology Transfer Success Stories

Asia

Project/ programme title: China-EU Biodiversity Programme, 2004			
Purpose: Focusing on balancing economic development and environmental protection and biodiversity conservation.			
Recipient country	Sector	Total funding	Years in operation
China	Biodiversity and Protected Areas	€30 million	2005-2010
Description: The EU-China Biodiversity Programme is a joint initiative between the EU, United Nations Development Programme (UNDP) the Chinese Ministry of Commerce (MOFCOM) and the Chinese State Environmental Protection Administration (SEPA) that combines policy dialogue and development, institutional strengthening and awareness raising with a set of field projects focusing on site-specific activities. EU contributes €30 million, of which €21 is earmarked for field projects. Field projects will require a minimum of 50% matching funds and will involve consortiums including at least one international and one domestic organization.			
Indicate factors which led to project's success: • The approach of EU-China Biodiversity Programme has: • Addressed "upstream" drivers of biodiversity loss, where potential impact is highest, such as through policy development and implementation and awareness raising; • Strengthened linkages and feedback mechanisms between national level initiatives and local implementation; • Built partnerships and cooperation, e.g. among sectoral agencies, between national and international organizations; • Improved the monitoring of biodiversity impacts. • Made the protection of carbon sinks a priority			
Technology transferred: Protected areas management, sustainable management of natural resources, development of participative approaches			
Impacts on greenhouse gas emissions/sinks: A positive impact has been made through this project but it is currently not measurable			
Project/ programme title: Euro-Asian Research and Training in Climate Change Management (CLIMA), 2005			
Purpose: To enhance the capabilities of professors and researchers to create an international thematic network on Climate Change and Sustainable Development, to relate scientists, policy makers and stakeholders from the EU and Asia on the issues of global impacts determined by local development practices.			

Project/ programme title: China-EU Biodiversity Programme, 2004			
Recipient country	Sector	Total funding	Years in operation
Regional Asia	Research, capacity building	€0.73 million	2006-2009
Description: The overall objective of the project is to create a knowledge system on climate change and sustainable development linking Asia and Europe as well as to contribute towards the Millennium Development Goals.			
Indicate factors which led to project's success: The project intends to achieve this objective by • implementing a modular training programme for scientists, • initiating joint and interdisciplinary research groups on different topics, • elaborating a curriculum for a prospective online master course on climate change and sustainable development, • disseminating of promotional material to a wider community.			
Technology transferred: Capacity building, research			
Impacts on greenhouse gas emissions/sinks: A positive impact has been made through this project but it is currently not measurable			

Latin America

Project/ programme title: EURO-SOLAR, solar systems and ICT for remote regions, 2006			
Purpose: The objective of the Programme is to contribute to the sustainable development of isolated communities through the use of renewable energies. Furthermore, it will help generate income and, by strengthening local organisations, promote education and skills development as well as communication with the outside world. The rural communities identified will be supplied with the necessary infrastructure to generate electrical energy.			
Recipient country	Sector	Total funding	Years in operation
Latin America (Guatemala, El Salvador, Honduras, Nicaragua, Ecuador, Peru, Bolivia and Paraguay)	Renewable Energy Technology	€27.8 million	2006-2010
Description: The Euro-Solar Programme will supply communities, identified and selected on the basis of objective criteria, with 600 electrification systems. These systems, combining solar and wind energy, are also composed of a charger of batteries, a refrigerator for the conservation of vaccines, a water cleaning system, computers, a projector to disseminate information at the local community level and a Internet connection for educational and productive use. These systems will be used by the communities in a broad range of applications; in telephony, education, health and in accessing information to promote the sustainable development of these rural communities.			
Indicate factors which led to project's success:			
Technology transferred: Renewable energy technology, capacity building, communications			
Impacts on greenhouse gas emissions/sinks: A positive impact has been made through this project but it is currently not measurable			

Project/ programme title: Leña, renewable energy for the conservation of native forests in the south of Chile, 2006[530].			
Purpose: To promote a sustainable exploitation of the existing primary/native forest in the south of Chile.			
Recipient country	Sector	Total funding	Years in operation
Chile	Renewable Energy Technology	€3.4 million	2006-2011
Description: 93% of the wood exploited from primary forest in the south of Chile is used as firewood. This situation is causing fast degradation and loss of native forests (both in area and biodiversity). The project aims to tackle the problem through four activities: • Consolidation of a national system for firewood certification, • Promotion of sustainable management practices for the native forest (providing specialized training to farmers and arranging logistical networks to distribute the firewood), • Regulation to encourage the access to the certification system and to formal markets to small producers.			
Indicate factors which led to project's success:			
Technology transferred: Capacity building, best certification practices			
Impacts on greenhouse gas emissions/sinks: A positive impact has been made through this project but it is currently not measurable			

530 Original Project Title: Leña, energía renovable para la conservación de los bosques nativos del sur de Chile, 2006

Project/ programme title: Regional Programme for the reduction of environmental degradation and vulnerability[531] (PREVDA)			
Purpose: To contribute to the integration of institutions and policies of the Central American region regarding water and environmental risk management.			
Recipient country	Sector	Total funding	Years in operation
Central America	Adaptation	€20 million	2006-2011
Description: The target of the project is to strengthen the capacity of existing regional institutions to plan and to link territorial planning and basin management as tools for environmental management. The project aims to create synergies to increase risk identification and mitigation capabilities to diminish the impact of socio economic impacts threats on vital resources.			
Indicate factors which led to project's success:			
Technology transferred: Capacity building, best practices in basin planning and protection			
Impacts on greenhouse gas emissions/sinks: A positive impact has been made through this project but it is currently not measurable			

[531] Original Project Title: PREVDA-Programa Regional para la Reducción de la Vulnerabilidad y Degradación Ambiental

ACP

Project/ programme title: Hydro-Biopower in Ethiopia			
Purpose: Livelihood improvement in rural areas through collaborative development of renewable energy sources in Oromia and Southern Nation Regional States of Ethiopia.			
Recipient country	Sector	Total funding	Years in operation
Ethiopia	Renewable Energy Technology	€0.74 million	2007-2010
Description: The aim of the action is to improve the living conditions of the people living in the above un-served areas through the implementation of renewable energy schemes, i.e. pico-hydropower plants and low cost biogas systems at household level. An important component of the project is devoted to capacity building targeting regional and district offices (WEREDA), as well as local cooperatives and associations. The involvement of local communities in the implementation and management of the energy schemes contributes to increase local ownership and empowerment.			
Indicate factors which led to project's success: This project is still in progress so all project aims have yet to be achieved, but include: • Construction of 5 pico-hydro and 5 micro hydro schemes at the village level • Installation of 1400 household-based biogas schemes • Capacity building for users, maintenance operators and local construction firms • Dissemination of information on Biogas and Hydropower technologies • Development of standards and good practices			
Technology transferred: Renewable energy technology, capacity building,			
Impacts on greenhouse gas emissions/sinks: A positive impact has been made through this project but it is currently not measurable			

Project/ programme title: Regional Weather Radar Warning System			
Purpose: Building a network of early warning radar systems in the Caribbean			
Recipient country	Sector	Total funding	Years in operation
Caribbean Region	Disaster Risk Reduction	€13.2 million	2006-2011
Description: The weather radar which is under installation in Trinidad & Tobago is part of a €13.2 million Caribbean weather radar network project funded by the EU and implemented by the Port of Spain-based Caribbean Meteorological Organization (CMO). The weather radar at Brasso Venado is a sophisticated state-of-the-art system built by the Selex-Gematronix company of Germany, which has been placed on a five-storey 20-metre reinforced concrete tower that will house the related equipment. The CMO is also installing similar new weather radars in Guyana, Barbados and Belize. These four radars will be linked with other existing radars in the Caribbean to form a modern network of nine radars that will be a key component in the Caribbean Early Warning System for predicting and monitoring severe weather conditions.			
Indicate factors which led to project's success: This project is still in progress so all project aims have yet to be achieved, but include the following: The weather radar will provide complete coverage of both islands and out to a distance of 400 km, enabling meteorologists to provide more accurate and timely information on all kinds of severe weather, such as approaching tropical storm and hurricanes, heavy rainfall events, etc. Information from the radar will be made available by the Meteorological Services to the public, national disaster preparedness and emergency agencies and other users in Trinidad & Tobago and throughout the Caribbean via the Internet and the media.			
Technology transferred: Weather monitoring technology, disaster risk reduction			
Impacts on greenhouse gas emissions/sinks: A positive impact has been made through this project but it is currently not measurable			

Project/ programme title: Regional Solar Programme[532]			
Purpose: Reduction in environmental deterioration in the Sahel Region by increased used of solar energy.			
Recipient country	Sector	Total funding	Years in operation
Region West Africa	Renewable Energy Technology and Water/Sanitation	€65 million (PRS1+2)	PRS1:2006-2006 PRS2:2006-2010
Description: **A. Principal objective** Contributing towards reduced environmental degradation by promoting the use of renewable energy **B. Specific Objectives** • Improved quality of life and sanitation of rural populations as well as improved water resource management. • Improved water distribution infrastructure.			
Indicate factors which led to project's success: This project has contributed to poverty reduction by improving economic, financial and social conditions of the community. Approximately 2 million people have been affected, focusing on women and children. • Improved access to drinking water and energy : 30 % of all households benefited from solar equipment. • Income generated from water sales is estimated at €1.52 million. Mechanisms have been put in place to increase returns on savings and thereby leading to more general quality of life improvements. • Renewable energy technologies have led to considerable savings on conventional fossil fuel consumption. • Protection and restoration of the natural environment as well as biodiversity protection. • **Institutional improvements**: increased intervention capacity ; improved water access policies ; identification of barriers to water access • **Private sector strengthening**: Organised via the Association Africaine des Industriels et Installateurs Solaires (AFRIISOL) and leading to increased and improved information and knowledge sharing. • **Technology development**: Improved skill base focusing on solar technology and installation.			

[532] Original Project Title: Programme Regional Solaire

Project/ programme title: Regional Solar Programme[532]
• **Income generation**: Price of water varying between €0.25 and €0.3 per m^3.
Technology transferred: Renewable energy technology (solar); water access and water purification
Impacts on greenhouse gas emissions/sinks: A positive impact has been made through this project but it is currently not measurable

OCT

Project/ programme title: (TEP) Adding value to renewable energy technologies as well as knowledge and experience transfer, 2006[533].			
Purpose: The main objective of improving livelihood opportunities of the rural and isolated areas of New Caledonia, French Polynesia and Wallis and Futuna, through the promotion of renewable energy sources.			
Recipient country	Sector	Total funding	Years in operation
French Polynesia, Wallis, New Caledonia, Futuna	Renewable Energy Technology	€10.3 million	2006-2009
Description: This initiative focuses on solar and wind energy. Several wind farm projects have been implemented in the past few years in New Caledonia. One of these is located in the North of New Caledonia's main island, with some 22 windmills already erected. The farm eventually aims to provide some 11 Megawatt to the three main towns of the area, Koné, Voh and Pouembout. The wind-generating units span 32 metres and reach a height of 55 metres on a mast. They start producing power when winds reach 10 knots, but can also easily be dismantled in case of cyclone. They are also equipped with a self-orienting device, which allow the two rotors to maximize wind production, according to the winds direction and strength. The longer term plan is to install a total of 42 units on the same site, called Kafeate. However, for the whole of New Caledonia, the plan is to build wind-generated electricity to 60 Megawatts (an estimated 15 % of all of New Caledonia's electricity consumption) by 2010. Wind-generated production is directly connected to the existing power distribution network, which is operated by French company Enercal.			
Indicate factors which led to project's success: • Improved rural electrification in order to improve quality of life. • Improved electrification of public services such as schools, hospitals as well as commercial properties. • Increased energy independence and security for island inhabitants. • Encourage co-operation and solidarity between islands concerned. • Transfer of acquired knowledge and skills between the islands.			
Technology transferred: Renewable energy technologies			
Impacts on greenhouse gas emissions/sinks: A positive impact has been made through this project but it is currently not measurable			

[533] Original Project Title: Tonnes équivalent Pétrole - Valorisation des énergies renouvelables et transfert d'expérience et de savoir-faire, 2006

Neighbourhood

Project/ programme title: Renewable Energy Policy and the Rehabilitation of Small Scale Hydropower Plants			
Purpose: To support the Russian Federal Government and regional administrations in the development of legal and regulatory framework to facilitate and encourage the use of renewable energy in the Russian Federation.			
Recipient country	Sector	Total funding	Years in operation
Russia[534]	Renewable Energy Technology	€2 million	2005-2009
Description: To develop justifiable and attainable national and regional RES/RES-E targets and national and regional policies and action plans, in 3 selected regions, to reach these targets, which then become integral part of national and regional RES/RES-E programs.			
Indicate factors which led to project's success: Result 1: A proposal for a Federal policy framework to promote RES and RES-E. (Federal RES/RES-E Policy Proposal). Result 2: National RES/RES-E Action Plan, including the formation and monitoring mechanism of RES/RES-E federal targets to be achieved within an established time. (National Action Plan to Set, Monitor and Achieve RES-E Targets) Result 3: Technical and economic feasibility studies of using RES as a primary energy source in each of the three regions. (Regional RES Feasibility Studies). Result 4: RES/RES-E Action Plans in Three Regions, including proposals for a policy framework permitting the implementation of RES and RES-E in these regions. (Regional RES/RES-E Action Plans)			
Technology transferred: Renewable energy technologies, capacity building			
Impacts on greenhouse gas emissions/sinks: A positive impact has been made through this project but it is currently not measurable			

[534] Russia is an Annex 1 country

Project/ programme title: Energy Efficiency in the Construction Sector in the Mediterranean (MED-ENEC)			
Purpose: To enhance the establishment of cost effective energy efficiency measures by the countries and the application of renewable energy solutions by the respective service providers.			
Recipient country	Sector	Total funding	Years in operation
All Mediterranean countries	Renewable Energy Technology, Energy Efficiency	€4 million	2005-2008
Description: The objective of this project is to develop or improve: • Regional and sub-regional information, communication and cooperation networks among the MEDA countries and with the EU-member countries are established; • Policy measures, regulations, standards and incentive instruments are available for adoption by policy makers; • New services and business and technology cooperation between European and MEDA countries to support communities, real state developers and building owners with comprehensive cost effective services, are established; • Best practices and new technologies as well as integrative approaches are demonstrated and documented through pilot projects. • Increased public awareness and civil society participation.			
Indicate factors which led to project's success: The proposed project design is very flexible: it entails the elaboration of national work-plans, which will address the local needs and priorities, as they derive from the national baseline studies, the national consultation days, and the national market and capacity assessment studies. Business development is a project key issue. In Tunisia the PP is consistent with the Government's policies and project activities are in line with on-going projects financed by other donors as well as a good knowledge of the region.			
Technology transferred: Renewable energy technologies, capacity building			
Impacts on greenhouse gas emissions/sinks: A positive impact has been made through this project but it is currently not measurable			

Project/ programme title: Sustainable Integrated Land Use of the Eurasian Steppes

Purpose:
The project is designed to provide viable responses to the current pressures on steppe ecosystems and their biodiversity by addressing the key threats and negative trends hampering the sustainable development in the steppe zone of Moldova, Russia and Ukraine.

Recipient country	Sector	Total funding	Years in operation
Moldova, Russia, Ukraine	Forestry, biodiversity	€2.5 million	30 months (2007-2009)

Description:
The project will develop and test a regional approach at trans-boundary level to both protect existing steppe areas and restore steppes for fauna and flora conservation as well as to provide more sustainable livelihoods. Since the project cannot solve all problems, TACIS inputs are meant to provide "seed-money" with which good initiatives can be funded and best international practices demonstrated, in pilot manner, in trans-boundary pilot demonstration areas. Replications of successful examples will be invited as a follow-up by new and additional funding.
The specific objectives of this project are:

- to increase sustainable land use in wetland, steppe and forest steppe ecosystems;
- to restore and use abandoned land, and improve management of privatised areas;
- to mobilize financial resources through, e.g., carbon sequestration and greenhouse gas emission reduction through the provision of alternative energy;
- to mainstream biodiversity concerns into rural land use policy and practice at the regional, national and local levels; and
- to encourage cross border cooperation between states.

Indicate factors which led to project's success:
The overall results of the project are twofold:

1. The sustainable use of biodiversity assets that contribute to rural poverty reduction and increase economic growth is in place. This result will have the following outcomes: i) holistically managed steppe landscape; ii) local economic benefits, linked to sustainable steppe use and rural poor livelihood generation; iii) appropriate alternative agricultural practices, based on increased land productivity; iv) viable rural populations; v) sustainable, ecologically friendly community business activities; vi) harmonised policy development; vii) increased uptake of opportunities at government level; viii) a shift towards commercial pro-biodiversity business taking out loans.

2. The conservation and restoration of a globally significant ecosystem at a regional level is taken up. This result will have the following outcomes: i) restored and managed natural wetland, steppe and forest-steppe complexes; ii) maintenance of key species; iii)

Project/ programme title: Sustainable Integrated Land Use of the Eurasian Steppes
increased biodiversity and reconnected migratory species routes; iv) a regional ecological network at strategic level; v) reduced threat of desertification; vi) less biodiversity-destructive practices; vii) harmonised policy development; and viii) increased financial incentives for steppe maintenance and restoration.
Technology transferred: Renewable energy technologies
Impacts on greenhouse gas emissions/sinks: A positive impact has been made through this project but it is currently not measurable

Appendix H - Further information: Education, Training and Public Awareness

H1 Examples of education and training projects on climate change supported by the Lifelong Learning Programme

Project	Focus	Target	Description
CO_2nnect: CO_2 on the way to school[535] - 2007-2010	Education	Any school in any country	Education and awareness raising activities on transport and climate change. Supported by the Comenius Programme.
Compass Project[536] - 2003-2006	Education	Schools with pupils with learning difficulties	School partnership on comparison and analysis all aspects of school life, environment, culture and climate. Supported by the Comenius Programme.
Our living environment: Today – Yesterday - Tomorrow[537] - 2004-2007	Education	Schools from 3 EU-15 Member States and 2 EU-12 Member States	School partnership around different thematic areas including environment. Supported by the Comenius Programme.
Education for change – 2005-2007	Training	Educators from kindergarten to upper secondary school, school leaders and teacher trainers	Cooperation between skilled educators in schools, NGOs and teacher trainers at universities to develop a method for in-service training for school educators. Develop training materials, website, design a curriculum for sustainable development and publish a brochure on in-service training. Contribution from Comenius programme 337.134€ out of a budget of 449.513€.
SEE EU Tool – 2005-2007	Training	High school teachers, educational authorities, in-service training	Production of training tools and materials enabling teachers to raise pupils' interest in science and technology in a field directly related to their life and future by promoting sustainable energy. Contribution from Comenius programme €340.777 out of a budget of €454.370.
Training for the Future – 2004-2007	Training	Managers of SMEs, young graduates	The project develops practice-oriented training for students and company managers on the topic of corporate 'sustainability' with respect to both economic and environmental considerations. It produces training packages on 'sustainability'. Supported by the Leonardo da Vinci programme. Contribution from Leonardo da Vinci programme €243.326 out of a total budget of €324.435.

535 www.CO_2nnect.org

536 www.compassproject.ik.org

537 http://ole.mok.lt/

Project	Focus	Target	Description
Sustainable Cities – 2006-2008	Training	Local authorities	Create an e-training tool and supporting material, directed towards town municipalities functionaries and policy makers, which will include information, examples and case studies on urban sustainable development. Contribution from Leonardo da Vinci programme €346.470 out of a total budget of €479.294.
EMTEU – 2006-2008	Training	Energy management professionals	Define the content of Energy Management Technician studies. This is a cross-training along other professions: electric installers, heater installers, technicians in refrigeration, renewable energies, etc. The project intends to contribute to the establishment of a European model that allows to carry out a standardised training to facilitate the recognition of credits and professional mobility. Contribution from Leonardo da Vinci programme €363.340 out of a total budget of €506.745.
Qualification and advanced training for teachers and instructors of vocational education in biogenic raw materials and renewable energies – 2008-2010	Training	Teachers, instructors of vocational training	Development of programme for advanced training and further qualification of teachers, instructors, and tutors of vocational education in the topic "Biogenic Raw Materials and Renewable Energies". Establishment of working groups and a transnational education network. Contribution from Leonardo da Vinci programme €299.916 out of a total budget of €399.890.

H2 Examples of education and training projects on climate change supported by the Intelligent Energy Europe Programme

Project	Focus	Target	Description
Video "Europe's children learn to fight climate change"	Education	Children and teachers	Video feature available on the ManagEnergy KidsCorner website that presents a selection of grass root projects using a range of creative energy education activities both within and outside the classroom.
FEEDU project[538]	Education and Training	Children (10-12), teachers, parents, public authorities on primary school level	Educational tools on energy and mobility issues including: information cards and books, science fair projects, games and activity books. One part of the project is the Teachers Courses.
Fourth International Pupils' Conference 2007 – "Renewable Energy in Theory and Practice"	Education	Students from Europe and beyond	Conference for students covering energy saving, renewable energy, hydrogen and fuel cell technology as well as CO_2 and climate change issues.
European Young Energy Manager Championship – 2008-2011	Education and Training	Students and teachers	International competition involving international teams of students facing the problem of energy management of their schools and homes. It starts with an energy training of the teachers and the students that leads to the EYE Manager competition and the EYE Manager Award. The last step is a peer to peer transfer of knowledge from students to students and from teachers to teachers. Total budget of 898.677€ with EC contribution of 75%.
Kids4Future Project – 2007-2009[539]	Education	Children aged 6-12	A common platform, consisting of a universal energy story and one brand are at the core of the concept. Pillars representing children's own arenas; school, internet, TV and event will support the platform. The project will provide high quality pedagogic tools and engaging energy activities to make energy more interesting and learning more fun. Total budget of 1.539.643 € with EC contribution of 50%.
CONNECT – 2007-2010[540]	Education	Primary and secondary schools	CONNECT is a dissemination, implementation and learning by doing project that encourages school children, students and their parents to use more sustainable modes when travelling to and from school. Two different campaigns target the primary and secondary schools. Educational materials for teachers are available in several languages. Creation of a close network and dissemination via www.schoolway.net. Total budget of

538 http://www.feedu.org/index.php

539 www.kids4future.eu

Project	Focus	Target	Description
			€1.438.224 with EC contribution of 50%. CONNECT won the Sustainable Energy Europe Campaign award in 2009 in the category 'Promotional, Communication and Educational Actions'.
RES COMPASS – 2008-2010	Education / Training	High schools and higher education	Development of training tools and training offers on renewable energy sources to withdraw the barrier of non-availability of trained and skilled personnel in this area. Total budget of €798.111 with EC contribution of 75%.
Energy Intelligent Education[541] – 2006-2007	Training	Social housing companies and municipalities	Development of training tools and organization of training courses to help social housing companies practice energy intelligent retrofitting. Total budget of €919.465 with EC contribution of 50%.
EEBD action[542] – 2005-2007	Training	Building professionals and owners	Produce a web-based training tool to help implement the training requirements for the building certification market arising from the new European legislation. Total budget of €1.402.076 with EC contribution of 50%.

540 www.schoolway.net

541 www.ei-education.aarch.dk

542 www.eebd.org

H3 Examples of EC support to international cooperation on education and training projects

Project	Focus	Target	Description
Energy Efficiency Training of Trainers (EETT) project[543] – 2006-2007	Training	Sub-Saharan Africa – energy management professionals	Set up a sustainable training system providing structured training and training materials to facilitate a training system in energy management in both the public and private sectors. The courses focus on transfer of know-how through a training the trainers programme in each target country. Total budget of €581.219 with EC contribution of 50% via the Intelligent Energy Europe programme.
ENABLE[544] – 2005-2007	Training	Sub-Saharan Africa – central and local government staff	Builds policy and planning capacity amongst ministry and local government staff regarding the role that renewable energy technologies can play in meeting sector goals. Organisation of workshops and training activities. Total budget of €1.159.686 with EC contribution of 50% via the Intelligent Energy Europe programme.
BEPITA – 2005-2007	Training / Education	Sub-Saharan Africa – public, private sector, professional organizations, high schools and universities	Establish specialized training platforms for biomass technologies covering two wide regions in Sub-Saharan Africa: the dry zone and the wetland zone. Organisation of targeted training sessions and workshops for policymakers and private sector representatives; and training courses for students/teachers in high schools, university and technical institutes. Total budget of €530.755 with EC contribution of 46% via the Intelligent Energy Europe programme.

543 www.eett.info

544 www.enable.nu

H4 Examples of public awareness projects on climate change supported by DG RELEX

Project	Target	Budget € million
2005 - Climate Change and Poverty Reduction: Building Awareness and Promoting Action.	Global	0.36
2006 - L'information Environnementale corporative au service des grands défis régionaux d'Afrique	Reg - Africa	0.37
2006 - Challenges for sustainable development in the South - News reporting, opinion building and media training regarding climate change, biodiversity, food security and the extractive industries	Global	0.67
2007 - National Environmental Visibility Event in Afghanistan	Afghanistan	0.10
2008 - The Climate Change Media Partnership (CCMP): Developing World Media Capacity-Building on the Post 2012 Climate Change Negotiations and the Clean Development Mechanism,	Global	0.77
2008 - IPCC Dissemination of results / Understanding the findings of the IPCC Fourth Assessment Report “Climate Change 2007” - Integrating climate change adaptation and mitigation in development planning	Global	1..00
2008 - Climate Change Awareness Programme	India	8.50

Appendix I – Summary of reporting of supplementary information under Article 7, paragraph 2 of the Kyoto protocol

Information reported under Article 7 paragraph 2	National Communication section(s)
National systems in accordance with Article 5, paragraph 1	4.3
National registries	4.4
Supplementarity relating to the mechanisms pursuant to Articles 6, 12 and 17	5.2.1, 5.2.2, 6.7
Policies and measures in accordance with Article 2	5.2, 5.5.12
Domestic and regional programmes and/or legislative arrangements and enforcement and administrative procedures	5.2.6
Information under Article 10	
Art 10, para a (efforts to improve emissions inventories)	4.3
Art 10, para b (policy action on mitigation AND adaptation measures)	5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9, 7.3
Art 10, para c (Activities related to transfer of technology)	8.6
Art 10, para d (Activities related to systematic observation)	9.1, 9.3
Art 10e (Activities related to international education and training, and national level public awareness)	10.2.10, 10.3
Financial Resources	8.1, 8.2, 8.5