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Tables/text on pp. 8, 9, 50, 52 and 53 were corrected. Only the EN version is concerned.

COMMISSION STAFF WORKING DOCUMENT

Annex to the

COMMUNICATION FROM THE COMMISSION

FOURTH 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)

{COM(2006) 40 final}

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1. NATIONAL CIRCUMSTANCES RELEVANT TO GREENHOUSE GAS EMISSIONS AND REMOVALS

Developments

1. The European Union's institutional system is unique, with 25 Member States delegating sovereignty for some matters to independent institutions

2. The Gross Domestic Product (GDP) of the EU-15 has increased by 18 % in real terms from 1995 to 2002 (average annual increase of over 2%), putting an upward pressure on greenhouse gas emissions.

3. Counteracting this trend, the energy intensity has decreased since 1990

4. Renewable energy currently contributes 6% to energy supply and is expected to grow significantly in the next few years

5. Agricultural land use is decreasing but forestry is increasing steadily

1.1. Government structure

The European Union's institutional system is unique. The Member States (of which there are currently 25) delegate sovereignty for certain matters to independent institutions, which represent the interests of the Union as a whole, its member countries and its citizens[1]. Each national government is represented within a 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 preparing legislation abd watching over its implementation by Member States. 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.

On 1 May 2004 ten New Member States (NMS) joined the Union:the Czech Republic, Cyprus, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia. Where possible this chapter presents historical data for all Member States.

1.2. Population profile

During the 1990s, the population of the 25 EU Member States has grown by 3.2 %, at an average growth rate of 0.27 % per annum. The accession of the New Member States (NMS) added approximately 74M people to the EU's total.

[1] http://europa.eu.int/institutions/index_en.htm

Table -1 Aggregate EU-25 population from 1990 to 2002 (millions)

Year	Total population in EU-25 (as of January each year) Millions
1990	438. 7
1991	440. 5
1992	442. 2
1993	444. 1
1994	445. 4
1995	446. 4
1996	447. 4
1997	448. 4
1998	449. 2
1999	450. 1
2000	451. 2
2001	452. 2
2002	452. 8
2003	454. 8
2004	456. 9

Source:EUROSTAT[2]

Individual EU Member States vary considerably in size and population density, as shown in Table -2.

[2] New Cronos Database of the EU, Eurostat, Luxembourg

Table -2 Population, and population density

Country	Population in 2002 (millions)	Population density (inhabitants/km^2)
Belgium	10.3	338.6
Czech Republic	10.2	132
Denmark	5.4	124.7
Germany	82.4	231
Estonia	1.4	31.3
Greece	11.0	83.5
Spain	41.0	81.6
France	59.5	109.7
Ireland	3.9	57.3
Italy	57.0	189.7
Cyprus	0.7	124.7
Latvia	2.3	37.5
Lithuania	3.5	53.1
Luxembourg	0.4	172.5
Hungary	10.2	109.2
Malta	0.4	1254.7
Netherlands	16.1	476.7
Austria	8.1	96.4
Poland	38.2	122.3
Portugal	10.3	112.8
Slovenia	2.0	99.1
Slovakia	5.4	109.7
Finland	5.2	17.1
Sweden	8.9	21.8
United Kingdom	59.2	243.3

Source:EUROSTAT

Compared to the majority of all Parties to the Convention, most EU Member States have a relatively high population density. This has implications for settlement and building patterns, and a tendency to relatively short transport distances. However, it facilitates economic integration among communities and regions, resulting in a tendency for higher transport intensity.

1.3. Geographic profile

There is considerable difference in land-use within the Member States as illustrated in **Table -3**. Agriculture stills accounts for a considerable portion of land-use but is in general decreasing, with a wide variation in the scale of different types of activities undertaken, for example the level of fallow land compared to crops, pasture etc (also see sections 1.10 and 1.11).

Table -3 Land-use patterns within the EU-25, 2000

Country	Total Area (km^2)	Land Area (km^2)	Inland Waters (km^2)	%	Forested and other woodland areas (km^2)	%	Utilised agricultural land	%
Belgium	30528	30278	250	1%	6170	20%	13938	46%
Czech Republic	78867	77265	1601	2%	26442	34%	36314	46%
Denmark	43098	42399	700	2%	4862	11%	26640	62%
Germany	357031	349233	7798	2%	n/a	n/a	170204	48%
Estonia	45227	42394	2833	6%	22670	50%	7703	17%
Greece	131957	128837	3120	2%	n/a	n/a	56002	42%
Spain	504878	499466	5413	1%	190283	38%	252494	50%
France	549087	542565	6522	1%	154999	28%	296317	54%
Ireland	70295	68894	1391	2%	n/a	n/a	42970	61%
Italy	301323	294123	7200	2%	103062	34%	150972	50%
Cyprus	9251	n/a	n/a	n/a	n/a	n/a	1360	15%
Latvia	64589	62290	2299	4%	28855	45%	16421	25%
Lithuania	65300	62679	2621	4%	20261	31%	26043	40%
Luxembourg	2586	2563	23	1%	886	34%	1281	50%
Hungary	93034	89615	3419	4%	17751	19%	58624	63%
Malta	316	316	0	0%	n/a	n/a	96	30%
Netherlands	37358	33783	3574	10%	3487	9%	19266	52%
Austria	83858	82748	1110	1%	32603	39%	33745	40%
Poland	312685	304293	8393	3%	91267	29%	163008	52%
Portugal	91909	93641	441	0%	33240	36%	38192	42%
Slovenia	20273	20138	135	1%	12834	63%	4905	24%
Slovakia	49047	48118	929	2%	20041	41%	19347	39%
Finland	338150	304600	33550	10%	262770	78%	22534	7%
Sweden	450295	410335	39960	9%	235065	52%	31532	7%
United Kingdom	244101	240824	3277	1%	5630	2%	170693	70%

Source:EUROSTAT

1.4. Climate profile

The whole of the EU is situated either in the Intermediate Climatic Regions or in the subtropics. The climate in most EU Member States is influenced by the proximity of the Atlantic Ocean or the North Sea, which results in relatively low temperature variations from summer to winter and relatively high rainfall. In all countries bordering the North Sea, the Gulf Stream has a warming influence.

In the Scandinavian region, countries have mild summers and cold winters although not as severe as one would expect in that latitude, thanks to the vicinity to the Gulf stream and prevailing westerly winds. The central European States have mild winters and mild summers, with more continental climatic conditions further east. In general, the countries bordering the Mediterranean Sea have a hot, dry summer climate and mild, often rainy winters. On the central Spanish plateau, in contrast, winters are relatively cold and dry. The 3rd National Communication illustrated the geographical distribution in terms of

minimum temperatures in January and maximum temperatures in February, i.e. , in months when heating is normally necessary in the majority of Member States.

The external temperature directly affects energy consumption for space heating, primarily within the domestic sector. From 1980 to 2004, there were on average 3386 heating degree-days in EU-25 (based upon the Eurostat methodology with a 15 °C heating threshold). The number varies considerably between Member States; by far the highest number of degree-days is found in Finland with 5823 on average between 1980 and 2004, followed by Sweden and Estonia. The lowest number is experienced in Malta with 564, followed by Cyprus and Portugal.

Table -4 Annual number of heating degree-days in Member States (average from 1980 to 2004)

Country	Average annual degree days
EU-25	**3386**
EU-15	**3358**
Austria	**3569**
Belgium	**2882**
Cyprus	**787**
Czech Republic	**3559**
Denmark	**3479**
Estonia	**4420**
Finland	**5823**
France	**2494**
Germany	**3244**
Greece	**1698**
Hungary	**2917**
Ireland	**2916**
Italy	**2085**
Latvia	**4243**
Lithuania	**4071**
Luxembourg	**3216**
Malta	**564**
Netherlands	**2905**
Poland	**3605**
Portugal	**1302**
Slovakia	**3440**
Slovenia	**3044**
Spain	**1856**
Sweden	**5423**
United Kingdom	**3354**

Source:EUROSTAT

Since the base year for Kyoto reduction commitments for CO_2, 1990, was a warm year relative to the average 1960-1999, it looks possible that in the first commitment period

2008-2012 there will be more heating degree days[3] than 1990, which would exert an additional burden on target fulfilment[4].

1.5. Economic profile

1.5.1. Changes in overall GDP

The Gross Domestic Product (GDP) of the EU-15/25 has increased by 18 % in real terms from 1995 to 2002 (average annual increase of 2.3%).

Table -5 EU-15/25 GDP growth in million € (1995 prices)

	EU-15				EU-25							
Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
GDP	6222	6300	6271	6444	6828	6947	7126	7335	7548	7819	7952	8037

Source:EUROSTAT

Note: Complete data on New Member States prior to 1995 is not available.

1.5.2. Development of economic sectors

Agriculture and fishing, industry and construction have all grown in absolute terms but their overall share has slightly declined. Almost half of gross value added is made up by the services sector, with both financial and other services having grown significantly in the late nineties.

[3] The cumulative number of degrees in a month or year by which the mean temperature falls below 18.3°C.They are usually indicators of household energy consumption for space heating.

[4] A sensitivity analysis for 6 of the bigger EU Member States by Fraunhofer-ISI and ECOFYS, assuming the 5 year variability would be at the cold end of the range experienced in the 80s and 90s, resulted in an emission increase of approx.13 MtC in 2008-12.Extrapolating this to the whole EU-15 would result in 18 MtC higher emissions if the first commitment period is relatively cold.

Table -6 Gross value added at basic prices by main economic sectors (in million € at 1995 prices and in terms of percentage shares)

Branch	1991 (EU-15)	%	1995 (EU-25)	%	2002 (EU-25)	%
All branches total	5787	100. 0%	6353	100.0%	7512	100.0%
Agriculture, hunting, forestry and fishing	157	2.7%	176	2.8%	186	2.5%
Total industry (excluding construction)	1425	24.6%	1529	24.1%	1728	23.0%
Construction	362	6.3%	373	5. 9%	387	5.1%
Other services:wholesale and retail trade; repair of motor vehicles and household goods; hotels and restaurants; transport, storage and communication	1200	20.7%	1338	21.1%	1684	22.4%
Financial intermediation; real estate, renting and business activities	1391	24.0%	1555	24.5%	1964	26.1%
Public administration and defence, social security; education; health and social work; other community, social and personal service activities; private households with employed persons	1252	21.6%	1381	21.7%	1565	20.8%

Source:EUROSTAT

Note: Complete data on New Member States prior to 1995 is not available.

The growth in the services sectors has implications for increases in transportation and energy use[5] as the sector:

- tends to have a higher transport intensity (kilometres per gross value added in the sector) than industry.

- does not involve highly energy consuming production processes but tends to have a high, and increasing, use of electrical and electronic equipment, e.g., for IT and communication purposes, heating of buildings etc. .

See section 1.7 on industry patterns for the development of value added in the various industrial sub-sectors.

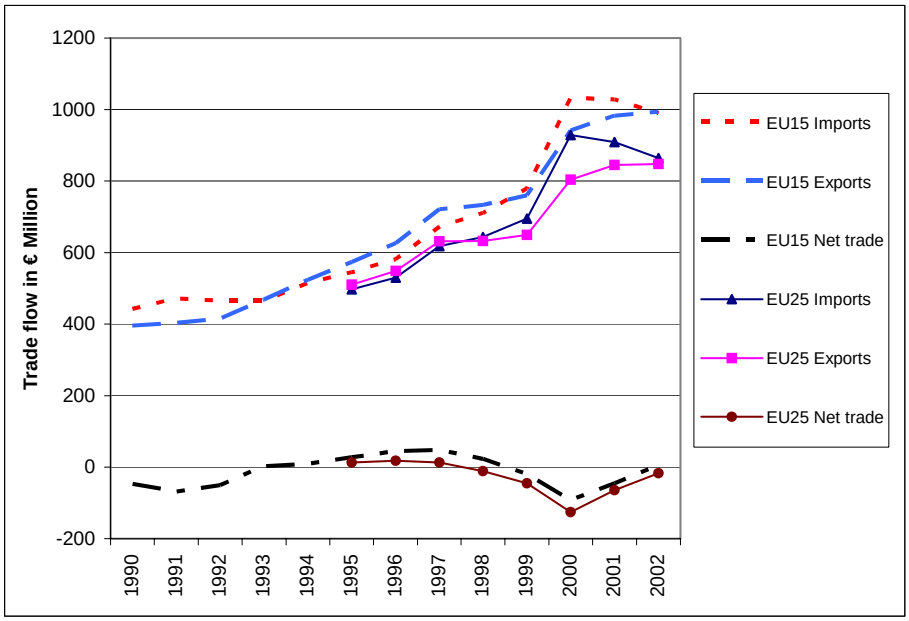
1.5.3. Trade patterns

Trade between the Member States of the EU is more than 1. 5 times higher than trade of EU Member States with the rest of the world; however, this latter (extra-EU) trade grew significantly in the 1990's. From 1990 to 2002 it fluctuated between deficit and surplus but in 2002 it was neutral, i.e., total exports almost equalled total imports. The balance of extra-EU trade is significant as having any net imports of goods, particularly energy-intensive goods, can be seen as 'exporting' emissions, and having net exports of goods, particularly energy- intensive goods, as 'importing' emissions. Whilst any such situation might be interesting to note, there is no mechanism under the Kyoto Protocol for taking it

[5] "Environment in the European Union at the turn of the century", EEA Environmental Assessment Report No 2, 1999.

into account. Figure 1-1 shows extra-EU trade for both the EU-15 and the EU-25 (complete data for NMS is only available from 1995 onwards). Extra-EU-25 trade is lower than Extra-EU-15 trade because the EU-15's trade with NMS accounted for much of their original extra-EU trade.

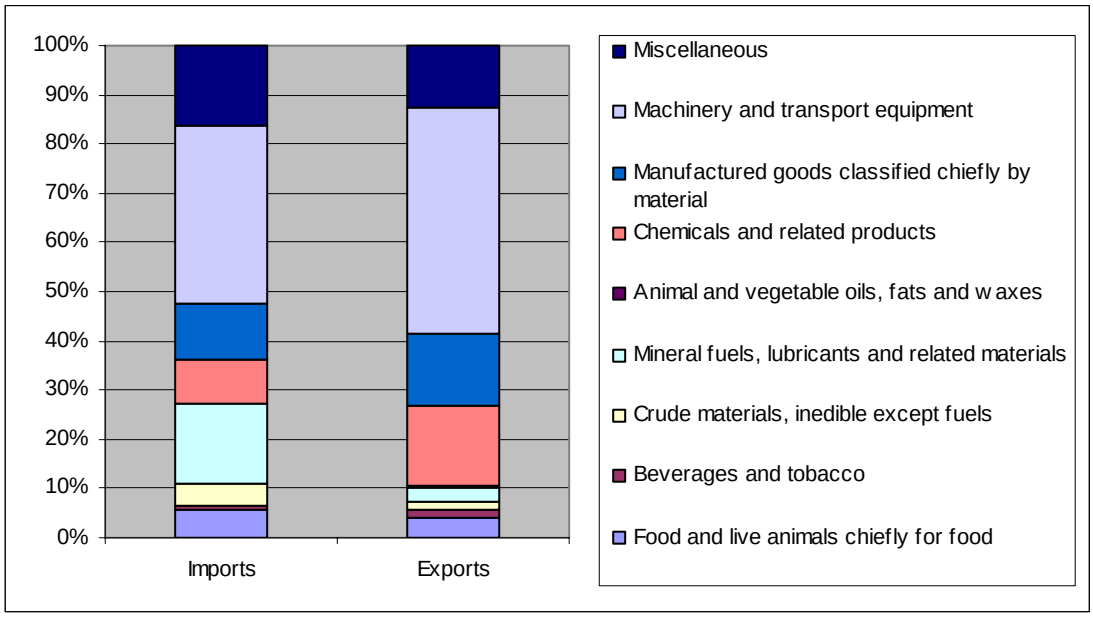
Figure 1-1 Development of Extra-EU trade



Source:Eurostat

Figure 1-2 shows that manufactured goods, including machinery, electronics, vehicles and chemical products make up the largest share of exports, while their share in imports is also significant but not as large. Raw materials play a bigger role in imports, including fossil fuels.

Figure 1-2 Composition of Extra-EU-25 trade, 2002



Source:EUROSTAT.

1.5.4. Energy profile

The most recent comprehensive energy profile of the EU is reported in the European Commission's Green Paper of 29 November 2000:"Towards a European Strategy for the security of energy supply"[6]. A final report on the green paper[7] was issued on 26 June 2002 summarising views from various parties (Governments, National Energy Agencies, private sector organisations, academia, NGOs etc) on the questions posed in the document[8].

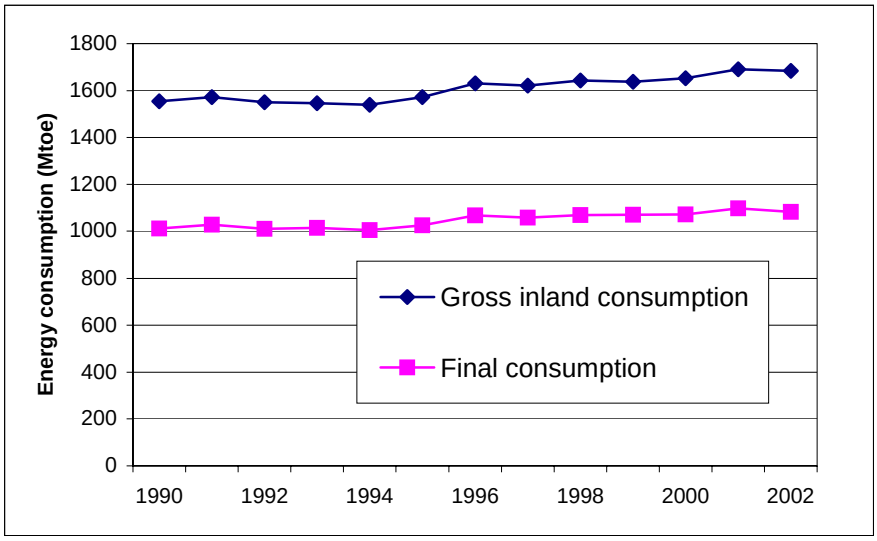
The total energy consumption in the EU is on a slowly growing trend, both in absolute terms and on a per capita basis as seen from Figure 1-3 and Figure 1-4. There is a decline in energy intensity, even against the backdrop of relatively low energy prices during most of the period.

[6] COM(2000) 769 final-Green Paper - Towards a European strategy for the security of energy supply

[7] COM(2002) 321 final-Communication of 26 June 2002 from the Commission to the Council and the European Parliament-Final report on the Green Paper "Towards a European strategy for the security of energy supply

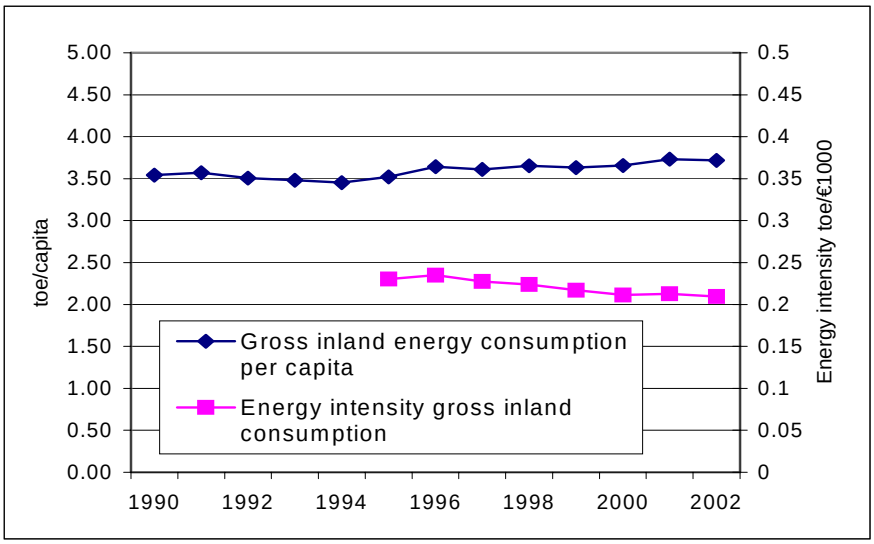
[8] http://europa.eu.int/comm/energy_transport/en/lpi_lv_en1.html

Figure 1-3 Total energy consumption, primary and final, EU-25



Source:EUROSTAT

Figure -4 Energy intensity and energy consumption per capita, EU-25



Source:EUROSTAT

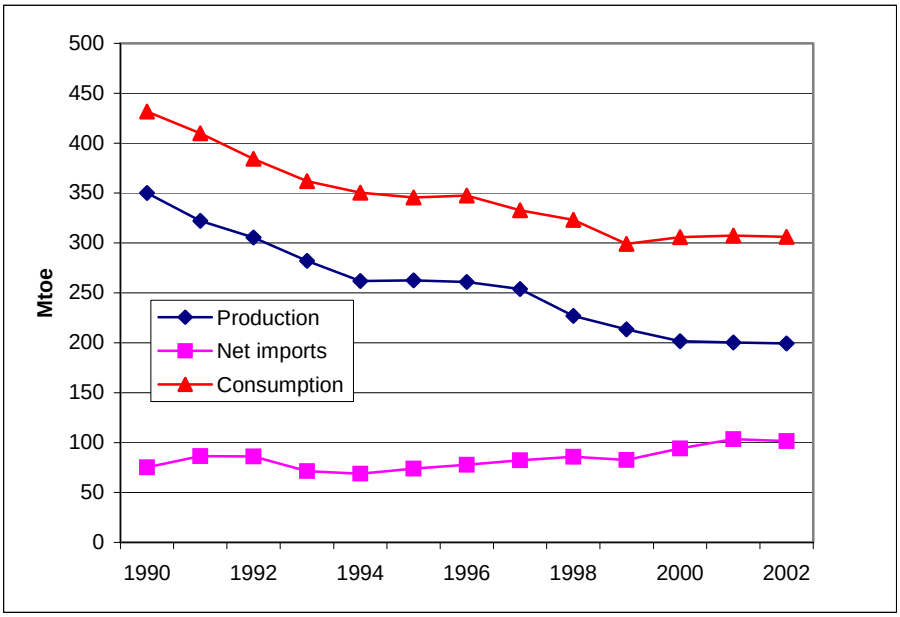
1.5.5. Energy Supply

The **energy supply profile** of the EU-25 can be summarised by the following observations:

Solid fuels (coal and lignite) are on a declining curve, from previously being the driver of industrialisation in Member States and from a short revival after the oil price shocks in the 1970s. Solid fuel accounted for around 18% of overall energy supply in the EU-25 in

2002, much of it subsidised for social and employment objectives in the regions where it is produced. Domestic coal production is expected to continue its decline in importance within overall EU supply as subsidies are gradually abandoned and atmospheric emission limits tightened. The EU ETS could also exacerbate the decline in use of solid fuels. Development of 'clean' coal technology and carbon capture storage factors could slow the speed of this decline:

Figure -5 Solid fuels in the EU-25



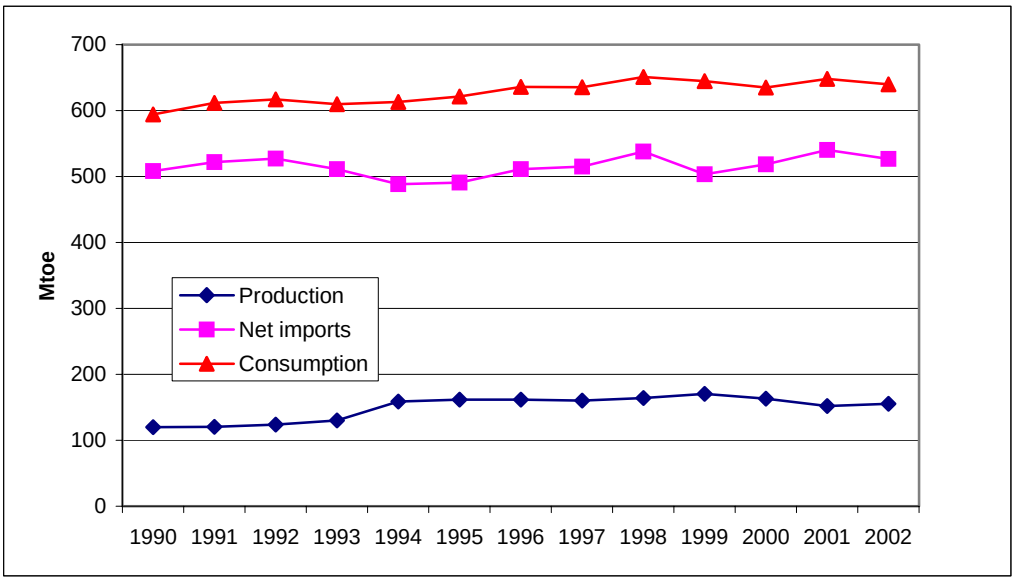
Source:EUROSTAT

Oil is still the major energy source in the EU-25 accounting for around 38% of total energy supply in 2002 and more than 60% in some Member States. The percentage has been relatively stable over the last decade, growing slightly in absolute terms.

The present trend reflects the contrasting effect of continued efforts to replace oil as a fuel in industry, electricity generation and domestic heating, with steady growth in the consumption of oil products in the transport sector. Although this trend appears t have leveled out lately. As options for substitution in non-transport sectors are gradually being more utilised, the transport sector will increasingly determine the quantity of oil required, unless strong policy action is taken.

Figure 1-6 shows that EU-25 production during the early 1990's increased as a proportion of consumption. However, the degree of self-sufficiency has dropped slightly in recent years due to a plateau in the level of production but continued growth in consumption. In addition, the steadily increasing percentage of transport fuels to be produced from crude oil leads to increasingly deep conversion of heavier oils into gasoline, diesel and jet fuel with sharply increasing CO_2 emissions per ton of transport fuel produced.

Figure -6 Oil in the EU-25



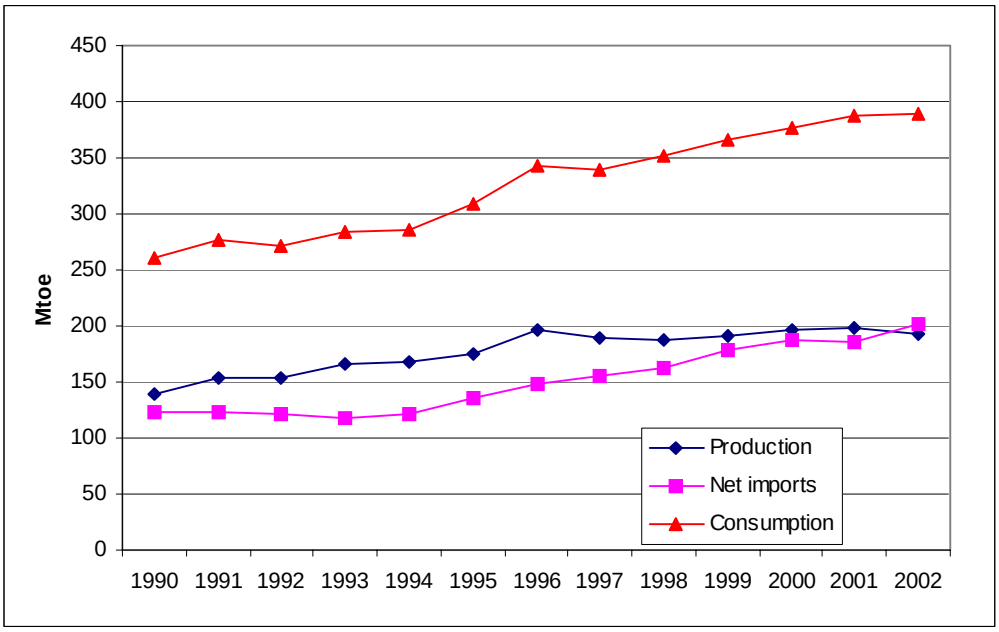
Source:EUROSTAT

Natural gas has become the second largest component, after oil, accounting for around 23% of overall supply, an increase of almost 50% from 1990. Sizeable gas field discoveries in the North Sea and willing sellers on the doorstep of the EU (Russia, Algeria, Norway) have made this development possible and forecasts show a continued, albeit slower, growth in the share of natural gas within overall energy supply.

Aside from cheap, imported coal, natural gas is a very cost-competitive energy source – with additional environmental benefits in the form of lower CO_2 emissions and negligible sulphur or particulate emissions.

EU-25 gas production kept pace with rising consumption in the early part of the 1990's but, as with oil, growth in demand is now rising faster than levels of production. As demand rises and the dependence on imports continues to increase, the gas transport infrastructure and the limited number of physical pipeline connections for imported gas will be important consideration in the overall security of supply.

Figure -7 Gas in the EU-25



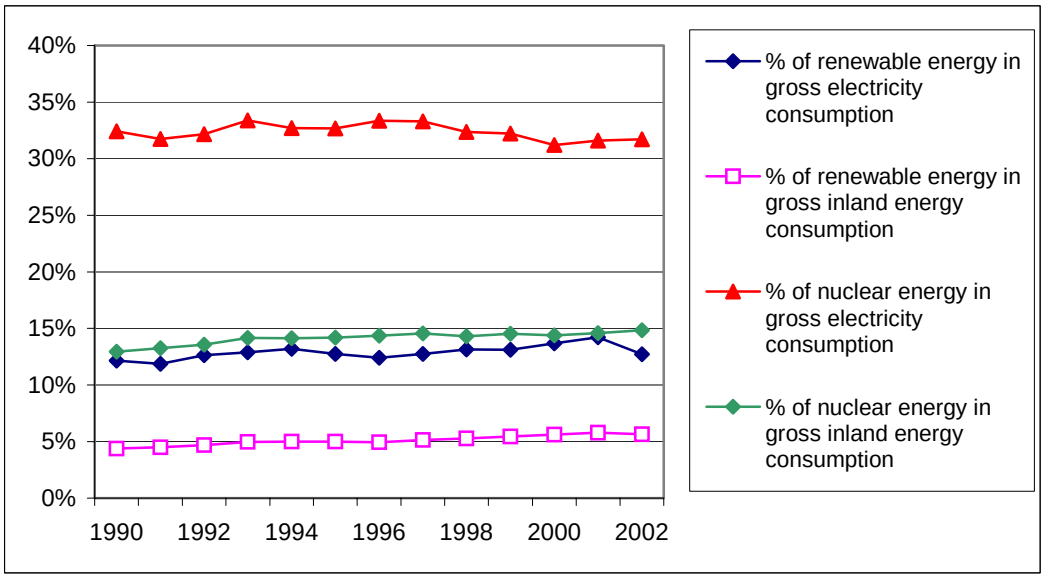
Source:EUROSTAT

Nuclear energy supplies approximately 15% primary energy in the EU-25, slightly less than solid fuels, and approximately one third of electricity generation. After 2010 the share of nuclear energy in the overall supply pattern may decline if present decommissioning plans are continued without replacement. Any significant decline in production of nuclear energy offers a serious challenge to security of energy supply and future reductions in greenhouse gas emissions unless there is significant growth in the uptake of new technologies and renewable energy.

Renewables provide a modest 6% of overall EU-25 primary energy supply, and around 13% of electricity. The primary sources of renewable energy across the EU-25 are hydropower and biomass, although the relative contribution between Member States varies significantly. This reflects both national policies and measures, and also the distribution of biomass and hydropower resources.

Renewable energy was expected to show strong growth over the next decade towards an agreed EU-25 target of 12% of primary energy. However, latest growth figures are not as high as expected, so further actions are being developed to spur renewables growth. Biomass and wind (there has been a strong increase of wind energy) are seen as having a significant potential to cover part of the increase, whilst hydropower has more limited scope for further expansion. Other sources, such as solar energy, are further away in terms of cost-effectiveness so are seen as an option for the medium to long term in most Member States, although as technological development continues their cost effectiveness may improve considerably.

Figure -8 Percentage of nuclear and renewable energy, in primary energy and electricity consumption, EU-25



Source:EUROSTAT

1.5.6. Energy consumption in different sectors

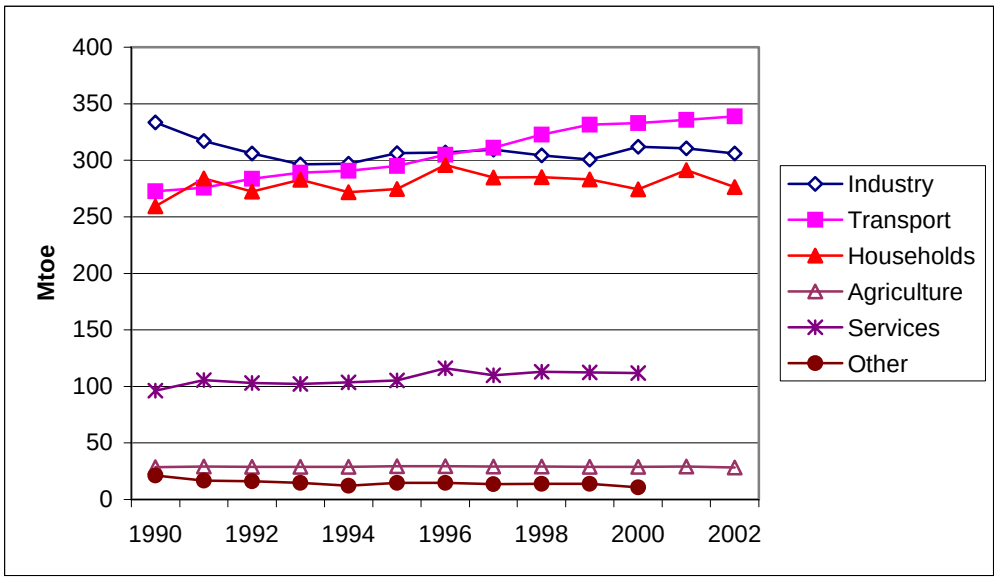
As stated in section 2. 6, overall energy consumption in the EU has shown modest but steady growth from 1990-2002; however, consumption within individual sectors has varied considerably as shown in **Figure 1-9**.

The transport sector has experienced strong growth, largely due to a similar increase in GDP and intra and extra EU trade with a limited efficiency improvement. Without a strong policy response this trend will continue over the next decade, particularly so in air transport, a mode which is growing rapidly. This policy response is discussed in Chapter 4.

The industrial sector is using a decreasing share of overall EU energy consumption, due in part to the relative decline of heavy industry, but also to extensive energy efficiency improvement programmes in this sector.

The domestic and tertiary/service sectors show growing energy consumption, particularly due to strong growth in the latter. Although, energy intensity in the tertiary sector is normally far less than in the industrial sector, the potential for energy efficiency improvement in this sector is considered to be significant and is the subject of a number of initiatives at EU level.

Figure -9 Final energy consumption by sector EU-25



Source:EUROSTAT

Note:Complete data is not available for the EU-25 for services and other for 2001/2002

1.5.7. Liberalisation and privatisation of energy markets

Markets for electricity and gas are in the process of liberalisation in all EU Member States, as a result of the EU Electricity Directive and Gas Directive[9]. In addition, electricity producers and gas suppliers are increasingly privatised. Since the 3rd National Communication further Directives have been passed on the common rules for the internal markets in gas[10] and electricity[11].

1.5.8. Energy Prices

Electricity prices for industrial and domestic consumers have decreased in real terms in almost all Member States due to increased competition. However, due to a number of factors, including increased fuel prices and the introduction of a price for carbon dioxide, electricity prices have recently substantially increased in absolute terms. The most significant price reductions can be found in the Member States with liberalised energy markets. The picture is less clear for gas; markets were liberalised later and the gas price since liberalisation has been significantly influenced by the increase in the crude oil price in the last couple of years and the development in the euro/dollar exchange rate. However, energy prices have been relatively low in real terms and this has had an adverse effect on

[9] European Commission (2001):Completing the internal energy market.Commission Staff Working Paper.SEC(2001) 438.

[10] Directive **2003/55/EC** of the European Parliament and of the Council of 26 June 2003 concerning common rules for the internal market in natural gas and repealing Directive **98/30/EC**

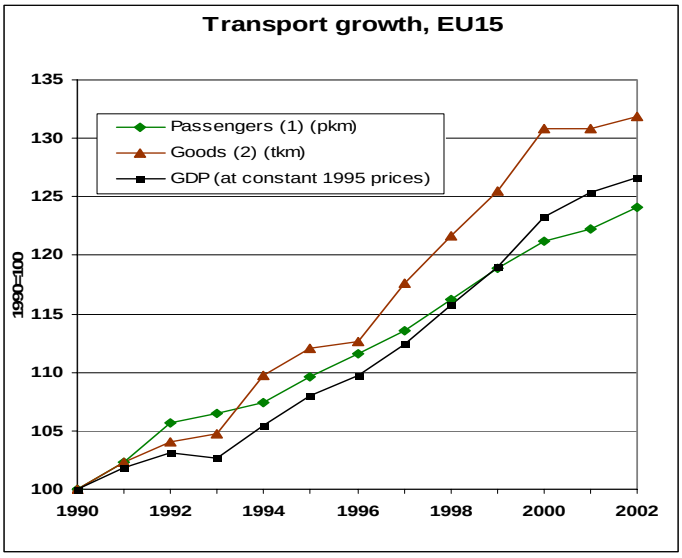
[11] Directive **2003/54/EC** of the European Parliament and of the Council of 26 June 2003 concerning common rules for the internal market in electricity and repealing Directive **96/92/EC**.

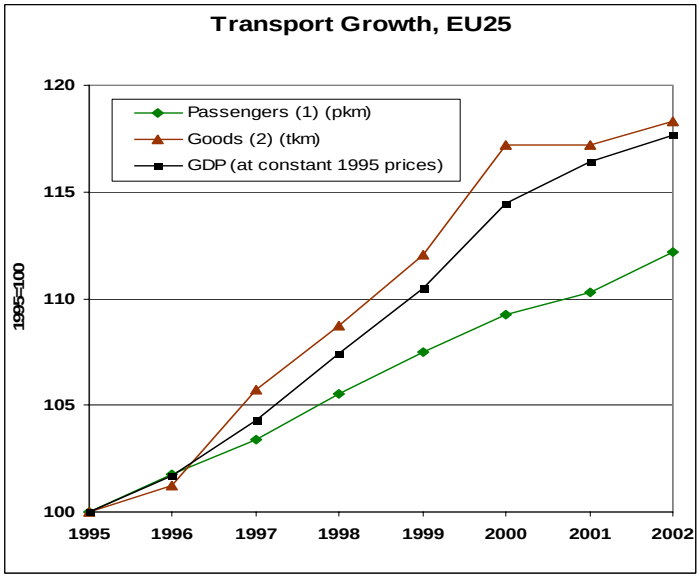
energy demand reduction and on the cost-effectiveness of energy efficiency measures and alternative energy sources.

1.6. Transport profile

Throughout the period 1990 to 2002 both freight and passenger transport have continued to grow strongly. Growth in freight transport up till recently has been exceeding 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-25 (and this consumption has grown steadily from 1990 to 2002 – see Figure 1-9) and any attempt to limit future greenhouse gas emissions will need to address this sector. There appears to be a trend for decoupling of passenger transport growth from GDP (Figure -10) but more data are needed to confirm this trend.

Figure -10 Transport growth in the EU-15 and EU-25





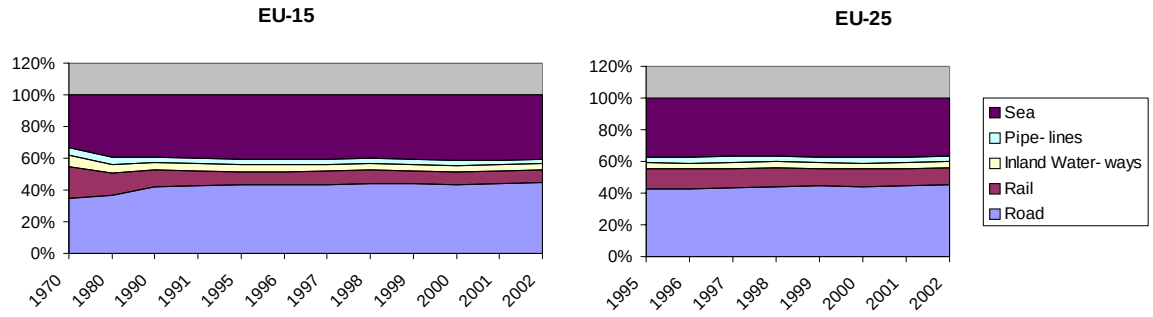
Source:DG Transport and Energy, EUROSTAT;

Note:(1) = passenger cars, buses & coaches, tram metro, railways, air. (2) = road, rail, inland waterways, pipelines, sea (intra-EU + domestic)

1.6.1. Freight transport

Total freight transport in 2002 in the EU-15 was approximately 3076 Gtkm (3412 Gtkm in the EU-25, however no data are available on NMS sea freight transport), equivalent to a 32% increase since 1990. Road freight transport is the largest sector, accounting for 45% of the total freight transport in 2002 in the EU-15. Sea freight transport (both domestic and intra-EU) accounted for 41% in the same year. However, whilst the shares of pipeline, sea and inland waterway transport have remained fairly constant from 1990 to 2002 in the EU-15, the share of rail freight transport has declined relative to road freight transport (the situation is the same throughout the EU-25). This has implications for freight energy consumption, as rail transport is in general more energy efficient than road transport.

Figure -11 Relative share in goods transport by mode (%)



Source:DG Transport and Energy, EUROSTAT

Note:Sea transport is domestic plus intra-EU-15, no data is available for NMS sea freight transport

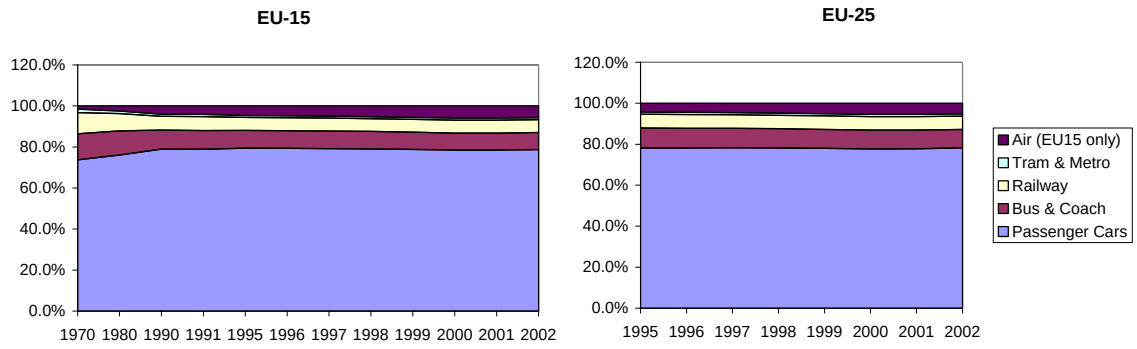
There are considerable differences between Member States, with the percentage of rail freight in the NMS higher than in the EU-15, although even in the NMS the trend is moving towards road freight transport.

1.6.2. Passenger transport

Passenger transport has also increased substantially (24% growth from 1990-2002 in the EU-15) amounting to 4927 billion passenger kilometres in 2002 in the EU-15 with tourism and leisure traffic an important driving force behind this development, particularly for air transport.

Passenger cars remain the dominant mode of transport accounting for 79% of all transport miles in the EU-15 in 2002. The most rapid growth has been seen in air transport (a 78% increase from 1990 to 2002 in pkm with the modal share increasing from 4% to 5.7%). This poses particular difficulties for emissions reduction in the transport sector due to the high carbon intensity of air travel relative to other modes.

Figure -12 Relative share in passenger transport by mode (%)



Source:DG Transport and Energy, EUROSTAT

Note: Air transport is domestic plus intra-EU-15 travel, no data is available for air transport in NMS

Car ownership varies throughout the Member States, from 247 per 1000 inhabitants in Slovakia in 2002 to 542 in Denmark in the same year. All Member States have seen a substantial rise in vehicle ownership from 1990 to 2002, with the highest rate increases in the NMS[12].

The NMS have a higher share of public transport compared to the EU-15. The highest level in 2002 was 38.8% (of all pkm travelled) in Hungary and the lowest 12.9%, in the UK[13].

1.6.3. Taxes on and prices of transport fuels

Both fuel prices and fuel taxes differ from Member State to Member State. However, as an average it can be stated that they are broadly equivalent to Japan but far higher than in the US, Canada and Australia, due to significantly higher taxes on these fuels

1.7. Industry profile

Table -7 highlights the changes within industrial sub-sectors. This is particularly important as sectors with high energy intensity and/or high process emissions of greenhouse gases (such as the chemical industry, pulp and paper, basic metals and 'other' non-metallic mineral products) have increased substantially over time. The chemicals, pulp and paper and building materials industries are all expected to expand further.

[12] Estimates made by DG Transport and Energy
[13] Estimates made by DG Transport and Energy

Table -7 composition of industry based on gross value added €bn (1995 prices)

Sub-sector	EU-15				EU-25		
	1991	1995	2002	% change 1991-2002	1995	2002	% change 1995-2002
Mining and quarrying of energy producing materials	41.2	38.7	40.5	-1.7%	40.7	42.3	4.0%
Other mining	10.8	12.3	13.0	20.2%	12.7	13.6	6.6%
Food products, beverages and tobacco	144.4	155.0	167.8	16.2%	162.0	176.4	8.9%
Textiles and textile products	70.2	65.6	60.5	-13.8%	68.5	63.8	-6.8%
Leather and leather products	13.8	13.0	11.4	-17.7%	13.6	12.0	-12.0%
Wood and wood products	25.1	29.2	32.6	29.7%	30.5	34.5	12.9%
Paper, paper products, publishing and printing	110.8	118.2	126.3	14.0%	122.0	131.6	7.8%
Coke, refined petroleum products and nuclear fuel	20.9	21.2	27.7	32.8%	22.9	29.5	28.7%
Chemicals, chemical products and man-made fibres	118.2	132.3	153.8	30.1%	137.2	160.0	16.7%
Rubber and plastic products	51.7	56.2	66.6	28.8%	58.1	69.6	19.9%
Other non-metallic mineral products	54.1	61.2	64.5	19.1%	63.8	68.0	6.6%
Basic metals and fabricated metal products	162.7	167.5	186.2	14.5%	174.6	194.9	11.7%
Machinery and equipment n. e. c	141.1	135.2	146.3	3.7%	140.1	152.6	8.9%
Electrical and optical equipment	148.6	145.1	188.6	26.9%	150.0	197.3	31.6%
Transport equipment	126.4	123.1	152.0	20.3%	126.9	159.2	25.5%
Other manufacturing	50.1	50.1	52.9	5.6%	51.9	55.4	6.7%

Source:EUROSTAT;

Note:Complete data is not available for the NMS prior to 1995.

1.8. Waste profile

Trends in waste generation, recovery and recycling are a proxy for resource use, and have both a direct and indirect affect on greenhouse gas emissions. Basic data on the generation and treatment of waste are based on the Joint Eurostat/OECD questionnaire. The data are published on the Eurostat website and in the publication "Waste generated and treated in Europe 1995-2003"[14]. Data collection is done on a voluntary basis and there are considerable gaps and inconsistencies in the data availability. Waste data collected by

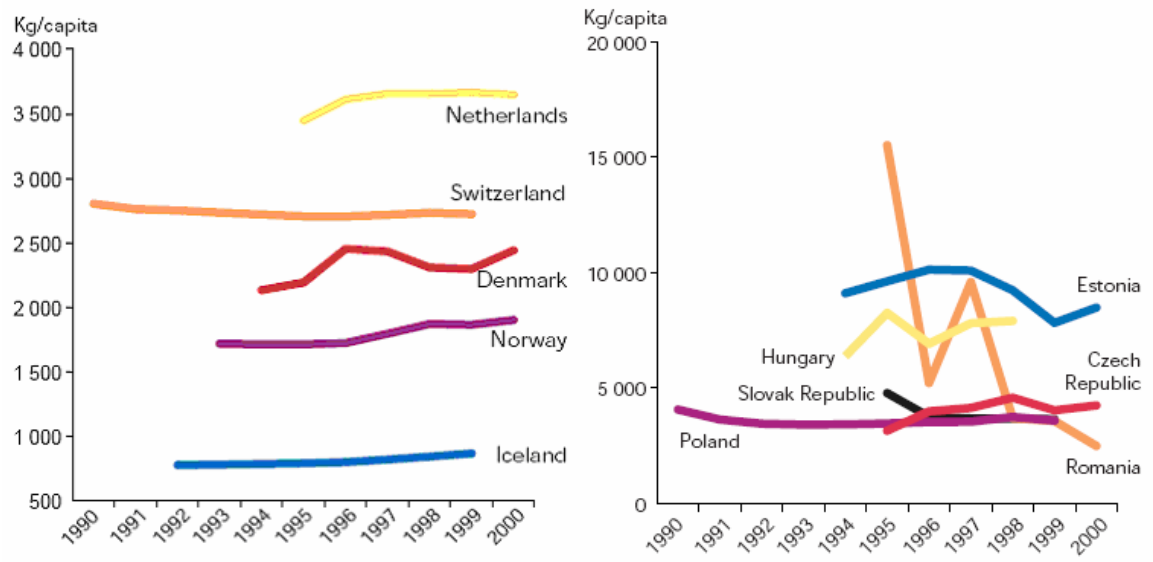
14

http://epp.eurostat.cec.eu.int/portal/page?_pageid=1073,46587259&_dad=portal&_schema=PORTAL&p_product_code=KS-69-05-755

Eurostat is used by the European Topic Centre on Resource and Waste management (which replaced the previous ETC on Waste in January 2005)[15] for further assessments.

Figure 1-13 gives an overview of total waste generation per capita selected countries. In Western European (WE) countries (EU-15 and others) the average was approximately 4. 4 tonnes per capita in 2000 and 6.3 tonnes in Central and Eastern European (CEE) countries (NMS and others). Total waste quantities are continuing to increase in most WE countries for which data are available. In CEE, the picture is more mixed:quantities are increasing in some countries (Czech Republic, Hungary, and Poland) and decreasing in others (Estonia and the Slovak Republic). In general, limited data sets preclude an accurate assessment[16].

Figure -13 Total waste generation per capita in selected countries

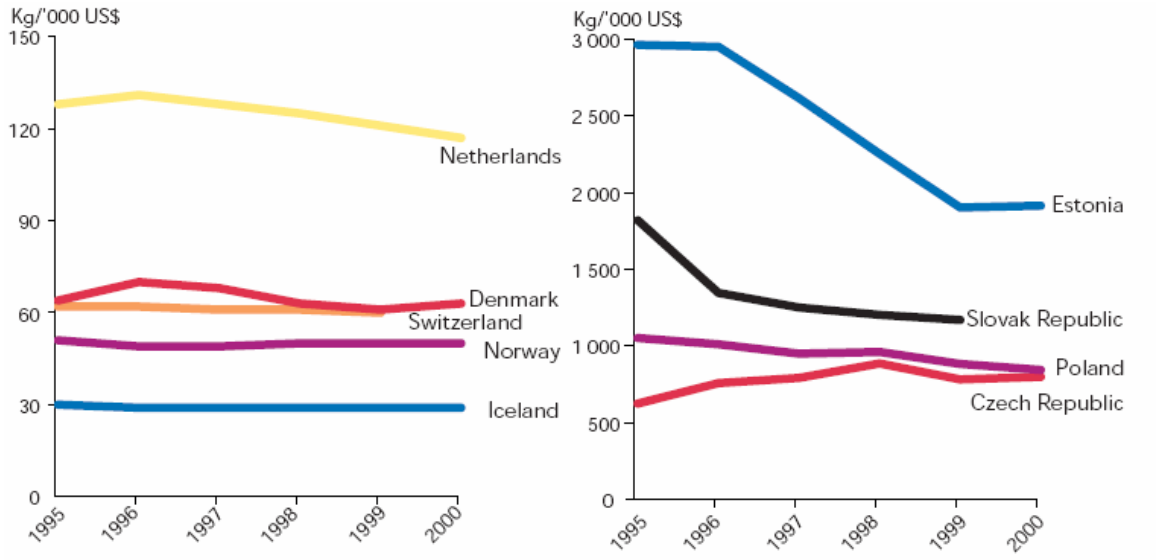


Source: Europe's Environment:The Third Assessment (2003)

Figure 1-14 gives an overview of waste generation per unit GDP per capita and expresses the link between waste generation and economic activity. The limited data appears to show a decoupling of waste from GDP in countries such as the Netherlands and the majority of the CEE countries. However, in the latter case this reduction may be associated with significant structural changes and industrial decline and more disaggregated data would be needed to explore this further.

[15] http://waste.eionet.eu.int/
[16] Europe's Environment:The Third Assessment (2003)
http://reports.eea.eu.int/environmental_assessment_report_2003_10/en/kiev_chapt_07.pdf

Figure -14 Total waste generation per GDP per capita for selected countries



Source:Europe's Environment:The Third Assessment (2003)

The treatment of biodegradable waste differs markedly between Members States, but is subject to a Landfill Directive[17], which will lead to lower emissions as it promotes increased recycling, recovery and reuse and requires reductions in landfilling and collection of landfill gas.

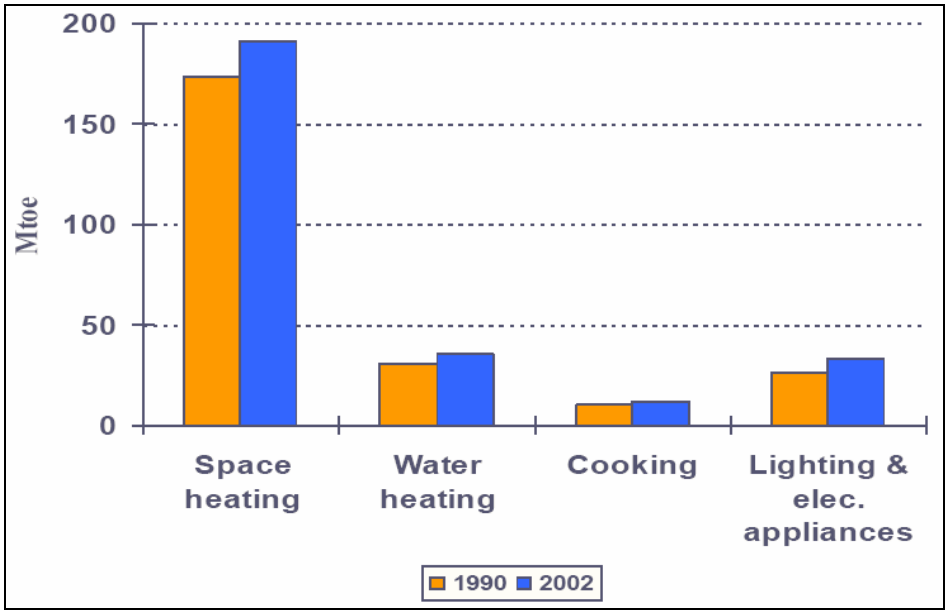
1.9. Building stock and urban structure

Energy consumption within buildings forms a significant component of all EU energy consumption. Total energy consumption within both these sectors has been rising since 1990 (as previously shown in Figure 1-9). This is due primarily to increasing economic activity in the service sector, increasing population pressures and a shift towards fewer members per dwelling in the household sector.

The majority of energy consumption is due to space and water heating within households as illustrated within, although the share of consumption of lighting and appliances is rising over time (this situation is similar within the service sector although the share of lighting and appliance consumption is higher than in households due to greater utilisation of ICT equipment).

[17] Directive 1999/31/EC on the Landfill of Waste

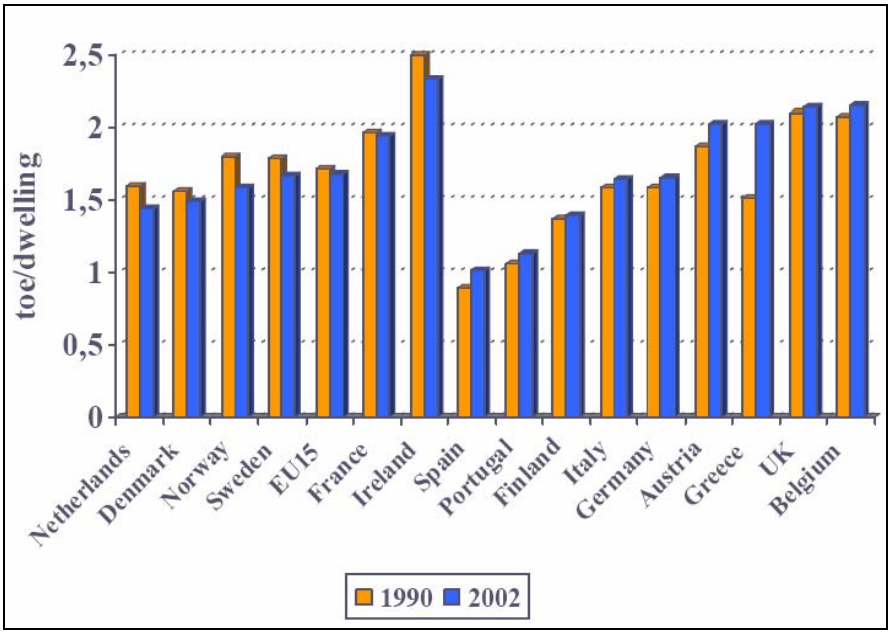
Figure -15 Total household energy consumption by end-use, EU-15



Source:EU Odyssee project on energy efficiency indicators[18]

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 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 and flats more efficient than houses. There is a considerable difference in housing stock between Member States.

Figure -16 Household energy consumption per dwelling (climate corrected)



Source:EU Odyssee project on energy efficiency indicators[19]

[18] http://www.odyssee-indicators.org

From 1990 to 2002, the level of energy consumption per dwelling has fallen in some EU-15 countries but has increased in others (illustrated in Figure -). In general older buildings have gradually been improved in terms of heating and thermal efficiency (e.g. double glazing and loft and wall insulation) and new dwellings now have to be constructed to higher energy standards under the terms of the Directive on the energy performance of buildings[20].

However, counteracting factors that have contributed to a rise in energy consumption per dwelling include:increasing energy consumption of appliances (for example, the use of air conditioners within Southern European countries); rising service demand (higher average internal temperature), increasing dwelling area per capita and the size/type of new dwellings (which is not accounted for in Figure -16).

For appliance consumption, higher levels of ownership act to increase the overall level of energy consumption but a focus on improving efficiency of individual appliances has counteracted this to a certain extent.

1.10. Agriculture

Agricultural land use area is continuously decreasing within the EU-25, as illustrated by Table -8, due to an increasing use of land for settlement and/or leisure areas. The use of agriculture land is important for greenhouse gas emissions thanks to its ability to act as a carbon sink. It is also important though due to the emissions associated with it due to energy consumption (e.g., machinery use and energy input to fertilizers) and methane emissions from livestock.

There are considerable differences in the composition of agricultural areas between the Member States. In Finland, Denmark and Sweden, the majority of agricultural land is used for arable crop farming/tillage. In Ireland, by contrast, nearly 65% is used for pasture or as meadows. Permanent cultures (e.g. vineyards) cover considerable areas especially in the Mediterranean countries Greece, Spain, Italy, Portugal, and France[21]. Data also indicates that the composition of livestock is changing, with a decrease of approximately 9% in head of cattle from 1995 to 2002 within the EU-15, and a rise in the number of pigs and poultry by 5% and 3% respectively. The use of fertilisers is also declining trend with a reduction in total consumption of approximately 11% from 1997 to 2001 (from Eurostat data), although this is in absolute terms and coupled with the decline in agriculture land does indicate a decline in the intensity of fertilizer consumption. As a result of the reform of the Common Agricultural Policy in 2003 payments to farmers are linked to obligations regarding the environment and provide greater opportunity for funding environmentally sound farming methods which could lead to this trend continuing.

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[19] http://www.odyssee-indicators.org

[20] Directive 2002/91/EC on the energy performance of buildings:http://europa.eu.int/eur-lex/pri/en/oj/dat/2003/l_001/l_00120030104en00650071.pdf

[21] Landesstelle für landwirtschaftliche Marktkunde (LLM) Schwaebisch Gmuend) (2001):Loseblattsammlung Marktwirtschaftliche Erzeugerberatung; Flächennutzung.Internet pages http://www.landwirtschaft-mlr.baden-wuerttemberg.de/la/lel/llm/meb/Kap311.htm

Table -8 Total agriculture land and usage in EU-25

	1990					2000				
	Total (km2)	**Arable**	**LUPC**	**LUPMP**	**Other/not classified**	**Total (km2)**	**Arable**	**LUPC**	**LUPMP**	**Other/not classified**
Belgium	13840	55,51%	1,13%	41,80%	1,55%	13957	62,12%	1,48%	36,22%	0,18%
Czech Republic	42880	75,07%	1,82%	19,43%	3,68%	42824	72,00%	1,60%	22,41%	3,98%
Denmark	27883	91,84%	0,37%	7,79%	0,00%	29646	93,73%	0,20%	6,05%	0,02%
Germany	178691	66,99%	1,39%	31,44%	0,18%	170642	69,15%	1,22%	29,58%	0,05%
Estonia	13578	82,18%	0,85%	16,95%	0,01%	9858	85,61%	1,08%	13,31%	0,01%
Greece	51801	45,01%	20,46%	34,54%	0,00%	39057	71,37%	28,50%	45,81%	-45,67%
Spain	306252	50,07%	15,98%	33,94%	0,00%	253938	52,17%	19,55%	27,70%	0,58%
France	304942	58,38%	4,07%	36,81%	0,74%	297191	61,61%	4,11%	33,67%	0,60%
Ireland	45364	17,08%	0,04%	82,88%	0,00%	44432	24,16%	0,05%	75,01%	0,78%
Italy	181663	56,09%	16,50%	26,80%	0,61%	156277	53,90%	17,73%	27,85%	0,52%
Cyprus	1415	64,03%	35,97%	2,97%	-2,97%	1444	61,86%	28,86%	0,76%	8,52%
Latvia	25396	65,21%	1,41%	33,38%	0,00%	24674	75,02%	0,43%	24,55%	0,00%
Lithuania	35135	85,30%	1,40%	13,30%	0,00%	34887	84,05%	1,69%	14,25%	0,01%
Luxembourg	1266	44,18%	1,26%	54,45%	0,10%	1346	50,45%	1,02%	48,49%	0,05%
Hungary	64731	72,81%	n/a	18,31%	n/a	64192	78,81%	3,21%	16,38%	1,61%
Malta	n/a	n/a	n/a	n/a	n/a	97	89,79%	9,82%	n/a	n/a
Netherlands	20193	45,56%	1,65%	52,57%	0,22%	19687	51,73%	1,70%	45,81%	0,75%
Austria	34580	40,72%	2,28%	56,48%	0,52%	33807	40,85%	2,16%	56,72%	0,28%
Poland	186456	77,16%	1,83%	21,00%	0,00%	182204	77,18%	1,57%	21,25%	0,00%
Portugal	40190	58,45%	19,46%	21,35%	0,75%	38951	44,08%	19,63%	35,68%	0,61%
Slovenia	n/a	n/a	n/a	n/a	n/a	5145	34,28%	5,81%	59,90%	0,00%
Slovakia	24166	62,44%	2,20%	32,13%	3,22%	24022	61,71%	1,28%	35,58%	1,42%
Finland	25597	99,30%	0,10%	0,59%	0,02%	22086	98,61%	0,16%	1,17%	0,06%
Sweden	34164	83,27%	0,10%	16,63%	0,00%	29741	87,40%	0,10%	12,50%	0,00%
United Kingdom	169985	39,09%	0,34%	60,48%	0,09%	155179	37,25%	0,29%	62,46%	0,00%

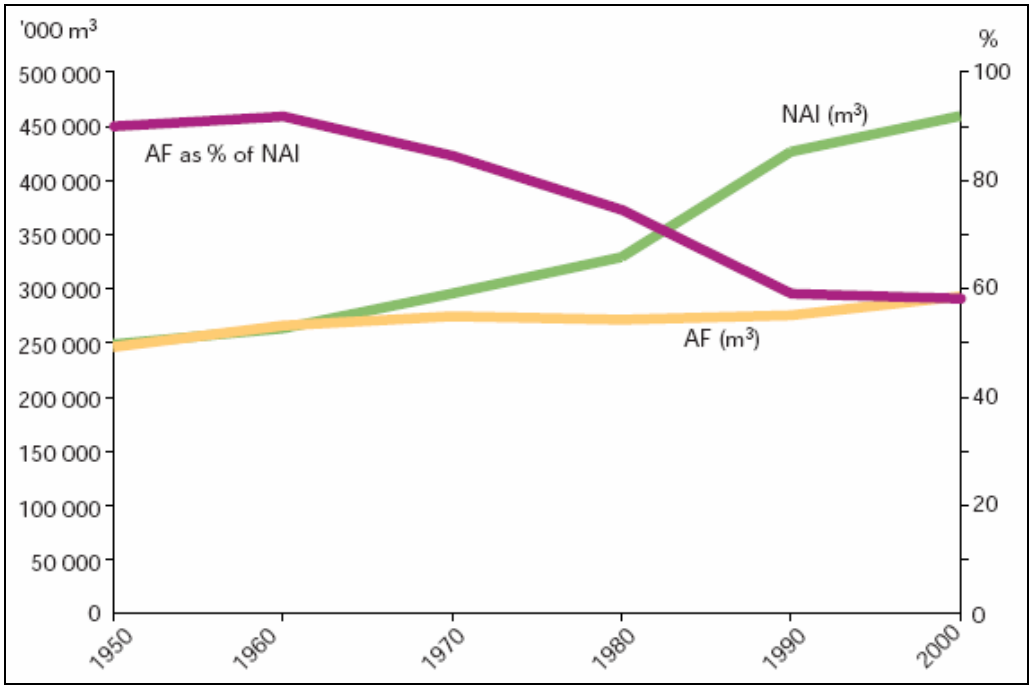
Source:EUROSTAT

Note:LUPC = Land Under Permanent Crops, LUPMP = Land Under Permanent Meadows and Pastures

1.11. Forest

Total forest area in the EU-25 is currently around 2.1 million km^2 and has been growing steadily in almost all Member States since the mid-1960s, as the level of Annual Fellings (AF) has been less than the annual increment in forest stock leading to a Net Annual Increment (NAI) in forest stock year on year, as shown in Figure 1-17.

Figure -17 Net Annual Increase of forest stock and Annual Fellings in EU-25



Source:Europe's Environment:The Third Assessment (2003)

The level of annual fellings as a percentage of NAI has declined over time (to just under 60% in the EU-25 as a whole). This has occurred more rapidly in recent years in the Mediterranean and South Eastern NMS, leading to a greater expansion of forest stock in these areas. Even as the percentage of annual fellings within NAI has declined, total annual fellings have gradually increased, indicating a sustainable expansion of the use of this resource

In terms of the impact on the EU-15 Carbon Sink the Actual Net Carbon Increment (subtracting removals) was 63.21 million tons per year, or 0.46 tons per hectare per year, which resulted from an NAI of 164.5 million tons and harvest of 103.47 million tons[22].

Those removals that are used for sawn woods and wood-based panels have a high proportion being used in permanent constructions, which means that the carbon stored in the wood is bound in these materials over a long period. Other materials produced from wood, like fuel wood and paper, store the carbon stored for a shorter time period.

The overall potential within European carbon sinks is still not clear with regards to their use in meeting Kyoto commitments. The European Commission funded Integrated Sink Enhancement (INSEA) Project[23], which is due to run from January 2004 to July 2006 aims to address the analytical gaps in the use of carbon sinks in European Agriculture and Forestry.

[22]United Nations Food and Agricultural Organisation Forest Resource Assessment 2000.N.B.the 2005 FRA is still currently ongoing.

[23] http://www.iiasa.ac.at/Research/FOR/INSEA/index.html

2. GREENHOUSE GAS INVENTORY INFORMATION

Developments

1. Total GHG emissions in the EU25 (without LUCF) decreased by more than 5% from 1990 to 2003. In the EU15 they decreased by nearly 2% over the same period

2. Averaged over the latest five years, EU-15 emissions stood nearly 3% below their 1990 level

3. Emissions of carbon dioxide (CO_2) and other greenhouse gases rose by 1.3% in the EU-15 in 2003 compared with 2002. This was primarily due to a rise in coal use for electricity generation in 2003

2.1. Introduction

This chapter presents greenhouse gas emission trends of the European Community (EC); due to the enlargement of the EC with 10 New Member States on 1 May 2004 the inventory information now covers the EU-25 for the period 1990-2003. The legal basis of the compilation of the EC inventory is described briefly and the inventory methodology and data availability are given in Annex 1.

The greenhouse gas data presented in this chapter are consistent with the 2005 Submission of the EC to the United Nations Framework Convention on Climate Change (UNFCCC) Secretariat[24]. This submission also contains further details of contacts, relevant institutions and the development/procedural arrangements of the inventory, beyond those presented in this chapter. The EC inventory has been compiled on the basis of data delivered by the Member States by 15 January 2005 under Council Decision 280/2004/EC. The annex of the EC Fourth National Communication includes the Summary Reports 1. A of the European Community for 1990-2003.

This data and also the complete submissions of the Member States under Council Decision 280/2004/EC are available on the EEA website[25].

2.2. The EC Monitoring Mechanism

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[26]. More details of the decision are given in Chapter 4 of this document.

The EC GHG inventory is the direct sum of the national inventories. Only for the EU-15 is the reference approach for CO_2 from fossil fuels of the developed by the Intergovernmental Panel on Climate Change (IPCC) Eurostat energy data used. More details of this are provided in the inventory report[24].

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[24] European Environment Agency, Technical Report No 4/2005 Annual European Community greenhouse gas inventory 1990–2003 and inventory report 2005

[25] http://reports.eea.eu.int/technical_report_2005_4/en/tab_content_RLR

[26] Note that Council Decision No 280/2004/EC entered into force in March 2004.Therefore, the compilation of the inventory report 2004 started under the previous Council Decision 1999/296/EC.

The main institutions involved in the compilation of the EC GHG inventory are the Member States, the European Commission (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 (DG JRC).

The reporting requirements for the Member States under Council Decision No 280/2004/EC are elaborated in Commission Decision 2005/166/EC, which lays down rules for its implementation[27].

According to the Council and Commission decisions, the reporting content and format requirements are exactly the same as for the UNFCCC. The EC and its Member States use the 'UNFCCC guidelines on reporting and review' (Document FCCC/CP/2002/8), and prepare inventory information in the common reporting format (CRF) and the 'national inventory report' that contains background information.

In accordance with UNFCCC guidelines, the EC and its Member States use the IPCC *Good practice guidance and uncertainty management in national greenhouse gas inventories*[28], which is consistent with the *Revised 1996 IPCC guidelines for national greenhouse gas inventories*[29]. The use of the 2000 IPCC guidance by countries is expected to lead to higher quality inventories and more reliable estimates of the magnitude of absolute and trend uncertainties in reported GHG inventories. The inventory update has also made extended use of the new IPCC Good Practice Guidance for LULUCF[30].

It should be noted that all Member States are Annex I parties to the UNFCCC, except Cyprus and Malta, are committed to preparing individual GHG inventories and submit those inventories to the UNFCC secretariat by 15 April.

2.3. EC greenhouse gas emission trends

Total GHG emissions without LUCF in the EU-25 decreased by 5.5 % between 1990 and 2003 although emissions increased by 1.5 % between 2002 and 2003. In the EU-15 the decrease between 1990 and 2003 was 1.7% with an increase of 1.3% from 2002 to 2003. However, averaged over the last five years EU-15 emissions stood 2.9% below their 1990 level - this measure is used because the Kyoto target itself is based upon a five-year average from 2008-2012 - which is shown in Figure -2.

[27]Commission Decision 2005/166/EC - laying down rules implementing Decision No 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.
[28]IPCC 2000, Good practice guidance and uncertainty management in national greenhouse gas inventories, Intergovernmental Panel on Climate Change.
[29] IPCC 1997, *Revised 1996 IPCC guidelines for national greenhouse gas inventories*, Intergovernmental Panel on Climate Change.
[30] IPCC (2003) Good Practice Guidance for Land Use, Land-Use Change and Forestry, Intergovernmental Panel on Climate Change.

Figure -1 EU-25 GHG emissions 1990–2003 (excl. LUCF)

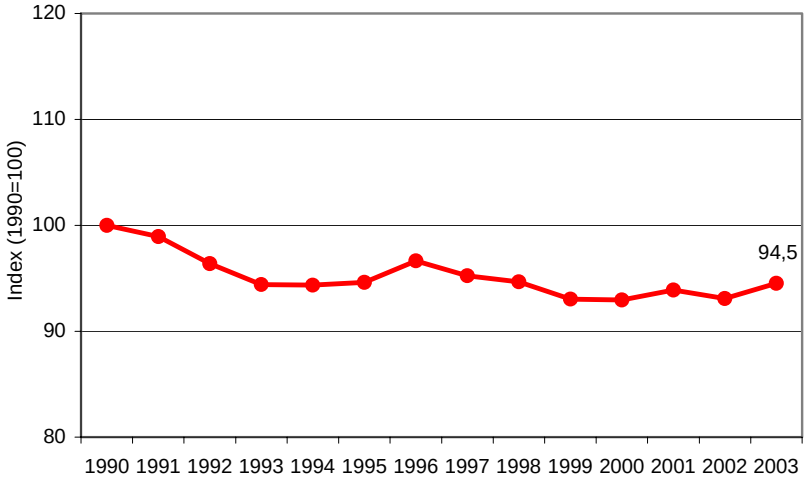
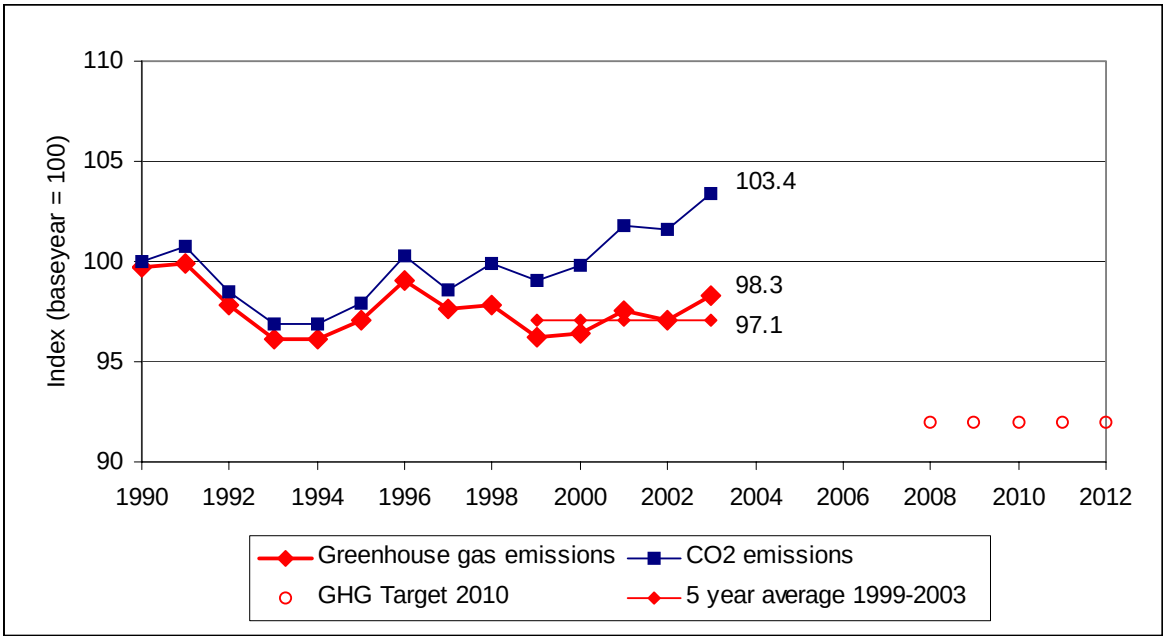


Figure -2 EU-15 GHG emissions 1990–2003 compared with target for 2008–2012 (excl. LUCF)



Notes:

GHG emission data for the EC as a whole do not include emissions and removals from LUCF. 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. 13 Member States have chosen to select 1995 as base year under the Kyoto Protocol, Finland and France have chosen to use 1990. Therefore, the EC base year estimates for fluorinated gas emissions are the sum of 1995 emissions for 13 Member States and 1990 emissions for Finland and France. For CO_2, methane (CH_4) and nitrous oxide (N_2O) the base year is 1990 for most Member States, with the following exceptios:The base year for CO_2, CH_4 and N_2O for Hungary is the average of 1985-1987, for Slovenia 1986 and for Poland 1988.

Table -9 gives an overview of the main trends in EU-25 GHG emissions and removals for 1990–2003. The most important GHG by far is CO_2, accounting for 82 % of total EU-25 emissions in 2003. In 2003, EU-25 CO_2 emissions without LUCF were 4064Tg, which was 1.6 % below 1990 levels. Compared to 2002, CO_2 emissions increased by 2.1 %.

Table -9 Overview of EU-25 GHG emissions and removals from 1990 to 2003 in CO_2 equivalents (Tg)

GREENHOUSE GAS EMISSIONS	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Net CO2 emissions/ removals	3,818	3,748	3,645	3,567	3,561	3,571	3,657	3,597	3,619	3,542	3,562	3,606	3,56	3,669
CO2 emissions (without LUCF)	4,128	4,106	3,998	3,921	3,917	3,925	4,028	3,963	3,967	3,921	3,931	4,005	3,982	4,064
CH4	554	537	525	513	504	501	490	479	471	456	443	425	415	407
N2O	474	460	447	431	439	441	448	448	424	407	408	402	391	389
HFCs	27	27	29	30	34	40	45	52	53	47	46	47	49	53
PFCs	17	16	13	12	11	11	11	10	9	8	7	7	6	6
SF6	11	11	12	13	14	15	15	14	12	10	10	9	10	10
Total (with net CO2 emissions/ removals)	**4,902**	**4,798**	**4,670**	**4,566**	**4,563**	**4,579**	**4,666**	**4,600**	**4,589**	**4,471**	**4,477**	**4,496**	**4,432**	**4,533**
Total (without CO2 from LUCF)	**5,212**	**5,157**	**5,023**	**4,920**	**4,919**	**4,933**	**5,038**	**4,965**	**4,936**	**4,850**	**4,846**	**4,895**	**4,854**	**4,928**
Total (without LUCF)	**5,212**	**5,156**	**5,023**	**4,919**	**4,917**	**4,931**	**5,036**	**4,964**	**4,935**	**4,849**	**4,844**	**4,894**	**4,852**	**4,925**

Table -10 gives an overview of the main trends in the EU-15 GHG emissions and removals for 1990–2003. Also in the EU-15 the most important GHG by is CO_2, also accounting for 82 % of total EU-15 emissions in 2003. In 2003, EU-15 CO_2 emissions without LUCF were 3 447 Tg, which was 3.4 % above 1990 levels. Compared to 2002, CO_2 emissions increased by 1.8 %.

Table -10 Overview of EU-15 GHG emissions and removals from 1990 to 2003 in CO_2 equivalents (Tg)

GREENHOUSE GAS EMISSIONS	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Net CO2 emissions/ removals	3,111	3,111	3,088	3,023	2,97	2,964	3,004	3,063	3,008	3,053	3,010	3,044	3,086	3,058	3,138
CO2 emissions (without LUCF)	3,335	3,335	3,359	3,285	3,232	3,230	3,267	3,343	3,288	3,331	3,304	3,328	3,394	3,388	3,447
CH4	441	441	432	426	419	410	408	402	392	383	372	361	351	342	334
N2O	408	408	403	396	383	391	392	398	399	376	352	352	344	336	336
HFCs	41	27	27	29	30	34	40	45	51	53	46	44	44	46	50
PFCs	12	16	14	12	10	10	9	9	8	8	7	6	6	6	6
SF6	15	10	11	12	12	13	15	15	13	12	10	10	9	10	9
Total (with net CO2 emissions/ removals)	**4,029**	**4,015**	**3,976**	**3,897**	**3,825**	**3,823**	**3,868**	**3,932**	**3,872**	**3,884**	**3,797**	**3,817**	**3,839**	**3,798**	**3,873**
Total (without CO2 from LUCF)	**4,253**	**4,238**	**4,246**	**4,159**	**4,087**	**4,089**	**4,131**	**4,212**	**4,151**	**4,162**	**4,092**	**4,101**	**4,148**	**4,127**	**4,182**
Total (without LUCF)	**4,252**	**4,238**	**4,246**	**4,159**	**4,087**	**4,088**	**4,129**	**4,211**	**4,150**	**4,160**	**4,091**	**4,100**	**4,146**	**4,126**	**4,180**

The increase of CO_2 emissions was compensated by decreases in CH_4 and N_2O in the same period:CH_4 decreased by 108 Tg (CO_2 equivalents) (–24 %) and N_2O by 73 Tg (CO_2 equivalents) (-18 %).

Table -11 gives an overview of EU-25 GHG emissions in the main source categories for 1990–2003. The most important sector by far is 'Energy' accounting for 80 % of total EU-25 emissions in 2003. The second largest sector is 'Agriculture' (10 %), followed by Industrial processes' (6 %).

Table -11 Overview of EU-25 GHG emissions in the main source and sink categories 1990 to 2003 in CO_2 equivalents (Tg)

GHG SOURCE AND SINK	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1 Energy	4,123	4,113	4,003	3,931	3,91	3,914	4,023	3,948	3,944	3,894	3,895	3,970	3,946	4,015
2 Industrial Processes	351	331	321	311	332	344	345	354	333	300	303	299	293	305
3 Solvent and Other Product Use	12	11	11	11	10	11	11	11	11	11	11	10	10	10
4 Agriculture	547	524	509	493	494	494	496	497	493	496	491	483	476	468
5 Land-Use Change and Forestry	-310	-358	-353	-354	-354	-351	-370	-364	-346	-378	-365	-398	-421	-392
6 Waste	178	176	177	173	171	167	160	154	154	148	143	131	126	125
7 Other	1	1	1	1	1	1	1	1	1	1	1	1	1	1

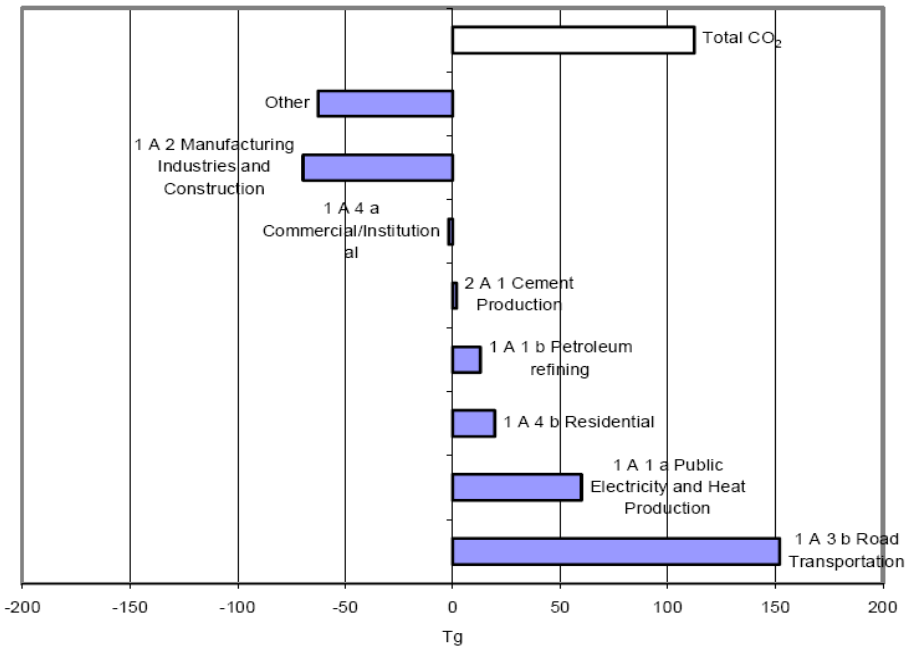
Table -12 gives an overview of EU-15 GHG emissions in the seven sectors for 1990–2003. The emissions from the largest sector 'Energy', with an 81 % share of the total emissions, increased by 83 Tg CO_2 equivalents (2.5 %). This increase was offset by decreases in all other source categories:emissions from 'Industrial processes' decreased by 48 Tg CO_2 equivalents (– 15 %), emissions from 'Agriculture' by 47 Tg CO_2 equivalents (– 10 %), emissions from 'Waste' by 44 Tg CO_2 equivalents (– 31 %) and emissions from 'Solvent and other product use' by 1 Tg CO_2 equivalents (– 10 %).

Table -12 Overview of EU-15 GHG emissions in the main source and sink categories 1990 to 2003 in CO_2 equivalents (Tg)

GHG SOURCE AND SINK	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1 Energy	3,310	3,310	3,344	3,273	3,221	3,203	3,235	3,316	3,253	3,292	3,264	3,280	3,347	3,339	3,393
2 Industrial Processes	328	313	301	292	283	302	313	315	320	298	265	266	259	258	265
3 Solvent and Other Product Use	10	10	10	10	10	10	10	10	10	10	10	10	9	9	9
4 Agriculture	462	462	449	442	433	436	437	440	442	440	437	435	426	420	414
5 Land-Use Change and Forestry	-223	-223	-270	-262	-262	-265	-261	-278	-278	-276	-294	-283	-307	-329	-307
6 Waste	141	141	142	141	140	137	133	130	124	120	114	109	104	99	97
7 Other	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

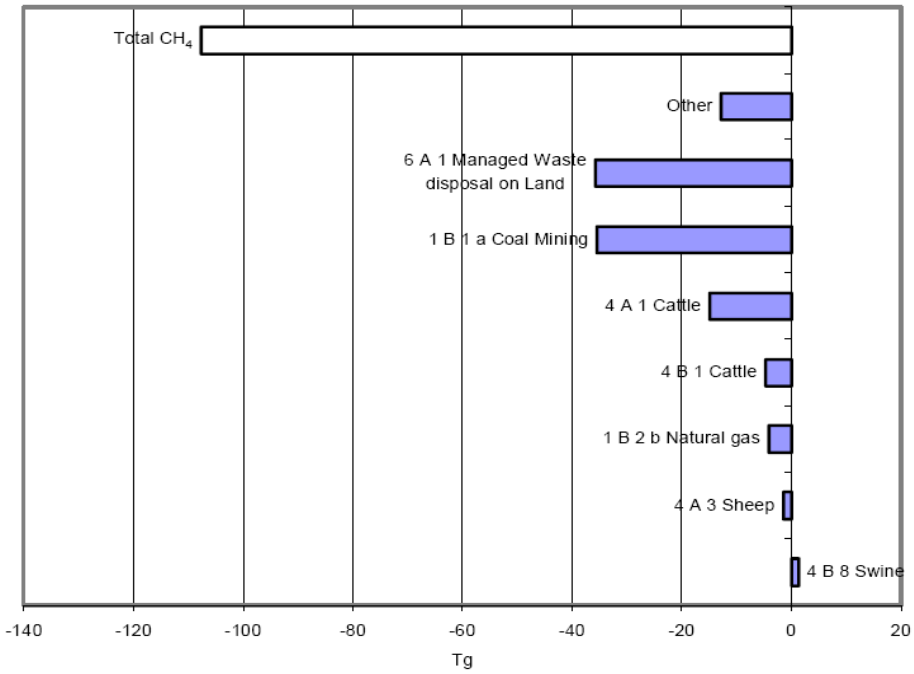
The main reason for the increase in EU-15 CO_2 emissions between 1990 and 2003 was growing road transport demand. The large increase in road transport-related CO_2 emissions was only partly offset by reductions in energy-related emissions from manufacturing industries, as shown in **Figure -3**.

Figure -3 Absolute change of CO_2 emissions by large key source categories 1990 to 2003 in CO_2 equivalents (Tg) for EU-15



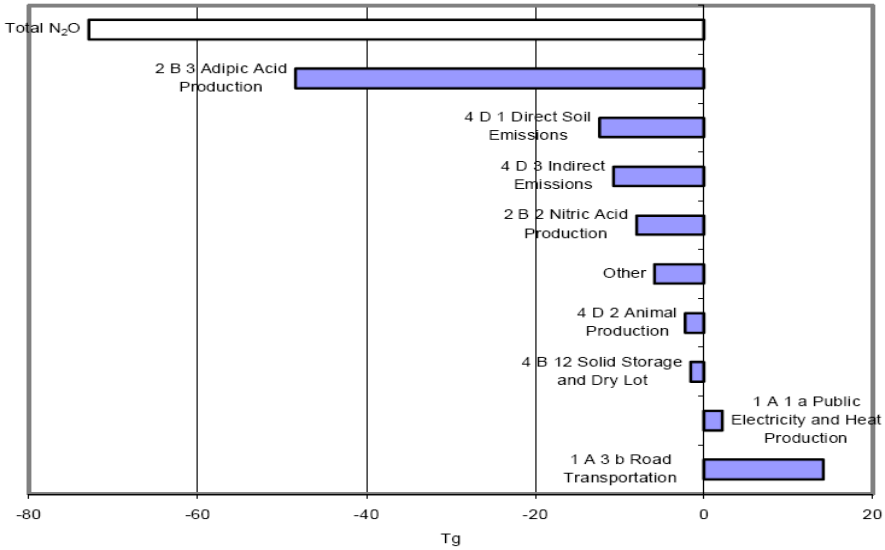
CH_4 emissions account for 8 % of total EU-15 GHG emissions and decreased by 24 % since 1990 to 334 Tg (CO_2 equivalents) in 2003. The two largest key sources account for slightly more than 50 % of CH_4 emissions in 2003. **Figure -4** shows that the main reasons for declining CH_4 emissions were reductions in solid waste disposal on land, the decline of coal-mining and falling cattle population.

Figure -4 Absolute change of CH_4 emissions by large key source categories 1990 to 2003 in CO_2 equivalents (Tg) for EU-15



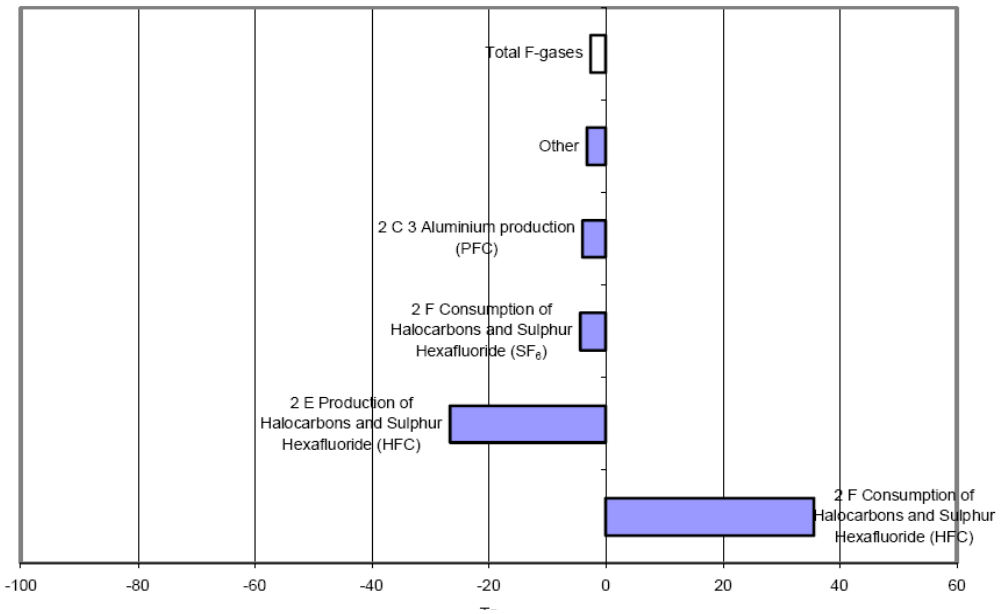
N_2O emissions are responsible for 8 % of total EU-15 GHG emissions and decreased by 18 % to 336 Tg (CO_2 equivalents) in 2003. The two largest key sources account for about 50 % of N_2O emissions in 2003. Figure 2-5 shows that the main reason for large N_2O emission cuts were reduction measures in the adipic acid production.

Figure -5 Absolute change of N_2O emissions by large key source categories 1990 to 2003 in CO_2 equivalents (Tg) for EU-15



Fluorinated gas emissions account for 1.6 % of total EU-15 GHG emissions. In 2003, emissions were 65 Tg (CO_2 equivalents), which was 22 % above 1990 levels, but 4 % below base year level. The two largest key sources account for 77 % of fluorinated gas emissions in 2003. Figure -6 shows that HFCs from consumption of halocarbons showed large increases between 1990 and 2003. 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 decreased substantially. The decrease started in 1998 and was strongest in 1999.

Figure -6 Absolute change of fluorinated gas emissions by large key source categories 1990 to 2003 in CO_2 equivalents (Tg) for EU-15



2.3.1. Contribution of MS to Greenhouse reduction trends

Table 2-5 and Table 2-6 give an overview of Member States' contributions to the EC GHG emissions for 1990–2003. Member States show large variations in GHG emission trends.

Table -13 Overview of Member States' contributions to EC GHG emissions excluding LUCF from 1990 to 2003 in CO_2 equivalents (Tg)

Member State	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Austria	79	83	76	76	77	80	83	83	83	80	81	85	86	92
Belgium	146	149	147	146	151	152	157	148	153	146	148	147	145	148
Cyprus	6	6	7	7	7	7	8	8	8	8	9	8	9	9
Czech Republic	192	178	164	158	152	153	155	159	149	140	148	148	143	147
Denmark	69	80	74	76	80	77	90	80	76	73	68	70	69	74
Estonia	43	41	30	23	24	22	23	24	21	20	20	19	20	21
Finland	70	69	67	68	74	71	77	76	73	72	70	76	77	86
France	568	593	585	559	555	563	578	572	584	566	560	564	554	557
Germany	1,244	1,191	1,142	1,126	1,108	1,103	1,121	1,084	1,057	1,021	1,017	1,028	1,015	1,018
Greece	109	109	110	110	113	114	118	123	128	127	132	134	134	138
Hungary	104	96	86	85	85	84	86	84	85	84	81	84	81	83
Ireland	54	55	56	56	57	58	60	63	65	67	69	71	69	68
Italy	511	513	509	505	496	528	519	525	535	544	551	556	555	570
Latvia	25	24	19	16	15	12	12	12	11	10	10	11	11	11
Lithuania	51	45	42	38	35	31	28	24	22	21	21	20	20	17
Luxembourg	13	13	13	13	13	10	10	9	8	9	10	10	11	11
Malta	2	2	3	3	3	3	3	3	3	3	3	3	3	3
Netherlands	212	216	215	221	221	224	233	225	227	215	214	216	213	215
Poland	460	438	440	430	440	417	437	427	404	402	386	383	370	384
Portugal	59	61	65	64	65	70	67	70	75	83	80	81	86	81
Slovakia	72	63	59	55	52	53	54	54	52	51	48	53	52	52
Slovenia	19	18	18	18	18	19	20	20	20	19	19	20	20	20
Spain	284	290	299	287	303	315	307	328	337	365	380	379	399	402
Sweden	72	72	72	72	75	73	77	73	73	70	67	68	69	71
United Kingdom	748	752	729	710	700	691	714	691	686	652	652	663	644	651
EU25	**5,212**	**5,156**	**5,023**	**4,919**	**4,917**	**4,931**	**5,036**	**4,964**	**4,935**	**4,849**	**4,844**	**4,894**	**4,852**	**4,925**
EU15	**4,238**	**4,246**	**4,159**	**4,087**	**4,088**	**4,129**	**4,211**	**4,150**	**4,160**	**4,091**	**4,100**	**4,146**	**4,126**	**4,180**

Note: For some countries the data provided in this table is based upon the gap filling procedure; see Annex 1 for more details.

Table -14 Greenhouse gas emissions in CO_2 equivalents (excl. LUCF) and Kyoto Protocol targets for 2008–2012

MEMBER STATE	Base year [1] (million tonnes)	2003 (million tonnes)	Change 2002–2003 (%)	Change base year–2003 (%)	Targets 2008–12 under Kyoto Protocol and "EU burden sharing" (%)
Austria	78,5	91,6	5,9%	16,6%	-13,0%
Belgium	146,8	147,7	1,6%	0,6%	-7,5%
Cyprus	6,0	9,2	5,3%	52,8%	-
Czech Republic	192,1	145,4	1,8%	-24,3%	-8,0%
Denmark	69,6	74,0	7,3%	6,3%	-21,0%
Estonia	43,5	21,4	9,7%	-50,8%	-8,0%
Finland	70,4	85,5	10,8%	21,5%	0,0%
France	568,0	557,2	0,7%	-1,9%	0,0%
Germany	1248,3	1017,5	0,2%	-18,5%	-21,0%
Greece	111,7	137,6	3,1%	23,2%	25,0%
Hungary	122,2	83,2	3,0%	-31,9%	-6,0%
Ireland	54,0	67,6	-2,6%	25,2%	13,0%
Italy	510,3	569,8	2,7%	11,6%	-6,5%
Latvia	25,4	10,5	-0,9%	-58,5%	-8,0%
Lithuania	50,9	17,2	-12,1%	-66,2%	-8,0%
Luxembourg	12,7	11,3	4,3%	-11,5%	-28,0%
Malta [2]	2,2	2,9	-0,5%	29,1%	-
Netherlands	213,1	214,8	0,6%	0,8%	-6,0%
Poland [2]	565,3	384,0	3,7%	-32,1%	-6,0%
Portugal	59,4	81,2	-5,3%	36,7%	27,0%
Slovakia	72,0	51,7	-1,3%	-28,2%	-8,0%
Slovenia	20,2	19,8	-1,2%	-1,9%	-8,0%
Spain	286,1	402,3	0,9%	40,6%	15,0%
Sweden	72,3	70,6	1,5%	-2,4%	4,0%
United Kingdom	751,4	651,1	1,1%	-13,3%	-12,5%
EU-15	**4252,5**	**4179,6**	**1,3%**	**-1,7%**	**-8,0%**

([1])The base year for CO_2, CH_4 and N_2O is 1990; for the fluorinated gases 13 Member States have chosen to select 1995 as the base year, whereas Finland and France 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 13 Member States and 1990 emissions for Finland and France.

([2])Malta and Poland did not provide GHG emission estimates for 2003, therefore the data provided in this table is based on gap filling (see Annex 1).

Note: Malta and Cyprus do not have Kyoto targets.

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-25 GHG emissions. These two Member States achieved total GHG emission reductions of 323 million tonnes compared to 1990 and the reasons for this were discussed in the 3rd National Communication[31].

Italy and France are the third and fourth largest emitters with shares of 12% and 11% respectively. Italy's GHG emissions were 12% above 1990 levels in 2003. Italian GHG emissions have increased since 1990 primarily from road transport, electricity and heat

[31]The EU-15 as a whole needs emission reductions of total GHG of 8 %, i.e.340 million tonnes on the basis of the 2005 inventory in order to meet the Kyoto target.

production and petrol-refining. France's emissions were 2% below 1990 levels in 2003. In France, large reductions were achieved in N_2O emissions from the adipic acid production, but CO_2 emissions from road transport increased considerably between 1990 and 2003.

Spain and Poland are the fifth and sixth largest emitters in the EU-25 each accounting for about 8% of total EU-25 GHG emissions. Spain increased emissions by 42% between 1990 and 2003 (41% 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 16 % between 1990 and 2003[32] (-32 % since the base year, which is 1988 in the case of Poland). The 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 3-6 shows that 12 Member States (including Cyprus and Malta, which do not have a Kyoto target) were above base year levels in 2003 and 13 Member States were below. The percentage changes of GHG emissions from the base year to 2003 range from – 66 % (Lithuania) to + 41 % (Spain).

2.3.2. Information on indirect greenhouse gas emissions for EU-15

Emissions of CO, NOx, NMVOC and SO_2 have to be reported to the UNFCCC Secretariat as they have an indirect influence on climate change:CO, NOx 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 -15 shows the total indirect GHG and SO_2 emissions in the EU-15 between 1990 and 2003. All emissions were reduced significantly from 1990 levels:the largest reduction was achieved in SO_2 (– 68 %) followed by CO (– 48 %) NMVOC (– 38 %) and NO_x (– 31 %).

Table -15 Overview of EU-15 indirect GHG and SO_2 emissions for 1990–2003 (Gg)

GREENHOUSE GAS EMISSIONS	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Gg													
NOx	13,390	13,145	12,832	12,243	11,881	11,599	11,316	10,836	10,593	10,259	9,913	9,686	9,420	9,273
CO	50,457	48,605	46,522	44,276	41,983	40,325	38,766	36,854	35,303	33,246	30,618	29,199	27,263	26,481
NMVOC	15,556	14,865	14,451	13,774	13,436	13,085	12,519	12,322	11,808	11,346	10,643	10,244	9,782	9,594
SO2	16,527	14,977	13,825	12,563	11,347	10,229	8,852	8,047	7,519	6,753	6,093	5,875	5,669	5,234

[32]Note that for Poland data for 2003 have been estimated by gap filling because Poland did not provide GHG emission estimates before the monitoring mechanism data deadline.

3. POLICIES AND MEASURES

Developments

1. In 2005, the world's first international CO_2 emissions trading scheme came into operation in the EU

2. The large majority of policies and measures identified by the Commission as a priority for the EU as a result of the work undertaken in European Climate Change Programme (ECCP) I are now implemented.

3. ECCP II continues to provide the main policy framework for meeting the challenge of climate change focusing in particular on energy efficiency, renewable energy, the transport sector (including aviation and maritime transport), carbon capture and storage and the role of the EU in reducing vulnerability and promoting adaptation

4. The European Community has new policy actions in most sectors

5. Links to the Kyoto Mechanisms will ensure that the EU emissions trading scheme will also contribute to technology transfer to developing countries

6. Action by the European Community strengthens and supports a multitude of national measures to reduce climate change

3.1. The Policy Framework

3.1.1. Policy making process

In the European Union, two sets of policies and measures impact on the level of greenhouse gas emissions:

- those developed by the European Union and applying across the Member States, called common and co-ordinated policies and measures (CCPMs); and

- those developed by Member States and applying to that Member State.

CCPMs are used in areas where the EU has competence according to the Treaty establishing the European Community and in which common action strengthens and supports national efforts to reduce greenhouse gases most effectively, for example where larger markets would give greater effect. The EC Fourth National Communication focuses on these CCPMs.

The legal instruments available to the Community institutions to carry out their tasks under the Treaty are:

- *Regulations*: these are binding in their entirety and directly applicable in all Member States;

- *Directives*: these bind the Member States as to the results to be achieved and leave a margin for manoeuvre as to the form and means of implementation;

- *Decisions*: these are fully binding on those to whom they are addressed;

- *Recommendations and opinions*: these are non-binding instruments.

Thus, measures adopted by the EU institutions still have to be transposed into the national legal framework in all Member States. If a Member State fails to do so, this can invoke Treaty infringement proceedings (Article 226 EC)[33].

The strategy of the European Union for sustainable development and its implications for climate change, as well as the concrete measures initiated to translate the strategies into practical steps up to the first commitment period 2008/2012 were described in the 3rd National Communication. In this Chapter, we report the developments to common and co-ordinated policies and measures discussed in the previous National Communication and detail new policies and measures. Member State policies and measures are reported in their own National Communications.

The European Community, is currently not a direct member of either the International Maritime Organisation or the International Civil Aviation Organisation, it acts as an observer with individual Member States directly represented. As such, Member States are responsible for implementing any decisions taken by the ICAO or IMO to reduce greenhouse gas emissions from aviation/maritime bunker fuels not controlled by the Montreal Protocol.

3.1.2. The Lisbon Strategy

In Lisbon in March 2000, the EU set a new goal 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". A detailed strategy for achieving this goal was agreed and this covers such matters as research, education, training, internet access and on-line business. It also covers reform of Europe's social protection systems, which must be made sustainable so that their benefits can be enjoyed by future generations.

On 22-23 March 2005, a meeting of the EU heads of states discussed the Commission's mid-term review[34] of the Lisbon strategy for economic, social and environmental renewal. It was decided that there should be more focus on growth and employment, simplification and national ownership via national action plans, as the key elements to help re-launch the Lisbon reform agenda.

3.1.3. European Climate Change Programme (ECCP) – The main framework for policy action

The European Climate Change Programme[35] was established in June 2000 to help identify the most environmentally and cost effective additional measures to meet its target. In the first phase, the ECCP acted predominantly as an initiator, catalyst and discussion forum that enabled the EU to present an Action Plan in October 2001. The policies and measures under the ECCP complement those of the Member States. The programme investigated

[33]TREATY OF NICE
http://europa.eu.int/eur-lex/pri/en/oj/dat/2002/c_325/c_32520021224en00010184.pdf
http://europa.eu.int/eur-lex/en/about/abc/abc_22.html
[34]COM(2005)24 of 2 February 2005 – Working together for growth and jobs – A new start for the Lisbon Strategy.
[35]http://europa.eu.int/comm/environment/climat/home_en.htm#eccp

more than 40 measures in total using selection criteria such as cost effectiveness and time frames. A package of 12 priority measures was identified in the Action Plan to be implemented with priority and many of these measures have been or are close to implementation, as described in this Chapter.

In autumn 2005, the Commission launched ECCP II as a continued programme for policy preparation and policy development. Next to the review and further work on the implementation of existing polices and measures, it will investigate new policy areas such adaptation, aviation and carbon capture and storage.

3.1.4. EU Climate Change Strategy post-2012

The Kyoto Protocol requires the international community to initiate consideration of Annex I Parties commitments for subsequent periods (after the end of the Protocol's 'first commitment period') by the end of 2005. In anticipation, the European Council, at a meeting in March 2004, announced that it would consider medium and longer term emission reduction strategies, at its meeting in spring 2005. They requested that the Commission prepares an analysis of benefits and costs of action against climate change, which takes account both of environmental and competitiveness considerations. In response, the Commission adopted the 2005 Communication on "Winning the Battle Against Global Climate Change"[36] and a more detailed Staff Working Paper[37]. The Communication outlines key elements for the EU's post-2012 strategy. It highlights the need for broader participation by countries and sectors, the development of low-carbon technologies, the continued and expanded use of market mechanisms and other cost-effective measures, and the need to adapt to the inevitable impacts of climate change.

Following the 2005 spring meeting the EU Council of Ministers proposed that “without prejudicing new approaches for differentiation between Parties in a future fair and flexible framework, the EU looks forward to exploring with other Parties possible strategies for achieving necessary emission reductions and believes that, in this context, reduction pathways by the group of developed countries in the order of 15-30% by 2020 and 60-80% by 2050 compared to the base line envisaged in the Kyoto Protocol should be considered". The meeting also emphasised that a global approach is needed which includes cooperation with big industrialised countries that have opted out of Kyoto, as well as with new emerging economic powers such as China and India. The Council also invited the Commission to continue studies on costs and benefits (including of non-action) and to look at the competitiveness aspects of the new strategy. Following on from this, a summit of EU leaders on 22-23 March 2005 confirmed that with a view to the ultimate objective of the UNFCCC the global annual mean surface temperature increase should not exceed 2°C above pre-industrial levels. The Conclusions of this Summit also state that the EU is looking forward to exploring with other Parties strategies for achieving necessary emission reductions and that in this context reductions pathways for developed countries in the order of 15-30% by 2020 should be considered.

[36] COM(2005) 35 final of 9 February 2005 – Winning the battle against global climate change
[37] http://europa.eu.int/comm/environment/climat/pdf/staff_work_paper_sec_2005_180_3.pdf

3.1.5. Environmental Technologies Action Plan

Work began on the Environmental Technologies Action Plan in 2001 and was officially adopted[38] in January 2004. The aim is to help complement the EU's Lisbon Strategy by speeding the development of environmental technologies within the EU as well as globally - in areas relating to climate change, soil, water and sustainable production and consumption. It seeks to exploit their potential to improve both the environment and competitiveness, thus contributing to economic growth and job creation. It set out a number of actions that the Commission will take and some that other stakeholders, such as industry and national and regional government, should undertake for the plan to be successful.

On 27 January 2005, the Commission produced a 'Report on the implementation of ETAP in 2004'[39]. It summarised the main achievements of the Action Plan in 2004, outlines actions by Member States on which the implementation of ETAP can build and highlights areas where efforts could be stepped up to make faster progress towards tapping the full potential of environmental technologies.

3.1.6. Monitoring Mechanism

The monitoring mechanism is an instrument to assess accurately and regularly the extent of progress being made throughout the Union towards the Community's commitments under the UNFCCC and Kyoto Protocol. The new legal basis for the mechanism was agreed in February 2004[40].

The scope of the current Decision is wider than earlier decisions and includes the insertion of new monitoring and reporting requirements that cover areas such as the registries for flexible mechanisms set out under the Kyoto Protocol. Provisions on projections of greenhouse gas emissions are strengthened since experience with the current provisions has shown that there is a need for more comprehensive and detailed data in this area.

Under the provisions of the Decision, the Member States shall report to the Commission not later than 15 January each year (X) their anthropogenic greenhouse gas emissions by sources and removal by sinks for the year before last (X-2). By 15th March 2005 and every two years thereafter, Member States are required to report on projected progress. The Commission is obliged to assess annually the progress of the Community and its Member States towards fulfilling their commitments under the UNFCCC and Kyoto Protocol.

Member States are required to report to the Commission by 15 March/15 June 2005 on 'demonstrable progress' for the Community to fulfil its reporting obligation to the UNFCCC by 1 January 2006. Linked to this, provisions are included for a review to be undertaken to assess the progress made and, if necessary, to propose suitable measures in order to ensure achievement of the EC target.

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[38] COM(2004) 38 final - Stimulating Technologies for Sustainable Development:An Environmental Technologies Action Plan for the European Union

[39] COM(2005) 16 final - Report on the implementation of the Environmental Technologies Action Plan in 2004

[40] Decision No 280/2004/EC, 11 February 2004,C*oncerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol.*

The reporting requirements for the Member States under Council Decision 280/2004/EC are elaborated further in additional implementing provisions under this Decision, taking account of the rather technical nature of the Decision. This has now entered into force via Commission Decision 2005/166/EC[41].

3.1.7. Minimisation of adverse impacts

The Kyoto Protocol was adopted in pursuit of the ultimate objective of the Convention. Its full implementation by Annex I Parties is thus intended to contribute to preventing dangerous anthropogenic interference with the climate system and thus to contribute to minimising the adverse effects of climate change on other Parties especially developing country Parties identified in article 4, paragraphs 8 and 9, of the Convention.

The Kyoto Protocol is, in principle and in general, designed to minimize adverse effects on specific sectors, specific industries or specific trade partners of a Party, including the adverse effects of climate change, on international trade, and social, environmental and economic impacts on other parties, especially developing country Parties etc. This is due to fact that:

- The Protocol is not targeting a single gas – but the 6 Kyoto gas basket. In addition, it also foresees the use of carbon sequestration by means of CO_2 sinks. All this ensures a distribution and sharing out of the efforts to reducing emissions across various fields of action, thereby limiting the depth of any specific effect of a particular measure targeting a specific gas.

- The Kyoto Protocol is not limiting action to a specific sector or to reducing greenhouse gases only by domestic efforts – instead the protocol foresees flexible mechanisms. Emission Trading, the Joint Implementation and the Clean Development Mechanism are tools designed into the protocol to share efforts in reducing greenhouse gases, ensuring that investment is 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. The implementation and comprehensive use of flexible mechanisms guarantees that possible impacts are distributed on various fields of action and ensure that the depth of any specific effect of a particular measure targeting a specific sector or trade partner is minimized, while the overall target of minimizing the adverse effect of climate change is met.

- Action to support the least developed countries are addressed by responsibilities for the developed countries to cooperate in technology transfer, in the field of scientific and technical research, in national capacity building and in providing financial resources (art. 10 and 11 in the Kyoto Protocol).

It therefore follows that the Kyoto Protocol already has the tools for ensuring that affects on international trade, and social, environmental and economic impacts on other Parties,

[41]Commission Decision (2005/166/EC) – 10 February 2005 laying down rules implementing Decision No 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.

especially developing country Parties and in particular those identified in article 4, paragraphs 8 and 9, of the Convention are minimized as integral features. By striving to comprehensively and thoroughly implement all the features that the Protocol has integrated (target all gases, include sinks, extensive use of the flexible mechanisms) a Party is naturally working to minimize any adverse effects due to the reduction of greenhouse gases.

In this sense, the following CCPMs, through their variety, completeness and methods of implementation, are in affect describing the way the EC is striving to minimise the adverse effects of its response to anthropogenic climate change.

3.2. EU Emissions Trading Scheme

In January 2005, the world's first international trading system for CO_2 emissions came into force with the EU-wide emissions trading scheme (ETS). It covers installations representing close to half of the European Union's emissions of CO_2. The aim is to help EU Member States achieve compliance with their commitments under the Kyoto Protocol. Companies are allowed to use credits from Kyoto project-based mechanisms to help comply with their obligation. This means the system will not only provide a cost-effective means for EU-based industries to cut their emissions but will also create additional incentives for businesses to invest in emission-reduction projects elsewhere. This will contribute to the transfer of technologies to developing nations.

The Directive establishing the scheme was agreed in October 2003[42]. It applies to around 12000 installations, mainly industrial but also some larger publicly owned combustion installations, e.g. in hospitals, educational facilities. The scheme is based on the following fundamental principles:

- it is a cap and trade system, where participants are distributed a set amount of allowances up front and they are required to annually surrender an amount of allowances that is equal to their emissions in that year,

- the EU-wide total amount of allowances to be allocated is less than what the included sector would emit in the absence of emissions trading, and the resulting scarcity creates a market for emission reductions

- its initial focus is on CO_2 from industrial emitters

- implementation will take place in phases, with periodic reviews and opportunities for expansion to other gases and sectors

- the allocation of emission allowances is decided in advance for 5 year periods by the Member States for the installations on their territory

- it includes a strong compliance framework, with severe penalties for non-compliance

- the market is EU-wide but taps emissions reduction opportunities in the rest of the world through the Kyoto mechanisms

[42]Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC, 13 October 2003.

- allowances are held in a fully electronic registry system which allows immediate transfers of allowances from one installation to another all over the EU

Each Member State has developed a National Allocation Plan (NAP) that states the total number of allowances allocated in the first trading period 2005 to 2007 and how many each plant covered by the trading scheme will receive. The allowances have mostly been distributed free of charge, though auctioning is allowed to a small extent. These NAPs have been submitted to the Commission and have been assessed against a set of criteria given in the Directive.

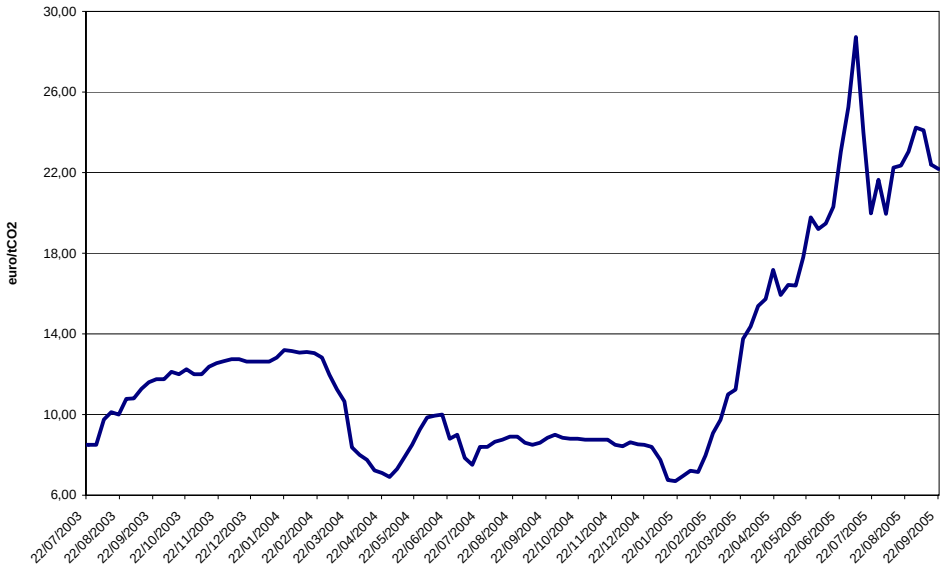
Principles for monitoring and reporting carbon dioxide emissions and criteria for verification are set out in the Directive. The Commission has developed more detailed guidance[43]. Competent authorities within Member States carry out permitting and verification.

The fully electronic registry system used for holding allowances is also a novel solution. Each Member State has its own national registry. The registries communicate with each other through the Community Independent transaction log, which checks all trans-boundary transactions for any irregularities. The EU registries system is a useful forerunner for setting up the registries required for international country-level emissions trading under the Kyoto Protocol.

As of September 2005 around 156 million allowances have already been traded (including a small amount of forward trades prior to the start of the scheme), with average trading volumes of around 1.5 million allowances per day. Eleven national electronic registries are up and running and over half of the allowances to be credited to companies have already been allocated. Figure 3-1 and Figure -8 indicate the evolution of allowance prices and traded volumes from prior to the beginning of the scheme until July 2005. They indicate a dynamic market, in particular since the beginning of 2005.

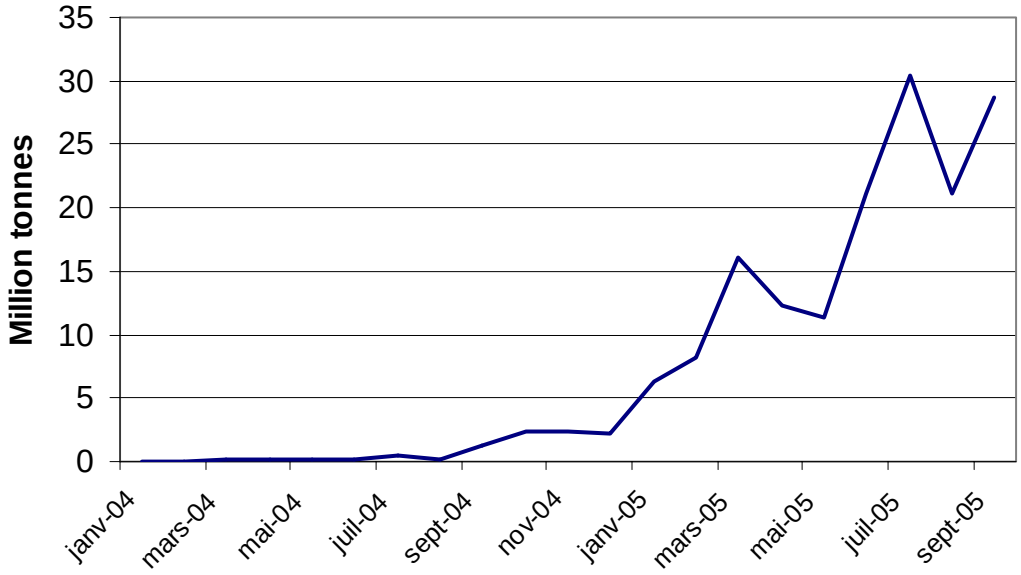
[43] http://europa.eu.int/eur-lex/pri/en/oj/dat/2004/l_059/l_05920040226en00010074.pdf

Figure -7 estimated average price of traded allowances within the ETS



Source:www. pointcarbon. com

Figure -8 volume of traded allowances within the ETS



Source:www. pointcarbon. com

According to Article 25 of the Directive, the EU ETS can be linked with compatible greenhouse gas emission trading schemes in other Annex B countries that have ratified the Kyoto Protocol.

A review, including proposals for changes to the system if appropriate, is foreseen in mid 2006, in accordance with the Directive. In addition, Member States need to submit their

National Allocation Plans for the period 2008-2012 at the same time. Invaluable experience has been gained during the development and verification of the first phase NAPs, which will help simplify and streamline the process during the second phase.

3.2.1. Linking project based mechanisms to the emissions trading scheme

The EU-ETS also provides provision for the recognition of credits from project-based mechanisms for fulfilling its obligations. Directive 2004/101/EC[44] allows a linking of credits from the joint implementation (JI) and clean development mechanism (CDM) of the Kyoto Protocol.

This will help to increase the diversity of low-cost compliance options within the Community scheme leading to a reduction of the overall costs of compliance with the Kyoto Protocol, while improving the liquidity of the Community market in greenhouse gas emission allowances. Potential impacts of the use of linking JI/CDM credits are discussed further in an EC technical paper[45]. A particular benefit for developing countries will be the influx of funding from the private sector as the demand for CDM credits, due to the ETS, grows.

In the first period (2005-2007) CDM, and as of the beginning of the second period (2008-2012) also JI credits can be used for compliance purposes in the ETS with the exception of those generated by nuclear facilities, carbon sink enhancement projects or credits from projects hosted by a Member State, that would result in double counting of emissions reduction. In the second period, Member States have to provide for a maximum limit for the use of JI/CDM credits for compliance purposes in the ETS.

3.3. Member States' use of Kyoto mechanisms

Seventeen Member States have provided information on their intended use of the Kyoto mechanisms, either through a questionnaire under the EC mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol (see section 3.1.6), as part of their 3rd national communication or in their national allocation plans notified under the European emissions trading directive (2003/87/EC). In addition, the Commission decisions[46,47] on the national allocation plans have been taken into account.

Information on their current intentions is outlined in Table 4-1, all quantitative estimates on the use of Kyoto mechanisms derive from Commission decisions on the national allocation plans for the first trading period.

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[44] Directive 2004/101/EC of 27 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

[45] http://europa.eu.int/comm/environment/climat/pdf/kyotoprotocolimplementation.pdf

[46] COM(2004) 500 final on Commission Decisions of 7 July 2004 concerning national allocation plans for the allocation of greenhouse gas emission allowances of Austria, Denmark, Germany, Ireland, the Netherlands, Slovenia, Sweden, and the United Kingdom in accordance with Directive 2003/87/EC

[47] COM(2004) 681 final on Commission Decisions of 20 October 2004 concerning national allocation plans for the allocation of greenhouse gas emission allowances of Belgium, Estonia, Finland, France, Latvia, Luxembourg, Portugal, and the Slovak Republic in accordance with Directive 2003/87/EC

The status of preparation for the use of JI and CDM project-based activities differs greatly between Member States:Nine Member States have already allocated resources for the use of Kyoto mechanisms (Austria, Belgium, Denmark, Finland, Germany, Italy, the Netherlands, Spain and Sweden). Austria, Italy, the Netherlands and Spain allocated the largest budgets (€ 288 million, € 1320 million,€ 606 million and € 200[48] million for the five-year commitment period). The total budget allocated by all Member States that provided respective information amounts to about € 2730 million. Together these nine Member States (Austria, Belgium, Denmark, Finland, Ireland, Italy, Luxembourg, Netherlands, Spain) intend to purchase 106.8 million tonnes CO_2-equivalents per year during the first commitment period of the Kyoto Protocol. Based on a price range of 5 to 10 euros per tonne of CO_2 equivalents there is a need for additional resources to be allocated by EU Member States in order to achieve the intended use of Kyoto mechanisms (of a total of 106.8 Mt).

Table 3-1 shows that a number of Member States have also started to implement legal arrangements such as the preparation of national legal frameworks or bilateral/multilateral agreements for JI/CDM programmes (Austria, Belgium, Denmark, Finland, Germany, Italy, Netherlands, Spain, and Sweden). Up to now, more agreements or contracts have been arranged for joint implementation projects.

[48] An additional € 5 million has been allocated for capacity building

Table -16 Planned use of Kyoto mechanisms in EU15 Member States

Member State	Planned use of Kyoto mechanisms	Which Kyoto mechanisms? (ET, CDM, JI)	Plan to achieve the burden-sharing target through domestic action only (with no use of Kyoto mechanisms)?	Projected emission reduction 2008–12 through the use of Kyoto mechanisms [a] [Million tonnes CO_2-equiv. per year]
Austria	Yes	Priority on JI and CDM	No	7. 0[b]
Belgium	Yes	Priority on JI and CDM	No	8. 4
Denmark	Yes	CDM, JI	No	4. 5
Estonia	No	-	Not applicable (Yes for national Kyoto target)	-
Finland	Yes (Pilot programme to gain experiences implemented)	Not yet decided	Not yet decided	0.6 contracted, total quantity not yet decided
France	Yes	Priority on JI and CDM	Not yet decided	Not yet decided
Germany	Use of Kyoto mechanisms allowed at company level, no acquisition by government planned	ET, JI, CDM	Yes	No projected estimate as the amount will depend on private action
Greece	Not yet decided	Not yet decided	Not yet decided	Not yet decided
Ireland	Yes	ET	No	3. 7[c]
Italy	Yes	ET, CDM, JI	No	39. 6
Luxembourg	Yes	ET, CDM, JI	No	3. 0
Netherlands	Yes	CDM, JI	No	20. 0[d] (CDM and JI)
Portugal	Yes	ET, CDM, JI	No	No estimate provided[e] Studies on the use of JI/CDM initiated
Slovenia	Yes	ET, CDM, possibly JI	Not applicable (not yet decided for national Kyoto target)	Not yet decided
Spain	Yes	Priority on ET and CDM	No	20. 0
Sweden	Not yet decided, under consideration	ET, CDM, JI	Yes	Investments made are estimated to amount to 1 Mtonnes/year in emission credits
United Kingdom	Use of Kyoto mechanisms allowed at company level, no acquisition by government planned	ET, CDM, JI	Yes	No projected estimate as the amount will depend on private action

Notes:

[a] The projected emission reduction through the use of Kyoto mechanisms for Austria, Ireland and Luxembourg stems from the Commission decisions on the national allocation plans of those countries (COM(2004) 500 final, COM(2004) 681 final). The Commission has based its decision on information provided in the NAPs and/or in further

correspondence during the assessment of the NAPs. The figures for Belgium, Denmark, Italy, the Netherlands, Portugal and Spain are derived from the questionnaire, the 3rd national communication or the national allocation plan (for details see below).

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

[c] Ireland states in the questionnaire that it intends to purchase 3. 7 million tonnes CO_2-equiv. per year from international emissions trading.

[d] The Netherlands expect in the questionnaire a contribution of 100 million tonnes CO_2-equiv. from project based activities in 2008-12 (20. 0 million tonnes CO_2-equiv. per year). By the end of 2004 99. 0 million tonnes CO_2-equiv. have already been contracted, two thirds of which from CDM projects and the remaining third from JI.

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

Table -17 Preparations for the use of project based mechanisms by EU Member States

Member State	Preparation of JI/CDM programmes	Bilateral / multilateral agreements, memorandum of understanding or contracts arranged with countries		Allocated budget
		JI	CDM	
Austria	Legal framework and programmes under preparation	Czech Republic, Slovakia, Bulgaria, Romania	No arrangements yet	Up to € 288 million for 2003-2012[a]
Belgium	Federal Government:first JI/CDM tender 2005 Flemish region:preparation of legal framework and start of pilot projects in 2003 Walloon region:CDM project currently launched	No arrangements yet	Capital Region:DR Congo Walloon region:agreements with French-speaking African countries	Federal Government: € 25 million per year Capital Region: € 9 million Flemish region: € 25 million proposed Walloon region: € 2 million per year
Denmark	5 JI project contracted, several JI projects in progress Several CDM projects are being negotiated	Slovakia, Romania, Ukraine, Latvia, Estonia, Bulgaria, Hungary, Lithuania, Poland	Moldova, Armenia, Kyrgyzstan, Georgia, Armenia, Azerbaijan, Malaysia, China, Thailand, South Africa, Nicaragua, Chile, Argentina	€ 152 million for public procurement programme of JI and CDM credits 2003-2008
Finland	Pilot programme 9 CDM project ideas and 4 JI projects on-going	Estonia, Latvia, Lithuania, Poland, Hungary, Ukraine	China, Costa Rica, El Salvador, Nicaragua	Pilot Programme:€ 9 million PCF[c]:USD 10 million BASREC[b]:€ 1. 75 million
France	No programmes to date	Romania	Argentina, Brazil, Chile, China, Colombia, Morocco, Mexico and Uruguay	No arrangements yet
Germany	Participation in BASREC and initiation of climate fund	Norway, Finland, Sweden, Denmark, Estonia, Lithuania, Latvia, Poland and Russia through BASREC	No arrangements yet	€ 18 million for climate fund € 5 million for BASREC
Greece	Studies on use of JI/CDM initiated	--	--	No arrangements yet

Member State	Preparation of JI/CDM programmes	Bilateral / multilateral agreements, memorandum of understanding or contracts arranged with countries		Allocated budget
		JI	CDM	
Ireland	No preparation of JI/CDM programmes	Not applicable	Not applicable	Not applicable
Italy	Multilateral and Regional Financial Institutions:participations in CDCF, ICF[5], BCF[6], MEDREP[7], MEDREC[8], Trust Fund for the Environment in Asia and China (GEF), bilateral agreements	Bulgaria, Croatia, Moldavia, Kazakistan, Romania	Agreed MoUs: Algeria, China, Cyprus, Cuba, Egypt, Israel, Morocco, El Salvador, Argentina, Brazil, Mexico, Uruguay,Panama, Congo, Nigeria, Laos, Serbia and Montenegro	€ 169. 5 million are already allocated: € 58. 7 million for World Bank funds € 8. 5 million for GEF Trust Fund €10. 3 million for MEDREP[49] € 8. 5 million for MEDREC[50] € 79 million for China-Italian Facility € 4. 5 million for various funds € 1,150 million for the years 2006-2011 [51]
Netherlands	ERUPT CERUPT Multilateral and Regional Financial Institutions, Participation in PCF[c], Community Development Carbon Fund**,** Private Financial Institutions, bilateral contracts	Memoranda of Understanding Romania, Bulgaria, Estonia, Hungary, Slovakia, Croatia, New Zealand, participation in PCF	Memoranda of Understanding Argentina, Bolivia, Brazil, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Indonesia, Mexico Nicaragua, Panama, Uruguay, participation in PCF	€ 606 million
Portugal	Studies on use of JI/CDM initiated	No arrangements yet	No arrangements yet	No arrangements yet
Spain	2002:Pilot programme for JI/CDM, priority on CDM 2004:Establishment of the DNA and the Iberoamerican Climate Change Units Network	No arrangements yet	MoU with eight countries: Mexico, Uruguay, Argentina, Panama, Colombia, Brazil, El Salvador and Morocco	€200 million to be managed by the IBRD
Sweden	4 CDM projects in advanced stages of development, several JI proposals are under consideration Participation in PCF[h] and BASREC[i]	Bilateral agreements concluded with Romania; negotiations with Estonia, Russia Lithuania in progress. Multilateral agreement in Baltic Sea Region for high quality JI projects with ICE, NOR, SWE, DEN, GER, FIN, EST, LAT, LIT.	No arrangements yet	€ 10 million (SEK 94 million) in CDM-SCILIP[j] € 6. 5 million (SEK 61 million) in JI-SCILIP € 3. 5 million in BASREC USD 10 million in PCF[c]
United Kingdom	-	No arrangements yet	No arrangements yet	None

Notes:

[49] Mediterranean Renewable Energy Program
[50] Mediterranean Renewable Energy Centre
[51] During the negotiation with the Commission for the approval of the NAP Italy committed to allocate additional € 1,150 million for the years 2006-2011 (€ 100 million/a in 2006-2007, € 350 million in 2008 and € 200 million/a in 2009-2011).

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

b) Baltic Sea Region Energy Co-operation Testing Ground Facility

c)&h) Prototype Carbon Fund of the World Bank

d) International Finance Cooperation

e) International Bank for Reconstruction and Development

f) Corporación Andina de Fomento

g) Community Development Carbon Fund

i) Baltic Sea Region Energy Co-operation on JI and Emissions Trading

j) Swedish International Climate Investment Programme

3.4. Sectoral Policies and Measures

3.4.1. Introduction

The following sections describe developments in policy since the 3rd National Communication. The full range of climate related measures therefore includes the measures described in the 3rd National Communication as well as those described in these sections. The quantification of the effect of the measures reported in this Communication is mainly through the ECCP programme and relates generally to the technical potential for a measure. Unless otherwise stated the quantification is for the EU-15. Effort is being directed by the Commission to obtain updated estimates of the realisable reductions for the measures, both at the individual level and for aggregate effects of packages of measures but the results are not yet available. The updated revised reduction potentials will be published in a separate report at a later stage.

3.4.1.1. Developing the internal market

The EU continues to liberalise its energy markets and the Commission has introduced and amended a number of directives[52,53,54,55,56] to continue to help complete the internal market. The Commission intends to review the way the EU's energy markets operate and will begin an investigation in 2005 to look at the competitiveness of energy markets. The review will consider whether the Commission needs to take enforcement action to increase competitiveness. It is envisaged that the restructuring of the energy markets might help boost the use of environmentally friendlier forms of energy.

[52]Decision No 1229/2003/EC of the European Parliament and of the Council of 26 June 2003 laying down a series of guidelines for trans-European energy networks and repealing Decision No 1254/96/EC

[53]Regulation (EC) No 807/2004 of the European Parliament and of the Council of 21 April 2004 amending Council Regulation (EC) No 2236/95 laying down general rules for the granting of Community financial aid in the field of trans-European networks

[54]Directive 2003/54/EC of the European Parliament and of the Council of 26 June 2003 concerning common rules for the internal market in electricity and repealing Directive 96/92/EC

[55]Directive 2003/55/EC of the European Parliament and of the Council of 26 June 2003 concerning common rules for the internal market in natural gas and repealing Directive 98/30/EC

[56]Regulation (EC) No 1228/2003 of the European Parliament and of the Council of 26 June 2003 on conditions for access to the network for cross-border exchanges in electricity

3.4.1.2. Taxation of energy products

A Community framework on the taxation of energy products was agreed in October 200357. The Directive sets out minimum levels of taxation to be applied to energy products and electricity, but allows for exemptions or reductions to promote renewable sources of energy.

3.4.1.3. Promotion of electricity from renewable energy sources (RES-E)

The development of renewable energy sources is a central aim of European Union energy policy, reflecting the clear benefits that clean, sustainable and secure energy supplies will bring. The RES-E directive[58] promotes renewable energy sources for electricity generation.Between 1990 and 2003, wind power production increased by almost 57 times and electricity production from solar photovoltaic cells by 87 times.

A comprehensive EU regulatory framework is now in place and Member States have adopted national targets for green electricity consumption and are working towards them. By creating national targets, the directive gives a quantitative framework within which each Member State can plan and implement the most appropriate measure for their own situation. National indicative targets are included in the Accession Treaty for new Member States. With their accession the 22.1% target set initially for EU-15 for 2010 becomes 21% for the EU-25.

In 2004, as required by the directive, the European Commission produced an assessment of Member States' progress[59] based on reports submitted by Member States[60]. Four Member States (Denmark, Germany, Spain and Finland) are in line to meet their renewable electricity targets. For the rest of the Member States, further measures will be needed to increase the currently expected achievement of 18-19% in 2010 to the 21% target.

The report emphasises that more must be done for the production of electricity, heat, as well as biofuels for transport (see section 3.4.4.1 for more details), from bio-energy. The Commission will therefore propose a Community action plan for energy from biomass by the end of 2005. As an aid to the development of this the Commission held a public consultation from February to March 2005, the results of which are already available[61].

In addition, the Commission has proposed several concrete actions to take renewable energies forward and to emphasise the deployment of renewable energy in its main financial instruments, the Common Agricultural Policy (direct payments and rural development) and the Structural and Cohesion funds. The development of renewable energy is also supported by other programmes such as ALTENER within Intelligent Energy – Europe and the Campaign for Sustainable Energy (see 3.4.2.3) as well as

[57]Directive 2003/96/EC restructuring the Community framework for the taxation of energy products and electricity, 27 October 2003
[58]Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources in the internal electricity markets, October 2001.
[59]COM (2004) 366 final, Communication from the Commission to the Council and European Parliament 'The share of renewable energy in the EU', May 2004
[60]http://www.europa.eu.int/comm/energy/res/legislation/electricity_en.htm
[61]http://europa.eu.int/comm/energy/res/biomass_action_plan/doc/results_consultation_bap.pdf

ongoing community wide standardisation of technologies and products. This includes, amongst others, the development of standards for biodiesel and solar PV through the involvement of the European Standardisation Committee (CEN) and will also be reinforced by the proposed directive on eco-design of energy using products.

Structural Funds and Rural Development support specific investments and local actions to raise the capacities for biofuels and other renewable energy supply and demand. The ongoing process of CAP reform has reduced price support and helped to increase the competitiveness of EU agricultural production in all possible outlets, including biofuels.

The decoupling of price and income support which has been introduced by the CAP reform 2003 is a key instrument to further facilitate supply of energy crops. A specific aid for energy crops has been introduced with CAP reform 2003. For a maximum guaranteed area of 1.5 million hectares a premium of € 45 per ha will be available. This new scheme is subject to a Commission report by 31 December 2006 and appropriate proposals taking into account the implementation of the bio-fuels initiative.

3.4.1.4. Cogeneration directive

Promotion of cogeneration was one of the short-term priority areas identified in the Commission's Action Plan on energy efficiency. The purpose of the Directive[62] is to create a framework for promotion and development of high efficiency cogeneration based on useful heat demand and primary energy savings.

The Directive defines high-efficiency cogeneration as achieving more than 10% energy savings compared to the separate productions of heat and electricity. In this context the efficiency requirements for a cogeneration plant using renewable sources are less stringent to be qualified as 'high efficiency' than for fossil fuel fired plants, thus providing an incentive for the promotion of biomass CHP.

Member States are required to report annually on cogeneration statistics, prepared using a methodology outlined in the Directive. Other provisions include analysis of national potentials and the requirement for Member States to take steps to facilitate access to the electricity grid for CHP.

3.4.2. Policies in Energy Demand

The foundations of policy in the energy sector were set out in the 2000 green paper on security of energy supply[63] discussed in the 3rd National Communication, which was finalised in 2002[64].

Since this point a new green paper on energy efficiency[65] has also been adopted, on 22 June 2005. The Green Paper aims to act as a catalyst, leading to a renewed energy efficiency initiative at all levels of European society – EU, National, regional and local. In

[62]Directive 2004/8/EC of 11 February 2004 on the promotion of cogeneration based on a useful heat demand in the internal energy market and amending Directive 92/42/EEC

[63]Green Paper Towards a European strategy for the security of energy supply, http://europa.eu.int/comm/energy_transport/en/lpi_lv_en1.html

[64]COM(2002)321 Final report on the Green Paper "Towards a European strategy for the security of energy supply.

[65]COM(2005) 265 final of 22 June 2005 – GREEN PAPER on Energy Efficiency or Doing More With Less

addition, the Green Paper seeks to make a significant contribution, by way of example and leadership, to kick-start an international effort to contribute to addressing climate change through energy efficiency. It focuses on three key reasons for a renewed focus on energy efficiency:

- Competitiveness and the Lisbon Strategy. It is estimated that the EU could save up to 20% of its present energy consumption in a cost-effective manner, leading to net savings of up to €60bn per year and increased job creation.

- Environmental protections and the EU's Kyoto commitments. Energy savings is likely to be the quickest and most cost-effective manner for reducing greenhouse gas emissions as well improving air quality, in particular in heavily populated areas.

- Security of supply. By 2030 it is predicted that the EU will be 90% dependent upon imports for oil and 80% for gas. Rising energy prices and regional instability leading to shortages of supply, could lead to severe impacts on the economy and energy efficiency is one of the key mechanisms to help minimise this risk.

The green paper seeks to identify a number of bottlenecks, such as lack of information or finance that are preventing these cost-effective measures from being taken up. It also suggests a number of key actions that might be taken to overcome these including:

- Establishing annual energy efficiency action plans at a national level.

- Giving citizens better information, through improved labelling and targeted publicity campaigns.

- Better targeting of state aid where public support is appropriate.

- Using public procurement to "kick-start" new energy efficient technologies.

- Using new or improved financing instruments to induce cost-effective improvements.

- Further effort on buildings, including extending existing requirements to smaller premises.

- Speeding the development of a new generation of more fuel-efficient vehicles.

3.4.2.1. Action Plan to Improve Energy Efficiency in the European Community – enhancing demand side reduction measures

As described in the 3rd National Communication, The Energy Efficiency Action Plan[66] was prepared in 2000 to realise the available economic potential for energy efficiency in line with the proposed target for reduced energy intensity of 1% per year above and beyond business-as-usual trends. A set if core policy instruments for implementing the action plan[67] have been agreed.

[66] http://europa.eu.int/eur-lex/en/com/cnc/2000/com2000_0247en01.pdf
[67] http://europa.eu.int/comm/energy/demand/overview/measures.htm

3.4.2.2. Proposal for a Directive on energy end-use efficiency and energy services

The proposed Directive[68], still under discussion in the EU institutions, has the objective of increasing end-use energy efficiency using a number of operational measures. Member States are called on to:

- Remove barriers and provide credible information for companies to offer energy services and energy-efficiency programmes.
- Adopt general national targets of annual 1% cumulative savings.
- Ensure that retail suppliers or distributors of electricity, natural gas, fuel oil and district heating offer and actively promote energy services and/or energy audits.
- Ensure that the public sector in each Member State sets a good example with indicative national targets of annual 1.5% cumulative savings.
- Establish energy efficiency programmes.

3.4.2.3. Programmes

Intelligent Energy - Europe

Intelligent Energy – Europe[69] (IEE) supports sustainable development in the energy context. Its objectives are:

- to provide the elements needed for the promotion of energy efficiency, the increased use or renewable energy sources and energy diversification;
- to develop means and instruments to monitor and evaluate the impact of measures adopted by the Community and Member States in these fields; and
- to promote efficient and intelligent patterns of energy production and consumption.

There are four specific fields in the programme:

- SAVE, which concerns the improvement of energy efficiency and rational use of energy.
- ALTENER, which promotes new and renewable energy sources.
- STEER, which concerns support relating to all energy aspects of transport.
- COOPENER, which concerns support for initiatives relating to the promotion of renewable energy sources and energy efficiency in developing countries.

[68]Proposal for a Directive of the European Parliament and of the Council on energy end-use efficiency and energy services [COM(2003)453]

[69]Decision 1230/2003/EC adopting a multiannual programme for action in the field of energy:'Intelligent Energy – Europe' (2003-2006), 26 June 2003.

The financial framework for the implementation of the programme for the period 2003 to 2006 is approximately €200 million[70].

A decision was also taken[71] on the On 6 April, to adopt a proposal for the continuation of the Intelligent Energy - Europe programme during the period 2007-2013, as part of the Competitiveness and Innovation framework Programme (CIP). The continued IEE programme will provide support in the same fields as the current IEE programme. However, it will also introduce 'Replication Projects' throughout the SAVE and ALTENER parts of the programme which aim to help speed commercialisation of particularly innovative process or products that are close to but not yet cost-competitive. The proposed EIE budget from 2007-2013 is €1. 639 billion, with approximately €896 million allocated to replication projects.

Action Plan - Campaign for Sustainable Energy

The new 'Campaign for Sustainable Energy' started in mid-2004 and will run until 2007. It is the successor to the previous 'Renewable Energy Campaign for Take-Off' (described in the previous 3rd National Communication) that ran from 1999-2003, but now includes both energy efficiency and renewable energy.

The new campaign will continue the efforts of the previous one as well as providing indicative sectoral targets, an extended series of promotional tools and will allow partners to join the common effort of implementing programmes and initiatives in the Union and beyond. Renewable Energy Partnerships were one of the most important parts of the original campaign for take-off. From 2000-2003, 130 renewable energy programmes and projects involving more than 700 partner organisations in the EU joined the Campaign as Renewable Energy Partners and they will continue to operate and expand via the successor Campaign for Sustainable Energy.

3.4.2.4. Non-greenhouse gases

The two measures reported here are aimed at improving air quality but their provisions will affect emissions of non-greenhouse gases through control of combustion. The measures are the National Emissions Ceiling and Large Combustion Plant Directives

National Emissions Ceiling Directive

The National Emissions Ceiling Directive[72] 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 (SO_2, NOx, VOCs and ammonia), but leaves it largely to the Member States to decide which measures to take in order to comply.

[70] http://europa.eu.int/comm/energy/intelligent/work_programme/doc/global_wp_%202003_2006_en_final.pdf

[71] COM(2005)121 final - Proposal for a DECISION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL establishing a Competitiveness and Innovation Framework Programme (2007-2013)

[72] DIRECTIVE 2001/81/EC – 23/10/2001 on national emission ceilings for certain atmospheric pollutants.

Large Combustion Plant Directive

The 2001 revised Large Combustion Plants Directive[73] (LCPD) applies to combustion plants with a thermal output of greater than 50 MW and replaces the existing LCPD[74]. The LCPD aims to reduce acidification, ground level ozone and particles throughout Member States by controlling emissions of SO_2, NO_x and PM from large combustion plants(LCPs).

[73]DIRECTIVE 2001/80/EC – 23/10/2001 – on the limitation of certain pollutants into the air from large combustion plants

[74]Directive 88/609/EC on the Limitation of Emissions of Certain Pollutants into the Air from Large Combustion Plants

Table 4. 3. 1 Summary of the policies and measures in the energy sector

Name of the policy	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 CO_2 equivalent) for EU15	
						2010	Beyond 2010
Developing the internal market for energy	Liberalising energy supply within gas and electricity markets	CO_2	Regulatory	Number of directives adopted implementation ongoing	EU/Member States	~80-120[75]	
Emissions Trading Scheme	EU-wide trading scheme covering combustion plants >20MW	CO_2	Economic	Implemented. First phase 2005-2007. Second Phase 2008-2011	EU/Member States		
Directive on taxation of Energy Products	Minimum levels of taxation to encourage shift to less carbon intensive energy products	Mainly CO_2	Fiscal	Implemented	EU/Member States		
Directive on energy end-use efficiency and energy services	Remove barriers to and promotion of energy efficiency	Mainly CO_2	Regulatory	Adopted in 2003	EU/Member States	~40-55[75]	
Directive on promotion of renewable energies in electricity generation	Increase the contribution of renewables to primary energy supply by 2010	Mainly CO_2	Framework Regulatory	Implemented	EU/Member States	~100-125[75]	.

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

Name of the policy	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 CO_2 equivalent) for EU15	
						2010	Beyond 2010
Directive on the promotion of Biofuels	Increase environmentally benign use of liquid and gaseous bio-fuels	Mainly CO_2	Framework Regulatory	Adopted	EU/Member States	~35-40[75]	
Directive on promotion of cogeneration	Promote 'high efficiency' cogeneration	Mainly CO_2	Framework Regulatory	Adopted	EU/Member States	~24-42[76]	
Further RES-H measures	Measure to promote the generation of heat from renewables (linked to action below)	Mainly CO_2	-	Planned	-	36-48	
Action plan for energy from biomass	Increase biomass use for production of electricity, heat and transport fuels	Mainly CO_2	-	Plan expected by end of 2005			
Campaign for sustainable energy	Support activities for promotion of energy efficiency and renewables	Mainly CO_2	Primarily information and capacity building	Ongoing	EU/Member States		
Intelligent Energy Europe	Non-technical measures to	Mainly CO_2	RTD	Ongoing - EIE	EU		

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

Name of the policy	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 CO_2 equivalent) for EU15	
						2010	Beyond 2010
(SAVE and ALTNER programmes	promote energy efficiency and RES, respectively			from 2003-2006 and EIE2 from 2007-2013			
National Emission Ceiling Directive	National annual limits on emissions of NOx, SOx, VOCs, NH_3	Some indirect impact on – N_2O and CH_4	Framework Regulatory	Adopted ongoing implementation	EU/Member States		
Large Combustion Plant Directive	Emission limits on combustion plant >50MW on NOx SOx and PM	Some indirect impact on – N_2O and CH_4	Framework Regulatory	Adopted	EU/Member States		
Research Fund for Coal and Steel	Funding for cleaner coal technology and low CO_2 steel production processes	CO_2	RTD	Ongoing	EU/Member States		

3.4.3. Policies in the Residential and Tertiary Sector

The guidelines for European policy on the residential and tertiary sector were set out in the in the Action Plan to improve Energy Efficiency as discussed in the 3rd National Communication.

3.4.3.1. Energy performance of buildings

The residential and tertiary sector, the major part of which is buildings, accounts for more than 40% of final energy consumption in the Community. The Directive on energy performance of buildings adopted in December 2002[77] seeks to promote improvement in energy efficiency in buildings. It lays down requirements for:

- The general framework for a methodology of calculation of the integrated performance of buildings;
- The application of minimum requirements on the energy performance of new buildings;
- The application of minimum requirements on the energy performance of large existing buildings that are subject to major renovation;
- Energy certification of buildings; and
- Regular inspection of boilers and of air-conditioning systems in buildings and an assessment of the heating installation in which boilers are more than 15 years old.

3.4.3.2. Framework Directive for establishing Eco-design requirements for energy-using products

The Framework Directive for establishing Eco-design requirements for energy-using products.Directive 2005/32/EC creates a comprehensive and coherent legislative framework for addressing eco-design requirements with the aim of:

- ensuring the free movement of energy-using products in the EU;
- improving the overall environmental performance of these products;
- contributing to the security of energy supply and enhancing the competitiveness of the EU economy; and
- preserving the interests of both industry and the consumer.

The framework directive will be followed by implementing measures establishing eco-design requirements for specific types of products adopted by the Commission assisted by a regulatory committee. The Directive includes annexes setting out, inter alia, the methods for setting generic and specific eco-design requirements. In terms of implementing measures, the Directive includes a list of products that should be examined with priority

[77]Directive 2002/91/EC on the energy performance of buildings, 16 December 2002

that were identified by the ECCP as offering a high potential for cost-effective reduction of greenhouse gas emissions.

The Directive lays down eligibility criteria for adopting implementing measures. For example, a product will be selected only if it represents an important volume of sales in the EU market and an important environmental impact at European level. Another criterion is the potential for improvement, without entailing excessive costs and taking into account both existing legislation and pro-active initiatives from industry.

The level of eco-design requirements should normally be established on the basis of technical, economic and environmental analysis. Flexibility in the method of establishing the level of requirements can make swift improvement of environmental performance easier. Priority should be given to alternative courses of actions such as self-regulation by the industry, where such actions are likely to deliver the policy objectives faster or with less cost than mandatory requirements.

3.4.3.3. Labelling and minimum energy efficiency requirements for household appliances, electrical and electronic end-use equipment

Other developments in the buildings sector include the extension of the "Labelling Directive" (92/75/EEC) via Directives 2002/31/EC, 2002/40/EC and 2003/66/EC with regard to energy labelling of household air-conditioners, household electric ovens, household electric refrigerators, freezers and their combination

3.4.3.4. Non CO_2 gases

Both CH_4 and N_2O emissions from the buildings sector are relatively small and emissions are mainly linked to boiler operation and improve in parallel with the improvement of boiler efficiency and lowering of the demand. In addition, there is a small but increasing contribution of fluorinated gases, mainly due to air conditioning, although this will be in part be affected by the regular audits required under the Energy Performance of Buildings Directive as well as the Commission proposal on fluorinated gases discussed in section 3.4.5.1. Fluorinated gases.

Table 4. 3. 2:Summary of the policies and measures in the tertiary sector

Name of the policy	Objective and /or activity affected	GHG affected	Type of instrument	Status[78]	Implementing entity or entities	Estimate of mitigation impact, by gas (for a particular year, not cumulative, in Mt CO_2 equivalent) for EU15	
						2010	beyond 2010[79]
Directive on energy end-use efficiency and energy services	Remove barriers to and promotion of energy efficiency	Mainly CO_2	Regulatory	Adopted in 2003	EU/Member States	~40-55[80]	
Directive on Energy performance of buildings	Improve energy performance of new (and partially existing) buildings and	Mainly CO_2	Regulatory	Adopted	EU/Member States	~20[81]	
Proposed Directive of eco-design requirements for energy using products	Create overall framework for improving energy and environmental aspects of products	Mainly CO_2	Framework Regulatory	Proposed	EU/Member States		MTP 180[82]
EU Boiler Directive 92/42/EEC	Improve minimum boiler efficiency	CO_2	Regulatory	Implemented	Member States	~22[83]	

[78]Unless the measure is already implemented, the timescales are indicative and are largely drawn from the ECCP working groups.These actions do not yet have political agreement.
[79]The figures in the column are measures from the ECCP, the timescale is uncertain and some measures may be agreed and implemented before the end of the first commitment period.
[80]Second ECCP progress report April 2003 - http://europa.eu.int/comm/environment/climat/pdf/second_eccp_report.pdf
[81]COM(2004)366 final "The share of renewable energy in the EU, May 2004
[82]Maximum technical potential – actual savings will depend upon subsequent Daughter Directives – Second ECCP progress report April 2003.
[83]MURE Database Case Study:Impact of the Introduction of the EU Boiler Directive 92/42/EEC (see www.mure2.com).Scenario B which takes into account future improvements in the building insulation, i.e.a reduced energy demand.

Labelling and minimum energy efficiency requirements for household appliances	Improve share of energy efficient electric appliances	CO_2	Regulatory	Implemented	Member States	~31[80]	
Revision of the Energy Labelling Directive 92/75/EC	To provide additional and effective information to consumers	CO_2	Regulatory	Implemented	EU/Member States	~23[82]	10
EMAS energy audit and management scheme	Efficient energy use within business/public sector organisations	Mainly CO_2	Voluntary	Ongoing	EU/Business/ Public sector organisations		
Energy Star Programme and Code of Conduct for Digital TV Services and standby losses	To reduce energy consumption of information and communication technology, particularly from stand by losses	CO_2	Voluntary & negotiated agreements	Adopted	Manufacturers	~30-35[80]	13
Intelligent Energy Europe - SAVE programme	Non-technical measures to promote energy efficiency	Mainly CO_2	RTD	Ongoing - IEE 2003-2006 and EIE2 2007-2013	EU		
WEEE Directive	To minimise the environmental impact of waste from electrical and electronic equipment	CO_2	Directive	Adopted	EU/Member States/Manufacturers		
Greenlight programme	To promote use of CFLs within non-residential (i.e. public/private) consumers	CO_2	Voluntary	Ongoing	Manufacturers		
Motor challenge programme	to achieve system optimisation in motor driven processes	CO_2	Voluntary	Ongoing	EU	~30 MTP	

3.4.4. Policies in the Transport Sector

The guidelines for European policy on transport were set out in the transport white paper as discussed in the 3rd National Communication. Clear progress has made on the objectives set out in the white paper but demand in the road transport sector continues to grow, giving higher greenhouse gas emissions. Emissions of air pollutants have however decreased (The European Environment Agency's 2004 Transport and Environment Report Mechanism (TERM))[84]. The alternative fuels policy is starting to take effect with the use of biofuels increasing, however, still modestly.

DG Environment also undertook a study[85] in 2003 to examine the affect of other EU policies on transport activity, particularly those where the generation of increased transport activity is an avoidable side-effect. Whilst only an initial overview it did provide some general conclusions and recommendations regarding the affects on transport of the following areas: agriculture, competition, environment, internal market, regional policies and taxation (see study for more details).

The strategy for reducing CO_2 emissions of passenger cars[86]described in the 3rd National Communication will improve the fuel efficiency of passenger cars through voluntary commitments with car manufacturing associations (ACEA, JAMA, KAMA), labelling and fiscal measures. The voluntary agreements with European, Japanese and Korean car manufacturers signed in 1999, on increased fuel efficiency of new passenger cars aim to achieve total new passenger car fleet average CO_2 emissions of 140 g CO_2/km by 2012. By 2003, CO_2 emissions from new cars in the EU-15 were 12% lower than in 1995[87]. As regards future actions beyond the current commitments in view of the Community's objective of 120 g CO_2/km, the Commission will review, in 2006, the options available to further reduce CO_2 emissions from passenger cars, subject to an impact assessment and taking into account the work of the CARS21 high-level group.

3.4.4.1. Biofuels

The biofuels directive[88] is one component of an active European energy policy that seeks to safeguard energy supplies and promote sustainability. It requires the substitution of conventional transport fuels by biofuels derived from agricultural crops, notably biodiesel and bioethanol. To achieve this, the directive, accompanied by the energy taxation directive, sets indicative targets for biofuel substitution and then gives a legal framework for fiscal and other national measures to promote biofuels. The indicative targets for the biofuel share in the Union are set at 2% by 2005, and 5.75% by 2010, with Member States setting their own national targets.

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[84] http://reports.eea.eu.int/TERM2004/en/TERM2004web.pdf
[85] http://europa.eu.int/comm/environment/air/pdf/policy_legislation.pdf
[86] COM(95)689 final
[87] http://europa.eu.int/comm/environment/co2/co2_monitoring.htm
[88] Directive 2003/30/EC on the promotion of the use of biofuels of other renewable fuels for transport, May 2003

Under the directive Member States may choose how to implement its objectives and to promote biofuels. However, it requires them to ensure that such measures are selected and designed with the whole life cycle of the particular biofuel in mind, taking account of the overall carbon balance and other impacts, and giving priority to promoting those fuels that are environmentally cost-effective.

To monitor progress towards the biofuel targets, the directive requires that Member States report yearly on their biofuel promotional measures and the share of biofuels in their national market. Every two years, the European Commission will produce an evaluation report on progress towards the biofuel target. On the basis of the findings of the report, the Commission can propose changes to the system of targets, including mandatory targets if it seems that national targets will be missed.

3.4.4.2. Infrastructure charging for heavy goods vehicles

A directive is proposed to modernise the existing charging system for heavy goods vehicles[89]. The philosophy of the approach recommended by the Commission is that road charges, usually in the form of tolls, should enable Member States to recover the total costs of infrastructure. The charges must also be able to reflect the level of congestion of the road network and the level of pollution of the zone crossed by a major road, to convey a signal to users. Revenues from the charges should also be allocated by Member States to fund improvements in the transport sector. Proposals will also be developed for a common framework for infrastructure user charges, including port and airport charges.

To aid in the development of road charging an additional Directive[90] was created 2004 looking in particular at the interoperability of electronic road toll systems and the standardisation of microwave technology used.

3.4.4.3. Third railway package

Introduction of the new European regulatory framework for rail transport is progressing in line with the reform objectives set out in the White Paper on the common transport policy. The objectives place the revitalisation of the rail sector at the heart of the sustainable mobility strategy and, seek to improve the attractiveness and competitiveness of more environmentally friendly modes of transport[91].

3.4.4.4. Programmes

Marco Polo Programme

In its White Paper, the Commission proposed to take measures which should make the market shares of the modes of transport return, by 2010, to their 1998 levels. This will prepare the ground for a shift of balance from 2010 onwards.

[89]Proposal for a Directive amending Directive 1999/62/EC on the charging of heavy goods vehicles for the use of certain infrastructures,COM(2003) 448, July 2003.
[90]DIRECTIVE 2004/52/EC of 29 April 2004 on the interoperability of electronic road toll systems in the Community
[91]Further integration of the European rail system:third railway package, COM(2004) 140 final, March 2004

One measure to achieve this objective is the establishment of the Marco Polo Programme with its adoption on 22 July 2003[92]. The Programme's objective is to reduce road congestion and to improve the environmental performance of the freight transport system within the Community and to enhance intermodality, thereby contributing to an efficient and sustainable transport system.

To achieve this objective, the Programme supports actions in the freight transport, logistics and other relevant markets. The Programme runs from 2003 to 2006 with a budget of €100 million for the EU-25.

In 2004 the Commission presented a proposal[93] to establish a second, significantly expanded "Marco Polo" programme from 2007 onwards. Marco Polo II includes new actions such as motorways of the sea and traffic avoidance measures. The programme, which has a budget of €740 million for 2007-2013, has been extended to countries bordering the EU. The Commission estimates that every €1 in grants to Marco Polo will generate at least €6 in social and environmental benefits. The final form of Marco Polo II will depend on the outcome of the negotiations with the European Parliament and the Council.

STEER

As mentioned in section 3.4.2.3, STEER is one of the sub-programmes within Intelligent Energy – Europe, which focuses specifically on transport energy issues. It provides funding in the areas of:

- Alternative fuels and vehicle propulsion.
- Policy measures for efficient use of energy in transport.
- Strengthening the knowledge of local energy agencies in the transport field.

[92]Regulation (EC) No 1382/2003 of the European Parliament and of the Council of 22 July 2003 on the granting of Community financial assistance to improve the environmental performance of the freight transport system (Marco Polo Programme)

[93]COM(2004) 478 final – 14 July 2004 - establishing the second “Marco Polo” programme for the granting of Community financial assistance to improve the environmental performance of the freight transport system ("Marco Polo II")

Table 4. 3. 3:Summary of the policies and measures in the transport sector

Name of the policy	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 equivalent) for EU15	
						2010	beyond 2010[94]
Directive on the promotion of Biofuels	Increase environmentally benign use of liquid and gaseous bio-fuels	Mainly CO_2	Framework Directive	Adopted	EU/Member States	~35-40[95]	
Proposed directive on Infrastructure charging	Structure and levels of charging for all modes of transport	Primarily CO_2	Framework directive	Under preparation	EU/Member States		~40-60
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	EU/ manufacturers' associations	~75-80[95]	
Various Air quality legislation, e.g. Auto-Oil I and II	Regulations and Research on pollution, i.e. ozone precursors, indirect effect on fuel consumption, limits on sulphur content etc	Indirectly CO_2	Regulation, Research	Implemented	EU/Member States		
Air quality legislation, Directive 98/70/EC + additions	Vehicle (and non-mobile) emissions (Euro) standards	Indirectly CO_2 and N_2O	Regulatory	Implemented but ongoing tightening of standards	EU/Member States		
Car Labelling Directive	Indication of CO_2 emissions for car	CO_2	Labelling	Adopted	EU/Member States +		

[94]The figures in the column are measures from the ECCP, the timescale is uncertain and some measures may be agreed and implemented before the end of the first commitment period.
[95]Second ECCP progress report April 2003 - http://europa.eu.int/comm/environment/climat/pdf/second_eccp_report.pdf

1999/94/EC	purchasers				institutes		
Infrastructure charging	Road charging to recover costs of infrastructure	CO_2	Fiscal	Heavy duty road vehicles in implementation	EU/Member States		40-60[96]
Marco Polo Programme	Promote modal shift in freight transport away from road	Primarily CO_2	Economic	Ongoing 2003-2006. Proposed second phase from 2007-2013	EU		
Fiscal measures	Promote modal shift, lower congestion.	CO_2	RTD on Taxes, Road-Pricing etc	Ongoing research[97]	EU/Member States		~32-35[95]

[96] This relates to the potential as a whole, implementation is for heavy goods vehicles only to date.
[97] http://www.transport-pricing.net/

3.4.5. Policies in the Industry Sector

The guidelines and background for European policy on industrial greenhouse gas emissions were discussed in the 3rd National Communication based upon the Action Plan to improve Energy Efficiency and the Green Paper on Integrated Product Policy[98].

3.4.5.1. Fluorinated gases

There are two elements to the Commission proposal in the Common Position[99] adopted by Council on 20 June 2005[100], which have subsequently been split into two separate legal texts:

- A regulation on containment, recovery, training and certification, prohibitions, use bans and reporting of F-gases;
- A common position on mobile air conditioning in passenger vehicles.

The proposal is to put into place a legislative framework to reduce emissions of fluorinated gases. The primary focus is on new requirements for the containment, recovery, training and certification of personnel involved in maintaining equipment containing fluorinated gases. A secondary aspect is concerned with a limited number of marketing bans for specific fluorinated gases in specified applications. These harmonised restrictions have been agreed on the basis of extensive stakeholder consultation and following cost-benefit analyses. Examples of the restrictions include the use of SF6 in magnesium die casting, vehicle tires and in footwear.

The Common Position on mobile air conditioning systems would prohibit the placing on the market of passenger cars with HFC 134a (a fluorinated gas) mobile air conditioners in new passenger cars from 2011 and in all passenger cars from 2017.

3.4.5.2. Integrated Pollution Prevention and Control

Compliance with the 2001 Integrated Pollution Prevention and Control Directive as outlined in the 3rd National Communication is one of the key prerequisites for European industry to achieve good environmental performance. Successful implementation, including full application of best available techniques by October 2007, is essential to achieve more sustainable production patterns in the European Union.

A communication[101] in 2003 indicated that whilst some good progress had been made on implementation of the directive, this was unevenly spread and a number of Member States needed to accelerate their efforts. A stakeholder consultation on the communication was also undertaken with a summary of the feedback available on the Commission website[102].

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[98] COM(2001) 68 final –7/2/2001 Green Paper on Integrated Product Policy

[99] Member States are required to comply with and uphold such positions which have been adopted unanimously at the Council.

[100] Proposal for a Regulation on certain fluorinated greenhouse gases COM(2003) 492 final, 11th August 2003.

[101] COM(2003) 354 final - On the Road to Sustainable Production Progress in implementing Council Directive 96/61/EC concerning integrated pollution prevention and control

[102] http://europa.eu.int/comm/environment/ippc/pdf/summary_ms_comments.pdf

To help support the implementation of the directive a number of support structures have been developed and enhanced:

- IMPEL an informal network of authorities responsible for implementation and enforcement of EU environmental law, has devoted a great deal of its activities to the IPPC Directive. A number of relevant projects[103] have been carried out, such the use of energy efficiency in environmental permits[104].

- The IPPC Experts Group is an informal group that was originally created to further discussions between Member States and the Commission on various ambiguities that needed to be dealt with when the Directive was transposed into national law. More recently the group has focused on reporting and on strategic issues.

- The Information Exchange Forum (IEF) has been set up as part of the information exchange on Best Available Techniques established pursuant Article 16(2) of the IPPC Directive. The IEF is composed of representatives of Member States, industry and NGOs. The draft final BAT Reference Documents are presented to the IEF before their adoption by the Commission.

- EPER - The European Pollutant Emission Register[105], which has been running since 2004. This provides access to information on the annual emissions of approximately 10000 industrial facilities in the 15 Member States.

- The PHARE project[106], which is aimed at capacity building for implementation of the IPPC directive as well as the Environmental Impact Assessment Directive[107] in the New Member States

Interaction of IPPC and Emissions Trading

The EU-ETS and Integrated Pollution Prevention and Control Directive have synergies in a number of areas such as permitting, coverage, emission limits etc and the ETS Directive has been formed in such a way as to complement this. Due to the lower threshold rating of the installations covered under the ETS (20MW, rather than 50MW under IPPC), the ETS scheme will cover some of the installations that also fall under the IPPC requirements. In these cases CO_2 emissions effectively form part of the ETS scheme whilst the installations must still conform to the general requirements of their IPPC permits, for example emission limits for other pollutants such as VOCs (see non-paper by DG Environment[108] for more information).

Review of the IPPC Directive

The Commission has launched a process to review the IPPC Directive. The cornerstones of the review will be the streamlining of IPPC Directive and other pieces of legislation on

[103]Completed reports available on:http://europa.eu.int/comm/environment/impel/index.htm
Ongoing projects:http://europa.eu.int/comm/environment/impel/workprog.htm
[104]http://europa.eu.int/comm/environment/impel/finnish_energy_efficiency.htm
[105]http://www.eper.cec.eu.int/eper/default.asp
[106]http://www.cowiprojects.com/phare-ippc-eia-training/
[107]Directive 97/11/EC amending DIRECTIVE 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment
[108]http://europa.eu.int/comm/environment/climat/pdf/non-paper_ippc_and_et.pdf

industrial emissions (in particular the LCP, Waste Incineration and Solvents Directives), the development of incentives for a more dynamic system aimed at improving the environmental performance of installations and the introduction of "technical" amendments (e.g., rectifying inconsistencies, clarifying definitions/concepts, possible extension of the scope, streamlining of reporting). It is expected to complete the review in 2007.

Table 4. 3. 4:Summary of the policies and measures in the industry sector

Name of the policy	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 CO_2 equivalent) for EU15	
						2010	Beyond 2010[109]
IPPC Directive	Integration of pollution issues into permits for plant operation based on BAT	All gases	Regulation[1]	Adopted, implementation ongoing	EU/Member States		
Directive on Fluorinated Gases	Improve monitoring and verification, improve containment and apply marketing and use restrictions	HFC, PFC and SF_6	Regulation and agreements	Adopted	EU/Member States	~23[110]	
Directive on Mobile Air Conditioning	Prohibit the use of HFCs in mobile air conditioning systems in new vehicles	HFC	Regulation	Adopted	EU/Vehicle manufacturers		
E2MAS*	Environmental auditing Energy efficiency in non-core areas of industry and SMEs	Primarily CO_2	Voluntary	Implemented	EU/Member States		
Framework guidelines for good practice	Promote VAs as part of an appropriate mix of policy instruments and promote best practice	All	Voluntary	Ongoing	EU, industry, Member States		
Promotion of use of Renewable Raw Materials	Through working group promote the greater use of RRM in the EU. E.g. via standards	Mainly CO_2	Research, consumer information, Support for industry	Ongoing	EU		

[109]The figures in the column are measures from the ECCP, the timescale is uncertain and some measures may be agreed and implemented before the end of the first commitment period.The figures in italics are the potential at a cost of more than 20 Euros per tonne

[110]COM(2003) 492 final

3.4.6. Policies in Agriculture and Forestry

The foundations of policy in the agricultural and forestry sectors were set out in the 3rd National Communication, primarily in relation to Agenda 2000[111] and reforms of the Common Agricultural Policy (CAP) in 1999 (Agenda 2000) and in 2003-2004 and the Forestry strategy for the European Union[112].

Effort on quantification emissions reduction potential and future measures has continued via the Working Group on Agriculture and two sub-groups, which delivered reports in 2003 under ECCP activity on carbon Sinks Related to Agricultural Soils[113] and Forest Sinks[114]. The working group on Agriculture identified mitigation potentials linked to extensification (coupled to reduced fertiliser use) and bio-energy production:

- N_2O emissions from agricultural soils of 10 $MtCO_2$-eq
- CH_4 emissions from enteric fermentation of 0.3 $MtCO_2$-eq
- CH_4 and N_2O emissions from manure management of 1.7 $MtCO_2$-eq
- Bio-energy production and the replacement of fossil fuels of 200-600 $MtCO_2$eq

The working group identified a mitigation potential for carbon sinks in agricultural soils through conservation and enhancement of carbon stocks by extensification (e.g., organic farming, conservation agriculture) of 60-70 $MtCO_2$-eq.

The working group on Forest Sinks estimated that for the first Kyoto commitment period 2008-2012, the combined potentially accountable carbon credits for the EU from ARD (Afforestation, Reforestation, Deforestation) measures, assuming a continuation of the rate of AR from 1990-2000 would lead to a mitigation potential of around 14Mt CO_2 eq/yr. When this is added to the estimated mitigation potential from Forest management (capped under the Protocol at 19Mt CO_2eq/yr) it would be equal to approximately 33Mt CO_2eq /yr.

3.4.6.1. Policy Actions in Agriculture

As part of the continuing process of CAP reform the Commission adopted a new proposal[115] in 2004 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD).

This is aimed at reinforcing the EU's rural development policy and simplifying its implementation. The proposal, if approved, could increase EU funding, amounting to a total of € 13.7 billion per year for 2007-2013.

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[111] http://europa.eu.int/comm/agenda2000/index_en.htm

[112] "Council Resolution of 15th December 1998 on a forest strategy for the European Union (1999/C 56/01", Dec 98.

[113] http://europa.eu.int/comm/environment/climat/pdf/finalreport_agricsoils.pdf

[114] http://europa.eu.int/comm/environment/climat/pdf/forest_sinks_final_report.pdf

[115] COM(2004)490 final – 14 July 2004 – Proposal for a Council regulation on support for rural development by the European Agricultural Fund for Rural Development (EAFRD)

CAP reform measures which impact on climate change, and their predicted effect are listed in the following table.

Measure	Expected effect
Decoupling of single farm payment from production, replacing most of the current direct payments.	Eliminates incentives for intensified production (e.g., reduced soil erosion, fertiliser use, irrigation etc).
Cuts in direct payments of up to €5bn. Modulation amounts will be used for rural development measures and will be available from 2006 onwards.	Larger budget for Rural Development provides MS with increased margin to support Agri-Environmental Measures, which go beyond Good Farming Practice.
Partial or entire reduction of direct payments in case of non-respect of: • Statutory management requirements in areas such as environment, plant health, animal welfare etc. • Maintenance of land in good agricultural and environmental condition (defined by MS on basis of common framework laid down in Annex IV of CAP regulation). • Cross-compliance	Provides additional incentive to comply with mandatory requirements on environmental protection. E.g,. Nitrate Directive leading to reduced fertiliser use.
Carbon credits:45 €/ha for energy crops (contract with processor required) for a maximum guaranteed area of 1. 5 Mio ha.	Incentives for cultivation of energy crops
Set aside scheme.	Increased carbon sequestration, in particular in non-rotational set aside.
Non-food crops can be grown on set-aside land – but in these cases would need receive 45 €/ha support.	Incentives for non-food crops including energy crops.

Rural development support is also being widened by introducing new measures targeted towards the following:

Measure	Expected effect
Support for participation in food quality schemes using local and traditional resources.	This type of food production is often associated with less intensive production.
Support to help farmers adapt to new more demanding standards within Community legislation.	Better compliance with environmental standards.
Farm advisory systems – involving structured and regular stock taking and accounting of material flows and processes relevant for a particular target issue (e.g. animal welfare, environment etc).	Raises awareness of potentially superfluous and negative input in agricultural production.
Investment in state owned forests for ecological and social reasons.	Enhanced carbon sequestration.
Market measures – intervention price cuts for rice reducing incentives for intensified production. Abolition of intervention for rye.	Less incentive for intensive production.
Support for dried fodder to growers will be integrated into single farm payment, and thus be decoupled from drying techniques used.	Reduces incentives for energy consuming drying techniques.
Support for Organic Farming Action Plan	Less intensive production, lower fertiliser use, higher content of organic matter in soil.
Increased community support for agri-environmental measures.	Incentives for uptake of measures such as soil conservation, organic farming, etc.

3.4.6.2. Policy Actions in Forestry

EU Forestry Strategy

In 2005 the Commission reported116 on progress in implementing the EU's Forestry Strategy from 1999-2004. A detailed description of the actions and activities implemented over the period 1999–2004 is contained within Commission staff working document attached to the communication117. The EU's Forestry Strategy recognises the importance to climate change mitigation of multi-purpose sustainable forestry. In addition, to their contribution to the protection of biodiversity and the social and economic development of communities, forests function as carbon sinks and reservoirs, and as a sustainable source of biomass for renewable energy and material.

At the EU level, the adoption of the 6th Community Environment Action Programme in 2002 and the reform of the CAP in 2003, which has strengthened rural development policy, are important developments with implications for the forest policies of the

[116] COM(2005) 84 final – 10 March 2005 - Reporting on the implementation of the EU forestry strategy
[117] SEC(2005)333-10 March 2005–Annex to COM(2005) 84 final reporting on the implementation of the EU forest strategy.

Member States. At the Pan-European level, the MCPFE (Ministerial Conferences on the Protection of Forests in Europe) has become a well-established process, through which European countries and the European Community have developed a framework for sustainable forestry, and strengthened co-ordination and co-operation.

Substantial progress has been achieved in the preparation and implementation of national forest programmes (NFPs) in the EU. A common approach to NFPs has been developed in the context of the MCPFE, with the aim of establishing a social and political framework for forest management, based on participatory and transparent governance, and in line with international forest-related commitments. The NFPs address issues such as the productive function of forests and the economic viability of sustainable forest management, the contribution of forestry to rural development, the protection and enhancement of biodiversity in forests, climate change mitigation, the protective functions of forests, and social, recreational and cultural aspects.

The rural development policy[118] has been the main instrument for the implementation of the EU Forestry Strategy at Community level. The regulation contains forestry measures including:

- Afforestation.
- Investment in forests aimed at significantly improving their economic, ecological or social value.
- Maintaining and improving the ecological stability of forests.

Financial support from the Community for forestry measures in the context of rural development amounts to €4.8 billion for the period 2000–2006 (approximately 10% of the rural development budget).

The rural development regulation requires "cross-compliance", i.e. EU funding is conditional on meeting all relevant EU legislation, including environment (e.g., those related to biodiversity or water). The rural development programmes are implemented by MS on the basis of their National Rural Development Plans (NRDPs), which must be approved by the Commission. These NRDPs must identify priorities and document the mechanism to achieve cross-compliance. Payments are regularly audited by EU institutions, which further enhances compliance with these rules.

The new Rural Development Regulation[119] to reinforce the EU's rural development policy for the period 2007–2013, as mentioned in section 3.4.6.1, provides a basis for a fuller integration of forestry into rural development.

Protection Against Forest Fires

[118]Council Regulation (EC) No 1257/1999 of 17 May 1999 on support for rural development from the European Agricultural Guidance and Guarantee Fund (EAGGF) and amending and repealing certain Regulations)

[119]Council Regulation 9EC) No 1698/2005 on Support for Rural Development by the European Agricultural Fund for Rural Development.

The Community measures to support the protection of forests against fires[120] and atmospheric pollution[121] have yielded a considerable amount of information and operational developments. Forest fires continue to be a major concern in many European countries. The Commission has recently set up an expert group to analyse forest fire prevention at Community level and to make recommendations for future actions. The Forest Focus Regulation[122] adopted in 2003 provides an opportunity for the EU to develop a comprehensive and integrated system for monitoring a range of effects that signal damage, or potential damage to forest ecosystems. Monitoring may include new parameters on soils, biodiversity and climate change.

Although the role of the forest sector in climate mitigation was confirmed by the rules of the Kyoto Protocol agreed since the adoption of the Strategy, development of measures to encourage carbon sequestration as an objective of afforestation, reforestation and forest management, has been slower than expected. The use of biomass for energy purposes has increased considerably, especially in some member states, but has not yet been developed to its full potential in the EU. In the future, wood for products may also play an important role as carbon reservoir and may be included within a forest carbon accounting.

There is also an emerging need to evaluate the impacts of climate change on forest ecosystems and to develop measures to adapt to these impacts. In the future, not only mitigation measures (reduction of greenhouse gases) but also adaptation measures (adaptation of forests to a changed climate) will need to be considered.

The Commission is currently elaborating a future EU Forest Action Plan, to be presented in 2006. Its aims will be to:

- Develop an EU Forest Action Plan, which should provide a coherent framework for the implementation of forest-related actions and serve as an instrument of co-ordination between Community actions and the forest policies of the Member States.

- Review the existing Community means and practices to facilitate co-ordination, communication and co-operation between different policy sectors, which have an influence on forestry, in the light of the increasing complexity of forest policy and of the decision-making processes. This review will also include Council Decision 89/367/EEC of 29 May 1989 setting up the Standing Forestry Committee, and the role this body should play in the implementation of the Action Plan.

Tropical Deforestation

Tropical deforestation, sometimes associated with illegal logging, is a major source of anthropogenic greenhouse gas emissions. To build on a commitment taken at the World Summit on Sustainable Development, in May 2003 the Commission, with support from the timber trade in its development and implementation, published an Action Plan for Forest Law Enforcement, Governance and Trade (FLEGT)[123] aimed at the reduction and

[120]Council Regulation (EEC) No 2158/92 on the protection of the Community's forests against fire.
[121]Council Regulation (EEC) No 3528/86 on the protection of forests against atmospheric pollution.
[122]Council Regulation (EC) No 2152/2003 concerning monitoring of forests and environmental interactions in the Community (Forest Focus)
[123]COM(2003) 251 final - Communication from the Commission to the Council and the European Parliament Forest Law Enforcement, Governance and Trade (FLEGT) Proposal for an EU Action Plan.

eventual elimination of the imports into the EU of illegally harvested timber. Among the many other adverse effects of illegal logging, the action plan recognises that it "can be a contributory factor to the process of deforestation, and it can increase the vulnerability of forests to fires - both of which have climate change implications".

Council Conclusions were adopted in October 2003, and the European Parliament motion on the FLEGT action plan was adopted in February 2004. A proposal for a FLEGT regulation[124] is being debated. When fully implemented, the legislative package will exclude the import of illegally harvested wood to the Community.

[124] COM(2004) 515 final – Proposal for a Council Regulation concerning the establishment of a voluntary FLEGT licensing scheme for imports of timber into the European Community.

Table 4.3.5 Summary of the policies and measures in the agriculture sector

Name of the policy	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 MtCO2 equivalent) for EU15	
						2010	Beyond 2010
CAP (market policies)	Sustainable agriculture	CO_2, CH_4, N_2O	Regulation	Implementation ongoing	EU	~12[125]	(potential of 200-600 from bioenergy crops)
CAP (rural development policy)	Sustainable agriculture	CO_2, CH_4, N_2O	Regulation	Implementation ongoing	EU/Member States	Potential of up to 60-70 from agricultural sinks[125]	
Forestry strategy	Sustainable forestry	CO_2	Resolution	Implementation ongoing	EU	~33 from forest sinks through AR and management [126]	Long term ~124
Other forestry measures	Prevention of damage to forests	CO_2	Regulation	Implementation ongoing	EU		

[125] 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.
[126] From ECCP working group on forest sinks.

3.4.7. Policies in Waste Management

The background to the various waste policies and their relation to climate change and the ECCP were discussed in the 3rd National Communication.

In 2003, the Commission adopted a Communication[127] towards a thematic strategy on the prevention and recycling of waste. It included an assessment of Community waste policy in relation to prevention and recycling, with a view to identifying means to further develop waste management policy in line with the hierarchy of objectives set out in the Community's waste strategy. It also focused on the means to promote more sustainable waste management, by minimising the environmental impacts of waste while also taking into account economic and social considerations.
This section outlines developments since the 3rd National Communication. More detail is available in a 2003 communication[128] on Member States' implementation of Waste Legislation from 1998-2000.

3.4.7.1. Landfill of Waste

The Landfill Directive[129] required implementation at the Member State level by 2001 and a communication in 2005[130] examined national strategies for achieving the Directives requirement to cut down the landfill of biodegradable municipal waste by 65% by 2016. In addition, landfills must collect, treat and where possible produce energy from landfill gases. Where energy production is not possible the gases must be flared.

3.4.7.2. Directive on Waste Packaging

Member States have broadly complied with the recycling and recovery targets set in the Directive on Waste Packaging[131] to be achieved by 2001. Increased recycling and recovery targets have been adopted in 2004[132] to be achieved by 2008, including:

- 60 % as a minimum by weight of packaging waste to be recovered or incinerated at waste incineration plants with energy recovery;

- Between 55 % as a minimum and 80 % as a maximum by weight of packaging waste to be recycled;

The European Parliament and the Council must then decide, by 31 December 2007, on targets for the third five-year phase, 2009 until 2014, based on the practical experience gained in the Member States.

Greece, Ireland and Portugal are, because of their specific situations (such as a large number of small islands, the presence of rural and mountain areas and the current low level of packaging consumption) allowed a period derogation from these and the original

[127] COM (2003) 301 – 27 May – 2003 towards a thematic strategy on the prevention and recycling of waste.
[128] COM(2003)250 final/3 – 11 July 2003 – on the implementation of community waste legislation.
[129] Directive 1999/31/EC on the Landfill of Waste
[130] COM(2005) 105 final – 30 March 2005 – On the national strategies for the reduction of biodegradable waste going to landfills pursuant to article 5(1) of Directive 1999/31/EC on the landfill of waste.
[131] Directive 94/62/EC on packaging and packaging waste
[132] Directive 2004/12/EC of 11 February 2004 amending Directive 94/62/EC on packaging and packaging waste

targets. The New Member States are also allowed a period of derogation, dependent upon each country, until between 2012 and 2015.

It has been estimated by the EC's Environment DG (Directorate General) that recycling of waste packaging at 2001 levels reduces emissions by around 25 $MtCO_2$ compared to zero recycling. The impact of the waste packaging directive itself, due to business as usual recycling and legislation predating the directive, is estimated to be 3 $MtCO_2$.

3.4.7.3. Directive on End-of-Life Vehicles

Following the 2000 Directive[133] on End-of-Life Vehicles a number of pieces of secondary legislation[134] have been made, amending sections on items such as material and coding standards, recycling of spare parts etc.

The majority of Member States are on track to meet the 2006 requirements of the directive. The Directive also mandates the separation and treatment of air conditioning fluids.

3.4.7.4. Directives on Waste Electrical and Electronic Equipment

The Directive on Waste Electrical and Electronic Equipment (WEEE) came into force in 2002. It includes the target that by 31 December 2006 Member States should be achieving separate collection rates of at least 4kg per capita per year of WEEE from private households - to be taken for reuse, recycling etc. The various categories of WEEE are subject to sets of recycling and recovery targets. The directive also mandates the separation and treatment of CFC, HCFC, HFC and HC and refers to the regulation on ozone depleting substances.

3.4.7.5. Incineration of Waste

The Directive on the incineration of waste came into force in 2000[135]. As requested by Parliament in its first reading, the Commission's proposal was merged into a single text. It now covers the incineration of hazardous (formerly Directive 94/67/EC) and non-hazardous (89/369/EEC and 89/429/EEC) waste.

The aim of the Directive is to prevent or - where that is not practicable - to reduce as far as possible negative effects on the environment caused by the incineration and co-incineration of waste. This is to be achieved through stringent operational conditions and technical requirements and by setting up emission limit values for waste incineration and co-incineration plants within the Community.

The Directive aims to cover all waste including pollutants such as SO_2 and HCl but the main effect on greenhouse gas emissions will be from the level of energy generation from waste within the energy mix.

The Directive entered into force on 29 December 2000. Transposition into national legislation was necessary by 28 December 2002. From this date on new incinerators will have to comply with the provisions of the Directive; the deadline for existing plants will

[133] Directive 2000/53/EC - 18 September 2000 on end-of life vehicles
[134] Commission Decisions:2005/63/EC, 2003/138/EC, 2002/151/EC, 2002/525/EC, 2001/753/EC
[135] Directive 2000/76/EC - 4 December 2000 - on the incineration of waste

be 28 December 2005. Then all old Directives (89/369/EEC, 89/429/EEC und 94/67/EC) will be repealed.

Table 4.3.6:Summary of the policies and measures in the waste sector

Name of the policy	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 CO_2 equivalent) for EU15	
						2010	Beyond 2010
Landfill Directive	Amount of waste to landfills; recovery of landfill gas	CH_4	Regulatory	Adopted	EU/Member States	~41[136]	
Directive on Waste Packaging	Recovery rates for waste packaging	CH_4 CO_2	Regulatory	1st phase implemented, but 2nd phase targets for 2008	EU/Member States	~3[137]	
Directive on End-of-Life Vehicles	Acceptance of used vehicles and recovery by their producers	CH_4 CO_2 Fluorinated gases	Regulatory	Implemented, but 2nd phase targets for 2015	EU/Member States		
Directive on Waste Electrical and Electronic Equipment (WEEE)	Recovery of WEEE	CH_4 CO_2 Fluorinated gases	Regulatory	Adopted	EU/Member States/Producers		
Directive on incineration of waste	Reduce negative impacts of incineration and co-incineration of waste	Indirectly CO_2 CH_4	Regulatory	Adopted	EU/Member States		

[136] Second ECCP progress report April 2003 - http://europa.eu.int/comm/environment/climat/pdf/second_eccp_report.pdf
[137] Estimate from internal of review of waste packaging recycling by DG Environment 2005.

3.5. Policies no longer in place

3.5.1. CARNOT

The CARNOT Programme ran from 1998-2002 and provided funding for technological actions promoting the clean and efficient use of solid fuels. The primary aim was to limit emissions, including CO_2 emissions, from the use of solid fuels and encourage the uptake of advanced clean solid fuel technologies in order to improve Best Available Technologies, at reasonable cost. No provision was allowed for research into cleaner solid fuels within the current 6th Framework Programme (2003-2006) of research funding, with the exception of that associated with carbon capture and sequestration.

However, some research into cleaner coal and other solid fuel technologies has continued separately via funding from the Research Fund for Coal and Steel (see section 3.4.2.3).

Current proposals[138] for the 7th Research Framework Programme (2007-2013) have now reintroduced specific funding for clean coal technologies, such as improvement of general plant efficiency, alongside CO_2 capture and sequestration.

[138]COM(2005) 119 final-6 April 2005– concerning the seventh framework programme of the European Community for research, technological development and demonstration activities (2007-2013)

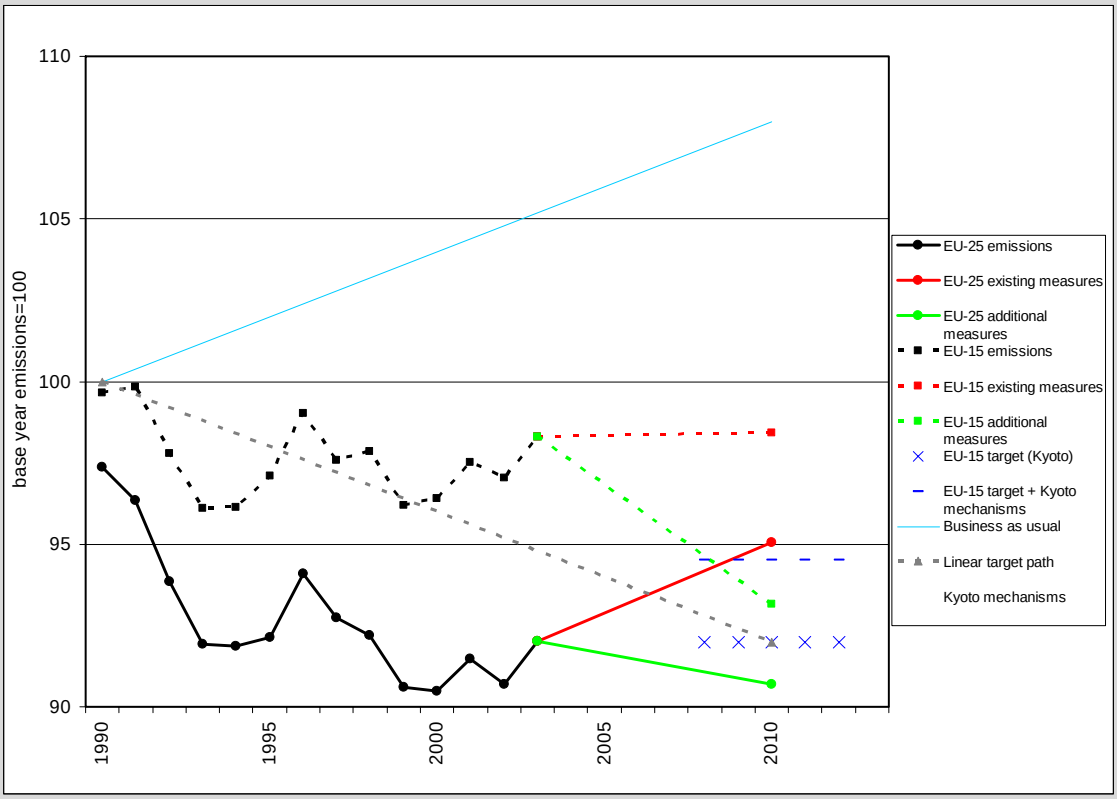
4. PROJECTIONS[139] AND THE TOTAL EFFECT OF POLICIES AND MEASURES

Developments

1. Emissions of greenhouse gases in the EU-25 are projected to be 5% below 1990 levels in 2010 as a result of measures already implemented.

2. In the EU-15 emissions of greenhouse gases are projected to be 1.6% below base year emissions in 2010 as a result of measures already under implementation. If the reductions that Member States forecast they will achieve through the use of Kyoto mechanisms are included, then projected emissions in 2010 are 4.1%. below base year emissions.

3. The implementation of additional proposed measures is projected to reduce EU-25 GHG emissions to 9.3% below 1990 levels by 2010 and in the EU-15 emissions fall to 6.8% below base year emissions by 2010. The use of Kyoto mechanisms brings the emissions to below 8%, thus meeting the Kyoto targets.



Notes:

The index on the y axis refers to the base year. This is 1990 for most Member States for CO_2, methane (CH_4) and nitrous oxide (N_2O) but 1995 for fluorinated gases, with the following exceptios:The base year for CO_2, CH_4 and N_2O for Hungary is the average of 1985-1987, for Slovenia 1986 and for Poland 1988; the base year for fluorinated gases is 1990 for France and Finland. This means that for EU-15 and EU-25, the value for 1990 is not exactly 100. Business as usual describes the projected emissions without climate related policies and measures.

[139]Due to the limited submission of relevant data from the MS, information on 2015 and 2020 projections is not provided in this report.

4.1. Introduction

This chapter presents projections of greenhouse gases for the European Community (EC) to 2010 under a 'with measures' and a 'with additional measures' scenario. The projections presented are an aggregate of Member State projections. This aggregation depends on the timeliness and extent of the information provided by Member States under the Monitoring Mechanism. In this report, the detailed discussion concentrates on those elements where most Member States have submitted information.

Further analysis of these aggregated projections is needed as the projections are not necessarily updated at the same time. This further analysis will be carried out in the future as part of the Monitoring Mechanism.

4.2. With measures projection

4.2.1. EC wide with measures projection

The 'with measures' emissions projections aim to quantify the impact of all policies and measures implemented by Member States; this includes national measures to implement existing EC wide policies and measures as well as other national policies and measures.

The results of the 'with measures' projections are shown for the EU-25 and EU-15, Figure 4-1 and Table -18. The emissions data for the base year are from the projections and have not been calibrated to the emissions reported in the inventory.

In the 'with measures' projection, emissions in the EU-25 fall by 5.0% from 1990 levels by 2010. The reduction to 2010 is due in part to a projected 1% fall in CO_2 emissions. Despite strong growth in emissions from the transport sector, CO_2 emissions fall overall as there is continued fuel switching from coal to gas, an increasing use of renewables in the power generation sector and a reduction in emissions from industry as a result of the shift to less energy intensive industry. The shift to renewable energy is encouraged by both national policies and measures and implementation of directives such as the one on the promotion of electricity from renewable energy sources.

Another major contribution to the overall reduction in emissions comes from a more than 30% fall in methane emissions due to the continuing phase out of coal mining, continuing reduction in landfill gas emissions from the implementation of the Landfill Gas Directive (99/31/EC) and reduced emissions from livestock as livestock populations decline, and the efficiency of livestock farming increases. Emissions of N_2O are also projected to fall, but F-gases rise due to their increased use in refrigeration systems, as replacements for ozone depleting substances whose use is banned under the Montreal Protocol.

Table -18 Aggregate of Member States projections for the various scenarios, including Kyoto mechanisms

	1990/ base year[1] Mt CO_2 eq	2010 Mt CO_2 eq	Change 1990-2010
Aggregate of EU-15 MS with measures projections[2]	4145	3974	-4. 1%
Aggregate of EU-25 MS with measures projections [2,3]	5150	4788	-7. 0%
Aggregate of EU-15 MS with additional measures projections	4145	3756	-9. 4%
Aggregate of EU-25 MS with additional measures projections[2,3]	5150	4564	-11. 4%

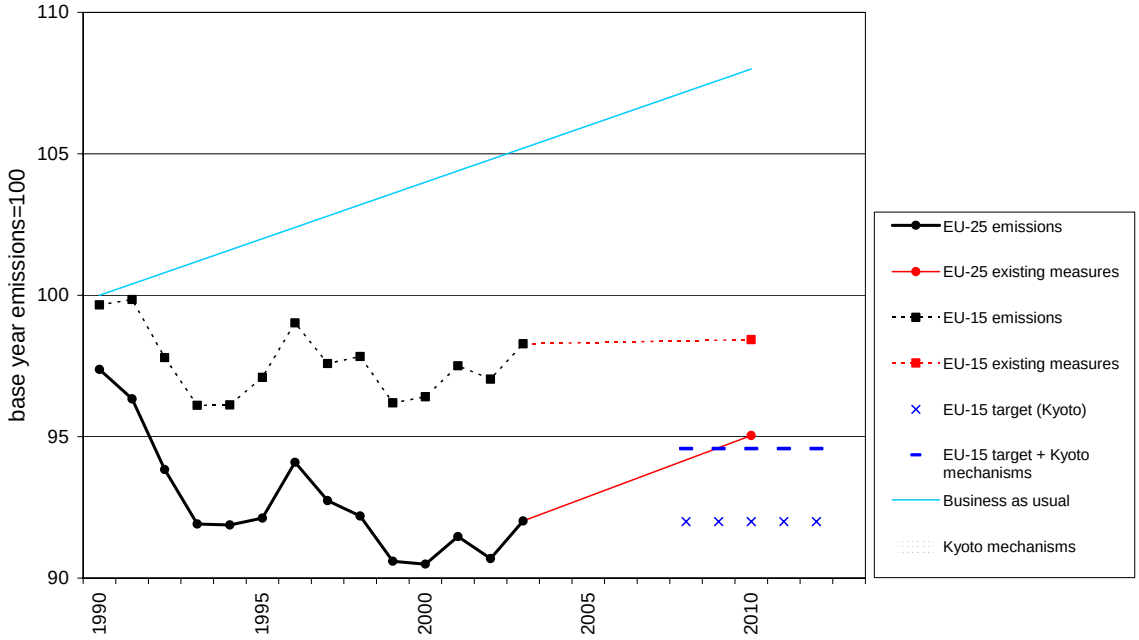
Notes:

1. The base year for the Member States projection is the aggregate of base years from the projections and has not been adjusted to emissions reported in the latest inventory.

2. Member State (MS) Projections as submitted to the EC Monitoring Mechanism or from Member States 3rd National Communication

3. No projections are available for Cyprus and Malta; 1990 GHG emissions in these countries totalled 8. 2 Mt CO_2 eq.

Figure -9 Projected greenhouse gas emissions (excluding LULUCF) in 'with measures scenario



Notes:

1. The index on the y axis refers to the base year. This is 1990 for most Member States for CO_2, methane (CH_4) and nitrous oxide (N_2O) but 1995 for fluorinated gases, with the following exceptions:The base year for CO_2, CH_4 and N_2O for Hungary is the average of 1985-1987, for Slovenia 1986 and for Poland 1988; the base year for fluorinated gases is 1990 for France and Finland. This means that for EU-15 and EU-25, the value for 1990 is not exactly 100. Business as usual describes the projected emissions without climate related policies and measures.

2. Reported emissions to 2003. The 1990 reported emissions are below the aggregate base year emissions from Member States projections.

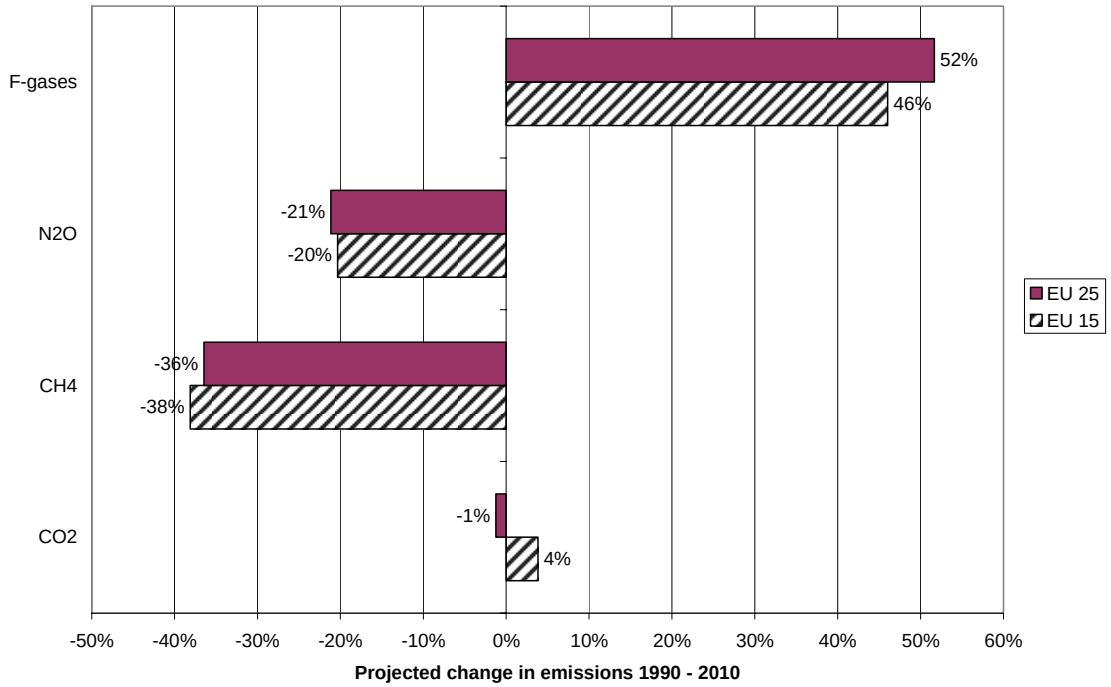
Projections for the EU-15 show a fall in emissions of 1.6% from the base year140 emissions by 2010, this is despite an increase of CO2 emissions of 4%. This increase comes largely from growing transport emissions. Emissions of HFCs show strong growth due to their increased use in the refrigeration sector, but emissions of the other non-CO2 greenhouse gases fall, with particularly strong reductions in methane emissions due to the continued phase out of coal mining, reduced landfill gas emissions as a result of the landfill directive and reduced agricultural emissions due to improvements in livestock productivity and a decrease in the number of livestock. The overall decline in emissions is greater for the EU-25 than for the EU-15, due to the large fall in CO2 emissions that occurred between 1990 and 2000 in some of the new Member States as a result of economic restructuring.

The reduction in EU-15 emissions by 2010 is not enough to meet the EU-15's target of an 8% reduction from the base year in the commitment period of 2008 -2012. The Member States forecast they will achieve reductions of over 100 Mt CO_2 eq through the use of

[140] Base year is 1990 for all CO_2, CH_4 and N_2O emissions and 1995 for emissions of HFCs, PFCs and SF_6, apart from Finland and France where it is 1990.

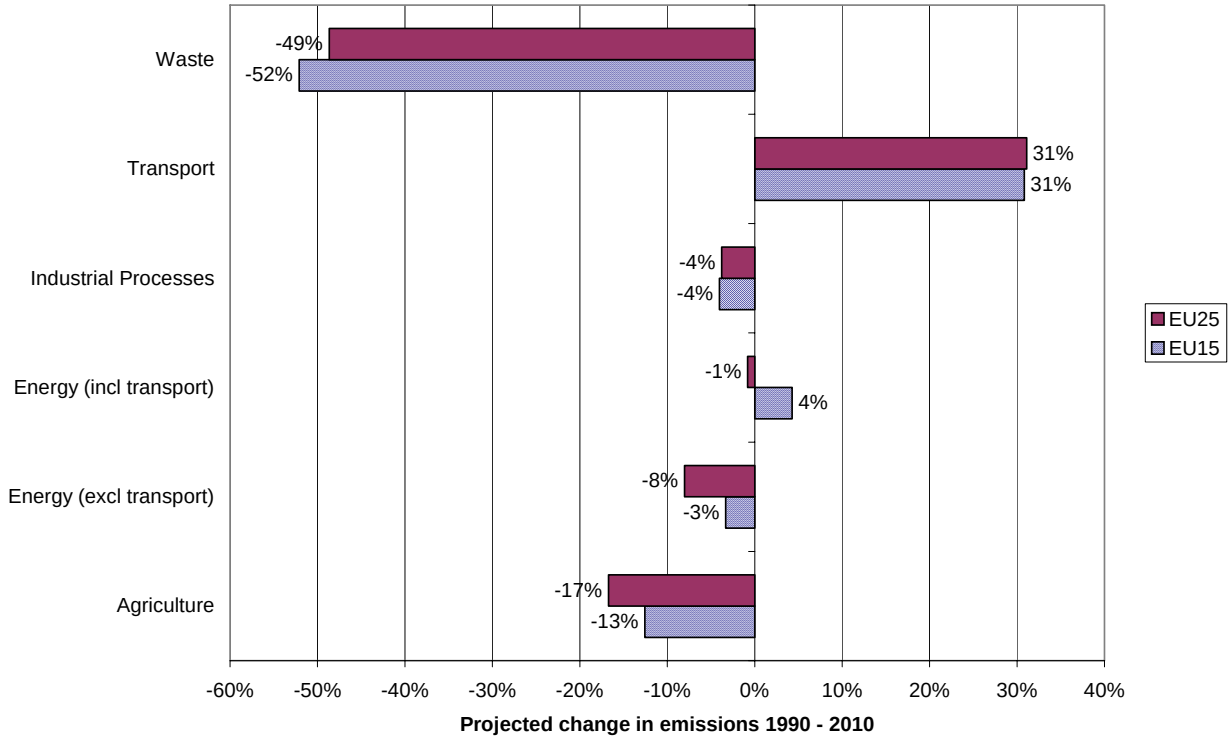
Kyoto mechanisms, bringing emissions down to 4.1% below 1990 levels by 2010. To reach the Kyoto target further action is therefore required and planned measures are included in the with additional measures projections discussed below.

Figure -10 Projected greenhouse gas emissions (excluding LULUCF) by gas for the 'with measures' scenario



Note: Not all Member States have reported a split of projection by gas and the trends above represent only part coverage of the EU. Coverage for CO_2 emissions is near complete, for the F-gases only 17 of the 25 Member States have reported separate projections.

Figure -11 Projected greenhouse gas emissions (excluding LULUCF) by sector for the 'with measures' scenario



Note: Not all Member States have reported a split of projection by sector and the trends above represent only part coverage of the EU. Coverage for emissions from energy is near complete but sectoral projections for Germany are not yet available (Sep. '05), for the waste and industrial process 18 of the 25 Member States have reported separate projections

4.2.2. Use of Kyoto mechanisms

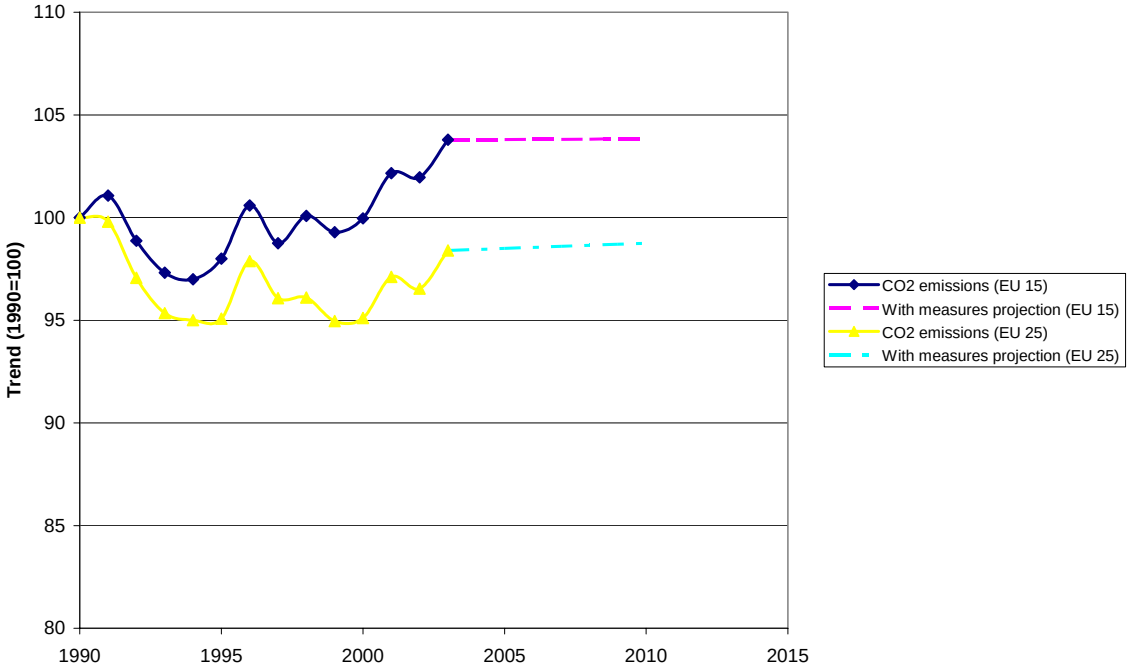
Information has been gathered from Member States about their intended use of flexible mechanisms of the Kyoto Protocol (Kyoto mechanisms: Joint Implementation (JI), Clean Development Mechanism (CDM)) and Emissions trading (ET) to achieve their targets for the commitment period 2008–12141 (EEA, 2005). On the basis of information received from the EU-15 Member States, 11 currently intend to use Kyoto Mechanisms to meet their burden sharing targets, two are as yet undecided, and two will allow companies to use Kyoto mechanisms for compliance with their obligations under the EU emissions trading scheme. Available estimates of projected emissions reductions in 2008-12 through the use of Kyoto mechanisms in the ten relevant Member States total 106.8 million tonnes of CO_2-equiv. per year of the commitment period. To achieve these reductions, resources totalling about € 2730 million have been allocated for the 5-year commitment period.

4.3. With measures projections for CO_2

Figure -12 shows CO_2 emissions and projections for the 'with measures' scenarios.

[141] EEA (2005), Greenhouse gas emission trends and projections in Europe 2005, EEA (Draft)

Figure -12 CO_2 emissions in with measures projections



EU-25 CO_2 emissions fell by 2% between 1990 and 2000 and are projected to remain at that level until 2010. The stabilisation is mainly due to continued fuel switching from coal to gas and an increase in generation from renewables. The increase in generation from renewables is driven by both domestic measures by Member States and directives such as the RES-E Directive described in Chapter 4. For the EU-15, CO_2 emission after an initial fall have risen to around 4% above the 1990 level, mainly due to increased transport emissions.

4.4. With measures projections in the energy sector

Figure -13 Greenhouse gas emissions and projections in the energy sector (excluding transport)

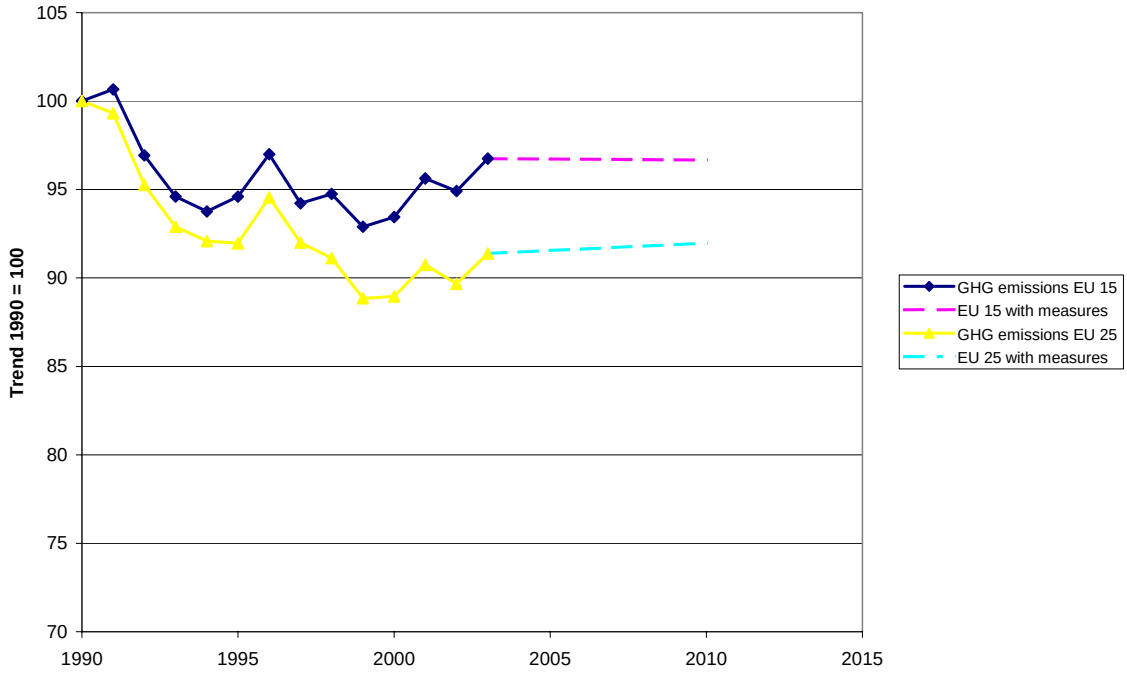
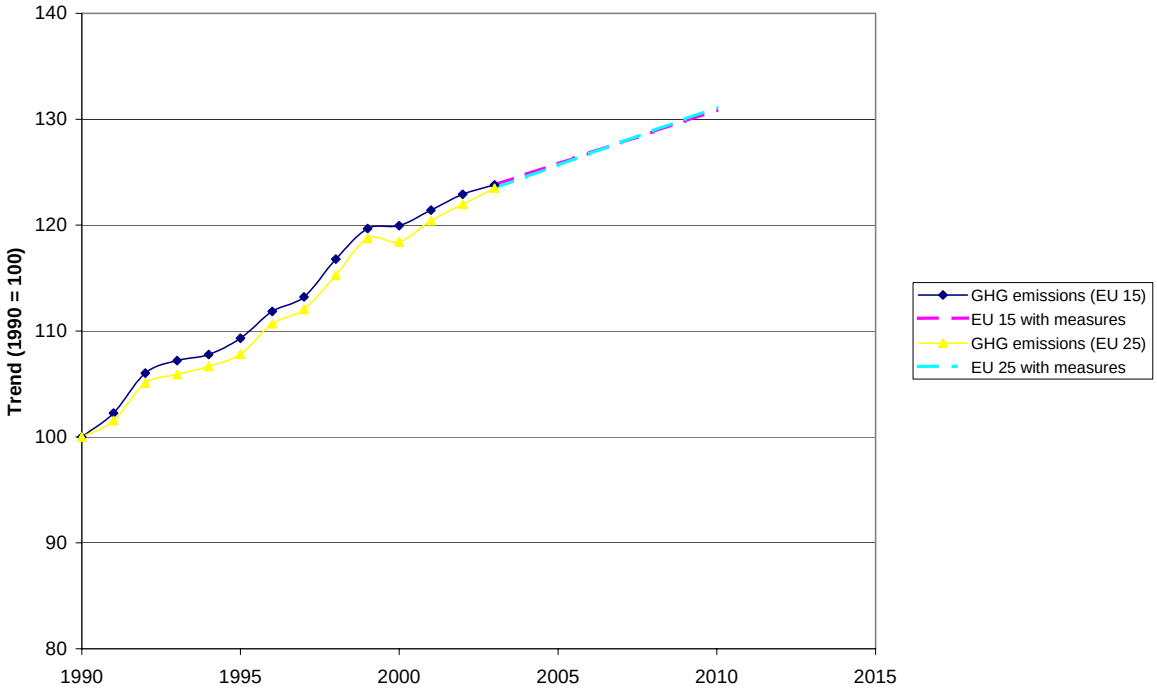


Figure -13 shows the greenhouse gas emissions and projections from the energy sector excluding transport. For both EU-15 and EU-25, emissions have fallen since 1990 mainly due to fuel switching to gas and the restructuring of industry in the new Member States. Emissions have started to rise again since 2000, this is projected to stabilise. Measures such as increased use of renewables driven by EU and Member State policies contribute to these trends, which are to a certain extent counteracted by economic growth in the new Member States.

In the transport sector, Figure 4-6, greenhouse gas emissions have risen since 1990 and are projected to continue to increase, reaching 30% above 1990 levels by 2010 for EU-15 and EU-25. The EU strategy for improving the fuel efficiency of passenger cars is beginning to deliver improvements in the carbon emissions from cars, but growth in demand continues to be strong.

Figure -14 Greenhouse gas emissions and projections in the transport sector

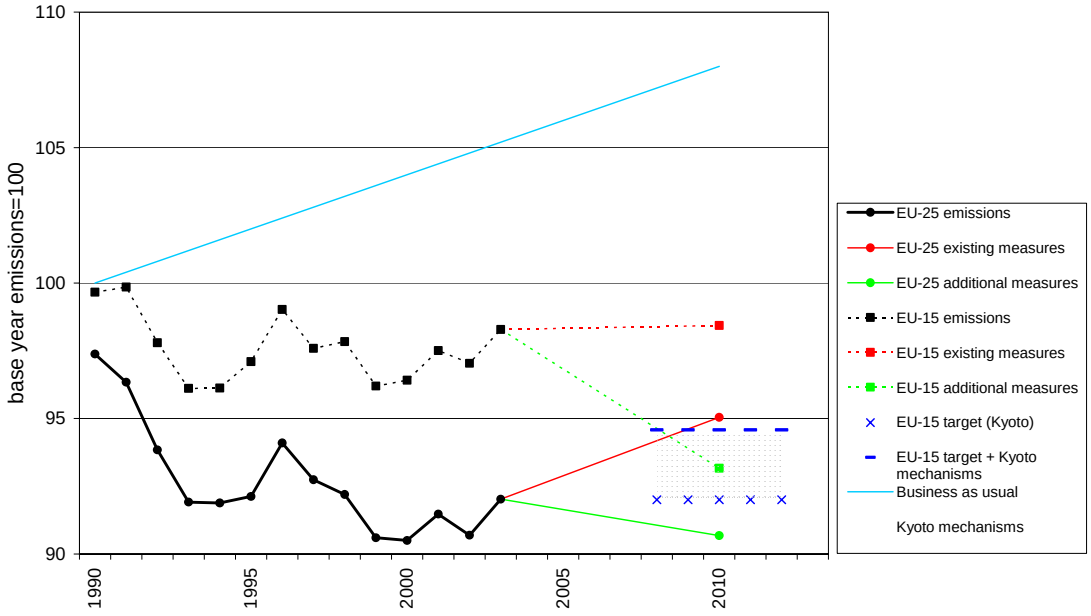


4.5. With additional measures projection

In the 'with measures' projection, the implementation of planned policies and measures and the fuller implementation by Member States of agreed EC wide policies and measures, delivers additional emissions savings. The aggregated Member States 'with additional measures[142], projection suggests a 6.8% and 9.3% reduction on 1990 levels for the EU-15 and EU-25 respectively by 2010 (Figure 4-7). Together with the flexible mechanisms already planned, the EU-15 aggregated Member States 'with additional measures' projection will result in a 9.3% reduction on base year emissions. This reduction is more than is needed to meet the EU-15 Kyoto target.

[142] Measures already implemented and measures planned but not yet implemented.

Figure -15 Greenhouse gas emissions and projections for the 'with measures' and 'with additional measures' scenarios



Notes:

1. The index on the y axis refers to the base year. This is 1990 for most Member States for CO_2, methane (CH_4) and nitrous oxide (N_2O) but 1995 for fluorinated gases, with the following exceptions: The base year for CO_2, CH_4 and N_2O for Hungary is the average of 1985-1987, for Slovenia 1986 and for Poland 1988; the base year for fluorinated gases is 1990 for France and Finland. This means that for EU-15 and EU-25, the value for 1990 is not exactly 100. Business as usual describes the projected emissions without climate related policies and measures.

2. Reported emissions to 2003. The 1990 reported emissions are below the aggregate base year emissions from Member States projections.

4.6. Key policies and measures projected to deliver reductions

From the information provided in EU-15 Member States projections, six key areas can be identified, where polices and measures in are both widespread, and projected to deliver substantial emissions reductions (Figure -16). These are in:

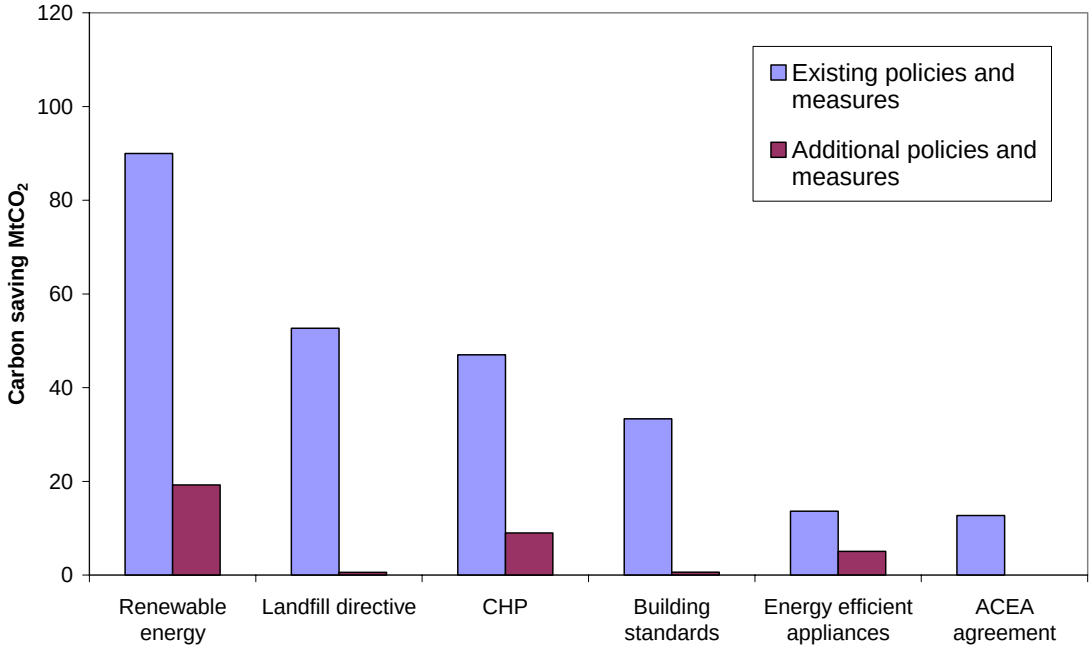
- the energy supply sector, through the use of renewable energy and CHP;
- the energy use sector, through energy efficient appliances and building standards;
- transport and the EU-wide ACEA agreement; and
- the waste sector, through the Landfill Directive.

Information on the savings achieved from additional policies and measures is only available from four Member States, so does not provide a comprehensive picture of the impact of the additional policies and measures. In total policies and measures in these key areas (including additional policies and measures) are projected to deliver reductions of

about 284 Mt CO_2 eq. of this, over one third comes from increased use of renewable energy.

The EU Common and Co-ordinated Policies and Measures (CCPMs) in each of these key areas are summarised in Table -19. The aggregate savings in each of the policy areas include the effects of transposition of the relevant CCPMs by the Member States into national policies and measures, together with other domestic polices and measures.

Figure -16 Aggregated savings in 2010 in EU-15 for key policy areas



Notes:

1. Aggregated savings for existing policies and measures based on information from 12 Member States and savings for additional policies and measures based on information from 4 Member States.

2. The reported effects of single quantified measures do not necessarily sum to the projections for the total effect of all reported measures. Therefore, the amounts for additional domestic measures are not the difference between the with existing domestic measures projections and with additional domestic measures projection.

Source: Information submitted under the EC GHG Monitoring Mechanism, the CCPM questionnaire and in 3rd national communications.

Table -19 CCPMs in Key Policy Areas

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

4.7. Model methodology

The projection is an aggregation of 23 Member States projections; each of the Member State uses its own methodology and models to produce its emissions projections. There is therefore no single overarching model methodology that can be described here. Details of the models and methodologies used by Member States are given in their 3rd National Communications and updates in the 4th National Communications.

5. VULNERABILITY ASSESSMENT, CLIMATE CHANGE IMPACTS AND ADAPTATION MEASURES

Developments

1. Predicted sea level rises could impact up to 68 million people

2. Temperatures are expected to increase leading to more deaths due to high temperatures in summer but fewer cold related deaths in winter

3. Northern Europe is expected to have increased precipitation, Southern Europe less with the potential for more droughts

4. The European Commission is already involved in adaptation related activities, through the running of EU wide early warning systems for floods and forest fires

5. New work on adaptation is planned under the next phase of the European Climate Change Programme

5.1. Vulnerability and Impacts of Climate Change

In Europe, recent work by the EEA has outlined the past trends and likely future effects of climate change[143]. The main categories of impacts are described below, and relevant key indicator data for the European Union presented.

Sea level rise

By 2100, an average global sea level rise of 0.09 to 0.88 metres is predicted, with a central value of 0.48m[144]. Sea level rise will cause flooding, coastal erosion and the loss of flat coastal regions. Coastal protection is possible, though this leads to additional costs and may prove uneconomic in some areas or at some levels of sea level rise. Rising sea levels increases the likelihood of storm surges, exacerbates landward intrusion of salt water and endangers coastal ecosystems and wetlands. Estimates in the European Union, where the coastline is about 89 000 km long, indicate that up to 68 million people could be affected by sea level changes[147]. Although, as outlined above, the predicted rise in sea level is subject to a large degree of variation – with the population affected varying accordingly.

Energy

Higher average temperatures are predicted in Europe, with both warmer summers and milder winters. There are also likely to be changes in seasonal temperature variability, with increased summer peaks (heat waves). The changes in average and peak temperatures will have positive and negative effects on energy use. There is likely to be a decrease in winter energy demand for heating, but this will be offset by an increase in summer energy use for cooling (air conditioning). The pattern of changes in energy use will vary across Europe, with northern latitudes likely to experience more benefits.

[143] Impacts of Europe's Changing Climate, An indicator-based assessment, EEA Report No 2/2004
[144] IPCC Third Assessment Report (2001).

Health: thermal stress

More than 20 000 excess deaths attributable to heat, particularly among the aged population, occurred in western and southern Europe during the summer of 2003. Heat waves are projected to become more frequent and more intense during the twenty-first century and hence the number of excess deaths due to heat is projected to increase in the future[143]. However, rising temperatures will reduce winter excess deaths. This will have particular benefits in northern latitudes of Europe whereas continental Europe will still continue to have relatively cold winters. There are however other factors, such as influenza pandemics, that have to be taken into account when extrapolating winter months deaths. By 2080, it is likely that cold winters in major parts of continental Europe will have disappeared.

Health: disease burden

Changing climates can provide a more fertile breeding ground for a range of disease bearing vectors, increasing both the scale and location of the population at risk. In Europe, tick-borne encephalitis cases increased in the Baltic region and central Europe between 1980 and 1995, and have remained high. Ticks can transmit a variety of diseases, such as tick-borne encephalitis (TBE) and Lyme disease (in Europe called Lyme borreliosis). It is not clear how many of the 85 000 cases of Lyme borreliosis reported annually in Europe are due to the temperature increase over the past decades.

Climate variability is often a cause of health impacts and extreme weather events are likely to increase with global warming. Recent research indicates that much of the occurrence of climate related disease outbreak is caused by specific weather events, in combination with non-climate factors.

Agriculture

Parts of Europe, particularly mid and northern Europe, are expected to have potential benefits to agriculture from increasing CO_2 concentrations and rising temperatures. The cultivated area could be expanded northwards, and growing seasons extended. This will lead to increased crop yields (provided there is sufficient water supply). In southern parts of Europe, over the longer term, agriculture may be threatened by climate change due to increased water stress, with reduced yields in hotter and dryer areas. During the heat wave in 2003, many southern European countries suffered drops in yield of up to 30%, while some northern European countries profited from higher temperatures. Bad harvests could become more common due to an increase in the frequency of extreme weather events (droughts, floods, storms, hail). Crops dependent upon seasonal conditions e.g. fruit during the flowering season, may be particularly susceptible. There is also the possibility that any direct yield gain could be partly off-set by losses due to changes in the spatial distribution and intensity of pests and diseases.

Ecosystems and Forestry

There are likely to be significant effects on ecosystems in Europe from climate change. The will include impacts upon forests. For some species, there may be benefits from warmer winters from modest levels of climate change, for example with the survival rate of most bird species likely to increases, and potential benefits from increases in vegetation

growth. However, there are also likely to be significant impacts, particularly for sensitive species such as alpine and mountain plant species and vegetation. There are also potential impacts from water shortages, especially if combined with high summer temperature peaks. Recent studies[145] indicate that a rise of up to 1°C above pre-industrial levels will cause up to 10% of ecosystem areas worldwide to shift. The change in sea temperature will also impact upon marine ecosystems.

Water resources, water supply and water quality

There are likely to be significant changes in future European precipitation (rainfall), both in terms of average precipitation, seasonal variations, and the frequency of heavy events. The projections for Europe show increases in precipitation, but there will be seasonal variations, and strong regional differences between northern and southern countries. Northern Europe is likely to see increases in rainfall, and increases in annual river discharges. Southern Europe is likely to see decreases in rainfall and river discharges, which may lead to further stress on water resources. This may have important impacts on agriculture, as soil moisture availability is already often limited in summer.

Strong variations in rainfall and potential water shortages will also have a significant impact on power generation. They could lead to reduced output from hydroelectric plants across much of Europe and also create shortages of water that are essential for cooling in power plants, which may force the plants to be operated at constrained levels of output, or even be taken offline temporarily. However, in northern Europe, the projected increase in rainfall is expected to increase hydropower production.

Water quality is also sensitive to higher temperatures, lower river flows, saline intrusion with sea level rise and changes in storminess. Low flows are already a problem in southern Europe, and this could be exacerbated by climate change. The many local controls on water quality have hindered a global assessment of potential climate change damages.

Drought

Drought will have negative impacts in southern Europe where projections indicate up to 1 % per decade decrease in annual precipitation with decreases of 5 % per decade possible in summer[143]. These negative effects can cause very heavy economic losses, for example droughts in 1999 caused losses of more than €3 billion in Spain (EEA, 2004).

Floods

Between 1975 and 2001, 238 flood events were recorded in Europe. Over this period the annual number of flood events clearly increased. The number of people affected by floods rose significantly, with adverse physical and psychological human health consequences[143]. With a 2.0-6.4°C temperature increase the damage from riverine floods will be several times higher than in the no climate change case. In particular, flash floods due to heavy precipitation are expected to increase in frequency and magnitude. The level of impact will also increase with the degree of rise in temperature, with expected damages

[145]WBGU :Climate Protection Strategies for the 21st Century:Kyoto and beyond Special Report; Berlin 2003

from a 6.4°C temperature rise much larger than those anticipated from a 2.0°C temperature rise. With a 1.4°C temperature increase coastal floods are projected to increase the number of people at risk by 10 million, 3.2°C will bring 80 million at risk.

Impacts from storm damage and extreme weather

Extreme weather events are also likely to increase, with heat waves, drought, floods, and storms. Changes in both frequency and severity are possible, though these may not be linearly dependent on average climate.

In Europe, 64 % of all catastrophic events since 1980 are directly attributable to weather and climate extremes: floods, storms and droughts / heat waves. 79 % of economic losses caused by catastrophic events result from these weather and climate related events. Economic losses resulting from weather and climate related events have increased significantly in the last 20 years, from an annual average of less than USD 5 billion to about USD 11 billion. This is due both to wealth increase and more frequent events. Four out of the five years with the largest economic losses in this period have occurred since 1997. The average number of annual disastrous weather and climate related events in Europe doubled over the 1990s compared with the previous decade, while non-climatic events such as earthquakes remained stable. Climate change projections show an increasing likelihood of many types of extreme weather events. Thus, an escalation in damage caused is likely.

A new ABI (Association of British Insurers) report outlines "…how climate change could increase the financial costs of extreme weather around the world, based on the best-available scientific assessment of climate change. Even quite small increases in the intensity of major storms (hurricanes, typhoons, windstorms), as predicted by the latest climate change science, could increase damage costs by at least two-thirds by the end of the century. The most extreme storms could become even more destructive, making insurance markets more volatile, as the cost of capital required to cover such events increases. "[146]

5.2. Adaptation measures

The European ACACIA Project Report[147], published in 2000 by the European Commission and reported in the 3rd National Communication, was a comprehensive report assessing the impacts of climate change, providing a vulnerability assessment, and evaluating the potential for adaptation. Since that time there have been no large-scale studies on adaptation at the EU level, although the European Commission recognised the need to undertake further research and to develop adaptation strategies in their working paper 'Winning the battle against global climate change'. Most of the policy action currently in this area is undertaken by individual Member States and will be reported in their 4th National Communications. Research projects funded by the European Commission on adaptation in Developing Countries are described in Chapter 8.

[146] "Financial Risks of Climate Change", Climate Risk Management Limited, ABI (2005)

[147] "Assessment of the Potential Effects and Adaptations for Climate Change in Europe", The Europe ACACIA Project, EC Research DG (2000).

However, the Commission is already involved in some adaptation related activities, in particular through the running of an EU wide early warning system for floods (European Flood Alert System - EFAS) and forest fires (European Forest Fire Information System - EFFIS) developed by the Joint Research Center. This will improve responses to natural disasters and assist in preventing damage. Other examples of adaptation related activity in the area of forest fires, which occurs at the European level, includes:

- Prevention. Council Regulation (EEC) No 2158/92 of 23 July 1992[148], on the protection of Community's forests against fire, established a Community scheme to develop preventative activities against fires. Its measures, together with the monitoring of the occurrence of forest fires[149], will continue to be co-financed until the end of 2006 by the "Forest Focus Regulation". In the period 2007-2011 monitoring and information measures should then be covered by the new Regulation Life+ (still in draft) managed by DG Environment while prevention measures/infrastructures will be co-financed by the new Rural Development Regulation[150].

- Civil Protection. The Community mechanism to facilitate reinforced cooperation in civil protection assistance interventions, established by Council Decision 2002/792/EC[151], ensures the coordination of assistance intervention in order to provide prompt support and to assist a country (inside and outside the European Union) in need of help, including in the case of forest fires.

- Restoration. The Rural Development Regulation provides support to Member States for restoring forestry production potential damaged by natural disasters and fire linked with the introduction of appropriate prevention instruments. The European Union Solidarity Fund has been established[152] to enable the Community to respond in a rapid, efficient and flexible manner to emergency situations if classified as "major disasters". Following the huge damages of the exceptional summer 2003 [153] it provided EUR 48.5 million for Portugal and EUR 1.3 million for Spain.

Work is also currently progressing on EC adaptation related activity, under the second phase of the ECCP, the overarching objective of which is to reduce the vulnerability of European society and economy to the adverse affects of climate change. It aims to ensure that adaptation aspects are fully integrated into European climate policy. The expected results are:

- To share and review information on Member States' approaches to adaptation.

- Identify knowledge gaps and suitable opportunities for additional research programmes.

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[148] OJ L 217, 31.07.1992, p.3.
[149] Commission Regulation (EC) No 804/94 of 11 April 1994 (OJ L93, 12.04.1994, p.11)
[150] Council Regulation (EC) No 1257/99 of 17 May 1999 (OJ L160, 26.06.1999, p.80)
[151] Council Decision of 23 October (2001/792/EC, Euratom) (OJ L297, 15.11.2001, p.7)
[152] Council Regulation (EC) No 2012/2002 of 11 November 2002 (OJ L 311, 14.11.2022, p.3)
[153] according to figures recently released by the Joint Research Centre (Bulletin "Forest fires in Europe – 2003 fire campaign", http://natural-hazards.jrc.it/fires/) in the 2003 in the five EU Mediterranean countries globally 740.000 hectares of land got burned, of which some 421.000 ha in Portugal and 150.000 in Spain.

- Identify good practice and encourage its wider application.
- Define the role of the community in adaptation and examine how to best maximise its added value.
- Encourage Member States to draft national adaptation policies.

As part of this ongoing work a conference was held on 24 October 2005 to launch the second phase of the ECCP, including its new working groups. One of these will be on adaptation and will examine the European dimension of climate change adaptation strategies.

6. FINANCIAL RESOURCES AND TRANSFER OF TECHNOLOGY

Developments

1. The European Union is the world's largest donor in the development field

2. A strategy has been proposed and an action plan implemented to assist EU development partner countries in meeting the challenges proposed by climate change

3. Nearly 200 projects with a total budget of €300 million have been identified as having a climate change related element

4. Research and scientific technological co-operation with developing countries are key instruments for the implementation of the EU strategy on climate change and development and all partner countries can participate in the Community research programme (6th Framework programme)

6.1. Introduction

The European Union as a whole is the world's largest donor in the development field, providing more than half of all global development assistance, over €30 billion in 2003. The European Commission manages more than one-fifth of this budget on behalf of the European Community. These funds come from the Community budget as well as the European Development Fund (EDF).

The objective of the EC development co-operation is to foster sustainable development designed to eradicate poverty in partner countries and integrate them into the world economy. The strategic goals are based on the Millennium Development Goals agreed by the world's leaders at the Millennium Summit in September 2000.

The resources reported in this Chapter are those that come directly from the budget of the Community as a whole, not from individual Member States. Individual Member State contributions are reported in their National Communications.

6.2. Climate Change in Context of Development Cooperation

In 2003, the Commission published a Communication proposing a strategy to assist EU development partner countries in meeting the challenges proposed by climate change[154]. The Council endorsed the strategy in December 2003 and asked that further work be done to develop an Action Plan to accompany the EU Strategy on Climate Change in the Context of Development Cooperation. In December 2004, the Council adopted conclusions together with the EU action plan, whose implementation has already started.

The proposed strategy identifies four strategic priorities:

- Raising the policy profile of climate change, through dialogue and cooperation within the community and with other donors;

[154] COM(2003) 85 "Climate Change in the Context of Development Cooperation", 2003

- Support to EU partner countries for adaptation to the adverse effects of climate change through:
    - integrating climate risk management into planning processes; and
    - developing research on impacts, vulnerability and adaptation
- Support for mitigation and low GHG development paths through:
    - supporting the integration of low-GHG development into the planning process for partner countries;
    - supporting partner countries to benefit from the diffusion of environmentally sound technologies; and
    - encouraging the private sector to invest in mitigation and low GHG development in partner countries.
- Capacity development and raising public awareness in EU partner countries for the implementation of the UNFCCC and Kyoto Protocol.

The Action Plan[155] translates the recommendations of the strategy into concrete actions to be implemented by the Commission, the Member States, partner countries and other stakeholders.

6.3. New and Additional Resources

For overall development, the EU announced in the Monterrey Conference (March 2002) its commitment to increase its overseas development aid (ODA) from the current level of 0.33% of GNP to 0. 39% between now and 2006, which amounts to an extra €7 billion per year. In 2005, the Commission published a communication aimed at accelerating progress towards this target and to the UN target for ODA of 0.7% of Gross National Income by 2015[156].

The EU Action Plan for climate change in the context of development cooperation reaffirms the commitment made in Bonn in July 2001 for the EU to deliver $369 million annually for climate change funding for developing countries by 2005.

The European Investment Bank (EIB) is the European Union's long-term lending institution. Although the European Commission makes direct funds available to the EIB, e.g. risk capital, interest subsidies under the European Development Fund, most funds are raised on the markets, for financing of capital projects on favourable terms. In 2004, the EIB and The World Bank signed a Memorandum of Understanding (MoU) in which the two organizations agreed to cooperate in the development of a Pan-European Carbon Fund (PECF). The PECF would complement carbon trading within the EU ETS, with purchases of greenhouse gas emission reductions through CDM and JI arrangements.

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[155] Council Conclusions Climate Change in the context of development cooperation 15164/04 November 2004

[156] COM (2005) 133 "Accelerating progress towards attaining the Millennium Development Goals – Financing for Development and Aid Effectiveness" April 2005

6.4. Resources for development and co-operation in the field of climate change

6.4.1. Overview

The European Community is active in 140 countries and six regions of the world. Many of the projects funded by the EC have climate relevance, although it is not always possible to quantify this. Table -20 shows the financial resources in budget headings most relevant to climate change. The resources shown will not be directed wholly to climate change, and some projects under different headings may have a climate element. This gives a picture though of the overall spending, with a clear indication of the increase between 2002 and 2003.

Table -20 Financial resources relevant to climate change (million €)

Official Development Aid	**2001**	**2002**	**2003**
Economic infrastructure and services			
Transport	200. 16	318. 72	884. 74
Energy generation and supply	134. 12	104. 9	233. 19
Agriculture, forestry and fishing			
Forestry	not available	29. 54	5. 06
General Environmental Protection	132. 57	85. 13	115. 58
Water supply and sanitation	224. 27	100. 9	332. 28
Total*	**691. 12**	**639. 19**	**1570. 85**

* This represents the total in these budget headings and is not directed only to climate change

Financial contributions to multilateral institutions are shown in **Table 6-2**. It has not been possible to quantify relevant contributions to all the institutions, in some cases contributions will come directly from Member States and not through the European Community Institutions.

Table -21 Financial contributions to multilateral institutions and programmes

Institution or programme	Contribution (millions of €)		
	2001	**2002**	**2003**
Multilateral Institution			
World Bank*		1	2
United Nations Development Programme	18	45	176
United Nations Environment Programme*		3	3
UNITAR		0.7	0.7*
Multilateral scientific, technological and training programmes			
World wide fund for nature*	3	3	3.7

* This total is for climate-related projects but is not wholly directed towards climate change.

A more detailed breakdown of the financial contribution to the implementation of the convention is shown in Table -22. The table is in two parts:

- in the first part an estimate has been made of the part of the project that is directly climate related and of the allocation of that budget to the sectors;

- in the second part, projects having a climate change element and the sector to which they relate have been identified but no split of budget can be made.

The EU Action Plan for climate change in the context of development cooperation[155] has as one of its strategic objectives to increase the visibility of EU climate change programmes and projects. Progress is on-going, and is demonstrable compared to the 3rd National Communication, but a rigorous system of identification of projects is not in place and the details in Table -22 does not represent an exhaustive list of climate change related projects.

Table -22 Bilateral and regional financial contributions related to the implementation of the Convention (million €)

				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 assessment
2001	Argentina	1. 0	1	0. 5								
2002	Africa	0. 5	1	0. 3	0. 0							
2002	Africa - Latin America	1. 6	1							0. 8		
2002	Mozambique	1. 6	1									
2002	Various (Africa, Asia)	0. 7	1							0. 0		
2003	Asia-Pacific	0. 8	1							0. 0		
2003	Global	3. 3	1							0. 0		
2004	Ukraine and Belarus	1. 2	1							X		
2004	Central Asia	1. 4	1							X		
2004	NIS	1. 2	1							X		
2004	India	2. 1	2							X		X
2001	Asia*	31. 5	1							X		

				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 assessment
2001	China	20. 6	2	X	X		X		X	X		
2001	Ecuador	2. 9	2			X				X		X
2001	Gabon	4. 4	1									
2001	Global**	0. 5	1							X		
2001	Honduras	1. 1	1								X	
2001	India	2. 8	4	X		X	X					X
2001	Indonesia	1. 0	1			X						
2001	Latin America*	11. 0	1							X		
2001	Madagascar	1. 3	1			X						
2001	Multiple - Africa	6. 1	3			X				X		X
2001	Multiple – Latin America	1. 6	1			X						
2001	Nicaragua	1. 2	1				X					
2001	Peru	2. 2	2			X				X		
2001	Russia and NIS*	0. 2	1							X		

				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 assessment
2001	Uruguay	0. 8	1							X		
2002	Africa	0. 9	1							X		
2002	Argentina	1. 2	1							X		
2002	Armenia*	1. 0	1	X								
2002	Asia	1. 1	1							X		
2002	Belize	0. 0	1							X		
2002	Brazil	8. 5	2			X				X		
2002	Cameroon	1. 2	1			X						X
2002	Chile	0. 8	1									X
2002	Colombia	2. 1	1				X			X		
2002	Costa Rica	0. 9	1							X		
2002	Ecuador*	1. 0	1				X					
2002	Ethiopia	1. 2	1			X				X		
2002	Gabon	1. 4	1			X						

				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 assessment
2002	Global	1. 8	3			X				X		
2002	Guinea to Ghana	0. 4	1									
2002	India	0. 7	1									
2002	Indonesia	4. 3	4		X				X		X	
2002	Indonesia, Malaysia, The Philippines	1. 4	1									
2002	Kenya	1. 9	1									
2002	Kenya-Somali	1. 3	1									
2002	Kyrgyzstan	1. 0	1									
2002	Latin America*	0. 4	4	X						X		X
2002	Mexico**	0. 1	1							X		
2002	Multi dev. ctry.	0. 6	1							X		
2002	Nicaragua, Honduras, Guatemala	2. 2	1			X						
2002	Pacific	1. 3	1							X		X
2002	Pacific - Caribbean	0. 5	1							X	X	

				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 assessment
2002	Pakistan*	20. 0	1							X		
2002	Russia*	5. 2	3	X						X		X
2002	Russia and NIS**	0. 8	1	X								
2002	Russia and NIS*	1. 4	5	X						X		
2002	Sub-Saharan Africa	1. 6	1									X
2002	Tanzania	1. 8	1							X		
2002	The Philippines	0. 7	1							X		X
2002	West Africa	1. 7	1									
2003	Africa	6. 3	3				X			X		X
2003	Africa-Asia	3. 5	1			X						
2003	Asia*	5. 6	8	X			X		X	X		X
2003	Balkans*	6. 6	5	X	X				X	X		
2003	Bolivia	3. 0	1							X		X
2003	Cambodia	0. 4	1					X				

				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 assessment
2003	Cameroon*	0. 5	1			X						X
2003	Central Africa*	1. 4	1			X						
2003	China	17. 7	3	X		X				X		
2003	Croatia	0. 1	1							X		
2003	Global*	11. 8	7			X				X		
2003	India	2. 4	4	X			X			X		
2003	Indonesia*	0. 9	1			X						
2003	Kenya, Uganda, Tanzania	2. 8	1			X						
2003	Maldives	0. 2	1	X								
2003	Moldova**	0. 0	1	X								
2003	Russia*	3. 9	6	X					X	X		
2003	Singapore	0. 3	1					X				
2003	South America	3. 7	1			X	X					X
2003	Sri Lanka	0. 5	1							X		

				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 assessment
2003	Tanzania, Zambia	2. 1	1							X		X
2003	Thailand*	0. 9	3	X								
2004	Afghanistan**	4. 8	2							X		X
2004	Africa and Asia*	3. 5	1			X						
2004	Asia**	27. 4	15	X	X	X	X	X		X	X	X
2004	Balkans*	3. 6	8	X	X			X	X	X		
2004	Bangladesh	0. 3	1									
2004	Brazil	1. 5	1									
2004	China*	0. 8	2			X			X	X		
2004	Global*	8. 3	4			X				X		
2004	India	1. 7	6	X					X			X
2004	Indonesia**	0. 8	2								X	X
2004	Latin America*	0. 8	1	X								
2004	Malaysia**	1. 4	4	X						X		X

				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 assessment
2004	Moldova	0. 6	1									
2004	NIS	0. 9	1									
2004	Russia**	2. 1	2							X		
2004	Sri Lanka	0. 2	2	X								
2004	Thailand*	0. 1	1				X					
2004	Vietnam	0. 5	2				X			X	X	
2004	Vietnam and Cambodia	0. 1	1							X	X	
2005	Russia	2. 0	1							X		

* These projects have been identified using a Rio marker as having climate change as a significant objective

** These projects have been identified using a Rio marker as having climate change as a principal objective

6.4.2. Regional initiatives

The EC initiatives concentrate on six regions in the world.

The strategic objective of Community actions in the **Western Balkans**, delivered via the CARDS programme, is support for Stabilisation and Association Process. The policy aims to reinforce sustainable development to help the countries of the Western Balkans move down the road to European Integration. The EU is spending over €113 million between 2000 and 2004 to support the development of environmental policy and infrastructure. Most resources have been aimed at environmental "hot spots" that present immediate steps, however longer-term improvements such as air pollution and climate change have also been supported.

The South and East Mediterranean and the Middle East is an area of vital strategic importance to the European Union, which both the EU Council (which gathers together the Heads of State or Government of the Member States of the European Union and the President of the Commission) and the European Commission have identified as key external relations priority for the EU. The five priority areas for the environment in the Euro-Mediterranean partnership are: integrated water management, integrated waste management; environmental hotspots; integrated management of coastal zones and the fight against desertification. A total of €30 million were allocated for the second phase of the environment programme (starting in 2002).

With enlargement, the EU shares a long common border with the region of **Eastern Europe, the Caucasus and Central Asia.** The main aid instrument for this region is the TACIS programme. Within that programme, the theme Sustainable Management of Natural Resources supports action on biodiversity, water management and collaboration with other key environmental actors. Close and continual co-ordination on these issues is taking place with EU Member States, International Organisations (e.g. GEF and UNEP), and International Financial Institution, namely the World Bank.

Within the **TACIS**[157] programme three regional capacity building projects for implementation of the Convention and the Kyoto Protocol were launched in 2004:one in Ukraine and Belarus, one in Armenia, Azerbaijan, Georgia and Moldova, and one project in the Central Asian republics of Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan. The projects offer technical assistance to the governments of these countries in order to help them meet the objectives of the Convention and the Protocol with a special emphasis on monitoring and reporting.

The **TACIS** programme is also financing a technical assistance project to **Russia** for implementing the Kyoto Protocol that was launched in June 2005. The project assists the Russian government in establishing a national inventory and a monitoring and reporting system, a national registry, and national guidelines for Joint Implementation projects.

[157] http://europa.eu.int/comm/external_relations/ceeca/tacis/

The Commissions partnerships with **Asia** are based on six strategic priorities, highlighted by the adoption of two major policy papers on South East Asia[158] and on China[159]. Environmental dialogue and co-operation will remain a priority in the years ahead and climate change and energy efficiency has been identified as a continuing priority. An example of this dialogue and cooperation is the recent EU-China Partnership on Climate Change, which was agreed at the EU-China summit on 5 September 2005. This partnership provides the framework for a broad cooperation, which includes cooperation on research, technology, policy development and concrete demonstration projects.

EU development co-operation with **Latin America** aims to promote political stability and social and economic development. The financial and technical contributions are designed to help Latin America to achieve more equal wealth distribution, to reinforce the rule of law and democracy and to protect it's environment. Priority areas relevant to climate change are in strengthening natural disaster prevention and preparedness and in support of the adoption of sustainable energy policies.

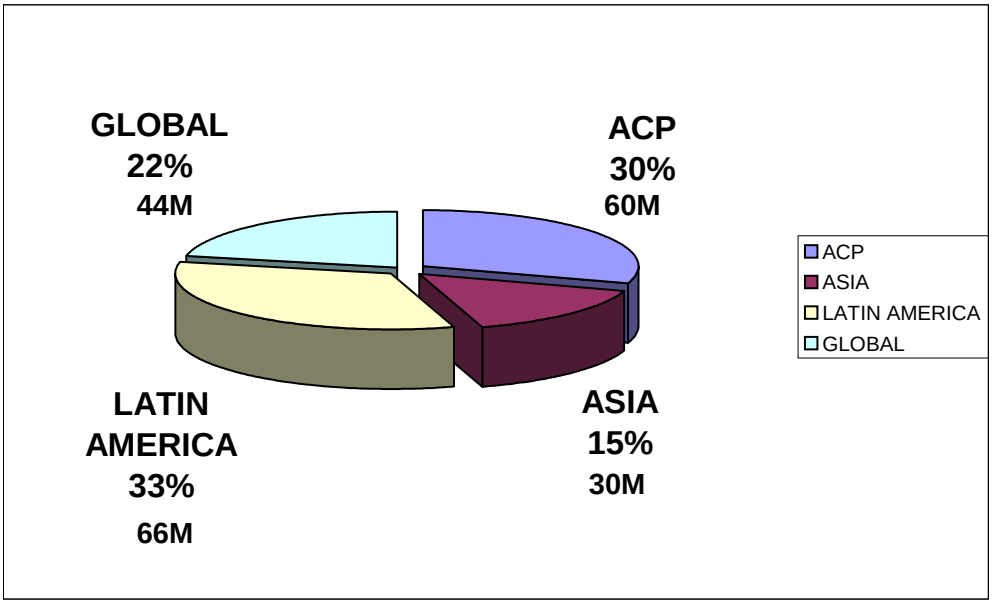
The partnership between the EU and the **African, Caribbean and Pacific States** is enshrined in the Cotonou Agreement. The main goals of the Cotonou Agreement are poverty eradication, sustainable development and gradual integration of the ACP countries into the world economy.

A number of development cooperation initiatives also cover countries in multiple regions. One example of these projects is the **BASIC Project (Building and Strengthening Institutional Capacity on Climate Change).** This project supports strengthening the in-country capacity of Brazil, South Africa, India and China to undertake analytical work to determine what kind of climate change actions best fit within their national circumstances, interests and priorities. The project brings these four developing country governments together with domestic and international non-governmental institutions with expertise in research, policy and implementation, providing an important starting point for shaping future climate policy, domestically and internationally.

The share of the environmental and tropical forest budget lines (the ones most relevant to climate change) in these latter three regions and for projects that cover all developing countries (global) is shown below. The largest shares are in Latin America and ACP regions, mainly due to the high share of the tropical forest budget line.

[158]COM(2003) 399 "A new partnership with South East Asia", July 03
[159]COM(2003) 533 "A maturing partnership – shared interests and challenges in EU-China relations", September 03

Figure -17 Share of the environmental and tropical forest budget lines (2000-2004)



6.4.3. Mainstreaming environment into development projects

The Commission is working to mainstream the environment into development projects, through an Environmental Helpdesk, training and developing a manual. Expenditure on this subject is estimated at €2M over 3 years.

The Helpdesk is based in Brussels, and comprises three specialists supporting the programmes and objective developments. They advise staff at Headquarters and Delegations on how to promote the role of the environment in development.

Training is provided in both Brussels and in the Delegations on how to integrate the environment in the cycle of operations, with a focus on programming and implementation. The training began in 2004 and is planned to continue until 2007. Training days have already been held in Indonesia, Zimbabwe and China and a further 9 are planned before the end of the year. The sessions are targeted at delegation staff and staff of key institutions in developing countries.

An integration handbook is being updated in the meanwhile, introducing the key concepts and mainstreaming tools. Advice on the use of the Rio Markers is will be provided through guidance notes targeting EC staff at Delegations and HQs.

6.5. Technology Transfer

The EU Energy Initiative (EUEI)[160] focuses on achieving poverty eradication and sustainable development by improving access to adequate sustainable energy services in rural, peri-urban and urban areas, through a menu of technical and institutional options, including:

- rural electrification

[160] http://europa.eu.int/comm/development/body/theme/energy/initiative/situation_en.htm

- enhanced energy efficiency (including cleaner, more efficient fossil fuel technologies, technology for more efficient appliances and the more efficient use of traditional biomass)

- decentralised energy systems

- increased use of renewable energy (such as hydropower, biomass, solar energy, wind power, tidal, wave, or geothermal energy)

- institutional capacity building and restructuring

- policy, planning and transfer of knowledge and skills.

The Partnership Dialogue Facility (PDF)[161] is an instrument developed by a number of EU Member States in the context of the EU Energy Initiative (EUEI). Its objective is to help build energy access partnerships with developing partner countries.

An important new initiative[162] is the Energy Facility to increase access to modern energy services for people in Africa, the Caribbean and the Pacific (ACP). It is a funding mechanism that would make it possible to use the leverage effect of development aid resources to attract funding from other financial sources. The European Commission is promoting the creation of a EUR 250 million Energy Facility for people in Africa, the Caribbean and the Pacific (ACP). This is a significant contribution to the EU Energy Initiative that was launched at the World Summit for Social Development in Johannesburg in 2002. The Commission has identified three priority areas of the Energy Facility:

* Delivery of energy services: The largest financial contribution from the Facility will be designed to improve rural people's access to modern energy services, particularly in Africa. Priority will be given to people in unserved areas. Proposals should ensure the economic, social and environmental sustainability of the investment.

* Creating an enabling environment: Where governance conditions are not in place for delivery-oriented intervention in the field, up to 20% of the Facility will support the development of an enabling environment for the energy sector based on good governance principles. The Facility will facilitate the implementation of sound national energy policies and strategies, improve the institutional, legal and regulatory framework, strengthen the capacity of key stakeholders, and improve monitoring and evaluation capacity.

* Supporting future large-scale investment programmes: Up to 20% of the Facility resources will be 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.

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[161] http://europa.eu.int/comm/development/body/theme/energy/initiative/docs/EUEI_PDF_Website_Information.pdf

[162] Communication from the Commission to the Council and the European Parliament of 26 October 2004 on the future development of the EU Energy Initiative and the modalities for the establishment of an Energy Facility for ACP countries [COM (2004) 711 final].

Examples of projects financed by SYNERGY:

- Regional action plan for "Energy and urban environment in the Mediterranean"
- Haifa conference on energy co-operation in the Middle East
- Study on the refining sector in the Mediterranean
- Energy policy dialogue with the Mediterranean partner
- Co-operation with the Palestinian institutions in the energy sector
- Conference on energy investment and networks in the Mediterranean
- Study on the legal and institutional investment framework for the European energy industry in southern and South-east Mediterranean
- Industrial co-operation between Russia and the European Community in the energy sector
- The activities of the Black Sea Regional Energy Centre
- Balkan Energy Interconnection Task Force
- Renewable energy sources around the Baltic Sea
- Training of Chinese engineers and decision makers on energy management and energy efficiency
- China - EU energy co-operation Conferences
- Contribution to the restructuring of the Chinese coal sector
- Evaluation of the potential for gas in the Philippines
- European industrialists' mission to the ASEAN region
- ASEAN electricity interconnection and deregulation round tables
- Market study of efficient energy use in Chile and definition of an access strategy for European companies
- Conference on strengthening energy co-operation between the European Union and Latin America
- Promotion of Energy Services Company (ESCOs) in Latin America
- Creation of a network of experts in rural electrification in Africa
- Identification of energy co-operation projects between the European Community and the countries of southern Africa
-Training of energy sector officials in third countries
- Development of an international energy co-operation data base

Another example is the SYNERGY Programme: SYNERGY is a co-operation programme managed by the Directorate General for Energy and Transport (DG TREN) of the European Commission. It finances co-operation activities with non EU countries in the field of the formulation and implementation of energy policy to the mutual benefit of all parties concerned. SYNERGY should promote sustainable development and improve energy efficiency. According to the Guidelines[163] for the Synergy programme, the programme has activities related to security of supply and implementation of the Kyoto protocol. A list of projects funded with SYNERGY is given in the box below; more details of some examples are given in Appendix 1:

Research and scientific technological co-operation with developing countries are key instruments for the implementation of the EU strategy on climate change and development (see Section 7.2).

[163] Official Journal of the EU of 5.5.01 (L125/24),

The 6th Framework Programme for research (see Chapter 8) is an important vehicle for reinforcing scientific and technological capacity in developing countries. All third country legal entities and international organisations can participate in the programme and benefit from Community financial contributions. Specific activities have been identified in support of the EU foreign and development aid policies. Both the public and private sectors in the EU will be targeted by capacity development initiatives to raise awareness of the opportunities offered by the UNFCCC and Kyoto frameworks in terms of financial and technical assistance, technology transfer and investment potential through CDM activities.

Technology transfer also constitutes and important component of bilateral partnerships between the EU and third countries. One example is the **EU-China Partnership on climate change**, agreed at the EU-China summit on 5 September 2005. The Partnership promotes technical cooperation on a number of key energy technologies. Among the objectives of this partnership is the development and demonstration in China of zero emissions coal technology through carbon capture and storage, a significant reduction of the cost of key energy technologies and the promotion of their deployment and dissemination.

Examples of on-going EC activities relating to technology transfer are given in Appendix 1. In previous years, the reports submitted to the EC on completed activities have not been directed to climate change reporting and details on completed projects are limited. This is being addressed and it is anticipated that in the next Communication, Appendix 2 will report on completed projects.

National activities also involving the private sector will be reported in the Member State National Communications.

Appendix 1 Programme SYNERGY Example Projects

1. "Development of Energy Supplies to Europe from the Southern and Eastern Mediterranean countries (MEDSUPPLY)"

*Project No :*4.1041/D/01. 002 (ref. 27-ss)

Main proposer:Observatoire Méditerranéen de l'Energie, France

Other EU consortium members:European University Institute (Italy)

Beneficiary countries:Algeria (Mediterranean)

Budget EU contribution:€ 315,000 (50% of total)

*Project duration:*18 months

Brief description of project's main objectives and activities:

Further expanding the existing energy trade to Europe from the Southern and Eastern Mediterranean countries and to promote dialogue with those countries. Evaluation of oil and gas reserves in the region, as well as resources and infrastructure needs. Analysis of potential for developing renewable energies in line with Kyoto Protocol's flexibility mechanisms. Direct participation of Algeria's Sonatrach in the project. A specific Task Force composed of experts from the OME's member companies and from international organisations and banks will be created to contribute to the analysis and studies to be made. Eurogas, E&P Forum, IEA, World Energy Council and other international organisations will be involved. Results of the project to be presented at a high level conference.

2. "Enhancing Gas Supply Security in an Enlarged Europe"

*Project No. :*4. 1041/D/01. 003 (ref. 33a-ss)

Main proposer:Energy Research Centre of the Netherlands (ECN),

Netherlands

Other EU consortium members:Beicip Franlab (France), ENI (Italy)

*Beneficiary countries:*Poland, Czech Republic, Slovakia, Ukraine, Russia.

Budget EU contribution:€ 419,203 (50% of total)

Project duration:18 months

Brief description of project's main objectives and activities:

Enhancing security of gas supply in the EU and Candidate countries in the long term, based on prospective analysis and subsequent recommendations to be put forward, and assuming liberalisation of the internal energy markets. Preparation of energy studies for some candidate countries, with emphasis on their energy policy. Special attention also to transit countries of East Europe. Dialogue between the EU, candidate countries and third countries on natural gas supply issues. Dissemination of activities through intermediate seminar, international conference at the end of the project.

3. "Training Programme on Greenhouse Gas Reducing Energy Strategies, Tools and Technologies in the People's Republic of China and in Europe"

*Project No. :*4.1041/D/01. 004 (ref. 55-kp)

Main proposer:CENTRIC AUSTRIA – Carinthian Environmental Training and Infrastructure Center, Austria

*Other EU consortium members:*ITUT GmbH (Germany)

*Beneficiary countries:*China

Budget EU contribution:€ 283,445 (50% of total)

*Project duration:*24 months

Brief description of project's main objectives and activities:

Project aims at upgrading human skills in China, that are suitable to save energy, to raise awareness on energy efficiency and to substitute energy resources with reference to greenhouse gas emissions. Training courses organised in China (over 150 experts to be trained, including energy managers, with five Chinese training centres involved), study tour carried out in Europe, plus other longer term training. Main subjects of the training include:development of a common understanding of the Kyoto mechanisms; energy efficiency; clean technologies; renewable sources of energy and capacity building for implementation (management tools). China's Ministry of Science and Technology is directly involved in the project.

4. "Planning and Strategies for the Implementation of Clean Development Mechanism of the Kyoto Protocol in Latin America (PLANER)"

*Project No. :*4.1041/D/01. 005 (ref. 4-kp)

Main proposer:Escan, S. A. , Spain

O*ther EU consortium members*:Eurofes (Luxembourg), Explicit, sarl (France), Lahmeyer International GmbH (Germany), Risoe National Laboratory (Denmark)

Beneficiary countries:Belize, Costa Rica, Guatemala, Honduras, Nicaragua, Panama, Ecuador, Peru, Colombia.

Budget EU contribution:€ 555,530 (50% of total)

Project duration:18 months

Brief description of project's main objectives and activities:

To increase energy co-operation with Latin America (countries of Central America and Andean Pact), strengthening the energy planning and policies for electricity generation with renewable sources through CDM as one of the Flexibility mechanisms of the Kyoto Protocol. Participation of CEAC (Central American Electrification Council) and OLADE (Latin American Energy Organisation) in the project, thus extending the benefits of the project to all countries of Latin America. Market analysis and elaboration of eligibility criteria for the introduction of CDM projects with renewable resources and cogeneration implementation. Screening and selection of CDM projects from potential regional and European investors. Publication of a "CDM user guide", implementation of two case studies (pilot

projects), regional conference, dissemination of activities and results.

5. "Clean Development Mechanism Capacity Building amongst the Private Sector in Africa"

*Project No. :*4.1041/D/01. 006 (ref. 25-kp)

Main proposer:Institute of Energy Economics and the Rational Use of Energy, Germany

Other EU consortium members:Energy for Sustainable Development, Ltd. ; Baker & McKenzie (United Kingdom)

Beneficiary countries:South Africa, Zambia, Swaziland, Botswana, Zimbabwe, Mozambique.

Budget EU contribution:€ 455, 722 (50% of total)

*Project duration:*18 months

Brief description of project's main objectives and activities:

Promoting energy efficiency , co-generation and renewable energy investments projects under the Clean Development Mechanism in countries of Southern Africa region (South Africa plus five other countries). Development of country-specific CDM guidelines with a minimum of three case studies in each participant country. CDM guidelines to be possibly used as a model for other countries. Directory of energy efficient suppliers and renewable technology manufactures to be created in each country, as well as a general website, in order to ensure dissemination of results. Promoting CDM projects in the region, in order to provide new opportunities for investors seeking to purchase Certificate of Emissions Reductions (CERs). Greater understanding of the role for private sector in the CDM process in African countries.

6. "Improved Security of Energy Supply and Implementation of the Kyoto Protocol in the Baltic Sea Region BASREC 2002"

*Project No. :*4.1041/D/01. 007 (ref. 8-ss)

Main proposer:Nordic Council of Ministers, Denmark

O*ther EU consortium members*:Sweden, Finland, Germany

Beneficiary countries:Estonia, Latvia, Lithuania, Poland, Russia, Norway, Iceland.

Budget EU contribution:€ 591,000 (50% of total)

*Project duration:*12 months

Brief description of project's main objectives and activities:

General contribution to improved security of energy supply and implementation of the Kyoto Protocol through strengthened co-operation between the eleven countries of the Baltic Sea Region (BSR). Participants in the implementation of the project are ministries and other government organisations, international energy organisations (IEA, Energy Charter Secretariat) and associations of energy

industry. Activities aiming at harmonisation and integration of the electricity markets, through strengthening common information and improving the pre-conditions to achieve such results. Analysis of the regional gas market and interdependencies with the electricity markets and the necessary investments. Establishing a "clearinghouse" for Joint Implementation (JI) projects and publication of a handbook for regional JI-projects. Promotion of energy efficiency, through harmonisation of procedures, and small-scale investments, increasing public awareness of energy saving. Seminar organised on renewable energy sources.

7. "Analysis of Viability of the Clean Development Mechanism in the Mediterranean Area (CDM AVINMAR)"

*Project No. :*4.1041/D/01. 008 (ref. 34-kp)

Main proposer:Instituto per la Promozione dell'innovazione tecnologica (ISNOVA), Italy

Other EU consortium members:IDAE (Spain)

*Beneficiary countries:*Lebanon, Morocco, Palestinian Authority, Tunisia, Turkey

Budget EU contribution:€ 317,500 (50% of total)

*Project duration:*24 months

Brief description of project's main objectives and activities:

Analysis of the possibilities of intervention in the energy, industry and building sectors of the economies of the Mediterranean countries, in or order to reduce gas emissions. To translate the CDM of the Kyoto Protocol into concrete procedures and functioning rules. Elaboration of pilot projects, involving five countries of the region. To promote awareness, common understanding and capacity building in the region for the implementation of the flexibility mechanisms of the Kyoto Protocol. Organisation of regional workshops and seminars in support to disseminate results.

Appendix 2: EC Activities in technology transfer

Project/programme title

The Regional Solar Programme (Phase II)

Purpose

The programme forms part of the struggle against desertification in the 9 sahelian member countries of the CILSS, with financial support from the EU. Using the abundant resources of solar energy, it aims to establish a sustainable supply of drinking water to the populations of disenfranchised areas.

To achieve this, the programme focuses on:

1. the involvement of the beneficiaries in the implementation of the programme,
2. their involvement in the management of the water supply service,
3. developing the decentralisation of core competences,
4. reinforcing the management capabilities of the operators, and
5. promoting the involvement of the private sector within the Sahel region.

Recipient country	Sector	Total funding	Years in operation
Sub-Saharan Africa	Solar/ Water	73 m€ over 6 years	2001-2007

Description

The activities planned include

Optimisation of the infrastructure of systems put in place during Phase I (about 210 Drinking Water Supply systems, and 280 community systems),

Installation of new Drinking Water Supply systems (465 systems across the 9 countries),

Studies looking at support to the implementation of technical and institutional measures for the sustainable management of a drinking water supply service.

1. Regional activities to promote sahelian private sector operators and accompanying measures based on provision of information, education, sanitation, and taking into account the impact on women.

Indicate factors which led to projects success

Learning from Phase I, the RSP II concentrates on the critical success factors for the sustainable management of drinking water supply equipment:

1. Systems will be installed only where there is a clear demand from the local population;
2. Systems will be run by competent private sector managers,
3. Systems will be under the control of the users and the authorities within an appropriate regulatory framework.

An effective after-sales service and the guarantee of funding are prerequisites for the viability of the exploitation of these resources on the basis of long term financial stability

Technology transferred: Under Phase I (1990-1998) of the RSP, 626 pumping systems and 629 community electrification schemes (schools and health centres) were installed – an installed capacity of 1380 kW_h at a cost of 34 billion CFA. Phase I demonstrated the relevance of this technology for isolated areas, while showing up serious deficiencies in the management of installations.
Impact on greenhouse gas emissions:Not quantified

Project/programme title

Energy Environment Programme for China

Purpose

The overall programme objectives are improved environmental quality and health conditions within the following strategic orientations:

- Foster co-operation between Chinese and EU industries in China's energy markets.
- To strengthen the security of energy supply in both Asia (China) and Europe.
- To protect the global environment, in line with international objectives in that sense (in particular in the context of climate change), and to ensure sustainable use of energy.

Recipient country	**Sector**	**Total funding**	**Years in operation**
China.	Energy/Capacity Building	€20M	2003-2008

Description

The project will undertake three different types of activities:

(i) Policy advice to central and local authorities;
(ii) Awareness and capacity building (training);
(iii) Introduction of new technologies through feasibility studies and demonstration projects.

The EEP is conceptually represented by four components (groups of activities) according to the specific topics tackled:

1. Cross sector energy policy development (CSPD)

2. Improve energy efficiency (EE)

3. Increase use of renewable energy (RE)

4. Increase use of natural gas (NG)

Indicate factors which led to projects success

Technology transferred:Capacity Building, energy related technologies

Impact on greenhouse gas emissions:Not quantified

Project/programme title

CO_2 Managers for the Industry in the People's Republic of China

Purpose

The project aims at preparing the ground for the multiplication of the CO_2 management approach in China in the larger scale. To this end the project will provide capacity building through the development of expert skills in the field of CO_2 management for the Industry in the People's Republic of China.

Recipient country	Sector	Total funding	Years in operation
China.	Capacity Building	€0.2M	2003-2008

Description

The specific objective of the project is capacity building for CO_2 management in China through education and training of about25 advanced Chinese CO_2 management experts, who should be able to contribute as multipliers to the long-term and overall objectives of the project:

- to build up a common understanding of the CO_2 problem and the climate change on scientific and political level and the role of world economies, in particular of China, to take responsibility.
- to develop the theoretical and practical skills to set up CO_2 management systems in industries according to international standards.
- to realize the assets of CO_2 management in practical terms to improve the performance of industrial companies.
- to understand new market-based instruments like emission trading and to set up such international projects in proper and eligible way.
- to follow up with own CO_2 management projects and further capacity building measures using the guideline for CO_2 management in China, which will be developed during the project.
- Being able to make valuable contributions to policy making on governmental respective industrial level by communicating the assets of CO_2 management and its various dimensions in professional manner

Indicate factors which led to projects success

Technology transferred: Capacity Building

Impact on greenhouse gas emissions: Not quantified

Project/programme title

Capacity Building of Developing NGOs to Achieve Sustainable Development through Implementation of Principle 10

Purpose

The partnership will:provide training; design new interactive assessment tools; support strategic national assessments; facilitate the exchange of best practices through meetings (regional, global) and electronic tools (listservs, websites, a new database); and convene action-oriented national dialogues.

Recipient country	Sector	Total funding	Years in operation
Cameroon, Chile, India, Malawi, Paraguay, the Philippines, South Africa, Thailand, Uganda, Vietnam, and Zimbabwe.	Capacity building	1.3M (only part is climate related)	From 2004

Description

The specific objectives of the partnership actions include:

- Building the capacity of developing country NGOs to monitor implementation of Principle 10. The partnership will work to achieve this by training NGOs on the TAI methodology and working with national NGO coalitions in 23 developing countries to conduct comprehensive assessments of implementation of Principle 10.

- Creating the knowledge base and tools to support informed decisions for the integration of environmental concerns into the development processes in target countries. The partnership will work with developing country NGOs to create new indicator assessment tools, based on the TAI methodology, to assess good governance in the key sectors of water and energy, and to assess how governments involve their citizens in international decision-making processes.

- Catalyzing commitments by developing country governments, international institutions, and developing country NGOs to implement Principle 10. The partnership will engage governments directly and early in the assessment processes and will convene national dialogues to promote governments' commitments to closing the gaps identified in the assessments of implementation of Principle 10.

- Developing a process and broad constituency for consistent action in implementation of Principle 10 and follow-up to the WSSD. The partnership will conduct regional and global meetings to discuss the implications of the assessments, share lessons learned, and document best practices as the partnership helps replicate the process in other countries.

Indicate factors which led to projects success

Technology transferred: Electronic tools and assessment methodologies

Impact on greenhouse gas emissions: Not quantified

Project/programme title

Capacity building - The UNFCCC: Facilitating implementation and participation in Asia-Pacific (United Nations Framework Convention on Climate Change)

Purpose

The aim of the Action is to ensure in each target country () that the government and key civil society stakeholders are a) informed of the main issues regarding participation in and implementation of the UNFCCC and b) empowered to act. The main target groups include (a) government Ministries especially those that traditionally are not involved in discussions on climate change (b) NGOs, academics and private sector actors who's core business or field of activity will be impacted by climate change (c) negotiators from the target countries responsible for ensuring that national interests are effectively represented at the UNFCCC negotiations.

Recipient country	**Sector**	**Total funding**	**Years in operation**
Tuvalu, Cook Islands, Indonesia and Nepal	Capacity building	0.75M	From 2004

Description

The 4 national programmes will focus on the following activities in each country:

1. Raising the awareness of a group of government officials at the national level on the key implementation issues of the UNFCCC and of the barriers and opportunities to participation in the UNFCCC negotiations
2. Identifying and effectively networking members of civil society with a genuine interest, and a stake in climate change – impacts and mitigation.
3. Linking networks of government and civil society to facilitate a multi-stakeholder platform for action on climate change an implementation of the UNFCCC at the national level
4. Utilising the multi-stakeholder platform and a derived 'Action Core Group' to support participation within the UNFCCC and national leadership at the international level

Indicate factors which led to projects success

Technology transferred:Networks and awareness raising

Impact on greenhouse gas emissions: Not quantified

Project/programme title

Environment and community based framework for designing afforestation, reforestation and revegetation projects in the CDM:methodology development and case studies (ENCOFOR)

Purpose

The aim of ENCOFOR is to develop a practical framework for selection, design and evaluation of CDM (Clean Development Mechanism, Kyoto Protocol) AR (Afforestation, Reforestation and Revegetation) projects in (sub)tropical non-annex I countries.

Recipient country	Sector	Total funding	Years in operation
Kenya, Uganda, Ecuador, Bolivia	Forestry		45 months

Description

The objectives are:

To develop a framework for the planning and evaluation of CDM AR projects.

To use the structural framework for building a toolbox incorporating a series of modules into an Arc View Geographical Information System environment:a land suitability and potential site selection procedure, the GORCAM carbon accounting model, an environmental impact assessment procedure and a community based socio-economic impact assessment

To design a logical sequence of data collection, database construction, stakeholder identification, purpose identification (e.g. bioenergy, construction timber or paper pulp), baseline definition and additionality evaluation, carbon balance prediction, local environmental impact evaluation, socio-economic impact evaluation and final project formulation.

To test and validate the ENCOFOR toolbox at representative test sites in four developing countries (Kenya, Uganda, Bolivia, Ecuador) with attention for data availability, user friendliness, accuracy and interpretability of output.

Information, presentation and promotion of the ENCOFOR tool and the test results to the users/stakeholders community. Feedback from the stakeholders and framework optimisation driven by the users group, animated through the ENCOFOR website.

Completed feasibility studies for at least 4 selected project sites including the elaboration of a technical folder, outlines for future negotiation and drafted contract documents.

Dissemination of results beyond the direct project environment through the ENCOFOR website, the final symposium and the scientific and technical publications

Indicate factors which led to projects success

Technology transferred:Information, computer models and data evaluation network

Impact on greenhouse gas emissions: Not quantified

Project/programme title

The Clean Air Initiative in sub-Saharan African Cities aims to reverse the urban air quality deterioration due to vehicle emissions, by far the most important source of urban air pollution in Africa.

Purpose

The five specific objectives of the Clean Air Initiative are to:

(a)Raise awareness of the dangers of urban air pollution

(b)Measure baseline vehicle emissions, air quality, pollution exposure, and pollution effects;

(c)Identify the most cost-effective measures targeting changes in vehicles, fuels, and traffic management;

(d)Design, implement, and monitor the impacts of Air Quality Action Plans to reduce pollution, including clear, measurable, and enforceable goals for reducing pollutants; and

(e)Strengthen local expertise on air pollution and vehicle and fuel performance

Recipient country	**Sector**	**Total funding**	**Years in operation**
Sub-Saharan Africa	Transport	0.5M from 2003	1998 -

Description

The following activities will be carried out in the 2003-2006

1. Phase-Out of Leaded Gasoline

2. Reinforcement of Capacity Building and Awareness Campaigns

2. 1. Co-ordination of Sub-Regional Focal Points:

2. 2. Establishment of National and Regional Databases:

2. 3. Promoting Awareness of the Clean Air Initiative:

3. Launching of Research & Dissemination of Information on the Impact of Sulphur in Diesel

4. Case Studies on Air Pollution in Selected Cities and Urban Air Quality Action Plan

5. Dissemination Strategy

Indicate factors which led to projects success

Technology transferred:Raising awareness, co-operation in the design and implementation of technical, institutional and regulatory measures, and support for the design and implementation of Action Plans. Most of the inputs required for the implementation of the Clean Air Initiative are related to services and capacity building

Impact on greenhouse gas emissions: Not quantified

Project/programme title

Tropical forests and climate change adaptation:Criteria and indicators for adaptive management for reduced vulnerability and long-term sustainability.

Purpose

The aim is to promote adaptation of tropical forests to adverse effect of climate change through the assessment of impacts and costs of climate change, and through the development of criteria and indicators for adaptive forest management for reduced vulnerability

Recipient country	**Sector**	**Total funding**	**Years in operation**
South-East Asia (Indonesia); West Africa (Burkina Faso, Mali, Ghana); Central America (Honduras, Nicaragua, Costa Rica)	Forestry, adaptation	3M €	2004 - 2008

Description

The specific objectives of the project are:

- To evaluate the impact of climate change and climatic variability on tropical forest ecosystems in selected sites, and to develop maps of critical vulnerable areas and forest types,
- To develop and test a set of monitoring protocols to assess the impacts of climate change on forest ecosystems, forest dependent livelihoods and key forest environmental services (water, carbon and biodiversity) ,
- To develop and test standards and tools (databases, expert systems) on adaptation measures, including analysis of their costs, resistance and resilience ,
- To develop and test criteria and indicators for adaptive management of tropical forests to minimize the negative effects of climate change and climatic variability,
- To carry out a science-policy dialogue in and across the three pilot regions (South East Asia; West Africa, Central America) in order to test the practicality of developed methods, to diffuse practical and useful information on adaptive forest management to reduce vulnerability, and to build capacities in developing countries through training sessions.

Indicate factors which led to projects success

Technology transferred:Expert systems, databases, monitoring protocols, awareness raising

Impact on greenhouse gas emissions: Not quantified

7. RESEARCH AND SYSTEMATIC OBSERVATION

Developments

1. The budget for the thematic area that covers climate change in the 6th Framework Programme is €2.12 billion. This is set to increase in the 7th Framework Programme

2. International co-operation is an integral part of the priority thematic areas

3. A wide spectrum of projects related to climate science, impacts, adaptation and mitigation have been supported by the European Union

4. The EU as part of the Group on Earth Observations (GEO), is working towards an unprecedented level of coordination and harmonisation of Earth Observation Systems, aimed at the creation of the Global Earth Observation System of Systems (GEOSS)

7.1. General Introduction

7.1.1. Background

Scientific research, technological development and innovation are at the heart of the knowledge-based economy. Launched at the Lisbon European Council, the European Research Area has established a reference framework for research, and set an objective of increasing European research effort (both public and private) to 3% of the EU GDP by 2010[164].

The main instruments used by the European Commission to implement research are the framework programmes, managed by DG Research. In addition, the Joint Research Centre (DG JRC) provides research-based policy support, working for the EU policy-maker. Other parts of the Commission, for example DG Transport and Energy, manage demonstration projects.

7.1.2. 6th Framework programme (2002-2006)

The 6th framework programme, which runs from 2002-2006, is investing a budget of €17.5 billion with the aim of supporting collaboration in research, promoting mobility and co-ordinating and investing in mobilising research in support of other EU policies.

The budget for the 6th framework programme represents about 4 to 5% of the overall expenditure on research in EU Member States.

The specific programme strives towards greater integration by promoting research:

- in seven key priority thematic areas of exceptional interest and added value for Europe;
- responding to the special needs of small and medium-sized enterprises;
- in international co-operation with partners in specific groups of third countries.

[164] For more discussion see 3rd National Communication

The thematic area that covers climate change is Sustainable Development, Global Change and Ecosystems and has a budget of €2.12 billion. This thematic area comprises:

Sustainable energy systems - €800m
short term – clean energy, efficiency savings, alternative fuels
long term – fuel cells, renewable energy technologies, capture and sequestration of CO_2.
Sustainable surface transport - €600m
environmentally friendly and competitive transport systems
safer, more effective and competitive rail and maritime transport
Global change and ecosystems - €700m
greenhouse gases and atmospheric pollution
water cycle and soil
biodiversity
desertification, natural disasters
sustainable land management
modelling and complementary research

An innovative component of the 6th framework programme is *ERA-NET*, which provides support for trans-national networking and co-ordination of national research programmes. Ultimately it is expected to lead to collaboration of major significance; including strategic planning and design of joint research programmes.

Examples of climate-related research under the 6th framework programme are discussed in the Section 8. 2.

7.1.3. The future for research-7th Framework Programme (2007-2013)

Research is becoming more and more expensive, owing to increasing complexity. As European industrial policy requires the integration of research efforts at the European level and this was recognised in a communication published in June 2004[165]. Six major objectives have been identified to increase the impact of European Union action, and it is proposed to organise future work round these objectives. An increase in the research budget for priority areas, including for climate related research, is also proposed. Stronger co-operation between national programmes and with third countries will further enhance the effectiveness of research. The 7th Framework Programme, that will take forward research based on these objectives from 2007 to 2013, is currently under development[166].

The approval process for the proposed 7th Framework Programme (FP7) for Research Development and Demonstration activities is currently underway, and its details are

[165] COM(2004) 353 final, "Science and technology, the key to Europe's future – Guidelines for future European Union policy to support research", June 2004
[166] COM(2005) final, "Proposal for a Decision of the European Parliament and of the Council concerning the seventh framework programme of the European Community for research, technological development and demonstration activities (2007 to 2013)", 2005

outlined in COM(2005) 119 final[167]. FP7 is due to run from 2007-2013, with an overall budget of approximately €72.7 billion. It aims to build upon the themes of FP6 and enhance progress towards the goals of the Lisbon Strategy in promoting economic growth, whilst at the same time ensuring social progress and environmental sustainability. The thematic areas most directly linked to climate change (with their indicative budgets) are:

(Theme 5) Energy (€2931M)– with its objective of "*transforming the current fossil-fuel based energy system into a more sustainable one based on a diverse portfolio of energy sources and carriers combined with enhanced energy efficiency, to address the pressing challenges of security of supply and climate change, whilst increasing the competitiveness of Europe's energy industries*". The key activities within this theme will focus upon:

- Hydrogen and fuel cells.
- Renewable electricity generation.
- Renewables for heating and cooling.
- CO_2 capture and storage technologies for zero emission power generation.
- Clean coal technologies.
- Smart energy networks.
- Energy efficiency and savings.
- Knowledge for energy policy making.

(Theme 6) Environment (including Climate Change) (€2535M)– with its objective of *"sustainable management of the environment and its resources through advancing our knowledge on the interactions between the biosphere, ecosystems and human activities, and developing new technologies, tools and services, in order to address in an integrated way global environmental issues"*. The key activities within this theme will focus upon:

- Climate change, pollution and risks – in particular looking at pressures on the environment, links to health and natural hazards.
- Sustainable Management of Resources.
- Environmental Technologies – for observation, prevention, mitigation, adaptation, remediation and restoration of the natural and man-made environment.

(Theme 7) Transport (including aeronautics) (€5940M) **–** with its objective "based on technological advances, develop integrated, "greener" and "smarter" pan-European

[167] COM(2005) 119 final – of 6 April 2005 – Proposal for a Decision of the European Parliament and of the Council concerning the seventh framework programme of the European Community for research, technological development and demonstration activities (2007 to 2013).

transport systems for the benefit of the citizen and society, respecting the environment and natural resources; and securing and further developing the leading role attained by the European industries in the global market". The key *related* activities within this theme will focus upon:

- The greening of air transport – including reduction of emissions, alternative fuels, traffic management etc.

- The greening of surface transport – including reduction of pollution, promotion of efficient engines, hybrid technology and alternative fuels.

- Encouraging modal shift and decongesting transport corridors.

7.1.4. International co-operation

International co-operation is an integral part of the priority thematic areas, with two main objectives:

- to help European research to access knowledge and expertise existing elsewhere in the world; and

- to ensure Europe's strong and coherent participation in international research initiatives, to help resolve major global issues, such as climate change

All third country legal entities and international organisations can participate in and eventually benefit from Community financial contributions. A number of initiatives directed toward encouraging international co-operation have been carried out, including visits by senior officials. There also specific activities identified in support of the EU foreign and development aid policies.

7.2. Research

7.2.1. Cross-cutting research

Understanding and accessing the results of research being carried out in the field of global climate change is essential to maximise the impact of existing research and define research needs for the future. The *ProPaCC* project, funded (with an EC contribution of €0.1M) under the fifth framework programme, created a valuable tool for both researchers and policy-makers[168]. The project gathered information on 160 climate related projects and compiled the information in a user-friendly website accessible through the internet. The project also provided a forum for discussion on global climate change issues. A workshop on the CDM was held in Bangkok in September 2004. The final report from the ProPacCC project[168] is a useful source of information on and discussion of the climate-related projects in the fifth framework programme.

[168] www-iip.wiwi.uni-karlsruhe.de/propacc

7.2.2. Climate systems studies and modelling

The European Union has supported climate change investigations since the 1980s. This support has strengthened over time as EU policies have moved towards placing sustainability at the centre of policy initiatives. Important advances were made, for example in quantifying the carbon cycle, and advanced climate modelling.

Under the 6th framework programme, a wide spectrum of projects is being supported. Operational forecasting, modelling and climate observation systems are included to improve our capacity for documenting on-going changes. Past climate changes are studied to understand better how the various parts of the Earth system interact and to establish a baseline of natural climate variation. Sinks for carbon and nitrogen are studied to understand how carbon sequestration can be promoted.

The funding mechanisms under the 6th framework programme, promote a multi-disciplinary approach bringing together leading research organisations in Europe and internationally.

Examples of research projects are discussed below.

Carbon Cycle

CarboEurope is a network of 15 European research projects with the aim of understanding and quantifying the present terrestrial carbon balance of Europe and the associated uncertainty. The network is a dynamic one, started in 2000 under the fifth framework programme and continuing as CarboEurope-IP[169] in the 6th programme, with the involvement of more than 150 scientists. The budget includes €16.3 million from the Commission and about the same amount from national funding.

The project consists of four components:

- ecosystem level measurements;
- high precision continental scale atmospheric measurements;
- a regional experiment aimed at reducing uncertainty in scaling; and
- merging the various data streams into a comprehensive assessment of the European carbon balance

As a participant in the project, the Joint Research Centre makes use of the results to provide QA/QC to monitoring of carbon sinks and reporting to the EU GHG Inventory System.

The carbon cycle in the oceans is addressed in the *Carboocean-IP*[170] project. This project aims to reduce uncertainties in the carbon balance in the Atlantic and Southern Oceans in particular, on a timescale from –200 up to 200 years from now, through a

[169] http://www.carboeurope.org/
[170] http://www.carboocean.org/

mixture of extensive large-scale observations, process studies and advanced computer models.

International projects

The PAN-AMAZONIA[171] project aims to build and strengthen European cooperation with Latin American partners to allow the development of a critical mass of human capacity and techniques for monitoring and understanding the Amazon's ecosystem role in climate change and biodiversity.

Climate modelling and scenario analysis

The focus in recent years has moved from the development of large-scale climate models to linking these models to policy needs and to validating the results

Three projects from the 5th framework programme brought together expertise from across Europe in the fields of climate modelling:

- *PRUDENCE* – provided high-resolution climate change scenarios using dynamic downscaling methods[172]
- *STARDEX* – provided improved downscaling methodologies for the construction of changes in the frequency and intensity of extreme events[173]
- *MICE* – used information taken directly from climate models to explore future changes in extreme events in Europe[174]

In the 6th framework programme, the *ENSEMBLES*[175] project brings together 70 partners from EU, Switzerland, Australia and the US, with funding from the programme of €15 million. The project aims to develop and validate an ensemble prediction system for climate change and to quantify and reduce the uncertainty in the representation of feedbacks in the Earth System

Deeper understanding of the intrinsic variability and stability properties of the climate will be gained through the *DYNAMITE*[176] project.

International projects

The *CLARIS*[177] projects provides for transfer of knowledge and expertise in Earth System Models between Europe and South America and the creation of a high-quality climate database for South America.

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[171] www.geox.ox.ac.uk/research/projects/panamazonia
[172] www.dmi.dk/f+u/klima/prudence
[173] www.cru.uea.ac.uk/projects/stardex
[174] www.cru.uea.ac.uk/projects/mice/
[175] www.ensembles-eu.org/
[176] http//dynamite.nersc.no
[177] www.claris-eu.org

7.2.3. Impacts of climate change

Research on the impacts of climate change have been undertaken under the various topics in Global Change and Ecosystems under the 6th framework programme and under previous programmes. During 2000, the results of different projects were brought together in the Acacia project described in the 3rd National Communication.

Dinas-Coast[178] was an integrated modelling project that combined state-of-the-art science and data from a range of different disciplines to help policymakers interpret and evaluate coastal vulnerability. *EURO-LIMPACS* addresses the impacts on freshwater eco-systems. cCASHh investigates the ways in which climate change affects health. The impacts of floods and heat waves are among the direct effects of weather on health. Food borne diseases that increase in summer, and diseases transmitted by ticks or mosquitoes are indirect effects of climate change through change in seasonal patterns of infectious diseases. [179]

International projects

The *AMMA*[180] project aims to re-enforce regional environmental monitoring systems to improve the ability to predict the impact of climate change on West African Monsoon variability. Integrated water management systems for twinned river basins in Botswana, Chile, Kazakhstan, UK and Sweden are the subject of a project *TWINBAS.* The EU's Joint Research Centre is involved in international research co-operation on monitoring and assessing ecosystem sustainability. One example of such activities is a co-operation project between the EU and Russia on using remote sensing for environmental monitoring. Researchers from the EU and Russia are applying satellite data to detect forest cover changes in north western Russia and in the Far East.

7.2.4. Socio-economic research

EU socio-economic work has and is being used to develop tools and methods to evaluate scientifically the economic, social and environmental impacts of proposed policies. There are three main topics and example projects are discussed below.

Total costs – social and environmental cost of energy system

The consideration of external costs is one way of re-balancing social and environmental dimensions with purely economic ones. Since the beginning of the 1990s, the *ExternE* network[181] has worked to produce robust and validated external costs associated with energy production and consumption. The work continues in the *NEEDS* project, which has 65 partners and support of €7 million. METHODEX (with an EC contribution of €1.2M) aims at:advancing best practice in external cost assessment, extending the analysis of external costs to agriculture, industry, waste and other sectors and assist the use of externality studies in these sectors by incorporating

[178] http://www.dinas-coast.net/
[179] http://www.euro.who.int/ccashh
[180] ttp//www.amma-eu.org
[181] http://www.externe.info/

this externality information into the 'Review of Externalities Data' database[182]. GREENSENSE developed a framework of monetary assessment accounting for efficiency and sustainability. It extended the measurement of physical damage to include other areas such as climate change and biodiversity and estimated emission reductions required and costs to satisfy sustainable development criteria such as stabilization of carbon dioxide concentrations[183].

Forecasting and scenario activity, quantitative and qualitative

Examples of the tools developed under previous programmes include the energy models, PRIMES and POLES, macro economic models such as GEM-E3 and HERMES and databases MURE and SAFIRE. These tools are being developed further and are also being used more widely in the Commission, in particular by its Joint Research Center, to evaluate specific policies and measures, also as part of sustainability impact assessments required for specific policies.

New tools being developed in the energy field include *CASCADE MINTS*, to be used to develop conclusions on the use of renewable energy sources, hydrogen, and *LETIT*, to introduce systematic methodologies to identify local sustainable energy opportunities.

WETO-H2 will forecast the world energy outlook for the period to 2050 to support EU energy, technology and environmental policies. The project will:

- Produce long-term energy demand, supply and price reference projections for the main regions of the world, focussing on European issues (renewables and CO_2 emissions reductions).

- Evaluate the consequences of technological breakthroughs on energy demand and supply.

- Consider the implications of two EU energy-environment strategies: implementation of a hydrogen-based energy system and reduction of energy-related CO_2 emissions by a 'factor 4'.

Beyond the energy field, methods are also developed that are used for sustainability impact assessments in general and land-use specifically. SENSOR will develop science based ex-ante sustainability impact assessment tools to support decision making on policies related to multifunctional land use in European regions[184]. MOSUS is developing an integrated ecological-economic simulation model to quantify relations between socio-economic driving forces and the state of the environment, and has an EC contribution of approximately €1.3M. The analysis will be based on a multi-country, multi-sectoral macroeconomic framework that integrates material and energy flows (and GHG emissions) as well as land use data in European and global simulations[185]. The project INSEA is analysing the possible role of

[182] http://www.methodex.org/
[183] http://staff.bath.ac.uk/hssam/greensense/
[184] http://www.zalf.de/home_ip-sensor/about/index.htm
[185] http://www.mosus.net/project-index.html

agriculture and forestry related carbon sinks at the European and international level, it has EC funding of €1.5M. [186]

The objectives of SustainabilityA-Test (Advanced Techniques for the Evaluation of Sustainability Assessment Tools) are to: provide an appraisal of tools for sustainable development assessments for key aspects of sustainable development and to apply a framework for evaluating the tools, it has EC funding of €1.3M[187]. MINIMA-SUD develops a methodology for integrating impact assessment in the field of sustainable development covering impacts on climate change, air pollution, transport, as well as economic impacts and energy-related issues. The EC funding contribution amounts to approximately €0.6M. The core is to construct a tool for policy integration incorporating uncertainty for a large number of objectives that reflect sustainable development indicators such as global temperature change.[188] The purpose of MATISSE is to achieve a step-wise advance in the science and application of Integrated Sustainability Assessment by:developing a systematic inventory of tools and methods and a conceptual framework, improving existing tools and methods and developing new ones and applying these methods in case studies such as agriculture, forestry and land use and dematerialization. The R&D for SD project describes sustainable development scenarios with the NEMESIS econometric model. It assesses the cost of sustainable development policies and their implications for energy use and greenhouse gases emphasizing the role of R&D, innovation and knowledge[189]. EC project funding is approximately €1M.

Finally, the goal of the GECS project was to develop global (world) scenarios in order to analyse the impacts of Post-Kyoto policies under flexibility mechanisms for emission reduction, including options to reduce emissions resulting from land use change and for strengthening carbon sinks[190]. The new GAINS-ASIA project brings together state-of-the-art models on air pollution and climate change to assess policies that maximize synergies and benefits between these policy areas with a special focus on China and India. The new ADAM (ADaptation And Mitigation) project will assess the extent to which mitigation and adaptation policies can achieve a transition to a global climate no warmer than 2°C above pre-industrial levels and identify the associated costs. ADAM will also assess a portfolio of longer term strategic policy options that could contribute to the achievement of the 2°C target as well as adaptation policy. The new TETRIS project aims at exploring the economic and industrial impacts as well as the prospects for achieving technology transfer associated with the implementation of the Kyoto flexibility mechanisms and the associated risks.

7.2.5. Mitigation and adaptation technologies

Energy system

[186] http://www.iiasa.ac.at/Research/FOR/INSEA/
[187] http://www.ecologic.de/download/projekte/1900-1949/1941/1941_a-test_brochure.pdf
[188] http://www.e3mlab.ntua.gr/
[189] http://www.e3mlab.ntua.gr/
[190] http://www.upmf-grenoble.fr/iepe/GECS/

Energy use has a number of important social, economic and environmental impacts and significant research resources have been directed towards the energy sector. The European Union's policy objective of achieving more sustainable energy systems (SES) is of great strategic importance and covers:

- development of cleaner energy systems, including renewable energies
- economical and efficient use of energy
- socio-economic activities.

Current SES research in the EU includes:

- Energy production from renewable sources
- Fuel cells and hydrogen
- Cleaner energy from fossil fuels (CO_2 capture and storage)
- Energy storage and distribution
- Reduced energy consumption
- Cross-cutting issues on energy markets

In addition to the more basic research funded under the 6th framework programme[191], the Intelligent Energy for Europe programme supports non-technological actions in the field of energy[192]. Running from 2003-2006, the programme will provide support of around €250 million. It is divided into four fields:

- *SAVE* aimed at improvement of energy efficiency, in particular in buildings and industry
- *ALTENER* for promotion of new and renewable energy for heat and electricity;
- *STEER* to support initiatives related to energy aspects of transport including promotion of new fuels; and
- *COOPENER* to support initiatives relating to the promotion of renewable energy sources and energy efficiency in developing countries

The Joint Research Centre operates a Scientific Technical Reference System on Renewable and End-Use Efficiency, providing data on the progress of the implementation of renewable energies.

[191] http://europa.eu.int/comm/research/energy/nn/nn_pu/article_1078_en.htm
[192] http://europa.eu.int/comm/energy/intelligent/index_en.html

Recognising the barriers to the take-up of environmental technologies, the European Commission launched the Environmental Technology Action Plan[193]. Actions were identified to boost the development and deployment of environmental technologies in a range of sectors.

Mitigation in transport has been addressed by several research projects in FP5 and FP6. Reductions in emissions from aeroplanes have for instance been targeted in two major engine research projects:

- EEFAE (Efficient and Environmentally Friendly Aero Engine)

- VITAL (Environmentally Friendly Aero-Engines).

The total costs of the projects amount to more than 200 million Euro and together they attempt to meet the difficult challenge of researching, developing and demonstrating the potential of advanced technologies to reduce substantially the CO2 and nitrogen oxide emitted by aero-engines. These technologies should be available in 2009 and could in the future cut up to 18% of the CO2 emitted compared with the levels achieved by the best engines of 2000, and some 60% or more of the NOx emissions with respect to CAEP2 standards.

Cleaner energy systems and efficient use of energy

More than half the renewable energy research in the EU is done by the public sector, with one quarter of the public spending coming directly from the EU budget[194].

Under the 6th framework programme, the *CIVITAS* initiative is aimed at help towns to develop a more balanced and cleaner urban mobility. The EU contribution accounts for approximately €100M with the budget for the overall initiative expected to be over €300M. *Concerto* is also aimed at urban centres, promoting energy efficiency and renewable energy. The potential for hydrogen is to be demonstrated through *CUTE*, where 27 fuel-cell powered buses are circulated through nine European towns. The total budget is approximately €18.5M.

European research on fuel cells is focussed on reducing the costs and on improving the performance, durability and reliability[195].

Several projects have been funded to look at carbon capture and storage[196]. These include *ENCAP* to provide pre-combustion de-carbonisation technologies and *CASTOR* aimed at reducing the costs of capture and storage. The indicative budgets for these projects are €10.7M and €8.5M respectively.

Most of the research activities on energy efficiency are undertaken in the *SAVE* programme or in integrated projects such as *Concerto*.

Research Fund for Coal and Steel

[193] http://europa.eu.int/comm/environment/etap/
[194] European research spending for renewable energy sources, Project report EUR21346.
[195] http://europa.eu.int/comm/research/energy/pdf/h2fuell_cell_en.pdf
[196] http://europa.eu.int/comm/research/energy/pdf/co2capt_en.pdf

The Treaty establishing the European Coal and Steel Community (ECSC) expired on 23 July 2002, after 50 years, and the remaining ECSC funds were transferred to the European Community to create a common fund dedicated for research in the coal and steel area.

The Research Programme of the Research Fund for Coal and Steel[197] is managed by DG Research and has open continuous calls for proposals along similar lines to the previous ECSC RTD programme.

Work related to the mitigation of climate change includes:

- Increasing the efficiency and improving the use of coal as a clean energy source.
- Low CO_2 steel production processes (which is coordinated with specific funding within the Priority 3[198] area of the 6th Framework Programme for 'very low CO_2 steel processes)

A Steel Technology Platform (STP), launched in 2003, brings together all interested stakeholders to develop a long term vision of technology use and to better integrate the two complementary research frameworks. The first long-term STP project aims to reduce the CO_2 emissions of the steel industry. The European steel industry is contributing to the challenge of lowering CO_2 emissions by creating the ULCOS (Ultra Low CO_2 Steelmaking) consortium of industries and of research institutes with the mission of developing innovative processes. This large-scale consortium (48 European participants) plans to develop a steelmaking process that has the potential of significantly reducing greenhouse gas emissions beyond 2020. The full development of the process, from basic concept to fully-fledged industrial implementation would cover both medium- and long-terms and consist of a number of consecutive projects.

Other mitigation

Mitigation in agriculture and forestry is being addressed in *INSEA* (mentioned in section 7.2.4) and *SEAMLESS-IF*. *INSEA* aims to develop a transparent toolbox to help understand how the forestry and agricultural sectors can contribute to the sustainable-development process by adopting mitigation technologies. *SEAMLESS-IF* will allow ex-ante analysis of the impacts of policies and behavioural changes, through clarification of the benefits, costs and externalities associated with farming system management. Potential mitigation options in dairy farming were calculated in the *MIDAIR* project funded under the 5th framework project[199], with a budget of approximately €1. 6M.

International projects

Several projects, mainly focussed on Africa, have been financed under the COOPENER programme. Opportunities for Joint Implementation in Central and

[197] http://www.cordis.lu/coal-steel-rtd/home.html

[198] Nanotechnologies and nano-sciences, knowledge-based multifunctional materials and new production processes and devices.

[199] http://www.energetik-leipzig.de/Bioenergie/Midair/MIDAIR%20summary%20EVK2%20CT%202000%2000096.pdf

Eastern Europe and the Clean Development Mechanism in the Mediterranean area were studied in the 5th framework programme[200].

7.3. Systematic observation and global climate observation

7.3.1. General approach to systematic observation

Over the past few decades, Europe has built up considerable experience and technical know-how in the design, production and operation of Earth observing tools. Now, the ad-hoc Group on Earth Observations (GEO), with strong political backing from governments and support from round the world, is working towards an unprecedented level of coordination and harmonisation of Earth Observation Systems, aimed at the creation of the Global Earth Observation System of Systems (GEOSS). On 16 February 2005, over 50 countries and 40 international and scientific organisations signed up to create the GEOSS, at a summit hosted by the European Commission in Brussels.

The GEOSS will bring together all available information on the state of the global environment, consolidating existing data from disparate sources. Responding to socio-economic needs, it will facilitate the provision of relevant and meaningful environmental information to policy-makers and the scientific community, improving the decision-making process. During its ten-year implementation period, GEOSS will also provide new impetus for research on EO systems and services.

As with the current programme, significant resources from within the next EU Framework Programme, due to start in 2006, will be available to research on Earth observation. Activities such as the Global Monitoring for Environment and Security (GMES)201 initiative described in the 3rd National Communication will play a key role in furthering earth observation activities, as the main contribution of the EU to GEO. Strong co-operation with both the EU's Member States and a range of other countries and organisations around the world will continue to be an important part of the programme.

In terms of direct participation in Global Climate Observation systems, the main responsibility lies with individual Member States, although sometimes individual stations will be part of EU projects.

7.3.2. Meteorological and atmospheric observation

The Joint Research Centre operates the World Data Centre for Aerosol under the Global Atmosphere Watch. Current work is concentrating on building up archives of commonly available parameters. Direct contributions to the GCOS Upper Air Network (GUAN) and the GCOS Surface Network (GSN) are from observing stations in individual Member States.

[200] Renewable Energy Technologies and the Kyoto Protocol Mechanism, EUR20871, 2003.
[201] COM(2004) 65, Global Monitoring for Environment and Security (GMES):Establishing a GMES capacity by 2008 – (Action Plan 2004-2008) 2004

GMES (Global Monitoring for Environment and Security) is a joint programme of the European Commission and the European Space Agency, designed to establish a European capacity for the provision and use of operational information for monitoring and management of the environment and for civil security. Europe makes a substantial contribution to the networks of research stations that make regular measurements of a broad range of atmospheric constituents. During 2002-2004, the GMES-GATO consortium defined a strategy for GMES to help develop an integrated global atmospheric observing system by 2008[202].

EARLINET (European Aerosol Research Lidar Network to Establish an Aerosol Climatology) 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 and DAEDALUS 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;
- be established for GMES; and
- develop the methodologies necessary for delivering operational aerosol products.

On-going action is the Preparation for the Use of Meteosat Second generation satellites in Africa (PUMA).

Future developments

Significant improvements in the co-ordination of ground-based and satellite-based atmospheric measurements are needed. The aims are the continuation, optimisation and analysis of long-term ground-based atmospheric observations, to complement satellite measurement systems.

7.3.3. Oceanic observations

A number of EU funded projects contribute to different aspects of oceanic observations. *GRAND* is an EU-supported project aimed at bringing together regional alliances of the Global Ocean Observing System (GOOS).

Large-scale observation of the carbon cycle in oceans is the subject of *Carboocean-IP* described in Section 7.2.2.

The overall objective of *MERSEA* was to integrate existing spaceborne observations with data from in-situ monitoring networks and systems through ocean modelling and data assimilation system.

Future developments

[202] GMES-GATO A European Strategy for Global Atmospheric Monitoring, EUR 21154, 2004.

Research will contribute to the establishment of a permanent European ocean margin observatory network, extending into deep water, capable of monitoring biological, geochemical, geophysical and physical processes. In addition, research will support the consolidation, integration and development of existing networks, including satellite remote-sensing and in-situ observation stations into a single integrated pan-European system, capable of making long-term systematic measurements of ocean parameters.

7.3.4. Terrestrial observations

Terrestrial observation projects in the EU have a number of objectives:

- monitoring the state of soils and understanding the carbon balance
- monitoring land use, land use change and forestry
- understanding and monitoring terrestrial ecosystems

Monitoring land use, land use change and forestry

The objective of the *AMESD* programme is to help African countries to improve the management of natural resources by providing them with appropriate information on their environment using Earth observation technologies.

The *SENSOR* project uses a variety of Earth Observation data to develop sustainable impact assessment tools for land-use.

Under the fifth framework programme, *BIOPRESS* aimed to provide decision makers with quantitative information on how changing land cover/use has affected the environment and biodiversity in Europe. *LADAMER* sought to identify hot spot areas subject to a high desertification/degradation risk, and to provide a detailed assessment of the present degradation of Mediterranean land.

Terrestrial Ecosystems

The JRC action on *Terrestrial Ecosystem Monitoring* will provide a long-term picture of the conditions in ecosystems identified according to the priorities of EU aid, development and international environmental policies:monitoring of land management issues in Africa, forest resources assessment and sustainable forest development in Russia. It will also contribute to the updating of the biomass burning emission inventory. These activities hinge on the use of the latest advances in remote sensing science and access to data acquired by various Earth Observing satellites to characterize the state and evolution of the vegetation cover. The action contributes to GMES by providing a scientific support to partner institutions, which have an operational mandate in Europe in the field of low-resolution satellite observations for terrestrial environmental monitoring.

GLORIA-Europe established a long-term monitoring network to study climate change-induced impacts on alpine eco-system.

Future work

The mechanisms of desertification and natural disasters have been identified as an important area for future work, and to understand their relationship to climate change, so as to improve decision-making. Further research aimed at protecting and restoring fragile ecosystems, including techniques for protection against surface water erosion and soil degradation, is also identified as a priority area.

7.3.5. Space-based observing programmes

Europe has successfully developed and launched Earth observation systems, providing a comprehensive set of operational space missions with permanent and continuous observing capabilities of the Earth's system. The current meteorological component will continue in service until 2015/2020, but the other Earth Observation European satellites currently in orbit have a nominal lifetime terminating in 2007/2008.

JRC builds on in-house research and networking with recognized Centres of Excellence in Europe to develop state of the art optimised algorithms to extract information from space observations in the optical domain. The action also advises Space Agencies on the design of future space instruments to meet the increasingly demanding needs of the user community and contributes directly to the GMES initiative. Specific advanced products to document the spatial and temporal distribution of land surface albedo and vegetation productivity will be generated in house or with the help of data providers to document the state and evolution of terrestrial environments over a multi-year period. This is directly relevant to the estimation of carbon sinks. Initial work in this direction led to the generation and delivery of preliminary biogeophysical products to document the productivity of the terrestrial biosphere for limited areas and periods of time. From 2004, this R&D project is focussed on extending their spatial extent and temporal coverage.

8. EDUCATION, TRAINING AND PUBLIC AWARENESS

Developments

1. The European Commission is committed to the principles of open government and provides a large amount of information to the public in a variety of forms

2. The European Commission internet site provides a comprehensive source of information on Community actions and concerns including climate change

3. The European Awards for the Environment given by the European Commission are designed to recognise and promote companies that make an outstanding contribution to sustainable development

4. Green Week 2005 was entirely devoted to climate change and brought together environmental stakeholders to 'think aloud' about the future of global climate change policies

5. EU Member States support activities conducted by the UN under Article 6 of the UNFCCC (Education, training, and public awareness). These activities have included, since 2002, several regional workshops and the preliminary development by the UN of an internet based information clearing house, as well as activities undertaken nationally by individual Member States.

8.1. Introduction

The European Commission is committed to the principles of open government and provides a large amount of information to the public in a variety of forms. Activities in these areas are focused on raising public awareness since most activities in education and training are conducted at the Member State level. The European Commission recognises the crucial importance of education and training and provides support through dissemination of good practice, in some cases through networks which it manages.

The Community's information policy in relation to the environment, including climate change, has several objectives:

- To promote the results of Community policies and to provide information about proposals and actions
- To make more explicit the links between Community actions and the concerns of citizens facing environmental problems
- To ensure the transparency of European policy
- To encourage debate and partnership and generate feedback on policies.

The main tools used by the Environment Directorate-General are:

- A comprehensive website providing access to a wide range of information tools such as press releases, speeches, reports, studies, policy discussions and legislative texts

- An information centre handling all types of enquiries and visits from the public

- Printed publications for the informed public, general readers and children

- Relationships with the written press and audio-visual media. The Commission gives briefings and press conferences, and provides press releases and memos, a TV news service and targeted audio-visual material such as video news releases

- Co-operation with business, NGOs and networks to disseminate information

- Subsidies for awareness-raising projects

- Conferences, such as Green Week – which this year was entirely devoted to climate change - to raise the visibility of environmental issues and of the European response to them.

The Environment Directorate-General is working on a climate change awareness campaign to take place during 2005-2006. The programme, mainly targeted at the general public, will seek to inform citizens about climate change in general and to convince them that everyone can make a difference and has a responsibility to protect the climate. The campaign will use a variety of media to address different categories of citizens.

8.2. Information centre

The Information Centre provides a focal point for enquiries regarding the environment and is open to the public as well as European Commission staff. Approx. 9,000 publications are held at the Information Centre, including books, studies, publications of the Environment DG and CD ROMs. It also subscribes to newspapers and environmental magazines. It is estimated that around 15% of enquiries from the public relate to climate change.

8.3. Internet site

The European Community internet site provides a comprehensive source of information on Community actions and concerns. Most information on Climate Change issues is accessed through the European Commission's DG Environment website http://europa.eu.int/comm/environment/index_htm. Other DGs as well as the European Environment Agency (EEA) (http://www.eea.eu.int/) also include information on climate change which can be accessed through their websites. Climate change has dedicated pages on the DG Environment site at http://europa.eu.int/comm/environment/climat/home_en.htm, but, where relevant, information relating to climate change can also be accessed through the other areas. The number of hits on the climate change pages has been steadily increasing, starting from around 2,000 per month in 1999 and reaching over 70,000 per month in 2004.

The DG Environment website as a whole covers a number of areas including:

- Policy areas: pages informing about policy on, for example air, water, land use, nature and biodiversity, resources and waste, environment and health, climate change.

- News:press releases, audiovisual material and news about activities, (upcoming) events, etc.

- Key speeches

- Integration: presentation of the relationships between the environment and other Community policy areas, including links to the environment pages of other DGs.

- Statistics:a variety of indicators and other statistical data on the environment.

- Legislation: information and links to existing and proposed legislation in the environmental field.

- Funding opportunities for environmental projects under a variety of programmes.

- Publications: books, newsletters and reports on aspects of the environment including climate change. Most of the reports and newsletters are downloadable.

- Working together: information about, and access to, initiatives and means for citizens and stakeholders to contribute to policy making.

An 'Environment for Young Europeans' section containing information on a range of environmental issues written for a youth audience

In the near future the environment internet site will be transformed into a thematic portal site, integrating through a unique entry a complete range of information and services on the environment.

8.4. Publication programme

The Environment DG has an active publication programme, but the number of publications is decreasing as more information is disseminated electronically through the internet and the audio visual media. Climate change issues are among those covered by the programme. In January 2005 the Environment DG produced a brochure and a video CD explaining the EU Emissions Trading Scheme, a key measure to reduce CO_2 emissions. The March 2005 issue of the DG's "Environment for Europeans" magazine[203] focused on climate change. It covered issues such as the outcome of the COP 10 meeting in Buenos Aires and the adoption of the Kyoto Protocol and its implications. 2005 will also see publications from DG Environment informing children, young adults and the general public on the effects of climate change and the need for action to slow it down. These publications are made available both electronically and on paper.

[203] http://europa.eu.int/comm/environment/news/efe/pdf/news19_en.pdf
http://europa.eu.int/comm/environment/news/efe/20/index_en.htm

8.5. Co-operation with the press and audio-visual sector

The written press and the audio-visual media are crucial communication channels which the European Commission serves extensively. Besides daily press briefings where journalists are free to raise any issue they wish, dedicated press conferences and technical briefings on environmental initiatives and issues take place regularly. The Commission produces press releases as well as providing backgrounder (information memos, Questions and Answers), with climate change a frequently covered theme.

The Commission runs a European TV news service, Europe by Satellite http://europa.eu.int/comm/ebs, which provides raw materials to be used by broadcasters. These include live transmissions, unedited pictures and full programmes. The Environment DG also produces 12-15 video news releases (VNRs) per year on environmental policies and issues for use by television stations and networks. Climate change is a regular theme. For the Green Week 2005 event, which will focus on climate change, three VNRs on climate change-related issues are planned. Recently produced VNRs include themes such as the EU emissions trading scheme and a package of three films on renewable energy sources. A CD-rom and video on the EU emissions trading scheme have also been produced.

Press releases and other news items can be found at http://europa.eu.int/comm/environment/press_en.htm while audiovisual content is available from http://www.tvlink.org/home.cfm?dg=env.

8.6. Co-operation with the business sector, NGO and networks

The European Awards for the Environment given by the European Commission are designed to recognise and promote companies that make an outstanding contribution to sustainable development (http://www.eu-environment-awards.org). The awards were created in 1987 and are presented every two years.

The EU has an Action Programme to promote European environmental NGOs. NGOs can apply for funding to support their activities in the field of environmental protection. Successful applicants during the last few years have included Climate Network Europe, a coordinating office for environmental groups in Western Europe working on climate change issues.

The Green Spider network is composed of information and communication officers from the central environmental administrations of Member States, the Environment DG and the European Environment Agency. It is an instrument of information and mutual support between the European Commission and national administrations. The network has recently carried out a comprehensive survey of climate change campaigns run by public administrations and NGOs as a basis for building future partnerships.

8.7. Subsidies to awareness raising projects

The objectives of the funding opportunities are to:

- Increase the general public's awareness of environmental issues;

- Inform citizens about European environmental policy;
- Encourage the creation of European partnerships;
- Encourage well targeted and creative communication activities at grassroots level.

Some of the climate change awareness raising projects which have received financing are:

- 'Building awareness of climate change,' a travelling exhibition on climate change designed and produced by Fondazione IDIS-Città della Scienza.
- An audio visual report (interview with Margot Wallström, then European Commissioner for the Environment) by EuroNews for their magazine programme "Europeans".
- Ocean & Climate Interactive Display For Aquariums and Museums designed and produced by CNM - Centre National de la Mer (France).
- A television campaign in three European countries about sustainable architecture, featuring success stories on low energy homes and buildings.
- Advertising campaign on 'green electricity' called 'Switch to Green Electricity', climate change and sustainable use of resources done by World Wide Fund for Nature (WWF) United Kingdom.
- ZOOM - a campaign for children all over the European Union about sustainable mobility and the environment.
- A Union wide information campaign by WWF's European Policy Office called 'POWER SWITCH!' to promote green electricity to businesses and local authorities.
- A call for proposals was launched in spring 2005. It focuses on awareness-raising projects in the field of climate change with special emphasis on European audiovisual productions for television, radio, cinema and internet.

8.8. Conferences

The European Commission organises conferences to discuss existing and future environmental policies, and to disseminate the results of environmental projects. Examples of these conferences are the annual Green Week and Mobility Week events.

Green Week 2005 is entirely devoted to climate change. Green Week brings together environmental stakeholders to 'think aloud' about how we can change our behaviour in order to protect the environment and improve the quality of life for this and future generations. Green Week is organised in the week prior to World Environment Day on June 5 and gathers about 4,000 participants. Besides a programme of conferences, Green Week also features a large exhibition by stakeholders.

Mobility Week puts the spotlight on sustainable transport options and the link between air pollution and health in urban areas, particularly focusing on action by local authorities. Mobility Week runs from 16 to 22 September, the latter date being European Car Free Day.

8.9. Education

EU Member States also support programmes undertaken by the UN under Article 6 of the UN Framework Convention on Climate Change, which deals with education, training and public awareness. The EU has endorsed the New Delhi Work Programme, which is a non-binding work programme agreed at COP8 in New Delhi (2002). This programme relates to the promotion of international cooperation, education, training, public awareness, public participation and public access to information. Member States (UK, France, Sweden) submitted information to the UN as part of an intermediate review of the New Delhi Work Programme in 2004. France and the UK have contributed 70,000 and 30,000 Euros respectively to support the development of an internet-based Information Clearing House designed to disseminate information on education, training and public awareness to the public. The EU held a European regional workshop on Article 6 in Belgium in 2002, and has also offered translation services (French) to a subsequent African regional workshop held in the Gambia in January 2004.

Annex 1:The EC inventory methodology and data

Methodology

The EC inventory is compiled, as far as possible, in accordance with the recommendations for inventories set out in the '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/CP/2002/8)[204]. It is compiled on the basis of the inventories of the 15 or 25 Member States. The emissions of each source category are the sum of the emissions of the respective source and sink categories of the 15 or 25 Member States. This is also provides the base year estimate of the EU-15 GHG inventory. Currently, 13 Member States have indicated they will chose 1995 as the base year for fluorinated gases, while Finland and France have indicated they will chose 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. However, 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, and emissions from agriculture and uncertainty assessment of GHG inventories. In Spring 2005 a workshop for improving methods related to GHG inventories and projections will be organised for the waste sector.

[204]At the moment, because of the unique nature of the EC it is not able to provide some of the information required in the guidelines, such as specific sectoral background data tables.

Table 23 Time series and reporting formats available from MS by 15 April 2005

MS	Submission to Commisson dates	Latest data available	Years covered	CRF Tables[1]	New LUCF tables	Old LUCF tables
Austria	14 Jan 2005	2003	1990-2003	All	1990-2003	
Belgium	14 Jan 2005	2003	1990-2003	All	-	
	15 Mar 2005	2003	1990-2003	All	1990-2003	Yes
Cyprus	29 Mar 2005	2003	1990-2003	All	-	Yes
Czech Republic	14 Jan 2005	2003	1990, 1992, 1994-2003	Full CRF only for 2003.	-	Yes
Denmark	14 Jan 2005	2003	1990-2003	All	1990-2003	
	15 Mar 2005	2003	1990-2003	All	-	Yes
Estonia	4 Jan 2005	2003	1990-2003	Full CRF only for 2003.	-	Yes
Finland	14 Jan 2005	2003	1990-2003	All	2003	
	15 Mar 2005	2003	1990-2003	All	1990-2003	Yes
France	7 Jan 2005	2003	1990-2003	All	-	Yes
Germany	14 Jan 2005	2003	1990-2003	All	1990-2003	Mapping
Greece	17 Jan 2005	2003	1990-2003	All	1990-2003	
	1 Mar 2005	2003	1990-2003	LUCF	-	Net
	31 Mar 2005	2003	1990-2003	All	-	
Hungary	17 Feb 2005	2003	1990-2003	Full CRF only for 2003.	-	
	17 Mar 2005	2003	1990-2003	Full CRF only for 2003.	-	Yes
Ireland	17 Jan 2005	2003	1990-2003	All	-	Yes
Italy	17 Mar 2005	2003	1990-2003	LUCF	1990-2003	
	25 Mar 2005	2003	1990-2003	All	-	Net
	7 Apr 2005	2003	1990-2003	All	-	Net
Latvia	19 Jan 2005 (earlier to COM)	2003	1990-2003	All	-	
	15 Mar 2005	2003	1990-2003	All	-	Yes
Lithuania	18 Jan 2005	2003	1998, 2001-2003	Full CRF only for 2003.	2003	-
	18 Mar 2005	2003	1998, 2001-2003	Full CRF only for 2003.	-	-
Luxembourg	11 Apr 2005	2003	2003	Limited	-	Yes
Malta						
Netherlands	14 Jan 2005	2003	1990-2003	All	90, 00, 03	
	15 Mar 2005	2003	1990-2003	All	1990-2003	Yes
Poland						
Portugal	14 Mar 2005	2003	1990-2003	All	-	Yes
Slovakia	19 Jan 2005	2003	1990-2003	Full CRF only for 2003.	-	
	7 Mar 2005	2003	1990-2003	Full CRF only for 2003.	-	Yes
Slovenia	14 Jan 2005	2003	1990-2003	Full CRF only for 2003.	-	
	15 Mar 2005	2003	1986, 1990-2003	All	-	Yes
Spain	1 Mar 2005	2003	1990-2003	All	-	Yes
Sweden	14 Jan 2005	2003	1990-2003	All	-	
	15 Mar 2005	2003	1990-2003	All	-	Yes
United Kingdom	21 Jan 2005	2003	1990-2003	All	-	
	22 Feb 2005	2003	1990-2003	LUCF	1990-2003	
	11 Mar 2005	2003	1990-2003	LUCF	1990-2003	
	15 Mar 2005	2003	1990-2003	All	-	Yes

All = all or almost all (approx. more than 90 %) of the CRF tables; Limited = Sectoral Report Tables, Table 1A(a), Summary 1. A, Summary 3

CRF Tables and Reference Approach

The annex presents greenhouse gas emission data for the European Community (EU-25) in the Summary Tables 1. A of the Common Reporting Format for 1990 to 2003. The complete CRF tables (including all background tables) for individual Member States are available on the EEA website.

Data gap procedure

The EC GHG inventory is compiled by using the inventory submissions of the EC Member States. For data gaps in Member States' inventory submissions, the following

procedure is applied by the ETC/ACC in accordance with the implementing provisions under Council Decision No 280/2004/EC:

- 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,[205] 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.

Instances where the data gap procedure has been applied are shown in Table 2.

([205]) As included in FCCC/SBSTA/2003/10/Add.2.

Table 24 Overview of missing data

Member State	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6
Cyprus				1990-2003	1990-2003	1990-2003
Czech Republic	1991; 1993	1991; 1993	1991; 1993	1990-94	1990-94	1990-94
Estonia				1990-2003	1990-2003	
Greece						1990-2003
Ireland						1990-94
Lithuania	1991-97; 1999-2000	1991-97; 1999-2000	1991-97; 1999-2000	1990-2000	1990-2003	1990-2003
Luxembourg	Summary 1A for 1991-93 [1]; Tables 1, 1A(a), 2(I), 3, 4, 5, 6 for 1990-97; 1999; 2001	Summary 1A for 1991-1993; Tables 1, 1A(a), 2(I), 3, 4, 5, 6 for 1990-97; 1999; 2001	Summary 1A for 1991-1993; Tables 1, 1A(a), 2(I), 3, 4, 5, 6 for 1990-97; 1999; 2001	1990-97; 1999	1990-97; 1999	1990-97; 1999
Malta	2001-03	2001-03	2001-03	1990-2003	1990-2003	1990-2003
Poland	2003	2003	2003	1990-94; 2003	1990-94; 2003	1990-94; 2003

([1])Total CO2 emissions for 1991–93 are available for Luxembourg but without sector and category split.

Differences between EC submissions and Member States' submissions in 2005

Due to the reporting required in Category 5 of CRF Table Summary 1.A., inconsistencies occur between the EC CRF submission 2004 and the sum of the EC Member States' submissions in 2005. Footnote 5 of CRF Table Summary 1.A. requires Parties to report net emissions (emissions minus removals) from LUCF in each subcategory 5 and in the total sum of Category 5. Only a single number should be placed in either the CO_2 emissions or CO_2 removals column, as appropriate. Thirteen Member States reported net removals from LUCF for 2002, two Member States (Portugal and the Netherlands) reported net CO_2 emissions. At EC level, CO_2 removals were larger than CO_2 emissions. Therefore, net removals were reported that resulted from adding the net removals of the 13 Member States and deducting the net emissions of Portugal and the Netherlands.

This means that total CO_2 emissions at EC level do not include net emissions from LUCF of Portugal and the Netherlands. (In turn, net emissions from LUCF of Portugal and the Netherlands reduce net removals of the EC.) The sum of CO_2 emissions of the national submissions to the UNFCCC Secretariat includes net emissions of Portugal and the Netherlands and therefore is higher. In turn, the sum of CO_2 removals in the national submissions to the UNFCCC is also higher.

International bunkers

International bunker emissions of the EC inventory are the sum of the international bunker emissions of the Member States and all international (including intra-EU) marine and aviation emissions are included in the Memo Item "International Bunkers".

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 EC Member States, and also the European Community as a whole, are currently implementing QA/QC procedures to comply with the IPCC good practice guidance.

In October 2004, the QA/QC programme for the inventory of the European Community was adopted in the Climate Change Committee. The European Commission (Directorate General for 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 the EC inventory report submitted to the UNFCCC.

Further improvement of QA/QC procedures

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 the National Inventory System. 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[206].

Uncertainty Evaluation

By 15 April 2005, Tier 1 uncertainty analyses were available from 13 EU-15 Member States. These Member States cover about 95 % of total EU-15 GHG emissions in 2003.

An overview of information provided by Member States on uncertainty estimates in their national inventory reports 2004 or 2005 is contained within the 2005 Submission of the EC to the United Nations Framework Convention on Climate Change (UNFCCC) Secretariat. From the remaining Member States, either a national inventory report was available, which did not include quantitative uncertainty analysis, or no national inventory report was available at all.

[206] http://air-climate.eionet.eu.int/docs/meetings/040902_GHG_MM_QAQC_WS/meeting040902.html

As part of the ongoing work on uncertainty in greenhouse gas inventories, a workshop was held in Helsinki on 5-6 September 2005.

Annex 2:
UNFCCC Summary Reports 1. A of the Common Reporting Format for the European Community – EU-15

EU-15 1990

SUMMARY 1. A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)
(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 emissions	CO_2 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)					
Total National Emissions and Removals	**3,334,938**	**-223,716**	**21,021**	**1,318**	**NE**	**27,160**	**NE**	**15,814**	**NE**	**0**	**13,390**	**50,457**	**15,556**	**16,527**
1. Energy	**3,168,337**		**4,786**	**134**							**13,008**	**46,202**	**8,564**	**16,084**
A. Fuel Combustion — Reference Approach	3,129,369													
Sectoral Approach	3,147,771		876	134							12,980	46,018	7,280	15,609
1. Energy Industries	1,151,697		45	43							2,896	492	59	10,202
2. Manufacturing Industries and Construction	645,923		55	26							1,718	4,030	129	2,955
3. Transport	689,550		223	34							6,889	32,345	6,021	766
4. Other Sectors	639,753		540	31							1,376	8,932	1,042	1,602
5. Other	20,847		12	1							102	219	29	84
B. Fugitive Emissions from Fuels	20,566		3,910	0							28	184	1,284	475
1. Solid Fuels	2,740		2,458	0							3	91	13	166
2. Oil and Natural Gas	17,826		1,452	0							25	93	1,271	309
2. Industrial Processes	**153,184**		**50**	**341**	**NE**	**27,160**	**NE**	**15,814**	**NE**	**0**	**152**	**2,974**	**898**	**423**
A. Mineral Products	110,115		1	0							8	18	177	55
B. Chemical Industry	16,572		40	338	NE	0	NE	0	NE	0	101	160	397	193
C. Metal Production	24,939		7	0				12,504		0	13	2,651	20	60
D. Other Production	758										16	13	265	70
E. Production of Halocarbons and SF_6						26,610		2,723		0				
F. Consumption of Halocarbons and SF_6					NE	550	NE	587	NE	0				
G. Other	800		2	3	NE	0	NE	0	NE	0	2	7	38	1
3. Solvent and Other Product Use	**6,298**			**13**							**0**	**0**	**4,256**	0
4. Agriculture	**0**	**0**	**10,191**	**800**							184	386	518	0
A. Enteric Fermentation			6,987											
B. Manure Management			3,108	80							30		305	
C. Rice Cultivation			104										0	
D. Agricultural Soils	0	0	-27	718							106		175	
E. Prescribed Burning of Savannas			0	0							0	0	0	
F. Field Burning of Agricultural Residues			18	1							48	386	39	
G. Other			0	1							0	0	0	0

SUMMARY 1. A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)
(Sheet 2 of 2)

5. Land-Use Change and Forestry	**0**	**-223,716**	**9**	**0**							**12**	**340**	**1,233**	**1**
A. Changes in Forest and Other Woody Biomass Stocks	0	-257,973												
B. Forest and Grassland Conversion	10,348		9	0							2	76	0	
C. Abandonment of Managed Lands	0	-69												
D. CO_2 Emissions and Removals from Soil	26,541	0												
E. Other	0	-2,563	0	0							10	264	1,233	1
6. Waste	**6,480**		**5,986**	**29**							**33**	**556**	**86**	**20**
A. Solid Waste Disposal on Land	1,303		5,450								1	34	39	
B. Wastewater Handling			499	28							0	0	5	
C. Waste Incineration	5,177		22	1							28	519	34	16
D. Other	0		16	0							4	3	9	4
7. Other	**640**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Memo Items:														
International Bunkers	**164,171**		**6**	**4**							**1,429**	**216**	**69**	**926**
Aviation	61,536		1	2							230	110	25	15
Marine	102,635		4	2							1,199	106	44	911
Multilateral Operations	**0**		**0**	**0**							**0**	**0**	**0**	**0**
CO_2 Emissions from Biomass	**132,557**													

Notes:

In order to obtain a complete inventory for all years the data gap filling procedure has been used in a number of instances. Please see Annex 1 for more details.

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SUMMARY 1. A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)
(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 emissions	CO_2 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)					
Total National Emissions and Removals	**3,359,112**	**-270,834**	**20,569**	**1,301**	**NE**	**27,330**	**NE**	**14,061**	**NE**	**0**	**13,145**	**48,605**	**14,865**	**14,977**
1. Energy	**3,202,253**		**4,672**	**139**							**12,799**	**44,704**	**8,159**	**14,602**
A. Fuel Combustion — Reference Approach	3,193,444													
Sectoral Approach	3,181,688		870	139							12,771	44,526	6,980	14,305
1. Energy Industries	1,157,455		46	43							2,803	480	60	9,616
2. Manufacturing Industries and Construction	624,058		53	26							1,633	3,688	125	2,580
3. Transport	704,374		213	38							6,885	31,302	5,728	745
4. Other Sectors	678,806		551	32							1,367	8,882	1,050	1,306
5. Other	16,996		8	1							83	174	17	59
B. Fugitive Emissions from Fuels	20,565		3,801	0							28	178	1,179	297
1. Solid Fuels	2,418		2,353	0							3	95	11	22
2. Oil and Natural Gas	18,147		1,449	0							25	84	1,168	275
2. Industrial Processes	**144,009**		**48**	**334**	**NE**	**27,330**	**NE**	**14,061**	**NE**	**0**	**126**	**2,430**	**798**	**359**
A. Mineral Products	104,680		1	0							7	14	190	49
B. Chemical Industry	16,020		39	331	NE	0	NE	0	NE	0	78	151	344	178
C. Metal Production	22,344		6	0				10,787		0	13	2,124	16	59
D. Other Production	518										16	13	249	37
E. Production of Halocarbons and SF_6						26,608		2,639		0				
F. Consumption of Halocarbons and SF_6					NE	722	NE	636	NE	0				
G. Other	447		2	3	NE	0	NE	0	NE	0	0	5	0	0
3. Solvent and Other Product Use	**6,093**			**13**							**0**	**0**	**4,101**	0
4. Agriculture	**0**	**0**	**9,808**	**784**							171	360	473	0
A. Enteric Fermentation			6,788											
B. Manure Management			2,926	78							27		266	
C. Rice Cultivation			101										0	
D. Agricultural Soils	0	0	-25	704							97		171	
E. Prescribed Burning of Savannas			0	0							0	0	0	
F. Field Burning of Agricultural Residues			17	1							47	360	35	
G. Other			0	1							0	0	0	0

SUMMARY 1. A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)
(Sheet 2 of 2)

5. Land-Use Change and Forestry	**0**	**-270,834**	**14**	**0**							**13**	**390**	**1,237**	**0**
A. Changes in Forest and Other Woody Biomass Stocks	0	-304,770												
B. Forest and Grassland Conversion	10,321		9	0							2	75	0	
C. Abandonment of Managed Lands	0	-91												
D. CO_2 Emissions and Removals from Soil	26,658	0												
E. Other	0	-2,952	5	0							11	316	1,237	0
6. Waste	**6,141**		**6,027**	**30**							**37**	**721**	**97**	**16**
A. Solid Waste Disposal on Land	1,275		5,499								1	38	41	
B. Wastewater Handling			480	28							0	0	5	
C. Waste Incineration	4,866		29	1							35	681	41	16
D. Other	0		19	0							0	1	10	0
7. Other	**615**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Memo Items:														
International Bunkers	**163,693**		**5**	**4**							**1,382**	**207**	**67**	**890**
Aviation	61,655		1	2							228	107	24	16
Marine	102,038		4	2							1,154	100	43	875
Multilateral Operations	**0**		**0**	**0**							**0**	**0**	**0**	**0**
CO_2 Emissions from Biomass	**142,812**													

Notes:

In order to obtain a complete inventory for all years the data gap filling procedure has been used in a number of instances. Please see Annex 1 for more details.

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SUMMARY 1. A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)
(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 emissions	CO_2 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)					
Total National Emissions and Removals	**3,284,578**	**-261,764**	**20,279**	**1,278**	**NE**	**28,794**	**NE**	**11,545**	**NE**	**0**	**12,832**	**46,522**	**14,451**	**13,825**
1. Energy	**3,132,816**		**4,590**	**141**							**12,515**	**43,080**	**7,952**	**13,484**
A. Fuel Combustion — Reference Approach	3,173,378													
Sectoral Approach	3,112,181		810	141							12,487	42,920	6,814	13,197
1. Energy Industries	1,119,412		46	43							2,647	457	59	8,916
2. Manufacturing Industries and Construction	597,895		49	25							1,552	3,630	124	2,382
3. Transport	729,832		210	41							6,885	30,575	5,620	761
4. Other Sectors	650,240		499	30							1,326	8,088	995	1,095
5. Other	14,804		5	1							78	171	16	42
B. Fugitive Emissions from Fuels	20,634		3,780	0							27	160	1,138	287
1. Solid Fuels	2,182		2,307	0							2	87	9	20
2. Oil and Natural Gas	18,452		1,473	0							25	72	1,128	267
2. Industrial Processes	**139,155**		**49**	**322**	**NE**	**28,794**	**NE**	**11,545**	**NE**	**0**	**112**	**2,292**	**795**	**325**
A. Mineral Products	102,868		1	0							7	14	180	49
B. Chemical Industry	14,958		40	319	NE	0	NE	0	NE	0	68	146	345	162
C. Metal Production	20,125		6	0				8,124		0	12	1,990	15	51
D. Other Production	735										15	13	254	31
E. Production of Halocarbons and SF_6						27,880		2,738		0				
F. Consumption of Halocarbons and SF_6					NE	915	NE	684	NE	0				
G. Other	469		2	3	NE	0	NE	0	NE	0	0	5	0	0
3. Solvent and Other Product Use	**5,865**			**13**							**0**	**0**	**3,938**	0
4. Agriculture	**0**	**0**	**9,664**	**772**							164	283	462	0
A. Enteric Fermentation			6,666											
B. Manure Management			2,910	77							26		262	
C. Rice Cultivation			100										0	
D. Agricultural Soils	0	0	-25	693							93		171	
E. Prescribed Burning of Savannas			0	0							0	0	0	
F. Field Burning of Agricultural Residues			13	1							44	283	28	
G. Other			0	1							0	0	0	0

SUMMARY 1. A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)
(Sheet 2 of 2)

5. Land-Use Change and Forestry	**0**	**-261,764**	**-5**	**0**							**8**	**223**	**1,209**	**0**
A. Changes in Forest and Other Woody Biomass Stocks	0	-294,643												
B. Forest and Grassland Conversion	10,493		9	0							2	75	0	
C. Abandonment of Managed Lands	0	-112												
D. CO_2 Emissions and Removals from Soil	24,803	0												
E. Other	0	-2,305	-14	0							6	148	1,209	0
6. Waste	**6,136**		**5,981**	**30**							**33**	**644**	**95**	**15**
A. Solid Waste Disposal on Land	1,242		5,463								2	42	41	
B. Wastewater Handling			469	28							0	0	5	
C. Waste Incineration	4,894		25	1							32	601	37	15
D. Other	0		23	0							0	1	11	0
7. Other	**608**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Memo Items:														
International Bunkers	**170,164**		**5**	**4**							**1,422**	**215**	**69**	**875**
Aviation	67,119		1	2							251	114	26	18
Marine	103,046		4	2							1,171	101	43	857
Multilateral Operations	**0**		**0**	**0**							**0**	**0**	**0**	**0**
CO_2 Emissions from Biomass	**142,840**													

Notes:

In order to obtain a complete inventory for all years the data gap filling procedure has been used in a number of instances. Please see Annex 1 for more details.

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SUMMARY 1. A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)
(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 emissions	CO_2 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)					
Total National Emissions and Removals	**3,231,520**	**-261,870**	**19,960**	**1,235**	**NE**	**30,380**	**NE**	**10,488**	**NE**	**1**	**12,243**	**44,276**	**13,774**	**12,563**
1. Energy	**3,084,790**		**4,366**	**142**							**11,953**	**41,048**	**7,461**	**12,260**
A. Fuel Combustion — Reference Approach	3,084,364													
Sectoral Approach	3,063,203		784	142							11,914	40,907	6,413	11,945
1. Energy Industries	1,071,509		49	41							2,379	439	56	7,975
2. Manufacturing Industries and Construction	580,119		48	24							1,460	3,564	117	2,158
3. Transport	737,033		201	46							6,673	28,760	5,252	756
4. Other Sectors	660,981		482	30							1,329	7,978	974	1,027
5. Other	13,561		4	1							73	166	15	30
B. Fugitive Emissions from Fuels	21,587		3,581	0							38	140	1,048	315
1. Solid Fuels	2,267		2,097	0							2	77	8	18
2. Oil and Natural Gas	19,320		1,485	0							37	63	1,040	297
2. Industrial Processes	**134,555**		**48**	**305**	**NE**	**30,380**	**NE**	**10,488**	**NE**	**1**	**93**	**2,237**	**784**	**288**
A. Mineral Products	99,516		1	0							6	14	185	43
B. Chemical Industry	14,067		39	302	NE	0	NE	0	NE	0	53	152	331	147
C. Metal Production	19,956		6	0				6,821		0	12	1,937	15	49
D. Other Production	621										15	13	253	29
E. Production of Halocarbons and SF_6						27,723		2,874		0				
F. Consumption of Halocarbons and SF_6					NE	2,657	NE	793	NE	0				
G. Other	395		2	3	NE	0	NE	0	NE	0	0	4	0	0
3. Solvent and Other Product Use	**5,545**			**13**							**0**	**0**	**3,799**	0
4. Agriculture	**0**	**0**	**9,608**	**746**							155	124	449	0
A. Enteric Fermentation			6,624											
B. Manure Management			2,904	76							26		258	
C. Rice Cultivation			99										0	
D. Agricultural Soils	0	0	-25	668							90		178	
E. Prescribed Burning of Savannas			0	0							0	0	0	
F. Field Burning of Agricultural Residues			6	1							39	124	13	
G. Other			0	1							0	0	0	0

SUMMARY 1. A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)
(Sheet 2 of 2)

5. Land-Use Change and Forestry	**0**	**-261,870**	**-6**	**0**							**8**	**222**	**1,184**	**1**
A. Changes in Forest and Other Woody Biomass Stocks	0	-293,521												
B. Forest and Grassland Conversion	10,568		9	0							2	76	0	
C. Abandonment of Managed Lands	0	-133												
D. CO_2 Emissions and Removals from Soil	24,328	0												
E. Other	0	-3,112	-14	0							6	146	1,184	1
6. Waste	**6,073**		**5,944**	**30**							**34**	**646**	**97**	**13**
A. Solid Waste Disposal on Land	1,186		5,431								1	41	41	
B. Wastewater Handling			462	28							0	0	5	
C. Waste Incineration	4,888		26	1							32	604	38	13
D. Other	0		26	0							0	1	13	0
7. Other	**556**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Memo Items:														
International Bunkers	**177,387**		**6**	**4**							**1,495**	**230**	**72**	**946**
Aviation	70,691		1	2							266	121	27	18
Marine	106,696		4	2							1,229	109	45	928
Multilateral Operations	**0**		**0**	**0**							**0**	**0**	**0**	**0**
CO_2 Emissions from Biomass	**147,345**													

Notes:

In order to obtain a complete inventory for all years the data gap filling procedure has been used in a number of instances. Please see Annex 1 for more details.

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SUMMARY 1. A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)
(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 emissions	CO_2 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)					
Total National Emissions and Removals	**3,230,134**	**-266,312**	**19,545**	**1,261**	**NE**	**34,408**	**NE**	**9,821**	**NE**	**1**	**11,881**	**41,983**	**13,436**	**11,347**
1. Energy	**3,075,455**		**3,879**	**147**							**11,606**	**38,504**	**7,071**	**11,038**
A. Fuel Combustion — Reference Approach	3,089,272													
Sectoral Approach	3,053,044		720	147							11,577	38,355	6,022	10,763
1. Energy Industries	1,076,515		53	44							2,277	462	58	7,201
2. Manufacturing Industries and Construction	595,115		52	24							1,473	3,640	118	1,961
3. Transport	740,079		193	50							6,467	26,787	4,929	723
4. Other Sectors	628,197		419	28							1,290	7,306	901	859
5. Other	13,138		2	1							70	159	15	19
B. Fugitive Emissions from Fuels	22,411		3,159	0							30	149	1,050	275
1. Solid Fuels	2,573		1,712	0							2	80	7	15
2. Oil and Natural Gas	19,838		1,448	0							28	69	1,042	259
2. Industrial Processes	**142,595**		**51**	**323**	**NE**	**34,408**	**NE**	**9,821**	**NE**	**1**	**92**	**2,572**	**786**	**296**
A. Mineral Products	104,059		1	0							6	15	181	47
B. Chemical Industry	15,590		41	321	NE	0	NE	0	NE	0	51	162	332	157
C. Metal Production	21,185		6	0				5,881		0	13	2,247	15	51
D. Other Production	609										16	12	258	25
E. Production of Halocarbons and SF_6						30,321		3,157		0				
F. Consumption of Halocarbons and SF_6					NE	4,087	NE	783	NE	0				
G. Other	1,152		2	3	NE	0	NE	0	NE	0	0	18	1	0
3. Solvent and Other Product Use	**5,505**			**13**							**0**	**0**	**3,778**	0
4. Agriculture	**0**	**0**	**9,731**	**747**							145	120	442	0
A. Enteric Fermentation			6,641											
B. Manure Management			3,002	74							21		240	
C. Rice Cultivation			108										0	
D. Agricultural Soils	0	0	-26	671							85		189	
E. Prescribed Burning of Savannas			0	0							0	0	0	
F. Field Burning of Agricultural Residues			6	1							38	120	12	
G. Other			0	1							0	0	0	0

SUMMARY 1. A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)
(Sheet 2 of 2)

5. Land-Use Change and Forestry	**0**	**-266,312**	**73**	**0**							**7**	**159**	**1,263**	**0**
A. Changes in Forest and Other Woody Biomass Stocks	0	-297,777												
B. Forest and Grassland Conversion	10,648		9	0							2	77	0	
C. Abandonment of Managed Lands	0	-154												
D. CO_2 Emissions and Removals from Soil	23,992	0												
E. Other	0	-3,020	64	0							5	82	1,263	0
6. Waste	**5,887**		**5,811**	**30**							**32**	**629**	**96**	**12**
A. Solid Waste Disposal on Land	1,100		5,306								1	35	40	
B. Wastewater Handling			452	28							0	0	5	
C. Waste Incineration	4,788		25	1							31	593	38	12
D. Other	0		27	0							0	1	13	0
7. Other	**692**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Memo Items:														
International Bunkers	**177,717**		**6**	**4**							**1,482**	**233**	**71**	**907**
Aviation	74,069		1	2							281	126	28	20
Marine	103,648		4	2							1,201	107	43	887
Multilateral Operations	**0**		**0**	**0**							**0**	**0**	**0**	**0**
CO_2 Emissions from Biomass	**145,982**													

Notes:

In order to obtain a complete inventory for all years the data gap filling procedure has been used in a number of instances. Please see Annex 1 for more details.

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SUMMARY 1. A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)
(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 emissions	CO_2 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)			
Total National Emissions and Removals	**3,267,233**	**-263,545**	**19,424**	**1,263**	**NE**	**39,866**	**NE**	**9,420**	**NE**	**1**	**11,599**	**40,325**	**13,085**	**10,229**
1. Energy	**3,106,910**		**3,884**	**151**							**11,307**	**36,446**	**6,707**	**9,901**
A. Fuel Combustion — Reference Approach	3,112,537													
Sectoral Approach	3,084,940		710	151							11,279	36,306	5,679	9,629
1. Energy Industries	1,086,707		61	43							2,145	452	61	6,586
2. Manufacturing Industries and Construction	597,994		51	24							1,466	3,666	120	1,763
3. Transport	749,452		188	55							6,260	25,248	4,600	610
4. Other Sectors	638,487		409	29							1,338	6,778	882	658
5. Other	12,299		1	1							69	163	15	13
B. Fugitive Emissions from Fuels	21,970		3,173	0							28	140	1,029	272
1. Solid Fuels	2,473		1,787	0							2	84	7	12
2. Oil and Natural Gas	19,497		1,387	0							26	56	1,022	260
2. Industrial Processes	**149,092**		**49**	**318**	**NE**	**39,866**	**NE**	**9,420**	**NE**	**1**	**99**	**2,821**	**826**	**317**
A. Mineral Products	108,262		1	0							8	17	169	49
B. Chemical Industry	16,512		39	315	NE	0	NE	0	NE	0	54	168	352	171
C. Metal Production	22,726		6	0				5,705		0	13	2,480	19	48
D. Other Production	617										16	13	261	23
E. Production of Halocarbons and SF_6						32,816		2,629		0				
F. Consumption of Halocarbons and SF_6					NE	7,049	NE	1,086	NE	0				
G. Other	975		2	3	NE	0	NE	0	NE	0	0	3	25	0
3. Solvent and Other Product Use	**5,523**			**13**							**0**	**0**	**3,712**	0
4. Agriculture	**0**	**0**	**9,727**	**751**							148	111	441	0
A. Enteric Fermentation			6,647											
B. Manure Management			2,992	74							21		238	
C. Rice Cultivation			107										0	
D. Agricultural Soils	0	0	-26	675							90		192	
E. Prescribed Burning of Savannas			0	0							0	0	0	
F. Field Burning of Agricultural Residues			5	1							37	111	11	
G. Other			0	1							0	0	0	0

SUMMARY 1. A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)
(Sheet 2 of 2)

5. Land-Use Change and Forestry	**0**	**-263,545**	**99**	**0**							**11**	**307**	**1,306**	**0**
A. Changes in Forest and Other Woody Biomass Stocks	0	-294,237												
B. Forest and Grassland Conversion	10,808		9	0							2	79	0	
C. Abandonment of Managed Lands	0	-175												
D. CO_2 Emissions and Removals from Soil	22,430	0												
E. Other	0	-2,372	90	0							9	228	1,306	0
6. Waste	**5,008**		**5,665**	**30**							**34**	**640**	**94**	**11**
A. Solid Waste Disposal on Land	940		5,161								0	21	36	
B. Wastewater Handling			448	28							0	0	5	
C. Waste Incineration	4,066		27	1							32	617	39	11
D. Other	2		30	0							2	2	14	0
7. Other	**699**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**
Memo Items:														
International Bunkers	**183,152**		**6**	**4**							**1,543**	**242**	**74**	**927**
Aviation	77,951		1	2							295	130	29	17
Marine	105,202		4	2							1,248	112	45	910
Multilateral Operations	**0**		**0**	**0**							**0**	**0**	**0**	**0**
CO_2 Emissions from Biomass	**149,728**													

Notes:

In order to obtain a complete inventory for all years the data gap filling procedure has been used in a number of instances. Please see Annex 1 for more details.

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SUMMARY 1. A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)
(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 emissions	CO_2 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)			
Total National Emissions and Removals	**3,343,263**	**-280,027**	**19,140**	**1,285**	**NE**	**44,822**	**NE**	**9,376**	**NE**	**1**	**11,316**	**38,766**	**12,519**	**8,852**
1. Energy	**3,188,844**		**3,705**	**158**							**11,055**	**35,485**	**6,412**	**8,589**
A. Fuel Combustion — Reference Approach	3,223,525													
Sectoral Approach	3,166,305		734	158							11,028	35,344	5,422	8,326
1. Energy Industries	1,099,932		68	45							2,082	490	65	5,576
2. Manufacturing Industries and Construction	587,105		51	24							1,414	3,604	120	1,581
3. Transport	766,030		186	59							6,084	24,205	4,323	530
4. Other Sectors	701,752		428	30							1,390	6,905	902	626
5. Other	11,486		1	1							58	138	11	13
B. Fugitive Emissions from Fuels	22,539		2,971	0							27	141	991	263
1. Solid Fuels	2,663		1,598	0							2	84	7	12
2. Oil and Natural Gas	19,877		1,372	0							25	57	984	251
2. Industrial Processes	**143,202**		**48**	**327**	**NE**	**44,822**	**NE**	**9,376**	**NE**	**1**	**74**	**2,371**	**797**	**253**
A. Mineral Products	104,280		1	0							7	15	155	47
B. Chemical Industry	16,106		39	324	NE	0	NE	0	NE	0	31	164	340	108
C. Metal Production	21,174		6	0				5,696		0	13	2,040	17	47
D. Other Production	680										16	13	262	22
E. Production of Halocarbons and SF_6						34,026		2,408		0				
F. Consumption of Halocarbons and SF_6					NE	10,796	NE	1,271	NE	0				
G. Other	963		2	3	NE	0	NE	0	NE	0	1	3	23	1
3. Solvent and Other Product Use	**5,505**			**14**							**0**	**0**	**3,647**	0
4. Agriculture	**0**	**0**	**9,781**	**756**							149	126	419	0
A. Enteric Fermentation			6,688											
B. Manure Management			2,998	75							21		239	
C. Rice Cultivation			115										0	
D. Agricultural Soils	0	0	-26	679							89		167	
E. Prescribed Burning of Savannas			0	0							0	0	0	
F. Field Burning of Agricultural Residues			6	1							39	126	13	
G. Other			0	1							0	0	0	0

SUMMARY 1. A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)
(Sheet 2 of 2)

5. Land-Use Change and Forestry	**0**	**-280,027**	**78**	**0**							**7**	**169**	**1,151**	**0**
A. Changes in Forest and Other Woody Biomass Stocks	0	-310,130												
B. Forest and Grassland Conversion	10,832		9	0							2	80	0	
C. Abandonment of Managed Lands	0	-196												
D. CO_2 Emissions and Removals from Soil	22,218	0												
E. Other	0	-2,751	69	0							5	89	1,151	0
6. Waste	**5,013**		**5,528**	**30**							**30**	**615**	**92**	**9**
A. Solid Waste Disposal on Land	910		5,030								0	18	35	
B. Wastewater Handling			440	29							0	0	5	
C. Waste Incineration	4,103		25	1							29	596	37	9
D. Other	0		33	0							0	1	15	0
7. Other	**698**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**
Memo Items:														
International Bunkers	**194,772**		**6**	**4**							**1,632**	**247**	**79**	**967**
Aviation	82,585		1	2							314	136	30	18
Marine	112,187		5	2							1,319	111	49	949
Multilateral Operations	**0**		**0**	**0**							**0**	**0**	**0**	**0**
CO_2 Emissions from Biomass	**155,152**													

Notes:

In order to obtain a complete inventory for all years the data gap filling procedure has been used in a number of instances. Please see Annex 1 for more details.

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SUMMARY 1. A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)
(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 emissions	CO_2 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)			
Total National Emissions and Removals	**3,287,864**	**-279,549**	**18,654**	**1,286**	**NE**	**51,299**	**NE**	**8,407**	**NE**	**1**	**10,836**	**36,854**	**12,322**	**8,047**
1. Energy	**3,129,123**		**3,523**	**161**							**10,574**	**33,308**	**6,030**	**7,782**
A. Fuel Combustion — Reference Approach	3,157,269													
Sectoral Approach	3,108,533		703	161							10,548	33,171	5,043	7,525
1. Energy Industries	1,066,655		72	44							1,916	408	58	5,033
2. Manufacturing Industries and Construction	600,582		52	25							1,411	3,677	119	1,552
3. Transport	774,775		177	62							5,812	22,286	3,995	375
4. Other Sectors	655,865		402	29							1,350	6,677	861	553
5. Other	10,656		1	1							59	123	11	12
B. Fugitive Emissions from Fuels	20,590		2,820	0							26	137	987	256
1. Solid Fuels	2,483		1,502	0							1	85	7	10
2. Oil and Natural Gas	18,107		1,318	0							25	52	981	247
2. Industrial Processes	**148,083**		**47**	**318**	**NE**	**51,299**	**NE**	**8,407**	**NE**	**1**	**75**	**2,594**	**801**	**258**
A. Mineral Products	107,817		1	0							8	15	166	50
B. Chemical Industry	16,437		38	315	NE	0	NE	0	NE	0	30	163	329	112
C. Metal Production	22,246		6	0				5,489		0	13	2,284	19	50
D. Other Production	644										16	14	267	22
E. Production of Halocarbons and SF_6						36,585		1,427		0				
F. Consumption of Halocarbons and SF_6					NE	14,713	NE	1,491	NE	0				
G. Other	944		2	3	NE	0	NE	0	NE	0	1	3	21	1
3. Solvent and Other Product Use	**5,564**			**14**							**0**	**0**	**3,654**	0
4. Agriculture	**0**	**0**	**9,763**	**764**							151	114	429	0
A. Enteric Fermentation			6,612											
B. Manure Management			3,057	75							21		237	
C. Rice Cultivation			114										0	
D. Agricultural Soils	0	0	-26	687							89		181	
E. Prescribed Burning of Savannas			0	0							0	0	0	
F. Field Burning of Agricultural Residues			5	1							41	114	11	
G. Other			0	1							0	0	0	0

SUMMARY 1. A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)
(Sheet 2 of 2)

5. Land-Use Change and Forestry	**0**	**-279,549**	**62**	**0**							**7**	**157**	**1,314**	**0**
A. Changes in Forest and Other Woody Biomass Stocks	0	-311,853												
B. Forest and Grassland Conversion	10,943		9	0							2	80	0	
C. Abandonment of Managed Lands	0	-217												
D. CO_2 Emissions and Removals from Soil	23,332	0												
E. Other	0	-1,755	53	0							4	77	1,314	0
6. Waste	**4,536**		**5,258**	**30**							**30**	**681**	**94**	**7**
A. Solid Waste Disposal on Land	905		4,757								0	16	33	
B. Wastewater Handling			435	29							0	0	5	
C. Waste Incineration	3,631		28	1							29	664	40	7
D. Other	0		38	0							0	1	15	0
7. Other	**558**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Memo Items:														
International Bunkers	**209,485**		**6**	**5**							**1,778**	**262**	**85**	**1,069**
Aviation	87,212		2	2							334	142	31	21
Marine	122,273		5	3							1,444	119	54	1,048
Multilateral Operations	**0**		**0**	**0**							**0**	**0**	**0**	**0**
CO_2 Emissions from Biomass	**157,487**													

Notes:

In order to obtain a complete inventory for all years the data gap filling procedure has been used in a number of instances. Please see Annex 1 for more details.

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SUMMARY 1. A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)
(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 emissions	CO_2 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)			
Total National Emissions and Removals	**3,330,534**	**-277,636**	**18,246**	**1,213**	**NE**	**52,577**	**NE**	**7,568**	**NE**	**1**	**10,593**	**35,303**	**11,808**	**7,519**
1. Energy	**3,170,289**		**3,356**	**166**							**10,331**	**31,632**	**5,660**	**7,251**
A. Fuel Combustion — Reference Approach	3,252,302													
Sectoral Approach	3,150,291		694	166							10,304	31,516	4,735	6,985
1. Energy Industries	1,099,586		70	45							1,836	413	58	4,761
2. Manufacturing Industries and Construction	585,230		51	25							1,406	3,548	120	1,321
3. Transport	798,710		170	67							5,662	20,933	3,698	389
4. Other Sectors	656,721		402	28							1,351	6,505	848	504
5. Other	10,045		1	0							50	118	10	9
B. Fugitive Emissions from Fuels	19,998		2,663	0							27	116	925	266
1. Solid Fuels	2,326		1,348	0							1	66	6	10
2. Oil and Natural Gas	17,672		1,315	0							26	50	918	256
2. Industrial Processes	**149,768**		**46**	**242**	**NE**	**52,577**	**NE**	**7,568**	**NE**	**1**	**75**	**2,583**	**794**	**262**
A. Mineral Products	109,914		1	0							7	14	178	49
B. Chemical Industry	16,731		37	239	NE	0	NE	0	NE	0	32	159	306	117
C. Metal Production	21,590		6	0				5,297		0	14	2,289	20	51
D. Other Production	622										16	14	267	20
E. Production of Halocarbons and SF_6						33,568		867		0				
F. Consumption of Halocarbons and SF_6					NE	19,009	NE	1,404	NE	0				
G. Other	912		2	3	NE	0	NE	0	NE	0	0	2	23	0
3. Solvent and Other Product Use	**5,559**			**14**							**0**	**0**	**3,635**	0
4. Agriculture	**0**	**0**	**9,716**	**760**							149	117	420	0
A. Enteric Fermentation			6,592											
B. Manure Management			3,035	75							21		238	
C. Rice Cultivation			109										0	
D. Agricultural Soils	0	0	-26	683							90		169	
E. Prescribed Burning of Savannas			0	0							0	0	0	
F. Field Burning of Agricultural Residues			6	1							38	117	12	
G. Other			0	1							0	0	0	0

SUMMARY 1. A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)
(Sheet 2 of 2)

5. Land-Use Change and Forestry	**0**	**-277,636**	**69**	**0**							**11**	**304**	**1,209**	**0**
A. Changes in Forest and Other Woody Biomass Stocks	0	-307,591												
B. Forest and Grassland Conversion	11,399		10	0							2	84	0	
C. Abandonment of Managed Lands	0	-238												
D. CO_2 Emissions and Removals from Soil	23,309	0												
E. Other	0	-4,515	59	0							8	221	1,209	0
6. Waste	**4,198**		**5,059**	**31**							**27**	**668**	**91**	**6**
A. Solid Waste Disposal on Land	894		4,566								0	15	33	
B. Wastewater Handling			426	29							0	0	5	
C. Waste Incineration	3,304		28	1							27	651	38	6
D. Other	0		39	0							0	1	15	0
7. Other	**720**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Memo Items:														
International Bunkers	**221,809**		**7**	**5**							**1,897**	**276**	**91**	**1,167**
Aviation	93,831		2	2							358	150	33	22
Marine	127,979		5	3							1,540	126	58	1,145
Multilateral Operations	**0**		**0**	**0**							**0**	**0**	**0**	**0**
CO_2 Emissions from Biomass	**158,453**													

Notes:

In order to obtain a complete inventory for all years the data gap filling procedure has been used in a number of instances. Please see Annex 1 for more details.

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SUMMARY 1. A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)
(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 emissions	CO_2 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)			
Total National Emissions and Removals	**3,304,377**	**-294,722**	**17,730**	**1,137**	**NE**	**45,737**	**NE**	**7,061**	**NE**	**0**	**10,259**	**33,246**	**11,346**	**6,753**
1. Energy	**3,144,549**		**3,200**	**169**							**10,003**	**29,905**	**5,241**	**6,513**
A. Fuel Combustion — Reference Approach	3,170,435													
Sectoral Approach	3,125,211		691	168							9,974	29,812	4,396	6,282
1. Energy Industries	1,075,628		80	44							1,746	405	60	4,248
2. Manufacturing Industries and Construction	580,319		50	24							1,379	3,509	118	1,184
3. Transport	817,864		164	71							5,450	19,331	3,375	363
4. Other Sectors	641,813		396	29							1,351	6,449	834	478
5. Other	9,587		1	0							47	119	9	10
B. Fugitive Emissions from Fuels	19,338		2,509	0							29	93	845	231
1. Solid Fuels	2,263		1,232	0							1	53	6	8
2. Oil and Natural Gas	17,075		1,277	0							28	40	839	222
2. Industrial Processes	**149,351**		**46**	**170**	**NE**	**45,737**	**NE**	**7,061**	**NE**	**0**	**70**	**2,335**	**752**	**234**
A. Mineral Products	111,360		1	0							6	13	172	41
B. Chemical Industry	15,035		37	167	NE	0	NE	0	NE	0	28	151	279	102
C. Metal Production	21,187		6	0				4,824		0	14	2,083	19	48
D. Other Production	712										16	13	265	19
E. Production of Halocarbons and SF_6						23,506		508		0				
F. Consumption of Halocarbons and SF_6					NE	22,230	NE	1,729	NE	0				
G. Other	1,056		2	3	NE	0	NE	0	NE	0	0	4	18	0
3. Solvent and Other Product Use	**5,507**			**14**							**0**	**0**	**3,518**	0
4. Agriculture	**0**	**0**	**9,674**	**754**							149	113	428	0
A. Enteric Fermentation			6,578											
B. Manure Management			3,010	75							21		237	
C. Rice Cultivation			107										0	
D. Agricultural Soils	0	0	-25	677							91		179	
E. Prescribed Burning of Savannas			0	0							0	0	0	
F. Field Burning of Agricultural Residues			5	1							37	113	11	
G. Other			0	1							0	0	0	0

SUMMARY 1. A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)
(Sheet 2 of 2)

5. Land-Use Change and Forestry	**0**	**-294,722**	**48**	**0**							**7**	**182**	**1,314**	**0**
A. Changes in Forest and Other Woody Biomass Stocks	0	-324,524												
B. Forest and Grassland Conversion	11,537		10	0							3	89	0	
C. Abandonment of Managed Lands	0	-259												
D. CO_2 Emissions and Removals from Soil	23,633	0												
E. Other	0	-5,109	38	0							5	93	1,314	0
6. Waste	**4,220**		**4,761**	**31**							**30**	**711**	**93**	**6**
A. Solid Waste Disposal on Land	954		4,266								0	15	31	
B. Wastewater Handling			423	29							0	0	4	
C. Waste Incineration	3,266		30	1							29	695	41	6
D. Other	0		42	0							1	2	16	0
7. Other	**750**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Memo Items:														
International Bunkers	**223,437**		**6**	**5**							**1,848**	**276**	**89**	**1,109**
Aviation	101,506		2	3							386	159	34	21
Marine	121,931		5	3							1,462	117	55	1,087
Multilateral Operations	**0**		**0**	**0**							**0**	**0**	**0**	**0**
CO_2 Emissions from Biomass	**163,848**													

Notes:

In order to obtain a complete inventory for all years the data gap filling procedure has been used in a number of instances. Please see Annex 1 for more details.

EU-15 2000

SUMMARY 1. A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)
(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 emissions	CO_2 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)					
Total National Emissions and Removals	**3,328,296**	**-284,545**	**17,176**	**1,135**	**NE**	**44,416**	**NE**	**6,353**	**NE**	**0**	**9,913**	**30,618**	**10,643**	**6,093**
1. Energy	**3,165,353**		**2,977**	**169**							**9,647**	**27,011**	**4,702**	**5,865**
A. Fuel Combustion — Reference Approach	3,190,490													
Sectoral Approach	3,146,589		657	169							9,625	26,916	3,887	5,646
1. Energy Industries	1,108,612		83	45							1,765	425	61	3,846
2. Manufacturing Industries and Construction	584,725		51	23							1,357	3,496	121	1,083
3. Transport	819,668		148	73							5,143	16,677	2,890	276
4. Other Sectors	625,022		373	28							1,317	6,220	806	433
5. Other	8,562		1	0							44	99	8	9
B. Fugitive Emissions from Fuels	18,764		2,320	0							22	95	815	219
1. Solid Fuels	2,187		1,071	0							1	54	6	10
2. Oil and Natural Gas	16,577		1,249	0							21	41	809	209
2. Industrial Processes	**152,458**		**46**	**166**	**NE**	**44,416**	**NE**	**6,353**	**NE**	**0**	**75**	**2,502**	**752**	**222**
A. Mineral Products	113,539		1	0							6	13	169	42
B. Chemical Industry	16,047		37	164	NE	0	NE	0	NE	0	31	171	272	90
C. Metal Production	21,137		6	0				3,786		0	14	2,191	20	47
D. Other Production	679										17	14	272	18
E. Production of Halocarbons and SF_6						17,388		550		0				
F. Consumption of Halocarbons and SF_6					NE	27,028	NE	2,017	NE	0				
G. Other	1,056		2	2	NE	0	NE	0	NE	0	1	2	19	0
3. Solvent and Other Product Use	**5,558**			**14**							**0**	**0**	**3,453**	0
4. Agriculture	**0**	**0**	**9,581**	**754**							153	119	413	0
A. Enteric Fermentation			6,503											
B. Manure Management			2,990	73							20		232	
C. Rice Cultivation			106										0	
D. Agricultural Soils	0	0	-25	679							93		169	
E. Prescribed Burning of Savannas			0	0							0	0	0	
F. Field Burning of Agricultural Residues			6	1							40	119	12	
G. Other			0	1							0	0	0	0

SUMMARY 1. A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)
(Sheet 2 of 2)

5. Land-Use Change and Forestry	**0**	**-284,545**	**64**	**0**							**12**	**350**	**1,237**	**0**
A. Changes in Forest and Other Woody Biomass Stocks	0	-316,272												
B. Forest and Grassland Conversion	11,535		10	0							2	87	0	
C. Abandonment of Managed Lands	0	-280												
D. CO_2 Emissions and Removals from Soil	24,305	0												
E. Other	0	-3,833	54	0							10	264	1,237	0
6. Waste	**4,197**		**4,508**	**31**							**26**	**636**	**87**	**5**
A. Solid Waste Disposal on Land	956		4,028								0	13	28	
B. Wastewater Handling			408	30							0	0	5	
C. Waste Incineration	3,241		26	1							26	622	36	5
D. Other	0		46	0							0	1	18	0
7. Other	**730**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Memo Items:														
International Bunkers	**235,233**		**7**	**6**							**1,928**	**249**	**89**	**1,172**
Aviation	106,752		2	3							398	126	31	23
Marine	128,481		5	3							1,530	123	58	1,148
Multilateral Operations	**0**		**0**	**0**							**0**	**0**	**0**	**0**
CO_2 Emissions from Biomass	**163,233**													

Notes:

In order to obtain a complete inventory for all years the data gap filling procedure has been used in a number of instances. Please see Annex 1 for more details.

EU-15 2001

SUMMARY 1. A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)
(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 emissions	CO_2 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)					
Total National Emissions and Removals	**3,394,289**	**-308,295**	**16,698**	**1,111**	**NE**	**43,754**	**NE**	**5,526**	**NE**	**0**	**9,686**	**29,199**	**10,244**	**5,875**
1. Energy	**3,234,588**		**2,798**	**174**							**9,428**	**25,815**	**4,409**	**5,643**
A. Fuel Combustion — Reference Approach	3,296,200													
Sectoral Approach	3,215,857		664	174							9,402	25,728	3,623	5,433
1. Energy Industries	1,130,513		90	46							1,727	436	61	3,634
2. Manufacturing Industries and Construction	582,290		50	23							1,360	3,360	124	1,073
3. Transport	829,428		136	75							4,924	15,430	2,608	271
4. Other Sectors	665,838		387	29							1,354	6,414	823	445
5. Other	7,788		1	0							37	89	7	9
B. Fugitive Emissions from Fuels	18,731		2,134	0							26	87	786	209
1. Solid Fuels	2,171		874	0							1	43	6	8
2. Oil and Natural Gas	16,560		1,260	0							24	43	781	201
2. Industrial Processes	**149,495**		**45**	**164**	**NE**	**43,754**	**NE**	**5,526**	**NE**	**0**	**71**	**2,399**	**744**	**226**
A. Mineral Products	111,687		1	0							6	14	180	41
B. Chemical Industry	15,841		36	161	NE	0	NE	0	NE	0	27	172	259	90
C. Metal Production	20,526		6	0				3,225		0	14	2,097	17	53
D. Other Production	636										17	15	273	16
E. Production of Halocarbons and SF_6						10,910		421		0				
F. Consumption of Halocarbons and SF_6					NE	32,844	NE	1,880	NE	0				
G. Other	806		2	3	NE	0	NE	0	NE	0	0	2	15	0
3. Solvent and Other Product Use	**5,362**			**13**							**0**	**0**	**3,299**	0
4. Agriculture	**0**	**0**	**9,540**	**728**							151	108	422	0
A. Enteric Fermentation			6,451											
B. Manure Management			3,004	74							20		234	
C. Rice Cultivation			105										0	
D. Agricultural Soils	0	0	-25	652							90		177	
E. Prescribed Burning of Savannas			0	0							0	0	0	
F. Field Burning of Agricultural Residues			5	1							41	108	11	
G. Other			0	1							0	0	0	0

SUMMARY 1. A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)
(Sheet 2 of 2)

5. Land-Use Change and Forestry	**0**	**-308,295**	**45**	**0**							**9**	**224**	**1,284**	**0**
A. Changes in Forest and Other Woody Biomass Stocks	0	-344,900												
B. Forest and Grassland Conversion	11,613		10	0							2	87	0	
C. Abandonment of Managed Lands	0	-301												
D. CO_2 Emissions and Removals from Soil	23,770	0												
E. Other	1,523	0	35	0							6	137	1,284	0
6. Waste	**4,154**		**4,270**	**31**							**28**	**653**	**86**	**6**
A. Solid Waste Disposal on Land	895		3,812								0	12	27	
B. Wastewater Handling			385	30							0	0	5	
C. Waste Incineration	3,258		27	1							27	640	36	6
D. Other	0		46	0							0	1	19	0
7. Other	**690**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Memo Items:														
International Bunkers	**238,009**		**7**	**6**							**1,925**	**244**	**89**	**1,191**
Aviation	104,803		2	3							394	123	31	24
Marine	133,206		5	3							1,530	121	58	1,167
Multilateral Operations	**0**		**0**	**0**							**0**	**0**	**0**	**0**
CO_2 Emissions from Biomass	**169,421**													

Notes:

In order to obtain a complete inventory for all years the data gap filling procedure has been used in a number of instances. Please see Annex 1 for more details.

EU-15 2002

SUMMARY 1. A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)
(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 emissions	CO_2 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)					
Total National Emissions and Removals	**3,387,885**	**-329,847**	**16,281**	**1,085**	**NE**	**45,905**	**NE**	**5,699**	**NE**	**0**	**9,420**	**27,263**	**9,782**	**5,669**
1. Energy	**3,227,561**		**2,719**	**177**							**9,168**	**23,821**	**4,063**	**5,441**
A. Fuel Combustion — Reference Approach	3,174,573													
Sectoral Approach	3,209,573		632	177							9,140	23,748	3,295	5,242
1. Energy Industries	1,166,156		98	48							1,814	479	61	3,652
2. Manufacturing Industries and Construction	566,385		49	22							1,333	3,316	124	969
3. Transport	839,368		125	78							4,637	13,893	2,317	219
4. Other Sectors	629,863		359	28							1,320	5,978	786	394
5. Other	7,801		1	0							36	82	7	9
B. Fugitive Emissions from Fuels	17,987		2,087	0							29	73	768	199
1. Solid Fuels	2,192		848	0							1	35	5	6
2. Oil and Natural Gas	15,795		1,239	0							28	38	763	193
2. Industrial Processes	**150,345**		**44**	**145**	**NE**	**45,905**	**NE**	**5,699**	**NE**	**0**	**68**	**2,428**	**753**	**223**
A. Mineral Products	111,988		1	0							6	14	188	43
B. Chemical Industry	15,285		36	143	NE	0	NE	0	NE	0	25	126	260	87
C. Metal Production	21,741		6	0				3,631		0	14	2,172	17	53
D. Other Production	589										17	15	273	15
E. Production of Halocarbons and SF_6						9,182		253		0				
F. Consumption of Halocarbons and SF_6					NE	36,724	NE	1,815	NE	0				
G. Other	742		2	3	NE	0	NE	0	NE	0	0	2	15	0
3. Solvent and Other Product Use	**5,336**			**13**							**0**	**0**	**3,200**	0
4. Agriculture	**0**	**0**	**9,394**	**718**							148	110	413	0
A. Enteric Fermentation			6,333											
B. Manure Management			2,975	73							20		230	
C. Rice Cultivation			105										0	
D. Agricultural Soils	0	0	-25	643							87		171	
E. Prescribed Burning of Savannas			0	0							0	0	0	
F. Field Burning of Agricultural Residues			5	1							41	110	11	
G. Other			0	1							0	0	0	0

SUMMARY 1. A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)
(Sheet 2 of 2)

5. Land-Use Change and Forestry	**0**	**-329,847**	**46**	**0**							**9**	**250**	**1,267**	**0**
A. Changes in Forest and Other Woody Biomass Stocks	0	-362,944												
B. Forest and Grassland Conversion	11,565		10	0							2	85	0	
C. Abandonment of Managed Lands	0	-322												
D. CO_2 Emissions and Removals from Soil	24,333	0												
E. Other	0	-2,479	36	0							7	165	1,267	0
6. Waste	**3,923**		**4,078**	**31**							**27**	**654**	**87**	**5**
A. Solid Waste Disposal on Land	793		3,616								0	11	25	
B. Wastewater Handling			385	30							0	0	5	
C. Waste Incineration	3,130		27	1							26	641	37	5
D. Other	0		50	0							1	2	21	0
7. Other	**720**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Memo Items:														
International Bunkers	**240,794**		**7**	**6**							**1,875**	**236**	**88**	**1,167**
Aviation	103,770		2	3							384	120	30	22
Marine	137,024		5	2							1,491	116	58	1,145
Multilateral Operations	**0**		**0**	**0**							**0**	**0**	**0**	**0**
CO_2 Emissions from Biomass	**170,448**													

Notes:

In order to obtain a complete inventory for all years the data gap filling procedure has been used in a number of instances. Please see Annex 1 for more details.

EU-15 2003

SUMMARY 1. A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)
(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 emissions	CO_2 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)					
Total National Emissions and Removals	**3,447,354**	**-309,033**	**15,890**	**1,083**	**NE**	**50,329**	**NE**	**5,583**	**NE**	**0**	**9,273**	**26,481**	**9,594**	**5,234**
1. Energy	**3,284,901**		**2,512**	**180**							**9,014**	**22,895**	**3,865**	**5,026**
A. Fuel Combustion — Reference Approach	NE													
Sectoral Approach	3,267,072		647	179							8,986	22,803	3,127	4,836
1. Energy Industries	1,189,920		110	49							1,821	491	60	3,332
2. Manufacturing Industries and Construction	576,424		50	22							1,357	3,366	125	885
3. Transport	845,361		117	79							4,439	12,845	2,131	232
4. Other Sectors	647,453		369	29							1,335	6,017	804	381
5. Other	7,913		1	0							34	84	7	7
B. Fugitive Emissions from Fuels	17,829		1,865	0							28	92	738	190
1. Solid Fuels	1,898		735	0							1	55	5	8
2. Oil and Natural Gas	15,931		1,130	0							27	36	733	183
2. Industrial Processes	**152,507**		**47**	**149**	**NE**	**50,329**	**NE**	**5,583**	**NE**	**0**	**63**	**2,099**	**759**	**203**
A. Mineral Products	113,901		1	0							5	14	195	49
B. Chemical Industry	14,529		38	147	NE	0	NE	0	NE	0	25	126	263	82
C. Metal Production	22,800		6	0				3,403		0	14	1,941	16	56
D. Other Production	560										17	16	271	16
E. Production of Halocarbons and SF_6						9,254		278		0				
F. Consumption of Halocarbons and SF_6					NE	41,075	NE	1,903	NE	0				
G. Other	715		2	3	NE	0	NE	0	NE	0	0	2	13	0
3. Solvent and Other Product Use	**5,310**			**13**							**0**	**0**	**3,177**	0
4. Agriculture	**0**	**0**	**9,262**	**709**							147	107	408	0
A. Enteric Fermentation			6,226											
B. Manure Management			2,951	71							20		229	
C. Rice Cultivation			105										0	
D. Agricultural Soils	0	0	-25	637							86		168	
E. Prescribed Burning of Savannas			0	0							0	0	0	
F. Field Burning of Agricultural Residues			5	1							41	107	11	
G. Other			0	1							0	0	0	0

SUMMARY 1. A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)
(Sheet 2 of 2)

5. Land-Use Change and Forestry	**0**	**-309,033**	**103**	**1**							**24**	**773**	**1,301**	**0**
A. Changes in Forest and Other Woody Biomass Stocks	0	-344,225												
B. Forest and Grassland Conversion	11,526		10	0							2	84	0	
C. Abandonment of Managed Lands	0	-322												
D. CO_2 Emissions and Removals from Soil	25,834	0												
E. Other	0	-1,846	93	1							22	689	1,301	0
6. Waste	**3,807**		**3,966**	**31**							**25**	**608**	**85**	**4**
A. Solid Waste Disposal on Land	790		3,513								0	10	24	
B. Wastewater Handling			380	30							0	0	5	
C. Waste Incineration	3,016		26	1							25	596	35	4
D. Other	0		47	0							1	2	21	0
7. Other	**830**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Memo Items:														
International Bunkers	**244,557**		**7**	**6**							**1,982**	**245**	**91**	**1,269**
Aviation	105,683		2	3							395	122	30	24
Marine	138,875		5	3							1,588	123	61	1,245
Multilateral Operations	**0**		**0**	**0**							**0**	**0**	**0**	**0**
CO_2 Emissions from Biomass	**180,314**													

Notes:

In order to obtain a complete inventory for all years the data gap filling procedure has been used in a number of instances. Please see Annex 1 for more details.

Annex 3: UNFCCC CRF Table 10 for the EU-25

CRF Table 10 - EU-25 - Gg CO_2 *(sheet 1 of 2)*

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990	1991	1992	1993	1994	1995	1996	1997	1998	
1. Energy	**3,935,207**	**3,927,723**	**3,824,537**	**3,754,154**	**3,741,498**	**3,743,869**	**3,854,244**	**3,782,178**	**3,782,670**	**3,**
A. Fuel Combustion (Sectoral Approach)	3,914,589	3,907,108	3,799,876	3,732,481	3,718,988	3,721,783	3,831,505	3,761,228	3,762,150	3,
1. Energy Industries	1,583,799	1,573,874	1,510,863	1,435,285	1,433,622	1,430,806	1,453,329	1,416,582	1,438,001	1,
2. Manufacturing Industries and Construction	787,100	743,610	711,084	703,413	730,244	729,731	727,393	733,925	704,774	
3. Transport	753,872	764,988	790,943	796,197	800,992	808,268	828,633	838,077	861,832	
4. Other Sectors	764,489	803,658	772,645	780,921	738,266	737,719	809,318	761,078	746,973	
5. Other	25,330	20,978	18,286	16,665	15,864	15,258	12,831	11,565	10,571	
B. Fugitive Emissions from Fuels	20,618	20,615	20,715	21,673	22,510	22,086	22,739	20,951	20,520	
1. Solid Fuels	2,740	2,418	2,202	2,283	2,589	2,503	2,769	2,758	2,743	
2. Oil and Natural Gas	17,878	18,197	18,513	19,390	19,921	19,583	19,971	18,193	17,777	
2. Industrial Processes	**178,734**	**164,404**	**159,645**	**153,264**	**162,018**	**169,203**	**161,947**	**168,653**	**172,687**	
A. Mineral Products	131,287	122,142	120,653	115,780	120,480	125,777	120,308	125,652	129,508	
B. Chemical Industry	18,062	17,208	15,575	14,983	16,474	17,556	17,208	17,480	18,381	
C. Metal Production	26,903	24,089	21,412	21,484	22,561	24,279	22,789	23,938	23,265	
D. Other Production	1,682	518	1,537	621	1,351	617	680	644	622	
E. Production of Halocarbons and SF_6	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	
G. Other	800	447	469	395	1,152	975	963	944	912	
3. Solvent and Other Product Use	**7,069**	**6,773**	**6,478**	**6,099**	**6,043**	**6,028**	**6,044**	**6,109**	**6,135**	

CRF Table 10 - EU-25 - Gg CO_2 *(sheet 2 of 2)*

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	
G. Other	0	0	0	0	0	0	0	0	0	0	
5. Land-Use Change and Forestry	**-310,161**	**-358,361**	**-352,807**	**-353,671**	**-355,901**	**-353,862**	**-371,667**	**-365,195**	**-347,804**	**-378,876**	**-3**
A. Changes in Forest and Other Woody Biomass Stocks	-338,022	-385,735	-378,574	-376,033	-376,617	-374,123	-389,032	-383,670	-363,819	-401,621	-3
B. Forest and Grassland Conversion	13,088	12,265	13,027	12,495	13,053	12,620	12,541	12,650	13,083	13,163	
C. Abandonment of Managed Lands	-14,139	-10,867	-14,489	-10,882	-14,282	-10,223	-11,520	-11,445	-11,588	-4,423	
D. CO_2 Emissions and Removals from Soil	31,474	28,929	29,534	23,861	24,965	20,236	19,095	19,025	19,034	19,114	
E. Other	-2,563	-2,952	-2,305	-3,112	-3,020	-2,372	-2,751	-1,755	-4,515	-5,109	
6. Waste	**6,542**	**6,425**	**6,634**	**6,561**	**6,385**	**5,502**	**5,507**	**5,034**	**4,703**	**4,727**	
A. Solid Waste Disposal on Land	1,303	1,275	1,242	1,186	1,100	940	910	905	894	954	
B. Waste-water Handling	0	0	0	0	0	0	0	0	0	0	
C. Waste Incineration	5,240	5,149	5,392	5,376	5,285	4,560	4,597	4,129	3,809	3,772	
D. Other	0	0	0	0	0	2	0	0	0	0	
7. Other	**640**	**615**	**608**	**556**	**692**	**699**	**698**	**558**	**720**	**750**	
Total Emissions/Removals with LUCF	**3,818,031**	**3,747,579**	**3,645,094**	**3,566,962**	**3,560,733**	**3,571,440**	**3,656,773**	**3,597,337**	**3,619,111**	**3,541,961**	**3,5**
Total Emissions without LUCF	**4,128,192**	**4,105,940**	**3,997,901**	**3,920,633**	**3,916,635**	**3,925,302**	**4,028,441**	**3,962,532**	**3,966,916**	**3,920,837**	**3,9**
Memo Items:											
International Bunkers	**168,610**	**169,589**	**177,118**	**182,759**	**181,207**	**188,938**	**200,735**	**215,741**	**227,348**	**229,410**	**2**
Aviation	63,877	63,991	69,542	72,810	76,133	80,479	85,201	89,816	96,313	104,358	1
Marine	104,733	105,598	107,577	109,949	105,073	108,460	115,534	125,925	131,034	125,052	1
Multilateral Operations	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
CO_2 Emissions from Biomass	**144,113**	**153,283**	**153,516**	**157,939**	**157,943**	**164,858**	**168,731**	**171,579**	**172,584**	**177,579**	**1**

CRF Table 10 - EU-25 - Gg CH_4 *(sheet 1 of 2)*

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Total Emissions	**26,402. 10**	**25,568. 81**	**24,988. 40**	**24,447. 18**	**24,002. 18**	**23,859. 38**	**23,348. 99**	**22,827. 07**	**22,422. 27**	**21,734. 93**
1. Energy	**6,628. 24**	**6,390. 03**	**6,107. 29**	**5,961. 81**	**5,487. 52**	**5,524. 03**	**5,353. 27**	**5,156. 93**	**4,843. 99**	**4,603. 74**
A. Fuel Combustion (Sectoral Approach)	1,059. 90	1,028. 76	954. 90	952. 32	887. 60	878. 19	905. 75	869. 84	848. 81	840. 60
1. Energy Industries	79. 80	71. 40	75. 18	70. 76	79. 41	78. 63	82. 92	86. 14	83. 39	92. 98
2. Manufacturing Industries and Construction	77. 79	61. 04	65. 72	56. 60	72. 07	60. 84	59. 87	60. 48	59. 94	59. 25
3. Transport	239. 36	229. 27	225. 91	216. 16	209. 29	204. 15	205. 38	196. 65	185. 83	179. 28
4. Other Sectors	630. 12	638. 55	562. 13	584. 46	504. 05	512. 72	536. 29	505. 49	498. 70	488. 17
5. Other	32. 82	28. 51	25. 96	24. 34	22. 80	21. 86	21. 27	21. 08	20. 96	20. 91
B. Fugitive Emissions from Fuels	5,568. 34	5,361. 27	5,152. 40	5,009. 49	4,599. 92	4,645. 85	4,447. 52	4,287. 09	3,995. 18	3,763. 14
1. Solid Fuels	3,733. 51	3,557. 15	3,341. 03	3,186. 11	2,806. 80	2,893. 48	2,703. 30	2,601. 56	2,317. 25	2,128. 45
2. Oil and Natural Gas	1,834. 83	1,804. 13	1,811. 37	1,823. 38	1,793. 12	1,752. 37	1,744. 22	1,685. 53	1,677. 92	1,634. 69
2. Industrial Processes	**69. 28**	**64. 67**	**62. 40**	**62. 13**	**65. 60**	**64. 73**	**64. 19**	**62. 86**	**59. 99**	**58. 28**
A. Mineral Products	1. 10	0. 92	0. 85	0. 72	0. 80	0. 81	0. 90	0. 77	0. 80	0. 65
B. Chemical Industry	51. 02	48. 05	48. 88	46. 88	50. 08	49. 21	48. 29	47. 53	44. 64	43. 63
C. Metal Production	14. 92	13. 45	10. 45	12. 35	12. 51	12. 47	12. 80	12. 35	12. 29	11. 80
D. Other Production	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00
E. Production of Halocarbons and SF_6	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00
F. Consumption of Halocarbons and SF_6	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00
G. Other	2. 24	2. 24	2. 22	2. 18	2. 20	2. 24	2. 20	2. 21	2. 26	2. 20
3. Solvent and Other Product Use	**0. 00**	**0. 00**	**0. 00**	**0. 00**	**0. 00**	**0. 00**	**0. 00**	**0. 00**	**0. 00**	**0. 00**
4. Agriculture	**11,988. 59**	**11,451. 09**	**11,148. 55**	**10,935. 76**	**10,991. 76**	**10,939. 39**	**10,942. 33**	**10,900. 58**	**10,810. 13**	**10,671. 11**
A. Enteric Fermentation	8,545. 44	8,206. 44	7,942. 99	7,766. 75	7,726. 72	7,687. 15	7,684. 32	7,588. 07	7,525. 72	7,426. 87
B. Manure Management	3,343. 09	3,148. 16	3,114. 72	3,086. 18	3,174. 44	3,163. 15	3,160. 65	3,216. 77	3,193. 46	3,155. 71
C. Rice Cultivation	106. 74	103. 24	101. 02	100. 42	109. 07	107. 79	115. 41	114. 59	109. 51	106. 96
D. Agricultural Soils	-26. 77	-25. 42	-25. 09	-25. 26	-25. 57	-25. 60	-25. 58	-25. 56	-25. 63	-25. 16
E. Prescribed Burning of Savannas	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00
F. Field Burning of Agricultural Residues	20. 09	18. 68	14. 92	7. 67	7. 11	6. 91	7. 53	6. 71	7. 08	6. 74
G. Other	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00

CRF Table 10 - EU-25 - Gg CH_4 *(sheet 2 of 2)*

5. Land-Use Change and Forestry	**15. 38**	**21. 20**	**1. 31**	**1. 43**	**80. 66**	**107. 92**	**87. 75**	**73. 20**	**80. 48**	**60. 67**	
A. Changes in Forest and Other Woody Biomass Stocks	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	
B. Forest and Grassland Conversion	12. 93	13. 98	13. 58	14. 12	14. 93	15. 95	16. 10	17. 80	18. 98	20. 13	
C. Abandonment of Managed Lands	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	
D. CO_2 Emissions and Removals from Soil	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	
E. Other	2. 45	7. 22	-12. 27	-12. 69	65. 72	91. 97	71. 65	55. 40	61. 50	40. 54	
6. Waste	**7,700. 60**	**7,641. 81**	**7,668. 84**	**7,486. 04**	**7,376. 64**	**7,223. 30**	**6,901. 44**	**6,633. 50**	**6,627. 69**	**6,341. 14**	**6,**
A. Solid Waste Disposal on Land	6,837. 83	6,803. 81	6,879. 89	6,711. 63	6,618. 09	6,474. 70	6,152. 64	5,874. 74	5,875. 67	5,603. 64	5,
B. Waste-water Handling	824. 98	789. 72	740. 75	722. 90	706. 01	692. 40	690. 79	692. 60	685. 55	665. 24	
C. Waste Incineration	21. 72	29. 21	25. 45	25. 76	25. 46	26. 66	25. 22	28. 40	27. 57	29. 77	
D. Other	16. 07	19. 08	22. 75	25. 75	27. 09	29. 54	32. 79	37. 76	38. 91	42. 48	
7. Other	**0. 00**	**0. 00**	**0. 00**	**0. 00**	**0. 00**	**0. 00**	**0. 00**	**0. 00**	**0. 00**	**0. 00**	
Memo Items:											
International Bunkers	**6. 08**	**6. 03**	**6. 22**	**6. 26**	**6. 64**	**7. 15**	**7. 49**	**7. 79**	**8. 00**	**7. 83**	
Aviation	1. 57	1. 48	1. 52	1. 51	2. 25	2. 37	2. 63	2. 55	2. 53	2. 67	
Marine	4. 51	4. 55	4. 71	4. 75	4. 39	4. 78	4. 86	5. 24	5. 47	5. 15	
Multilateral Operations	**0. 00**	**0. 00**	**0. 00**	**0. 00**	**0. 00**	**0. 00**	**0. 00**	**0. 00**	**0. 00**	**0. 00**	
CO_2 Emissions from Biomass											

CRF Table 10 - EU-25 - 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	**1,530. 53**	**1,483. 31**	**1,440. 44**	**1,389. 59**	**1,417. 05**	**1,421. 20**	**1,446. 42**	**1,446. 11**	**1,367. 92**	**1,314. 01**
1. Energy	**158. 20**	**163. 34**	**163. 46**	**165. 70**	**170. 28**	**175. 01**	**182. 82**	**185. 62**	**190. 76**	**193. 89**
A. Fuel Combustion (Sectoral Approach)	157. 96	163. 11	163. 22	165. 44	170. 00	174. 76	182. 55	185. 39	190. 53	193. 69
1. Energy Industries	52. 43	53. 44	53. 12	51. 54	53. 87	52. 45	53. 68	52. 92	55. 10	53. 74
2. Manufacturing Industries and Construction	29. 31	28. 99	27. 80	27. 13	27. 23	27. 56	26. 60	27. 66	27. 37	26. 32
3. Transport	37. 42	40. 89	44. 93	49. 07	53. 47	58. 73	64. 08	68. 19	72. 52	77. 27
4. Other Sectors	37. 79	38. 87	36. 49	36. 86	34. 66	35. 28	37. 57	36. 00	35. 02	35. 89
5. Other	1. 01	0. 91	0. 87	0. 84	0. 77	0. 74	0. 62	0. 61	0. 53	0. 48
B. Fugitive Emissions from Fuels	0. 23	0. 23	0. 24	0. 26	0. 28	0. 26	0. 26	0. 23	0. 23	0. 20
1. Solid Fuels	0. 01	0. 01	0. 01	0. 01	0. 01	0. 01	0. 01	0. 01	0. 01	0. 01
2. Oil and Natural Gas	0. 22	0. 22	0. 24	0. 25	0. 26	0. 24	0. 25	0. 22	0. 22	0. 19
2. Industrial Processes	**374. 48**	**359. 51**	**344. 69**	**329. 11**	**352. 51**	**347. 40**	**359. 25**	**349. 95**	**271. 06**	**197. 26**
A. Mineral Products	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00
B. Chemical Industry	371. 28	356. 36	341. 57	326. 10	349. 61	344. 56	356. 48	347. 32	268. 48	194. 65
C. Metal Production	0. 04	0. 03	0. 03	0. 03	0. 03	0. 03	0. 03	0. 03	0. 03	0. 03
D. Other Production	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00
E. Production of Halocarbons and SF_6	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00
F. Consumption of Halocarbons and F_6	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00
G. Other	3. 16	3. 12	3. 09	2. 98	2. 86	2. 80	2. 73	2. 60	2. 55	2. 57
3. Solvent and Other Product Use	**14. 47**	**14. 17**	**14. 34**	**14. 39**	**14. 18**	**14. 44**	**15. 22**	**14. 82**	**15. 54**	**15. 20**
4. Agriculture	**952. 47**	**915. 04**	**886. 89**	**849. 47**	**848. 82**	**852. 96**	**857. 63**	**864. 16**	**858. 56**	**875. 61**
A. Enteric Fermentation	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00
B. Manure Management	94. 92	91. 94	89. 60	87. 43	84. 43	84. 88	85. 05	84. 83	85. 47	104. 35
C. Rice Cultivation	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00
D. Agricultural Soils	855. 31	820. 89	795. 16	760. 05	762. 46	766. 18	770. 63	777. 34	771. 17	769. 39
E. Prescribed Burning of Savannas	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00
F. Field Burning of Agricultural Residues	1. 47	1. 44	1. 36	1. 23	1. 19	1. 15	1. 20	1. 25	1. 18	1. 13
G. Other	0. 77	0. 77	0. 77	0. 77	0. 75	0. 75	0. 75	0. 74	0. 74	0. 74

CRF Table 10 - EU-25 - Gg N_2O *(sheet 2 of 2)*

5. Land-Use Change and Forestry	**0. 47**	**0. 49**	**0. 33**	**0. 28**	**0. 23**	**0. 33**	**0. 22**	**0. 30**	**0. 35**	**0. 30**	
A. Changes in Forest and Other Woody Biomass Stocks	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	
B. Forest and Grassland Conversion	0. 10	0. 10	0. 10	0. 10	0. 11	0. 11	0. 12	0. 13	0. 14	0. 15	
C. Abandonment of Managed Lands	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	
D. CO_2 Emissions and Removals from Soil	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	
E. Other	0. 37	0. 39	0. 23	0. 18	0. 12	0. 22	0. 10	0. 18	0. 21	0. 14	
6. Waste	**30. 43**	**30. 75**	**30. 72**	**30. 63**	**31. 04**	**31. 05**	**31. 29**	**31. 24**	**31. 65**	**31. 76**	
A. Solid Waste Disposal on Land	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	0. 00	
B. Waste-water Handling	29. 17	29. 27	29. 29	29. 13	29. 50	29. 47	29. 79	29. 73	30. 16	30. 20	
C. Waste Incineration	1. 19	1. 38	1. 29	1. 31	1. 27	1. 29	1. 20	1. 20	1. 19	1. 25	
D. Other	0. 08	0. 11	0. 16	0. 20	0. 26	0. 29	0. 30	0. 30	0. 30	0. 31	
7. Other	**0. 00**	**0. 00**	**0. 00**	**0. 00**	**0. 00**	**0. 03**	**0. 03**	**0. 00**	**0. 00**	**0. 00**	
Memo Items:											
International Bunkers	**3. 95**	**3. 92**	**4. 19**	**4. 32**	**4. 34**	**4. 65**	**4. 89**	**5. 22**	**5. 51**	**5. 51**	
Aviation	1. 68	1. 67	1. 83	1. 92	2. 11	2. 22	2. 35	2. 46	2. 63	2. 82	
Marine	2. 27	2. 25	2. 36	2. 40	2. 24	2. 43	2. 55	2. 76	2. 88	2. 69	
Multilateral Operations	**0. 00**	**0. 00**	**0. 00**	**0. 00**	**0. 00**	**0. 00**	**0. 00**	**0. 00**	**0. 00**	**0. 00**	
CO_2 Emissions from Biomass											

CRF Table 10 - EU-25 - Gg F-gases

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Emissions of HFCs - CO_2 equivalent (Gg)	**27,163**	**27,333**	**28,797**	**30,384**	**34,415**	**39,952**	**45,109**	**51,957**	**53,382**	**47,194**	**46,**
HFC-23											
HFC-32											
HFC-41											
HFC-43-10mee											
HFC-125											
HFC-134											
HFC-134a											
HFC-152a											
HFC-143											
HFC-143a											
HFC-227ea											
HFC-236fa											
HFC-245ca											
Emissions of PFCs - CO_2 equivalent (Gg)	**17,443**	**15,690**	**12,993**	**11,857**	**11,206**	**10,808**	**10,588**	**9,632**	**8,859**	**8,149**	**7,**
CF_4											
C_2F_6											
C_3F_8											
C_4F_{10}											
$c\text{-}C_4F_8$											
C_5F_{12}											
C_6F_{14}											
Emissions of F_6 - CO_2 equivalent (Gg)	**10,557**	**11,039**	**11,861**	**12,517**	**13,672**	**15,285**	**15,125**	**13,551**	**12,340**	**10,097**	**10,**
SF_6											

CRF Table 10 - EU-25 - Gg - Summary

GREENHOUSE GAS EMISSIONS	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2
Net CO_2 emissions/removals	3,818,031	3,747,579	3,645,094	3,566,962	3,560,733	3,571,440	3,656,773	3,597,337	3,619,111	3,541,961	3,562,
CO_2 emissions (without LUCF)	4,128,192	4,105,940	3,997,901	3,920,633	3,916,635	3,925,302	4,028,441	3,962,532	3,966,916	3,920,837	3,931,
CH_4	554,444	536,945	524,756	513,391	504,046	501,047	490,329	479,368	470,868	456,434	443,
N_2O	474,463	459,827	446,537	430,774	439,287	440,571	448,391	448,293	424,055	407,342	407,
HFCs	27,163	27,333	28,797	30,384	34,415	39,952	45,109	51,957	53,382	47,194	46,
PFCs	17,443	15,690	12,993	11,857	11,206	10,808	10,588	9,632	8,859	8,149	7,
SF_6	10,557	11,039	11,861	12,517	13,672	15,285	15,125	13,551	12,340	10,097	10,
Total (with net CO_2 emissions/removals)	**4,902,101**	**4,798,412**	**4,670,040**	**4,565,885**	**4,563,359**	**4,579,102**	**4,666,316**	**4,600,138**	**4,588,614**	**4,471,177**	**4,477,**
Total (without CO2 from LUCF)	**5,212,262**	**5,156,774**	**5,022,847**	**4,919,556**	**4,919,260**	**4,932,964**	**5,037,983**	**4,965,333**	**4,936,419**	**4,850,053**	**4,845,**
Total (without LUCF)	**5,211,794**	**5,156,177**	**5,022,717**	**4,919,438**	**4,917,496**	**4,930,595**	**5,036,073**	**4,963,702**	**4,934,620**	**4,848,688**	**4,844,**
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2**
1. Energy	4,123,441	4,112,550	4,003,464	3,930,718	3,909,521	3,914,127	4,023,336	3,948,017	3,943,530	3,894,190	3,895,
2. Industrial Processes	351,440	331,273	321,461	311,351	331,965	344,301	345,485	353,597	332,557	299,703	303,
3. Solvent and Other Product Use	11,555	11,166	10,924	10,561	10,440	10,505	10,764	10,704	10,953	10,777	10,
4. Agriculture	547,026	524,135	509,054	492,986	493,962	494,144	495,653	496,803	493,165	495,533	491,
5. Land-Use Change and Forestry	-309,693	-357,765	-352,677	-353,553	-354,137	-351,492	-369,757	-363,563	-346,006	-377,511	-365,
6. Waste	177,689	176,436	177,204	173,264	170,916	166,818	160,137	154,021	153,695	147,735	143,
7. Other	640	615	608	556	692	710	709	558	720	750	