

**SECOND COMMUNICATION FROM THE EUROPEAN COMMUNITY UNDER  
THE UN FRAMEWORK CONVENTION ON CLIMATE CHANGE**

26 June 1998

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## 1. EXECUTIVE SUMMARY

- Introduction

This is the second report of the European Community under the United Nations Framework Convention on Climate Change. It updates the information given in the Community's first such Communication, dated 11 June 1996.

**All the information contained in this report, with the exception of Chapter 4 and the Annex, were registered before November 1997.**

- The European Community

The European Community is the only "regional economic integration organisation" under the UNFCCC. It is more than simply an international organisation: it is a supranational entity sui generis. It is made up of fifteen Member States: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom.

Its institutions have the power, in accordance with the Treaties, to make binding legislation as well as to undertake other non-binding acts.

- EC Inventory of greenhouse gas emissions and removals

Inventories for greenhouse gas emissions and removals for 1990, 1994 and 1995 are provided for carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), carbon monoxide (CO), nitrogen oxides (NO<sub>x</sub>) and non-methane volatile organic compounds (NMVOCs).

	CO <sub>2</sub>	CO <sub>2</sub> removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NMVOCs
1990	3 351 150	228 593	23 309	1 015	13 375	52 162	15 302
1994	3 228 656	233 119	21 981	968	12 159	44 254	13 703
1995	3 240 369	230 775	21 796	963	9 791	36 926	11 359

Table 1.1: Inventory of GHG emissions for EC-15 in 1990, 1994 and 1995 in Gg.

Main CO<sub>2</sub> emitting sources are fuel combustion and industrial processes. Agriculture and waste are responsible for most of the emissions of CH<sub>4</sub>. N<sub>2</sub>O comes mainly from industrial processes and agriculture. NO<sub>x</sub> and CO are strongly related to the use of energy (fuel combustion). NMVOCs originate mainly from fuel combustion (in particular transport) and solvent use.

CO<sub>2</sub> emissions in the EC-15 decreased between 1990 and 1994 by 3.7%. The main contributor to this figure was Germany, with a 10.8% decrease. Luxembourg has decreased its CO<sub>2</sub> emissions by 9.8%. 1995 estimates show an even greater decrease in these countries and the UK (6.8% decrease in the UK, 11.8% reduction in Germany and a 29.9% decrease in Luxembourg).

- Community Policies and Measures

The Community's policies and measures are related both to an overall strategy and to particular sectors of the economy.

In October 1997 the Commission presented a Communication '*Climate Change – The EU Approach to Kyoto*'<sup>1</sup> which underpinned the European Union's negotiating position in Kyoto. The analysis showed that a reduction of a basket of three gases carbon dioxide (CO<sub>2</sub>); methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) by 15% by 2010 compared to 1990 was technically feasible and economically manageable provided other industrialised countries made comparable efforts. This Communication was completed by a Commission Staff Working Paper '*Climate Change – Analysis of proposed EU emission reduction objectives for Kyoto*' which gave details about the nature, the potential and the cost of the policies and measures necessary to achieve this proposed emission reduction.

- Overall strategy

The Community strategy to limit CO<sub>2</sub> emissions and improve energy efficiency contain among other elements a monitoring mechanism for CO<sub>2</sub> and other greenhouse gas emissions (Council Decision 93/389/EEC) to monitor annually the Community's progress towards the objective of stabilising CO<sub>2</sub> emissions at 1990 levels by the year 2000 and the commitments undertaken under the UN Framework Convention on Climate Change. The ongoing assessment under the mechanism has produced two reports to date. While they show that the Community is on course to achieve its commitments, they do also demonstrate the need for strengthening policies and measures in Member States towards this end.

In line with the negotiations under the UNFCCC for a Protocol or other legal instrument, the Commission has proposed a revision of the mechanism (a) to provide for the continued monitoring of Community CO<sub>2</sub> emissions beyond 2000 and (b) to include all greenhouse gas emissions not controlled under the Montreal Protocol by sources and removals by sinks and in particular the main greenhouse gases CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O while providing for the other greenhouse gases along with the reporting requirements under the UNFCCC.

In 1992 the Commission proposed the introduction of a mandatory Community-wide energy and carbon dioxide tax. Following discussion in the Council, the proposal was modified in 1995 to allow for a transitional period when Member States would be free to set their own tax rates, including zero rates, while respecting a harmonised tax structure. The Council has not been able to reach an agreement on this proposal, and in March 1996 the Council invited the Commission to bring forward new proposals related to taxation of energy products.

The Commission presented such a proposal in March 1997.<sup>2</sup> The broad thrust of the new proposal is to extend the scope of the existing Community-wide excise system beyond mineral oils to also cover natural gas, coal and electricity. It also recommend Member States to avoid any increase in overall tax burden and to shift the burden of taxation away from labour.

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<sup>1</sup> COM (97) 481 final of 01.10.1997

<sup>2</sup> COM (97)30: Proposal for a Council Directive restructuring the Community framework for the taxation of energy products, OJ No C 139, 6.5.1997.



A further element of this strategy is the EC energy technology programmes.

In November 1996 the Commission adopted a strategy paper for reducing methane emissions, which proposes an option for Community action in the areas of agriculture, waste and coal and natural gas extraction and distribution.

- Specific sectors

In the energy and transformation industries the ALTENER programme (for the promotion of renewable energy resources) the SAVE programme (Specific Action for Vigorous Energy Efficiency) and the JOULE-THERMIE (non-nuclear energy programmes) continue to be relevant. The SAVE II Programme is already underway and ALTENER II is also planned.

As for transport, a strategy has been launched to improve the fuel efficiency of passenger cars, aimed at reducing average CO<sub>2</sub> emissions from newly registered cars to 120 g/km. There is a proposal gradually to raise minimum rates of excise duty on motor fuels. Other policy initiatives are aimed at encouraging the switch from road to more environmentally friendly forms of transport and from private to public passenger transport.

In the industry sector the Directive on "Integrated Pollution Prevention and Control IPPC" includes among main polluting substances energy efficiency as a criterion for the determination of best available technology.

The reform of the Common Agricultural Policy indirectly leads to a reduction of greenhouse gas emissions due to reduced number of cattle, a decrease in the use of nitrogen fertiliser, and non-food biomass production on set-aside land. Optional strategies for reducing methane emissions include animal manure management and research to develop viable policies and measures for methane produced from animal digestion.

In forestry, financial support is provided for afforestation of agricultural land. Forest fire prevention and protection against atmospheric pollution are both supported by Community schemes.

In the waste sector, several Directives regulate waste management across the Community. Further policies encourage the amount of waste created to be minimised. A Directive on packaging and packaging waste was required to be implemented by Member States by 30 June 1996. A proposal for a Directive on landfill would require new and old landfills which receive biodegradable waste to be fitted with a landfill gas control mechanism and, where possible, the gas collected to be used for energy production.

- Projections and effects of policies and measures

Under the monitoring mechanism, the progress towards the stabilisation target for the Community for the year 2000 is measured. Adding up the Member States projections results in the indication that CO<sub>2</sub> emissions will be stabilised in 2000. An alternative projection which uses some common assumptions on growth rates shows a likely increase of 3 - 5%. A projection based on the 1993 Commission energy scenarios shows that it cannot be excluded that Community emissions will increase within the range of 0 - 5% by 2000 over 1990 levels.

The first results of new EC "with measures" scenarios have been presented in the a Commission Staff Working Paper entitled '*Climate Change – Analysis of proposed EU emission reduction objectives for Kyoto*'. The "business as usual" scenario has been updated. Under the assumption that there are no strong policies to stimulate CO<sub>2</sub> reduction, it projects that energy-related CO<sub>2</sub> emissions will rise 2% by the year 2000, 8% by the year 2010 and 16% by the year 2020, compared to 1990 levels. The main sectors contributing to that growth are transport, power-heat production and energy. Industry will be the only sector that reduces its emissions under a "business as usual" scenario.

The first results of other studies, for instance related to the JOULE and THERMIE programmes show a considerable reduction potential below the business as usual scenario, and below the 1990 levels.

- Adaptation and vulnerability

The EC continues to fund projects on possible impacts of climate change on water resources. A doubling of CO<sub>2</sub> emissions is expected to cause large increases in evapotranspiration and a reduction in levels in ground aquifers in Southern Europe. The River Rhine will be filled from rain only instead of a combination of rain and snow. The effect on crops in the Rhine Valley is expected generally to be an increase in yields, although decreased low flow discharge may affect the irrigation of intensively fed crops.

A relatively small change in climate can have a significant impact on agricultural production due to interactions of increased CO<sub>2</sub> level, altered precipitation and enhanced evapotranspiration. Increased climate variability is likely to affect the inter-annual crop variability. Current differences in crop productivity between southern and northern Europe are likely to increase.

Recent data show that sea levels are rising along most of the coasts of Europe and that there is an increase in storminess in most of the North East Atlantic and in the North Sea. This may lead to increased flooding in the future.

Research projects about forests are continuing. They indicate that climate change tends to hasten the growth of young trees, while the restored forests in the Northern hemisphere may be providing carbon sinks. One pilot study shows an increase in ecosystem respiration which outweighs the observed increase in photosynthesis.

There are concerns about climate change impacts on desertification in Mediterranean countries. Winter conditions are drier and rainfall has been decreasing since about 1970. However, it is not clear that these trends are caused by global warming.

- Financial and international cooperation

The European Community, while not a participant in the Global Environment Facility, made ECU 4 million available in 1996 for co-financing a WB/GEF project on energy efficiency in China.

The SYNERGY programme fosters cooperation with other countries outside the Union in the field of energy policy. In 1997, a total budget of 6.9 MECU has been approved and is being used in a total of 41 projects across the globe including the Central and Eastern European countries (CEEC), Latin America, the Gulf, Asia and Africa. The THERMIE,

ALTENER, INCO, LIFE and PHARE co-operation programmes with third countries contain elements of considerable relevance to climate change.

Co-operation with developing countries proceeds in the context of a planned Europe-Asia energy co-operation strategy. Environmental aspects are an integral part of the bilateral co-operation with China. A number of tropical forest programmes have been funded, including those carried out under the Lomé Convention.

The TACIS programme allows the EC to support the newly independent States which were formerly part of the Soviet Union, and Mongolia. The grants for know-how to help these countries' transition to market economies include projects related to the environment. Under the PHARE co-operation programme with central and eastern Europe a number of national and multi country energy programmes are carried out.

- Research, demonstration and development.

Climate change relevant activities in the current Fourth Framework Programme for Research and Development are mainly carried out under the environment and climate and the non-nuclear energy "JOULE THERMIE" programmes. The Community research programmes have provided a significant input to the IPCC Second Assessment report. Areas of research include climate processes such as greenhouse gases studies, past climates, climate variability, simulation and prediction of climate change and impacts on natural resources. EC funded research is significantly contributing to the objectives of major international programmes dealing with the climate issue. The Community participates, through EURO-CLIVAR in Climate change modelling in the International CLIVAR (Climate Variability and Predictability) study of the World Climate Research Programme. There has been a significant amount of EC research on the human dimensions of and policy responses to climate change. Under JOULE THERMIE a new generation of models has been developed to represent the major components of the energy dimension of the climate change issue. A network of twenty institutions in Europe is participating in the "Climate Technology Strategies within Competitive Energy Markets towards a new and Sustainable growth" study, which is applying these new models. Under the INCO Programme, scientific co-operation with CEECs and developing countries has targeted joint research on sustainable management and use of natural resources, with emphasis on coastal zones, wetlands, inland seas, forests and drylands as well as on enabling energy, economic and environmental policies.

- Education, training and public awareness

The GREENSPIDER network, which is funded by the European Commission, promotes the coordination of public information activities and links Member States' environment ministries with those managing training and communication.

## 2. INTRODUCTION

The European Community<sup>3</sup> ratified the UN Framework Convention on Climate Change (UNFCCC) on 21 December 1993, and it entered into force on 21 March 1994. The

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<sup>3</sup> Throughout the text the term "European Community" is used, since this is the legal name deposited with the United Nations in 1994. The "Commission of the European Communities" is the formal name of the European Commission.

ratification was inter alia founded on Article 22 of the Convention which allows ratification, acceptance or approval by States and by Regional Economic Integration Organisations. It was considered that since the Community and its Member States share competence in the areas covered by the Convention, it is necessary that the Community and its Member States become contracting Parties so that all the obligations under the Convention can be properly fulfilled. A Council ad hoc group on climate change was established in which Member States and the Commission discuss and elaborate a Community strategy on climate change.

As a Party to the Convention, the European Community accepts, among others, the commitment to adopt policies and takes corresponding measures aimed at returning emissions of greenhouse gases to 1990 levels, individually or jointly, by the year 2000. With respect to CO<sub>2</sub>, the European Community set itself the objective of stabilising emissions at 1990 levels by the year 2000, in the terms agreed by the Council of Ministers on 29 October 1990.

In February 1993 the Fifth Environmental Action Programme "*Towards Sustainability*"<sup>4</sup> was launched. Climate change has been identified by the Fifth Action Programme as one of the key environmental themes to be tackled. A progress report covering the period 1992-95 was presented by the Commission in January 1996 (COM (95) 624 final<sup>5</sup>, 10.01.1996). It mentions the following obstacles which impede the success of current and future climate strategies:

- "the political difficulty in implementing pricing mechanisms that integrate climate change into economic and sectoral policies, as highlighted by the EC carbon/energy tax experience;
- the worrying trend in the transport sector;
- the limited impact of EC energy saving and reduction programmes, especially as far as energy efficiency measures for household appliances are concerned, above all due to Member States watering down the relevant Directives when it comes to transporting them into their own legislation;"

The first Communication of the European Community under the UNFCCC was submitted on 11.06.1996 (COM (96) 217 final)<sup>6</sup>. It covered the period 1990 - August 1995. The present Communication deals with measures taken and adopted in the period September 1995 – October / November 1997, and updates the state of implementation of measures to address climate change which are or will be pursued at Community level.

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<sup>4</sup> "*Towards Sustainability*" - ISBN n° 92-826-5157-6 (*out of stock*).

<sup>5</sup> Progress report from the Commission on the implementation of the European Community programme of policy and action in relation to the environment and sustainable development "*Towards Sustainability*".

<sup>6</sup> Communication from the Commission under the UN framework Convention on Climate Change.

### **3. SPECIFIC CIRCUMSTANCES IN THE EUROPEAN COMMUNITY**

#### **3.1 Administrative structure and decision-making process**

##### *3.1.1 Introduction*

This section outlines the structure of the European Community and how decisions and legislation, particularly those relating to the environment, are made in the Community at the time covered by the Report. It is not a legal text and does not attempt to give an exhaustive account, nor does it provide a substitute for referring to the Treaties and other legislation of the Community. It is intended to help the reader who is unfamiliar with the Community.

The European Community is the successor to the European Economic Community. The latter was established by the Treaty of Rome of 1957. This Treaty has been amended subsequently both to enlarge its objectives and to allow for the accession of new Member States. The principal amending instruments were the Single European Act of 1986 and the Treaty on European Union (often referred to as the 'Maastricht Treaty') of 1992. That Treaty changed the name from the European Economic Community to the European Community. It came into force on 1 November 1993. So the Community signed the UNFCCC as the European Economic Community. The new name was deposited with the United Nations in 1994. At the date of this Report the Community has fifteen Members: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom. The Treaty also established the European Union consisting of the European Community and two further pillars on common foreign and security policy and on co-operation in the fields of justice and home affairs. The European Union, however, is purely a political entity and does not have legal personality.

##### *3.1.2 Institutions*

The main institutions of the European Community are the directly elected European Parliament, the Council of Ministers, which consists of Ministers representing each of the fifteen Member States, the European Council (twice yearly summit conferences of the heads of State or Government of the Member States) the European Commission, which consists of twenty independent Members, and the Court of Justice.

##### *3.1.3 Nature of the Community*

As the only 'regional economic integration organisation' under the UNFCCC, the European Community is more than simply an international organisation: it is a supranational entity sui generis. The Community's institutions have power acting in accordance with the Treaties to pass legislation which can be binding throughout the Community on individuals, companies and other legal entities. The Court of Justice is to ensure that in the interpretation and application of the Treaty the law is observed.

##### *3.1.4 Community action - law making*

The main forms of legislation under the Treaties are regulations and directives. Regulations are directly applicable, that is they are binding in all Member States without any further action by the national legislatures. Directives are binding too, but only as to the result to be achieved. In order to apply generally in Member States, they have to be implemented in national legislation. A directive leaves to the national authorities the choice of form and methods.

In addition, the institutions have power to take decisions. A decision is binding in its entirety on those to whom it is addressed.

As far as law on the environment is concerned, on most subjects this is made under what is usually called the cooperation procedure. This procedure is laid down in Article 189c of the Treaty. It involves the Commission, the Council and the Parliament. The Commission makes a proposal; then the Council adopts a common position. Parliament has the opportunity to improve proposed legislation by proposing amendments to it or rejecting it. Depending on the positions adopted by the Parliament and the Commission, the procedure may conclude in the Council adopting the final text by qualified majority or by unanimity.

In contrast, legislation on some specific subjects requires the Council always to act unanimously on a proposal from the Commission and after consulting the Parliament. These include provisions primarily of a fiscal nature and measures significantly affecting a Member State's choice between different energy sources and the general structure of its energy supply.

### *3.1.5 Other Community action*

The other acts of the Community institutions have no binding force. These include recommendations and opinions.

Council conclusions are also in this category. They set out the conclusions of the Council of Ministers on the matters concerned, providing guidelines on the policy or on negotiating positions and possibly giving impetus to the development of legislation. They do not in themselves have legislative force.

There are other policy documents which do not have the force of law. Green papers present Commission policy orientation for debate to interested parties who may wish to comment. White papers are policy oriented documents prepared by the Commission. Strategy papers are often adopted in the form of communications by the Commission, for example presenting Commission policy orientation to the Council for consideration. Other communications are, similarly, policy documents without the force of law.

## **3.2 Basic data (update)**

A description of the specific circumstances within the European Community has already been given in the first communication. In this report, an update of relevant data is provided regarding land use, population density and growth, and basic figures for gross domestic product (GDP) and gross value added (GVA).

### *3.2.1 Geographical setting of the European Community*

The land use of the Community is dominated by agriculture (27%), forest (33%) and grassland (18%). Among Member States, there are big differences in land use. Finland (69%) and Sweden (62%) have a high proportion of forest, while Ireland has the highest proportion of agricultural land (80%). Table 1 provides an update of the use of land in the various Member States for the year 1994.

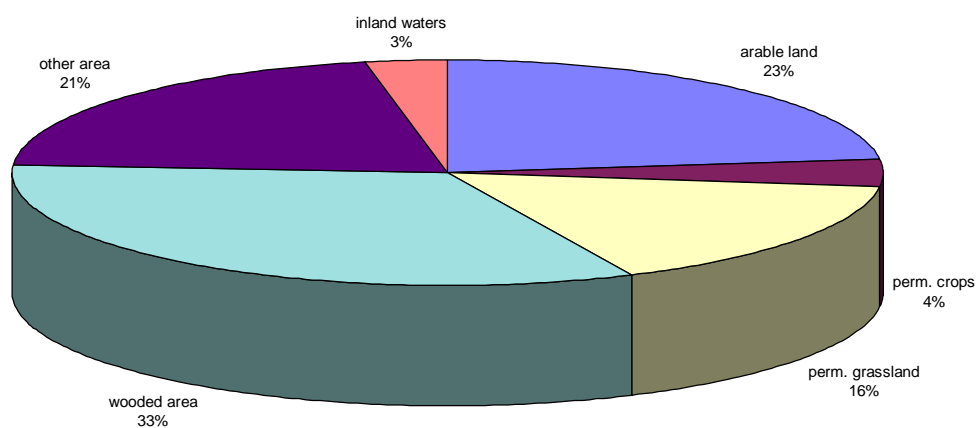
Table 3.1: Land use by main category in 1994

	<i>total area</i>	<i>agriculture</i>	<i>arable land</i>	<i>permanent crops</i>	<i>permanent grassland</i>	<i>wooded area</i>	<i>other area</i>
EUR 15	3 236 174	1 383 741	754 528	114 951	518 524	1 071 592	656 186
EUR 12 <sup>7</sup>	2 364 207	1 289 351	689 722	113 925	492 684	584 092	439 132
Austria	83 858	34 790	14 017	970	19 810	32 410	15 530
Belgium	30 518	13 631	9 329	145	4 069	6 170	10 448
Denmark	43 094	27 120	25 101	77	1 942	4 454	10 820
Finland	338 145	25 220	22 990	25	160	231 860	47 520
Germany	356 957	195 433	118 053	2 100	52 708	104 330	73 380
Greece	131 957	51 630	22 500	10 770	17 890	29 400	47 810
France	543 965	303 430	183 015	11 949	106 260	150 118	84 035
Ireland	70 285	44 070	9 577	20	34 329	3 200	21 630
Italy	301 323	167 430	90 300	33 230	43 000	67 700	58 980
Luxembourg	2 568	1 269	573	14	681	886	403
Netherlands	41 526	19 612	8 988	332	10 121	3 302	15 192
Portugal	91 905	39 902	23 258	7 720	8 617	31 080	20 483
Spain	505 990	289 287	139 540	47 157	102 589	159 152	51 782
Sweden	449 964	34 380	27 800	30	5 870	223 230	154 004
United Kingdom	244 101	158 889	59 487	411	110 480	24 300	44 170

(Source: Eurostat)

<sup>7</sup> In 1994, the year the figures refer to, the European Union consisted of twelve Member States. To get a more complete overview, data for Finland, Sweden and Austria are also included in this table.

land use by main category, 1994



### 3.2.2 Social profile

Total population, population density and population growth vary considerably among the Member States. An overview of population statistics for 1994 is provided in table 3.2.



Table 3.2: Population profile in the Member States in 1994

	<i>Population</i> <i>(1000)</i>	<i>Population density</i> <i>(persons/km<sup>2</sup>)</i>	<i>Population increase in</i> <i>% 1960 - 1994</i>
Austria	8 030	96	13
Belgium	10 116	331	11
Denmark	5 205	121	13
Finland	5 088	15	14
France	57 903	105	26
Germany	81 538	228	12
Greece	10 426	79	25
Ireland	3 571	51	26
Italy	57 193	190	14
Luxembourg	404	157	26
Netherlands	15 382	371	33
Portugal	9 902	108	11
Spain	39 143	78	28
Sweden	8 781	20	16
United Kingdom	58 351	236	11
Total	370 905	114	17

(Source Eurostat)

### 3.2.3 *Economic profile*

In 1995, the gross domestic product (GDP - a measure of the value of all produced goods and services) of the European Union (expressed in constant 1990 prices) amounted roughly to ECU 5 690 billion. The EC economy is a rather heterogeneous entity composed of the economies of its Member States, which are strongly differing in size. Table 3.3 provides an overview of GDP and its average annual growth rate over the period 1970-1995 in the Member States. Germany, France, Italy and the United Kingdom, the four Member States with the highest GDP, account for 73% of total GDP in the EC and are, therefore, largely determining the pace of economic development in the European Union.

Table 3.3: Gross Domestic Product at market prices in the European Union (expressed in 1990 prices)

Member State	GDP 1995 (1000 million ECU)	Annual %-change 1970-1995
Austria	137.9	2.7
Belgium	162.2	2.3
Denmark	112.2	2.1
Finland	102.7	2.5
France	994.8	2.5
Germany	1418.1	2.3*
Greece	70.6	2.8
Ireland	47.5	4.4
Italy	910.4	2.5
Luxembourg	10.6	3.9
Netherlands	248.0	2.5
Portugal	57.2	3.3
Spain	413.8	2.9
Sweden	183.1	1.6
United Kingdom	815.9	2.1
EC-15	5685.2	2.4*

\* Including West Germany only

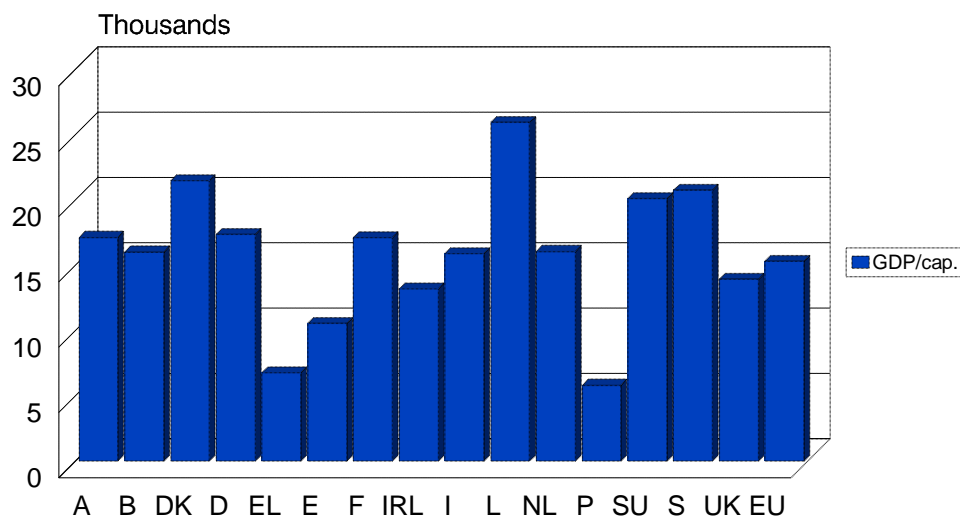
(Source: Commission services)

The level of development of the national economies in the European Union varies considerably across the Member States. Figure 3.1 shows the GDP per capita of the 15 Member States in 1995. In this year, average per capita GDP in the EC amounted to ca. ECU 15 300 (at 1990 prices). Three Member States have a per capita GDP which is considerably lower than the average per capita GDP for the European Union, ranging from ECU 5 800 to ECU 10 600. These countries, however, show a significantly higher growth trend than the average of the EC and thus can be expected to catch up with the other countries of the European Union.

Figure 3.1:

## Per capita GDP in the European Union in 1995

in ECU at 1990 prices



Source: European Commission

Service sectors (both market (including transport) and non-market services) are the most important economic sectors in the European Union. Together they account for two thirds of total gross value added (GVA) in the EC (see table 3.4). In the 1990s, growth in service sectors was considerably more dynamic than the average annual growth rate of all sectors. Manufacturing industries are the second most important sector. Their annual growth rate is far below average, though. The energy sector is growing swiftly from a low level. The share of the agricultural sector is currently decreasing.

Table 3.4: Sectoral Gross Value Added (at current prices) in EC-15

Sector	GVA 1994 (in mill. ECU)	%-share in total GVA 1994	Annual %-change 1990-1994
Agriculture, forestry	139 590.7	2.4	-2.0
Energy	270 536.8	4.7	4.6
Manufacturing	1 221 067.0	21.2	0.7
Building & construction	322 244.8	5.6	0.7
Market services	2 951 836.0	51.2	5.3
Non-market services	863 451.2	15.0	3.7
Total	5 768 727.0	100.0	3.5

Source: Eurostat

## **4. THE EC INVENTORY OF GREENHOUSE GAS EMISSIONS AND REMOVALS**

### **4.1 Introduction**

This chapter provides a summary of the European Community inventory of greenhouse gas emissions and removals for 1990, 1994 and 1995 for the gases CO<sub>2</sub> (carbon dioxide), CH<sub>4</sub> (methane), N<sub>2</sub>O (nitrous oxide), CO (carbon monoxide), NO<sub>x</sub> (nitrogen oxides) and NMVOCs (non-methane volatile organic compounds). Emission and removal estimates have been calculated on the basis of the national inventories of the 15 Member States and by using the 1995 "IPCC Guidelines for National Greenhouse Gas Inventories" as far as possible. The emission inventories of each of the 15 Member States are included in the Annex. Details on activity data, for example energy consumption, and emission factors have not been included in this second Communication since these have all been reported in national communications or within the Corinair databases. In the Annex references are given to the information sources for each Member State.

### **4.2 Inventory methodology**

Emissions and removals of greenhouse gases and precursors in the European Community in 1990, 1994 and 1995 are presented in Tables 4.1, 4.2 and 4.3. Estimates for 1995 should be considered provisional.

The EC inventory for these years has been compiled based on the inventories of the 15 individual Member States. The following sources have been used to compile the emission inventories of the individual Member States:

1. Second or first national communications prepared by the Member States under the UN Framework Convention on Climate Change, as far as these were available in May 1998;
2. National programmes and/or national emission inventories under the EC Decision on a Monitoring Mechanism for CO<sub>2</sub> and other greenhouse gases, as submitted between July 1996 and May 1998.
3. Corinair inventory programme of the European Environment Agency. Within this programme Member States have provided emission inventories for 1994 for this EU communication.
4. Eurostat. Emissions of CO<sub>2</sub> from fuel combustion are estimated by Eurostat, based on Eurostat energy balances and harmonised emission factors derived by Eurostat.

National communications submitted under UN FCCC or the EC Decision on a Monitoring Mechanism for CO<sub>2</sub> and other greenhouse gases are in this chapter further referred to as "national communications".

To estimate total greenhouse gas emissions in the European Community, greenhouse gas emissions and removals of each source category, as defined by IPCC, of each of the Member States were added together. In general the following procedure was followed. Estimates of emissions in the Member States were primarily taken from the national communications, as mentioned above. In some cases estimates were adjusted to comply fully with the 1995 IPCC Guidelines. If no emission estimates were reported in the Member States' national communications, then estimates provided by Member States as

part of the Corinair programme were used. Fuel combustion related CO<sub>2</sub> emissions reported in national communications and/or in Corinair were compared with Eurostat. In general a good correspondence was found between these estimates. For each IPCC source category and for each Member State, the details of the procedure followed are given in the Annex.

It should be noted that the emissions for 1990, as presented in table 4.1, are updates of the estimates provided earlier in the first EC Communication under the UN FCCC (*Communication from the Commission under the UN Framework Convention on Climate Change*, COM(96) 217 final, 11 June 1996). The previous 1990 emission estimate is therefore not included in this second Communication. It should be noted that the latest CO<sub>2</sub> emissions estimate for EU15 for 1990 (3 351 150 Gg) does not differ substantially from the previous emission estimate in the first EC Communication (3 285 620 Gg), the difference being less than 2%. These updates reflect improvements in understanding and improved methodologies for greenhouse gas emissions as provided in the complementary IPCC and European Monitoring and Evaluation of Pollutants (EMEP)/Corinair guidelines published in 1995 and 1996 respectively.

**Table 4.1 European Community (EU15) inventory of greenhouse gas emissions 1990 (Gg)**

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES							
EU-15 1990 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NMVOG
<b>NATIONAL TOTALS</b>	<b>3 364 879</b>	<b>242 322</b>	<b>23 309</b>	<b>1 015</b>	<b>13 375</b>	<b>52 162</b>	<b>15 302</b>
1 All Energy (Fuel Combustion + Fugitive)	3 152 565	0	5 350	174	13 100	47 968	9 082
A Fuel Combustion	3 140 503	0	853	174	13 000	47 850	7 743
1 Energy and Transformation Industries	1 196 136	0	46	62	2 935	677	67
2 Industry (ISIC)	583 759	0	58	31	1 485	3 503	138
3 Transport	694 989	0	252	40	7 069	34 188	6 382
4 Small Combustion	633 964	0	430	35	1 207	7 960	995
5 Other Combustion Activities	31 662	0	15	4	280	265	70
6 Traditional Biomass burned for Energy (*)	47 586	0	62	2	28	1 448	106
B Fugitive Emissions from Fuels	12 062	0	4 497	1	101	118	1 338
1 Solid Fuels	9	0	2 936	0	0	37	13
2 Oil and Natural Gas Fuels	12 053	0	1 561	1	101	81	1 325
2 Industrial Processes	142 477	0	20	357	189	2 697	819
3 Solvent and Other Product Use	5 505	0	0	9	0	2	4 271
4 Agriculture	1 430	0	9 521	417	27	831	272
A Enteric Fermentation	0	0	7 054	8	0	0	0
B Manure Management	0	0	2 022	29	0	0	1
C Rice Cultivation	0	0	117	0	0	0	0
D Agricultural Soils	1 430	0	284	379	6	0	198
E Prescribed Burning of Savannas	0	0	0	0	0	0	0
F Field Burning of Agricultural Residues	0	0	43	0	21	831	72
G Other Agriculture Activities	0	0	0	0	0	0	0
5 Land Use Change & Forestry	54 900	242 322	426	42	4	117	741
A Changes in Forests & other Woody Biomass Stocks	8 736	199 068	0	0	0	0	0
B Forest and Grassland Conversion	42 446	0	11	0	3	117	12
C Abandonment of Managed Lands	0	10 709	0	0	0	0	0
D Other Land Use Change Activities	3 719	32 546	415	42	1	0	729
6 Waste	7 275	0	7 991	11	55	546	118
A Solid Waste Disposal on Land	343	0	6 641	0	5	59	51
B Wastewater Treatment	1 314	0	679	6	0	0	5
C Waste Incineration	5 518	0	31	2	49	475	41
D Other Waste	100	0	642	3	1	13	20
7 Other	727	0	2	4	0	0	0
International Bunkers (not included in national totals)	169 590	0	10	4	1 470	288	198
Marine bunkers	110	0	5	3	1 094	163	133
Aviation bunkers	59 374	0	5	1	377	124	66
FNEC (**)	32 700	0	0	0	0	0	0

(\*) CO<sub>2</sub> emissions from biomass burning for energy is not included in the national totals, in accordance with the IPCC guidelines

(\*\*) FNEC: Final Non-Energy Consumption (EUROSTAT), see chapter 4.4

EU-15-Member States 1990	CO <sub>2</sub>		EMISSION ESTIMATES (Gg)				
	CO <sub>2</sub>	Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NMVOC
Austria	61 876	13 300	587	12	197	1 333	491
Belgium	116 090	2 057	634	31	339	1 127	331
Denmark	52 277	924	421	34	280	785	179
Finland	53 800	30 600	246	18	295	487	213
France	392 108	46 947	3 017	182	1 910	11 355	3 156
Germany	1 014 155	30 000	5 682	226	2 640	10 743	3 155
Greece	84 575	-	443	17	344	1 280	263
Ireland	30 719	5 160	811	29	115	429	180
Italy	441 653	35 891	2 329	165	1 943	7 892	2 222
Luxembourg	13 300	0	24	< 1	23	171	19
Netherlands	161 360	1 500	1 292	64	563	1 139	500
Portugal	47 123	1 152	816	14	346	1 254	282
Spain	226 423	28 970	2 218	95	1 177	5 581	1 179
Sweden	55 444	34 368	324	9	337	1 211	516
United Kingdom	613 976	11 453	4 464	120	2 867	7 374	2 618
<b>EU-15</b>	<b>3 364 879</b>	<b>242 322</b>	<b>23 309</b>	<b>1 015</b>	<b>13 375</b>	<b>52 162</b>	<b>15 302</b>

**Table 4.2 European Community (EU15) inventory of greenhouse gas emissions 1994 (Gg)**

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES							
EU-15 1994 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NMVOCs
<b>NATIONAL TOTALS</b>	<b>3 241 957</b>	<b>246 420</b>	<b>21 981</b>	<b>968</b>	<b>12 159</b>	<b>44 254</b>	<b>13 703</b>
1 All Energy (Fuel Combustion + Fugitive)	3 042 950	0	4 350	190	11 920	40 758	7 8
A Fuel Combustion	3 026 172	0	765	189	11 789	40 636	6 6
1 Energy and Transformation Industries	1 095 757	0	48	60	2 370	612	
2 Industry (ISIC)	543 340	0	53	31	1 301	3 439	1
3 Transport	736 034	0	225	61	6 740	28 535	5 3
4 Small Combustion	628 614	0	371	32	1 132	6 564	9
5 Other Combustion Activities	22 425	0	16	4	220	217	
6 Traditional Biomass burned for Energy (*)	49 730	0	52	1	24	1 271	
B Fugitive Emissions from Fuels	16 784	0	3 585	1	131	122	1 2
1 Solid Fuels	5	0	1 975	0	0	43	
2 Oil and Natural Gas Fuels	16 779	0	1 610	1	131	80	1 2
2 Industrial Processes	130 284	0	23	313	151	2 304	7
3 Solvent and Other Product Use	4 996	0	0	9	0	2	3 9
4 Agriculture	1 270	0	9 006	396	17	463	2
A Enteric Fermentation	0	0	6 615	8	0	0	
B Manure Management	0	0	1 929	27	0	0	
C Rice Cultivation	0	0	165	1	0	0	
D Agricultural Soils	1 270	0	272	361	6	0	1
E Prescribed Burning of Savannas	0	0	0	0	0	0	
F Field Burning of Agricultural Residues	0	0	24	0	11	463	
G Other Agriculture Activities	0	0	0	0	0	0	
5 Land Use Change & Forestry	53 807	246 420	435	44	2	73	777
A Changes in Forests & other Woody Biomass Stocks	10 344	197 093	0	0	0	0	0
B Forest and Grassland Conversion	39 796	0	6	0	2	73	7
C Abandonment of Managed Lands	0	16 467	0	0	0	0	0
D Other Land Use Change Activities	3 667	32 862	429	44	1	0	770
6 Waste	7 788	0	8 165	12	69	653	137
A Solid Waste Disposal on Land	353	0	7 223	0	6	70	62
B Wastewater Treatment	1 412	0	807	10	0	0	6
C Waste Incineration	6 024	0	36	3	58	568	46
D Other Waste	0	0	99	0	5	14	23
7 Other	863	0	2	4	0	0	0
<b>International Bunkers (not included in national totals)</b>	<b>182 123</b>	<b>0</b>	<b>1 859</b>	<b>6</b>	<b>1 463</b>	<b>352</b>	<b>211</b>
Marine bunkers	112 073	0	3	3	1 090	180	134
Aviation bunkers	70 050	0	1 856	3	373	172	77
<b>FNEC (**)</b>	<b>31 300</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

(\*) CO<sub>2</sub> emissions from biomass burning for energy is not included in the national totals, in accordance with the IPCC guidelines

(\*\*) FNEC: Final Non-Energy Consumption (EUROSTAT), see chapter 4.4



EU-15-Member States 1994	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NMVOC
Austria	59 467	14 726	581	13	178	1 132	411
Belgium	121 297	2 057	635	32	345	1 252	321
Denmark	63 344	956	428	33	272	704	166
Finland	59 253	16 800	245	18	282	443	165
France	386 386	59 654	2 860	168	1 794	9 658	2 865
Germany	904 500	30 000	4 849	219	2 211	6 738	2 135
Greece	89 005	-	457	17	367	1 427	332
Ireland	33 324	5 970	807	26	116	330	174
Italy	422 365	36 395	2 558	160	1 791	7 571	2 355
Luxembourg	11 998	0	22	1	22	145	18
Netherlands	168 390	1 700	1 203	70	493	905	388
Portugal	50 841	1 152	834	14	379	1 462	319
Spain	231 370	28 970	2 351	87	1 192	5 378	1 227
Sweden	58 438	30 000	302	9	330	1 142	478
United Kingdom	581 979	18 040	3 848	100	2 387	5 968	2 349
<b>EU-15</b>	<b>3 241 957</b>	<b>246 420</b>	<b>21 981</b>	<b>968</b>	<b>12 159</b>	<b>44 254</b>	<b>13 703</b>

Note: Sweden's CO<sub>2</sub> Removals estimates are from 1992.

**Table 4.3 European Community (EU15) inventory of greenhouse gas emissions 1995 (Gg). Provisional estimates.**

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES							
EU-15 1995 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>3 253 658</b>	<b>244 064</b>	<b>21 796</b>	<b>963</b>	<b>9 791</b>	<b>36 926</b>	<b>11 359</b>
1 All Energy (Fuel Combustion + Fugitive)	3 060 243	0	3 126	154	9 575	34 017	6 793
A Fuel Combustion	3 041 884	0	672	153	9 444	33 900	5 682
1 Energy and Transformation Industries	1 095 532	0	41	49	1 845	448	64
2 Industry (ISIC)	535 616	0	42	25	1	2 633	120
3 Transport	748 270	0	188	45	5 361	23 730	4 528
4 Small Combustion	639 472	0	335	28	1 028	5 771	875
5 Other Combustion Activities	22 999	0	13	4	76	47	6
6 Traditional Biomass burned for Energy	49 549	0	51	1	25	1 272	91
B Fugitive Emissions from Fuels	18 360	0	2 453	1	131	116	1
1 Solid Fuels	5	0	1 157	0	0	47	6
2 Oil and Natural Gas Fuels	18 355	0	1 296	1	131	69	1 106
2 Industrial Processes	125 299	0	23	229	126	1 716	651
3 Solvent and Other Product Use	4 867	0	0	3	0	2	2 808
4 Agriculture	1 529	0	7 272	312	17	455	212
A Enteric Fermentation	0	0	5 434	5	0	0	0
B Manure Management	0	0	1 421	21	0	0	1
C Rice Cultivation	0	0	122	0	0	0	0
D Agricultural Soils	1 529	0	272	280	6	0	175
E Prescribed Burning of Savannas	0	0	0	6	0	0	0
F Field Burning of Agricultural Residues	0	0	24	0	10	455	36
G Other Agriculture Activities	0	0	0	0	0	0	0
5 Land Use Change & Forestry	53 752	244 064	428	42	3	84	759
A Changes in Forests & other Woody Biomass Stocks	10 344	194 281	0	0	0	0	0
B Forest and Grassland Conversion	39 741	0	7	0	2	84	8
C Abandonment of Managed Lands	0	17 143	0	0	0	0	0
D Other Land Use Change Activities	3 667	32 641	420	42	1	0	751
6 Waste	7 105	0	6 159	8	70	651	136
A Solid Waste Disposal on Land	357	0	5 377	0	6	70	62
B Wastewater Treatment	1 563	0	672	6	0	0	3
C Waste Incineration	5 182	0	36	3	59	566	45
D Other Waste	2	0	74	0	5	14	26
7 Other	863	0	2	4	0,0	0	1
<b>International Bunkers (not included in national totals)</b>	<b>184 288</b>	<b>0</b>	<b>1 859</b>	<b>12</b>	<b>1 350</b>	<b>261</b>	<b>190</b>
Marine bunkers	111	0	1 853	10	1 003	124	123
Aviation bunkers	72 526	0	6	1	346	137	68
<b>FNEC (**)</b>	<b>30 900</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

(\*) CO<sub>2</sub> emissions from biomass burning for energy is not included in the national totals, in accordance with the IPCC guidelines

(\*\*) FNEC: Final Non-Energy Consumption (EUROSTAT), see chapter 4.4

Note: Totals do not add up for CH<sub>4</sub> and N<sub>2</sub>O (detail split not given for all countries)

EU-15-Member States 1995	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NMVOC
Austria	62 019	13 576	580	13	176	1 146	406
Belgium	112 194	2 057	635	32	345	1 252	321
Denmark	59 532	964	430	33	253	702	162
Finland	56 050	14 300	241	18	259	434	182
France	398 636	60 090	2 844	174	1 778	9 469	2 770
Germany	894 500	30 000	4 788	210	-	-	-
Greece	90 492	-	456	17	373	1 448	339
Ireland	33 931	6 230	812	26	118	295	170
Italy	447 644	36 199	2 516	162	1 849	7 786	2 375
Luxembourg	9 322	0	22	1	20	104	17
Netherlands	176 910	1 700	1 173	72	481	890	363
Portugal	50 841	1 152	834	14	379	1 459	319
Spain	231 370	28 970	2 351	87	1 192	5 378	1 227
Sweden	58 108	30 000	297	9	309	1 089	457
United Kingdom	572 109	18 826	3 817	95	2 259	5 474	2 252
<b>EU-15</b>	<b>3 253 658</b>	<b>244 064</b>	<b>21 796</b>	<b>963</b>	<b>9 791</b>	<b>36 926</b>	<b>11 359</b>

Note: 1994 data is given for some countries to get completeness: Belgium (CH<sub>4</sub>, N<sub>2</sub>O, NO<sub>x</sub>, CO, NMVOC), Germany (NO<sub>x</sub>, CO, NMVOC), Portugal (all) and (all) Spain. Sweden's CO<sub>2</sub> Removals are estimates from 1992.

**Table 4.4 Estimates of emissions of HFC, PFC, SF<sub>6</sub> for several EC Member States 1990, 1994 and 1995**

Note : in this table national total emission estimates are presented only for those Member States that have submitted these estimates to either UN FCCC or the EC Monitoring Mechanism

EU-15-Member States	EMISSION ESTIMATES (Gg)								
	1990	1994	1995	1990	1994	1995	1990	1994	1995
	HFC	HFC	HFC	PFC	PFC	PFC	SF6	SF6	SF6
Austria	-	0,25	-	-	0,00	0,00	-	0,06	-
Belgium	0,00	0,25	0,45	-	-	-	-	-	-
Denmark	0,00	0,60	0,75	NA	NA	0,00	0,02	0,02	0,02
Finland	-	0,06	0,06	-	0,00	0,00	-	0,00	0,00
France	2,97	-	-	2,00	-	-	0,14	-	-
Germany	0,20	1,94	2,21	0,40	0,25	0,25	0,16	0,24	0,25
Greece	-	-	-	-	-	-	-	-	-
Ireland	-	-	-	-	-	-	-	-	-
Italy	0,03	0,63	0,63	0,04	0,02	0,02	0,01	0,01	0,01
Luxembourg	-	-	-	-	-	-	-	-	-
Netherlands	0,49	0,71	0,86	0,36	0,35	0,35	0,06	0,06	0,06
Portugal	-	-	-	-	-	-	-	-	-
Spain	-	-	-	-	-	-	-	-	-
Sweden	0,00	0,15	0,15	0,06	0,06	0,06	0,04	0,05	0,05
United Kingdom	1,05	1,58	1,96	0,31	0,07	0,08	0,03	0,03	0,03
<b>EU-15</b>	-	-	-	-	-	-	-	-	-

### 4.3 Emission trends

Table 4.5 sets out the percentage change in total national and total EC CO<sub>2</sub> emissions (ignoring the effect of removals), between 1990 and 1994/1995.

**Table 4.5 Emission estimates of CO<sub>2</sub> of EU15 in 1994 and 1995<sup>(\*)</sup> and the relative change since 1990**

EU-15-Member States CO <sub>2</sub>	1994 (Gg)	Change from 1990 (%)	1995 (Gg)	Change from 1990 (%)
Austria	59 467	-3,9%	62 019	0,2%
Belgium	121 297	4,5%	112 194	-3,4%
Denmark	63 344	21,2%	59 532	13,9%
Finland	59 253	10,1%	56 050	4,2%
France	386 386	-1,5%	398 636	1,7%
Germany	904 500	-10,8%	894 500	-11,8%
Greece	89 005	5,2%	90 492	7,0%
Ireland	33 324	8,5%	33 931	10,5%
Italy	422 365	-4,4%	447 644	1,4%
Luxembourg	11 998	-9,8%	9 322	-29,9%
Netherlands	168 390	4,4%	176 910	9,6%
Portugal	50 841	7,9%	50 841	7,9%
Spain	231 370	2,2%	231 370	2,2%
Sweden	58 438	5,4%	58 108	4,8%
United Kingdom	581 979	-5,2%	572 109	-6,8%
<b>EU-15</b>	<b>3 241 957</b>	<b>-3,7%</b>	<b>3 253 658</b>	<b>-3,3%</b>

(\*) see footnote for table 4.3

Table 4.5 shows that total CO<sub>2</sub> emissions in the European Community decreased by 3.7% between 1990 and 1994.

### 4.4 Potential CO<sub>2</sub> emissions from feedstocks

The emission estimates presented in Tables 4.1, 4.2 and 4.3 are structured in source categories according to the reporting instructions of the 1995 "OECD/IPCC Guidelines for National Greenhouse Gas Inventories". However the source category "Final Non Energy Consumption (FNEC)" was added to the table, since inconsistencies exist between the detailed IPCC approach to calculating energy-related CO<sub>2</sub> emissions and the IPCC reporting instructions (Reference Approach). In general, the national communications of most Member States do not explicitly describe their approach to calculating potential and actual emissions from non-energy use of fossil fuels, or so-called feedstocks. These emissions can occur due to the fact that carbon in primary energy carriers is partly not burnt, but (partly) stored in products and (potentially) released. For reasons of consistency, Eurostat estimates have been used for each of the Member States for these actual "Final Non Energy Consumption (FNEC)" or "feedstock" emissions.

It should, however, be noted that Eurostat recently changed its approach to reporting the (potential) "FNEC" emissions (August 1997). The results of this revised methodology have been included in this second EC communication, while in the first EC communication the estimates prepared with the previous Eurostat method were reported. The latest

Eurostat method makes use of the IPCC guidelines for estimating the percentage of carbon stored for most products, thus resulting in an estimate of the "actual" FNEC emissions. The previous method did not use these guidelines for stored carbon and resulted in an estimate of the "potential" FNEC emissions, which was higher than the current estimate of "actual" FNEC emissions. In Table 4.2, the 1994 estimate is reported, and in Table 4.1, the revised estimate for 1990, both of which have been calculated using the latest Eurostat method for reasons of consistency.

The Eurostat estimates of CO<sub>2</sub> emissions from non-energy use of fossil fuels for each Member State are presented in the Annex.

#### **4.5 CO<sub>2</sub> emissions from bunkers**

According to the 1995 IPCC guidelines, CO<sub>2</sub> emissions from international marine and aviation bunkers are not included in the total emissions to be reported to UN FCCC, but these emissions should be reported separately. Therefore emission estimates from international marine and aviation bunkers for EU15 are reported separately in Tables 4.1, 4.2 and 4.3. The emission estimates for these source categories reported in this communication are based on the estimates in the national communications. Where these were not available, emission estimates from international marine bunkers were based on Eurostat figures and emission estimates from international aviation bunkers on Corinair figures.

The Annex provides the detailed estimates and the source of information for each of the Member States.

#### **4.6 Uncertainties**

The uncertainty in the emission estimates has not been quantified, since quantitative estimates of the uncertainty would be highly unreliable. A statistical approach to quantify uncertainties in the emission estimates would not result in reliable figures.

Estimates for CO<sub>2</sub> emissions from fuel combustion activities, based on energy balance figures, are rather reliable and are likely to be least uncertain, with an uncertainty of approximately +/- 3%, although the percentage uncertainty in the trend in emissions will be smaller than this.

The uncertainty in estimates of non-CO<sub>2</sub> greenhouse gas emissions is considerably higher, due to the lack of knowledge or awareness of some of the sources and appropriate emission factors for these gases. This is illustrated by the continuous development of the IPCC guidelines, especially for these gases, which resulted in new guidelines to be published in 1997 and to be used from 1998 onwards. As there may be some as yet unknown sources of these gases, estimates of these emissions are likely to be underestimated. The uncertainty in emission estimates is increasing in the following order : CO < NO<sub>x</sub> < CH<sub>4</sub> < NMVOC < N<sub>2</sub>O, with uncertainties increasing.

## 5. COMMUNITY POLICIES AND MEASURES

### 5.1 Introduction

#### 5.1.1 *The Community strategy to limit CO<sub>2</sub> emissions and improve energy efficiency*

In October 1991, the Commission presented an overall strategy to limit CO<sub>2</sub> emissions and improve energy efficiency, with the objective of stabilising CO<sub>2</sub> emissions in the Community in the year 2000 at the 1990 level (SEC (91) 1744 final)<sup>8</sup>.

In June 1992, a mutually reinforcing package of measures and programmes was proposed to the Council (COM(92) 246 final)<sup>9</sup>. It rests on four pillars :

- the EC energy technology programmes and trans-European networks;
- fiscal measures;
- complementary national programmes, and
- a monitoring mechanism for CO<sub>2</sub> and other greenhouse gases.

The initial outline of this strategy was described in the first Communication. An update on the implementation of the energy technology programmes is provided in Chapter 5.3 of this Communication. The original proposal for a carbon/energy tax did not receive approval. A description of new approaches towards fiscal measures is contained in Chapter 5.2.1.

On 24 June 1993 the Council of Environment Ministers adopted Decision 93/389/EEC<sup>10</sup> establishing a monitoring mechanism for anthropogenic CO<sub>2</sub> and other greenhouse gas emissions not controlled by the Montreal Protocol in the Community. The monitoring mechanism serves a double purpose of monitoring progress towards the stabilisation of CO<sub>2</sub> emissions at 1990 levels by the year 2000, and towards the fulfilment of the Community's joint commitments under the UNFCCC.

Member States are required to devise, publish, implement and periodically update national programmes for limiting their anthropogenic emissions of CO<sub>2</sub>. The Commission annually evaluates the national programmes, in order to assess whether progress in the Community as a whole is sufficient to attain the stabilisation objective.

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<sup>8</sup> Community strategy to limit carbon dioxide emissions and to improve energy efficiency.

<sup>9</sup> Communication from the Commission - A Community strategy to limit carbon dioxide emissions and to improve energy efficiency - 1.6.1992

<sup>10</sup> Council Decision for a *monitoring mechanism of Community CO<sub>2</sub> and other greenhouse gas emissions*, OJ No L 167, 9.7.1993, p. 31.

So far two evaluation reports have been presented by the Commission. The first evaluation report (COM (94) 67 final)<sup>11</sup> which was issued on 10.03.1994 covers the period 1990-1993. The second evaluation report (COM (96) 91 final)<sup>12</sup> was issued on 14 March 1996. The conclusions are described in Chapter 6.

While there has been considerable improvement in the quality of reporting since the first evaluation report, the Commission concluded that the information provided is still not sufficient to evaluate progress towards the Community stabilisation target in a satisfactory way.

The third evaluation report is under preparation.

In order to allow for the monitoring of greenhouse gas emissions in the post-2000 period, to ensure that the reporting under the monitoring mechanism is fully in line with the reporting requirements under the UNFCCC, and to cover any future commitments of the Community under a Protocol to the UNFCCC, the Commission proposed an amendment of the decision for a monitoring mechanism.

## **5.2 Cross-sectoral**

### *5.2.1 Fiscal measures*

#### 5.2.1.1 The 1992 proposal for energy/carbon taxation

In 1992, the European Commission proposed a Directive (COM (92) 226 final)<sup>13</sup> for the introduction of a tax on all energy products, excluding renewables, based 50% on energy content and 50% on the carbon content of fuels. The objective was to improve energy efficiency and favour fuel substitution towards products emitting less or no CO<sub>2</sub>.

It was proposed to introduce the tax in steps. After 7 years the rates would have reached 0.7 ECU/GJ and 9.4 ECU/CO<sub>2</sub>, equivalent to \$10 per barrel. Graduated reductions and conditional exemptions from the tax were to be applied for energy intensive firms.

It has been estimated that the tax proposal would lead to a reduction in CO<sub>2</sub> emissions of around 10% ten years after implementation, compared to a business-as-usual scenario. Depending on the business-as-usual scenario, this would imply a standstill or a slight reduction in CO<sub>2</sub> emissions compared to 1990.

The tax was intended to be an additional tax levied on top of existing excise duties. No agreement was reached in the Council.

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<sup>11</sup> Report from the Commission under Council Decision 93/389/EEC - *First evaluation of existing national programmes under the monitoring mechanism of Community CO<sub>2</sub> and other greenhouse gas emissions* - COM(94) 67 final, 10.3.1994.

<sup>12</sup> Report from the Commission under Council Decision 93/389/EEC - *Second evaluation of national programmes under the monitoring mechanism of Community CO<sub>2</sub> and other greenhouse gas emissions - Progress towards the Community CO<sub>2</sub> stabilisation target* - COM(96) 91 final, 14.3.1996.

<sup>13</sup> Proposal for a Council Directive *introducing a tax on carbon dioxide emissions and energy* - 30.6.1992, OJ No C 196, 3.8.1992.



### 5.2.1.2 The 1995 revision

As its meeting at Essen on 9 December 1994, the European Council took note of the Commission's intention to present guidelines on common parameters for those Member States willing to apply a CO<sub>2</sub>/energy tax. The Commission decided on 10 May 1995 to amend its initial proposal (COM (95)172 final)<sup>14</sup>, in order to overcome the obstacles raised during previous discussions in the Council.

The main change proposed was to introduce a transitional period during which the Member States, while respecting a harmonised structure, were free to set the tax rates product by product. This provided that the Community objectives of limiting CO<sub>2</sub> emission through improvement of energy efficiency and fuel switching towards low- or no-carbon fuels would be fully reflected in the structure of the rates applied. After this transition a harmonised tax would apply. In addition, the minimum rates set out in the original proposal were revised and became target rates towards which the Member states would endeavour to make their domestic rates converge in the medium term.

The Council was not able to reach agreement on the modified CO<sub>2</sub>/energy tax proposal and in March 1996 requested the Commission to come forward with new proposals in the field of taxation of energy products.

### 5.2.1.3 Restructuring of Community Excise Duty System on Energy Products

On 12 March 1997 the Commission adopted a proposal for a Council Directive restructuring the Community framework for the taxation of energy products (COM (97)30). The new proposal enlarges the scope of the Community minimum rate system beyond mineral oils to cover all energy products, including mineral oils, natural gas and solid fuels (coal, peat, lignite) when used as heating or motor fuel and to electricity. The main objective behind the proposed Directive is to strengthen the internal market by eliminating distortions between different types of fuels. It would, in addition, give Member States the opportunity to shift the burden of taxation away from employed labour and towards the use of natural resources which damage the environment.<sup>15</sup>

Even though the proposal has internal market aspects as its driving force it also takes account of environmental policy objectives.

Firstly, the expansion of the taxable scope will widen the application of Community taxation provisions to CO<sub>2</sub> emitting products from 40% to nearly 90%. The new proposed Directive envisages that the Community minimum levels of taxation on mineral oils (which were agreed in 1992 and are therefore, in many cases, now substantially below the rates applied by Member States) be up-rated and minimum levels introduced for products other than mineral oils. The proposed increases in minimum rates are spread over a four-year period. In order not to harm the competitiveness of European firms, the proposal contains

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<sup>14</sup> Amended proposal for a Council Directive *introducing a tax on carbon dioxide emissions and energy* - 10.5.1995.

<sup>15</sup> White Paper "Growth, Competitiveness, Employment" in 1993, and more recently in the Commission's "Confidence Pact for Employment" in 1995 and the fiscal strategy presented in October 1996 (COM(96)546 of 22.10.1996) and endorsed by the European Council in Dublin in December 1996.

some mandatory and optional exemptions for energy intensive industry. However, all users (polluters) pay something, since exemptions for energy intensive firms only apply to the amount of tax that exceeds 1 % of their sales value.

Secondly, the proposal provides Member States with a number of options enabling them to pursue more ambitious environmental policies. The proposed Directive itself does not introduce a carbon and energy tax, but establishes a minimum level of taxation on all energy products. Member States may take into account all indirect taxes (except VAT) borne by a product in order to fulfil the required tax level. Thus, depending on their national environmental policy objectives, Member States are free to apply taxes on CO<sub>2</sub> emissions or other emissions, taxes on energy, or excise duties. The proposal also provides Member States with the possibility of using differential levels of taxation depending on the environmental standards of products, provided that the Community minimum levels are respected. In addition, there are also a variety of optional exemptions and reductions for various forms of transport, depending on their environmental impact. Passenger transport or public-sector fleets using natural gas and LPG, rail transport and navigation on inland waterways may benefit from incentives to encourage their development.

Analysis suggests that the proposal will result in a reduction in CO<sub>2</sub> emission between 0,5 and 1,7 % from the year 2005 onwards compared to a "business as usual" scenario, which is equivalent to a reduction of between 20 and 60 Mtonnes CO<sub>2</sub>.

Estimates of the macro-economic costs of the proposed Directive made using three separate models confirm that when the tax revenues are used in a budget neutral way to reduce employers' non-wage costs, the proposal will have positive impacts on GDP and employment. Compared to economic projections for 2005 with the existing tax system, GDP is estimated to increase by between 0.02% and 0.24%. Overall employment in the EC is expected to be 150 000 to 450 000 persons higher in the same period.

## 5.2.2 *Strategy paper for reducing methane emissions*<sup>16</sup>

### 5.2.2.1 Introduction

Community discussions on the policy response to climate change initially focused on carbon dioxide (CO<sub>2</sub>). Less attention was paid to the other greenhouse gases, including methane and nitrous oxide, partly because of the gaps in quantitative knowledge about their sources and sinks.

In the January 1996 progress report on the implementation of the Fifth Action Programme for the Environment, the assessment made of the climate change issue concluded that priority action is required at EC level to "identify impacts of greenhouse gases other than CO<sub>2</sub>". In response, the Council asked the Commission to submit a strategy to reduce greenhouse gases other than CO<sub>2</sub>, in particular methane and nitrous oxide.

The main aims of the "Strategy paper for reducing methane emissions" adopted by the Commission on 15.11.96 are to identify the main emissions sources and sinks, and to provide a set of potential measures for incorporating into a Community greenhouse gas

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<sup>16</sup> COM(96)557 final of 15.11.1996 - Communication from the Commission to the Council and the European Parliament.

emissions mitigation strategy. A number of initiatives proposed in the strategy need a Community approach, while others may be better undertaken at national, regional and local levels.

#### 5.2.2.2 EC policies to be considered

Agriculture (45%) comes first, with methane production resulting from the anaerobic enteric fermentation (digestion) of animals (30%) and from the anaerobic management of animal wastes (manure) (15%). Next comes waste (32%), where methane is generated by the anaerobic fermentation of organic matter trapped in landfills. Finally, methane is emitted in the energy sector (23%), in particular in coal mining (12%) and the production, distribution and use of natural gas (8%).

Effective options proposed for a Community strategy are briefly described below.

- Agriculture

In the agriculture sector, the most promising area for reducing methane emissions is animal manure management. Anaerobic digesters or simple covered lagoons provide an effective means of limiting and reducing methane emissions. Awareness-raising programmes, demonstration projects and feasibility studies should prepare for an EC obligation to install recovery systems in livestock farms of a certain size.

- Waste

In the waste sector, a distinction needs to be drawn between specific measures addressing new and existing landfills and general measures aimed at reducing organic wastes in landfills. For a new anaerobic landfill, action should be taken at the EC level to ensure that the operating permit is only given if other methane reduction options have been investigated and, where these are not feasible, that a highly efficient system is put into place to recover and use any methane produced. For existing landfills, EC legislation should require their retrofitting in order to collect and to use the methane wherever possible. Where this is not feasible it should encourage the use of flaring. Higher methane recovery should be encouraged through economic incentives. In parallel, general measures to reduce the amount of organic wastes in all landfills should be taken. A proposal for a Council Directive on the landfill of waste is currently under discussion and described in greater detail in Chapter 5.10.

- Coal extraction and distribution

Existing policies in countries which are major coal producers would allow their CH<sub>4</sub> emissions to be reduced by 40% in 2010 compared to the 1990 level. Additional emission reduction could be achieved by the generalisation of CH<sub>4</sub> recovery techniques. However, coal production and consequently methane emissions from this source will continue to decline in the future and it would be extremely difficult to justify any additional expenditure to implement methane recovery techniques. An EC initiative should only encourage Member States to generate programmes promoting the application of the best available technologies for those coal mines that will still be in operation beyond a certain time frame (10 years for instance).

Another initiative that might be envisaged is the reinforcement of the financial instrument emerging from the budget line of the European Coal and Steel Community (ECSC), one

of whose objectives is to fund research projects promoting the best available methane emission reduction technologies.

- Natural gas extraction and distribution

Unlike coal consumption, gas consumption is expected to increase by 60% by 2010 compared to 1990.

A first measure to reduce leakages could be the setting-up of an EC minimum leakage standard which would be implemented in each Member State concerned according to a specific time schedule. One minimum leakage standard proposal could be 350m<sup>3</sup>/km/year. A second measure may consist in increasing the pipeline control frequency.

### **5.3 Energy and transformation industries**

#### *5.3.1 Energy / Climate Change*

The Commission has adopted a communication on the "Energy Dimension of Climate Change" (COM(97)196 final of 14.5.97). This communication focuses on the implications for the energy sector of meeting the Community's negotiating objective of 15 % reduction for a basket of 3 greenhouse gases in 2010 compared to 1990. A number of potential areas of action, including energy efficiency and energy saving, initiatives in power/heat production and integration with other policies, the role of technology and innovation, fiscal instruments and resourcing are discussed in this communication.

#### *5.3.2 ALTENER*

Renewable energy's contribution to the primary energy needs of the European Community is presently just below 6% and amounts to about 70 Mtoe/year. Biomass accounts for about 60% and hydro-power for 36%. Under ALTENER I, a quantitative target for the development of renewable energy sources was set at 8% for the Community of 12 for the year 2005. The 1994 Madrid Conference on Renewable Energy, declared an equivalent target of 15% contribution by renewable energy to primary energy supplies by 2010. This target was confirmed in 1996 by the Committee on Research, Technological Development and Energy of the European Parliament in a report on Renewables. In its Green Paper on Renewable Energy (COM(96)576 final of 20.11.1996)<sup>17</sup>, the Commission suggests setting a new objective for the year 2010, which could be the doubling of the contribution made by renewables to the energy mix compared to 1995.

The Green Paper states that renewable sources of energy are currently unevenly and insufficiently exploited to play their proper role in reaching the Community's energy and environment policy objectives. The European Commission adopted on November 1997 the Communication "Energy for the Future: Renewable Energy Sources, White Paper for a Community Strategy and Action Plan" (COM(97)599 Final), a White Paper which sets out a comprehensive Strategy and Action plan designed to achieve by 2010 an ambitious but realistic goal of doubling from 6% to 12% the share of renewable energies in the total

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<sup>17</sup> Communication from the Commission "Energy for the future: renewable sources of energy - Green Paper for a Community Strategy" of 20.11.1996.

energy gross inland consumption of the European Union. The ALTENER programme for the promotion of renewable energy sources, established by Council Decision 93/500/EEC<sup>18</sup>, began on 1 January 1993 and is due to expire at the end of 1997. An interim report on its results was published in March 1997 (COM(97) 122 Final). No assessment is available of the impacts of the programme in terms of avoided emissions of CO<sub>2</sub> and other greenhouse gases.

The Commission considered a continuation of this programme necessary because it makes an essential contribution to the increased use of environmentally friendly renewable energies, and it is a major part of the Community's strategy to reduce CO<sub>2</sub> emissions. It has therefore adopted a proposal for a Council Decision concerning a continuation of the programme until 2002 - ALTENER II, (1998-2002). The proposed budget for the period 1998-99 is ECU 30 million. Renewable Energy Sources (RES) in the proposal refer to: biomass, small scale hydro-power (under 10MW), wind energy, solar thermal and solar photovoltaics, geothermal energy, and tidal, wave and other ocean energies. The ALTENER II programme consists of the following elements: (a) extension of ALTENER I actions; (b) new actions to promote the penetration of RES; and (c) new actions on the implementation, follow-up and monitoring of the Community RES strategy. ALTENER II is open to cooperation with the CEEC countries who are in the pre-accession phase, and Cyprus. The TERES II report, prepared for the ALTENER programme, analyses through four scenarios the degree of political action necessary to promote renewables from their present level of 5%. The scenario analyses conclude that the Best Practice (BP) scenario provides the EC with the greatest net benefits. A 9.5% primary energy contribution by 2005 is achieved in the BP scenario. In terms of renewable energy impacts, the contribution to the environment is measured primarily by CO<sub>2</sub> emission reductions. Under the Present Policies (PP) scenario, CO<sub>2</sub> reduction reaches nearly 200 million tonnes and under BP just over 500 million tonnes, equivalent to 16.2% of 1990 emissions. TERES II recommends the internalisation of external costs. As the experience of those countries which have unilaterally imposed a carbon tax shows, the effect on renewables is extremely positive. It has been estimated that the annual energy technologies market for renewables will reach ECU 40 billion by 2020 from the current ECU 5 billion. The use of renewable energy could reduce CO<sub>2</sub> emissions by 16% (compared with 1990 levels) by 2020. Under favourable conditions the best estimate of the reduction in external costs is ECU 20 billion by the year 2020.

### 5.3.3 SAVE

The first phase of the SAVE (Specific Action for Vigorous Energy Efficiency)<sup>19</sup> initiative expired on 31 December 1995. For over 4 years the programme took a non-technological approach to energy efficiency, complementing existing technology-based programmes (i.e. THERMIE-JOULE). SAVE I achievements are:

(i) legal and administrative actions improving performance standards for buildings and equipment and encouraging greater efficiency in power generation and supply;

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<sup>18</sup> Council Decision of 13.9.1993 concerning the *promotion of renewable energy sources in the Community (Altener programme)* - OJ No L 235, 18.9.1993, p. 41.

<sup>19</sup> Proposal for a Council Directive (COM(92)182 final of 26.2.1992) and Council Directive 93/76/EEC of 13.9.93 *to limit carbon dioxide emissions by improving energy efficiency* - OJ No L 237, 22.9.1993, p.28.

- (ii) support for around 250 non-technical pilot actions in at least 12 EC Member States, designed to stimulate energy efficiency in industry, commerce, or the domestic environment;
- (iii) dissemination of the programme inside and outside the EC.

The total budget for the five-year programme was ECU 35 million. No assessment is available on the impacts of the programme in terms of avoided emissions of CO<sub>2</sub> and other greenhouse gases. Through SAVE II<sup>20</sup> the European Commission extended this initiative for another 5 years (1996-2000). The Council referred to an indicative budget of ECU 45 million. Save II will reinforce previous actions and encourage new ones, including the monitoring of energy efficiency progress at Member State and EC level.

SAVE II is focused on the preparation and implementation of measures and actions in a cost-effective manner in order to promote energy efficiency within the Community. The general overall objectives of this programme are: (a) to stimulate energy efficiency measures in all sectors; (b) to encourage investment in energy conservation by private and public consumers and by industry; and (c) to create the conditions for improving the energy intensity of final consumption. SAVE II programme finances the following activities and measures for energy efficiency: (i) studies and other related actions aimed at the full implementation of Community measures (e.g. voluntary agreements, the mandating of standardisation bodies, cooperative procurement and legislation) taken to improve energy efficiency; (ii) studies into the effect of energy pricing on energy efficiency; (iii) studies designed to establish energy efficiency as a criterion within Community programmes; (iv) sectoral targeted pilot actions aimed at accelerating energy efficient investment and/or improving energy use; (v) information dissemination, to foster the exchange of experience and promoting better coordination between Community, national, regional and local activities; (vi) the monitoring of progress towards energy efficiency within the Community and individual Member States and ongoing evaluation and monitoring of the actions and measures undertaken under the programme; and (vii) the encouragement of specific actions to promote energy management at regional and urban levels as well as greater cohesion between Member States and regions in the field of energy efficiency.

#### 5.3.3.1 Regional and Urban Energy Management

The main objective of energy management at regional and urban level is to define and put into effect a series of measures designed to improve demand management.

Local and regional authorities have to reinforce their role as they have more responsibility for areas related to energy consumption and production. Their responsibility for urban and land use planning also has an impact on transport needs, energy consumption and the associated environmental consequences.

In terms of climate change, the regional and local implementation of mitigation measures can add up to a significant contribution to reducing greenhouse gas emissions. Throughout Europe approximately 1 600 decentralised agencies could be used in this context.

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<sup>20</sup> Council Decision 96/737/EC of 16.12.1996 concerning *a multiannual programme for the promotion of energy efficiency in the Community* - OJ No L 335, 24.12.1996.

The European Commission, on the basis of the findings of a pilot initiative run during 1992-95, suggested, as part of the SAVE II programme, providing financial support for the setting-up of local and regional energy management agencies. It encourages them to network with their counterparts in the European Union. Some 141 agencies of this type have already been set up in the EC since 1992, as part of a pilot project. In 1996, under SAVE II, 34 new regional (18), island (3) and urban (13) energy agencies will benefit from Community funding. Each agency will have a budget of ECU 150 000 at its disposal for the first three years of its operation. During 1997 the Commission has financed the creation of 31 agencies.

Selected projects have to contribute to better Community integration in energy matters by adopting a new bottom-up approach to energy problems and encouraging local bodies to cooperate at European level and to foster economic and social cohesion by reducing regional disparities. They also contribute to environmental protection and the quality of life and directly or indirectly to the creation of local employment.

#### 5.3.3.2 Labelling and Energy Efficiency Requirements for Household Electric Appliances

Household appliances account for a significant share of domestic electricity consumption in the EC and thus of total electricity consumption. To promote their energy-efficiency under the SAVE programme, new pertinent legislation was passed during 1996, namely: (i) Directive 96/57/EC of 3.9.1996 *on energy efficiency requirements for household electric refrigerators, freezers and combinations thereof*<sup>21</sup>; (ii) amendment of 17.12.1996 of Directive 95/12/EC implementing Council Directive 92/75/EEC<sup>22</sup> with regard to energy labelling of household washing machines; and (iii) Directive 96/60/EC on energy labelling of combined washer-dryers.

#### 5.3.4 JOULE-THERMIE

The THERMIE<sup>23</sup> demonstration component of the JOULE-THERMIE programme is funded under the Fourth Framework Programme for Research and Technological Development (RTD) (see Chapter 9.). THERMIE focuses on the cost-effective, environment-friendly and targeted demonstration and promotion of clean and efficient energy technologies in the fields of renewable energy technologies, rational use of energy in industry, buildings and transport and clean and more efficient use of solid fuels and hydrocarbons. It essentially supports actions aiming to prove both the technological and economical viability and validity of innovative energy technologies by highlighting their benefits and by assuring a wider replication and market penetration. The programme runs until 1998 and has a total budget of ECU 1 030 million of which ECU 566 million are

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<sup>21</sup> Directive of the European Parliament and of the Council of 3.9.1996 on *energy efficiency requirements for household electric refrigerators, freezers and combinations thereof* - OJ No L 236, 18.9.1996, p. 36.

<sup>22</sup> Commission Directive 96/89/EC of 17.12.1996 (OJ No L 388, 28.12.1996, p. 85), amending Commission Directive 95/12/EC of 23.5.1995 (OJ No L 136, 21.6.1995, p. 1) implementing Council Directive 92/75/EEC with regard to *energy labelling of household washing machines*.

<sup>23</sup> *Commission report concerning the promotion of energy technology in Europe*, COM(93) 642 final of 9.12.1993

allocated to the THERMIE component of the programme for the support of project demonstration and associated measures.

The JOULE component of the JOULE-THERMIE programme addresses the R&D part of the non-nuclear energy technology area. Its budget is 464 million of ECUs from which about 59% is dedicated to Renewable Energies (see Chapter 9).

THERMIE operations focus on three areas:

(A) *Demonstration projects* (Type A actions) cost-shared actions by THERMIE provide support for important policy concerns such as reduction of environmental hazards, especially CO<sub>2</sub> emissions, and increasing the competitiveness of important actors in the European Union such as small and medium-sized enterprises (SMEs). From 1995 and 1997, 397 demonstration projects were selected to receive financial support from THERMIE amounting to ECU 370 million equivalent to almost 40% of the eligible project cost.

(B) *Associated measures* (Type B actions) support the development of sectoral strategies designed to identify and meet the needs of various parts of the energy market, and of a global energy RTD strategy that will serve as a guide for future activity in the field. Additionally, some clearly-focused information/dissemination activities supported by THERMIE and completed by market actors have encouraged widespread circulation of knowledge and improved the awareness of market actors, both in the EC and in relevant international markets, thereby contributing to the exploitation of the results of EC programmes. During 1995-97, 610 proposals out of 1 161 were supported, with a total of ECU 83 million.

(C) *Co-ordination with related EC and Member State programmes*: Technological input, as part of a wider implementation of European energy policy, is provided by effective coordination with other EC energy programmes.

Among activities launched in 1995-96, the targeted projects for urban technologies that form part of the "City of the Future" Task Force are of particular interest.

### 5.3.5 Nuclear Energy

On 25 September 1996 the Commission presented a communication *on the nuclear industries in the European Union (an illustrative nuclear programme according to Article 40 of the Euratom Treaty)* (COM(96)339 final)<sup>24</sup>. It contains the 1996 Illustrative Nuclear Programme for the Community (PINC) which, under Article 40 of the Euratom Treaty, should indicate nuclear energy production targets and all the types of investment required for their attainment. Since the Treaty was adopted, three PINCs have been published by the Commission: in 1966, 1972 and 1984, with one update in 1990. The 1996 PINC is intended to provide a transparent overview of the situation in the EC as regards nuclear energy within the context of a Community moving towards a liberalised energy market, underlining the major challenges faced by industry and the main concerns voiced by public opinion. The last PINC has been approved on 25 September 1997. The

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<sup>24</sup> Communication from the Commission on the nuclear industries in the European Union ("*An illustrative nuclear programme according to Article 40 of the Euratom Treaty*") - 25.9.1996



improvement of nuclear security in the CEECs candidates for accession constitutes one of the main Commission concerns in this realm.

According to current plans, the installed nuclear capacity in the Community is likely to increase only slightly in the next few years.

#### 5.3.6 *Power Sector*

The Commission is engaged in an active dialogue with the European electricity industry with the aim of establishing the contribution the electricity sector can make to sustainable development and in particular the reduction of CO<sub>2</sub> emissions. A number of key issues are being examined, in particular in relation to the role of the electricity sector, cleaner generating technologies - cogeneration, CHP fuel substitution, RTD, education and consumer information - together with the roles played by the other main actors in this process - national governments, the European Commission, and other market actors.

### 5.4 **Transport**

#### 5.4.1 *Introduction*

The transport sector continues to be a major concern for climate change policy in the Community. It currently accounts for 26% of total CO<sub>2</sub> emissions, up from a share of 23% in 1990. This increase reflects the overproportional growth in transport CO<sub>2</sub> emissions. According to Commission forecasts, CO<sub>2</sub> emissions from transportation could increase by a further 39% over 1990 levels by 2010 under a business-as-usual scenario. Transport is also an important source of other greenhouse gases.

Road traffic is of particular importance in this context as it accounts for about 85% of overall transport CO<sub>2</sub> and shows a strong CO<sub>2</sub> emission growth. Passenger car transport is expected to grow by 30% over 1990 levels by the year 2005, whilst for freight transport an increase of 25 % over the same period is forecast.

While the contribution of air transport to total CO<sub>2</sub> emissions is currently relatively minor, current and forecast air traffic growth is causing concern from a climate change perspective as a growth of 5.2 % per year up to 2003 is forecast.

#### 5.4.2 *CO<sub>2</sub> and cars*

The Community has addressed transport CO<sub>2</sub> emissions by launching a strategy for improving the fuel efficiency of passenger cars (Commission communication COM (95) 689 final, 20.12.1995; Council conclusions of 25.6.1996)<sup>25</sup>. Private cars account for about half of transport CO<sub>2</sub> at present. The strategy is aimed at achieving average CO<sub>2</sub> emissions for newly registered cars in the EC of 120 g/km (measured on the European test cycle according to Directive 93/116/EC<sup>26</sup>) by 2005, and at the latest by 2010. This corresponds to a fuel consumption of about 5 litres/100 km for petrol cars and 4.5 litres/100 km for

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<sup>25</sup> Communication from the Commission to the Council and the European Parliament - "A *Community strategy to reduce CO<sub>2</sub> emissions from passenger cars and improve fuel economy*" of 20.12.1995.

<sup>26</sup> Commission Directive 93/116/EC of 17.12.1993 adapting to technical progress Council Directive 80/1268/EEC relating to the *fuel consumption of motor vehicles* - OJ No L 329, 30.12.1993, p.39.

diesel cars. The strategy foresees an agreement with the automotive industry on the improvement of vehicle fuel economy, as well as fiscal measures and better consumer information to strengthen market demand for more fuel-efficient cars. The Commission is currently working to implement the strategy by discussing the content of a possible agreement with the automobile industry and preparing the other necessary proposals.

#### 5.4.3 *Other greenhouse gases generated by motor vehicles*

As regards other greenhouse gases, such as NO<sub>x</sub>, CO and VOCs, Community legislation is expected to lead to further substantial reductions over the next few years. A further strengthening of vehicle emission standards in the years 2000/2005 is currently in the legislative process. These measures are oriented towards achieving the Community's air quality objectives but, as the pollutants concerned are also greenhouse gases or contribute to the formation of greenhouse gases (in the case of ozone), they also have positive effects in terms of climate change.

#### 5.4.4 *Road fuel taxation*

In the context of its proposal for a directive on the taxation of energy, the Commission has also proposed to raise the minimum rates for excise duties on motor fuels in three steps in 1998, 2000 and 2002. These proposed minimum rates, however, would not lead to an overall significant increase in the actual excise duty rates in most Member States, since they already apply tax rates far above existing minimum rates.

#### 5.4.5 *Further measures in the transport sector*

The Community has furthermore taken a number of transport policy initiatives which are also expected to have a positive effect on greenhouse gas emissions, even if they are not primarily geared towards climate change objectives. Attention has been focused on pushing for a modal shift - that is to move traffic off the roads onto more environmentally friendly and energy-efficient modes, such as rail and sea.

These policy initiatives include:

- a broad discussion of a better internalisation of the external costs of transport through a restructuring of transport pricing. A *Green Paper "Towards Fair and Efficient Pricing in Transport"*<sup>27</sup> was adopted by the Commission in 1995. It explores ways of making transport pricing systems fairer and more efficient - by giving users and manufacturers incentives to adjust their transport behaviour.
- a Commission White Paper on "*A Strategy for Revitalising the Community's Railways*"<sup>28</sup> (1996). This paper is based on the principle that railways should play a much greater role in European transport. The Commission's purpose in putting forward the proposals contained in the White Paper is to create the conditions at Community level for the major adaptations needed. The promotion of intermodality as a prerequisite for offering different modal alternatives, on which a Commission

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<sup>27</sup> COM(95) 691 final of 20.12.1995.

<sup>28</sup> COM(96) 421 final of 30.07.1996.

communication will soon be adopted, is another element in this strategy and an ambitious action programme is foreseen.

- the promotion of public passenger transport addressed in a Commission Green Paper "The Citizen's Network"<sup>29</sup>. The Commission has also supported a number of initiatives to reduce car use in cities and promote alternative forms of mobility (e.g. Car-Free Cities Network).

Under Community research and development programmes, there is a substantial range of research on transport demand management measures which are aimed at modifying the overall modal split towards less polluting and more energy-efficient transport modes. There are also research activities under the Industrial and Materials Technologies programme targeting the development of technologies for means of transport with low emissions, and under the Non-nuclear Energy programme. The latter are working towards energy- and environment-efficient transport networks.

The effectiveness of these initiatives in terms of emission reductions, though, is difficult to assess. Benefits are likely to occur only in the longer term and are not expected to reverse the growth trend in CO<sub>2</sub> emissions from the sector.

## 5.5 Industry

Control of polluting emissions from industrial installations is primarily geared towards emissions with direct consequences for human health or the ecosystem - such as acidifiers, carbon monoxide, volatile organic compounds, metals, asbestos, halogens, dioxins and proven carcinogens. They have only marginal relevance to climate change. However, Council Directive 96/61/EC concerning *integrated pollution prevention and control (IPPC)*<sup>30</sup> - the most important framework Directive in the area of industrial installations - includes ammonia in the list of "main polluting substances" and, more importantly, includes energy efficiency among criteria for the determination of best available techniques (BAT), on which the setting of emission limit values (ELVs) and the issuing of operating permits must be based.

An example of how IPPC will be applied is Council Directive 88/609/EEC on large combustion plants (LCP)<sup>31</sup>, which is likely to be revised in the near future and whose primary purpose is the control of acidifying emissions. Updated ELVs for acidifying pollutants from large combustion plants must be based on BAT, and will therefore have to take energy efficiency into account.

At this stage it is not possible to predict the quantitative effect of these measures on CO<sub>2</sub> emissions.

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<sup>29</sup> COM(95) 601 final of 29.11.1995.

<sup>30</sup> OJ No L 257, 10.10.1996, p. 26.

<sup>31</sup> OJ No L 336, 7.12.1988, p.1.

## 5.6 Agriculture and Forestry

### 5.6.1 The CAP reform

According to the Treaty on European Union, environmental requirements need to be taken thoroughly into account in the common agricultural policy (CAP). A reform of the CAP was decided in 1992. Measures such as the accompanying measures of the CAP reform and the "non-food" set-aside, while mainly designed to serve other purposes, can help mitigate greenhouse gas emissions.

The reduction of agricultural prices makes the use of inputs less profitable and in the first years after the reform, mineral fertiliser use in the crop sector was reduced by around a third. This decreases the total amount of N<sub>2</sub>O emissions from nitrate and ammonium fertilisers.

The European Fertiliser Manufacturer Association forecast for the development of mineral fertiliser consumption in Western Europe until the year 2005/06<sup>32</sup> indicates that application rates of mineral nitrogen fertiliser will decrease due to better use of nitrogen from organic manure and to changes in crop areas. This should lead to a decrease in nitrogen application from 9.5 million tonnes in 1994/95 to 9.2 million tonnes after 2000.

The number of cattle in the Community is falling. Approximately two thirds of all the Community's cows are dairy cattle and the number of cows is being reduced by around 2 % per year because of milk quotas and increasing yields. The number of beef cows is limited by the ceiling on the number of premiums. In the sheepmeat and goatmeat sector, the number of breeding animals is also restricted by a premium ceiling and an increase in numbers is not expected.

Non-ruminants do not directly emit significant amounts of greenhouse gases. Pigmeat production is not expected to increase markedly in the medium term (around 0.5 % annually). Poultry meat production is expected to grow more strongly (2% annually), while egg production tends to be stagnant.

Animal numbers (millions) in the EC-15			
	1990	1995	2005
Cattle	90	85	80
Sheep and goats	115	106	106
Pigs	115	117	123
Poultry *			14%

\* estimate of increase in poultry production 2005/1995

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<sup>32</sup> EFMA Agro-Economic Task Force, September 1996; "Moderate Grain Price Scenario".

### 5.6.1.1 The agro-environmental scheme

This scheme to promote farming activities that benefit the environment was explained in the First Communication<sup>33</sup>. By the end of 1996, 117 programmes had been approved in total, comprising approximately 2 500 measures available to farmers in regions throughout the EC. While these are not specifically aimed at greenhouse gas reduction, some of them will have an impact on emissions.

Although it is unlikely that there will be measures designed solely to reduce greenhouse gas emissions in isolation from other environmental criteria, the Commission is seeking to ensure that the monitoring of programmes will take into account the effects on greenhouse gas emissions.

### 5.6.1.2 The farm investment aid scheme<sup>34</sup>

This scheme was modified in 1994 to permit investments in units designed to dispose of waste from intensive animal production, with the objective of reducing the negative impact on the environment. The primary aim of such investments is to avoid water pollution, but there should also be reductions in emissions of CH<sub>4</sub>.

### 5.6.1.3 Non-food biomass production on set-aside land

The possibility of growing non-food<sup>35</sup> products on set-aside land constitutes a positive link to the reduction of greenhouse gas emissions, helping to substitute fossil fuel with bio-fuel.

The "non-food" set-aside scheme has been running since the marketing year 1993/1994 (harvest 1993). In the marketing year 1995/1996, an estimated 60% of the raw materials produced on set-aside land has been used for energy purposes. The remaining 40% has been used in the chemical and pharmaceutical industry.

There are two different categories of outlet for renewable energy materials produced on set-aside land: liquid bio-fuels, mainly from rape and sunflower seed, and biomass for direct combustion. There has been a modest uptake of short rotation forest trees and other biomass crops for direct combustion such as miscanthus, kenaf or reed grass. The development of the scheme is shown in the following table:

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<sup>33</sup> This programme is implemented by Commission Regulation (EC) No 746/96, OJ No L 102, 25.4.1996, p. 19.

<sup>34</sup> Council Regulation (EC) No 2328/91, OJ No L 218, 6.8.1991, p. 1.

<sup>35</sup> Article 7(4) of Council Regulation (EEC) No 1765/92, OJ No L 181, 1.7.1992, p. 12; Commission Regulation (EEC) No 334/93, OJ No L 38, 16.12.1993, p. 12, provides an exhaustive list of the eligible raw materials and end-products.

Year of harvest	Total non-food set-aside (ha)	Rapeseed and sunflower seed * (ha)	Biomass crops for direct combustion (ha)
1993	237 000	199 000	750
1994	677 000	594 000	1 300
1995	1 050 000	945 000	14 000
1996	780 000 #	700 000 \$	not available

\* mainly for liquid bio-fuels

# provisional

\$ estimate

Industrial sources indicate a total capacity for the production of bio-diesel in the EC of the order of 300 000 to 500 000 tonnes in 1994. New production plants are under construction. The production of bio-diesel is merely based on oilseeds from set-aside land. In the marketing year 1995/1996, bio-ethanol production amounted to 430 000 hl, of which a significant part is based on raw materials from set-aside land.

The reduction of greenhouse gas emissions due to the production and utilisation of energy varies strongly between crops, production areas and end-uses<sup>36</sup>.

## 5.6.2 Forestry

### 5.6.2.1 Afforestation of agricultural land<sup>37</sup>

Afforestation of agricultural land is among the accompanying measures of the 1992 CAP-reform.

The measures improve forest resources while helping to control agricultural production and improving countryside management. The Regulation also explicitly aims at carbon absorption. It contributes directly to carbon sequestration by participating in the costs of afforestation of agricultural land. It also contributes to the silvicultural improvement of certain existing forests and enhancing their CO<sub>2</sub> absorption capacity.

The scheme is mandatory at Member State level, but optional for land owners. The European Agricultural Guidance and Guarantee Fund co-finances 50 % of the costs or 75% in specially designated areas. The available budget is ECU 1 325 million for 1993-1997. Member States presented 43 programmes in 1993 (some national, others regional), most of which were approved in spring 1994. The implementation of the measure lagged behind expectations in 1993 and 1994, but the afforestation rate improved in 1995 and 1996. Up to 30 April 1996, 550 000 ha were afforested and the Member States have

<sup>36</sup> Sustainability of Energy Crops in Europe, CLM 234, 1996

<sup>37</sup> Council Regulation (EEC) No 2080/92, OJ No L 215, 30.7.1992, p. 96.

committed a much larger area to afforestation under this Regulation. The expenditure by the end of 1996 was ECU 500 million.

#### 5.6.2.2 Forest fires

The measures to protect forests from fire were strengthened in 1992<sup>38</sup> to give greater effect and consistency between action financed by Member States and the Community, and renewed in 1997. Under the scheme, preventive measures by Member States in fire-hazard areas can be co-financed. 490 fire prevention projects form part of national or regional fire-protection plans submitted by the Member States.

#### 5.6.2.3 Protection of forests against atmospheric pollution

This Community scheme started a decade ago and was reinforced in 1992 and 1996.

The Member States implement the measure and receive co-funding from the Community. This includes projects (inventory), intensive monitoring of permanent plots (experimental), 50% co-financed by the Community. From 1987 to 1996, 452 projects were funded, 207 of which have been completed and 152 are ongoing.

An annual forest damage survey, a forest soil condition inventory and an optional survey of the chemical content of needles have been carried out on the 16 X 16 km grid-net. Results are published yearly in "Forest Conditions in Europe".

In total ECU 42.4 million have been allocated by the Community under the Regulation, of which ECU 5.2 million were spent for execution of inventory projects, ECU 10.7 million for intensive monitoring projects, and ECU 26.4 million for experimental projects.

#### 5.6.3 *Agricultural and forest research*

Agricultural and forest research is provided for in specific programmes within the Community's RTD-Framework Programmes<sup>39</sup> as described in section 9.1. They are mainly implemented through the funding of shared-cost projects and concerted actions following the publication of calls for proposals for such projects or actions.

On a limited basis, this includes greenhouse gas emissions from agriculture and the adaptation of agriculture and forestry to climate change. While only one shared-cost project and one concerted action are aimed directly at greenhouse gases, many agricultural and forest projects are indirectly related to greenhouse gases or adaptation to climate change (research into biomass, forestry, reduction of fertiliser use, manure management, water management or drought tolerance).

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<sup>38</sup> Council Regulation (EEC) No 3528/86, OJ No L 326, 21.11.1986, p. 2, strengthened by Council Regulation (EEC) No 2158/92, OJ No L 217, 31.7.1992, p. 3.

<sup>39</sup> The current agricultural research programme, FAIR (1994-1998), is based on Decision No 1110/94/EC of the European Parliament and of the Council, OJ No L 126, 18.5.1994, p.1. Most projects of the programme AIR (1990-1994) are still ongoing.

#### 5.6.4 Rural development

The development of rural areas is now one of the principal objectives of the CAP, and includes the promotion of measures that can reduce greenhouse gas emissions. The measures are co-financed from EAGGF-Guidance<sup>40</sup> in Objective 1 and 5b regions.

In forestry the measures include fire prevention. In 1994-1996, ECU 80 million investments were effected concerning energy stations based on biomass (straw, wood slurry). Investments in installations for processing and use of 'non-food' raw materials are also supported within certain programmes.

### 5.7 Waste Management

#### 5.7.1 General aspects

The management of waste can give rise to a number of emissions relevant to climate change, such as methane from the disposal of waste in landfill, when biodegradable waste decays in anaerobic conditions.

Waste management operations account for about one third of all anthropogenic methane emissions.

Landfill gas usually contains around 55% methane, 45% CO<sub>2</sub> and over a hundred trace gaseous compounds<sup>41</sup>. The discussions, however, tend to focus on the methane content of the gas, because of its powerful global warming potential. Additional problems arise from methane produced from the treatment of sewage sludge. Emissions from waste incinerators are also relevant and these include emissions of CO<sub>2</sub>, CO, N<sub>2</sub>O, NOX and NMVOC.

In the 15 Member States in 1990 it is estimated that 67% of municipal waste was landfilled, 6% incinerated without energy recovery, 12% incinerated with energy recovery, 5% composted, 3% mechanically sorted, 2% recycled, with the remaining 5% going to other destinations.

#### 5.7.2 Methane

The Strategy Paper for Reducing Methane Emissions introduced in Chapter 5.2.2 deals with all anthropogenic methane emissions including those from the waste management sector. Specific measures and proposals focusing on how an integrated waste management strategy can divert biodegradable waste away from landfills are described there.

##### 5.7.2.1 Existing Policies

The Communication from the Commission of 30 July 1996 on the *Review of the Community Strategy for Waste Management* (COM(96)399 final) updates the 1989 Commission Strategy on waste management. Central to this is the reconfirmation of the hierarchy of waste principles. The prevention of waste remains the first priority, failing

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<sup>40</sup> Council Regulation (EEC) No 2052/88, OJ No L 185, 15.7.1988, p. 9.

<sup>41</sup> *Landfill gas : from environment to energy* - EUR 14017-EN-1992



which it should be recovered and, failing either of those, the last option is its safe disposal. Within the range of recovery operations, recycling or composting should be preferred, where they are environmentally sound, over, for example, the use of waste as a fuel. The promotion of waste minimisation and material recovery operations has additional climate benefits, as it helps to ensure the conservation of raw materials and energy.

Table 5.1: shows the existing procedures in Member States for the treatment of waste<sup>42, 43</sup>

	Percentage of waste going to landfills (%)	Incineration (%)	Recycling (%)	Composting (%)
Belgium	45	50-55	5	0
Denmark	20-30	50	20	4
Germany	40	30-40	15-20	5
Greece	major part			minor part (1 plant)
Spain	60-70	5	10-15	15-20
France	45	40-45	5	10
Ireland	90-95		5	
Italy	75	15	5	5-10
Luxembourg	20-25	75	1-5	1
The Netherlands	40-45	15-25	35-40	5
Austria	65	10-15	5-10	15-20
Portugal	85			15
Finland	80-85	1-5	15	
Sweden	30-35	45-50		1-5
United Kingdom	80-90			

The Community has in place several binding legislative measures to regulate the management of waste in the European Union<sup>44</sup>. The Commission's First Communication mentioned the Directive on packaging and packaging waste. The Directive required Member States to implement it before 30 June 1996. Member States are required to minimise the packaging waste produced and to achieve within 5 years of the implementation date a minimum 50% and maximum 65% by weight recovery rate for packaging waste. As the term 'recovery' also covers incineration with energy recovery, the Directive sets further targets which need to be achieved for material recovery through recycling alone.

Some waste packaging has methane producing potential, such as paper, cardboard and wood, which represent the largest component of the packaging waste stream.

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<sup>42</sup> *Composition and management of leachate from landfills within the EU*, Hjelmar et al., 1994

<sup>43</sup> Dobrís Report, European Environmental Agency, 1995

<sup>44</sup> Council Directive 75/442/EEC on *waste*, OJ No L 194, 25.7.1975, p. 39, as amended by Council Directive 91/156/EEC, OJ No L 78, 26.3.1991, p. 32; Council Directive 91/689/EEC on *hazardous waste*, OJ No L 377, 31.12.1991, p. 20; Parliament and Council Directive 94/62/EC on *packaging and packaging waste*, OJ No L 365, 31.12.1994, p. 10.

As the Directive has only recently been implemented, it is too early to assess its effects in terms of amounts of biodegradable packaging waste collected and diverted away from landfills.

#### 5.7.2.2 Proposals

The proposal for a Council Directive on the landfill of waste was mentioned in the First Communication. It aims to control the landfilling of waste and contains provisions on tackling methane emissions. The Proposal as presently drafted would require Member States to fit all new and existing landfills which receive biodegradable waste with a landfill gas control mechanism, where possible using the gas collected for energy production.

The proposed Directive introduces reduction targets for the landfilling of biodegradable municipal waste, as well as provisions to ensure that the gases produced in new and existing landfills are collected and treated. Reduction targets for biodegradable municipal waste are set for the years 2002, 2005 and 2010. This provision is aimed both at reducing methane emissions from landfills and encouraging separate collection of biodegradable waste to reduce landfilling in general. Biodegradable waste can be collected, sorted and then submitted to national composting facilities, biogas or incineration plants. A recent study<sup>45</sup> estimates the average percentage of biodegradable waste in municipal waste in Europe at 20-50%. Several Member States have already introduced limits or guidelines for biodegradable waste going to landfills. These include Germany, Austria, Finland, France and the Netherlands.

#### 5.7.2.3 Potential Future Action

Turning to the criteria for composting and policy on soil protection, a study has been launched to look into composting standards and methods. Its results may form the basis for future Commission action in this field. Any such action would be taken in the context of encouraging alternatives to the landfill of biodegradable waste.

#### 5.7.3 *Carbon dioxide and other greenhouse gases*

Waste management operations also emit other greenhouse gases. One issue of concern is that the effort to persuade Member States to avoid landfilling waste will lead to unnecessary increases in incineration capacity rather than material recovery operations such as recycling and composting. As the Waste Strategy Review points out, the promotion of minimisation and waste recovery options often has the advantage that raw materials and energy can be conserved. This can have direct impacts on CO<sub>2</sub> emissions.

## 6. PROJECTIONS AND EFFECTS OF POLICIES AND MEASURES

### 6.1 Trajectories for the year 2000

Under the monitoring mechanism, the Commission regularly evaluates Member States' national programmes with respect to progress towards the Community stabilisation target for the year 2000. The conclusions of the second evaluation report (COM(96)91 final of

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<sup>45</sup> *Cost-Benefit analysis of the different Municipal waste management systems: objective and instruments for the year 2000, Coopers & Lybrand, 1996.*

14.03.96) and preliminary conclusions from the third evaluation are described in this Chapter.

Table A1 of the second evaluation report provides an aggregation of country trajectories of emissions for 2000. These trajectories are based on Member State submissions in their first National Communications to the UNFCCC, and updates which were officially communicated to the Commission before July 1995 for the preparation of this second evaluation. The trajectories are based on the assumption that there is no Community CO<sub>2</sub>/energy tax in the countries that have not yet introduced such a tax.

By *adding up* the individual Member States trajectories and projections, we can estimate Community CO<sub>2</sub> emissions in 2000. It should be noted, however, that this method of compiling a Community trajectory only gives *indicative* results, since the broad range of models and assumptions that have been used by the Member States introduces a certain amount of inconsistency between their trajectories. Table A1 does not show 'without measures' trajectories since they were not submitted by all countries.

The trajectories and projections for 2000 have been adjusted to be consistent with the same 1990 baseline, the EC CO<sub>2</sub> inventory for 1990 as reported in the first Commission Communication. Recent updates of the 1990 baseline have not been taken into consideration.

In the "with measures" scenario, Member States have used widely different models and methods of estimating the impact that measures would have. Only four Member States have clearly quantified each measure which is included in the "with measures" scenario.

All countries have measures that remain to be implemented and for some Member States such measures constitute the major part of CO<sub>2</sub> strategy. If implementation is not started soon, the measures cannot be expected to have an effect by 2000.

Greece, Ireland, Portugal and Spain all have 'objectives' that take account of their expected economic growth. Emission levels in these countries will depend more on the level of economic growth achieved in the years up to 2000 than on implementation of the measures in their national CO<sub>2</sub> strategies.

Several of the countries that use nuclear power are finding it increasingly difficult to acquire the public's consent to build new power plants. In France, four 1 450 MW PWR units are now under construction and expected to be commissioned before the year 2000. Having regard to current forecasts of electricity consumption, the greater availability of French nuclear plants and the expected level of French electricity exports, it is not expected that further nuclear reactors will be ordered before the year 2000. Sweden has made its projection on the assumption that the planned phase-out of nuclear power is not initiated before 2000.

Since there is considerable uncertainty surrounding the trajectories and projections discussed above, a modified projection based on Member State trajectories but using a number of common assumptions, in particular an analysis of the sensitivity of growth rates, and a further Commission projection based on a new energy scenario, are presented in Table A2.

The 'modified projection' replaces the country GDP growth rates given by the Member States with rates that are consistent with the projected Community growth rate and fuel import prices (particularly for crude oil) pertaining to the EC<sup>46</sup>. For the years 1990-1993, estimated actual CO<sub>2</sub> emission growth from energy only has been used<sup>47</sup>. Thereafter, emissions are estimated, based on OECD GDP projections for 1993-1995, and Commission projections for 1995-2000<sup>48</sup>.

While the compilation of Member State trajectories shows a stabilisation of CO<sub>2</sub> emissions by the year 2000, the alternative trajectories show a likely increase of emissions by 3 - 5%. The presentation of a Community trajectory for 2000 based on information from Member States was not possible due to the differences in methodology and assumptions referred to above, the insufficient information provided in the national reports about the effectiveness of measures, and the high level of uncertainty related to the implementation of measures. The Commission concluded in the second evaluation report that, while current emissions reported at the time were below 1990 levels, it cannot be excluded that Community emissions will increase within the range of 0-5 % by 2000 over 1990 level.

The third evaluation was planned to be completed in time to provide input to this second communication. However, due to the delayed submissions from Member States, the compilation of an updated Community trajectory for the year 2000 was not possible.

A preliminary Commission forecast under the monitoring mechanism indicates that stabilisation of EC CO<sub>2</sub> emissions in 2000 might be close to 1990 levels.

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<sup>46</sup> Assumptions regarding GDP growth from the European Commission (DG II), 'Medium Term Projections 1995-2000', June 1995. GDP figures 1992-1995 from OECD Economic Outlook (57), June 1995. Import prices for oil taken from OECD Green model (June 1995), which projects a change of \$4 979-\$4 052 per terrajoule from 1985-2000 for the EU. Energy price assumptions have also been taken from 'A view to the Future', September 1992.

<sup>47</sup> "Carbon dioxide emissions from fossil fuels 1985-1993" -Eurostat, 1996 - ISBN 92-827-6198-3

<sup>48</sup> The 2000 emission data have been projected using a 'change index' constructed on the basis of the OECD/Commission GDP growth rates and fuel prices taken from the OECD Green model, the GDP growth rates included in the national communications, and assumptions about income and price elasticities.

**Table A1 Member State Trajectories and Projections and Effect of Measures 1990-2000 (Gg CO<sub>2</sub>)-Adjusted on a Common 1990 baseline (Gg CO<sub>2</sub>)**

<b>Member State</b>	<b>(a) CO<sub>2</sub> Inventory 1990</b>	<b>(b) Change 1990/2000</b>	<b>(c) % change 1990/2000</b>	<b>(d) Trajectory 2000 (With Measures)</b>	<b>Comments</b>
<b>Austria</b>	59 200	380	0.6	59 580	STAB scenario is 'with measures' scenario. STAB aims at stabilising emissions at 1990 levels by 2005 (reduction of 8 800 Gg CO <sub>2</sub> over IER reference scenario for 2005). Effect of measures interpolated for 2000.
<b>Belgium</b>	114 500	-1 300	-1.1	113 200	Projection is temperature corrected. Bureau de Plan scenario without a CO <sub>2</sub> tax is 'with measures' scenario.
<b>Denmark</b>	52100	-6200	-11.9	45900	Energy 2000 follow-up trajectory 1990/2000 is 'with measure' scenario. Aim is to achieve 20% reduction by 2005 compared to 1988 levels.
<b>Finland</b>	53 900	16 000	29.7	69 900	Energy related emissions only. Assumption that all electricity imports will in future be replaced by domestic production (see country summary).
<b>France</b>	366 500	31 840	8.7	398 340	Scenario 1 from note to Monitoring Mechanism Committee is 'with measures' scenario, including sinks.
<b>Germany</b>	1 013 000	-131 560	-13.0	881 440	'Without measures' scenario is based on assumptions of consistent set of fuel prices and GDP growth rate. 'With measures' scenario for 2000 is 13% reduction over 1990 levels, as communicated to Commission in Monitoring Mechanism Committee meeting in February 1995.
<b>Greece</b>	86 100	12 320	14.3	98 420	'With measures' scenario is 'most realistic objective' of 15% increase by 2000 over 1990 levels.
<b>Ireland</b>	30 720	6 300	20.5	37 020	'Without measures' scenario is based on assumptions of consistent set of fuel prices and GDP growth rate. 'With measures' scenario 20% increase by 2000 over 1990 levels. Insufficient quantification of measures.
<b>Italy</b>	436 300	12 630	2.9	448 930	'With measures' scenario 1-5% (average 3%) increase by 2000 over 1990 levels, as communicated to Commission in Monitoring Mechanism Committee meeting in February 1995. Insufficient quantification of measures.
<b>Luxembourg</b>	13 300	-3 200	-24.1	10 100	'Without measures' scenario based on assumptions of consistent set of fuel prices and GDP growth rate. Insufficient quantification of measures.
<b>Netherlands</b>	151 800	-600	-0.4	151 200	'With measures' and 'without measures' scenarios from Energy Policy Scenario. Sectoral quantification of measures.
<b>Portugal</b>	42 500	15 300	36	57 800	'Without measures' scenario based on assumptions of consistent set of fuel prices and GDP growth rate. 'With measures' scenario is 40% increase in emissions by 2000 over 1990 levels. No quantified measures.
<b>Spain</b>	227 300	54 100	23.8	281400	'Without measures' scenario is based on assumptions of consistent set of fuel prices and GDP growth rate. 'With measures' scenario is 25% increase by 2000 over 1990 levels. No clear quantification of measures.
<b>Sweden</b>	61 300	2 700	4.4	64 000	'With measures' scenario is 4% increase by 2000 over 1990 levels, not temperature corrected, and stabilisation if temperature corrected. All measures included in the scenario are quantified.
<b>UK</b>	579 800	-35 140	-6.1	544 660	'With measures' scenario from EP-65, central GDP growth, high fuel prices,

Member State	(a) CO <sub>2</sub> Inventory 1990	(b) Change 1990/2000	(c) % change 1990/2000	(d) Trajectory 2000 (With Measures)	Comments
					reduction of 6% by 2000 compared to 1990 levels. All measures in scenario quantified.
EC-15	3 285 620	-26 430	-0.8	3 260 900	

Table A2 Alternative Trajectories for the Year 2000 (percentage change 1990/2000)

Member State	(a) Member State Trajectories/ Projections	(b) Modified Trajectories/ Projections	(c) Commission Projection	Notes
<b>Austria</b>	1	8		Growth rates differ marginally but fuel prices assumed in (a) are very high compared to (b) which explains low emission growth in (a).
<b>Belgium</b>	-1	3		Due to lack of information about GDP growth rate, the assumed growth rate is 0.7% lower than in modified trajectory.
<b>Denmark</b>	-12	7		GDP growth assumptions differ marginally between (a) and (b) but fuel prices are very high in (a) and price elasticity is very high, leading to fall in emissions in (a).
<b>Finland</b>	30	33		Lower GDP growth rate and higher fuel prices in (a) than in (b) but the income effect is higher leading to higher emissions in (b).
<b>France</b>	9	13		GDP growth rate lower and fuel prices higher in (a) than in (b), leading to lower emissions in (a).
<b>Germany</b>	-13	-10		Due to lack of information about growth rate, it is assumed to be 0.7% lower than in modified trajectory.
<b>Greece</b>	14	19		Due to lack of information about growth rate, it is assumed to be 0.7% lower than in modified trajectory.
<b>Ireland</b>	20	25		Due to lack of information about growth rate, it is assumed to be 0.7% lower than in modified trajectory.
<b>Italy</b>	3	6		Much higher GDP growth rate in (b) than in (a) and higher fuel price increase. Income effect outweighs price effect leading to higher emissions in (b).
<b>Luxembourg</b>	-24	-20		Growth rate in (a) lower than in (b). Fuel prices are the same. Emission reduction greater in (a).
<b>Netherlands</b>	0	10		Higher GDP growth rate in (b) than (a) and high income elasticity explains higher growth in emissions. Fuel prices higher in (a) than in (b).
<b>Portugal</b>	36	36		Due to lack of information about growth rate, it is assumed to be 0.7% lower than in modified trajectory.
<b>Spain</b>	21	23		Lower growth rate and higher fuel prices in (a) than in (b) explain the higher emissions in (b).
<b>Sweden</b>	4	6		Lower growth rate and higher fuel prices in (a) than in (b). Price effect dominates leading to lower rise in emissions in (a).
<b>UK</b>	-6	-2		Higher GDP growth rate in (b) leading to higher emissions than in (a).
<b>EC-15</b>	-1	3	5.4	Aggregate figure for EC-total.



## 6.2 Updated 'Business as usual' CO<sub>2</sub> projections from energy use

Scenarios and projections of future EC greenhouse gas emissions were described in the first Communication. The scenarios differed with regard to exogenous variables, but did not entirely correspond to the policies and measures under consideration or implementation. New EC 'with measures' scenario are under preparation but not yet available. For the time being only a revised baseline scenario has been presented.

The following 'business as usual' scenario analysis of CO<sub>2</sub> emission trends and their driving forces is based on the absence of strong policy action for CO<sub>2</sub> abatement.

Energy related CO<sub>2</sub> emissions in the Union are rising through 2020 :

- in 2000, there may be an overshoot over 1990 of 2%;
- in 2010, CO<sub>2</sub> emissions are projected to exceed the 1990 level by 8% and
- in 2020, emissions might be 16% higher than they were in 1990.

A sectoral breakdown of energy related CO<sub>2</sub> emissions gives the following picture :

Energy related CO<sub>2</sub> emissions by sector (million t CO<sub>2</sub>)

percentage change over 1990					
	1990	2000	2005	2010	2020
industry	626	- 14%	- 14%	- 15%	- 15%
transport	743	+ 22%	+ 31%	+ 39%	+ 49%
domestic/tertiary	654	- 1%	+ 2%	+ 4%	+ 6%
power/heat production	1036	- 2%	+ 2%	+ 2%	+ 17%
energy sector	141	+ 9%	+ 11%	+ 12%	+ 13%
total emissions	3200	+ 2%	+ 6%	+ 8%	+ 16%

Transport is the strongest growing sector with emissions increasing over the 1990 level by 39% in 2010 and by almost 50% in 2020.

Industrial CO<sub>2</sub> emissions are expected to decrease by 15% between 1990 and 2010, and they should stabilise at this lower level.

CO<sub>2</sub> emissions in the domestic/tertiary sector are expected to remain more or less stable over the next years, but they might increase after the turn of the century. In 2020, they could exceed the 1990 level by 6%.

CO<sub>2</sub> reduction and limitation in the industrial and domestic/tertiary sectors are brought about among other things by increased market penetration of electricity and heat, i.e. they are achieved by 'exporting' CO<sub>2</sub> emissions to the power station sector.

In spite of strongly growing electricity and heat demand, CO<sub>2</sub> emissions in the power and heat producing sector might remain at a level slightly below the 1990 emission level through 2010. However, after 2010, changes in the power generation structure (e.g. retirement of nuclear power plants at the end of their lifetime) may cause CO<sub>2</sub> emissions to rise strongly again.

CO<sub>2</sub> emissions in the energy sector reflect the increasing demand for final energy carriers and the emerging conversion of biomass into biofuels for transport involving some fossil fuel use.

### **6.3 Other studies and projections**

A number of studies are presently being carried out under the JOULE-THERMIE programme and in the framework of the climate change ad hoc group on emission projections beyond the year 2000 under "with measures" scenarios. While the final results were not available at the time of the completion of this communication, preliminary data show a considerable reduction potential below the "business as usual" scenario described above and below the 1990 emission levels.

## **7. EXPECTED IMPACTS OF CLIMATE CHANGE, VULNERABILITY ASSESSMENT AND ADAPTATION MEASURES**

### **7.1 Introduction**

Under the Environment and Climate Programme of the Fourth Framework Programme for Research and Development, which is described in more detail in Chapter 9, a number of studies of climate change impacts and possible adaptation measures have been carried out. The most recent results from these projects are described in this Chapter.

### **7.2 Hydrological regimes and water resources in Europe**

Ongoing EC-funded projects are examining the implications of climate change on hydrological regimes and water resources in Europe, in particular on water resource availability, flow regimes and drought.

Potential impacts on water resources in various river basins in Europe have been assessed. Although annual rainfall amounts are found to change little, considerable intra-annual variability is found, generally with increased winter rainfall, and longer summer dry-spells with decreased summer discharges. Parallel modelling work on the impact of climatic variations on aquifers in Southern Europe catchments has shown that a doubling of CO<sub>2</sub> will essentially result in large increases in potential evapotranspiration leading to depletion of groundwater aquifers.

Newly developed climate change scenarios suggest that the hydrological regime of the Rhine may shift from a combined rain-snow fed regime to a rain-fed regime. The most dramatic changes in the discharge regime can be expected in the Alpine region, which is considered to be the "water tower" of Central Europe. New results from the northern Mediterranean show

that traditional forecasting techniques seriously underestimate maximum water discharges into rivers and precipitation.

The development of climate change scenarios for a range of time horizons allows a better estimation of the vulnerability of river-based dependent activities such as inland navigation, drinking water supply, irrigation and tourism.

Land-use scenarios were developed for the entire Rhine basin for the period 2040-2049. The simulation results for present and future climate changes suggest a positive effect on yields for most cultivars. It is anticipated from the model simulations that with a contracting agricultural area there is a tendency to grow crops in those parts of the Rhine basin that have the highest yields. However, with decreased low-flow discharge into the Rhine, irrigated intensive horticulture cash crops may be affected if irrigation has to be curtailed in the summer periods.

### **7.3 Sea-level change in Europe**

Recent results show that sea surface levels around the coasts of the European Union are currently rising at a rate of between 1 and 1.5 millimetres per year. An increase in storminess has been observed in most of the North-East Atlantic and in the North Sea during the last few decades.

Despite some upward movement of the land in some areas of the EC (probably as a result of the decay of the last ice sheet), the broad pattern is that relative sea levels are rising against the coasts of most areas of the European Union. This, combined with changing storminess, may result in greater areas being susceptible to flooding in future years.

### **7.4 Forests**

On-going research projects provide a strong, methodological basis for estimating how forests will be affected by rising atmospheric concentration of CO<sub>2</sub> and change in climatic parameters, and how forests will influence regional carbon, water and energy fluxes.

Impact studies on young forest trees have shown that growth and development are speeded up.

With regard to CO<sub>2</sub> exchange, terrestrial ecosystems have a potential role for long-term CO<sub>2</sub> uptake from the atmosphere and carbon storage. Attention is focused on two questions: how much carbon the biosphere can store, and where. A number of recent studies suggest a sink of carbon in the regrowing forests of the Northern Hemisphere, though the estimates are imprecise, ranging from virtually zero to > 0.7 Gt C y<sup>-1</sup>.

Climate change is expected to have important implications for boreal ecosystems. Most striking of all, as seen from a pilot study, is the increase in ecosystem respiration, which greatly outweighs the observed increase in photosynthesis. Similarly, the severalfold increase in NO<sub>2</sub> losses and methane oxidation are important observations in consideration of the effects of future climate on boreal nutrient pools.

### **7.5 Mediterranean desertification**

There is a growing realisation of the problem of desertification in European countries, especially those of the Mediterranean.

Since the 1950s there have been major changes in land use having vital effects on the economies of Mediterranean countries. The prospects of climate change over the next few decades have led to further complications. Climatic variability experienced during recent years already led to dramatic situations of water shortages, erosion, landslides and harvest losses. These threats may be aggravated by even relatively small shifts in climate conditions, which would hinder rather than help sustaining water supplies and agricultural productivity. Drier winter conditions are the largest potential problem, but much depends on the changes in rainfall patterns for which there is as yet no reliable predictive methodology. There is also evidence of decreasing rainfall in the Mediterranean basin since around 1970. However, it is not possible to establish whether this trend is due to global warming or whether it is simply due to natural decadal time-scale variability.

Clearly, mitigation strategies will require a complex blend of geographical, social, economic and scientific information combined with carefully developed policy and the instruments to implement that policy. A major international Conference on Mediterranean Desertification was organised by the European Commission at the end of 1996 with a view to developing common strategies. The results are being analysed and will provide important input to the implementation of the UN Convention on Combating Desertification.

## **7.6 Agriculture - Land use change**

Relatively small changes in climate can have significant impacts on agricultural productivity. Simulations of crop responses to current and possible future environmental conditions have improved, and yield responses of the different models to the climate change scenarios are in broad agreement.

While elevated CO<sub>2</sub> concentrations cause beneficial effects on C<sub>3</sub> crops (e.g. vegetables, grapevines, wheat), interactions with warmer temperatures and nutrient limitations reduce these increases in yield. The yields of C<sub>4</sub> crops (e.g. maize) do not increase as a direct result of a higher CO<sub>2</sub>-level, but indirect effects on water use efficiency and high temperatures may lead to increased yields. Interactions with altered precipitation and increased evapotranspiration may affect the response.

Current differences in crop productivity between northern and southern Europe are likely to increase under climate change. Exceeding crop-specific high temperature thresholds may result in a significantly higher risk of crop failure in parts of southern Europe, while northern Europe may be able to grow a wider range of crops than is currently possible due to a warmer and longer growing season. Crops which are presently grown throughout Europe experience more positive impacts in northern Europe compared with southern Europe.

Climatic variability may also change in the future due to climate change. The inter-annual variability of crop yields is particularly sensitive to changes in climatic variability. In regions where crop production is affected by water shortages, such as in southern Europe, increases in the year-to-year variability of yields in addition to lower mean yields are predicted. The inter-annual variability of adaptive strategies, including changing variety and altering sowing date, may alleviate yield losses by reducing the risk of low yields in most situations.

Climate change will therefore be an important aspect to consider in the future, in particular, in relation to land management and spatial planning. In parallel, the progress in forecasting interannual and seasonal variations of European climate will, among other benefits, help to maintain agricultural productivity.

## **8. FINANCIAL ASSISTANCE AND TECHNOLOGY TRANSFER**

### **8.1 Introduction**

EC programmes for international co-operation with third countries, like SYNERGY, LIFE, PHARE and TACIS, were described in the first communication on Climate Change. In this second communication, the data for these programmes will be updated, and some other forms of cooperation will be briefly introduced, such as the EC-Asia cooperation in the field of energy, the EC-China cooperation on environmental issues, and the contribution to the Global Environment Facility (GEF).

These programmes are not specifically designed to combat climate change, but contain elements related to this issue. It is therefore difficult to give an overview of all the existing programmes, and to list all the projects that are related to climate change as well as the exact amount of money that is spent in cooperation with third countries to reduce greenhouse gas emissions. This Chapter describes general cooperation programmes with all non-member States and programmes specifically targeted at groups of countries.

### **8.2 Global Environment Facility (GEF)**

The European Community is not a Participant in the GEF, and is therefore not contributing to the GEF Trust Fund. However, the European Parliament added ECU 4 million for Community cooperation with the GEF to the 1996 budget. These funds were used to co-finance the GEF/WB "China Energy Conservation Project".

### **8.3 EC Cooperation Programmes with third countries**

#### *8.3.1 SYNERGY*

SYNERGY<sup>49</sup> is a programme for cooperation with non-member States in the field of energy policy. The areas of cooperation with regard to the prevention of climate change include the encouragement of energy efficiency and clean technology in third countries, the development of renewable energy sources, and training to raise environmental awareness.

The programme concentrates on the geographical priorities in the Community's external relations, and covers the following areas: Central and Eastern European countries (CEEC), CIS, Mediterranean Countries, Latin America, Asia, and Africa. As an international programme, SYNERGY addresses not only individual third countries, but also cross-boundary projects, both of which have links with THERMIE, PHARE and TACIS. Horizontal activities, such as the development of a database and logistical support for the various meetings, are also included in the SYNERGY work programme for 1997.

Until 1996, SYNERGY operated on an annual budgetary basis with funding of ECU 8 million per year in the last few years. In 1995 the Commission proposed a new legal regime on a multi-annual basis and closer involvement of Member States in the decision-making process. The regime was approved by the Council on 14 April 1997 for the year 1997. SYNERGY will, in all likelihood, be part of a new framework energy programme, which will assure more effective coordination between all the Community

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<sup>49</sup> Synergy - Council Decision 701/97/EC of 14.4.1997, OJ No L 104, 22.4.1997, p. 1.

actions in the energy field, thus providing the external component of such future framework energy programme.

In Africa a specific action will contribute to the elaboration of a regional energy policy for renewables in southern Africa.

The reduction of greenhouse gas emissions is explicitly stated to be one of the objectives of SYNERGY. So, generally, the other projects, especially those involving training on energy programming actions, have tended to incorporate promotion of renewables or energy efficiency.

For the 1997 work programme a budget of ECU 6.9 million was approved, divided among the regions as follows:

Table 8.1: Amount of money to be spent on SYNERGY projects in 1997 (in ECU)

<i>Region</i>	<i>Priority projects (ECU)</i>	<i>Number of projects for 1997</i>
CEEC	1 180 000	10
NIS	1 150 000	5
Mediterranean area	1 180 000	6
Gulf	100 000	1
Asia	875 000	7
Latin America	1 030 000	6
Africa	200 000	2
Horizontal activities	1 125 000	4
Total	6 840 000	41

(Source: Synergy action programme 1997)

In the CEEC, SYNERGY complements other EC programmes such as PHARE, TACIS and THERMIE.

Projects carried out in the CEEC include studies on widening the use of natural gas in Bulgaria; the effects of standardisation and labelling of the energy efficiency of household appliances in Romania; energy scenarios for analyses and forecasts in the Czech Republic; and an energy efficiency program for the public sector in Slovenia. An Energy Efficiency Centre was set up in Albania.

A standing Working Group for Energy matters has been set up within the framework of the EC-China Joint Committee; it will focus on technical and strategic approaches in the electricity, oil, gas and coal sectors.

In Latin America, SYNERGY concentrates on creating, developing and supporting local capacities and expertise in energy planning and is promoting energy efficiency through providing support to local institutions.

SYNERGY expanded its activities in the Mediterranean region during 1994-96. The actions undertaken have contributed to the development of energy co-operation at the regional level, such as the 1994 "*Regional and Urban Energy Management*".

### 8.3.2 *THERMIE*

The first THERMIE programme covered the period 1990 - 1994 and had a total budget of about ECU 700 million. Although it was mainly aimed at the use of energy within the Community, cooperation with third Countries was an important element. Under THERMIE, projects in the CEEC, the former Soviet Union, the Mediterranean region, Latin America, South-East Asia, Africa and non-EC industrialised countries were developed.

One of the main accomplishments is the establishment of 15 Energy Centres across the CEEC and the former Soviet Union. They provide the permanent logistical basis for cooperation between the EC and the CEEC in the energy field, and for specific, small-scale actions. During the first year of operation, over 150 THERMIE activities were carried out in the CEEC, including about 100 short-term activities. At the end of 1994, the total number of actions implemented in the region since the start exceeded 400.

The second THERMIE programme covers the period 1995 - 1998, and has a total budget of ECU 577 million.

### 8.3.3 *ALTENER*

ALTENER (see Chapter 5.3.2) focuses on barriers to deployment and on measures which encourage technical and environmental standards for renewable energy throughout the Community. In addition, an effort is being made to exchange information and cooperate with other countries, in particular in the developing world.

### 8.3.4 *LIFE*

LIFE<sup>50</sup> is a Community financial instrument supporting environmental actions in the Member States and bordering regions. The total budget for phase II, from 1996 - 1999, is ECU 450 million. Part of this programme, called LIFE third countries, is aimed at countries outside the Union. LIFE third countries receives five percent of the total LIFE funding. In 1996, thirteen projects were selected, focusing on technical assistance in the environmental sector, nature conservation, and demonstration actions to promote sustainable development. For 1997, the programme is open to applicants from sixteen countries in the Mediterranean and the Baltic Region.

With the opening of the Community programmes to the associated countries, the CEEC can now apply on the same 'footing' as the Member States, provided they fulfil specific financial conditions. The process of selecting new projects has just started, and the choice will be made by midsummer.

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<sup>50</sup> Council Regulation (EC) No 1404/96 adopted on 15.07.96, OJ No L 181, 20.7.1996, p. 1.

### 8.3.5 *Cooperation with third countries in RTD framework programme*

In the RTD Framework Programme, activity 2 covers cooperation with third countries where issues of global importance, such as environment protection, are part of the objectives (please see Chapter 9). Specific programmes such as JOULE - THERMIE also involve cooperation with third countries.

## **8.4 Cooperation with developing countries**

### 8.4.1 *EC-Asia Energy Cooperation*

The Commission adopted a communication to the Council and European Parliament on a Europe-Asia cooperation strategy for energy (COM (96) 308 final)<sup>51</sup>. Particular attention is paid to the protection of the global environment. It will concentrate on establishing a dialogue on energy policy and mobilising the private sector, but will also take account of the social and environmental factors involved in developing the energy sector. Measures will be taken both on the supply side, through optimum use of local resources, and on the demand side, through management of consumption. Priority will be given to electricity, natural gas and coal, energy efficiency and energy supply in rural areas, with greater use being made of new and renewable energy sources.

### 8.4.2 *EC-China Cooperation*

Environmental cooperation has become one of the main items of bilateral cooperation with China. The Environmental Management Cooperation Programme (EMCP) sets the scene for active environmental cooperation with China for the next 3 - 4 years.

### 8.4.3 *Cooperation on forest-related issues*

A budget line for tropical forests (now B7-6201, formerly B7-5041) was established in 1990, as part of broader international cooperation with tropical forest countries, to finance projects concerned with the conservation and management of tropical and subtropical forests.

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<sup>51</sup> Communication from the Commission dated 18.7.1996.



**Table 8.2:** Budget item B7-6201 (formerly B7-5041), tropical forests. Breakdown of funding by year and region (in ECU million).

Budget year	Latin America	Asia	ACP countries	Horizontal operations	Total
1991	-	-	-	-	2
1992	25.74 (49.4%)	8.80 (17.0%)	17.46 (33.6%)	-	52
1993	22.00 (44.0%)	11.75 (23.5%)	14.55 (29.0%)	1.50 (3.5%)	50
1994	22.10 (46.5%)	9.70 (20.4%)	14.50 (30.6%)	1.20 (2.5%)	47.5
1995	34.85 (70.0%)	3.17 (6.0%)	10.00 (20.0%)	1.98 (4.0%)	50

In line with the mandate from the European Council, the Commission drew up an action programme covering the three main tropical forest regions (Latin America, Asia and Africa) and emphasising preservation and sustainable management by a wide variety of partners at regional, national and local levels, and more recently at international level too.

Action has often been backed by projects funded under other budgets in the context of financial and technical cooperation with the Asian and Latin American countries, where 10% of the resources for financial and technical cooperation are earmarked for environmental and tropical forest operations. A number of tropical forest programmes are being carried out under the Lomé Convention, a regional agreement with 70 States in Africa, the Caribbean and the Pacific (ACP).

## **8.5 Cooperation with Central and Eastern European Countries (CEEC)**

### *8.5.1 PHARE*

PHARE<sup>52</sup> covers country-oriented as well as 'multi-country' programmes in Central and Eastern Europe. The annual budget is around ECU 1 000 million. For the period 1995-1999, ECU 6 700 million have been allocated. The percentage spent on the environment is around 10%. Phare, the instrument for accession of the Associated Countries of Central and Easter Europe, provides technical assistance and support to investments to these countries, in order to achieve the *acquis communautaire* and compliance with the *acquis*.

It covers energy and other sectors. Each CEEC has its own energy programme. As regards the multi-country programme (ECU 43 million for the period 1992 - 1996), priorities in the energy sector include studies on interconnection of electricity and gas networks, the development of an energy policy dialogue, training and twinning schemes. The PHARE Cross-Border Programme (ECU 150 million annually as from 1994) concentrates on the development of networks and cooperation in border regions between CEEC and the Union.

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<sup>52</sup> Council Regulation (EEC) No 3906/89 of 18 December 1989 on economic aid to certain countries of Central and Eastern Europe, OJ No L 375, 23.12.1989, p. 11, as last amended by Council Regulation (EC) No 753/96 of 22 April 1996, OJ No L 103, 26.4.1996, p. 5.

Projects under the PHARE programme originally focused on technical assistance for the development of (sectoral) energy policies and energy legislation, restructuring of energy utilities, training and so on. Since 1993 the development of energy saving funds has been on the agenda.

#### 8.5.2 *ECSC, Euratom and EIB loans*

In the framework of the ECSC Treaty, loans of up to ECU 200 million may be granted for investments in the steel and coal sectors of CEECs. Projects planned in the coal sector include reconversion of the coal industry and environmental protection.

Since March 1994, Euratom loans have been made available to the CEEC for safety improvements at nuclear installations.

Since 1990, the EIB has been authorised to provide loans to the CEEC. The Bank's projects in the energy sector are aimed at energy savings and improvement of the environment.

It should also be noted that the EC and its Member States have a majority share in the EBRD, which also finances energy projects.

### **8.6 Cooperation with the former Soviet Union - the TACIS Programme**

The TACIS<sup>53</sup> programme is a European Union initiative for the newly independent States and Mongolia. It fosters the development of harmonious and prosperous economic and political links between the European Union and these partner countries. TACIS provides grants for know-how to support the process of transformation to market economies and democratic societies. In the first six years of operation, 1991 - 1996, TACIS has committed ECU 2 807 million to launch more than 2 250 projects.

TACIS works closely with the partner countries to determine how funds should be spent. This ensures that TACIS funding is relevant to each country's own reform policies and priorities.

Energy, nuclear safety, and more recently the environment are some of the priority areas for TACIS funding. These policy areas are included in a number of TACIS programmes adopted during 1996. In the Russian programme, a separate environmental sub-programme has been included. In the Ukraine there is a joint energy and environment sub-programme, while in Kazakstan a variety of environment-related projects are supported. During 1997, there will be extensive training on the use of environmental assessments.

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<sup>53</sup> Council Regulation (Euratom, EC) No 1279/96 of 25.6.1996, OJ No L 165, 4.7.1996, p. 1.

## 9. RESEARCH AND SYSTEMATIC OBSERVATION

### 9.1 Fourth Framework Programme for Research and Development (1994-1998)<sup>54</sup>

The Fourth Framework Programme had an initial budget of ECU 12.3 billion, which has since been increased by ECU 800 million to reflect the accession of the new Member States. It comprises four activities :

- (1) Research, technological development and demonstration programmes
- (2) Cooperation with third countries and international organisations
- (3) Dissemination and optimisation of results
- (4) Training and mobility of researchers

Most climate-change-relevant projects are carried out under activity (1) "Research, technological development and demonstration programmes". It is organised around fifteen specific programmes. Two of the programmes are of direct relevance to climate change:

- Environment and Climate (ECU 566.5 million)
- Non-nuclear Energy 'JOULE-THERMIE' (ECU 1 030 million)

These two programmes will be described in more detail in the following Chapters.

The "marine science and technologies" programme also contains elements which are relevant in the context of climate change. The aims of the programme, which has a budget of ECU 244 million, are to move towards a new phase of the long-term strategic programme of exploration, protection and exploitation, and to understand how marine systems function at basin scale, in order to prepare for sustainable use of the oceans and determine their role in global change. Research activities carried out under this programme include marine science, strategic marine research, marine technology and supporting initiatives.

The programmes on agriculture and fisheries and on transport include elements related to climate change. Agricultural research is discussed in Section 5.6.3.

Activity (1) includes support for the Joint Research Centre (JRC) of the European Commission. Research on climate-change-related issues is carried out in two institutes of the JRC, the Institute for the Environment in Ispra, Italy, and the Institute for Prospective Technological Studies in Sevilla, Spain.

Climate change related aspects are also addressed in programmes of other activities such as the programmes on "sustainable management of renewable natural resources" and on "sustainable improvement of agricultural and agro-industrial resources" within activity (2) "Co-operation with third countries and international organisations".

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<sup>54</sup> "EC Research Funding - A guide to applicants. General information" - EUR/16729. Latest issue 1996 - ISBN 92-827-5668-8

## 9.2 Environment and Climate

### 9.2.1 Overview

The aims of the programme, which has a budget of ECU 566.5 million, are as followings:

- \* to improve the scientific base of EC environmental policy
- \* to understand the basic processes of the climate and of natural systems and detect climate change
- \* to predict climate variations on seasonal, interannual and decadal scales
- \* to help meet the objectives of world programmes of research into global change
- \* to assess the impacts of climate change
- \* to develop environment-friendly products, technologies, techniques and services which meet new needs and could create new jobs.

The areas of research related to climate change include:

- (1) research into the natural environment, environmental quality and global change - 47% of the budget
- (2) environmental technologies - 25% of the budget
- (3) space techniques applied to environmental monitoring and research - 20.5% of the budget
- (4) human dimensions of environmental change - 7.5% of the budget.

Recent results from research in areas (1) and (4) are described in further detail below.

### 9.2.2 *Research into the natural environment, environmental quality and global change*

#### 9.2.2.1 Climate processes and climate system studies

- Carbon cycle

While new high-resolution ice-core measurements have confirmed the rise in atmospheric CO<sub>2</sub> concentration by more than 25% since pre-industrial times, the current assessment of the global budget of atmospheric CO<sub>2</sub> still contains large uncertainties.

New approaches confirm the important role of the oceans, which on decadal time scales take up approximately 30% of anthropogenic CO<sub>2</sub>. Since about 45% of anthropogenic emissions accumulate in the atmosphere, the remaining 25% must be absorbed by the terrestrial biosphere. However, the processes which constitute this sink are still unidentified. Measurements of the atmospheric distribution of CO<sub>2</sub> concentration indicate that a large fraction of this terrestrial uptake occurs in the temperate latitudes of the northern hemisphere.

The picture of the global carbon cycle is further complicated by large interannual variations. Following the Pinatubo volcanic eruption, the growth rate of atmospheric CO<sub>2</sub> was reduced by almost two thirds in 1992 and 1993.

The carbon balance and its response to warmer climates of the tundra, the Arctic and the tropical forests regions are still uncertain. For the tundra and the Arctic, first estimates show an

additional source of the order of 0.1-1.0 Gt C/y. Recent measurements in Amazonian tropical rainforest show a net sink of 0.9 +/- 0.1 tonne C/ha/year under the present climate conditions. First estimates indicate an additional source of carbon to the atmosphere due to the land use changes of 0.6 - 2.0 Gt C/y, with the majority resulting from tropical deforestation.

- Methane

Methane (CH<sub>4</sub>) is the second most important greenhouse gas. Its effects account for roughly a fifth of expected global warming. Atmospheric CH<sub>4</sub> has increased sharply since the industrial revolution (up to 1990).

EC supported research has studied methane over Europe and the Atlantic. The concentration stabilised in 1990-1993, with little change, but since then has increased again. The research studied European sources of methane, both locally and broadly over the region. The atmospheric measurements and modelling were contrasted against the European Environment Agency's 1990 emission inventory (CORINAIR). The CORINAIR inventory is based on statistical analysis of sources (e.g. landfills, cows, gas systems, coal mines, wetlands, etc.). The direct atmospheric results supported the broad conclusions of the CORINAIR inventory, but showed significant specific inconsistencies, especially in emission factors for certain sources in particular areas (e.g. landfills in part of Germany). The experiments show that the dominant (70-75%) west European sources are biogenic (e.g. cows, biological effects of human activities - landfills, sewage, etc.). Results in the Netherlands and the UK suggest that fossil fuel emissions are important in heavily populated areas, locally over 30% of total emissions. The research work shows the need for substantially revising the national and regional estimates of emissions, using internationally consistent emission factors. High methane concentrations and large sources in Eastern Europe are reported. These may in part be from the leakage of the natural gas systems there, as well as from coal. Targeting wasteful emissions and losses in these regions may be a cost-effective way of reducing the global atmospheric methane concentration, thus counteracting expected global warming.

- Aerosols and clouds

Aerosol and cloud processes are not very well described in climate models, due to the complex physical processes involved, and are a source of major uncertainty. New estimates of the impact of anthropogenic aerosols on solar radiation over Europe show a reduction of 3 - 4 Wm<sup>-2</sup> and peak values of up to 20 Wm<sup>-2</sup>. However, the uncertainty is of the same order of magnitude. The integrated aerosol forcing indicates a cooling over Europe.

- Past climates

Important aspects of the functioning of the climate system are still insufficiently known, and improvement in climate change prediction depends on the progress in more basic climate system studies. Within EC climate research, important results have been obtained in studies of past climates, notably from the Greenland ice cores (GRIP). GRIP results showed that during glacial conditions frequent and abrupt climate changes dominated Greenland (20°C warming within a century). The link between these abrupt changes and events occurring in the North Atlantic as a result of massive iceberg discharges is now well documented. The studies of oceanic sediment cores have also demonstrated that the climate system is extremely sensitive to minor changes in rainfall and the water cycle over the North Atlantic. This has raised basic questions on the stability of our current climate. In view of this, a major new EC effort on polar ice core analysis has been initiated in Antarctica (EPICA: European Project on Ice Coring in Antarctica). Several other palaeoclimate studies are documenting climate variability

during the last few hundred and thousand years and are helping to disentangle human-induced changes from the natural variability. These studies utilise data, for instance, from tree rings, corals, pollen, cave calcite deposits and multiproxy databases.

- Upper atmospheric processes

The changes in the vertical concentration profiles of minor atmospheric components, such as ozone, and of temperature in the stratosphere (15-50 Km altitude) are considered to be important indicators of the anthropogenic forcing of climate change. Results of both modelling and analysis of long-term stratospheric/mesospheric observational data of temperature profile show a significant temporal change indicating a cooling of about  $-0.4^{\circ}\text{C}$  per decade in the lower stratosphere and of about  $-4^{\circ}\text{C}$  per decade in the mesosphere. The amplitudes of these temperature changes are one or two orders of magnitude higher than the observed temperature changes at the earth's surface. These results indicate that the observed upper atmospheric changes are due to the depletion of atmospheric ozone and increase of atmospheric  $\text{CO}_2$  and cannot be attributed to natural forcing alone (e.g. solar variability or volcanoes).

The programme also supports important international research activities like LBA (Large scale Biosphere-atmosphere experiment in the Amazon) aiming to investigate interactions between regional climate and land use changes and their effect on global climate. First results indicate that the Amazonian deforestation will significantly affect the composition and the functioning of the global atmosphere. Model results show that strong biospheric responses in the tropics can affect the high-latitude climate due to the coupling between vegetation and the atmosphere.

A major European Conference on "Climate and Ozone at the dawn of the Third Millennium" was held in Brussels on 13-14 May 1996 focusing on European scientific achievements and involving a number of prestigious prizewinning European scientists. In addition, a series of workshops, conferences and advanced study courses devoted to climate research are taking place and/or are planned at different locations in the Member States for 1997/98 (e.g. European Greenhouse Gases Workshop, Orvieto, Italy, 10-13 November 1997).

In general, the results of research under this topic have provided a significant contribution to IPCC process.

#### 9.2.2.2 Modelling and prediction, including Global Circulation Models

A central aim of these projects is better assessment of future climate change as expected due to anthropogenic emissions of greenhouse gases and aerosols. European groups have developed the most advanced coupled ocean-atmosphere climate models and notably have provided essential evidence to underpin the IPCC Second Assessment Report (SAR) conclusions that there is a discernible human influence on climate.

In parallel, there are efforts underway to document in further detail the climate change to be expected in the coming decades and century, and to provide sound scientific basis for the assessment of different emission scenarios. In this perspective an important effort has gone into the development of models to "downscale" effects to regional and local scale and to link to model studies of climate change impacts. Regional limited area dynamical and statistical models developed in this context have been found to be able to provide climatic downscaling to scales of only tens of kilometres from the much coarser Global Circulation Models (GCMs).

New coupled model results show that the supply of large amounts of meltwater, such as happened during the last deglaciation, can cause an interruption in the northward heat transport associated with the "conveyer belt" circulation<sup>55</sup> of the North Atlantic. Such regional cooling is, however, embedded in the expected global warming due to possible doubling of CO<sub>2</sub>.

The EC effort within climate system modelling, including climate change modelling, research on climate variability and seasonal to interannual climate prediction, is now being coordinated within the broad concerted action "EURO-CLIVAR", which is linked to the international CLIVAR (Climate Variability and Predictability Study) of the World Climate Research Programme (WCRP). This effort is contributing to the coherence and effectiveness of European climate research and will provide a joint contribution to the worldwide efforts on predicting seasonal and interannual climate variations which will have potential economic benefits. Some evidence of decadal-scale predictability is also emerging as a result of EC supported research.

### 9.2.3 *Human dimensions of environmental change*

EC research on socio-economic aspects of the environment was initiated in 1991. By the end of 1996, 8 research projects focusing on climate change issues had been completed and 6 others were in progress. The research undertaken focused on three main aspects:

- policy responses to climate change,
- social behaviour contributing to greenhouse gas emissions and/or to the adoption of measures to reduce them,
- the improvement of the research/policy interface and the use of integrated assessment tools to assist decision making and to facilitate public debate on climate risks and response options.

The completed projects include : ‘Climate change and extreme events: socio-economic and policy responses’, ‘Consumers’ lifestyles and pollutant emission’, ‘Designing European governing institutions for climate futures’, ‘Distribution conflicts as a constraint for implementation of environmental policies’, ‘Greenhouse gas abatement through fiscal policy in the European Community’, ‘Greenhouse gas inventories: national reporting processes and implementation review mechanisms in the European Community’, ‘Links between instruments and decision criteria in the negotiated management of global environmental risks’, ‘Optimising the climate strategies of European municipalities’.

The research projects in progress include ‘A proposal to enhance policy making capacity under the FCCC’, ‘Climate change research and its integration into environmental policy: conditions for the establishment of a European climate region’, ‘Integrated assessment modelling of global environmental policies and decision patterns’, ‘Joint Implementation: Accounting and accreditation mechanisms under the FCCC and the Oslo Protocol’, ‘Strategies for European leadership of international climate and sustainable regimes’,

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<sup>55</sup> The deep water circulation of the Atlantic Ocean and the associated northward (from low to high latitudes) transport are important factors for global climate and its variability. Currently the Gulf stream transports 1PW of heat northward, thus largely determining the European climate. The water cools down and sinks returning to the south at depths of 2-3 km. This circulation is referred to as "conveyer belt".

‘Urban lifestyles, sustainability and integrated environmental assessment (focus on climate change)’.

Other research projects into socio-economic aspects of climate change, and complementing the work already undertaken, are expected to start by the end of 1997. These projects will focus on the identification of methods and processes to foster policy integration and for improved environmental target setting, the development of methodologies to identify socio-economic vulnerability to environmental change and its relevance for the EC.

Several workshop were held (policies and measures; flexibility instruments; verification aspects related to sinks) or are being planned to discuss research results (final or in progress) of the projects with interested researchers and policy makers. These workshops are intended not only to improve research networking and dissemination of results, but even more to assist the process of negotiation of the FCCC and the implementation of climate measures with focus on the EC socio-economic context.

A major conference was also held in cooperation with IPCC-WG III on ‘Prospects for integrated environmental assessment: lessons learned from the case of climate change’ in Toulouse, October 1996.

A Summer school for European students and young researchers, scheduled for summer 1997 in Berlin, is intended to contribute to the development of future European research capability in the field of socio-economic aspects of the environment with particular regard to climate change.

### **9.3 Non-nuclear Energy ‘JOULE-THERMIE’**

#### *9.3.1 Overview*

The programme includes research, technological development and demonstration measures. It has a budget of ECU 1 030 million.

The aims of the programme are as follows:

- \* development and testing of safe, environment-friendly and economic energy technologies,
- \* better conversion and use of energy,
- \* greater use of renewable energy in Europe’s energy supply.

Research and technological development is carried out in the following areas:

- (1) strategic issues and modelling (further details explained under 10.3.2 below),
- (2) rational use of energy (in buildings, industry, transport, the energy industry, and fuel cells),
- (3) renewable energies (photovoltaics, RE in buildings, wind, biomass and waste, hydroelectric power, geothermal energy, energy storage),



- (4) fossil fuels (clean technologies for solid fuels, generic combustion, new fuels in transport, hydrocarbons).

New technologies are considered to have an important influence with regard to the cleaner production and use of energy, in particular the emissions of CO<sub>2</sub>.

### 9.3.2 *Studies on strategic issues and modelling activities related to Climate Change*

The climate change issue is one of the main driving forces behind the Community's energy R&D strategy. Activities in the area of the development and application of E3 (Energy-Economy-Environment) modelling were stepped up in the early 1990s in order to address this issue in a comprehensive and relevant way. The aim is to determine what changes could be made to climate change technology strategies at EC level which would be consistent with the climate change policies adopted at European and world level, e.g. in the UNFCCC context.

For this purpose, a new generation of models has been developed. These models represent all the main components of the energy dimension of the climate change issue, including:

- \* the E3 inter-relationship, all European countries and the economic links between EC countries and between Europe and the rest of the world are taken into account in a specific manner. Macro-economic and sectoral models have been developed for this purpose. They are either of a general equilibrium nature or of mixed neo-Keynesian and equilibrium approaches. The economic impacts of market instruments used for the deployment of new technologies or for CO<sub>2</sub> mitigation policies are evaluated using these models;
- \* energy supply and demand aspects, both at EC level, by country, and at world level, split into 28 regions according to CO<sub>2</sub> emissions and other criteria. Partial equilibrium and simulation models have been developed, in which technology is represented in detail both at the supply and demand levels. For the EC countries, a micro-economic approach is followed in order to determine the mix of energy technologies that could be used at the demand level depending on a set of criteria. The consistency of the micro-economic results is then ensured through the application of more 'top-down' approaches;
- \* the environmental costs and benefits of energy technologies, including the climate change impacts. This activity consists in giving a monetary value to the damage occurring as a result of energy use (it takes into account the scientific results established in the climate change research programme).

The new generation of models is, as a matter of priority, applied to a comprehensive study related to climate change. This study, entitled 'Climate Technology Strategies within Competitive Energy Markets towards a New and Sustainable Growth', is assessing on the one hand the impacts of major technological energy options for the mitigation of CO<sub>2</sub> emissions and, on the other, the effects of globalisation and liberalisation on energy markets, energy use and CO<sub>2</sub> emissions. The time horizon is to 2010-2020-2030.

The main components of this study are as follows:

- \* elaboration of a European and world base line for energy consumption: this base line is used to determine the impacts of policies and measures.
- \* evaluation of the potential from technology options in the field of energy efficiency in the context of decentralisation and market operation, new fuel cycles and renewables, conventional technologies and advanced fossil fuels technique, changes in transport and new vehicle technologies: these potentials are determined in relation to the costs of the options, including or excluding (depending on the type of analysis) environmental and transactional costs. European and world markets are considered (the POLES (prospective outlook on long-term energy systems) model is used for the world, the PRIMES model (price-driven equilibrium model of the energy system and markets for Europe) assisted by SAFIRE (strategic assessment framework for the implementation of rational energy) for EC countries).
- \* evaluation of policy instruments at the energy system level and of economic policy issues at the macro-economic level. The role of tax reforms and subsidies, and the conditions of feasibility for the double dividend achievement in terms of environment and employment are evaluated at macro and meso sectoral levels, with a special focus on the competitiveness issue. The concept of sustainability, which implies a better understanding of the role of technological progress and endogenous growth, is also addressed in this task; because the climate change issue has to be linked to these, more advanced sectoral models like WARM (world assessment of resources management) and E3-ME (energy-environment-economy model for Europe) are used for such evaluations.

A network of 20 institutes in Europe is participating in this activity, which is coordinated by NTUA in Athens. The link between this activity and decision making on R&D strategies, and also environment and energy policies, is ensured through the internal cooperation mechanisms of the Commission.

## **10. EDUCATION, TRAINING AND PUBLIC AWARENESS**

### **10.1 Introduction**

The Community has recently been developing a number of initiatives in preparation for the forthcoming Conference of the Parties in Kyoto. These include the GREENSPIDER network, the Luxembourg exhibition, the Climate Change Information Campaign and, possibly, a conference in Brussels.

### **10.2 Greenspider**

GREENSPIDER is a network funded by the European Commission. It links the people in the Environment Ministries of the Member States who manage training and communication. It is intended to facilitate the exchange of information and the development of common programmes for information and communication. It is concerned with the environment generally, but the issue of climate change is one of those it addresses, particularly during 1997.

In June 1997, there is to be an exhibition arranged through GREENSPIDER at the same time as the meeting of the European Environment Council in Luxembourg . This will

demonstrate the various achievements by Member States on the environment generally, including climate change.

### **10.3 Climate change information campaign**

The European Commission has decided to set up a substantial information campaign on climate change in 1997 to coincide with the Kyoto Conference of the Parties in December of this year. This Campaign will include a brochure aimed at the general public. In addition, the Commission is currently considering holding a follow-up conference on climate change in Brussels during March or April 1998 as part of this campaign.

### **10.4 Continuing programmes**

The Commission's First Communication under the Convention referred to a number of other information, education and training programmes particularly in the fields of energy supply, transport, urban development, and agriculture.

The SAVE, ALTENER and THERMIE/JOULE programmes are still continuing and being developed. SAVE set up an information exchange network on energy efficiency. ALTENER also operates an information exchange network . THERMIE /JOULE is the non-nuclear energy programme.

**11. ANNEX**

**MEMBER STATES' EMISSION INVENTORIES**

**1990-1995**

# Annex: Detailed IPCC tables (7A) - Summary reports Member States<sup>1</sup>

## A: Emissions 1990

### Austria 1990

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES							
Austria 1990 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>61 876</b>	<b>13 300</b>	<b>587,4</b>	<b>11,6</b>	<b>196,7</b>	<b>1 333,0</b>	<b>490,7</b>
1 All Energy (Fuel Combustion + Fugitive)	48 625	-	25,2	4,3	171,6	997,8	169,8
A Fuel Combustion	46 486	-	21,0	4,3	167,2	994,6	161,0
1 Energy and Transformation Industries	12 412	-	0,2	0,1	14,8	0,9	0,4
2 Industry (ISIC)	7 219	-	0,5	0,1	19,4	6,6	1,2
3 Transport	13 968	-	4,3	3,1	105,4	475,1	107,4
4 Small Combustion	12 845	-	16,1	0,9	27,2	511,3	52,0
5 Other Combustion Activities	41	-	0,0	0,0	0,5	0,6	0,1
6 Traditional Biomass burned for Energy	-	-	-	-	-	-	-
B Fugitive Emissions from Fuels	2 139	-	4,3	0,0	4,3	3,2	8,8
1 Solid Fuels	0	-	0,0	0,0	0,0	0,0	0,0
2 Oil and Natural Gas Fuels	2 139	-	4,3	0,0	4,3	3,2	8,8
2 Industrial Processes	12 703	-	0,1	0,6	17,9	329,3	20,7
3 Solvent and Other Product Use	541	-	0,0	0,8	0,0	0,0	173,7
4 Agriculture	0	-	208,1	3,3	6,2	1,5	2,4
A Enteric Fermentation	0	-	146,0	0,0	0,0	0,0	0,0
B Manure Management	0	-	26,5	0,0	0,0	0,0	0,0
C Rice Cultivation	0	-	0,0	0,0	0,0	0,0	0,0
D Agricultural Soils	0	-	35,5	3,3	6,2	0,0	2,2
E Prescribed Burning of Savannas	0	-	0,0	0,0	0,0	0,0	0,0
F Field Burning of Agricultural Residues	0	-	0,1	0,0	0,0	1,5	0,2
G Other Agriculture Activities	0	-	0,0	0,0	0,0	0,0	0,0
5 Land Use Change & Forestry	-	13 300	126,8	2,6	0,8	0,0	123,5
A Changes in Forests & other Woody Biomass Stocks	-	13 115	0,0	0,0	0,0	0,0	0,0
B Forest and Grassland Conversion	0	-	0,0	0,0	0,0	0,0	0,0
C Abandonment of Managed Lands	-	185	0,0	0,0	0,0	0,0	0,0
D Other Land Use Change Activities	0	-	126,8	2,6	0,8	0,0	123,5
6 Waste	7	-	227,1	0,0	0,2	4,4	0,6
A Solid Waste Disposal on Land	0	-	193,2	0,0	0,0	0,0	0,0
B Wastewater Treatment	0	-	13,7	0,0	0,0	0,0	0,0
C Waste Incineration	7	-	0,2	0,0	0,2	4,4	0,6
D Other Waste	0	-	20,0	0,0	0,0	0,0	0,0
7 Other	0	-	0,0	0,0	0,0	0,0	0,0
International Bunkers (not included in national totals)	891	-	0,0	0,0	4,7	1,5	0,6
Marine bunkers	0	-	0,0	0,0	0,0	0,0	0,0
Aviation bunkers	891	-	0,0	0,0	4,7	1,5	0,6
FNEC (*)	900	-	-	-	-	-	-

Ref.: "Austrian 2<sup>nd</sup> National Communication under the UN-FCCC", May 1997.

(\*) Final Non-Energy Consumption (EUROSTAT)

<sup>1</sup> According to IPCC Guidelines of 1995 (with a separate presentation of CO<sub>2</sub> removals and emissions for transparency).

## Belgium 1990

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Belgium 1990 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> <sup>-</sup> Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>116 090</b>	<b>2 057</b>	<b>634,0</b>	<b>30,8</b>	<b>339,0</b>	<b>1 127,0</b>	<b>331,0</b>
1 All Energy (Fuel Combustion + Fugitive)	105 919	-	68,5	8,3	330,0	1 094,0	204,0
A Fuel Combustion	105 919	-	15,5	7,7	330,0	1 094,0	178,0
1 Energy and Transformation Industries	28 140	-	0,3	2,1	72,0	16,0	1,0
2 Industry (ISIC)	31 027	-	1,4	1,9	49,0	11,0	3,0
3 Transport	19 964	-	9,3	0,9	194,0	974,0	166,0
4 Small Combustion	26 262	-	4,4	2,8	15,0	93,0	7,0
5 Other Combustion Activities	526	-	-	-	0,0	0,0	0,0
6 Traditional Biomass burned for Energy	-	-	-	-	-	-	-
B Fugitive Emissions from Fuels	-	-	53,1	0,6	-	-	26,0
1 Solid Fuels	-	-	14,5	-	-	-	-
2 Oil and Natural Gas Fuels	-	-	38,6	0,6	-	-	26,0
2 Industrial Processes	9 188	-	3,5	11,5	6,0	17,0	37,0
3 Solvent and Other Product Use	-	-	-	-	-	-	90,0
4 Agriculture	-	-	388,0	10,9	-	-	1,0
A Enteric Fermentation	-	-	373,5	-	-	-	-
B Manure Management	-	-	-	-	-	-	-
C Rice Cultivation	-	-	-	-	-	-	-
D Agricultural Soils	-	-	14,5	10,9	-	-	-
E Prescribed Burning of Savannas	-	-	-	-	-	-	-
F Field Burning of Agricultural Residues	-	-	-	-	-	-	-
G Other Agriculture Activities	-	-	-	-	-	-	-
5 Land Use Change & Forestry	-	2 057	-	-	-	-	-
A Changes in Forests & other Woody Biomass Stocks	-	-	-	-	-	-	-
B Forest and Grassland Conversion	-	-	-	-	-	-	-
C Abandonment of Managed Lands	-	-	-	-	-	-	-
D Other Land Use Change Activities	-	2 057	-	-	-	-	-
6 Waste	983	-	174,0	0,1	3,0	16,0	0,0
A Solid Waste Disposal on Land	-	-	172,9	-	-	-	-
B Wastewater Treatment	-	-	-	-	-	-	-
C Waste Incineration	983	-	1,1	0,1	3,0	16,0	0,0
D Other Waste	-	-	-	-	-	-	-
7 Other	-	-	-	-	-	-	-
International Bunkers (not included in national totals)	15 726	-	-	-	-	-	-
Marine bunkers	13 356	-	-	-	-	-	-
Aviation bunkers	2 370	-	-	-	-	-	-
FNEC (**)	1 300	-	-	-	-	-	-

Ref.: "Deuxième Communication Nationale conformément aux articles 4 et 12 de la Convention (mise à jour de la première communication)", Ministère des Affaires sociales, de la Santé publique et de l'Environnement, Royaume de Belgique, May 1997 et "Inventaire des émissions de gaz à effet de serre en Belgique", Ministerie van sociale zaken, volksgezondheid en leefmilieu, Brussel, 21 November 1996.

(\*\*) Final Non-Energy Consumption (EUROSTAT)

Note: Belgium delivered data according to the *Revised 1996 IPCC Guidelines*. This table presents these data in the format of the 1995 IPCC Guidelines for consistency reasons.

# Denmark 1990

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Denmark 1990 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>52 277</b>	<b>924</b>	<b>421,0</b>	<b>34,0</b>	<b>280,0</b>	<b>785,0</b>	<b>179,0</b>
1 All Energy (Fuel Combustion +Fugitive)	51 138	-	22,0	2,0	279,0	785,0	124,0
A Fuel Combustion	50 898	-	10,0	2,0	278,0	751,0	116,0
1 Energy and Transformation Industries	25 865	-	1,0	1,0	96,0	38,0	1,0
2 Industry (ISIC)	5 776	-	1,0	0,0	19,0	9,0	2,0
3 Transport	10 474	-	2,0	0,0	125,0	552,0	101,0
4 Small Combustion	8 664	-	6,0	0,0	37,0	153,0	12,0
5 Other Combustion Activities	119	-	0,0	0,0	1,0	0,0	0,0
6 Traditional Biomass burned for Energy	-	-	-	-	-	-	-
B Fugitive Emissions from Fuels	240	-	12,0	0,0	1,0	34,0	8,0
1 Solid Fuels	-	-	3,0	-	-	33,0	-
2 Oil and Natural Gas Fuels	240	-	9,0	0,0	1,0	1,0	8,0
2 Industrial Processes	1 006	-	-	-	1,0	-	-
3 Solvent and Other Product Use	133	-	-	-	-	-	43,0
4 Agriculture	-	-	329,0	33,0	-	-	2,0
A Enteric Fermentation	-	-	167,0	-	-	-	-
B Manure Management	-	-	161,0	-	-	-	-
C Rice Cultivation	-	-	-	-	-	-	-
D Agricultural Soils	-	-	-	33,0	-	-	2,0
E Prescribed Burning of Savannas	-	-	-	-	-	-	-
F Field Burning of Agricultural Residues	-	-	-	-	-	-	-
G Other Agriculture Activities	-	-	-	-	-	-	-
5 Land Use Change & Forestry	-	924	-	-	-	-	9,0
A Changes in Forests & other Woody Biomass Stocks	-	924	-	-	-	-	-
B Forest and Grassland Conversion	-	-	-	-	-	-	-
C Abandonment of Managed Lands	-	-	-	-	-	-	-
D Other Land Use Change Activities	-	-	-	-	-	-	9,0
6 Waste	-	-	71,0	-	-	-	-
A Solid Waste Disposal on Land	-	-	71,0	-	-	-	-
B Wastewater Treatment	-	-	-	-	-	-	-
C Waste Incineration	-	-	-	-	-	-	-
D Other Waste	-	-	-	-	-	-	-
7 Other	-	-	-	-	-	-	-
Correction for electricity exchange	6 253	-	-	-	-	-	-
Correction for the impact of climate variation	1 703	-	-	-	-	-	-
International Bunkers (not included in national totals)	4 986	-	0	0	85	9	3
Marine bunkers (*)	3 019	-	-	-	85	9	3
Aviation bunkers	1 967	-	-	-	IE	IE	IE
FNEC (**)	100	-	-	-	-	-	-

Ref.: "Denmark's Second National Communication on Climate Change", Ministry of Environment and Energy, Danish Environmental Protection Agency, 1997.

(\*) Marine Bunkers (EUROSTAT)

(\*\*) Final Non-Energy Consumption (EUROSTAT)

Note: Denmark delivered data according to the Revised 1996 IPCC Guidelines. This table presents these data in the format of the 1995 IPCC Guidelines for consistency reasons.

## Finland 1990

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Finland 1990 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>53 800</b>	<b>30 600</b>	<b>246,0</b>	<b>18,0</b>	<b>295,0</b>	<b>487,0</b>	<b>213,0</b>
1 All Energy (Fuel Combustion +Fugitive)	52 600	-	15,0	5,0	291,0	484,0	135,0
A Fuel Combustion	52 600	-	15,0	5,0	291,0	484,0	126,0
1 Energy and Transformation Industries	19 500	-	IE	IE	64,0	9,0	0,0
2 Industry (ISIC)	13 700	-	IE	IE	41,0	32,0	0,0
3 Transport	11 500	-	3,0	2,0	160,0	368,0	91,0
4 Small Combustion	5 800	-	IE	IE	8,0	61,0	35,0
5 Other Combustion Activities	2 100	-	11,0	3,0	18,0	14,0	0,0
6 Traditional Biomass burned for Energy	17 100	-	-	-	-	-	-
B Fugitive Emissions from Fuels	-	-	-	-	-	-	9,0
1 Solid Fuels	-	-	-	-	-	-	-
2 Oil and Natural Gas Fuels	-	-	-	-	-	-	9,0
2 Industrial Processes	1 200	-	4,0	3,0	4,0	3,0	19,0
3 Solvent and Other Product Use	-	-	-	-	-	-	57,0
4 Agriculture	-	-	101,0	9,0	-	-	-
A Enteric Fermentation	-	-	90,0	8,0	-	-	-
B Manure Management	-	-	11,0	1,0	-	-	-
C Rice Cultivation	-	-	-	-	-	-	-
D Agricultural Soils	-	-	-	-	-	-	-
E Prescribed Burning of Savannas	-	-	-	-	-	-	-
F Field Burning of Agricultural Residues	-	-	-	-	-	-	-
G Other Agriculture Activities	-	-	-	-	-	-	-
5 Land Use Change & Forestry	-	30 600	-	-	-	-	-
A Changes in Forests & other Woody Biomass Stocks	-	30 600	-	-	-	-	-
B Forest and Grassland Conversion	-	-	-	-	-	-	-
C Abandonment of Managed Lands	-	-	-	-	-	-	-
D Other Land Use Change Activities	-	-	-	-	-	-	-
6 Waste	-	-	126,0	-	-	-	2,0
A Solid Waste Disposal on Land	-	-	116,0	-	-	-	-
B Wastewater Treatment	-	-	NE	-	-	-	-
C Waste Incineration	-	-	IE	-	-	-	-
D Other Waste	-	-	10,0	-	-	-	-
7 Other	-	-	-	-	-	-	-
International Bunkers (not included in national totals)	2 800	-	1,0	1,0	22,0	-	-
Marine bunkers (*)	1 800	-	1,0	1,0	22,0	-	-
Aviation bunkers	1 000	-	IE	IE	IE	-	-
FNEC (**)	300	-	-	-	-	-	-

Ref.: "Finland's National Report under the United Nations Framework Convention on Climate Change", Ministry of the Environment, January 1995, and "Finland's Second Report under the Framework Convention on Climate Change", April 1997.

(\*) Marine Bunkers (EUROSTAT)

(\*\*) Final Non-Energy Consumption (EUROSTAT)



France 1990:

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

France 1990 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> <sup>-</sup> Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>392 108</b>	<b>46 947</b>	<b>3 016,9</b>	<b>181,7</b>	<b>1 909,5</b>	<b>11 354,7</b>	<b>3 155,6</b>
1 All Energy (Fuel Combustion + Fugitive)	356 691	-	494,9	14,4	1 861,5	10 422,8	1 853,4
A Fuel Combustion	356 259	-	162,8	14,3	1 856,0	10 417,8	1 724,7
1 Energy and Transformation Industries	81 881	-	1,3	2,3	153,3	18,1	3,6
2 Industry (ISIC)	49 597	-	6,8	3,6	182,8	650,7	13,5
3 Transport	124 921	-	23,9	4,0	1 163,0	7 759,8	1 416,6
4 Small Combustion	99 860	-	130,8	4,4	356,8	1 989,3	291,0
5 Other Combustion Activities	0	-	0,0	0,0	0,0	0,0	0,0
6 Traditional Biomass burned for Energy	-	-	-	-	-	-	-
B Fugitive Emissions from Fuels	432	-	332,2	0,0	5,6	5,0	128,7
1 Solid Fuels	0	-	206,3	0,0	0,0	4,3	1,1
2 Oil and Natural Gas Fuels	432	-	125,9	0,0	5,6	0,7	127,6
2 Industrial Processes	16 638	-	2,6	90,0	23,2	650,5	86,4
3 Solvent and Other Product Use	2 284	-	0,0	1,9	0,0	0,0	732,9
4 Agriculture	0	-	1 626,5	54,5	0,0	0,0	11,2
A Enteric Fermentation	0	-	1 430,4	0,0	0,0	0,0	0,0
B Manure Management	0	-	168,1	0,0	0,0	0,0	0,0
C Rice Cultivation	0	-	8,7	0,1	0,0	0,0	0,0
D Agricultural Soils	0	-	19,3	54,4	0,0	0,0	11,2
E Prescribed Burning of Savannas	0	-	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	0,0
G Other Agriculture Activities	0	-	0,0	0,0	0,0	0,0	0,0
5 Land Use Change & Forestry (*)	13 729	46 947	92,6	17,9	0,8	49,7	448,3
A Changes in Forests & other Woody Biomass Stocks	-	37 899	0,0	0,0	0,0	0,0	0,0
B Forest and Grassland Conversion	13 729	-	3,4	0,0	0,8	49,7	4,2
C Abandonment of Managed Lands	-	9 048	0,0	0,0	0,0	0,0	0,0
D Other Land Use Change Activities	-	-	89,2	17,8	0,0	0,0	444,1
6 Waste	2 766	-	800,2	3,1	23,9	231,7	23,6
A Solid Waste Disposal on Land	0	-	757,9	0,0	0,0	0,0	4,8
B Wastewater Treatment	1 314	-	15,8	1,9	0,0	0,0	3,0
C Waste Incineration	1 452	-	14,2	1,2	23,9	231,7	8,1
D Other Waste	0	-	12,4	0,0	0,0	0,0	7,6
7 Other	0	-	0,0	0,0	0,0	0,0	0,0
<b>International Bunkers (not included in national totals)</b>	<b>17 485</b>	<b>-</b>	<b>0,0</b>	<b>0,3</b>	<b>223,7</b>	<b>25,1</b>	<b>80,3</b>
Marine bunkers	7 923	-	0,0	0,3	150,6	2,0	68,9
Aviation bunkers	9 562	-	0,0	0,0	73,2	23,0	11,4
<b>FNEC (**)</b>	<b>4 900</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>

Ref.: "Second National Communication of France under the Climate Convention", November 1997.

(\*) Totals for sector 5 compiled by the European Environment Agency (EEA)

(\*\*) Final Non-Energy Consumption (EUROSTAT)

Note: emission data include oversee territories.

# Germany 1990

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Germany 1990 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>1 014 155</b>	<b>30 000</b>	<b>5 682,0</b>	<b>226,0</b>	<b>2 640,0</b>	<b>10 743,0</b>	<b>3 155,0</b>
1 All Energy (Fuel Combustion +Fugitive)	986 640	-	1 768,0	37,0	2 606,0	10 059,0	1 902,0
A Fuel Combustion	986 640	-	205,0	37,0	2 606,0	10 032,0	1 619,0
1 Energy and Transformation Industries	439 427	-	13,0	15,0	658,0	197,0	11,0
2 Industry (ISIC)	169 741	-	14,0	4,0	277,0	848,0	14,0
3 Transport	158 647	-	66,0	11,0	1 310,0	6 529,0	1 418,0
4 Small Combustion	198 190	-	109,0	6,0	170,0	2 241,0	113,0
5 Other Combustion Activities	20 635	-	3,0	1,0	191,0	217,0	63,0
6 Traditional Biomass burned for Energy	NO	-	NE	NE	NE	NE	NE
B Fugitive Emissions from Fuels	NE	-	1 563,0	0,0	0,0	27,0	283,0
1 Solid Fuels	NO	-	1 230,0	NO	NO	NO	6,0
2 Oil and Natural Gas Fuels	NE	-	333,0	0,0	0,0	27,0	277,0
2 Industrial Processes	27 515	-	0,0	83,0	34,0	684,0	93,0
3 Solvent and Other Product Use	NO	-	NO	6,0	NO	NO	1 160,0
4 Agriculture	NO	-	2 044,0	96,0	NE	NE	NE
A Enteric Fermentation	NO	-	1 430,0	NO	NO	NO	NO
B Manure Management	NO	-	614,0	11,0	NO	NO	NO
C Rice Cultivation	-	-	-	-	-	-	-
D Agricultural Soils	NO	-	NO	85,0	NO	NO	NO
E Prescribed Burning of Savannas	-	-	-	-	-	-	-
F Field Burning of Agricultural Residues	NO	-	NE	NE	NE	NE	NE
G Other Agriculture Activities	-	-	-	-	-	-	-
5 Land Use Change & Forestry	-	30 000	NO	NO	NO	NO	NO
A Changes in Forests & other Woody Biomass Stocks	-	30 000	NO	NO	NO	NO	NO
B Forest and Grassland Conversion	NO	-	NO	NO	NO	NO	NO
C Abandonment of Managed Lands	-	-	NO	NO	NO	NO	NO
D Other Land Use Change Activities	-	-	-	-	-	-	-
6 Waste	NE	-	1 870,0	4,0	NE	NE	NE
A Solid Waste Disposal on Land	NO	-	1 777,0	NO	NO	NO	NO
B Wastewater Treatment	NO	-	93,0	4,0	NO	NO	NO
C Waste Incineration	NE	-	NE	NE	NE	NE	NE
D Other Waste	-	-	-	-	-	-	-
7 Other	-	-	-	-	-	-	-
International Bunkers (not included in national totals)	19 569	-	0,0	NE	206,0	96,0	26,0
Marine bunkers (*)	7 800	-	0,0	NE	130,0	84,0	15,0
Aviation bunkers	11 769	-	0,0	NE	76,0	12,0	11,0
FNEC (**)	6 700	-	-	-	-	-	-

Ref.: "Second National Communication of Germany", 16 April 1997.

(\*) Marine Bunkers (EUROSTAT)

(\*\*) Final Non-Energy Consumption (EUROSTAT)

NO not occurring

NE not estimated

## Greece 1990

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Greece 1990 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>84 575</b>	<b>-</b>	<b>443,0</b>	<b>17,3</b>	<b>344,1</b>	<b>1 280,0</b>	<b>262,7</b>
1 All Energy (Fuel Combustion +Fugitive)	76 834	-	58,5	6,6	306,2	1 114,3	201,5
A Fuel Combustion	76 834	-	14,6	6,6	304,6	1 114,2	181,1
1 Energy and Transformation Industries	43 661	-	0,7	1,4	72,2	6,6	2,6
2 Industry (ISIC)	9 820	-	1,5	1,4	19,8	4,6	2,3
3 Transport	15 193	-	2,6	1,6	165,4	849,8	152,4
4 Small Combustion	8 159	-	9,8	2,2	47,2	253,2	23,8
5 Other Combustion Activities	-	-	-	-	-	-	-
6 Traditional Biomass burned for Energy	-	-	-	-	-	-	-
B Fugitive Emissions from Fuels	0	-	43,9	0,0	1,8	0,1	20,5
1 Solid Fuels	0	-	43,5	0,0	0,0	0,0	0,0
2 Oil and Natural Gas Fuels	0	-	0,4	0,0	1,8	0,1	20,5
2 Industrial Processes	7 398	-	0,0	2,3	31,5	30,5	2,6
3 Solvent and Other Product Use	0	-	0,0	0,0	0,0	0,0	NE
4 Agriculture	0	-	272,8	8,4	4,6	111,9	50,2
A Enteric Fermentation	0	-	141,8	0,0	0,0	0,0	0,0
B Manure Management	0	-	23,7	0,0	0,0	0,0	0,0
C Rice Cultivation	0	-	4,9	0,0	0,0	0,0	0,0
D Agricultural Soils	0	-	97,0	8,2	0,0	0,0	29,7
E Prescribed Burning of Savannas	0	-	0,0	0,0	0,0	0,0	0,0
F Field Burning of Agricultural Residues	0	-	5,3	0,1	4,6	111,9	20,6
G Other Agriculture Activities	0	-	0,0	0,0	0,0	0,0	0,0
5 Land Use Change & Forestry	0	-	0,0	0,0	0,0	0,0	0,0
A Changes in Forests & other Woody Biomass Stocks	0	-	0,0	0,0	0,0	0,0	0,0
B Forest and Grassland Conversion	0	-	0,0	0,0	0,0	0,0	0,0
C Abandonment of Managed Lands	0	-	0,0	0,0	0,0	0,0	0,0
D Other Land Use Change Activities	0	-	0,0	0,0	0,0	0,0	0,0
6 Waste	343	-	111,7	0,0	1,7	23,4	8,3
A Solid Waste Disposal on Land	343	-	102,0	0,0	0,0	0,0	0,0
B Wastewater Treatment	0	-	6,1	0,0	0,0	0,0	0,0
C Waste Incineration	0	-	3,6	0,0	1,7	23,4	8,3
D Other Waste	0	-	0,0	0,0	0,0	0,0	0,0
7 Other	0	-	0,0	0,0	0,0	0,0	0,0
International Bunkers (not included in national totals)	10 423	-	0,2	0,5	173,8	32,5	27,1
Marine bunkers	7 971	-	0,2	0,5	173,8	32,5	27,1
Aviation bunkers	2 452	-	IE	IE	IE	IE	IE
FNEC (*)	300	-	-	-	-	-	-

Ref.: "2<sup>nd</sup> National Communication to the United Nations Framework Convention on Climate Change, Review of the Greek National Action Plan for the Abatement of CO<sub>2</sub> and other greenhouse gas emissions", Ministry for the Environment, Physical Planning and Public Works, Athens, June 1997.

(\*) Final Non-Energy Consumption (EUROSTAT)

Ireland 1990

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Ireland 1990 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>30 719</b>	<b>5 160</b>	<b>811,3</b>	<b>29,4</b>	<b>114,6</b>	<b>429,0</b>	<b>180,0</b>
1 All Energy (Fuel Combustion +Fugitive)	29 038	-	15,5	2,8	112,2	390,1	74,7
A Fuel Combustion	29 038	-	5,3	2,8	112,2	390,1	71,6
1 Energy and Transformation Industries	10 863	-	0,0	1,4	46,4	3,3	0,3
2 Industry (ISIC)	5 431	-	0,2	0,4	11,3	0,9	0,3
3 Transport	4 885	-	1,2	0,2	45,3	305,3	62,6
4 Small Combustion	7 859	-	3,9	0,8	9,3	80,6	8,4
5 Other Combustion Activities	0	-	0,0	0,0	0,0	0,0	0,0
6 Traditional Biomass burned for Energy	0	-	0,0	0,0	0,0	0,0	0,0
B Fugitive Emissions from Fuels	0	-	10,2	0,0	0,0	0,0	3,1
1 Solid Fuels	0	-	0,3	0,0	0,0	0,0	0,0
2 Oil and Natural Gas Fuels	0	-	9,9	0,0	0,0	0,0	3,1
2 Industrial Processes	1 627	-	0,0	2,6	1,7	0,0	0,7
3 Solvent and Other Product Use	0	-	0,0	0,0	0,0	0,0	21,4
4 Agriculture	0	-	640,3	23,3	0,7	38,3	82,8
A Enteric Fermentation	0	-	551,4	0,0	0,0	0,0	0,0
B Manure Management	0	-	52,0	0,0	0,0	0,0	0,0
C Rice Cultivation	0	-	0,0	0,0	0,0	0,0	0,0
D Agricultural Soils	0	-	35,1	23,3	0,0	0,0	78,5
E Prescribed Burning of Savannas	0	-	0,0	0,0	0,0	0,0	0,0
F Field Burning of Agricultural Residues	0	-	1,8	0,0	0,7	38,3	4,3
G Other Agriculture Activities	0	-	0,0	0,0	0,0	0,0	0,0
5 Land Use Change & Forestry	0	5 160	19,6	0,6	0,0	0,0	0,0
A Changes in Forests & other Woody Biomass Stocks	0	5 160	0,0	0,0	0,0	0,0	0,0
B Forest and Grassland Conversion	0	-	0,0	0,0	0,0	0,0	0,0
C Abandonment of Managed Lands	0	-	0,0	0,0	0,0	0,0	0,0
D Other Land Use Change Activities	0	-	19,6	0,6	0,0	0,0	0,0
6 Waste	54	-	136,0	0,0	0,1	0,6	0,5
A Solid Waste Disposal on Land	0	-	136,0	0,0	0,0	0,0	0,0
B Wastewater Treatment	0	-	0,0	0,0	0,0	0,0	0,0
C Waste Incineration	54	-	0,0	0,0	0,1	0,6	0,5
D Other Waste	0	-	0,0	0,0	0,0	0,0	0,0
7 Other	0	-	0,0	0,0	0,0	0,0	0,0
International Bunkers (not included in national totals)	1 172	-	0,1	0,0	5,4	2,2	0,4
Marine bunkers (*)	100	-	0,0	0,0	0,0	0,0	0,0
Aviation bunkers	1 072	-	0,1	0,0	5,3	2,2	0,4
FNEC (**)	800	-	-	-	-	-	-

Ref.: "Ireland: Second Communication under the United Nations Framework Convention on Climate Change".

(\*) Marine Bunkers (EUROSTAT)

(\*\*) Final Non-Energy Consumption (EUROSTAT)

Italy 1990

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Italy 1990 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>441 653</b>	<b>35 891</b>	<b>2 328,8</b>	<b>164,5</b>	<b>1 942,8</b>	<b>7 892,2</b>	<b>2 221,6</b>
1 All Energy (Fuel Combustion +Fugitive)	400 504	-	405,4	44,6	1 922,5	7 078,6	1 325,9
A Fuel Combustion	399 590	-	96,5	44,6	1 917,4	7 069,8	1 179,4
1 Energy and Transformation Industries	148 445	-	5,0	19,9	458,6	30,9	5,2
2 Industry (ISIC)	78 117	-	8,1	9,5	295,5	522,7	15,4
3 Transport	95 063	-	61,7	3,6	965,9	5 685,7	1 048,9
4 Small Combustion	76 805	-	21,4	11,6	186,0	806,6	105,3
5 Other Combustion Activities	1 159	-	0,2	0,0	11,4	23,9	4,7
6 Traditional Biomass burned for Energy	3 100	-	10,8	0,5	5,2	192,8	15,8
B Fugitive Emissions from Fuels	914	-	309,0	0,0	5,1	8,8	146,5
1 Solid Fuels	-	-	5,0	-	-	-	3,0
2 Oil and Natural Gas Fuels	914	-	304,0	-	5,1	8,8	143,5
2 Industrial Processes	27 520	-	4,4	23,5	7,2	527,5	72,5
3 Solvent and Other Product Use	1 999	-	-	-	-	-	641,5
4 Agriculture	0	-	909,1	75,2	0,9	24,9	1,4
A Enteric Fermentation	-	-	643,1	-	-	-	-
B Manure Management	-	-	191,5	12,9	-	-	0,7
C Rice Cultivation	-	-	73,3	-	-	-	-
D Agricultural Soils	-	-	0,0	62,2	-	-	-
E Prescribed Burning of Savannas	-	-	-	-	-	-	-
F Field Burning of Agricultural Residues	-	-	1,2	0,0	0,9	24,9	0,8
G Other Agriculture Activities	-	-	-	-	-	-	-
5 Land Use Change & Forestry	10 942	35 891	187,2	20,9	1,9	67,7	159,9
A Changes in Forests & other Woody Biomass Stocks	8 736	35 817	-	-	-	-	-
B Forest and Grassland Conversion	2 154	-	7,7	0,1	1,9	67,7	7,7
C Abandonment of Managed Lands	-	74	-	-	-	-	-
D Other Land Use Change Activities	52	-	179,4	20,9	-	-	152,2
6 Waste	688	-	822,7	0,3	10,2	193,4	20,4
A Solid Waste Disposal on Land	0	-	302,1	-	-	-	6,1
B Wastewater Treatment	0	-	511,4	-	-	-	1,3
C Waste Incineration	688	-	9,2	0,3	10,2	193,4	13,0
D Other Waste	0	-	-	-	-	-	-
7 Other	-	-	-	-	-	-	-
International Bunkers (not included in national totals)	12 204	-	1,1	0,6	206,3	23,5	8,2
Marine bunkers	8 467	-	0,8	0,5	194,3	20,0	5,7
Aviation bunkers	3 737	-	0,3	0,1	12,0	3,5	2,5
FNEC (*)	3 900	-	-	-	-	-	-

Ref.: "Excerpt from the Second National Communication to the United Nations Framework Convention on Climate Change", Ministry of Environment, Department for Air and Noise Pollution and Industrial Risk, submitted to Commission on 24 March 1998.

(\*) Final Non-Energy Consumption (EUROSTAT)

Note (1): CO<sub>2</sub> emissions from geothermal activity have been excluded (National Communication: 1B3: 1439 Gg).

Note (2): Italy delivered data according to the Revised 1996 IPCC Guidelines. This table presents these data in the format of the 1995 IPCC Guidelines for consistency reasons.

Note (3): Emissions for *Land-use Change & Forestry* are given as emissions and removals.

Note (4): CH<sub>4</sub> emissions from sector 6D "Other Waste" are excluded (19.8 Gg).

## Luxembourg 1990

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Luxembourg 1990 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>13 300</b>	<b>0</b>	<b>24,0</b>	<b>&lt; 1</b>	<b>23,0</b>	<b>171,0</b>	<b>19,0</b>
1 All Energy (Fuel Combustion + Fugitive)	12 600	-	2,0	-	23,0	154,0	14,0
A Fuel Combustion	12 600	-	0,0	-	23,0	154,0	12,0
1 Energy and Transformation Industries	1 900	-	0,0	-	< 1	< 1	-
2 Industry (ISIC)	6 600	-	-	-	11,0	98,0	< 1
3 Transport	2 900	-	-	-	11,0	48,0	11,0
4 Small Combustion	1 100	-	-	-	1,0	6,0	1,0
5 Other Combustion Activities	100	-	-	-	-	1,0	-
6 Traditional Biomass burned for Energy	-	-	-	-	-	-	-
B Fugitive Emissions from Fuels	0	-	2,0	0,0	0,0	0,0	2,0
1 Solid Fuels	-	-	-	0,0	-	-	-
2 Oil and Natural Gas Fuels	-	-	2,0	0,0	-	-	2,0
2 Industrial Processes	600	-	0,0	< 1	0,0	17,0	1,0
3 Solvent and Other Product Use	0	-	0,0	-	0,0	0,0	4,0
4 Agriculture	0	-	18,0	-	0,0	0,0	< 1
A Enteric Fermentation	-	-	16,0	-	-	-	-
B Manure Management	-	-	2,0	-	-	-	-
C Rice Cultivation	-	-	-	-	-	-	-
D Agricultural Soils	-	-	-	-	-	-	-
E Prescribed Burning of Savannas	-	-	-	-	-	-	-
F Field Burning of Agricultural Residues	-	-	-	-	-	-	-
G Other Agriculture Activities	-	-	-	-	-	-	-
5 Land Use Change & Forestry	-	-	-	-	-	-	-
A Changes in Forests & other Woody Biomass Stocks	-	-	-	-	-	-	-
B Forest and Grassland Conversion	-	-	-	-	-	-	-
C Abandonment of Managed Lands	-	-	-	-	-	-	-
D Other Land Use Change Activities	-	-	-	-	-	-	-
6 Waste	100	-	4,0	0,0	< 1	0,0	0,0
A Solid Waste Disposal on Land	< 1	-	4,0	-	-	-	-
B Wastewater Treatment	-	-	< 1	-	-	-	-
C Waste Incineration	-	-	-	-	-	-	-
D Other Waste	100	-	1,0	-	-	-	-
7 Other	-	-	-	-	-	-	-
International Bunkers (not included in national totals)	300	-	-	-	-	-	-
Marine bunkers (*)	0	-	-	-	-	-	-
Aviation bunkers (**)	300	-	-	-	-	-	-
FNEC (***)	0	-	-	-	-	-	-

Ref.: "Rapport National du Luxembourg en vue de la 1<sup>e</sup> Conférence des Parties à la Convention-Cadre des Nations-Unies sur les Changements Climatiques", Ministère de l'Environnement, Mars 1995.

(\*) Marine Bunkers (EUROSTAT)

(\*\*) Reconciliation of EUROSTAT and CORINAIR transport estimates

(\*\*\*) Final Non-Energy Consumption (EUROSTAT)

# Netherlands 1990

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>161 360</b>	<b>1 500</b>	<b>1 292,3</b>	<b>63,9</b>	<b>563,2</b>	<b>1 139,2</b>	<b>499,8</b>
1 All Energy (Fuel Combustion +Fugitive)	157 950	-	213,5	5,3	545,0	979,7	266,4
A Fuel Combustion	157 530	-	34,8	5,3	543,9	973,5	218,8
1 Energy and Transformation Industries	51 040	-	3,0	0,5	98,6	14,5	2,6
2 Industry (ISIC)	41 440	-	4,0	0,1	65,7	114,2	4,7
3 Transport	28 560	-	7,8	4,6	336,9	748,9	200,5
4 Small Combustion	35 400	-	16,3	0,1	40,6	11,1	5,1
5 Other Combustion Activities	1 100	-	-	-	-	-	-
6 Traditional Biomass burned for Energy	3 080	-	3,7	0,0	2,1	84,8	5,9
B Fugitive Emissions from Fuels	420	-	178,8	-	1,1	6,2	47,6
1 Solid Fuels	-	-	-	-	-	-	-
2 Oil and Natural Gas Fuels	420	-	178,8	-	1,1	6,2	47,6
2 Industrial Processes	1 880	-	3,4	31,5	13,5	153,6	130,4
3 Solvent and Other Product Use	10	-	0,0	0,5	0,1	2,4	101,4
4 Agriculture	-	-	505,0	22,2	-	-	0,2
A Enteric Fermentation	-	-	402,0	-	-	-	-
B Manure Management	-	-	103,0	0,7	-	-	-
C Rice Cultivation	-	-	-	-	-	-	-
D Agricultural Soils	-	-	-	21,5	-	-	0,2
E Prescribed Burning of Savannas	-	-	-	-	-	-	-
F Field Burning of Agricultural Residues	-	-	-	-	-	-	-
G Other Agriculture Activities	-	-	-	-	-	-	-
5 Land Use Change & Forestry	-	1 500	-	-	-	-	-
A Changes in Forests & other Woody Biomass Stocks	-	1 500	-	-	-	-	-
B Forest and Grassland Conversion	-	-	-	-	-	-	-
C Abandonment of Managed Lands	-	-	-	-	-	-	-
D Other Land Use Change Activities	-	-	-	-	-	-	-
6 Waste	1 520	-	568,4	0,5	4,5	3,5	1,4
A Solid Waste Disposal on Land	-	-	562,1	-	0,3	1,4	0,2
B Wastewater Treatment	-	-	6,3	0,5	-	-	-
C Waste Incineration	1 520	-	0,0	0,1	4,2	2,1	1,3
D Other Waste	-	-	-	-	-	-	-
7 Other	-	-	2,0	3,8	-	-	-
Nature	-	-	125,0	2,4	16,3	26,7	3,2
International Bunkers (not included in national totals)	40 400	-	-	-	-	-	-
Marine bunkers	35 900	-	-	-	-	-	-
Aviation bunkers	4 500	-	-	-	-	-	-
FNEC (*)	4 800	-	-	-	-	-	-

Ref.: "Greenhouse gas emissions in the Netherlands 1990-1996: Updated methodology. A report on the International Commitments with respect to Greenhouse Gas Emission Inventories for the United Nations Framework Convention on Climate Change and the European Union's Greenhouse Gas Monitoring Mechanism", National Institute of Public Health and the Environment, Bilthoven, The Netherlands, December 1997.

(\*) Final Non-Energy Consumption (EUROSTAT)

Portugal 1990

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Portugal 1990 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>47 123</b>	<b>1 152</b>	<b>815,8</b>	<b>14,4</b>	<b>346,2</b>	<b>1 254,5</b>	<b>282,1</b>
1 All Energy (Fuel Combustion +Fugitive)	43 440	-	26,5	2,1	341,7	1 223,1	173,2
A Fuel Combustion	43 281	-	22,2	2,1	341,7	1 223,1	126,0
1 Energy and Transformation Industries	17 015	-	1,3	0,3	71,1	7,1	2,2
2 Industry (ISIC)	7 225	-	1,6	0,2	18,2	25,3	7,6
3 Transport	14 060	-	4,8	0,5	196,9	646,7	66,7
4 Small Combustion	4 468	-	7,1	0,8	45,2	273,3	24,7
5 Other Combustion Activities	512	-	0,2	0,0	3,6	0,2	0,3
6 Traditional Biomass burned for Energy	10 866	-	7,3	0,4	6,8	270,6	24,5
B Fugitive Emissions from Fuels	159	-	4,3	NA	NA	NA	47,1
1 Solid Fuels	9	-	3,1	NA	NA	NA	0,0
2 Oil and Natural Gas Fuels	150	-	1,1	NA	NA	NA	47,1
2 Industrial Processes	3 421	-	0,4	1,9	4,5	30,8	17,6
3 Solvent and Other Product Use	262	-	NA	NA	NA	NA	84,1
4 Agriculture	NE	-	210,7	7,4	NE	NE	NE
A Enteric Fermentation	NA	-	123,9	NE	NE	NA	NA
B Manure Management	NA	-	67,8	IOC	NE	NA	NA
C Rice Cultivation	NA	-	19,0	0,0	NA	NA	NA
D Agricultural Soils	NA	-	NE	7,4	NE	NA	NE
E Prescribed Burning of Savannas	NA	-	NA	NA	-	-	0,0
F Field Burning of Agricultural Residues	NE	-	NE	NE	-	-	0,0
G Other Agriculture Activities	-	-	-	-	-	-	-
5 Land Use Change & Forestry	-	1 152	NA	NA	NA	NA	NA
A Changes in Forests & other Woody Biomass Stocks	-	IE	-	-	-	-	-
B Forest and Grassland Conversion	-	IE	-	-	-	-	-
C Abandonment of Managed Lands	-	IE	-	-	-	-	-
D Other Land Use Change Activities	-	1 152	-	-	-	-	-
6 Waste	0	-	578,3	2,9	0,0	0,6	7,3
A Solid Waste Disposal on Land	-	-	IE	IE	IE	IE	IE
B Wastewater Treatment	-	-	IE	IE	IE	IE	IE
C Waste Incineration	-	-	IE	IE	IE	IE	IE
D Other Waste	-	-	578,3	2,9	0,0	0,6	7,3
7 Other	0	-	0,0	0,0	0,0	0,0	0,0
International Bunkers (not included in national totals)	2 062	-	2,1	0,0	36,5	2,4	0,1
Marine bunkers (*)	1 904	-	2,1	0,0	36,5	2,4	0,1
Aviation bunkers	158	-	IE	IE	IE	IE	IE
FNEC (**)	200	-	-	-	-	-	-

Ref.: "Portugal's Second Report to be submitted to the Conference of the Parties to the Framework Convention on Climate Change", Ministry of the Environment, 1997.

(\*) Marine Bunkers (EUROSTAT)

(\*\*) Final Non-Energy Consumption (EUROSTAT)

NA ... not available

NE ... not estimated

IE ... included elsewhere

Note: National totals include non-CO<sub>2</sub> emissions from Biomass (1A6).



Spain 1990

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Spain 1990 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>226 423</b>	<b>28 970</b>	<b>2 218,2</b>	<b>94,8</b>	<b>1 176,9</b>	<b>5 581,3</b>	<b>1 178,7</b>
1 All Energy (Fuel Combustion + Fugitive)	208 006	-	799,3	20,8	1 152,9	4 867,3	694,7
A Fuel Combustion	207 592	-	112,5	20,8	1 152,9	4 867,3	505,9
1 Energy and Transformation Industries	75 184	-	12,4	10,2	274,2	21,6	29,6
2 Industry (ISIC)	47 971	-	6,0	5,2	187,5	432,7	17,5
3 Transport	58 260	-	12,2	2,0	566,0	2 620,5	327,5
4 Small Combustion	26 177	-	45,1	2,8	112,7	944,9	75,9
5 Other Combustion Activities	-	-	-	-	-	-	-
6 Traditional Biomass burned for Energy	12 304	-	36,9	0,6	12,5	847,5	55,4
B Fugitive Emissions from Fuels	414	-	686,7	0,0	0,0	0,0	188,9
1 Solid Fuels	-	-	612,5	0,0	0,0	0,0	0,0
2 Oil and Natural Gas Fuels	414	-	74,3	0,0	0,0	0,0	188,9
2 Industrial Processes	17 690	-	2,0	10,4	11,8	247,4	52,1
3 Solvent and Other Product Use	0	-	0,0	0,0	0,0	0,0	309,5
4 Agriculture	0	-	925,6	63,5	5,8	396,7	96,3
A Enteric Fermentation	0	-	345,6	0,0	0,0	0,0	0,0
B Manure Management	0	-	464,6	0,0	0,0	0,0	0,0
C Rice Cultivation	0	-	10,8	0,4	0,0	0,0	0,0
D Agricultural Soils	0	-	82,7	63,2	0,0	0,0	74,4
E Prescribed Burning of Savannas	-	-	-	-	-	-	-
F Field Burning of Agricultural Residues	0	-	21,9	0,0	5,8	396,7	21,9
G Other Agriculture Activities	-	-	-	-	-	-	-
5 Land Use Change & Forestry	-	28 970	-	-	-	-	-
A Changes in Forests & other Woody Biomass Stocks	-	-	-	-	-	-	-
B Forest and Grassland Conversion	-	-	-	-	-	-	-
C Abandonment of Managed Lands	-	-	-	-	-	-	-
D Other Land Use Change Activities	-	28 970	-	-	-	-	-
6 Waste	0	-	491,3	0,1	6,4	69,9	26,1
A Solid Waste Disposal on Land	0	-	471,5	0,0	5,2	57,8	20,7
B Wastewater Treatment	0	-	0,0	0,0	0,0	0,0	0,3
C Waste Incineration	-	-	-	-	-	-	-
D Other Waste	0	-	19,8	0,1	1,2	12,1	5,1
7 Other	727	-	0,0	0,0	0,0	0,0	0,0
International Bunkers (not included in national totals)	18 024	-	2,0	0,3	272,9	17,0	11,4
Marine bunkers	12 076	-	0,6	0,3	249,3	7,2	11,2
Aviation bunkers	5 948	-	1,5	-	23,6	9,8	0,2
FNEC (*)	1 300	-	-	-	-	-	-

Ref.: "Segunda Comunicación Nacional de España", Ministerio de Medio Ambiente, 1997.

(\*) Final Non-Energy Consumption (EUROSTAT)

Note (1): National totals include non-CO<sub>2</sub> emissions from Biomass (1A6).

Note (2): The national communication excludes CO<sub>2</sub> emissions from sector 4 and 6 for the national total as they are considered to be from renewable sources (sector 4: 18 725 Gg and sector 6: 2 161 Gg CO<sub>2</sub>).

# Sweden 1990

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Sweden 1990 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>55 444</b>	<b>34 368</b>	<b>324,0</b>	<b>9,2</b>	<b>337,0</b>	<b>1 211,0</b>	<b>516,0</b>
1 All Energy (Fuel Combustion +Fugitive)	51 381	-	39,0	6,3	312,0	1 205,0	382,0
A Fuel Combustion	51 328	-	39,0	6,3	312,0	1 205,0	356,0
1 Energy and Transformation Industries	8 849	-	1,0	1,1	16,0	6,0	2,0
2 Industry (ISIC)	13 050	-	5,0	2,1	23,0	28,0	6,0
3 Transport	18 650	-	23,0	2,6	261,0	1 046,0	216,0
4 Small Combustion	10 672	-	10,0	0,5	12,0	124,0	131,0
5 Other Combustion Activities	107	-	NE	NE	NE	NE	NE
6 Traditional Biomass burned for Energy	IE	-	IE	IE	IE	IE	IE
B Fugitive Emissions from Fuels	53	-	NE	-	-	-	26,0
1 Solid Fuels	NO	-	-	-	-	-	-
2 Oil and Natural Gas Fuels	53	-	NE	-	-	-	26,0
2 Industrial Processes	3 787	-	NE	2,7	25,0	6,0	42,0
3 Solvent and Other Product Use	276	-	-	-	-	-	92,0
4 Agriculture	-	-	200,0	0,2	-	-	-
A Enteric Fermentation	-	-	188,0	-	-	-	-
B Manure Management	-	-	12,0	-	-	-	-
C Rice Cultivation	NO	-	NO	NO	-	-	-
D Agricultural Soils	NE	-	NE	0,2	-	-	-
E Prescribed Burning of Savannas	NO	-	NO	NO	NO	NO	NO
F Field Burning of Agricultural Residues	NO	-	NO	NO	NO	NO	NO
G Other Agriculture Activities	-	-	-	-	-	-	-
5 Land Use Change & Forestry	-	34 368	-	-	-	-	-
A Changes in Forests & other Woody Biomass Stocks	-	34 368	-	-	-	-	-
B Forest and Grassland Conversion	NE	-	-	-	-	-	-
C Abandonment of Managed Lands	NE	-	-	-	-	-	-
D Other Land Use Change Activities	-	-	-	-	-	-	-
6 Waste	-	-	85,0	-	-	-	-
A Solid Waste Disposal on Land	NA	-	85,0	-	-	-	-
B Wastewater Treatment	NA	-	-	-	-	-	-
C Waste Incineration	IE	-	IE	IE	IE	IE	IE
D Other Waste	-	-	-	-	-	-	-
7 Other	-	-	-	-	-	-	-
International Bunkers (not included in national totals)	4 207	-	0,1	NE	52,2	6,2	1,5
Marine bunkers (*)	2 100	-	0,1	-	52,2	6,2	1,5
Aviation bunkers	2 107	-	IE	-	IE	IE	IE
FNEC (**)	400	-	-	-	-	-	-

Ref.: "Swedish submission of annual inventories of greenhouse gases for 1996 (preliminary) and revisions for the years 1990 through 1995", Ministry of the Environment, 9 March 1998.

- (\*) Marine Bunkers (EUROSTAT)
- (\*\*) Final Non-Energy Consumption (EUROSTAT)
- NE not estimated
- NO not occurring
- IE included elsewhere

Note: NMVOC national total has been changes according to the sum of sector 1-7 (the national communication gives 542.0 Gg).

# United Kingdom 1990

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

United Kingdom 1990 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>613 976</b>	<b>11 453</b>	<b>4 464,0</b>	<b>120,0</b>	<b>2 867,0</b>	<b>7 374,0</b>	<b>2 618,0</b>
1 All Energy (Fuel Combustion +Fugitive)	571 199	-	1 397,0	14,7	2 845,0	7 113,0	1 561,0
A Fuel Combustion	563 908	-	98,3	14,7	2 764,0	7 080,0	1 168,0
1 Energy and Transformation Industries	231 954	-	6,6	6,4	840,2	308,2	5,4
2 Industry (ISIC)	97 045	-	8,1	2,9	265,3	719,6	50,1
3 Transport	117 944	-	30,4	3,4	1 463,3	5 579,3	996,9
4 Small Combustion	111 703	-	49,7	1,7	139,2	411,8	109,5
5 Other Combustion Activities	5 263	-	0,2	0,2	54,3	8,2	1,8
6 Traditional Biomass burned for Energy	1 136	-	3,3	0,1	1,4	52,5	4,3
B Fugitive Emissions from Fuels	7 291	-	1 298,0	NE	82,0	33,5	393,0
1 Solid Fuels	NO	-	818,0	NO	NO	NO	3,3
2 Oil and Natural Gas Fuels	7 291	-	480,0	NE	82,0	33,5	390,0
2 Industrial Processes	10 304	-	NE	94,0	8,1	NE	244,0
3 Solvent and Other Product Use	NO	-	NO	NO	NO	NO	761,0
4 Agriculture	1 430	-	1 143,0	10,4	8,8	258,0	24,5
A Enteric Fermentation	NO	-	1 005,0	NO	NO	NO	NO
B Manure Management	0	-	125,0	3,6	NO	NO	NO
C Rice Cultivation	NO	-	NO	NO	NO	NO	NO
D Agricultural Soils	1 430	-	NE	6,6	NO	NO	NO
E Prescribed Burning of Savannas	NO	-	NO	NO	NO	NO	NO
F Field Burning of Agricultural Residues	0	-	12,3	0,2	8,8	258,0	24,5
G Other Agriculture Activities	NO	-	NO	NO	NO	NO	NO
5 Land Use Change & Forestry	30 229	11 453	NE	NE	NO	NO	NO
A Changes in Forests & other Woody Biomass Stocks	-	9 685	NE	NE	NO	NO	NO
B Forest and Grassland Conversion	26 563	-	NE	NO	NO	NO	NO
C Abandonment of Managed Lands	-	1 402	NE	NO	NO	NO	NO
D Other Land Use Change Activities	3 667	367	NE	NO	NO	NO	NO
6 Waste	814	-	1 925,0	0,4	5,3	3,0	27,6
A Solid Waste Disposal on Land	0	-	1 890,0	NO	NO	NO	18,9
B Wastewater Treatment	0	-	33,0	NO	NO	NO	NO
C Waste Incineration	814	-	2,4	0,4	5,3	3,0	8,7
D Other Waste	0	-	NO	NO	NO	NO	NO
7 Other	NE	-	NE	NE	NE	NE	NE
International Bunkers (not included in national totals)	19 341	-	3,5	0,8	182,0	72,4	39,6
Marine bunkers (*)	7 800	-	-	-	-	-	-
Aviation bunkers	11 541	-	3,5	0,8	182,0	72,4	39,6
FNEC (**)	6 800	-	-	-	-	-	-

Ref.: "UK Greenhouse Gas Emission Inventory, 1990 to 1995", December 1997.

(\*) Marine Bunkers (EUROSTAT)

(\*\*) Final Non-Energy Consumption (EUROSTAT)

NE not estimated

NO not occurring

IE included elsewhere

Note : Emissions for *Land-use Change & Forestry* are given as emissions and removals.

## B: Emissions 1994

### Austria 1994

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES							
Austria 1994 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> <sup>-</sup> Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>59 467</b>	<b>14 726</b>	<b>581,4</b>	<b>12,6</b>	<b>177,9</b>	<b>1 131,9</b>	<b>411,5</b>
1 All Energy (Fuel Combustion + Fugitive)	47 920	-	24,1	5,3	153,6	833,1	131,5
A Fuel Combustion	45 511	-	19,3	5,3	150,2	832,6	121,6
1 Energy and Transformation Industries	9 377	-	0,1	0,1	7,1	0,7	0,2
2 Industry (ISIC)	6 426	-	0,5	0,1	12,7	6,6	1,1
3 Transport	15 657	-	3,8	4,2	103,8	368,7	73,7
4 Small Combustion	14 010	-	15,0	0,9	26,1	456,0	46,5
5 Other Combustion Activities	41	-	0,0	0,0	0,5	0,6	0,1
6 Traditional Biomass burned for Energy	-	-	-	-	-	-	-
B Fugitive Emissions from Fuels	2 410	-	4,8	0,0	3,4	0,5	9,9
1 Solid Fuels	0	-	0,0	0,0	0,0	0,0	0,0
2 Oil and Natural Gas Fuels	2 410	-	4,8	0,0	3,4	0,5	9,9
2 Industrial Processes	11 130	-	0,1	0,6	17,1	292,8	21,5
3 Solvent and Other Product Use	411	-	0,0	0,8	0,0	0,0	131,8
4 Agriculture	0	-	209,1	3,3	6,2	1,5	2,4
A Enteric Fermentation	0	-	145,9	0,0	0,0	0,0	0,0
B Manure Management	0	-	27,4	0,0	0,0	0,0	0,0
C Rice Cultivation	0	-	0,0	0,0	0,0	0,0	0,0
D Agricultural Soils	0	-	35,7	3,3	6,2	0,0	2,2
E Prescribed Burning of Savannas	0	-	0,0	0,0	0,0	0,0	0,0
F Field Burning of Agricultural Residues	0	-	0,1	0,0	0,0	1,5	0,2
G Other Agriculture Activities	0	-	0,0	0,0	0,0	0,0	0,0
5 Land Use Change & Forestry	-	14 726	126,8	2,6	0,8	0,0	123,5
A Changes in Forests & other Woody Biomass Stocks	-	14 541	0,0	0,0	0,0	0,0	0,0
B Forest and Grassland Conversion	0	-	0,0	0,0	0,0	0,0	0,0
C Abandonment of Managed Lands	-	185	0,0	0,0	0,0	0,0	0,0
D Other Land Use Change Activities	0	-	126,8	2,6	0,8	0,0	123,5
6 Waste	7	-	221,3	0,0	0,2	4,5	0,7
A Solid Waste Disposal on Land	0	-	186,8	0,0	0,0	0,0	0,0
B Wastewater Treatment	0	-	14,2	0,0	0,0	0,0	0,0
C Waste Incineration	7	-	0,2	0,0	0,2	4,5	0,7
D Other Waste	0	-	20,0	0,0	0,0	0,0	0,0
7 Other	0	-	0,0	0,0	0,0	0,0	0,0
International Bunkers (not included in national totals)	1 140	-	0,0	0,0	6,0	2,0	0,8
Marine bunkers	0	-	0,0	0,0	0,0	0,0	0,0
Aviation bunkers	1 140	-	0,0	0,0	6,0	2,0	0,8
FNEC (*)	500	-	-	-	-	-	-

Ref.: "Austrian 2<sup>nd</sup> National Communication under the UN-FCCC", May 1997.

(\*) Final Non-Energy Consumption (EUROSTAT)

## Belgium 1994

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Belgium 1994 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> <sup>-</sup> Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>121 297</b>	<b>2 057</b>	<b>635,3</b>	<b>32,3</b>	<b>345,0</b>	<b>1 252,0</b>	<b>321,0</b>
1 All Energy (Fuel Combustion +Fugitive)	109 748	-	58,7	9,0	337,0	1 183,0	201,0
A Fuel Combustion	109 748	-	14,0	8,4	337,0	1 183,0	173,0
1 Energy and Transformation Industries	28 953	-	0,3	2,5	72,0	27,0	1,0
2 Industry (ISIC)	29 236	-	0,7	1,8	59,0	173,0	4,0
3 Transport	21 877	-	8,6	1,2	190,0	884,0	160,0
4 Small Combustion	29 373	-	4,4	2,9	15,0	99,0	8,0
5 Other Combustion Activities	309	-	-	-	-	-	-
6 Traditional Biomass burned for Energy	-	-	-	-	-	-	-
B Fugitive Emissions from Fuels	-	-	44,7	0,6	-	-	29,0
1 Solid Fuels	-	-	-	-	-	-	-
2 Oil and Natural Gas Fuels	-	-	44,7	0,6	-	-	29,0
2 Industrial Processes	10 456	-	3,2	12,3	5,0	50,0	35,0
3 Solvent and Other Product Use	-	-	-	-	-	-	84,0
4 Agriculture	-	-	389,2	10,8	-	-	1,0
A Enteric Fermentation	-	-	374,7	0,0	-	-	-
B Manure Management	-	-	-	-	-	-	-
C Rice Cultivation	-	-	-	-	-	-	-
D Agricultural Soils	-	-	14,4	10,8	-	-	1,0
E Prescribed Burning of Savannas	-	-	-	-	-	-	-
F Field Burning of Agricultural Residues	-	-	-	-	-	-	-
G Other Agriculture Activities	-	-	-	-	-	-	-
5 Land Use Change & Forestry	-	2 057	-	-	-	-	-
A Changes in Forests & other Woody Biomass Stocks	-	-	-	-	-	-	-
B Forest and Grassland Conversion	-	-	-	-	-	-	-
C Abandonment of Managed Lands	-	-	-	-	-	-	-
D Other Land Use Change Activities	-	2 057	-	-	-	-	-
6 Waste	1 093	-	184,2	0,1	3,0	19,0	0,0
A Solid Waste Disposal on Land	-	-	183,5	-	-	-	-
B Wastewater Treatment	-	-	-	-	-	-	-
C Waste Incineration	1 093	-	0,7	0,1	3,0	19,0	0,0
D Other Waste	-	-	-	0,0	-	-	0,0
7 Other	-	-	-	-	-	-	-
International Bunkers (not included in national totals)	16 021	-	-	-	-	-	-
Marine bunkers	13 721	-	-	-	-	-	-
Aviation bunkers	2 300	-	-	-	-	-	-
FNEC (*)	1 800	-	-	-	-	-	-

Ref.: "Deuxième Communication Nationale conformément aux articles 4 et 12 de la Convention (mise à jour de la première communication)", Ministère des Affaires sociales, de la Santé publique et de l'Environnement, Royaume de Belgique, May 1997 and "United Nations Framework Convention on Climate Change – First Belgian National Communication under articles 4 and 12 of the Convention", Ministry of Social Affairs, Public Health and the Environment, January 1997 supplemented by e-mail (21 May 1997).

(\*) Final Non-Energy Consumption (EUROSTAT)

Note (1): Belgium delivered data according to the Revised 1996 IPCC Guidelines. This table presents these data in the format of the 1995 IPCC Guidelines for consistency reasons.

Note (2): CH<sub>4</sub> emissions from sector 6D "Other Waste" are excluded (1.4 Gg).

# Denmark 1994

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Denmark 1994 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>63 344</b>	<b>956</b>	<b>428,0</b>	<b>33,0</b>	<b>272,0</b>	<b>704,0</b>	<b>166,0</b>
1 All Energy (Fuel Combustion +Fugitive)	61 899	-	27,0	3,0	271,0	704,0	113,0
A Fuel Combustion	61 117	-	10,0	3,0	269,0	662,0	97,0
1 Energy and Transformation Industries	35 213	-	1,0	1,0	106,0	48,0	1,0
2 Industry (ISIC)	6 481	-	1,0	0,0	24,0	12,0	3,0
3 Transport	11 345	-	2,0	1,0	103,0	422,0	77,0
4 Small Combustion	8 020	-	6,0	0,0	35,0	180,0	15,0
5 Other Combustion Activities	58	-	0,0	0,0	1,0	1,0	0,0
6 Traditional Biomass burned for Energy	-	-	-	-	-	-	-
B Fugitive Emissions from Fuels	782	-	17,0	0,0	3,0	41,0	16,0
1 Solid Fuels	0	-	6,0	-	0,0	40,0	0,0
2 Oil and Natural Gas Fuels	782	-	11,0	0,0	3,0	2,0	16,0
2 Industrial Processes	1 318	-	1,0	-	1,0	0,0	1,0
3 Solvent and Other Product Use	127	-	-	-	-	-	41,0
4 Agriculture	-	-	326,0	30,0	-	-	2,0
A Enteric Fermentation	-	-	155,0	-	-	-	-
B Manure Management	-	-	171,0	-	-	-	-
C Rice Cultivation	-	-	-	-	-	-	-
D Agricultural Soils	-	-	-	30,0	-	-	2,0
E Prescribed Burning of Savannas	-	-	-	-	-	-	-
F Field Burning of Agricultural Residues	-	-	-	-	-	-	-
G Other Agriculture Activities	-	-	-	-	-	-	-
5 Land Use Change & Forestry	-	956	-	1,0	-	-	9,0
A Changes in Forests & other Woody Biomass Stocks	-	956	-	-	-	-	-
B Forest and Grassland Conversion	-	-	-	-	-	-	-
C Abandonment of Managed Lands	-	-	-	-	-	-	-
D Other Land Use Change Activities	-	-	-	1,0	-	-	9,0
6 Waste	-	-	74,0	-	-	-	1,0
A Solid Waste Disposal on Land	-	-	72,0	-	-	-	-
B Wastewater Treatment	-	-	2,0	-	-	-	-
C Waste Incineration	-	-	-	-	-	-	1,0
D Other Waste	-	-	-	-	-	-	-
7 Other	-	-	-	-	-	-	-
Correction for electricity exchange	-3 932	-	-	-	-	-	-
Correction for the impact of climate variation	193	-	-	-	-	-	-
International Bunkers (not included in national totals)	6 736	-	0	0	123	12	4
Marine bunkers	4 825	-	0	0	116	11	4
Aviation bunkers	1 910	-	0	0	7	1	1
FNEC (*)	100	-	-	-	-	-	-

Ref.: "Denmark's Second National Communication on Climate Change", Ministry of Environment and Energy, Danish Environmental Protection Agency, 1997.

(\*) Final Non-Energy Consumption (EUROSTAT)

Note: Denmark delivered data according to the Revised 1996 IPCC Guidelines. This table presents these data in the format of the 1995 IPCC Guidelines for consistency reasons.

## Finland 1994

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Finland 1994 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>59 253</b>	<b>16 800</b>	<b>245,0</b>	<b>18,0</b>	<b>282,0</b>	<b>443,0</b>	<b>165,0</b>
1 All Energy (Fuel Combustion +Fugitive)	58 413	-	16,0	6,0	279,0	433,0	110,0
A Fuel Combustion	58 337	-	16,0	6,0	279,0	433,0	97,0
1 Energy and Transformation Industries	24 526	-	IE	IE	54,0	7,0	0,0
2 Industry (ISIC)	14 098	-	IE	IE	42,0	41,0	1,0
3 Transport	11 414	-	3,0	2,0	146,0	317,0	53,0
4 Small Combustion	6 706	-	IE	IE	20,0	48,0	32,0
5 Other Combustion Activities	1 593	-	13,0	4,0	16,0	21,0	11,0
6 Traditional Biomass burned for Energy	20 981	-	-	-	IE	IE	IE
B Fugitive Emissions from Fuels	80	-	-	-	-	-	13,0
1 Solid Fuels	-	-	-	-	-	-	-
2 Oil and Natural Gas Fuels	80	-	-	-	-	-	13,0
2 Industrial Processes	840	-	4,0	3,0	2,0	10,0	10,0
3 Solvent and Other Product Use	-	-	-	-	-	-	46,0
4 Agriculture	-	-	93,0	9,0	-	-	-
A Enteric Fermentation	-	-	83,0	8,0	-	-	-
B Manure Management	-	-	10,0	1,0	-	-	-
C Rice Cultivation	-	-	-	-	-	-	-
D Agricultural Soils	-	-	-	-	-	-	-
E Prescribed Burning of Savannas	-	-	-	-	-	-	-
F Field Burning of Agricultural Residues	-	-	-	-	-	-	-
G Other Agriculture Activities	-	-	-	-	-	-	-
5 Land Use Change & Forestry	-	16 800	-	-	-	-	-
A Changes in Forests & other Woody Biomass Stocks	-	16 800	-	-	-	-	-
B Forest and Grassland Conversion	-	-	-	-	-	-	-
C Abandonment of Managed Lands	-	-	-	-	-	-	-
D Other Land Use Change Activities	-	-	-	-	-	-	-
6 Waste	-	-	132,0	-	-	-	-
A Solid Waste Disposal on Land	-	-	122,0	-	-	-	-
B Wastewater Treatment	-	-	10,0	-	-	-	-
C Waste Incineration	-	-	-	-	-	-	-
D Other Waste	-	-	-	-	-	-	-
7 Other	-	-	-	-	-	-	-
International Bunkers (not included in national totals)	2 120	-	1,0	1,0	25,0	8,0	4,0
Marine bunkers (*)	1 300	-	1,0	1,0	25,0	8,0	4,0
Aviation bunkers	820	-	IE	IE	IE	IE	IE
FNEC (**)	1 100	-	-	-	-	-	-

Ref.: "Finland's National Report under the United Nations Framework Convention on Climate Change", Ministry of the Environment, January 1995, and "Finland's Second Report under the Framework Convention on Climate Change", April 1997.

(\*) Marine Bunkers (EUROSTAT)

(\*\*) Final Non-Energy Consumption (EUROSTAT)

IE included elsewhere

# France 1994

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

France 1994 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>386 386</b>	<b>59 654</b>	<b>2 860,5</b>	<b>168,4</b>	<b>1 793,8</b>	<b>9 657,7</b>	<b>2 865,4</b>
1 All Energy (Fuel Combustion + Fugitive)	353 277	-	495,4	16,2	1 752,2	8 771,2	1 671,4
A Fuel Combustion	350 329	-	161,4	15,9	1 744,5	8 767,1	1 551,5
1 Energy and Transformation Industries	63 901	-	1,2	1,8	128,6	16,3	2,7
2 Industry (ISIC)	53 000	-	8,0	3,7	167,8	599,2	12,7
3 Transport	132 815	-	22,2	5,9	1 133,7	6 228,2	1 257,6
4 Small Combustion	100 613	-	130,0	4,5	314,6	1 923,3	277,5
5 Other Combustion Activities	0	-	0,0	0,0	0,0	0,0	0,0
6 Traditional Biomass burned for Energy	-	-	-	-	-	-	-
B Fugitive Emissions from Fuels	2 948	-	334,0	0,2	7,6	4,2	119,8
1 Solid Fuels	0	-	212,9	0,0	0,0	3,5	0,9
2 Oil and Natural Gas Fuels	2 948	-	121,	0,2	7,6	0,7	119,0
2 Industrial Processes	14 335	-	2,4	77,4	11,4	602,6	77,6
3 Solvent and Other Product Use	1 945	-	0,0	2,0	0,0	0,0	624,2
4 Agriculture	0	-	1 555,5	51,5	0,0	0,0	10,3
A Enteric Fermentation	0	-	1 353,8	0,0	0,0	0,0	0,0
B Manure Management	0	-	169,6	0,0	0,0	0,0	0,0
C Rice Cultivation	0	-	12,4	0,1	0,0	0,0	0,0
D Agricultural Soils	0	-	19,6	51,4	0,0	0,0	10,3
E Prescribed Burning of Savannas	0	-	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	0,0
G Other Agriculture Activities	0	-	0,0	0,0	0,0	0,0	0,0
5 Land Use Change & Forestry (*)	13 301	59 654	92,5	17,9	0,8	49,7	456,3
A Changes in Forests & other Woody Biomass Stocks	-	50 684	0,0	0,0	0,0	0,0	0,0
B Forest and Grassland Conversion	13 301	-	3,4	0,0	0,8	49,7	4,2
C Abandonment of Managed Lands	-	8 970	0,0	0,0	0,0	0,0	0,0
D Other Land Use Change Activities	0	-	89,1	17,8	0,0	0,0	452,1
6 Waste	3 528	-	714,6	3,6	29,4	234,2	25,7
A Solid Waste Disposal on Land	0	-	666,9	0,0	0,0	0,0	4,9
B Wastewater Treatment	1 412	-	16,8	2,1	0,0	0,0	3,2
C Waste Incineration	2 117	-	15,9	1,5	29,4	234,2	8,2
D Other Waste	0	-	14,9	0,0	0,0	0,0	9,3
7 Other	0	-	0,0	0,0	0,0	0,0	0,0
<b>International Bunkers (not included in national totals)</b>	<b>16 140</b>	<b>-</b>	<b>0,0</b>	<b>0,2</b>	<b>200,6</b>	<b>27,8</b>	<b>73,3</b>
Marine bunkers	6 868	-	0,0	0,2	130,6	1,8	59,8
Aviation bunkers	9 272	-	0,0	0,0	70,0	26,0	13,6
<b>FNEC (**)</b>	<b>5 000</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>

Ref.: "Second National Communication of France under the Climate Convention", November 1997.

(\*) Totals for sector 5 compiled by the European Environment Agency (EEA)

(\*\*) Final Non-Energy Consumption (EUROSTAT)

Note: emission data include oversee territories.



# Germany 1994

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Germany 1994 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>904 500</b>	<b>30 000</b>	<b>4 849</b>	<b>219</b>	<b>2 211</b>	<b>6 738</b>	<b>2 135</b>
1 All Energy (Fuel Combustion +Fugitive)	879 300	-	1 289	42	2 188	6 143	955
A Fuel Combustion	879 300	-	119	42	2 188	6 130	821
1 Energy and Transformation Industries	387 000	-	10	14	500	167	10
2 Industry (ISIC)	128 300	-	10	5	173	675	9
3 Transport	167 600	-	40	19	1 249	4 018	693
4 Small Combustion	183 300	-	57	5	130	1 112	64
5 Other Combustion Activities	13 100	-	2	0	136	158	49
6 Traditional Biomass burned for Energy	NO	-	NE	NE	NE	NE	NE
B Fugitive Emissions from Fuels	NE	-	1 170	0	0	13	134
1 Solid Fuels	NO	-	850	NO	NO	NO	4
2 Oil and Natural Gas Fuels	NE	-	320	0	0	13	130
2 Industrial Processes	25 200	-	0	81	23	595	90
3 Solvent and Other Product Use	NO	-	NO	6	NO	NO	1 090
4 Agriculture	NO	-	1 660	86	NE	NE	NE
A Enteric Fermentation	NO	-	1 162	NO	NO	NO	NO
B Manure Management	NO	-	498	9	NO	NO	NO
C Rice Cultivation	-	-	-	-	-	-	-
D Agricultural Soils	NO	-	NO	77	NO	NO	NO
E Prescribed Burning of Savannas	-	-	-	-	-	-	-
F Field Burning of Agricultural Residues	NO	-	NE	NE	NE	NE	NE
G Other Agriculture Activities	-	-	-	-	-	-	-
5 Land Use Change & Forestry	-	30 000	NO	NO	NO	NO	NO
A Changes in Forests & other Woody Biomass Stocks	-	30 000	NO	NO	NO	NO	NO
B Forest and Grassland Conversion	NO	-	NO	NO	NO	NO	NO
C Abandonment of Managed Lands	-	NE	NO	NO	NO	NO	NO
D Other Land Use Change Activities	-	-	-	-	-	-	-
6 Waste	NE	-	1 900	4	NE	NE	NE
A Solid Waste Disposal on Land	NO	-	1 780	NO	NO	NO	NO
B Wastewater Treatment	NO	-	120	4	NO	NO	NO
C Waste Incineration	NE	-	NE	NE	NE	NE	NE
D Other Waste	-	-	-	-	-	-	-
7 Other	-	-	-	-	-	-	-
International Bunkers (not included in national totals)	20 100	-	0	NE	161	98	24
Marine bunkers (*)	6 500	-	0	NE	105	85	14
Aviation bunkers	13 600	-	0	NE	56	13	10
FNEC (**)	5 100	-	-	-	-	-	-

Ref.: "Second National Communication of Germany", 16 April 1997.

(\*) Marine Bunkers (EUROSTAT)

(\*\*) Final Non-Energy Consumption (EUROSTAT)

NO not occurring

NE not estimated

## Greece 1994

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Greece 1994 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>89 005</b>	<b>-</b>	<b>456,6</b>	<b>16,7</b>	<b>367,4</b>	<b>1 427,0</b>	<b>332,0</b>
1 All Energy (Fuel Combustion +Fugitive)	81 289	-	63,7	6,5	329,2	1 243,8	272,2
A Fuel Combustion	81 289	-	15,2	6,5	327,1	1 243,7	250,9
1 Energy and Transformation Industries	47 106	-	0,7	1,4	83,7	6,9	2,9
2 Industry (ISIC)	9 236	-	1,6	1,2	19,9	14,7	2,3
3 Transport	16 925	-	3,6	1,7	178,7	978,6	222,9
4 Small Combustion	8 022	-	9,3	2,1	44,7	243,4	22,7
5 Other Combustion Activities	-	-	-	-	-	-	-
6 Traditional Biomass burned for Energy	-	-	-	-	-	-	-
B Fugitive Emissions from Fuels	0	-	48,6	0,0	2,1	0,1	21,3
1 Solid Fuels	0	-	48,2	0,0	0,0	0,0	0,0
2 Oil and Natural Gas Fuels	0	-	0,4	0,0	2,1	0,1	21,3
2 Industrial Processes	7 364	-	0,0	1,8	31,1	24,4	2,7
3 Solvent and Other Product Use	0	-	0,0	0,0	0,0	0,0	0,0
4 Agriculture	0	-	278,2	8,4	5,4	134,9	48,6
A Enteric Fermentation	0	-	142,6	0,0	0,0	0,0	0,0
B Manure Management	0	-	26,2	0,0	0,0	0,0	0,0
C Rice Cultivation	0	-	7,0	0,1	0,0	0,0	0,0
D Agricultural Soils	0	-	96,0	8,2	0,0	0,0	29,4
E Prescribed Burning of Savannas	0	-	0,0	0,0	0,0	0,0	0,0
F Field Burning of Agricultural Residues	0	-	6,4	0,1	5,4	134,9	19,2
G Other Agriculture Activities	0	-	0,0	0,0	0,0	0,0	0,0
5 Land Use Change & Forestry	0	-	0,0	0,0	0,0	0,0	0,0
A Changes in Forests & other Woody Biomass Stocks	0	-	0,0	0,0	0,0	0,0	0,0
B Forest and Grassland Conversion	0	-	0,0	0,0	0,0	0,0	0,0
C Abandonment of Managed Lands	0	-	0,0	0,0	0,0	0,0	0,0
D Other Land Use Change Activities	0	-	0,0	0,0	0,0	0,0	0,0
6 Waste	352	-	114,7	0,0	1,7	24,0	8,6
A Solid Waste Disposal on Land	352	-	104,7	0,0	0,0	0,0	0,0
B Wastewater Treatment	0	-	6,3	0,0	0,0	0,0	0,0
C Waste Incineration	0	-	3,7	0,0	1,7	24,0	8,6
D Other Waste	0	-	0,0	0,0	0,0	0,0	0,0
7 Other	0	-	0,0	0,0	0,0	0,0	0,0
International Bunkers (not included in national totals)	13 026	-	0,3	0,7	222,4	41,9	33,5
Marine bunkers	10 416	-	0,3	0,7	222,4	41,9	33,5
Aviation bunkers	2 610	-	IE	IE	IE	IE	IE
FNEC (*)	100	-	-	-	-	-	-

Ref.: "2<sup>nd</sup> National Communication to the United Nations Framework Convention on Climate Change, Review of the Greek National Action Plan for the Abatement of CO<sub>2</sub> and other greenhouse gas emissions", Ministry for the Environment, Physical Planning and Public Works, Athens, June 1997.

(\*) Final Non-Energy Consumption (EUROSTAT)

Ireland 1994

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Ireland 1994 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>33 324</b>	<b>5 970</b>	<b>807,2</b>	<b>26,0</b>	<b>115,6</b>	<b>329,6</b>	<b>174,4</b>
1 All Energy (Fuel Combustion +Fugitive)	31 443	0	14,8	3,5	115,2	329,0	69,8
A Fuel Combustion	31 443	0	4,1	3,5	115,2	329,0	65,4
1 Energy and Transformation Industries	12 574	0	0,0	1,6	45,4	3,4	0,3
2 Industry (ISIC)	3 640	0	0,1	0,4	9,9	1,6	0,2
3 Transport	5 811	0	1,2	0,5	47,7	262,3	58,7
4 Small Combustion	9 418	0	2,7	1,0	12,2	61,7	6,3
5 Other Combustion Activities	0	0	0,0	0,0	0,0	0,0	0,0
6 Traditional Biomass burned for Energy	0	0	0,0	0,0	0,0	0,0	0,0
B Fugitive Emissions from Fuels	0	0	10,7	0,0	0,0	0,0	4,4
1 Solid Fuels	0	0	0,0	0,0	0,0	0,0	0,0
2 Oil and Natural Gas Fuels	0	0	10,7	0,0	0,0	0,0	4,4
2 Industrial Processes	1 827	0	0,0	2,6	0,3	0,0	0,0
3 Solvent and Other Product Use	0	0	0,0	0,0	0,0	0,0	22,0
4 Agriculture	0	0	633,3	19,1	0,0	0,0	58,9
A Enteric Fermentation	0	0	548,2	0,0	0,0	0,0	0,0
B Manure Management	0	0	55,6	0,0	0,0	0,0	0,0
C Rice Cultivation	0	0	0,0	0,0	0,0	0,0	0,0
D Agricultural Soils	0	0	29,5	19,1	0,0	0,0	58,9
E Prescribed Burning of Savannas	0	0	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	0,0
G Other Agriculture Activities	0	0	0,0	0,0	0,0	0,0	0,0
5 Land Use Change & Forestry	0	5 970	23,2	0,8	0,0	0,0	23,2
A Changes in Forests & other Woody Biomass Stocks	0	5 970	0,0	0,0	0,0	0,0	0,0
B Forest and Grassland Conversion	0	0	0,0	0,0	0,0	0,0	0,0
C Abandonment of Managed Lands	0	0	0,0	0,0	0,0	0,0	0,0
D Other Land Use Change Activities	0	0	23,2	0,8	0,0	0,0	23,2
6 Waste	54	0	136,0	0,0	0,0	0,0	0,5
A Solid Waste Disposal on Land	0	0	136,0	0,0	0,0	0,0	0,0
B Wastewater Treatment	0	0	0,0	0,0	0,0	0,0	0,0
C Waste Incineration	54	0	0,0	0,0	0,0	0,0	0,5
D Other Waste	0	0	0,0	0,0	0,0	0,0	0,0
7 Other	0	0	0,0	0,0	0,0	0,0	0,0
International Bunkers (not included in national totals)	1 350	-	0,0	0,0	8,6	4,4	1,1
Marine bunkers (*)	100	-	0,0	0,0	6,8	1,1	0,2
Aviation bunkers	1 250	-	0,0	0,0	1,8	3,4	0,8
FNEC (**)	800	-	-	-	-	-	-

Ref.: "Ireland: Second Communication under the United Nations Framework Convention on Climate Change".

(\*) Marine Bunkers (EUROSTAT)

(\*\*) Final Non-Energy Consumption (EUROSTAT)

Italy 1994

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Italy 1994 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>422 365</b>	<b>36 395</b>	<b>2 557,6</b>	<b>160,4</b>	<b>1 791,1</b>	<b>7 570,6</b>	<b>2 354,7</b>
1 All Energy (Fuel Combustion +Fugitive)	385 395	-	458,5	41,7	1 769,9	6 951,3	1 458,1
A Fuel Combustion	384 232	-	106,2	41,7	1 764,2	6 942,9	1 303,7
1 Energy and Transformation Industries	129 069	-	4,6	18,7	346,6	27,9	4,6
2 Industry (ISIC)	81 071	-	7,3	7,7	246,0	516,6	14,9
3 Transport	102 221	-	70,4	5,4	961,4	5 656,4	1 180,3
4 Small Combustion	69 717	-	23,7	9,8	189,5	711,5	96,6
5 Other Combustion Activities	2 153	-	0,3	0,1	20,7	30,5	7,3
6 Traditional Biomass burned for Energy	-	-	-	-	-	-	-
B Fugitive Emissions from Fuels	1 163	-	352,2	0,0	5,7	8,4	154,4
1 Solid Fuels	-	-	3,4	-	-	-	2,7
2 Oil and Natural Gas Fuels	1 163	-	348,8	-	5,7	8,4	151,7
2 Industrial Processes	22 852	-	4,5	20,6	4,8	290,5	70,5
3 Solvent and Other Product Use	1 976	-	-	-	-	-	634,1
4 Agriculture	0	-	915,1	75,9	0,9	25,2	1,9
A Enteric Fermentation	-	-	607,2	-	-	-	-
B Manure Management	-	-	181,9	12,4	-	-	0,6
C Rice Cultivation	-	-	124,8	-	-	-	-
D Agricultural Soils	-	-	0,0	63,5	-	-	-
E Prescribed Burning of Savannas	-	-	-	-	-	-	-
F Field Burning of Agricultural Residues	-	-	1,2	0,0	0,9	25,2	1,2
G Other Agriculture Activities	-	-	-	-	-	-	-
5 Land Use Change & Forestry	11 421	36 395	192,4	21,6	0,7	23,1	163,9
A Changes in Forests & other Woody Biomass Stocks	10 344	35 947	-	-	-	-	-
B Forest and Grassland Conversion	1 077	-	2,6	0,0	0,7	23,1	2,6
C Abandonment of Managed Lands	-	133	-	-	-	-	-
D Other Land Use Change Activities	-	316	189,7	21,6	-	-	161,3
6 Waste	721	-	987,1	0,5	14,9	280,5	26,2
A Solid Waste Disposal on Land	0	-	426,5	-	-	-	7,7
B Wastewater Treatment	0	-	511,4	-	-	-	1,3
C Waste Incineration	721	-	13,4	0,5	14,9	280,5	17,3
D Other Waste	0	-	35,8	-	-	-	-
7 Other	-	-	-	-	-	-	-
Biomass burned for energy	4 178	-	15,3	0,7	6,9	272,2	22,3
International Bunkers (not included in national totals)	12 416	-	1,1	0,7	185,7	22,0	8,3
Marine bunkers	7 491	-	0,7	0,5	170,1	17,5	5,0
Aviation bunkers	4 926	-	0,4	0,2	15,6	4,5	3,3
FNEC (*)	3 000	-	-	-	-	-	-

Ref.: "Excerpt from the Second National Communication to the United Nations Framework Convention on Climate Change", Ministry of Environment, Department for Air and Noise Pollution and Industrial Risk, submitted to Commission on 24 March 1998.

(\*) Final Non-Energy Consumption (EUROSTAT)

Note (1): CO<sub>2</sub> emissions from geothermal activity have been excluded (National Communication: 1B3: 1505 Gg).

Note (2): Italy delivered data according to the Revised 1996 IPCC Guidelines. This table presents these data in the format of the 1995 IPCC Guidelines for consistency reasons.

Note (3): Emissions for *Land-use Change & Forestry* are given as emissions and removals.

Note (4): CH<sub>4</sub> emissions from sector 6D "Other Waste" are excluded (35.8 Gg).

## Luxembourg 1994

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Luxembourg 1994 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>11 998</b>	<b>0</b>	<b>21,9</b>	<b>0,7</b>	<b>22,4</b>	<b>144,7</b>	<b>18,5</b>
1 All Energy (Fuel Combustion +Fugitive)	11 520	-	2,3	0,2	22,0	131,0	12,6
A Fuel Combustion	11 520	-	0,8	0,2	22,0	131,0	10,8
1 Energy and Transformation Industries	1 064	-	0,0	0,0	0,3	0,0	0,0
2 Industry (ISIC)	5 475	-	0,1	0,0	9,7	76,3	0,3
3 Transport	3 685	-	0,2	0,1	10,4	44,0	9,1
4 Small Combustion	1 296	-	0,5	0,0	1,6	10,7	1,3
5 Other Combustion Activities	-	-	-	-	-	-	-
6 Traditional Biomass burned for Energy	-	-	-	-	-	-	-
B Fugitive Emissions from Fuels	0	-	1,5	0,0	0,0	0,0	1,8
1 Solid Fuels	0	-	0,0	0,0	0,0	0,0	0,0
2 Oil and Natural Gas Fuels	0	-	1,5	0,0	0,0	0,0	1,8
2 Industrial Processes	447	-	0,0	0,0	0,2	13,7	1,1
3 Solvent and Other Product Use	12	-	0,0	0,0	0,0	0,0	3,8
4 Agriculture	0	-	16,9	0,5	0,0	0,0	0,2
A Enteric Fermentation	0	-	15,8	0,0	0,0	0,0	0,0
B Manure Management	0	-	1,1	0,0	0,0	0,0	0,0
C Rice Cultivation	0	-	0,0	0,0	0,0	0,0	0,0
D Agricultural Soils	0	-	0,0	0,5	0,0	0,0	0,2
E Prescribed Burning of Savannas	0	-	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	0,0
G Other Agriculture Activities	0	-	0,0	0,0	0,0	0,0	0,0
5 Land Use Change & Forestry	0	-	0,0	0,0	0,0	0,0	0,8
A Changes in Forests & other Woody Biomass Stocks	0	-	0,0	0,0	0,0	0,0	0,0
B Forest and Grassland Conversion	0	-	0,0	0,0	0,0	0,0	0,0
C Abandonment of Managed Lands	0	-	0,0	0,0	0,0	0,0	0,0
D Other Land Use Change Activities	0	-	0,0	0,0	0,0	0,0	0,8
6 Waste	19	-	2,7	0,0	0,3	0,0	0,0
A Solid Waste Disposal on Land	1	-	2,2	0,0	0,0	0,0	0,0
B Wastewater Treatment	0	-	0,2	0,0	0,0	0,0	0,0
C Waste Incineration	18	-	0,0	0,0	0,3	0,0	0,0
D Other Waste	0	-	0,2	0,0	0,0	0,0	0,0
7 Other	0	-	0,0	0,0	0,0	0,0	0,0
International Bunkers (not included in national totals)	194	-	0,0	0,0	0,1	0,5	0,2
Marine bunkers	0	-	0,0	0,0	0,0	0,0	0,0
Aviation bunkers	194	-	0,0	0,0	0,1	0,5	0,2
FNEC (*)	0	-	-	-	-	-	-

Ref.: "Luxembourg CO<sub>2</sub> emissions in 1994 and 1995", Administration de l'Environnement, Grand Duche de Luxembourg, 29 August 1996.

(\*) Final Non-Energy Consumption (EUROSTAT)

# Netherlands 1994

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>168 390</b>	<b>1 700</b>	<b>1 203,0</b>	<b>70,1</b>	<b>493,3</b>	<b>905,1</b>	<b>387,6</b>
1 All Energy (Fuel Combustion +Fugitive)	165 750	-	202,3	7,2	479,6	797,0	215,8
A Fuel Combustion	165 560	-	33,7	6,9	479,1	789,4	173,5
1 Energy and Transformation Industries	54 780	-	3,7	0,1	78,5	14,2	2,9
2 Industry (ISIC)	40 950	-	2,6	0,1	54,4	114,3	2,6
3 Transport	30 800	-	6,3	6,6	304,4	559,9	156,5
4 Small Combustion	38 500	-	17,3	0,1	39,5	11,9	5,3
5 Other Combustion Activities	530	-	-	-	-	-	-
6 Traditional Biomass burned for Energy	3 500	-	3,9	0,0	2,2	89,1	6,2
B Fugitive Emissions from Fuels	190	-	168,5	0,4	0,5	7,6	42,3
1 Solid Fuels	-	-	-	-	-	-	-
2 Oil and Natural Gas Fuels	190	-	168,5	0,4	0,5	7,6	42,3
2 Industrial Processes	1 430	-	5,3	31,6	10,4	101,7	88,2
3 Solvent and Other Product Use	10	-	0,3	0,5	0,1	2,1	82,3
4 Agriculture	-	-	483,0	26,4	-	-	0,2
A Enteric Fermentation	-	-	382,0	-	-	-	-
B Manure Management	-	-	101,0	0,8	-	-	-
C Rice Cultivation	-	-	-	-	-	-	-
D Agricultural Soils	-	-	-	25,6	-	-	0,2
E Prescribed Burning of Savannas	-	-	-	-	-	-	-
F Field Burning of Agricultural Residues	-	-	-	-	-	-	-
G Other Agriculture Activities	-	-	-	-	-	-	-
5 Land Use Change & Forestry	-	1 700	-	-	-	-	-
A Changes in Forests & other Woody Biomass Stocks	-	1 700	-	-	-	-	-
B Forest and Grassland Conversion	-	-	-	-	-	-	-
C Abandonment of Managed Lands	-	-	-	-	-	-	-
D Other Land Use Change Activities	-	-	-	-	-	-	-
6 Waste	1 200	-	510,2	0,5	3,2	4,3	1,2
A Solid Waste Disposal on Land	-	-	505,1	-	0,3	1,4	0,2
B Wastewater Treatment	-	-	5,1	0,5	-	-	-
C Waste Incineration	1 200	-	0,0	0,1	2,9	2,9	1,0
D Other Waste	-	-	-	-	-	-	-
7 Other	-	-	2,0	3,8	-	-	-
Nature	-	-	125,0	2,4	16,3	26,7	3,2
International Bunkers (not included in national totals)	43 200	-	-	-	-	-	-
Marine bunkers	36 500	-	-	-	-	-	-
Aviation bunkers	6 700	-	-	-	-	-	-
FNEC (*)	4 600	-	-	-	-	-	-

Ref.: "Greenhouse gas emissions in the Netherlands 1990-1996: Updated methodology. A report on the International Commitments with respect to Greenhouse Gas Emission Inventories for the United Nations Framework Convention on Climate Change and the European Union's Greenhouse Gas Monitoring Mechanism", National Institute of Public Health and the Environment, Bilthoven, The Netherlands, December 1997.

(\*) Final Non-Energy Consumption (EUROSTAT)

Portugal 1994

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Portugal 1994 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>50 841</b>	<b>1 152</b>	<b>834,3</b>	<b>14,5</b>	<b>379,2</b>	<b>1 462,4</b>	<b>318,6</b>
1 All Energy (Fuel Combustion +Fugitive)	47 154	-	25,6	2,4	374,6	1 428,9	208,0
A Fuel Combustion	46 953	-	22,2	2,4	374,6	1 428,9	146,5
1 Energy and Transformation Industries	17 150	-	1,3	0,3	71,7	7,5	2,2
2 Industry (ISIC)	7 178	-	1,7	0,2	19,0	28,3	7,8
3 Transport	16 849	-	4,7	0,8	226,3	847,8	87,0
4 Small Combustion	5 074	-	7,1	0,8	46,0	274,8	24,8
5 Other Combustion Activities	701	-	0,2	0,0	4,9	0,2	0,4
6 Traditional Biomass burned for Energy	11 052	-	7,3	0,4	6,8	270,4	24,3
B Fugitive Emissions from Fuels	201	-	3,4	NA	NA	NA	61,5
1 Solid Fuels	5	-	2,0	NA	NA	NA	0,0
2 Oil and Natural Gas Fuels	196	-	1,4	NA	NA	NA	61,5
2 Industrial Processes	3 421	-	0,4	1,9	4,5	32,9	17,7
3 Solvent and Other Product Use	266	-	NA	NA	NA	NA	85,2
4 Agriculture	NE	-	194,8	7,2	NE	NE	NE
A Enteric Fermentation	NA	-	118,6	NE	NE	NA	NA
B Manure Management	NA	-	63,0	IOC	NE	NA	NA
C Rice Cultivation	NA	-	13,2	0,0	NA	NA	NA
D Agricultural Soils	NA	-	NE	7,2	NE	NA	NE
E Prescribed Burning of Savannas	NA	-	NA	NA	-	-	0,0
F Field Burning of Agricultural Residues	NE	-	NE	NE	-	-	0,0
G Other Agriculture Activities	-	-	-	-	-	-	-
5 Land Use Change & Forestry	-	1 152	NA	NA	NA	NA	NA
A Changes in Forests & other Woody Biomass Stocks	-	IE	-	-	-	-	-
B Forest and Grassland Conversion	-	IE	-	-	-	-	-
C Abandonment of Managed Lands	-	IE	-	-	-	-	-
D Other Land Use Change Activities	-	1 152	-	-	-	-	-
6 Waste	0	-	613,5	2,9	0,0	0,6	7,8
A Solid Waste Disposal on Land	0	-	528,3	0,0	0,0	0,6	6,7
B Wastewater Treatment	0	-	85,2	2,9	0,0	0,0	1,1
C Waste Incineration	0	-	0,0	0,0	0,0	0,0	0,0
D Other Waste	0	-	0,0	0,0	0,0	0,0	0,0
7 Other	0	-	0,0	0,0	0,0	0,0	0,0
International Bunkers (not included in national totals)	3 300	-	1 850,0	1,7	0,0	30,1	2,3
Marine bunkers (*)	1 500	-	IE	IE	IE	IE	IE
Aviation bunkers	1 800	-	1 850,0	1,7	0,0	30,1	2,3
FNEC (**)	200	-	-	-	-	-	-

Ref.: "Portugal's Second Report to be submitted to the Conference of the Parties to the Framework Convention on Climate Change", Ministry of the Environment, 1997.

(\*) Marine Bunkers (EUROSTAT)

(\*\*) Final Non-Energy Consumption (EUROSTAT)

NA ... not available

NE ... not estimated

Note: National totals include non-CO<sub>2</sub> emissions from Biomass (1A6).

Spain 1994

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Spain 1994 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>231 370</b>	<b>28 970</b>	<b>2 351,0</b>	<b>87,5</b>	<b>1 192,2</b>	<b>5 377,7</b>	<b>1 226,5</b>
1 All Energy (Fuel Combustion + Fugitive)	214 135	-	729,6	21,1	1 167,9	4 756,6	709,9
A Fuel Combustion	213 707	-	111,2	21,1	1 167,9	4 756,6	512,2
1 Energy and Transformation Industries	76 081	-	11,9	9,8	275,5	27,6	29,4
2 Industry (ISIC)	50 896	-	6,2	5,3	194,5	418,0	19,1
3 Transport	59 721	-	12,8	2,6	575,9	2 526,2	335,3
4 Small Combustion	27 009	-	43,1	2,8	108,0	926,0	72,5
5 Other Combustion Activities	-	-	-	-	-	-	-
6 Traditional Biomass burned for Energy	13 061	-	37,2	0,6	14,0	858,8	55,8
B Fugitive Emissions from Fuels	428	-	618,4	0,0	0,0	0,0	197,7
1 Solid Fuels	0	-	525,2	0,0	0,0	0,0	0,0
2 Oil and Natural Gas Fuels	428	-	93,2	0,0	0,0	0,0	197,7
2 Industrial Processes	16 372	-	2,3	8,0	9,0	236,6	51,2
3 Solvent and Other Product Use	0	-	0,0	0,0	0,0	0,0	338,8
4 Agriculture	0	-	933,3	58,2	4,4	301,5	87,5
A Enteric Fermentation	0	-	351,6	0,0	0,0	0,0	0,0
B Manure Management	0	-	480,6	0,0	0,0	0,0	0,0
C Rice Cultivation	0	-	7,7	0,2	0,0	0,0	0,0
D Agricultural Soils	0	-	76,8	58,0	0,0	0,0	70,9
E Prescribed Burning of Savannas	-	-	-	-	-	-	-
F Field Burning of Agricultural Residues	0	-	16,6	0,0	4,4	301,5	16,6
G Other Agriculture Activities	-	-	-	-	-	-	-
5 Land Use Change & Forestry	-	28 970	-	-	-	-	-
A Changes in Forests & other Woody Biomass Stocks	-	-	-	-	-	-	-
B Forest and Grassland Conversion	-	-	-	-	-	-	-
C Abandonment of Managed Lands	-	-	-	-	-	-	-
D Other Land Use Change Activities	-	28 970	-	-	-	-	-
6 Waste	0	-	685,8	0,1	10,8	83,0	39,0
A Solid Waste Disposal on Land	0	-	657,9	0,0	6,1	68,5	24,5
B Wastewater Treatment	0	-	0,0	0,0	0,0	0,0	0,6
C Waste Incineration	-	-	-	-	-	-	-
D Other Waste	0	-	27,9	0,1	4,7	14,5	14,0
7 Other	863	-	0,0	0,0	0,0	0,0	0,0
International Bunkers (not included in national totals)	19 144	-	2,3	0,3	286,9	18,5	12,2
Marine bunkers	12 418	-	0,6	0,3	260,2	7,4	12,0
Aviation bunkers	6 726	-	1,7	-	26,7	11,1	0,2
FNEC (*)	1 700	-	-	-	-	-	-

Ref.: "Segunda Comunicación Nacional de España", Ministerio de Medio Ambiente, 1997.

(\*) Final Non-Energy Consumption (EUROSTAT)

Note (1): National totals include non-CO<sub>2</sub> emissions from Biomass (1A6).

Note (2): The national communication excludes CO<sub>2</sub> emissions from sector 4 and 6 for the national total as they are considered to be from renewable sources (sector 4: 17 554 Gg and sector 6: 2 657 Gg CO<sub>2</sub>).



# Sweden 1994

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Sweden 1994 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>58 438</b>	<b>30 000</b>	<b>302,4</b>	<b>9,3</b>	<b>329,5</b>	<b>1 142,4</b>	<b>477,5</b>
1 All Energy (Fuel Combustion +Fugitive)	53 962	-	39,0	6,8	302,5	1 088,4	358,1
A Fuel Combustion	53 946	-	39,0	6,8	302,5	1 088,4	343,4
1 Energy and Transformation Industries	11 068	-	1,7	1,2	14,2	7,4	4,6
2 Industry (ISIC)	13 938	-	5,4	2,2	18,1	30,1	5,5
3 Transport	18 685	-	20,8	2,9	260,3	914,6	187,5
4 Small Combustion	10 148	-	11,1	0,5	9,9	136,3	145,8
5 Other Combustion Activities	107	-	-	-	-	-	-
6 Traditional Biomass burned for Energy	-	-	-	-	-	-	-
B Fugitive Emissions from Fuels	16	-	-	-	-	-	14,7
1 Solid Fuels	-	-	-	-	-	-	-
2 Oil and Natural Gas Fuels	16	-	-	-	-	-	14,7
2 Industrial Processes	4 227	-	-	2,3	27,0	54,0	36,0
3 Solvent and Other Product Use	249	-	-	-	-	-	83,4
4 Agriculture	-	-	202,3	0,2	-	-	-
A Enteric Fermentation	-	-	183,7	-	-	-	-
B Manure Management	-	-	18,7	-	-	-	-
C Rice Cultivation	-	-	-	0,2	-	-	-
D Agricultural Soils	-	-	-	-	-	-	-
E Prescribed Burning of Savannas	-	-	-	-	-	-	-
F Field Burning of Agricultural Residues	-	-	-	-	-	-	-
G Other Agriculture Activities	-	-	-	-	-	-	-
5 Land Use Change & Forestry	-	30 000	-	-	-	-	-
A Changes in Forests & other Woody Biomass Stocks	-	30 000	-	-	-	-	-
B Forest and Grassland Conversion	-	-	-	-	-	-	-
C Abandonment of Managed Lands	-	-	-	-	-	-	-
D Other Land Use Change Activities	-	-	-	-	-	-	-
6 Waste	-	-	61,0	-	-	-	-
A Solid Waste Disposal on Land	-	-	61,0	-	-	-	-
B Wastewater Treatment	-	-	-	-	-	-	-
C Waste Incineration	-	-	-	-	-	-	-
D Other Waste	-	-	-	-	-	-	-
7 Other	-	-	-	-	-	-	-
International Bunkers (not included in national totals)	5 400	-	0,1	NE	54,0	6,2	1,6
Marine bunkers (*)	3 300	-	0,1	-	54,0	6,2	1,6
Aviation bunkers	2 100	-	IE	-	IE	IE	IE
FNEC (**)	600	-	-	-	-	-	-

Ref.: "Swedish submission of annual inventories of greenhouse gases for 1996 (preliminary) and revisions for the years 1990 through 1995", Ministry of the Environment, 9 March 1998.

(\*) Marine Bunkers (EUROSTAT)

(\*\*) Final Non-Energy Consumption (EUROSTAT)

NE not estimated

NO not occurring

IE included elsewhere

Note : CO<sub>2</sub> Removals: Estimate from 1992, latest official statistics available.

# United Kingdom 1994

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

United Kingdom 1994 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>581 979</b>	<b>18 040</b>	<b>3 848,0</b>	<b>100,0</b>	<b>2 387,0</b>	<b>5 968,0</b>	<b>2 349,0</b>
1 All Energy (Fuel Combustion +Fugitive)	541 745	-	904,0	19,2	2 378,0	5 965,0	1 371,0
A Fuel Combustion	533 180	-	92,7	19,2	2 269,0	5 918,0	938,0
1 Energy and Transformation Industries	197 895	-	11,9	7,8	586,7	251,1	6,7
2 Industry (ISIC)	93 415	-	8,0	2,8	250,9	732,0	50,3
3 Transport	120 629	-	25,6	6,9	1 249,0	4 506,9	779,4
4 Small Combustion	117 408	-	43,7	1,5	140,1	369,6	96,2
5 Other Combustion Activities	3 833	-	0,2	0,2	40,5	6,1	1,3
6 Traditional Biomass burned for Energy	1 136	-	3,3	0,1	1,4	52,5	4,3
B Fugitive Emissions from Fuels	8 566	-	811,0	NE	109,0	47,3	433,0
1 Solid Fuels	NO	-	327,0	NO	NO	NO	2,6
2 Oil and Natural Gas Fuels	8 566	-	484,0	NE	109,0	47,3	430,0
2 Industrial Processes	9 065	-	NE	70,1	4,6	NE	246,0
3 Solvent and Other Product Use	NO	-	NO	NO	NO	NO	705,0
4 Agriculture	1 270	-	1 116,0	10,0	NO	NO	NO
A Enteric Fermentation	NO	-	991,0	NO	NO	NO	NO
B Manure Management	0	-	125,0	3,5	NO	NO	NO
C Rice Cultivation	NO	-	NO	NO	NO	NO	NO
D Agricultural Soils	1 270	-	NE	6,4	NO	NO	NO
E Prescribed Burning of Savannas	NO	-	NO	NO	NO	NO	NO
F Field Burning of Agricultural Residues	NO	-	NO	NO	NO	NO	NO
G Other Agriculture Activities	NO	-	NO	NO	NO	NO	NO
5 Land Use Change & Forestry	29 085	18 040	NE	NE	NO	NO	NO
A Changes in Forests & other Woody Biomass Stocks	-	10 495	NE	NE	NO	NO	NO
B Forest and Grassland Conversion	25 418	-	NE	NO	NO	NO	NO
C Abandonment of Managed Lands	-	7 179	NE	NO	NO	NO	NO
D Other Land Use Change Activities	3 667	367	NE	NO	NO	NO	NO
6 Waste	814	-	1 828,0	0,4	5,3	3,0	26,6
A Solid Waste Disposal on Land	0	-	1 790,0	NO	NO	NO	17,9
B Wastewater Treatment	0	-	36,0	NO	NO	NO	NO
C Waste Incineration	814	-	2,4	0,4	5,3	3,0	8,7
D Other Waste	NO	-	NO	NO	NO	NO	NO
7 Other	NE	-	NE	NE	NE	NE	NE
International Bunkers (not included in national totals)	21 836	-	3,8	0,9	189,0	81,1	45,1
Marine bunkers (*)	7 134	-	IE	IE	IE	IE	IE
Aviation bunkers	14 702	-	3,8	0,9	189,0	81,1	45,1
FNEC (**)	6 700	-	-	-	-	-	-

Ref.: "UK Greenhouse Gas Emission Inventory, 1990 to 1995", December 1997.

(\*) Marine Bunkers (EUROSTAT)

(\*\*) Final Non-Energy Consumption (EUROSTAT)

NE not estimated

NO not occurring

IE included elsewhere

Note : Emissions for *Land-use Change & Forestry* are given as emissions and removals.

## C: Emissions 1995

### Austria 1995

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES							
Austria 1995 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NMVOG
<b>NATIONAL TOTALS</b>	<b>62 019</b>	<b>13 576</b>	<b>580,2</b>	<b>12,8</b>	<b>175,9</b>	<b>1 145,6</b>	<b>406,1</b>
1 All Energy (Fuel Combustion +Fugitive)	50 302	-	24,6	5,5	152,4	819,9	126,0
A Fuel Combustion	47 950	-	19,4	5,5	149,1	819,4	116,3
1 Energy and Transformation Industries	11 052	-	0,1	0,1	7,2	1,0	0,2
2 Industry (ISIC)	7 394	-	0,5	0,1	14,0	6,9	1,2
3 Transport	15 881	-	3,6	4,3	101,4	344,8	68,0
4 Small Combustion	13 582	-	15,2	0,9	26,0	466,1	46,7
5 Other Combustion Activities	41	-	0,0	0,0	0,5	0,6	0,1
6 Traditional Biomass burned for Energy	-	-	-	-	-	-	-
B Fugitive Emissions from Fuels	2 352	-	5,2	0,0	3,4	0,6	9,7
1 Solid Fuels	0	-	0,0	0,0	0,0	0,0	0,0
2 Oil and Natural Gas Fuels	2 352	-	5,2	0,0	3,4	0,6	9,7
2 Industrial Processes	11 300	-	0,1	0,5	16,2	319,8	21,7
3 Solvent and Other Product Use	411	-	0,0	0,8	0,0	0,0	131,8
4 Agriculture	0	-	208,9	3,3	6,2	1,5	2,4
A Enteric Fermentation	0	-	145,8	0,0	0,0	0,0	0,0
B Manure Management	0	-	27,3	0,0	0,0	0,0	0,0
C Rice Cultivation	0	-	0,0	0,0	0,0	0,0	0,0
D Agricultural Soils	0	-	35,7	3,3	6,2	0,0	2,2
E Prescribed Burning of Savannas	0	-	0,0	0,0	0,0	0,0	0,0
F Field Burning of Agricultural Residues	0	-	0,1	0,0	0,0	1,5	0,2
G Other Agriculture Activities	0	-	0,0	0,0	0,0	0,0	0,0
5 Land Use Change & Forestry	-	13 576	126,8	2,6	0,8	0,0	123,5
A Changes in Forests & other Woody Biomass Stocks	-	13 391	0,0	0,0	0,0	0,0	0,0
B Forest and Grassland Conversion	0	-	0,0	0,0	0,0	0,0	0,0
C Abandonment of Managed Lands	-	185	0,0	0,0	0,0	0,0	0,0
D Other Land Use Change Activities	0	-	126,8	2,6	0,8	0,0	123,5
6 Waste	7	-	219,7	0,0	0,2	4,4	0,7
A Solid Waste Disposal on Land	0	-	185,2	0,0	0,0	0,0	0,0
B Wastewater Treatment	0	-	14,2	0,0	0,0	0,0	0,0
C Waste Incineration	7	-	0,2	0,0	0,2	4,4	0,7
D Other Waste	0	-	20,0	0,0	0,0	0,0	0,0
7 Other	0	-	0,0	0,0	0,0	0,0	0,0
International Bunkers (not included in national totals)	1 208	-	0,0	0,0	6,4	2,1	0,8
Marine bunkers	0	-	0,0	0,0	0,0	0,0	0,0
Aviation bunkers	1 208	-	0,0	0,0	6,4	2,1	0,8
FNEC (*)	500	-	-	-	-	-	-

Ref.: "Austrian 2<sup>nd</sup> National Communication under the UN-FCCC", May 1997.

(\*) Final Non-Energy Consumption (EUROSTAT)

Belgium 1995 (\*\*)

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Belgium 1995 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> <sup>-</sup> Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NMVOC
<b>NATIONAL TOTALS</b>	<b>112 194</b>	<b>2 057</b>	<b>635,3</b>	<b>32,3</b>	<b>345,0</b>	<b>1 252,0</b>	<b>321,0</b>
1 All Energy (Fuel Combustion +Fugitive)	109 331	-	58,7	9,0	337,0	1 183,0	201,0
A Fuel Combustion	109 331	-	14,0	8,4	337,0	1 183,0	173,0
1 Energy and Transformation Industries	31 351	-	0,3	2,5	72,0	27,0	1,0
2 Industry (ISIC)	26 313	-	0,7	1,8	59,0	173,0	4,0
3 Transport	21 277	-	8,6	1,2	190,0	884,0	160,0
4 Small Combustion	30 389	-	4,4	2,9	15,0	99,0	8,0
5 Other Combustion Activities	-	-	-	-	-	-	-
6 Traditional Biomass burned for Energy	-	-	-	-	-	-	-
B Fugitive Emissions from Fuels	0	-	44,7	0,6	-	-	29,0
1 Solid Fuels	-	-	-	-	-	-	-
2 Oil and Natural Gas Fuels	0	-	44,7	0,6	-	-	29,0
2 Industrial Processes	2 864	-	3,2	12,3	5,0	50,0	35,0
3 Solvent and Other Product Use	-	-	-	-	-	-	84,0
4 Agriculture	-	-	389,2	10,8	-	-	1,0
A Enteric Fermentation	0	-	374,7	-	-	-	-
B Manure Management	-	-	-	-	-	-	-
C Rice Cultivation	-	-	-	-	-	-	-
D Agricultural Soils	-	-	14,4	10,8	-	-	1,0
E Prescribed Burning of Savannas	-	-	-	-	-	-	-
F Field Burning of Agricultural Residues	-	-	-	-	-	-	-
G Other Agriculture Activities	-	-	-	-	-	-	-
5 Land Use Change & Forestry	-	2 057	-	-	-	-	-
A Changes in Forests & other Woody Biomass Stocks	-	-	-	-	-	-	-
B Forest and Grassland Conversion	-	-	-	-	-	-	-
C Abandonment of Managed Lands	-	-	-	-	-	-	-
D Other Land Use Change Activities	-	2 057	-	-	-	-	-
6 Waste	NA	-	184,2	0,1	3,0	19,0	0,0
A Solid Waste Disposal on Land	-	-	183,5	-	-	-	-
B Wastewater Treatment	-	-	-	-	-	-	-
C Waste Incineration	-	-	0,7	0,1	3,0	19,0	0,0
D Other Waste	-	-	-	0,0	-	-	0,0
7 Other	-	-	-	-	-	-	-
International Bunkers (not included in national totals)	16 455	-	-	-	-	-	-
Marine bunkers	12 400	-	-	-	-	-	-
Aviation bunkers	4 055	-	-	-	-	-	-
FNEC (*)	1 600	-	-	-	-	-	-

Ref.: "Inventaire des émissions de gaz à effet de serre en Belgique", Ministerie van sociale zaken, volksgezondheid en leefmilieu, Brussel, 21 November 1996.

(\*) Final Non-Energy Consumption (EUROSTAT)

(\*\*) For CH<sub>4</sub>, N<sub>2</sub>O, NO<sub>x</sub>, CO and NMVOC 1994 data is used.

NA not available

Note (1): Belgium delivered data according to the Revised 1996 IPCC Guidelines. This table presents these data in the format of the 1995 IPCC Guidelines for consistency reasons.

Note (2): CH<sub>4</sub> emissions from sector 6D "Other Waste" are excluded (1.4 Gg).

# Denmark 1995

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Denmark 1995 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>59 532</b>	<b>964</b>	<b>430,0</b>	<b>33,0</b>	<b>253,0</b>	<b>702,0</b>	<b>162,0</b>
1 All Energy (Fuel Combustion +Fugitive)	58 096	-	29,0	3,0	252,0	702,0	109,0
A Fuel Combustion	57 748	-	11,0	3,0	250,0	656,0	93,0
1 Energy and Transformation Industries	31 482	-	1,0	1,0	91,0	49,0	2,0
2 Industry (ISIC)	6 039	-	1,0	0,0	23,0	10,0	3,0
3 Transport	11 370	-	2,0	1,0	100,0	389,0	71,0
4 Small Combustion	8 718	-	7,0	0,0	35,0	206,0	17,0
5 Other Combustion Activities	139	-	0,0	0,0	2,0	2,0	0,0
6 Traditional Biomass burned for Energy	-	-	-	-	-	-	-
B Fugitive Emissions from Fuels	348	-	17,0	0,0	2,0	45,0	17,0
1 Solid Fuels	-	-	6,0	-	0,0	44,0	0,0
2 Oil and Natural Gas Fuels	348	-	11,0	0,0	2,0	1,0	17,0
2 Industrial Processes	1 311	-	1,0	-	1,0	0,0	1,0
3 Solvent and Other Product Use	125	-	-	-	-	-	40,0
4 Agriculture	-	-	327,0	30,0	-	-	2,0
A Enteric Fermentation	-	-	155,0	-	-	-	-
B Manure Management	-	-	172,0	-	-	-	-
C Rice Cultivation	-	-	-	-	-	-	-
D Agricultural Soils	-	-	-	30,0	-	-	2,0
E Prescribed Burning of Savannas	-	-	-	-	-	-	-
F Field Burning of Agricultural Residues	-	-	-	-	-	-	-
G Other Agriculture Activities	-	-	-	-	-	-	-
5 Land Use Change & Forestry	-	964	1,0	-	-	-	9,0
A Changes in Forests & other Woody Biomass Stocks	-	964	-	-	-	-	-
B Forest and Grassland Conversion	-	-	-	-	-	-	-
C Abandonment of Managed Lands	-	-	-	-	-	-	-
D Other Land Use Change Activities	-	-	1,0	-	-	-	9,0
6 Waste	-	-	74,0	-	-	-	-
A Solid Waste Disposal on Land	-	-	72,0	-	-	-	-
B Wastewater Treatment	-	-	2,0	-	-	-	-
C Waste Incineration	-	-	-	-	-	-	-
D Other Waste	-	-	-	-	-	-	-
7 Other	-	-	-	-	-	-	-
Correction for electricity exchange	-615	-	-	-	-	-	-
Correction for the impact of climate variation	0	-	-	-	-	-	-
International Bunkers (not included in national totals)	7 080	-	0	0	130	13	4
Marine bunkers (*)	5 018	-	0	0	122	12	4
Aviation bunkers	2 062	-	0	0	7	1	1
FNEC (**)	100	-	-	-	-	-	-

Ref.: "Denmark's Second National Communication on Climate Change", Ministry of Environment and Energy, Danish Environmental Protection Agency, 1997.

(\*) Marine Bunkers (EUROSTAT)

(\*\*) Final Non-Energy Consumption (EUROSTAT)

Note: Denmark delivered data according to the Revised 1996 IPCC Guidelines. This table presents these data in the format of the 1995 IPCC Guidelines for consistency reasons.

## Finland 1995

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Finland 1995 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>56 050</b>	<b>14 300</b>	<b>241,0</b>	<b>18,0</b>	<b>259,0</b>	<b>434,0</b>	<b>182,0</b>
1 All Energy (Fuel Combustion + Fugitive)	55 210	-	16,0	6,0	257,0	424,0	121,0
A Fuel Combustion	55 130	-	16,0	6,0	257,0	424,0	113,0
1 Energy and Transformation Industries	21 720	-	IE	IE	40,0	8,0	0,0
2 Industry (ISIC)	13 570	-	IE	IE	35,0	43,0	0,0
3 Transport	11 130	-	3,0	2,0	139,0	306,0	81,0
4 Small Combustion	7 110	-	IE	IE	26,0	46,0	32,0
5 Other Combustion Activities	1 600	-	13,0	4,0	17,0	21,0	0,0
6 Traditional Biomass burned for Energy	20 670	-	-	-	-	-	0,0
B Fugitive Emissions from Fuels	80	-	-	-	-	-	8,0
1 Solid Fuels	-	-	-	-	-	-	-
2 Oil and Natural Gas Fuels	80	-	-	-	-	-	8,0
2 Industrial Processes	840	-	4,0	3,0	2,0	10,0	13,0
3 Solvent and Other Product Use	-	-	-	-	-	-	46,0
4 Agriculture	-	-	88,0	9,0	-	-	-
A Enteric Fermentation	-	-	78,0	5,0	-	-	-
B Manure Management	-	-	10,0	4,0	-	-	-
C Rice Cultivation	-	-	-	-	-	-	-
D Agricultural Soils	-	-	-	-	-	-	-
E Prescribed Burning of Savannas	-	-	-	-	-	-	-
F Field Burning of Agricultural Residues	-	-	-	-	-	-	-
G Other Agriculture Activities	-	-	-	-	-	-	-
5 Land Use Change & Forestry	-	14 300	-	-	-	-	-
A Changes in Forests & other Woody Biomass Stocks	-	14 300	-	-	-	-	-
B Forest and Grassland Conversion	-	-	-	-	-	-	-
C Abandonment of Managed Lands	-	-	-	-	-	-	-
D Other Land Use Change Activities	-	-	-	-	-	-	-
6 Waste	-	-	133,0	-	-	-	2,0
A Solid Waste Disposal on Land	-	-	123,0	-	-	-	IE
B Wastewater Treatment	-	-	NE	-	-	-	IE
C Waste Incineration	-	-	IE	-	-	-	IE
D Other Waste	-	-	10,0	-	-	-	2,0
7 Other	-	-	-	-	-	-	-
International Bunkers (not included in national totals)	1 850	-	1,0	1,0	19,0	6,0	3,0
Marine bunkers (*)	1 000	-	1,0	1,0	19,0	6,0	3,0
Aviation bunkers	850	-	IE	IE	IE	IE	IE
FNEC (**)	400	-	-	-	-	-	-

Ref.: "Summary table of Finnish greenhouse gases", Ministry of the Environment, 16 January 1997, and "Finland's Second Report under the Framework Convention on Climate Change", April 1997.

(\*) Marine Bunkers (EUROSTAT)

(\*\*) Final Non-Energy Consumption (EUROSTAT)

NE not estimated

# France 1995

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

France 1995 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>398 636</b>	<b>60 090</b>	<b>2 844,1</b>	<b>173,5</b>	<b>1 778,1</b>	<b>9 469,1</b>	<b>2 770,3</b>
1 All Energy (Fuel Combustion + Fugitive)	363 925	-	519,9	17,0	1 735,7	8 589,6	1 639,8
A Fuel Combustion	356 588	-	187,4	16,9	1 730,7	8 585,4	1 518,0
1 Energy and Transformation Industries	67 645	-	1,3	1,9	142,1	17,1	3,9
2 Industry (ISIC)	52 564	-	7,2	3,5	166,3	568,2	12,1
3 Transport	134 623	-	21,1	6,7	1 086,9	5 696,7	1 178,2
4 Small Combustion	101 756	-	157,8	4,7	335,3	2 303,4	323,8
5 Other Combustion Activities	0	-	0,0	0,0	0,0	0,0	0,0
6 Traditional Biomass burned for Energy	-	-	-	-	-	-	-
B Fugitive Emissions from Fuels	7 337	-	332,5	0,2	5,0	4,2	121,8
1 Solid Fuels	0	-	211,0	0,0	0,0	3,5	0,9
2 Oil and Natural Gas Fuels	7 337	-	121,5	0,2	5,0	0,7	120,9
2 Industrial Processes	15 866	-	2,7	80,4	10,8	594,8	77,5
3 Solvent and Other Product Use	1 792	-	0,0	2,0	0,0	0,0	574,9
4 Agriculture	0	-	1 551,2	52,6	0,0	0,0	10,5
A Enteric Fermentation	0	-	1 359,2	0,0	0,0	0,0	0,0
B Manure Management	0	-	160,7	0,0	0,0	0,0	0,0
C Rice Cultivation	0	-	11,7	0,1	0,0	0,0	0,0
D Agricultural Soils	0	-	19,6	52,5	0,0	0,0	10,5
E Prescribed Burning of Savannas	0	-	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	0,0
G Other Agriculture Activities	0	-	0,0	0,0	0,0	0,0	0,0
5 Land Use Change & Forestry (*)	13 289	60 090	92,0	17,9	0,8	49,7	444,7
A Changes in Forests & other Woody Biomass Stocks	-	51 165	0,0	0,0	0,0	0,0	0,0
B Forest and Grassland Conversion	13 289	-	2,9	0,0	0,8	49,7	4,2
C Abandonment of Managed Lands	-	8 925	0,0	0,0	0,0	0,0	0,0
D Other Land Use Change Activities	-	-	89,1	17,8	0,0	0,0	440,6
6 Waste	3 764	-	678,4	3,7	30,7	234,9	23,0
A Solid Waste Disposal on Land	0	-	629,4	0,0	0,0	0,0	4,8
B Wastewater Treatment	1 433	-	17,1	2,1	0,0	0,0	0,0
C Waste Incineration	2 330	-	16,3	1,6	30,7	234,9	8,3
D Other Waste	0	-	15,6	0,0	0,0	0,0	9,8
7 Other	0	-	0,0	0,0	0,0	0,0	0,0
<b>International Bunkers (not included in national totals)</b>	<b>16 815</b>	<b>-</b>	<b>0,0</b>	<b>0,2</b>	<b>208,2</b>	<b>29,0</b>	<b>75,7</b>
Marine bunkers	7 071	-	0,0	0,2	134,0	1,8	62,0
Aviation bunkers	9 745	-	0,0	0,0	74,0	27,2	14,0
<b>FNEC (**)</b>	<b>5 000</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>

Ref.: "Second National Communication of France under the Climate Convention", November 1997.

(\*) Totals for sector 5 compiled by the European Environment Agency (EEA)

(\*\*) Final Non-Energy Consumption (EUROSTAT)

Note: emission data include oversee territories.

# Germany 1995

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Germany 1995 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>894 500</b>	<b>30 000</b>	<b>4 788,0</b>	<b>210,0</b>	-	-	-
1 All Energy (Fuel Combustion +Fugitive)	869 300	-	-	-	-	-	-
A Fuel Combustion	869 300	-	-	-	-	-	-
1 Energy and Transformation Industries	373 200	-	-	-	-	-	-
2 Industry (ISIC)	126 800	-	-	-	-	-	-
3 Transport	170 700	-	-	-	-	-	-
4 Small Combustion	186 100	-	-	-	-	-	-
5 Other Combustion Activities	12 500	-	-	-	-	-	-
6 Traditional Biomass burned for Energy	NO	-	-	-	-	-	-
B Fugitive Emissions from Fuels	NE	-	-	-	-	-	-
1 Solid Fuels	NO	-	-	-	-	-	-
2 Oil and Natural Gas Fuels	NE	-	-	-	-	-	-
2 Industrial Processes	25 200	-	-	-	-	-	-
3 Solvent and Other Product Use	NO	-	-	-	-	-	-
4 Agriculture	NO	-	-	-	-	-	-
A Enteric Fermentation	NO	-	-	-	-	-	-
B Manure Management	NO	-	-	-	-	-	-
C Rice Cultivation	NO	-	-	-	-	-	-
D Agricultural Soils	NO	-	-	-	-	-	-
E Prescribed Burning of Savannas	NO	-	-	-	-	-	-
F Field Burning of Agricultural Residues	NO	-	-	-	-	-	-
G Other Agriculture Activities	-	-	-	-	-	-	-
5 Land Use Change & Forestry	-	30 000	-	-	-	-	-
A Changes in Forests & other Woody Biomass Stocks	-	30 000	-	-	-	-	-
B Forest and Grassland Conversion	NO	-	-	-	-	-	-
C Abandonment of Managed Lands	-	NE	-	-	-	-	-
D Other Land Use Change Activities	-	-	-	-	-	-	-
6 Waste	NE	-	-	-	-	-	-
A Solid Waste Disposal on Land	NO	-	-	-	-	-	-
B Wastewater Treatment	NO	-	-	-	-	-	-
C Waste Incineration	NE	-	-	-	-	-	-
D Other Waste	0	-	-	-	-	-	-
7 Other	0	-	-	-	-	-	-
International Bunkers (not included in national totals)	20 100	-	-	-	-	-	-
Marine bunkers (*)	6 500	-	-	-	-	-	-
Aviation bunkers	13 600	-	-	-	-	-	-
FNEC (**)	5 100	-	-	-	-	-	-

Ref.: "Second National Communication of Germany", 16 April 1997.

(\*) Marine Bunkers (EUROSTAT)

(\*\*) Final Non-Energy Consumption (EUROSTAT)

NO not occurring

NE not estimated

Note: detailed split for CH<sub>4</sub> and N<sub>2</sub>O not given by the National Communication



Greece 1995

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Greece 1995 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>90 492</b>	<b>-</b>	<b>455,6</b>	<b>16,9</b>	<b>372,6</b>	<b>1 447,9</b>	<b>338,5</b>
1 All Energy (Fuel Combustion +Fugitive)	82 426	-	64,7	6,6	333,1	1 272,4	279,9
A Fuel Combustion	82 426	-	15,3	6,6	330,7	1 272,2	257,1
1 Energy and Transformation Industries	46 899	-	0,7	1,5	79,5	7,0	2,7
2 Industry (ISIC)	10 173	-	1,6	1,3	22,4	15,1	2,4
3 Transport	17 255	-	3,7	1,6	183,4	1 006,5	229,3
4 Small Combustion	8 099	-	9,3	2,2	45,5	243,6	22,8
5 Other Combustion Activities	-	-	-	-	-	-	-
6 Traditional Biomass burned for Energy	-	-	-	-	-	-	-
B Fugitive Emissions from Fuels	0	-	49,4	0,0	2,4	0,1	22,8
1 Solid Fuels	0	-	49,0	0,0	0,0	0,0	0,0
2 Oil and Natural Gas Fuels	0	-	0,4	0,0	2,4	0,1	22,8
2 Industrial Processes	7 713	-	0,0	2,0	32,7	24,4	2,7
3 Solvent and Other Product Use	0	-	0,0	0,0	0,0	0,0	0,0
4 Agriculture	0	-	276,0	8,3	5,0	127,1	47,4
A Enteric Fermentation	0	-	138,9	0,0	0,0	0,0	0,0
B Manure Management	0	-	27,7	0,0	0,0	0,0	0,0
C Rice Cultivation	0	-	7,7	0,1	0,0	0,0	0,0
D Agricultural Soils	0	-	95,6	8,1	0,0	0,0	29,3
E Prescribed Burning of Savannas	0	-	0,0	0,0	0,0	0,0	0,0
F Field Burning of Agricultural Residues	0	-	6,1	0,1	5,0	127,1	18,2
G Other Agriculture Activities	0	-	0,0	0,0	0,0	0,0	0,0
5 Land Use Change & Forestry	0	-	0,0	0,0	0,0	0,0	0,0
A Changes in Forests & other Woody Biomass Stocks	0	-	0,0	0,0	0,0	0,0	0,0
B Forest and Grassland Conversion	0	-	0,0	0,0	0,0	0,0	0,0
C Abandonment of Managed Lands	0	-	0,0	0,0	0,0	0,0	0,0
D Other Land Use Change Activities	0	-	0,0	0,0	0,0	0,0	0,0
6 Waste	353	-	114,9	0,0	1,7	24,0	8,6
A Solid Waste Disposal on Land	353	-	104,9	0,0	0,0	0,0	0,0
B Wastewater Treatment	0	-	6,3	0,0	0,0	0,0	0,0
C Waste Incineration	0	-	3,7	0,0	1,7	24,0	8,6
D Other Waste	0	-	0,0	0,0	0,0	0,0	0,0
7 Other	0	-	0,0	0,0	0,0	0,0	0,0
International Bunkers (not included in national totals)	13 623	-	0,3	0,7	237,7	42,5	33,2
Marine bunkers (*)	11 204	-	0,3	0,7	237,7	42,5	33,2
Aviation bunkers	2 419	-	IE	IE	IE	IE	IE
FNEC (**)	100	-	-	-	-	-	-

Ref.: "2<sup>nd</sup> National Communication to the United Nations Framework Convention on Climate Change, Review of the Greek National Action Plan for the Abatement of CO<sub>2</sub> and other greenhouse gas emissions", Ministry for the Environment, Physical Planning and Public Works, Athens, June 1997.

(\*) Marine Bunkers (EUROSTAT)

(\*\*) Final Non-Energy Consumption (EUROSTAT)

Ireland 1995

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Ireland 1995 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>33 931</b>	<b>6 230</b>	<b>812,2</b>	<b>26,0</b>	<b>118,0</b>	<b>295,4</b>	<b>169,7</b>
1 All Energy (Fuel Combustion + Fugitive)	32 105	-	15,0	3,5	117,6	294,8	65,8
A Fuel Combustion	32 105	-	3,9	3,5	117,6	294,8	61,3
1 Energy and Transformation Industries	13 189	-	0,0	1,7	45,8	3,6	0,3
2 Industry (ISIC)	3 442	-	0,1	0,4	9,6	1,5	0,1
3 Transport	6 209	-	1,3	0,5	50,3	231,8	55,2
4 Small Combustion	9 265	-	2,5	1,0	12,0	57,9	5,7
5 Other Combustion Activities	0	-	0,0	0,0	0,0	0,0	0,0
6 Traditional Biomass burned for Energy	0	-	0,0	0,0	0,0	0,0	0,1
B Fugitive Emissions from Fuels	0	-	11,1	0,0	0,0	0,0	4,5
1 Solid Fuels	0	-	0,0	0,0	0,0	0,0	0,0
2 Oil and Natural Gas Fuels	0	-	11,1	0,0	0,0	0,0	4,5
2 Industrial Processes	1 772	-	0,0	2,6	0,3	0,0	0,0
3 Solvent and Other Product Use	0	-	0,0	0,0	0,0	0,0	20,0
4 Agriculture	0	-	636,9	19,1	0,0	0,0	58,9
A Enteric Fermentation	0	-	551,5	0,0	0,0	0,0	0,0
B Manure Management	0	-	55,9	0,0	0,0	0,0	0,0
C Rice Cultivation	0	-	0,0	0,0	0,0	0,0	0,0
D Agricultural Soils	0	-	29,5	19,1	0,0	0,0	58,9
E Prescribed Burning of Savannas	0	-	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	0,0
G Other Agriculture Activities	0	-	0,0	0,0	0,0	0,0	0,0
5 Land Use Change & Forestry	0	6 230	24,4	0,8	0,0	0,0	24,5
A Changes in Forests & other Woody Biomass Stocks	0	6 230	0,0	0,0	0,0	0,0	0,0
B Forest and Grassland Conversion	0	0	0,0	0,0	0,0	0,0	0,0
C Abandonment of Managed Lands	0	0	0,0	0,0	0,0	0,0	0,0
D Other Land Use Change Activities	0	0	23,2	0,8	0,0	0,0	24,5
6 Waste	54	-	136,0	0,0	0,1	0,1	0,5
A Solid Waste Disposal on Land	0	-	136,0	0,0	0,0	0,0	0,0
B Wastewater Treatment	0	-	0,0	0,0	0,0	0,0	0,0
C Waste Incineration	54	-	0,0	0,0	0,1	0,1	0,5
D Other Waste	0	-	0,0	0,0	0,0	0,0	0,0
7 Other	0	-	0,0	0,0	0,0	0,0	0,0
International Bunkers (not included in national totals)	1 510	-	0,0	0,0	12,3	5,0	1,2
Marine bunkers (*)	100	-	-	-	IE	IE	IE
Aviation bunkers	1 410	-	-	-	12,3	5,0	1,2
FNEC (**)	800	-	-	-	-	-	-

Ref.: "Ireland: Second Communication under the United Nations Framework Convention on Climate Change".

(\*) Marine Bunkers (EUROSTAT)

(\*\*) Final Non-Energy Consumption (EUROSTAT)

## Italy 1995

Italy 1995 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>447 644</b>	<b>36 199</b>	<b>2 515,6</b>	<b>161,8</b>	<b>1 848,6</b>	<b>7 785,7</b>	<b>2 374,7</b>
1 All Energy (Fuel Combustion +Fugitive)	410 278	-	467,2	44,0	1 827,0	7 154,9	1 489,4
A Fuel Combustion	409 116	-	115,0	44,0	1 821,3	7 146,5	1 335,0
1 Energy and Transformation Industries	139 180	-	4,9	20,0	375,6	30,1	4,9
2 Industry (ISIC)	83 043	-	7,3	7,9	252,9	519,7	15,2
3 Transport	108 842	-	77,1	5,5	990,7	5 894,2	1 217,3
4 Small Combustion	76 481	-	25,4	10,6	190,8	685,8	93,5
5 Other Combustion Activities	1 569	-	0,1	0,1	11,3	16,7	4,1
6 Traditional Biomass burned for Energy	-	-	-	-	-	-	-
B Fugitive Emissions from Fuels	1 163	-	352,2	0,0	5,7	8,4	154,4
1 Solid Fuels	-	-	3,4	-	-	-	2,7
2 Oil and Natural Gas Fuels	1 163	-	348,8	-	5,7	8,4	151,7
2 Industrial Processes	22 985	-	4,6	20,4	4,8	290,8	71,1
3 Solvent and Other Product Use	1 962	-	-	-	-	-	629,5
4 Agriculture	0	-	871,7	75,9	0,9	25,2	1,9
A Enteric Fermentation	-	-	607,2	-	-	-	-
B Manure Management	-	-	181,9	12,4	-	-	0,6
C Rice Cultivation	-	-	81,4	-	-	-	-
D Agricultural Soils	-	-	0,0	63,5	-	-	-
E Prescribed Burning of Savannas	-	-	-	-	-	-	-
F Field Burning of Agricultural Residues	-	-	1,2	0,0	0,9	25,2	1,2
G Other Agriculture Activities	-	-	-	-	-	-	-
5 Land Use Change & Forestry	11 692	36 199	183,3	20,9	1,0	34,2	156,1
A Changes in Forests & other Woody Biomass Stocks	10 344	35 947	-	-	-	-	-
B Forest and Grassland Conversion	1 348	-	3,9	0,0	1,0	34,2	3,9
C Abandonment of Managed Lands	-	157	-	-	-	-	-
D Other Land Use Change Activities	-	95	179,4	20,9	-	-	152,2
6 Waste	727	-	988,8	0,5	14,9	280,5	26,8
A Solid Waste Disposal on Land	0	-	464,0	-	-	-	8,2
B Wastewater Treatment	0	-	511,4	-	-	-	1,3
C Waste Incineration	727	-	13,4	0,5	14,9	280,5	17,3
D Other Waste	0	-	-	-	-	-	-
7 Other	-	-	-	-	-	-	-
Biomass burned for energy	4 279	-	15,3	0,7	7,6	270,5	22,2
International Bunkers (not included in national totals)	13 099	-	1,1	0,7	193,0	23,0	8,8
Marine bunkers	7 651	-	0,7	0,5	175,5	18,0	5,1
Aviation bunkers	5 447	-	0,4	0,2	17,5	5,0	3,7
FNEC (*)	3 000	-	-	-	-	-	-

Ref.: "Excerpt from the Second National Communication to the United Nations Framework Convention on Climate Change", Ministry of Environment, Department for Air and Noise Pollution and Industrial Risk, submitted to Commission on 24 March 1998.

(\*) Final Non-Energy Consumption (EUROSTAT)

Note (1): CO<sub>2</sub> emissions from geothermal activity have been excluded (National Communication: 1B3: 1505 Gg).

Note (2): Italy delivered data according to the *Revised 1996 IPCC Guidelines*. This table presents these data in the format of the 1995 IPCC Guidelines for consistency reasons.

Note (3): Emissions for *Land-use Change & Forestry* are given as emissions and removals.

Note (4): CH<sub>4</sub> emissions from sector 6D "Other Waste" are excluded (39.9 Gg).

# Luxembourg 1995

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Luxembourg 1995 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>9 322</b>	<b>0</b>	<b>22,1</b>	<b>0,7</b>	<b>20,0</b>	<b>104,1</b>	<b>17,4</b>
1 All Energy (Fuel Combustion + Fugitive)	9 033	-	2,4	0,2	19,5	94,7	11,8
A Fuel Combustion	9 033	-	0,7	0,2	19,5	94,7	10,0
1 Energy and Transformation Industries	820	-	0,0	0,0	0,2	0,0	0,0
2 Industry (ISIC)	3 474	-	0,0	0,0	7,6	43,9	0,2
3 Transport	3 426	-	0,2	0,1	10,2	41,4	8,6
4 Small Combustion	1 313	-	0,5	0,0	1,5	9,4	1,2
5 Other Combustion Activities	-	-	-	-	-	-	-
6 Traditional Biomass burned for Energy	-	-	-	-	-	-	-
B Fugitive Emissions from Fuels	0	-	1,8	0,0	0,0	0,0	1,8
1 Solid Fuels	0	-	0,0	0,0	0,0	0,0	0,0
2 Oil and Natural Gas Fuels	0	-	1,8	0,0	0,0	0,0	1,8
2 Industrial Processes	271	-	0,0	0,0	0,2	9,3	0,9
3 Solvent and Other Product Use	12	-	0,0	0,0	0,0	0,0	3,8
4 Agriculture	0	-	16,9	0,5	0,0	0,0	0,2
A Enteric Fermentation	0	-	15,8	0,0	0,0	0,0	0,0
B Manure Management	0	-	1,1	0,0	0,0	0,0	0,0
C Rice Cultivation	0	-	0,0	0,0	0,0	0,0	0,0
D Agricultural Soils	0	-	0,0	0,5	0,0	0,0	0,2
E Prescribed Burning of Savannas	0	-	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	0,0
G Other Agriculture Activities	0	-	0,0	0,0	0,0	0,0	0,0
5 Land Use Change & Forestry	0	-	0,0	0,0	0,0	0,0	0,8
A Changes in Forests & other Woody Biomass Stocks	0	-	0,0	0,0	0,0	0,0	0,0
B Forest and Grassland Conversion	0	-	0,0	0,0	0,0	0,0	0,0
C Abandonment of Managed Lands	0	-	0,0	0,0	0,0	0,0	0,0
D Other Land Use Change Activities	0	-	0,0	0,0	0,0	0,0	0,8
6 Waste	6	-	2,7	0,0	0,3	0,0	0,0
A Solid Waste Disposal on Land	4	-	2,2	0,0	0,0	0,0	0,0
B Wastewater Treatment	0	-	0,2	0,0	0,0	0,0	0,0
C Waste Incineration	0	-	0,0	0,0	0,3	0,0	0,0
D Other Waste	2	-	0,3	0,0	0,0	0,0	0,0
7 Other	0	-	0,0	0,0	0,0	0,0	0,8
International Bunkers (not included in national totals)	194	-	0,0	0,0	0,1	0,5	0,2
Marine bunkers	0	-	0,0	0,0	0,0	0,0	0,0
Aviation bunkers	194	-	0,0	0,0	0,1	0,5	0,2
FNEC (*)	0	-	-	-	-	-	-

Ref.: "Luxembourg CO<sub>2</sub> emissions in 1995, Administration de L'Environnement, 9 July 1996", and "Luxembourg CO<sub>2</sub> emissions in 1994 and 1995, Administration de L'Environnement, 29 August 1996".

(\*) Final Non-Energy Consumption (EUROSTAT)

Note: emissions from transport fuels sold in Luxembourg and consumed outside Luxembourg were included (2 244 Gg in 1995).

# Netherlands 1995

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>176 910</b>	<b>1 700</b>	<b>1 173,0</b>	<b>71,9</b>	<b>481,0</b>	<b>890,0</b>	<b>363,0</b>
1 All Energy (Fuel Combustion +Fugitive)	173 730	-	209,0	7,9	468,0	788,0	215,0
A Fuel Combustion	173 530	-	35,2	7,9	467,3	778,9	170,0
1 Energy and Transformation Industries	56 700	-	4,8	0,5	75,2	15,6	4,7
2 Industry (ISIC)	42 710	-	2,7	0,1	52,0	117,9	2,7
3 Transport	31 860	-	6,2	7,2	297,4	541,2	150,8
4 Small Combustion	39 780	-	17,6	0,1	40,4	13,8	5,5
5 Other Combustion Activities	2 490	-	-	-	-	-	-
6 Traditional Biomass burned for Energy	3 630	-	3,9	0,0	2,3	90,3	6,3
B Fugitive Emissions from Fuels	200	-	174,0	-	0,6	9,5	44,7
1 Solid Fuels	-	-	-	-	-	-	-
2 Oil and Natural Gas Fuels	200	-	174,0	-	0,6	9,5	44,7
2 Industrial Processes	1 750	-	5,0	31,6	10,5	98,0	76,3
3 Solvent and Other Product Use	50	-	0,0	0,4	0,1	2,1	70,5
4 Agriculture	-	-	476,0	27,6	-	-	0,2
A Enteric Fermentation	-	-	377,0	-	-	-	-
B Manure Management	-	-	99,0	0,8	-	-	-
C Rice Cultivation	-	-	-	-	-	-	-
D Agricultural Soils	-	-	-	26,8	-	-	0,2
E Prescribed Burning of Savannas	-	-	-	-	-	-	-
F Field Burning of Agricultural Residues	-	-	-	-	-	-	-
G Other Agriculture Activities	-	-	-	-	-	-	-
5 Land Use Change & Forestry	-	1 700	-	-	-	-	-
A Changes in Forests & other Woody Biomass Stocks	-	1 700	-	-	-	-	-
B Forest and Grassland Conversion	-	-	-	-	-	-	-
C Abandonment of Managed Lands	-	-	-	-	-	-	-
D Other Land Use Change Activities	-	-	-	-	-	-	-
6 Waste	1 380	-	480,6	0,5	2,8	1,8	1,2
A Solid Waste Disposal on Land	-	-	479,1	-	0,3	1,4	0,2
B Wastewater Treatment	130	-	1,5	0,5	-	-	-
C Waste Incineration	1 250	-	0,0	0,0	2,4	0,4	1,1
D Other Waste	-	-	-	-	-	-	-
7 Other	-	-	2,0	3,8	-	-	-
Nature	-	-	125,0	2,4	16,3	26,7	3,2
International Bunkers (not included in national totals)	44 600	-	-	-	-	-	-
Marine bunkers	37 500	-	-	-	-	-	-
Aviation bunkers	7 100	-	-	-	-	-	-
FNEC (*)	5 000	-	-	-	-	-	-

Ref.: "Greenhouse gas emissions in the Netherlands 1990-1996: Updated methodology. A report on the International Commitments with respect to Greenhouse Gas Emission Inventories for the United Nations Framework Convention on Climate Change and the European Union's Greenhouse Gas Monitoring Mechanism", National Institute of Public Health and the Environment, Bilthoven, The Netherlands, December 1997.

(\*) Final Non-Energy Consumption (EUROSTAT)

Portugal 1995 (\*\*)

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Portugal 1995 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>50 841</b>	<b>1 152</b>	<b>834,3</b>	<b>14,5</b>	<b>379,2</b>	<b>1 459,4</b>	<b>318,6</b>
1 All Energy (Fuel Combustion +Fugitive)	47 154	-	25,6	2,4	374,6	1 425,9	208,0
A Fuel Combustion	46 953	-	22,2	2,4	374,6	1 425,9	146,5
1 Energy and Transformation Industries	17 150	-	1,3	0,3	71,7	7,5	2,2
2 Industry (ISIC)	7 178	-	1,7	0,2	19,0	25,3	7,8
3 Transport	16 849	-	4,7	0,8	226,3	847,8	87,0
4 Small Combustion	5 074	-	7,1	0,8	46,0	274,8	24,8
5 Other Combustion Activities	701	-	0,2	0,0	4,9	0,2	0,4
6 Traditional Biomass burned for Energy	11 052	-	7,3	0,4	6,8	270,4	24,3
B Fugitive Emissions from Fuels	201	-	3,4	NA	NA	NA	61,5
1 Solid Fuels	5	-	2,0	NA	NA	NA	0,0
2 Oil and Natural Gas Fuels	196	-	1,4	NA	NA	NA	61,5
2 Industrial Processes	3 421	-	0,4	1,9	4,5	32,9	17,7
3 Solvent and Other Product Use	266	-	NA	NA	NA	NA	85,2
4 Agriculture	NE	-	194,8	7,2	NE	NE	NE
A Enteric Fermentation	NA	-	118,6	NE	NE	NA	NA
B Manure Management	NA	-	63,0	IOC	NE	NA	NA
C Rice Cultivation	NA	-	13,2	0,0	NA	NA	NA
D Agricultural Soils	NA	-	NE	7,2	NE	NA	NE
E Prescribed Burning of Savannas	NA	-	NA	NA	-	-	-
F Field Burning of Agricultural Residues	NE	-	NE	NE	-	-	-
G Other Agriculture Activities	-	-	-	-	-	-	-
5 Land Use Change & Forestry	-	1 152	NA	NA	NA	NA	NA
A Changes in Forests & other Woody Biomass Stocks	-	IE	-	-	-	-	-
B Forest and Grassland Conversion	-	IE	-	-	-	-	-
C Abandonment of Managed Lands	-	IE	-	-	-	-	-
D Other Land Use Change Activities	-	1 152	-	-	-	-	-
6 Waste	0	-	613,5	2,9	0,0	0,6	7,8
A Solid Waste Disposal on Land	0	-	528,3	0,0	0,0	0,6	6,7
B Wastewater Treatment	0	-	85,2	2,9	0,0	0,0	1,1
C Waste Incineration	0	-	0,0	0,0	0,0	0,0	0,0
D Other Waste	0	-	0,0	0,0	0,0	0,0	0,0
7 Other	0	-	0,0	0,0	0,0	0,0	0,0
International Bunkers (not included in national totals)	-	-	1 850,0	7,7	0,0	30,1	2,3
Marine bunkers	-	-	1 850,0	7,7	0,0	30,1	2,3
Aviation bunkers	-	-	IE	IE	IE	IE	IE
FNEC (*)	200	-	-	-	-	-	-

Ref.: "Portugal's Second Report to be submitted to the Conference of the Parties to Framework Convention on Climate Change", Ministry of the Environment, 1997.

(\*) Final Non-Energy Consumption (EUROSTAT)

(\*\*) 1994 data is used

NA ... not available

NE ... not estimated

Note: National totals include non-CO<sub>2</sub> emissions from Biomass (1A6).

Spain 1995 (\*\*)

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Spain 1995 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>231 370</b>	<b>28 970</b>	<b>2 351,0</b>	<b>87,5</b>	<b>1 192,2</b>	<b>5 377,7</b>	<b>1 226,5</b>
1 All Energy (Fuel Combustion +Fugitive)	214 135	-	729,6	21,1	1 167,9	4 756,6	709,9
A Fuel Combustion	213 707	-	111,2	21,1	1 167,9	4 756,6	512,2
1 Energy and Transformation Industries	76 081	-	11,9	9,8	275,5	27,6	29,4
2 Industry (ISIC)	50 896	-	6,2	5,3	194,5	418,0	19,1
3 Transport	59 721	-	12,8	2,6	575,9	2 526,2	335,3
4 Small Combustion	27 009	-	43,1	2,8	108,0	926,0	72,5
5 Other Combustion Activities	-	-	-	-	-	-	-
6 Traditional Biomass burned for Energy	13 061	-	37,2	0,6	14,0	858,8	55,8
B Fugitive Emissions from Fuels	428	-	618,4	0,0	0,0	0,0	197,7
1 Solid Fuels	0	-	525,2	0,0	0,0	0,0	0,0
2 Oil and Natural Gas Fuels	428	-	93,2	0,0	0,0	0,0	197,7
2 Industrial Processes	16 372	-	2,3	8,0	9,0	236,6	51,2
3 Solvent and Other Product Use	0	-	0,0	0,0	0,0	0,0	338,8
4 Agriculture	0	-	933,3	58,2	4,4	301,5	87,5
A Enteric Fermentation	0	-	351,6	0,0	0,0	0,0	0,0
B Manure Management	0	-	480,6	0,0	0,0	0,0	0,0
C Rice Cultivation	0	-	7,7	0,2	0,0	0,0	0,0
D Agricultural Soils	0	-	76,8	58,0	0,0	0,0	70,9
E Prescribed Burning of Savannas	-	-	-	-	-	-	-
F Field Burning of Agricultural Residues	0	-	16,6	0,0	4,4	301,5	16,6
G Other Agriculture Activities	-	-	-	-	-	-	-
5 Land Use Change & Forestry	-	28 970	-	-	-	-	-
A Changes in Forests & other Woody Biomass Stocks	-	-	-	-	-	-	-
B Forest and Grassland Conversion	-	-	-	-	-	-	-
C Abandonment of Managed Lands	-	-	-	-	-	-	-
D Other Land Use Change Activities	-	28 970	-	-	-	-	-
6 Waste	0	-	685,8	0,1	10,8	83,0	39,0
A Solid Waste Disposal on Land	0	-	657,9	0,0	6,1	68,5	24,5
B Wastewater Treatment	0	-	0,0	0,0	0,0	0,0	0,6
C Waste Incineration	-	-	-	-	-	-	-
D Other Waste	0	-	27,9	0,1	4,7	14,5	14,0
7 Other	863	-	0,0	0,0	0,0	0,0	0,0
International Bunkers (not included in national totals)	19 144	-	2,3	0,3	286,9	18,5	12,2
Marine bunkers	12 418	-	0,6	0,3	260,2	7,4	12,0
Aviation bunkers	6 726	-	1,7	-	26,7	11,1	0,2
FNEC (*)	1 700	-	-	-	-	-	-

Ref.: "Segunda Comunicación Nacional de España", Ministerio de Medio Ambiente, 1997.

(\*) Final Non-Energy Consumption (EUROSTAT)

(\*\*) 1994 data is used

Note (1): National totals include non-CO<sub>2</sub> emissions from Biomass (1A6).

Note (2): The national communication excludes CO<sub>2</sub> emissions from sector 4 and 6 for the national total as they are considered to be from renewable sources (sector 4: 18 725 Gg and sector 6: 2 161 Gg CO<sub>2</sub>).

# Sweden 1995

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

Sweden 1995 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>58 108</b>	<b>30 000</b>	<b>297,0</b>	<b>9,2</b>	<b>309,0</b>	<b>1 089,0</b>	<b>457,0</b>
1 All Energy (Fuel Combustion +Fugitive)	53 401	-	38,0	6,8	281,0	1 040,0	337,0
A Fuel Combustion	53 385	-	38,0	6,8	281,0	1 040,0	322,0
1 Energy and Transformation Industries	10 493	-	2,0	1,1	11,8	10,7	5,2
2 Industry (ISIC)	13 541	-	5,7	2,3	20,0	32,2	6,2
3 Transport	19 341	-	20,2	2,9	241,0	873,1	178,9
4 Small Combustion	9 903	-	10,1	0,5	8,6	124,2	132,2
5 Other Combustion Activities	107	-	NE	NE	NE	NE	NE
6 Traditional Biomass burned for Energy	IE	-	IE	IE	IE	IE	IE
B Fugitive Emissions from Fuels	16	-	NE	-	-	-	14,7
1 Solid Fuels	NO	-	NO	-	-	-	NO
2 Oil and Natural Gas Fuels	16	-	NE	-	-	-	14,7
2 Industrial Processes	4 458	-	NE	2,3	27,5	49,0	36,1
3 Solvent and Other Product Use	249	-	-	NE	-	-	83,4
4 Agriculture	-	-	198,0	0,2	-	-	-
A Enteric Fermentation	-	-	179,3	-	-	-	-
B Manure Management	-	-	19,1	-	-	-	-
C Rice Cultivation	NO	-	NO	NO	-	-	-
D Agricultural Soils	NE	-	-	0,2	-	-	-
E Prescribed Burning of Savannas	NO	-	NO	NO	NO	NO	NO
F Field Burning of Agricultural Residues	NO	-	NO	NO	NO	NO	NO
G Other Agriculture Activities	-	-	-	-	-	-	-
5 Land Use Change & Forestry	-	30 000	-	-	-	-	-
A Changes in Forests & other Woody Biomass Stocks	-	30 000	-	-	-	-	-
B Forest and Grassland Conversion	NE	-	-	-	-	-	-
C Abandonment of Managed Lands	NE	-	-	-	-	-	-
D Other Land Use Change Activities	-	-	-	-	-	-	-
6 Waste	-	-	61,0	-	-	-	-
A Solid Waste Disposal on Land	-	-	61,0	-	-	-	-
B Wastewater Treatment	-	-	NE	-	-	-	-
C Waste Incineration	IE	-	IE	IE	IE	IE	IE
D Other Waste	-	-	-	-	-	-	-
7 Other	-	-	-	-	-	-	-
International Bunkers (not included in national totals)	5 367	-	0,1	NE	54,0	6,0	1,5
Marine bunkers (*)	3 300	-	0,1	-	54,0	6,0	1,5
Aviation bunkers	2 067	-	IE	-	IE	IE	IE
FNEC (**)	400	-	-	-	-	-	-

Ref.: "Swedish submission of annual inventories of greenhouse gases for 1996 (preliminary) and revisions for the years 1990 through 1995", Ministry of the Environment, 9 March 1998.

(\*) EUROSTAT figures used

(\*\*) Final Non-Energy Consumption (EUROSTAT)

NE not estimated

NO not occurring

IE included elsewhere

Note: CO<sub>2</sub> Removals: Estimate from 1992, latest official statistics available.



# United Kingdom 1995

IPCC TABLE 7A - SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

United Kingdom 1995 Greenhouse Gas Source and Sink Categories	EMISSION ESTIMATES (Gg)						
	CO <sub>2</sub>	CO <sub>2</sub> - Removals	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC
<b>NATIONAL TOTALS</b>	<b>572 109</b>	<b>18 826</b>	<b>3 817,0</b>	<b>95,0</b>	<b>2 259,0</b>	<b>5 474,0</b>	<b>2 252,0</b>
1 All Energy (Fuel Combustion +Fugitive)	531 817	-	926,0	20,8	2 252,0	5 471,0	1 279,0
A Fuel Combustion	525 582	-	83,0	20,8	2 140,0	5 423,0	855,0
1 Energy and Transformation Industries	198 570	-	13,0	8,5	557,0	243,5	7,3
2 Industry (ISIC)	88 479	-	7,0	2,4	234,4	658,5	45,7
3 Transport	119 787	-	24,0	8,3	1 168,8	4 147,5	707,4
4 Small Combustion	114 893	-	35,0	1,4	138,2	314,5	88,9
5 Other Combustion Activities	3 852	-	0,0	0,2	40,6	6,1	1,3
6 Traditional Biomass burned for Energy	1 136	-	3,0	0,1	1,4	52,5	4,3
B Fugitive Emissions from Fuels	6 235	-	843,0	NE	112,0	48,4	424,0
1 Solid Fuels	NO	-	360,0	NO	NO	NO	2,6
2 Oil and Natural Gas Fuels	6 235	-	483,0	NE	112,0	48,4	422,0
2 Industrial Processes	9 176	-	NE	63,7	1,7	NE	247,0
3 Solvent and Other Product Use	NO	-	NO	NO	NO	NO	700,0
4 Agriculture	1 529	-	1 104,0	9,7	NO	NO	NO
A Enteric Fermentation	NO	-	981,0	NO	NO	NO	NO
B Manure Management	0	-	123,0	3,5	NO	NO	NO
C Rice Cultivation	NO	-	NO	NO	NO	NO	NO
D Agricultural Soils	1 529	-	NO	NO	NO	NO	NO
E Prescribed Burning of Savannas	NO	-	NE	6,2	NO	NO	NO
F Field Burning of Agricultural Residues	NO	-	NO	NO	NO	NO	NO
G Other Agriculture Activities	NO	-	NO	NO	NO	NO	NO
5 Land Use Change & Forestry	28 771	18 826	NE	NE	NO	NO	NO
A Changes in Forests & other Woody Biomass Stocks	-	10 584	NE	NE	NO	NO	NO
B Forest and Grassland Conversion	25 104	-	NE	NO	NO	NO	NO
C Abandonment of Managed Lands	-	7 876	NE	NO	NO	NO	NO
D Other Land Use Change Activities	3 667	367	NE	NO	NO	NO	NO
6 Waste	814	-	1 786,0	0,4	5,3	3,0	26,2
A Solid Waste Disposal on Land	0	-	1 750,0	NO	NO	NO	17,5
B Wastewater Treatment	0	-	34,0	NO	NO	NO	NO
C Waste Incineration	814	-	2,0	0,4	5,3	3,0	8,7
D Other Waste	0	-	NO	NO	NO	NO	NO
7 Other	NE	-	NE	NE	NE	NE	NE
International Bunkers (not included in national totals)	23 243	-	4,0	0,9	202,0	85,3	47,3
Marine bunkers (*)	7 600	-	IE	IE	IE	IE	IE
Aviation bunkers	15 643	-	4,0	0,9	202,0	85,3	47,3
FNEC (**)	7 000	-	-	-	-	-	-

Ref.: "UK annual inventory of greenhouse gas emissions", Department of the Environment, 11 September 1996, "UK Second Report under the Framework Convention on Climate Change", April 1997 and "UK Greenhouse Gas Emission Inventory, 1990 to 1995", December 1997.

(\*) EUROSTAT figures used

(\*\*) Final Non-Energy Consumption (EUROSTAT)

NE not estimated

NO not occurring

Note : Emissions for *Land-use Change & Forestry* are given as emissions and removals.