COMMISSION OF THE EUROPEAN COMMUNITIES

Brussels, 30.03.1995
SEC(95) 451 final

THE EC COMMUNICATION UNDER THE UN FRAMEWORK CONVENTION

ON CLIMATE CHANGE

PREFACE

The Overview of the EC Communication under the UN Framework Convention on Climate Change contains basic information on the inventories of greenhouse gases as well as policies and measures at Community and national level accounting for the period 1990 to November 1994. As the report only covers the period up till November 1994, the contributions of the Union's three new Member States, Austria, Sweden and Finland, to the overall Community stabilisation target are not taken into account in this report.

However, the full EC Communication, presently under preparation for submission mid 1995, will update and cover the efforts of the Community and its 15 Member States to meet the obligations under the Convention. This Communication will also include a full acount of the new policy initiatives in the field of climate change taken since November 1994 and the climate change policy developments following the conclusions of the Council of the Environment Ministers in March 1995.

EXPLANATORY MEMORANDUM

As a full Party to the UN Framework Convention on Climate Change the European Community is bound to submit to the Conference of the Parties to the Convention a communication, which contain information on its implementation of the Convention. The Secretariat of the Convention will prepare a compilation and synthesis of the available communications for discussion at Conferences of the Parties.

At its ninth session in February 1994, the United Nations Intergovernmental Negotiating Committee (INC) decided that, at its eleventh session in February 1995 and on an interim basis, it will carry out the task for the first Conference of the Parties of reviewing the available Communications.

The first compilation and synthesis will be submitted to the first Conference of the Parties, to be held in Berlin from 28 March to 7 April 1995.

The overview of the EC Communication will be taken into account in a supplement to the report of the Secretariat to the Convention on the first compilation and synthesis of national communications.

Pursuant to Article 12 of the Convention the overview contain information on inventories of emissions of greenhouse gases, policies and measures to combat climate change, as well as projections of emissions of CO2 for the year 2000.

This

SUMMARY

The overview contains basic information on the inventory of emissions of greenhouse gases, policies and measures to combat climate change, as well as projections for emissions of CO2 for the year 2000. Pursuant to Article 12 to the UN Framework Convention on Climate Change the European Community was bound to submit its communication at 21 September at the latest. Due to internal procedures and the fact that not all Member States have already finished their communications the Member States were informed that the EC Communication will be submitted to the Secretariat of the Convention in two stages. Submission of the Overview (stage 1) will ensure that the EC efforts to combat climate change will be honoured in the compilation and synthesis report, which will be submitted to the first Conference of the Parties to the Convention(COP-1); Berlin, March/April 1995. The full Communication will not be completed before COP-1.

THE EC COMMUNICATION UNDER THE UN FRAMEWORK CONVENTION ON CLIMATE CHANGE

(Article 4.2.(b)(c)(d) and Article 12)

AN OVERVIEW

NOVEMBER 1994

III

TABLE OF CONTENTS

1. INTRODUCTION

The European Community[1] signed the UN Framework Convention on Climate Change (UN FCCC) at the Earth Summit (UN Conference on Environment and Development) in Rio de Janeiro in 1992. On the 21st of December 1993, the European Community ratified the UN FCCC. On the same day, the threshold of 50 ratifications was met, leading to the Convention entering into force on the 21st March 1994.

The Treaty establishing the European Community entered into force in 1958; it has been modified several times, to allow new States to accede to membership and to reinforce and enlarge its objectives. The two major texts modifying the original Treaty are the Single European Act (SEA), entered into force in 1987, and the Treaty of European Union (TUE) know also as Treaty of Maastricht, entered into force the 1st November 1993.
Twelve States [2]are at present members of the European Community: Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain and the United Kingdom, and three others will become members from 1st January 1995 : Austria, Finland and Sweden.

The main objectives of the European Community are set out in article 2 of the Treaty : "to promote throughout the Community a harmonious and balanced development of economic activities, sustainable and non-inflationary growth respecting the environment, a high degree of convergence of economic performance, a high level of employment and of social protection, the raising of the standard of living and quality of life, and economic and social cohesion and solidarity among Member States"[3].

The tasks entrusted to the European Community are carried out by the following institutions: an elected European Parliament, a Council consisting of a representative of each Member State at ministerial level, a Commission, consisting of independent Members and a Court of Justice to ensure the interpretation and application of the Treaty.

As the only Regional Economic Integration Organisation to sign and ratify the UN FCCC, the European Community is in a unique situation regarding the implementation of its commitments. Action by the Community regarding environmental issues has to be taken in accordance with, inter alia, the principle of subsidiarity. This principle states that the Community should take action only if and in so far as the objectives of the proposed actions cannot be sufficiently achieved by the Member States and can therefore, by reason of the

---

1 Throughout the text the term "European Community" is used, since this is the legal name deposited to the United Nations in 1994. The "Commission of the European Communities" is the formal name of the European Commission.

2 The overview of the EC Communication under the FCCC is dated November 1994.

3 Art. 2, Treaty establishing the European Community (as amended) by Art. G(1) and G(2) of the Treaty on European Union.

scale or effects of the proposed action, be better achieved by the Community[3]. The new Treaty on European Union, which entered into force on 1 November 1993, has introduced as a principal objective the promotion of sustainable and non-inflationary growth respecting the environment. The Treaty on European Union recognizes that environmental protection requirements must be integrated into the definition and implementation of other Community policies. One of the objectives of Community environmental policy is to promote measures at the international level to deal with regional or worldwide environmental problems.

To enact Community legislation under normal conditions, a proposal from the Commission is necessary. Acting on the basis of such proposal, the legislative bodies under the Treaty (the Council, and to some extent, the Parliament), assisted by some advisory bodies, adopt the final text.

Different legal instruments are available, in particular Regulations, Directives and Decisions.

Regulations are of general application. They are binding in their entirety and are directly applicable in all Member States. The main legal instrument in European environmental law is the Directive. Directives are binding as to the result to be achieved, but leave to Member States the choice of the form and methods. That means that they need to be incorporated into national legislation within a certain time limit fixed by the Directive itself.
Decisions are binding in their entirety upon those to whom they are addressed.

As a Party to the UN FCCC, the European Community accepts, among others, the commitment to adopt policies and take corresponding measures aimed at returning emissions of greenhouse gases to 1990 levels, individually or jointly, by the year 2000. With respect to CO_2, the European Community set itself the objective to stabilize emissions by the year 2000 at 1990 levels, on the terms agreed by the Joint Energy/Environment Council.

The present Communication of the European Community under the UN FCCC explicitly describes measures to address climate change which are or will be taken at the Community level. However, the commitments of the European Community is to be reached with complementary Community and national programmes. Since the national programmes have been described in detail in the National Communications to the UN FCCC of the Member States, these programmes have not been described in this communication. Only a short summary is included to provide a complete overview of activities taking place within the European Community.

---

[3] Article 3b of the Treaty on European Union.

2. EMISSION INVENTORY

2.1. Introduction

The EC emission inventory of greenhouse gases includes the following gases: CO_2, CH_4, N_2O, CO, NO_x and NMVOCs. Table 2.1 provides a breakdown of the 1990 emission inventory.

2.2. Inventory Methodology

The EC inventory for the year 1990 has been compiled based on the inventories of the 12 individual Member States. The following sources have been used:

- National communications (where available) prepared by the Member States under the UN Framework Convention on Climate Change and/or national programmes under the EC Decision on a Monitoring Mechanism for CO_2 and other greenhouse gases. In general, the inventories reported in these national reports followed the draft IPCC guidelines for National Greenhouse Gas Inventories.
- CORINAIR inventory programme. 1990 databases have been used, which were provided to the European Environment Agency Task Force (EEA-TF) by the Member States.
- Eurostat. CO_2 emission estimates have been compiled from Eurostat energy balances and harmonized emission factors derived by Eurostat from an analysis of emission factors used by the Member States in about 1990.

To estimate total greenhouse gas emissions in the European Community (see Table 2.1), total greenhouse gas emissions in each of the Member States were added together[4]. Estimates of emissions in the Member States were primarily taken from the national reports. If no nationally reported emission estimates were available, CORINAIR figures were used. Fuel combustion related CO_2 emissions reported in national reports and/or CORINAIR were compared with Eurostat CO_2 figures. Nationally reported (non-CORINAIR) emission estimates were used if these figures were available, and consistent with Eurostat figures. However, if the nationally reported estimate was significantly lower than the Eurostat estimate, the Eurostat estimate was used since it was assumed that the nationally reported value was likely to be incomplete. If no nationally reported estimates were available, CORINAIR figures were similarly compared with Eurostat.

---

[4] Estimates provided in Table 2.1 are provisional figures. National estimates used to calculate emissions in the EC will need to be checked/confirmed with each country prior to finalizing the EC totals.

Since nationally reported inventories were not available from all EC Member States, and CORINAIR does not include removals of CO_2, CO_2 emissions and/or removals from Land Use Change have not been quantified in this inventory.

Table 2.1. EC inventory of greenhouse gas emissions. 1990. (Gg) Provisional estimates[1].

Greenhouse Gas Source and Sink Categories	CO_2	CH_4	N_2O	CO	NO_x	NMVOC
Total (Net) National Emission	**3,154,750**	**23,964**	**880**	**12,743**	**48,022**	**13,367**
1. All Energy	2,998,600[2]	5,445	152	12,400	42,394	7,946
A Fuel Combustion	2,991,000	717	152	12,339	42,334	6,964
B Fugitive Fuel Emissions	7,600	4,689	0	61	60	882
2. Industrial Processes	124,270	50	324	210	2,608	915
3. Solvent Use	NA	0	6	0	0	3,816
4. Agriculture	NA	10,891	387	39	803	626
5. Land Use Change and Forestry	NE[3]	NE	NE	NE	NE	NA
6. Waste	31,850	7,617	11	94	2,217	164
7. Final Non Energy Consumption	243,600[2]					

NO = Not Occurring; NA = Not Applicable; NE = Not Estimated

1 Estimates of greenhouse gas emissions in the European Community are based on estimates of emissions in the Member States. Before the end of 1994, the national estimates will be checked/confirmed with each country prior to finalizing the totals for the EC.

2 Emissions from Final Non Energy Consumption (including feedstocks) have not been included in total emissions. Therefore, total emissions are underestimated in comparison with the IPCC methodology. Emissions from Final Non Energy Consumption (FNEC) are based on the total carbon contained in the products. The addition of total emissions and emissions from FNEC would therefore be an overestimation compared to the IPCC methodology.

3 CO_2 emissions and/or removals from Land Use Change are not known for many countries and hence have not been included in this table. Non-CO_2 greenhouse gas emissions from Land Use Change have neither been estimated.

The emission estimates presented in Table 2.1 are structured according to the reporting instructions of the draft IPCC guidelines for greenhouse gas inventories. The category "Final Non Energy Consumption (FNEC)" was added to the table, since emissions from feedstock have not been estimated following the IPCC guidelines. The IPCC guidelines include carbon emitted by the use of feedstocks in estimates of emissions from energy sources which are based on the total consumption of fuels. However, nationally reported emissions according to the IPCC guidelines were not available for all Member States, and therefore CORINAIR and/or Eurostat estimates have been used. CORINAIR and Eurostat estimate CO_2 emissions on the basis of fuel combustion activities in which emissions from feedstock are not included. The emissions reported in the category "Final Non Energy Consumption" are estimated by Eurostat based on the total carbon contained in feedstocks. Therefore, the applied methodology, in contrast with the IPCC methodology, does not recognize that part of the carbon will not be emitted into the atmosphere but will be sequestered in products with a long life time. The result is that, compared with the IPCC methodology, total CO_2 emissions as expressed in Table 2.1 are underestimated, while the addition of total CO_2 emissions and "Final Non Energy Emissions" would be an overestimation.

Table 2.2 provides a further breakdown of CO_2 emissions in subcategories.

2.3. Bunkers

Following the decisions taken at INC-9, emissions from bunkers are not included in the total emissions in summary Table 2.1. Total CO_2 emissions from marine bunkers in the EC amounted to 137,100 Gg in 1990, while total CO_2 emissions from aviation bunkers amounted to 58,700 Gg. Except for the Netherlands, emission estimates from maritime bunkers are based on Eurostat figures. Aviation bunker emissions have been estimated by reconciling non-road transport figures from Eurostat against estimates reported in CORINAIR and/or country reports. Figures for the Netherlands are based on nationally reported estimates.

2.4. Uncertainties involved

The uncertainty in the emission estimates has not been quantified, since quantitative estimates of the uncertainty would be highly unreliable. However, estimates for CO_2 emissions from fuel combustion activities (based on energy balance figures) are rather reliable.

The uncertainty in estimates of non-CO_2 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. As there may be some as yet unknown sources of these gases, estimates of these emissions are likely to be underestimated.

Table 2.2. CO_2 emissions in the European Community. 1990. (Gg) Provisional estimates.[1]

Greenhouse Gas Source and Sink Categories	CO_2
Total (Net) National Emission	**3,154,750**
1. All Energy (Fuel Combustion and Fugitive)	**2,998,600[2]**
A Fuel Combustion	**2,991,000**
- Energy & Transformation	1,029,800
- Industry	661,700
- Transport	665,500
- Other (including Commercial/Institutional, Residential, Agriculture/Forestry)	634,000
- Biomass Burned for Energy	NE
B Fugitive Fuel Combustion	**7,600[3]**
2. Industrial Processes	**124,300[3]**
3. Solvent Use	**NA**
4. Agriculture	**NA**
5. Land Use Change and Forestry	**NE[4]**
6. Waste	31,850
A Landfills	NE
B Wastewater	NE
C Other	NE
7. Final Non Energy Consumption	**243,600[2]**

NO = Not Occurring; NA = Not Applicable; NE = Not Estimated

1 Estimates of greenhouse gas emissions in the European Community are based on estimates of emissions in the Member States. Before the end of 1994, the national estimates will be checked/confirmed with each country prior to finalizing the totals for the EC.

2 Emissions from Final Non Energy Consumption (including feedstocks) have not been included in fuel combustion emissions and total emissions. Therefore, total emissions are underestimated in comparison with the IPCC methodology. Emissions from Final Non Energy Consumption (FNEC) are based on the total carbon contained in the products. The addition of total emissions and emissions from FNEC would therefore be an overestimation compared to the IPCC methodology.

3 No further breakdown could be provided since figures were not available for all Member States.

4 CO_2 emissions and/or removals from Land Use Change are not known for many countries and hence have not been included in this table.

3. POLICIES, MEASURES AND EXPECTED EFFECTS ON EMISSIONS

3.1. Introduction

This section describes the policies and measures that have been adopted by the European Community (3.2 to 3.5). Only policies that are explicitly and primarily directed towards a reduction of greenhouse gas emissions are included in this Overview. In other words, EC policies with potential side effects on greenhouse gas emissions are omitted. Among such policies are: the Reform of the Common Agricultural Policy, and EC policies for transport, waste and forestry, as well as economic and social policies in general.

3.2. The Community Strategy to limit Carbon Dioxide emissions and improve energy efficiency

In October 1991, the Commission presented an overall strategy to limit CO_2 emissions and improve energy efficiency, with the objective of stabilising CO_2 emissions in the Community in the year 2000 at the 1990 level (SEC(91)1744 final). This so-called "no-regret" strategy consists in unlocking the zero- or low-cost potential for limiting CO_2 emissions, which currently exists in all sectors of the economy and which also brings other benefits in the field of air pollution and energy security as well as competitiveness and employment. A strategy has not yet been presented whose objective is the reduction of other greenhouse gases.

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

- The EC programmes.
  Existing programmes, JOULE (see chapter 7), THERMIE and SAVE have been reinforced, while a new programme, ALTENER, has been adopted. The THERMIE programme is an energy technology dissemination programme. SAVE and ALTENER provide financial support for various actions in the field of energy efficiency and renewables, but also include the preparation of regulatory measures (Directives) at EC level (Section 3.3.).
- Fiscal measure.
  In June 1992, the Commission issued a draft Council Directive introducing a tax on carbon dioxide emissions and energy, which has not been adopted yet by the Council (Section 3.4.).
- Complementary national programmes.
  The Community strategy required policy programmes which limit greenhouse gas emissions at Member State level, and which will be complementary to actions taken at the Community level.
- EC Decision on a Monitoring mechanism for CO_2 and other greenhouse gases.

Part of the strategy is a monitoring mechanism to follow whether the CO_2 stabilisation target of the Community will be achieved. In the framework of the monitoring mechanism Member States are required to submit their national programmes to the Commission for evaluation. In June 1993 a Decision establishing the monitoring mechanism was adopted (Section 3.5) and presently Member States are in the process of submitting their national programmes (Chapter 4).

The four pillars constitute the first step towards the goal of reducing emissions of carbon dioxide. With the formulation of the strategy a continuous process has begun of evaluating measures adopted, and formulating new policies and measures to attain the carbon dioxide objectives the Community has committed itself to.

3.3. Community programmes

This section describes the Community programmes for support of energy technology (THERMIE), energy efficiency (SAVE) and the use of renewable energy sources (ALTENER), and rational use of energy (PERU).

THERMIE (Energy Technology Support Programme)

The THERMIE programme was adopted in 1990 (Council Regulation (EEC) No. 2008/90). THERMIE is part of the EC strategy to develop efficient and innovative energy technologies in order to meet challenges related to the production and use of energy. The protection of the environment is one of the prime objectives of the THERMIE programme. THERMIE also focuses on other Community objectives: security of energy supply, economic and social cohesion, improving competitiveness and employment, the single market and cooperation with Central and Eastern Europe and the CIS (Commonwealth of Independent States).

The current THERMIE programme runs for five years, from 1990 to 1994. The overall budget amounts to 700 MECU[5], or 140 MECU annually (0.2% of the EC budget). The main portion of the THERMIE budget (85%) is devoted to innovative technologies and projects, which have already passed through the R&D stage, but have not been implemented on a wider scale due to technical and economic risks. The remaining portion of the budget (ca. 15%) is spent on a wide range of promotional activities such as market assessments, monitoring, documentation, databases, workshops, conferences and training. To implement the wide range of measures the Commission has set up a network of Organisations for the Promotion of Energy Technologies (OPET) in 1991, consisting of 49 organisations from EC Member States which are both from the public and the private sector.

From 1990 to 1994 some 680 THERMIE projects were supported at a budgetary cost of 560 MECU.

---

[5] 1 MECU = 1 million ECU.

SAVE (Specific Actions for Vigorous Energy Efficiency)

The SAVE programme was adopted in October 1991 (Council Decision 91/565/EEC). The objective is to increase energy efficiency and thereby reduce CO_2 emissions through legislation, standardisation, quality labels, creation of infrastructures, pilot actions, training and dissemination of information. By creating a Community framework, SAVE enables the Member States to adopt energy efficiency measures at the national level. The budget of the programme is 35 MECU for the period 1.1.1991 - 31.12.1995.

SAVE consists of four elements:

1. Directives and Standards.

   The following Directives have been adopted:

   - Efficiency of new hot water boilers (Council Directive 92/42/EEC);
   - Energy labelling of major household appliances, (Council Directive 92/75/EEC). In the framework of the labelling Directive, a Directive on Energy labelling of household refrigerators and freezers (94/2/EEC) has been adopted.
   - Building certification, billing according to actual consumption, third party finance, insulation of new buildings, boiler inspection and energy management (Council Directive 93/76/EEC);

   Presently in preparation are:

   - A directive on Integrated Resource Planning
   - A proposal on performance requirements for cars concerning CO_2 emissions.

2. Financial Support for the creation of energy efficiency infrastructures in Member States. SAVE backs energy efficiency pilot actions and other projects in Member States in co-generation, transport, targeting and monitoring, audits, least cost planning, demand side management and third party finance in the Member States. The level of support can amount to 50% of total project costs. So far 204 projects have received support at a total budgetary cost of 21 MECU;

3. Information Exchange Network.

   The network involves a database on energy efficiency measures and specific promotional activities, such as conferences, symposia and workshops.

4. PACE.

   The Council adopted a Decision (OJ No L 157) establishing PACE, a Community action programme for improving the efficiency of electricity use. In the framework of PACE, which has been incorporated into SAVE, proposals are being prepared on efficiency standards for domestic appliances, electric motors, office equipment and commercial lighting; a first directive on performance standards for refrigerators and freezers is in preparation.

ALTENER (Programme for the Promotion of Renewable Energy Sources)

The ALTENER programme was adopted by the European Council in September 1993 (Council Decision 93/500/EEC). The overall purpose is to establish a framework for specific actions whose objective is a greater market penetration of renewable energy sources (small hydroelectric plants, wind power, solar energy, biomass, biofuels and biogas, geothermal energy). The programme runs from 1993 until 1997 and has a budget of MECU 40.

Specific objectives for the development of renewable energy sources in the present 12 Member States, as set out in ALTENER are:

- Increasing the market share of renewable energy sources from 4% in 1991 to 8 % in 2005 (equivalent to a 180.000 Gg reduction of CO_2 by the year 2005);
- Tripling the production of electricity from renewable energies;
- Securing a 5% market share of biofuels in motor vehicle consumption.

ALTENER has the following elements:

- Financial support programme for the development of technical standards and specifications, training and information activities, sectoral pilot projects, biofuels, integrated resource planning and demand-side management, third party finance, the guarantee of financial risks, local development plans and feasibility studies. In 1993 and 1994 a total of 114 projects have been supported.
- Information Exchange Network.
  Information and promotional activities include: coordination of national, Community and international activities, symposia, conferences and workshops and databases.

PERU: Action on regional and urban energy planning by the European Community has as its principal objective the promotion of rational use of energy, in particular by better use of local resources and improvements in energy efficiency. This action contributes to safeguarding the environment and improving economic and social cohesion.

Trans-european networks:

Switching to cleaner fuels with low carbon content can produce energy and environmental benefits especially as regards CO_2 emissions. This pertains in particular to those regions, where due to infrastructure limitations, fuels like natural gas have been unavailable so far. Trans-european networks have a crucial role to play in bringing cleaner fuels to peripheral regions. They improve at the same time the flexibility of the European gas supply system. The same applies for trans-european electricity networks which support the use of electricity produced from low/zero carbon sources throughout the Community.

3.4. The proposal for a carbon/energy tax

In June 1992 the European Commission proposed a draft Directive (COM(92)226 final) for the introduction of a tax on all energy products, excluding renewables, based 50% on energy content and 50% on carbon content of fuels. The objective was to improve energy efficiency and favour fuel substitution towards products emitting less or no CO_2.

It was proposed to introduce the tax in steps, starting at a rate of 0.21 ECU/GJ and 2.81 ECU/t CO_2 in the first year (equivalent to $3 per barrel of oil). In each of the following seven years these rates would be increased by one third of the tax rates of the initial year. In the last year these rates would therefore have reached 0.7 ECU/GJ and 9.4 ECU/t CO_2, equivalent to $10 per barrel.

Concerning electricity, the inputs in power stations would be taxed according to the carbon content of the fuels used. As regards the energy part, the tax would be fixed in terms of ECU per MWh. Raw materials, i.e. energy sources used as feedstocks, would not be taxed.

Graduated reductions and conditional exemptions of the tax would be applied for energy intensive firms. The reductions would depend on the share of energy costs in total value added of the products obtained using the energy.
Full exemption of the tax would be possible if substantial efforts are made to limit CO_2 emissions and/or improve energy efficiency.

According to the Draft Directive the following basic conditions must be satisfied for the tax to be implemented:

- Conditionality.
  The Community would not apply the tax until its main competitors within the OECD have introduced a similar tax or measures with an equivalent financial impact.
- Tax neutrality.
  The tax is not to involve an increase in the overall tax burden. In other words, it should be offset in full by tax incentives promoting energy savings or reduced CO_2 emissions, or by reductions in taxes and other statutory contributions for firms and individuals alike.
  The tax proposal has been estimated to lead to a reduction of 3.8% of 1990 CO_2 emissions by the year 2000.

Present status of the proposal
Unanimous approval from the Council is required for adopting a fiscal measure. The work is conducted simultaneously within the Environment and Economic and Finance Councils, the latter taking the final decision on the modalities of the EC tax. Discussions are currently following the framework being formulated since the end of 1993: the possibilities are being explored for i) introduction of the energy/carbon tax within the existing harmonised system for excise duties by broadening it so as to include coal, natural gas and electricity; ii) delayed but clearly scheduled introduction for some Member States; iii) differentiated sectoral approach: households, transport, small consumers and industry.

3.5. The monitoring mechanism

In the Council Decision of 24 June 1993 (93/389/EEC) a monitoring mechanism was established for Member States' anthropogenic emissions of CO_2 and other greenhouse gases not controlled by the Montreal Protocol.
According to the Council Decision Member States shall devise, publish and implement national programmes for limiting their anthropogenic emissions of CO_2. The programmes shall be periodically updated. The Commission annually evaluates the national programs, in order to assess whether progress in the Community as a whole is sufficient to attain the stabilisation objective.

The Council Decision specifies the information the national programmes must include: CO_2 emissions in the 1990 base year, inventories of emissions by sources and removal by sinks, details of national policies and measures contributing to limitation and sequestration of CO_2 emissions, trajectories of national emissions between 1994 and 2000, measures taken or envisaged for the implementation of relevant Community legislation and policies, and an assessment of the economic impact of the above measures. The methodology for determining emissions and removals by sinks must be compatible with the methodology developed by the IPCC. It has to take account of developments decided within the framework of the UN Framework Convention on Climate Change.

With respect to other greenhouse gases the Member States should send to the Commission data concerning emissions of these gases, as well as a description of the measures being taken or envisaged which will limit emissions.

The Decision includes a committee composed of the representatives of the Member States and chaired by the representative of the Commission.

To date, the monitoring committee has held three meetings in which it discussed, among other things, methodologies for evaluation of progress towards the Community CO_2 stabilisation objective, the content and format of annual inventories and the contents of the national programmes.

3.6. Voluntary Schemes

Limitation of CO_2 and other greenhouse gases requires the active involvement and participation of all economic and social actors. Voluntary schemes and auto regulation may have an important role to play in the future. The Commission has recently given a mandate to CEN/CENELEC to elaborate European Standards in the field of thermal solar systems and components. Likewise, standards are being elaborated in the field of photovoltaics and the field of wind turbines. The dissemination of cost-effective minimum standards is beneficial in both energy and environmental terms. Commission services have also been collaborating with the European Electricity Supply Industry to find cost-effective ways to limit CO_2 emissions through electricity related supply and demand side options.

Moreover, negotiations are underway for a voluntary labelling programme concerning energy efficiency of computer and other office equipment. This voluntary scheme which could include manufacturers from the USA and Japan, would provide for a quasi worldwide labelling scheme. Such a widespread agreement would be preferable to a mere Community scheme.

4. MEMBER STATE REPORTS

4.1. Introduction

This chapter summarizes the national programmes of the Member States to limit greenhouse gas emissions. This brief overview has been included, since the strategy of the European Community requires programmes at the Member State level to complement the actions of the EC to limit greenhouse gas emissions. Up to now, the National Communications of Denmark, the Netherlands, the United Kingdom, Germany and Spain have been submitted to the UN FCCC. These national communications are briefly described in Section 4.2. For the other Member States, a short description is given of their national programmes under the EC Decision on a Monitoring Mechanism for CO_2 and other greenhouse gases. These can be found in Section 4.3.

4.2. National Communications submitted to the UN FCCC

Denmark

The national CO_2 target adopted by Denmark is to achieve an emission reduction of 20 % by the year 2005 compared to 1988. Sectoral CO_2 targets have been set for the energy sector and the transport sector. Apart from the national targets, Denmark has committed itself to stabilize emissions at the 1990 level in 2000 within the framework of the Climate Convention, as well as to achieve a 5% reduction of CO_2 emissions, as a contribution to the objective of stabilizing CO_2 emissions in the Community as a whole by the year 2000.

Emissions in 1990, 2000 and 2005

Table 4.1 provides details of emissions of CO_2, CH_4 and N_2O in Denmark in 1990, 2000 and 2005. According to Denmark's projections, the national CO_2 target for the year 2000 is most likely to be achieved. A CO_2 emission reduction of approximately 8% is expected by the year 2000 compared to 1990 levels. This estimate is based on corrected figures for imported/ exported electricity. CH_4 emissions are expected to decrease by about 13% by the year 2000. N_2O emissions are expected to increase by 10% by 2000.

Table 4.1: Emissions of CO_2, CH_4 and N_2O in Denmark in 1990, 2000 and 2005 (Gg)

	1990	2000	2005
CO_2	58,353 [1]	53,753	52,051
CH_4	406.3	354.2	353.5
N_2O	10.5	11.5	12.1

[1] CO_2 emissions corrected for electricity import. Actual emissions amount to 52,053 Gg.

Policies, measures and programmes

The Energy Action Plan ("Energy 2000") emphasized efficiency improvements in both end use (especially electricity) and energy supply (notably increased use of combined heat and power), changing to cleaner fuels (a.o. biomass and wind) and increasing energy R&D.
The transport action plan promotes an efficient transport system.
The Danish waste policy aims to recycle about 50% of the total amount of waste generated in the year 2000. The remainder should primarily be incinerated and landfilling should be minimized. The energy content of the waste will be used to replace fossil fuels.
Regarding the forestry sector, the Danish Parliament decided that during a period of rotation, e.g. 80-100 years, the forest area should be doubled, leading to a CO_2 fixation rate of approximately 5% of the yearly CO_2 emission at its highest level.

The Netherlands

The national CO_2 target adopted by the Netherlands is to stabilize emissions by 1994-1995 and to achieve an emission reduction of 3-5 % by 2000 compared to 1989-1990. The CH_4 emission reduction target is 10% by 2000 compared to the 1990 level and the target for N_2O is to stabilize emissions at the 1990 level by 2000.

Emissions in 1990 and 2000

Table 4.2. provides details of emissions of CO_2, CH_4 and N_2O in the Netherlands in 1990 and in 2000 (projections) according to the IPCC-methodology on emission inventories. The national CO_2 target is based on another inventory methodology. So, Emission projections for the year 2000 which are calculated according to IPCC-methodology cannot be compared with the national CO_2 target. According to the Netherlands' projections (based on the IPCC-methodology), the national CO_2 and CH_4 targets are likely to be achieved. A CO_2 emission reduction of approximately 4% compared to 1990 levels is expected by the year 2000. This estimate is based on temperature corrected figures for CO_2 emissions in 1990. CH_4 emissions are expected to decrease by about 25% by the year 2000. The stabilization target for N_2O emissions is unlikely to be achieved: emissions are expected to increase by 5% by 2000.

Table 4.2. Emissions of CO_2, CH_4 and N_2O in the Netherlands in 1990 and 2000 (Gg) according to the IPCC emission inventory guidelines.

	1990	2000
CO_2	174,000 [1]	167,600
CH_4	1,067	786
N_2O	59.6	62.2

[1] CO_2 emissions corrected for temperature influences. Actual emissions in 1990 amount to 167,600 Gg.

Policies, measures and programmes

The Netherlands' policy package to address greenhouse gas emissions includes a wide range of policies and measures in various sectors, primarily energy, transport and waste.

To a large extent, the policy package for reducing CO_2 emissions is directed at energy conservation. The package consists of voluntary agreements (especially with industry, including the energy and transformation sector and the energy distribution sector), standards (especially for residential use and transport), transport infrastructure investment, financial support for renewables and energy conservation, and reduction of waste landfilling in addition to energy recovery.

Direct measures for reducing methane emissions include regulations for waste management and the improvement of gas distribution networks. There are no specific policies whose aim is the reduction of N_2O emissions. Any reduction in N_2O emissions is the result of policies in other areas than climate change, mainly the acidification abatement policy.

United Kingdom

The United Kingdom accepts the commitment of the UN FCCC to take measures aimed at returning emissions of greenhouse gases to 1990 levels by the year 2000.

Emissions in 1990 and 2000

Table 4.3 provides details of emissions of CO_2, CH_4 and N_2O in the United Kingdom in 1990 and projected emissions in 2000 taking into account the policies and measures in the national programme. A stabilization of CO_2 emissions is expected, a 10 % reduction in CH_4 emissions and a 75% reduction in N_2O emissions.

Table 4.3: Emissions of CO_2, CH_4 and N_2O in the United Kingdom in 1990 and 2000 (Gg)

	1990	2000
CO_2	580,268	580,268
CH_4	4,844	4,400
N_2O	109	30

Policies, measures and programmes

The UK's National Communication "Climate Change; the UK Programme" sets out measures aimed at returning emissions of each of the main greenhouse gases to 1990 levels by the year 2000.

The CO_2 programme is based on a national partnership approach drawn up after extensive public consultation, involving business, environmental and other interest groups. Measures are spread across all sectors:

- domestic energy consumption, through measures which include the introduction of taxation on domestic fuel and power, and a new Energy Saving Trust;
- energy consumption by business, including energy efficiency advice and information;
- energy consumption by the public sector, through targets for central and local government and public sector bodies; and
- transport, through e.g. increases in road fuel duties.

To reduce CH_4 emissions, initiatives are being taken to encourage the use of CH_4 for energy generation and reducing emissions from coal production. New guidance on limiting emissions from several industrial sectors is also being prepared. N_2O emissions from nylon manufacture will be considerably reduced.

Germany[6]

The German programme includes a wide range of measures such as economic instruments, regulations, administrative instruments, promotion programmes and information. Many of these measures have been designed to achieve a 25 to 30% reduction in 2005 compared to 1987 levels. Some of the measures, mainly taxes, have not yet been implemented. The restructuring of the economy in the new federal states will lead to a considerable reduction of CO_2 emissions.

Spain[7]

The Spanish programme to limit CO_2 emissions is based on the National Energy Plan (1991) and the Energy Saving and Efficiency Plan. It relies mainly on promotion programmes, on public and private subsidies, and information/advice. Effects on greenhouse gas emissions are mainly expected in the years beyond 2000.

4.3. National programmes under the EC Decision on a Monitoring Mechanism for CO_2 and other greenhouse gases

Belgium

The measures described in the Belgian national programme include economic instruments, regulations, administrative instruments, information/advice and investments production technologies and aim to reduce the national CO_2 emissions by 5% in 2000 compared to 1990 level.

France

The measures described in the French national programme are almost exclusively proposals for limiting CO_2 emissions. Only some of the measures have already been adopted. Most of the measures described are long term measures, affecting CO_2 emissions mainly in the years beyond 2000.

---

[6] Since Germany's national communication submitted to the UN FCCC was not available at the time of writing, a short summary is provided of the national programme under the EC Decision on a Monitoring Mechanism for CO_2 and other greenhouse gases.

[7] Since Spain's national communication submitted to the UN FCCC was not available at the time of writing, a short summary is provided of the national programme under the EC Decision on a Monitoring Mechanism for CO_2 and other greenhouse gases.

Greece

The Greek national programme is a compilation of the energy programme elaborated by the Public Power Corporation and programmes formulated by various Ministries. Measures taken to limit CO_2 emissions are mainly investments in the power generation sector that promote the use of natural gas and renewable energy sources. Energy savings are encouraged through information/advice. Regulations are currently being considered. Some of the measures have been adopted, others are under consideration.

Ireland

The Irish strategy to limit CO_2 emissions relies heavily on administrative instruments (e.g. voluntary agreements, least cost planning) and information dissemination to change consumer behaviour and to limit energy use by the commercial and industrial sector. Implementation of measures has commenced but the time required for the measures to be fully effective will probably extend beyond the year 2000.

Italy

Measures already adopted in the Italian national programme mainly consist of the granting of subsidies (to the public and private sector), investments in the power sector, and promotion of renewable energy sources. Decisions still need to be taken regarding the instruments for the implementation of proposed additional measures for achieving its stabilisation target.

Luxembourg

The programme of Luxembourg relies heavily on regulatory measures and laws. The restructuring of the iron and steel industry (from conventional plants to electric arc furnaces) will likely lead to the stabilisation of CO_2 emissions in 2000 compared to 1990 levels. This restructuring will take place before 2000.

Portugal

Portugal's strategy is based on the increased use of natural gas, increased energy efficiency by end users and increased use of renewable energy sources. The majority of the measures outlined in Portugal's national programme adopted in 1992 has been implemented.

4.4. Progress towards the stabilisation of CO_2 emissions in the Community as a whole.

The Community agreed in October 1990 to stabilise its CO_2 emissions by the year 2000 at their 1990 level. At the same time the Council recognised that:

- "... countries with, as yet, relatively low energy requirements, which can be expected to grow in step with their development, may need targets and strategies which can accomodate that development, while improving the energy efficiency of their economic activities ...". As a consequence, four Member States (Greece, Ireland, Portugal, Spain) have put forward national targets for the year 2000 that would result in an increase in their emissions.

It should be noted however, that France is not in a position to significantly reduce its CO_2 emissions due to the fact that emissions from its electricity sector are very low.

These countries as Parties to the Convention will conform to the Article 4 commitments jointly with the other Member States of the European Community. They are part of the overall Community CO_2 stabilisation target under which other Member States are planning to make substantial reductions by the year 2000.

The following points need to be taken into account when considering progress toward the achievement of the CO_2 stabilisation target for the Community as a whole.

- Some of the four Member States that originally considered they needed substantial emission increases for the year 2000 compatible with their hoped development are currently revising their targets, in the light of the recent economic recession and a more realistic appraisal of their potential for development in the short time interval remaining. These revisions are expected to lead to lower emissions for these Member States for the year 2000.
- Contrary to the expectations expressed in October 1990, that emissions of CO_2 would increase in the first part of the 90s, provisional figures show that there was a slight reduction in the Community CO_2 emissions between the years 1990 and 1993. This development, however, reflects both the recent economic recession and the significant reduction in emissions form the economic restructuring in the former GDR following the German unification.
- The degree of implementation of the national programmes to date varies considerably among the Member States at this relatively early stage of development of CO_2 control policies and measures.
- If the economic development in the EU in the late 1990's grows in accordance with their expectations (generally a 3% annual increase of GDP), then it will be necessary to adopt and implement further national and Community measures if the Community CO_2 stabilisation target is not to be exceeded.

Community Energy related CO_2 Emissions

Current and short-term outlook

The Annual Energy Review published in June 1994 suggested that 1995 levels of emissions would be lower than those reported in 1990. This analysis was based on the economic projections available in Spring of this year. Since then growth expectations have strengthened and the final outcome for 1995 may be for levels similar to 1990.

Energy considerations include accounting for improvements in Power Generation (switching to gas and increases in nuclear production) compensating to some extent for the steadily increasing levels from the transport sector.

Medium Term Outlook: 1995-2000

At the beginning of the 1990's the expectation was for growth in CO_2 levels over the decade to 2000 of some 14%. The deep economic recession in the early 1990's requires a downward revision of this earlier forecast. Current expectations suggest that CO_2 emissions could grow overall between 5 and 8% in the remaining years of this decade.

Much will depend on the speed and type of recovery in the coming months as well as the continuing rate of fuel substitution of gas in power generation. Final prices to consumers are expected to rise faster than crude oil prices (changes in taxation levels and the readjustments in electricity prices). Improvements in energy intensity tend to move in cycles reflecting the level of investment and this linked to the implementation of various programmes, both national and Community, should reduce the final levels of CO_2 per unit of energy. The upward pressure on CO_2 emissions in the industrial and domestic/tertiary sectors is likely to be damped more than proportionally to the pressure from rising transport emissions. These considerations point to an outcome nearer the bottom of the range; while sustained economic growth of 3% p.a. would probably suggest a result nearer the upper limit. Inclusion of four applicant members does not change these broad expectations. These projections take no account of any further measures that may be included in national programmes or taken at Community level.

5. VULNERABILITY ASSESSMENT AND ADAPTATION MEASURES

5.1. Introduction

This chapter describes the possible impacts of climate change on the European Community. Research on the assessment of possible impacts of climate change on various environmental sectors took place in a specific programmes: "European Programme on Climatology and natural Hazards (EPOCH) 1989-1992 and ENVIRONMENT 1991-1994 (described in section 7). This research on climate change impacts focuses on impacts of climate change on European land and water resources and on sea level rise and subsequent impacts on European coastal resources. Also included are research activities on desertification in the Mediterranean area.

Adaptation activities taken at the Community level are also described in this chapter.

5.2. Possible impacts of climate change on the European Community

Since the territory of the European Community consists of a rich variety of landscapes and also the climate varies considerably among the different parts of the Community, the possible impacts of climate change can differ enormously depending on local or regional circumstances. It is expected that temperature increases in northern Europe will be larger than temperature increases in the Mediterranean regions. Precipitation is expected to decrease in the Mediterranean countries, leading to enormous impacts on the agricultural potential of those countries. Since the European Community is a primary exporter of agricultural products, the

impacts of climate change on agricultural production may lead to a major disturbance of agricultural trade. Sea level rise is a potential threat to the large coastal area of the European Community (approximately 58 000 km of coastline, without counting the coasts of the small islands), especially to low lying lands.

Furthermore, changes in the composition of the Earth's atmosphere and consequent changes in climate are likely to have both favorable and adverse effects on the forests within the EU (72.5 million hectares - EU12). These effects may include reduced vitality, stability and regeneration of forests, increased risks of pests, fires and storms, increased growth of forest vegetation as a result of increases in CO_2, increased mineralization of organic matter, etc.

5.3. Adaptation activities

One of the key targets of the 5th Action Programme of the EC "Towards sustainability" is the integrated management of coastal zones. By request of the Council of Ministers (Environment), in a Resolution adopted on 25 February 1992, the Commission is currently preparing a strategy for the integrated management of coastal zones, with a view to providing a coherent environmental framework for integrated and sustainable forms of development. The strategy will cover the entire ambit of the coastal zones of the EC, including fore-shore, coastal waters and estuaries, and coastal land up to the limit of the marine or coastal influence. Research and development activities will provide a scientific basis for sound ecological management of these zones. In appropriate cases, financial support could be provided for an effective implementation of the strategy.

Foreseen for 1995 is a communication, which proposes in particular the creation of a coastal environment monitoring centre, support for pilot projects and the adoption of a directive providing for compulsory strategic plans for sustainable development and integrated management of the whole of the Community coastline.

In June 1993, at the Helsinki Ministerial Conference on the protection of forests in Europe, the European Community signed the resolution on strategies for a process of long term adaptation of forests in Europe to climate change. The European Union actively participates in the follow-up process of this conference and its resolutions. One of the objectives of the resolution on climate change is to intensify European research and its international cooperation to improve the understanding of the linkages between climate change and forest ecosystems, including feedbacks from the ecosystem to the climate system. This should help to adjust European forest management systems in order to optimize the adaptation of forests to climate change. Another objective of the resolution is the adaptation of existing forest monitoring schemes to assess alterations in forests that may be due to climate change.

6. FINANCE AND INTERNATIONAL COOPERATION

6.1. Introduction

As an Annex II country, the EC is obliged to communicate details of measures taken in accordance with Article 4, paragraph 3, 4 and 5. This chapter describes multilateral and bilateral cooperation between the European Community and developing countries and between the European Community and the countries with economies in transition. Most of these cooperation programmes and structures are not specifically orientated towards climate change, but will have elements related to it.

6.2. Cooperation with third countries and multilateral cooperation

SYNERGY

In 1980 SYNERGY, a programme for energy cooperation with all non Community countries, including developing countries and countries with economies in transition, started. The objective of SYNERGY is to improve the long term world energy situation and, hence, Community energy security, by helping other countries to make effective energy policy decisions. By encouraging energy planning, the rational use of energy, counselling and training, SYNERGY contributes to the reduction of greenhouse gas emissions. The funding of the programme amounts to 8 MECU per year. SYNERGY is, inter alia, concerned with the principal energy consuming developing countries and currently supports cooperation projects in India, China, Mexico, Brazil, Peru, Venezuela, Argentina and Indonesia. Programmes of cooperation are also under way with Tunisia, Algeria, Morocco and Jordan.

Global Environment Facility

The Global Environment Facility (GEF) is the interim financial mechanism of the UN FCCC. It provides grants to developing countries for projects and programmes aimed at protecting the global environment. GEF resources are available for investments and technical assistance projects that address climate change, loss of biological diversity, pollution of international waters and depletion of the ozone layer. The European Parliament expressed itself, in the Resolution on the Global Environment Facility, to be in favour of the participation of the European Community in the GEF as this would facilitate its coordinating role in international environmental matters. Furthermore, it should be noted that the EC is listed amongst the developed country Parties (Annex II) which, according to Art. 4, par. 3 of the Convention[8], "shall provide new and additional financial resources" to developing countries.

---

[8] United Nations Framework Convention on Climate Change (UNFCCC).

6.3. Cooperation with developing countries

Research cooperation with Developing Countries

The European Community has financed scientific cooperation with developing countries since 1982. the only programme targeted towards research cooperation with developing countries under the Third Framework Programme for Research was Life Sciences and Technologies for Developing Countries.

The Fourth Framework Programme for Research, Technology and Demonstration (1994-98) covers activities specifically aimed at promoting cooperation in the field of International Scientific Cooperation (second activity). This area has a budget of 540 MECU (i.e. approximately 5% of the total budget of the fourth Framework Programme for RTD, where the largest part will be used on cooperation with Central and Eastern Europe and with the new independant states of former Soviet Union and with Developing Countries.
The forthcoming research cooperation with developing countries covers topics that are seen to be common to all developing countries and of prime importance to their economic and social development. The new programme opens new areas; underlines the concept of sustainable development and strengthens interdisciplinary approaches. The programme will target three sectors:

- the sustainable management of renewable natural resources;
- improvement of agricultural production and agro-industrial production;
- health research for development.

Areas of relevance to processes of global environmental change covers research on the use and management of ecosystems (e.g. forests; coastal zones, wetlands, drylands, oceans, mountain areas and highlands). Human driving forces behind changes in the use and management of ecosystems will also be covered, for instance the impact of various policies on land-use systems. Agriculture and agro-industrial production are sectors of great importance for developing countries; and there is a need for research on sustainable production systems taking account of socio-economic as well as environmental considerations, for instance, the improvement of systems for processing and use, crop and animal production.
Additional scientific areas of mutual interest may also be covered.
Cooperation with developing countries will be implemented in close liaison with other forms for cooperation such as the Lome Convention, the new Mediterranean policy and the regulation on financial and technical assistance to, and economic cooperation with, the developing countries in Asia and Latin America.

Cooperation on energy related issues

Energy projects in Asian and Latin American countries are funded also in the frame of economic co-operation from Budget Line B7-3013. Since 1990 eight projects have been set up within this budget line which are of direct relevance to the climate change issue. These projects involved the expenditure of around 15 MECU. Five similar projects are still ongoing. Funding for these projects amounts to approximately 13 MECU.

Cooperation on forestry related issues

Worth mentioning in this respect is the establishment of the Community budget line "Tropical forest activities" (Budget Line B7-5041). This budget line is intended to finance projects with concerned with the conservation and sustainable management of tropical and subtropical forests. The budget line was established in 1990 and resulted in an allocation of 2 MECU to tropical forest projects in 1991. This amount was increased to 50 MECU in the following years. Approximately one third of the budget line is devoted to projects in the African, Caribbean and Pacific countries and two-thirds to projects in Asia and Latin America. A proposal for a Regulation to establish the legal basis of the budget line has been presented to the Council and is due to be approved towards the end of 1994 (COM(93) 53, 26/02/93).

Within Budget Line B7-5041 a Pilot Programme for the Conservation of Brazilian Tropical Forests has been established. The objective of this programme, set up in 1991, is to combine an improvement of the living standards of local populations with forest conservation. The Community is contributing 10-12 MECU a year starting from 1993. In addition the Community is contributing technical assistance to the projects.

Other bilateral cooperation

The most comprehensive of all the Community's regional agreements with developing countries are those with the African, Caribbean and Pacific nations, namely the Lomé Conventions (I-IV). Some of the fields of cooperation in Lomé IV concern the protection of the environment, particularly the wise management of forest resources.

Energy was explicitly mentioned for the first time in Lomé II (1980-1985) and has its importance acknowledged by Lomé III (1985-1990) and Lomé IV (1990-1995). The main objectives of cooperation in the energy field are to encourage the increased use of alternative, new and renewable energy sources and to protect the natural environment by conserving biomass resources.

Under new guidelines for Community cooperation with Asian and Latin American countries (Regulation 443/92), at least 10% of technical and financial resources must be devoted to projects and programmes with a primary environmental objective -with tropical forests a priority- out of a total budget for 1991-1995 of 2.9 BECU.

European Energy Charter

The central principle of the European Energy Charter is the complementary relationship between the owners of energy resources, holders of advanced technologies and know-how, and consumer markets in Europe. Environment protection and more efficient use of energy brought about by treaties and protocols in the frame of the Charter will have a positive impact on limiting CO_2 and other greenhouse gas emissions in particular by encouraging market prices, and hence more efficient energy usage. Negotiations encompassing some 50 countries have been successfully concluded in June 1994. The European Energy Charter Treaty and the Energy Efficiency Protocol will therefore be signed in Lisbon on 17 December 1994.

6.4. Cooperation with the countries of Central and Eastern Europe and the former Soviet Union

The cooperation with the countries of Central and Eastern Europe and the former Soviet Union is mainly based on the PHARE (Poland and Hungary Assistance to the Restructuring of the Economy) and the TACIS (Technical Assistance to the Commonwealth of Independent States) programmes which are described below. The PHARE programme was established in 1989 and its main objective was to provide direct assistance to Poland and Hungary. Since then the programme has been expanded to other countries in Central and Eastern Europe. The TACIS programme, oriented on the Commonwealth of Independent States (CIS), was established in 1991. Close links are being maintained between the PHARE and the TACIS programme.

PHARE

The environment is one of the priority sectors in the PHARE programme. Additionally, investments in energy efficiency, energy saving and rational use of energy in the PHARE countries are also of relevance to climate change. There are also other Community programmes aiming at energy cooperation with Central and Eastern Europe and CIS countries. For example, THERMIE will help to facilitate the transfer of technology.

Between 1990 and 1993, the EC made available from its budget 3,294 MECU to finance the PHARE programme. The environment and nuclear safety sector and the infrastructure sector (includes energy) have accounted for both 9% of PHARE funds.

TACIS

The overall aim of the TACIS programme is to contribute to the transition towards a market economy. Technical assistance aims at reducing the energy intensity of the industrial and commercial sectors is already provided directly to specific energy intensive enterprises through demonstration projects. Although the TACIS Regulation does not mention the environment as a sectoral priority, environmental concerns have played a major role in all TACIS activities.

Energy is specified as one of the five focal areas of the TACIS programme. Many of the energy actions concern energy efficiency and saving. In the following years TACIS will provide energy saving advice to the existing institutions involved in energy distribution. Technical assistance will be provided directly to specific energy-intensive enterprises, aimed at reducing the energy intensity of the industrial and commercial sectors. Advice will also be offered to assess the potential of renewable resources, mainly hydropower but also solar, wind and geothermal power.

The budget for the whole TACIS programme amounted to 400 MECU in 1991 and 480 MECU in 1992.

7. RESEARCH AND DEVELOPMENT

7.1. Introduction

This chapter gives information about research efforts to understand the physical and human aspects of global climate change, with a view to supporting the process of policy-making. These research efforts are described in the light of the present and the next Community research programmes. It summarises also the research activity both in the field of non nuclear energy including technological activity and support of the evaluation of energy-environment RTD policies.

The Community completes its Third Framework Programme (1990-1994) of Research and Development this year. The Fourth Framework Programme of Research and Development was adopted on the 26th of April 1994. It will run until 1998. The specific research programmes on environment, on energy and the action relative to cooperation with Third countries (section 6.3) are of particular importance to climate change.

7.2. Third Research & Development Framework Programme

The emphasis on environmental research has increased in the third framework programme: 518 MECU have been devoted to the environment programme. Of this 518 MECU, a significant proportion is dedicated to research with direct relevance to global climate change. The programme consists of support to research projects involving the main European institutions involved in climate change research, and including research performed at the EC Joint Research Centre (JRC). These projects are included in EPOCH (European Programme on Climatology and natural Hazards) (89/625/EEC), and consist of the following themes:

- natural climate change;
- anthropogenic climate change;
- climate change impacts.

Furthermore, the third framework programme includes research in the field of new energy technologies. Two successive programmes, JOULE I (1989-1992) and JOULE II (1990-1994), have been established by the Community. Both programmes addressed the development of clean and efficient energy technologies in the following areas: rational use of energy (in industry, transport and building), advanced technologies for fossil fuels and renewable energies. An additional activity relative to the elaboration of energy-environment models and analysis of RTD strategies is also part of these programmes. In general terms, the environment dimension which was already an integral part of JOULE I has been strengthened in JOULE II, in particular the CO_2 emission reduction objectives.
Furthermore, an accompanying action has also been undertaken consisting of associating Eastern countries teams within some research project, of JOULE II. The budget for both programmes is respectively 122 MECU and 258 MECU.

7.3. Fourth Research & Development Framework Programme

The fourth framework programme includes a specific programme on "Environment and Climate" for which 825 MECU (JRC included) will be reserved. The programme covers three themes:

- natural environment, environmental quality and global change;
- environmental technologies;
- space technology applied to environmental monitoring and research.

In order to reinforce the coordination of Community research on global environmental change, the fourth framework programme proposes the establishment of a European Network for Research in Global Change (ENRICH). The role of ENRICH will be to provide a stronger basis for public policy by collecting and analysing relevant information, promoting cooperation, education, training and dissemination of information. An ENRICH office has been set up in Brussels.

A specific programme on non-nuclear energies will be continued under the fourth framework programme. This programme, called "Clean and Efficient Energy Technologies" (CEET), merges for the first time both the R&D and the Demonstration (for this reason it is also called JOULE-THERMIE by reference to the previous programmes). The motivation of the RDT strategy supporting the new programme is to ensure the energy security, considered in the broadest sense i.e. ensuring to our economies reliable energy services at affordable cost and conditions; the main driving force for technological change is the environment due to production and use of energy (in particular the CO_2 issue); futhermore the RTD policy must integrate regional dimensions and must build on concertion with other Community policies, including the international cooperation.

The budget of the CEET programme is 967 MECU for the period 1994-1998. The main component of the programme is technology in the same areas mentioned for JOULE and THERMIE; R&D will give more emphasis to the introduction of renewable energy (including the Third Countries), whereas the Demonstration will support more substantially rational use of energy and fossil fuel technologies. Furthermore, a wide activity for the RTD strategy definition will be undertaken: it will cover global analysis, socio-economic research, energy, environment, economy modelling and Forum; exchange of information with Third Countries and dissemination of tools and results with them will be part of this activity.

8. EDUCATION, TRAINING AND PUBLIC AWARENESS

At the Community level, information, training and education programmes concerning climate change and energy use mainly take place within the scope of (sectoral) policy programmes. Within the scope of sustainable energy use, the provision of information to, education and training of end-users takes place. Specific projects have started in 1993. Regarding the transport sector, the commission proposed in a Communication on transport and the environment a strategy for "sustainable mobility" including the promotion of a more environmentally rational use of private cars, and changes in driving rules and habits (including speed limits). Information activities are also being carried out within the scope of sustainable development of coastal zones.

Besides information, education and training activities as part of sectoral policies, attempts are being made to provide the general public with a complete picture of the climate change problem. The Directorate General for Environment, Nuclear Safety and Civil Protection (DG XI) will soon publish a climate change brochure, explaining all issues related to climate change.

Information for the wider public is also a key element of the SAVE, ALTENER, THERMIE and PERU programmes. These programmes have been described in Chapter 3 of the Executive Summary.

LIST OF ABBREVIATIONS USED

ALTENER	Programme for the Promotion of Renewable Energy Sources
CEET	Programme on Clean and Efficient Energy Technologies
CIS	Commonwealth of Independent States
CORINAIR	CORINE AIR emissions inventory
ECU	European Currency Unit
ENRICH	European Network for Research In global Change
EPOCH	European Programme On Climatology and natural Hazards
FCCC	Framework Convention on Climate Change
GEF	Global Environment Facility
INC	Intergovernmental Negotiating Committee
IPCC	Intergovernmental Panel on Climate Change
JOULE	Programme on Joint Opportunities for Unconventional or Longer-term Energies
OECD	Organisation for Economic Cooperation and Development
OPET	Network of Organisations for the Promotion of Energy Technologies
PACE	Action programme for improving the efficiency of electricity use
PHARE	EC Programme on Poland and Hungary Assistance to the Restructuring of the Economy
R & D	Research and Development
SAVE	Programme on Specific Actions for Vigorous Energy efficiency
SYNERGIE	Programme for energy cooperation with all non-Community countries
TACIS	EC programme on Technical Assistance to the Commonwealth of Independent States
THERMIE	Energy Technology Support Programme
UN	United Nations Organisations

CHEMICAL FORMULAE AND REFERENCES

CO	Carbon Monoxide
CO_2	Carbon Dioxide
CH_4	Methane
NMVOC	Non-Methane Volatile Organic Compounds
N_2O	Nitrous Oxide
NO_x	Nitrogen Oxides