The European Union & Global climate change

A Review of Five National Programmes

Prepared for the Pew Center on Global Climate Change

by

John Gummer
Robert Moreland

SANCROFT INTERNATIONAL LTD.

June 2000

Contents

Foreword *Eileen Claussen, President, Pew Center on Global Climate Change*

As we approach the third anniversary of the Kyoto Protocol and continue working to address the questions raised but not answered in the agreement, entry into force is increasingly the subject of climate change discussions. European Union (EU) countries have voiced their strong support for early ratification. With Kyoto targets that become legally binding upon the Protocol's entry into force, how close these countries are to delivering the promised reductions is worthy of analysis and discussion.

This report reviews the progress of five EU member states whose emissions totalled nearly 60 percent of the EU emissions in 1990: Germany, United Kingdom, The Netherlands, Austria, and Spain. As part of the Annex I group of developed countries, the EU member states agreed to a collective target to reduce their greenhouse gas emissions under the Kyoto Protocol. They have assumed national commitments at varying levels through Article 4 of the Protocol, which establishes that groups of countries may redistribute their emissions reductions in ways that preserve their collective goal. The five countries reviewed in this report have chosen varied approaches to cutting their emissions, with some similarities including voluntary agreements with industry and eco-taxes. Analysis suggests the following:

- The EU will meet its Rio target to keep emissions to 1990 levels by 2000, largely due to reductions in the UK and Germany.
- The UK is currently the furthest of the five countries below its 1990 level and is likely to meet its Kyoto commitment of a 12.5 percent reduction in 2008/12.
- Germany, the EU's largest emitter in 1990, may fall short of its Kyoto commitment (21 percent reduction) without further action; given the high level of political commitment and the recent proposal of additional measures, it is possible that Germany could achieve its target.
- The three smaller countries are not on track: CO_2 emissions from the Netherlands currently exceed 1990 levels by 17 percent, rendering it highly unlikely that it will reach its Kyoto target even if half its reductions come from emissions trading; Austria faces per capita emissions that are already low due to the high use of renewable energy — additional reduction measures will be very difficult and plans and programs are not now in place to deliver the necessary reductions; Spain is already close to reaching the level of emissions growth that it was allowed as a relatively poor country in the EU, with little indication that sufficient action will be taken to prevent exceeding its target.

The authors and the Pew Center gratefully acknowledge the following individuals for their review of previous drafts of this report: Tom Burke, Jos Delbeke, Hermann Ott, Karl Steininger, Pier Vellinga, Hauke Von Seht, and Anne Weir.

Executive Summary

Most member states of the European Union (EU) have been at the forefront of international efforts to mitigate global climate change. They have been leaders in proposing targets for reducing greenhouse gas (GHG) emissions and developing policies for action. In 1990, the EU Ministers of Environment and Energy agreed that carbon dioxide (CO_2) emissions of the member states would be no higher in 2000 than in 1990. Seven years later in Kyoto, Japan, the EU ministers agreed to reduce the EU's GHG emissions by 8 per cent between 1990 and the period from 2008 to 2012 (2008/12). This reduction was apportioned among the 15 member states. The wealthier nations took a higher percentage of reductions, while the less economically developed nations agreed to moderate increases in emissions growth.

Although there is an overall EU target, actions taken to reduce GHG emissions are the responsibility of the individual member states. This report examines the response of five states: The Federal Republic of Germany, the United Kingdom (UK), The Netherlands, Austria, and Spain, which in total contributed 60 per cent of the EU's emissions in 1990. Germany and the UK — the leading emitters — contributed 46 per cent. The Netherlands and Austria are often considered leaders on environmental issues, while Spain was chosen because its emissions will be allowed to increase over 1990 levels. Progress made since 1990, obstacles encountered, and the likelihood of successfully meeting the reduction target within the time scale envisaged in the Kyoto Protocol are discussed. Government plans that have turned into action and plans for future implementation are also addressed. The political commitment of governments to reduce emissions and potential obstacles to reductions are examined.

The European Commission concluded in 1999 that the EU's GHG emissions as a whole will be approximately the same in 2000 as they were in 1990, but that the stabilisation of emissions will largely result from the efforts of the two biggest emitters, Germany and the United Kingdom. Major factors in the reduction of GHG emissions have been the switch from coal-powered to natural gas-fired electricity production and rehabilitation policies in the former East Germany. Other measures, noticeably energy efficiency incentives and high gasoline prices (relative to the United States), played a part. However, in

the future, the member states are likely to rely more on renewable energy, combined heat and power (co-generation) schemes, eco-taxes, voluntary agreements with industry, and a moderation of increases in emissions from traffic. Despite political difficulties over coal, nuclear energy, eco-taxes, and road transport, the authors believe that, generally, the political commitment to reduce GHG emissions remains strong.

The European Union's strong support for action could be seen in its pressure for high targets at Kyoto. Power, however, lies with member state governments. Consequently Europe-wide action has been very limited, but all member states have taken action, and emissions would be higher but for this action. However, the 2000 emissions target will be achieved largely through reductions in Germany and the United Kingdom, although some member states — notably the Netherlands — will be well behind their individual targets. The European Commission estimates that emissions would increase by 6 per cent between 2000 and 2008/12 without further measures. Thus, in reality, the Kyoto target is a reduction of 14 per cent for the period from 2000 to 2008/12.

Germany, as the largest emitter in the EU, has long recognised the need to reduce GHG emissions. It has taken on the responsibility for the largest reductions: 252 million metric tonnes (mmt), equivalent to a 21 per cent reduction between 1990 and 2008/12. While action in Germany has been taken nationwide, the improvement in the German position to date — a reduction of about 17 per cent in GHG emissions from 1990 to 2000 — largely reflects the dramatic decrease in emissions from the former East Germany. This reduction is unlikely to continue at the same pace and meeting the Kyoto target will be difficult but not impossible. The government has a national programme that includes a reduction in coal use and production, voluntary agreements with industry, traffic measures, eco-taxes, and an emphasis on co-generation and renewable energy. German public opinion is mixed on the success of some of these measures, the need to use nuclear energy, and, indeed, whether Germany should have accepted such a large share of the EU's obligation. However, there is little dissent on the need for action and the government of Chancellor Gerhard Schröder has regularly stressed its importance. The German position is illustrated by the government's keen desire to see the Kyoto Protocol enter into force by 2002.

The United Kingdom has historically had a high per capita level of GHG emissions. It has accepted a reduction of 12.5 per cent between 1990 and 2008/12, and has adopted a national target of about double this percentage. The UK has already achieved a 14.6 per cent reduction due primarily to

substantial fuel switching from coal to natural gas. However, further reductions in this area are limited and, like all the EU countries reviewed in this report, the UK will have to contend with increases in transportation sector emissions. To ensure continued reductions, the government is relying heavily on several measures, including greater use of renewable energy, eco-taxes, and voluntary arrangements with industry. The country is also examining the possibility of a domestic emissions trading scheme. The UK does face political difficulties concerning nuclear energy, coal, domestic energy use, and traffic growth. The national target of obtaining 10 per cent of electricity generation by 2010 from renewables is ambitious. However, these difficulties do not yet threaten the fulfillment of the UK's strong commitment to achieve its obligations under the Protocol.

The Netherlands is often considered an environmental leader and indeed was at the forefront of EU appeals for action on climate change at both Rio and Kyoto. However, the Dutch economy, which has grown faster than the European average, is energy-intensive, partly due to the country's large resources of offshore natural gas. Although the Netherlands has accepted a 6 per cent reduction in emissions between 1990 and 2008/12, it has increased its CO_2 emissions by about 17 per cent since 1990. This increase brings into question the country's ability to reach its Kyoto Protocol target. The government has already stated that it intends to take advantage of emissions trading to meet half its target. Like Germany, the Netherlands is introducing a wide range of measures to achieve its goal and is promising more. These measures will affect some of the traditional strengths of the economy — the transport sector and its energy-intensive industries — and will involve further taxation. The Dutch commitment to reducing GHG emissions is very strong and the Netherlands has shown willingness in recent years to tackle other difficult problems, such as making its labour market more flexible. Nevertheless, it is difficult to be optimistic about the country's ability to meet its obligations under the Kyoto Protocol.

Austria has a low level of per capita GHG emissions, largely as a result of its heavy reliance on renewable energy, particularly hydropower and biomass. It also has provided strong support for public transport — particularly rail. Austria has agreed to cut emissions under the Kyoto Protocol by 13 per cent between 1990 and 2008/12. From examination of the data available, this target may be more difficult to achieve than the Austrians envisaged. There may be less opportunity to expand the use of renewable energy than anticipated, and the Austrian government will not entertain the use of nuclear energy. The government is firmly

behind actions to reduce GHG emissions and intends to meet its obligations. Because of the high use of renewables for energy production, the Austrian public appears to believe that the country has no great problem from emissions other than transport and could react against tougher measures.

Spain is the one country examined in this report that has been allowed increased emissions (15 per cent between 1990 and 2008/12) because of the country's need for economic development and relatively low level of per capita GHG emissions. Statistical information for Spain is more limited than for other countries covered, but GHG emissions between 1990 and 2000 appear to have increased between 11 and 13 per cent. Greater use of natural gas and renewables instead of oil and coal should help, but much will depend on political will in Spain and on pressure from other member states. Unless further action is taken, Spain will not meet its target.

The report draws a number of conclusions. However, no hard conclusion on the likelihood of the EU as a whole achieving its obligations by 2008/12 can be drawn. Much depends on the development of new programmes to form voluntary agreements with industry, accelerate renewable energy use in electricity generation, and increase the use of co-generation. Much also depends on the extent to which strong political commitments to reduce emissions can outweigh countervailing political pressures. Demands to slow the switch from coal-powered generation, reduce the contribution of nuclear energy without adequate replacement of its generating capacity from non-CO_2 generation sources, and avoid restrictions on road transport could put member states off course. However, the political commitment to take action on GHG emissions appears generally to be strong and supported by public opinion.

I. Introduction

A. Background

The need to face the issue of climate change and reduce greenhouse gas (GHG) emissions[1] has been recognised by member states of the European Union[2] (EU) since the 1980s. In 1990, a joint meeting of all EU Ministers of Environment and Energy agreed that CO_2 emission levels in the EU should be no higher in 2000 than in 1990. Since 1990, EU member states have adopted further goals related to greenhouse gases. Some have adopted national targets. All have agreed to the targets of the 1997 Kyoto Protocol. The EU's commitment to meet its obligations is clear.

In Kyoto, Japan, the EU agreed as its main commitment to reduce the overall level of GHG by 8 per cent between 1990 and 2008/12. Because the responsibility for the action to achieve this target lies with its 15 member states, the EU invoked Article 4 of the Kyoto Protocol. The article establishes that countries may redistribute their emissions commitments in ways that preserve the collective goal (usually referred to as the "Bubble"). As a result, every member state has a specific target within the Bubble. Country targets differ significantly: Luxembourg agreed to a 28 per cent reduction, while Portugal was allowed an increase up to 27 per cent. Viewed in absolute terms, Germany agreed to a reduction of 252 million metric tonnes (mmt), while Spain was granted an increase in emissions of 46 mmt.

This report is intended to be a review of selected EU member states rather than of the EU as a whole. Action taken to meet the EU target is primarily a national responsibility. Although the report describes the EU context in which national actions are taking place, it concentrates on a detailed analysis of five member states: Germany, the United Kingdom, The Netherlands, Austria, and Spain. This report illustrates their progress in meeting these targets, describes actions being taken and planned, enumerates the problems being encountered, and assesses the chances of success.

Germany and the United Kingdom have the highest levels of emissions in the EU and have assumed by far the largest commitment for absolute emissions reductions. The Netherlands and Austria both have strong reputations for environmental leadership and are often regarded as role models by other

EU member states. Austria has been taking a strong line on environmental issues with its Eastern European neighbours, some of whom are currently applying for EU membership. The progress of these two countries in meeting their obligations will be carefully watched by other countries. Spain is less economically developed than the other four countries and is only responsible for limiting its increase in emissions.

B. Methodology

The analysis draws on data and reports produced by the member states, the European Commission, and the European Environment Agency (EEA). The analysis also draws on the independent external assessments of the "In-Depth Review" teams (IRT) established under the United Nations Framework Convention on Climate Change (UNFCCC) to review the progress of national plans.[3] Information has also been obtained from government ministers and officials and other interested parties, such as energy producers and business and environmental organisations. The authors note that these national forecasts of emissions trends have sometimes diverted from the reality. Nevertheless, they have generally accepted the data provided by governments and well-known organisations as being reliable.

Member states are obligated under EU law to provide regular data related to GHG emissions to the European Commission and the EEA. In practice, the adequacy of information since 1997 varies, particularly for Spain. This lack of information limits the ability to assess progress in that country. Limitation of data also partly explains why this review does not go more deeply into the costs — particularly in terms of public expenditure — of reducing GHG emissions. Costing is also difficult because reducing GHG is not the only objective of many countries' programmes.

Before the Kyoto Protocol, both EU and national GHG targets tended to emphasise CO_2. However, the EU accepts that the obligation to reduce emissions covers six greenhouse gases. Primarily because of difficulties in obtaining accurate measurement of hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF_6), the European Commission typically produces figures for total levels of GHG emissions in CO_2 (not carbon) equivalents based on CO_2, methane (CH_4), and nitrous oxide (N_2O) levels. For consistency, this report follows that procedure. Unless otherwise specified, figures for GHG emissions exclude the contribution of HFCs, PFCs and SF_6 — a difference of probably 1 to 2 per cent. However, the analysis does consider actions being taken to reduce these three minor gases.

The report highlights significant obstacles to action and the extent to which governments are prepared to face them. Many obstacles are political, rather than technical or financial. The authors analyse the political realities of reducing emissions and the political commitment of governments to achieve their targets. They also discuss the EU's monitoring procedures and those of its member states — specifically, the objectivity and transparency of those procedures and the extent to which they might alter plans.

To assist comparison of the progress of the member states, there is a common format to the individual member state chapters. The factual position in 1990 is taken as the starting point for comparison as it is the base date for targets under the Kyoto Protocol. The report ends with some conclusions on the likelihood of the targets being reached.

C. The European Union Context for National Action

The Kyoto Protocol targets were not adopted unilaterally by each member state. Instead, each state negotiated its Bubble targets with other member states in the effort to reduce GHG emissions from the EU as a whole by 8 per cent over the period 1990 to 2008/12. Consequently, the position of each country has to be set in the overall EU context. (See Box 1.)

Before the Kyoto Protocol

The European Background. Early in the global warming debate, the EU was convinced that scientific analysis of global warming should be taken seriously and decisive action was required. This conviction was matched by growing environmental concern in Europe, which led to the growth of "Green" parties and even — as in the case of Germany since 1998 — of their formal inclusion in government.

There had already been considerable debate about the effects of some of the sources of GHG emissions, particularly coal use. This debate was not initially related to global warming. The issue of acid rain due to coal assumed international importance in the 1970s and 1980s, with the Scandinavian countries blaming the UK and Germany for damage to their lakes and forests. The argument highlighted the need for Europe to reduce emissions from coal burning. Germany and the United Kingdom were not blind to the problem. Prior to reunification, there was concern in West Germany about air pollution (and CO_2 emissions) from East Germany. In the UK, there was legislation as early as the 1950s to reduce domestic coal burning that had caused the winter fog immortalised by Charles Dickens and Sir Arthur Conan Doyle.

While there was concern, there was also caution in a number of member states about reducing coal burning significantly. Coal was once the main source of electricity generation in Europe. Change meant huge infrastructure costs and finding inexpensive alternative energy sources. Coal and lignite production was also an important source of employment, particularly in the United Kingdom and Germany but also in France, Belgium, and Spain. Coal mining was concentrated in particular areas, presenting highly emotional political problems. Any reduction in production was fiercely resisted by trade unions.

Twice in the 1970s, the European economy had been severely affected by the restricted supply of oil from the Middle East. The oil crises led to continuing concern about losing domestic sources of energy. Furthermore, publicity over the effects of accidents at nuclear power plants — particularly Three Mile Island and Chernobyl — had damaging effects on public support for nuclear energy production. The public's fears were enhanced by environmental campaigns highlighting the problems of nuclear waste disposal.

Box 1

The European Union

Any examination of the EU requires an understanding of its role vis-à-vis its 15 member states. The EU is a supra-national level of government with common law established primarily by agreement between its member state governments. Decisions about EU action, as distinct from member state action, lie primarily with the member state governments, who act together through the Council of Ministers. Decision-making in the EU has a variety of mechanisms. The two main ones are described below.

- *Decisions taken by majority voting* (usually weighted to reflect the population of the individual member states) and with the agreement of the European Parliament (elected by popular vote).

Majority voting is used primarily for those legislative proposals that ensure trade between member states operates on an open and fair basis. Proposals include financial services, intellectual property, agriculture, health and safety, transport, and research. In recent years, the coverage has widened slightly and now includes labour legislation (or, as it is referred to in the EU, "social policy"). The European Commission (a body of nominees from the member states) has the sole right to make proposals for legislation but has a limited role in decision-making. However, if it disagrees with a decision by the Council of Ministers, the Commission can withdraw its proposal unless overruled by a unanimous vote of all EU governments. The European Parliament has had an increasing role in the EU's decision-making and now has power to veto decisions of the Council of Ministers.

- *Decisions to be taken only by the unanimity* of all member state governments. By definition, this mechanism covers all matters not covered by majority voting. In particular, any EU tax — even if it affects the movement of trade in the EU — must be decided by unanimity.

In nearly all cases for voting (either majority or by unanimity), the legislative proposal is drafted by the European Commission and advice must be obtained from the European Parliament regardless of its powers to alter legislation. Advice usually must be obtained from the Economic and Social Committee (which includes representatives from businesses, trade unions, consumers, farmers, and other interested parties) and the Committee of the Regions (which includes representatives from regional and local governments). The European Commission has the responsibility to ensure that member governments follow EU decisions. If necessary, the Commission can take governments to the European Court of Justice for failure to comply.

Most decisions on environmental issues (other than eco-taxes) are taken by majority voting. However, the agreement on target GHG levels under the Kyoto Protocol required negotiations between member states and was taken without recourse to majority voting.

The economics of coal production changed these positions. European coal was largely extracted from deep mines — a costly process. Both Belgium and France abandoned nearly all coal mining in the 1970s and 1980s, and France made a substantial and generally successful investment in nuclear power. In the UK, Margaret Thatcher successfully withstood a coal miners' strike in 1984 and, by deregulating the energy market, made possible a significant transfer from coal to natural gas. It was deregulation that cut the link between the power generators and the coal mines and finally ended the reign of "Old King Cole."

Coal from the remaining mines and imported coal — primarily from South Africa, Australia, and the United States — continued to be used. However, the discovery of natural gas under the North Sea and the construction of pipelines to natural gas reservoirs in Eastern Europe and North Africa supported the transition to gas. These developments opened up the possibility of substantial expansion in the use of natural gas, especially for electricity.

Concern about the environment in general — and climate change in particular — began to dominate the political debate during the 1980s in several countries in Northern Europe. Sweden, Austria, and Finland sought early action in reducing GHG emissions; they were joined by the UK, Germany, Denmark, and The Netherlands. Poorer countries — Spain, Portugal, Greece, and Ireland — were less convinced because they feared GHG emissions restrictions would inhibit economic development. However, each country came to support emissions reductions on the condition that the burden fell upon the main emitters and not upon the more fragile economies. The 1990 joint meeting of EU Ministers of Energy and Environment set the first EU target to stabilise CO_2 emissions by 2000 at 1990 levels and some member states, such as Germany, adopted more stringent national targets. Consequently, the EU was ready to take an early and strong lead on international efforts to reduce greenhouse gases.

The Route to Kyoto. The level of the EU's concern was evident at the Rio Earth Summit in 1992, where the United Nations Framework Convention on Climate Change (UNFCCC) was signed, and in international discussions, such as the 1990 joint Ministers' meeting. In March 1997, the EU adopted a negotiating position for Kyoto, which included a 15 per cent reduction of emissions for CO_2, CH_4, and N_2O for all industrialised countries by 2010 from 1990 levels.[4] In June 1997, the EU also agreed to propose at Kyoto an intermediate reduction of at least 7.5 per cent by 2005.[5]

Article 4: The Bubble. A unique part of the EU's Kyoto arrangement to reduce GHGs by 8 per cent was the use of Article 4, which establishes that groups of countries may redistribute their emissions commitments in ways that preserve their collective goal. Any group can use this provision, but it was designed for the EU's unique character as a political union but not a federal state. The Bubble is a political agreement between the 15 member states. While there is no doubt about the legitimacy of this agreement, it has still to be incorporated formally into EU legislation. This may happen during EU discussions leading to formal ratification of the Protocol and may take place shortly after COP6.[6]

The March 1997 negotiating position meant a 30 per cent reduction for Luxembourg and a 25 per cent reduction for Germany, Denmark, and Austria, but an increase for the poorer states, ranging up to 40 per cent for Portugal.

In maintaining its position on burden sharing and in its internal negotiations on the Bubble, the EU had been firmly guided by the principle that the more economically advanced countries should take the burden. Already the EU had developed a major policy of supporting development in the less economically developed regions and countries of the EU. Consequently, it took the view that poorer countries should not take too heavy an obligation to reduce GHGs (a position it adopted both internally and towards the developing world). In practice, the EU position meant that, for example, Germany should take the major share of the burden whereas Spain, which had a standard of living a third less than that of Germany, would be able to sustain a rise in emissions. The EU's argument was comparable to stating, for example, that in fulfilling its commitments under the Kyoto Protocol, the United States would not place the same burden on the states of West Virginia or Mississippi as it would on California or New York State.

The member states also took into account other factors, including the accepted notion that those countries that had already taken action on GHGs and/or had a low per capita GHG level should have a reduced burden. This particularly benefited France because of its switch to nuclear energy.

Implementing the Kyoto Protocol[7]

EU Emissions Sources (1990). The EU is second only to the United States in gross domestic product and in the volume of GHG emissions. In 1990 — the base year for the targets agreed under the Kyoto Protocol — its GHG emissions were approximately 4,334 mmt.[8] The major contributors were Germany (28 per cent of total emissions), the United Kingdom (18 per cent), France (15 per cent), Italy

(13 per cent), and Spain (7 per cent). Member states with above average per capita emissions were Luxembourg, Ireland, Germany, Finland, The Netherlands, Belgium, Denmark, and the United Kingdom. In 1990, the main sources of GHG emissions were electricity and heat production. The main sources by sector are presented in Table 1.[9]

EU Commitments on Climate Change. The EU's main commitment under the Kyoto Protocol is an overall reduction in GHG emissions of 8 per cent compared to 1990 levels. This commitment superseded the proposals of March 1997 and necessitated changes in the allocations. For example, having reviewed its position, Austria insisted on a much smaller share of the burden. Table 2 lists the current allocations for GHG emissions by country.

Table 1

Emissions Sources by Sector, European Union 1990 (CO_2 equivalent, million metric tonnes)

	Carbon Dioxide	Methane	Nitrous Oxide
Transport	743	—	—
Industry	626	—	100
Energy	141	92	—
Residential and Service	654	—	—
Electricity/Heat Production	1,036	—	—
Other (Agriculture and Waste)	200	518	200
Total	3,400	600	300

Note: Dashes indicate insignificant amounts.

Source: Eurostat data published in the 1997 Communication of the European Commission.[10]

Table 2

Current **EU Bubble Allocations** (CO_2 equivalent, million metric tonnes)

Member State	Percent Change 1990-2008/12	Absolute Change	Total 1990	Total 2008/12
Austria	-13	-10	74	64
Belgium	-7.5	-10	139	129
Denmark	-21	-15	72	57
Finland	0	0	73	73
France	0	0	637	637
Germany	-21	-252	1,201	949
Greece	25	26	104	130
Ireland	13	7	57	64
Italy	-6.5	-36	542	506
Luxembourg	-28	-4	14	1
Netherlands	-6	-12	208	196
Portugal	27	18	69	87
Spain	15	46	301	347
Sweden	4	3	69	72
United Kingdom	-12.5	-97	775	678
Total	-8	-336	4,334	3,998

Source: "Preparing for Implementation of the Kyoto Protocol" (Brussels 19.05.1999) (COM (99) 230).

Progress to Date. In its 1999 Communication, the European Commission indicated that the EU's CO_2 emissions may be roughly the same in 2000 as they were in 1990.[11] While all member states have taken steps towards reducing GHG emissions, the major contributors have been Germany and the United Kingdom.

Economic restructuring of the former East Germany and fuel switching from coal to natural gas, particularly in the United Kingdom, are the most significant factors in emissions reductions. However, several factors are working in the opposite direction. The most significant of these is GHG emissions from the transport sector, which rose by about 22 per cent over the decade. In its 1999 Communication, the European Commission also notes "with concern" that the decline in total GHG emissions was achieved in the first half of the decade. Emissions have risen during the latter half, when economic growth in the EU was slightly higher.

Means of Achieving Targets. Means of achieving the targets are left to the member states. Europe-wide measures are essentially complementary. In its 1999 Communication, the European Commission estimated that the EU's total GHG emissions would increase by some 6 per cent between 2000 and 2010 without policy measures.[12] This estimate implies that the reduction effort to achieve the Kyoto Protocol target of an 8 percent reduction effectively becomes 14 per cent between 1990 and 2008/12. In their plans, all member states have taken or are planning measures in all sectors producing GHGs. However, member states believe that such measures will only moderate the growth of GHG emissions from transport. Further action taken in the residential sector appears to leave GHG emissions from the residential and service sectors about the same between 2008 and 2012 as in 2000. Therefore, there is a heavy burden on industry and power generation to achieve the EU's target under the Kyoto Protocol.

The European Council of Ministers has envisaged that some EU-wide action may be needed and that European Commission proposals will take into account the Kyoto objectives. The following actions at the EU level are included in national programmes:

- *Agreement in 1998 with the automobile industry to improve fuel efficiency.* Under this voluntary agreement, the average fuel efficiency of new cars will improve by 25 per cent between 1995 and 2008.[13]
- *Research programmes related to climate change.*
- *Compulsory permit procedures for large installations that emit GHGs.*

- *Commission guidelines to reduce state aid for coal between 1994 and 2002.*
- *EU energy-saving initiatives.*
- *Legislation on waste* (the "Landfill" Directive), which limits the biodegradable content of waste to 75 per cent by 2006, 50 per cent by 2009, and 35 per cent by 2016 (with a four-year derogation for the United Kingdom, Ireland, and Spain).[14] Landfill emissions account for around one-third of the EU's methane emissions, or about 160 mmt of CO_2 equivalent.
- *The Strategy and Action Plan on Renewables* ("ALTENER 2" Programme), which aims to increase the share of renewables in EU primary energy production to 12 per cent by 2010, saving 400 mmt of CO_2 per annum by 2010.[15]

The European Commission has made further proposals for EU legislation related to greenhouse gases. Still under discussion is a proposal for an energy products tax. The previous concept of a CO_2 tax with high rates of taxation and a high degree of harmonisation across the member states has been replaced with a more pragmatic approach that foresees an extension of excise duties and a gradual increase in taxation. The proposal is deadlocked in the Council of Ministers largely because of the opposition of some countries to taxation at the EU level. However, most member states, including those with reservations on EU taxation, are introducing legislation for some form of national energy taxation.

The Commission committed to propose the taxation of aircraft fuel "as soon as the international legal situation allows the Community to levy such a tax on all carriers including those from third countries."[16] The Commission also has proposed amending existing EU legislation on establishing common rules for certain types of combined transport of goods between member states (i.e., road/rail links and links to waterways). The Commission will propose further legislation designed to revitalise rail transport.

The Commission published a "Green Paper" (a discussion paper) in 2000 on emissions trading by industry within the EU. The paper advocates a single price across the EU for emissions.[17] It also cites research indicating that emissions trading across all economic sectors could reduce the annual cost of compliance with the Kyoto Protocol by one-third. Several member states are either examining plans for national emissions trading or devising such plans. Denmark has already passed a plan for national emissions trading for the electric power industry. The European Commission approved the plan as not being anti-competitive in March 2000.[18] No decision has been made on the EU approach to international emissions trading.

Obstacles to Achieving Targets. Because responsibility for meeting the EU's target lies with the member states, obstacles are found at the national rather than the EU level. Member states have so far resisted any internal political pressures to break from the overall EU policy. Nonetheless, the European Commission believes that measures common to all member states are needed and that progress on such measures is too slow. EU decision-making is now under serious review by member state governments and will be considered at an EU Inter-Governmental Conference (IGC) this year.

Political Commitment. All the EU institutions have had a strong and consistent record of commitment to action on GHGs. The real question is whether member states can carry out their individual obligations under the EU Bubble. They are clearly prepared to meet their obligations and some have national targets that go even further. The EU's strong commitment to implementing the Kyoto Protocol was underlined in a November 1999 speech by the President of the EU Council of Ministers, Mrs. Satu Hassi. She announced at COP5 in Bonn that the EU and its member states plan to jointly ratify the Protocol by 2002.

Monitoring Procedures. In 1993, the EU agreed on a monitoring plan to allow the Commission to judge progress on the CO_2 objectives set in 1990. The plan was strengthened in May 1999 and extended to all greenhouse gases. This procedure will be amended because it does not yet formally cover the Kyoto Protocol obligations. In previous years, a minority of member states did not submit data in accordance with the monitoring plan, prompting the Commission to state that it would take infraction proceedings against any member state failing to meet its obligations on data submission. However, in April 2000 all member states submitted data that fulfilled their obligations.

Conclusions. The EU's ability to meet its obligations under the Kyoto Protocol is dependent on the action taken by its member state governments. So far the commitment of these governments remains strong. However, as will be further demonstrated in the sections of the five individual countries, there are obstacles to be overcome and political nettles to be grasped. It appears that the EU's target of stabilising CO_2 in 2000 at 1990 levels will be achieved largely due to the decline in emissions from Germany and the United Kingdom. Some member states have underestimated the difficulties in achieving the Kyoto Protocol target. Some — most noticeably the Netherlands — will fall short of their targets.

II. The Federal Republic of Germany

Introduction. The Federal Republic of Germany[19] (FRG or Germany) has the largest gross domestic product (GDP) and the largest volume of GHG emissions (1,201 mmt in 1990) in the EU.[20] It ranks third in total carbon emissions within the seven largest industrialised nations (the Group of 7, or G-7) after the United States and Japan. In 1990, Germany's GHG emissions were approximately 28 per cent of the total of the entire EU and 55 per cent more than the next highest EU emitter (the United Kingdom). In per capita terms, the only other EU members that exceeded Germany's GHG emissions level (14.7 mt) in the 1990s were Luxembourg and Ireland. German per capita emissions were approximately 12 per cent higher than the EU average.

Under the Kyoto Protocol, the FRG is committed to a 21 per cent reduction in GHG emissions below 1990 levels by 2008/12 and therefore will be making around two-thirds of the EU's emissions reductions. It is Germany's willingness to play a pivotal role that has enabled the EU to set its ambitious target for reducing GHG emissions. Environmental conditions were poor in the New Länder (the former East Germany) when it was reunited with West Germany in 1989. Action in the New Länder has been a major part of the overall German plan to reduce emissions.

German Emissions Sources (1990). In Germany, coal and oil were the two primary sources of emissions. In 1989, oil was responsible for about 45 per cent of CO_2 emissions and coal 36 per cent. Coal provided 55 per cent of electricity generation while oil was the main source of fuel for transport.[21] Other less-polluting sources of primary energy were natural gas (15.5 per cent), nuclear (11 per cent), and renewables (1.5 per cent) for a total of about 28 per cent. Nuclear energy generated 30 per cent of electricity and gas 10 per cent. The major sources of methane emissions were livestock (36 per cent), waste (33 per cent), and fugitive fuel emissions from coal mining, oil and gas systems (27 per cent). Table 3 lists Germany's share of the six greenhouse gases addressed in the Kyoto Protocol.

Table 3

German Greenhouse Gas Emissions 1990

Greenhouse Gas	Percent
CO_2 — carbon dioxide	83.9
CH_4 — methane	9.68
N_2O — nitrous oxide	5.67
HFCs — hydrofluorocarbons	0.19
PFCs — perfluorocarbons	0.22
SF_6 — sulphur hexafluoride	0.32

Source: "The 1999 Report of the Federal Republic of Germany for a Monitoring Mechanism of Community CO_2 and Other Greenhouse Gas Emissions Pursuant to the Council Decision, 1999/296/EC."

German Commitments on Climate Change. In 1990, the German government set a 25 per cent target for CO_2 reductions between 1990 and 2005. Programmes established before the Kyoto Protocol were designed to meet that target. Today, the main German commitment within the EU Bubble is a 21 per cent (210 mmt) reduction in all six greenhouse gases by 2008/12 (compared to 1990 levels). However, the plans of the government were geared to its original target of a 25 per cent reduction between 1990 and 2005 and this target has not been dropped.

The German government accepts that non-CO_2 GHGs should be included in the Kyoto Protocol. Germany has no national target for reducing other gases, but the IRT reported in 1997 that "the measures implemented under the CO_2 reduction programme will cut emissions of other GHGs...back by 40 to 50 per cent by the year 2005 compared to 1990."[22] However, there are discussions within the German government about introducing targets for each gas, as opposed to maintaining a general target for greenhouse gases as a whole and a specific target for CO_2 alone.

Progress to Date. The German government estimates that between 1990 and 1998, GHG emissions fell 16 per cent overall, CO_2 fell 13 per cent, CH_4 37.5 per cent, and N_2O 28 per cent.[23] By 2000, the government projects a further reduction in overall GHG emissions of around 1.5 per cent, making the total reduction about 17 per cent.

In East Germany, the decline in GHG emissions may have been as much as 50 per cent. This reduction reflects the German government's emphasis on renovation, modernisation, and the reduction of air pollution in East Germany. There has been a 2 to 3 per cent increase in emissions in West Germany (which is approximately 3.5 times the size of the New Länder) between 1990 and 2000. This increase is partly explained by the immigration of about one million people from East Germany and an additional one million from other Eastern European countries since reunification. An increase in manufacturing in West Germany to compensate for the decline in production in East Germany is another factor.

Emissions of CH_4 and N_2O have been declining due to improvements in technological processes, the implementation of regulatory measures, and the decline in coal mining. The German government estimates that in 1998, non-CO_2 greenhouse gases made up about 13 per cent of GHG emissions.[24] There is some evidence of an increase in the three minor gases (HFC, PFC, SF_6). The German government is undertaking further research into these emissions and future trends.

The reduction of all greenhouse gases, particularly CO_2, has been significantly affected by the following factors:

- Coal produced 36 per cent of primary energy in 1990, but only 25 per cent in 1998. Meanwhile, coal production has almost halved. Inefficient and highly polluting lignite-fuelled power plants in the New Länder have closed.

- The use of imported natural gas for energy supply increased 20 per cent during 1997 and another 15 per cent during 1998. In 1990, natural gas contributed 15 per cent of primary energy, compared to 21 per cent in 1998. The share of oil in total energy use has risen between 1990 and 1998 from 36 per cent to 40 per cent.

- Legislation establishing the minimum payment for electricity generated from renewables has promoted its use. Installed capacity of wind power has increased from 61 MW to 1,122 MW, geothermal power has increased from 32 MW to 36 MW, and photovoltaic has increased from 1.6 MW to 10 MW — all between 1990 and 1995. However, only 2.5 per cent of energy production came from renewables in 1995. The legislation has recently been revised to improve the incentives for renewables.

- Partly because of reduced production in the New Länder, but also because of efficiency measures and reduced coal use, industry's CO_2 emissions have been cut by 23 per cent (45 mmt) from 1990 to 1998.

- The German government believes its programme of building reconstruction in the New Länder is a major factor in the government's ability to meet its CO_2 target. The government estimates that the effect of the amendment to the Thermal Insulation Ordinance (1 January 1995) is a reduction of CO_2 emissions by 8 mmt per annum.[25]

- Petrol and diesel taxation has also contributed. In 1998, the revenue raised was $5 billion. This is partly to reduce the cost of the German railway's pension fund and partly "ringfenced" for transport improvements, particularly for public transport. However, the German government stated to the IRT that the petrol and diesel tax must be doubled and road haulage charges must be "greatly increased" to achieve a reduction from 1987 emissions levels by 2005.[26] Petrol and diesel taxes are now being increased annually at rates well above inflation.

Means of Achieving Targets. The German government has produced a range of emissions forecasts based on different economic growth rates and scenarios. All indicate that the government's targets cannot be achieved without additional measures. The government estimates that without any such measures since 1990, CO_2 emissions would *increase* by 19 per cent by 2005 if economic growth continues at the current rate.[27] The government's programme to reduce GHG emissions has been updated regularly. The emphasis is on reducing current emissions from industry, buildings, and energy production, and reducing the increase in emissions from transport that would have occurred without policy measures.

The German government realised that significant steps had to be taken upon reunification in 1989 to modernise equipment, renovate old factories and offices, improve the quality of housing, and eliminate outdated technology in the New Länder. These actions, although not undertaken solely for environmental reasons, reduced emissions. The government stresses that its programme to reduce emissions covers all of Germany. The German government stated in 1999 in its documentation for COP5 that it has a "package of 150 measures" in operation or in preparation.[28] Another package will be finalised in 2000.

The package outlined for COP5 involves direct government intervention through education and training programmes, new economic instruments and tax reform, new legislation, and cooperation with the Länder (state governments) both directly and through obtaining the Länder's support in the Bundesrat.[29] An integral part of the programme involves voluntary agreements with industry backed by possible tax penalties for failure to achieve targets. The package covers action in different areas, particularly energy savings, energy generation, and transport. The FRG puts a high priority on savings in the production and use of energy in industry and in energy use in buildings. District heating systems and co-generation are promoted particularly in the New Länder.

Keys to Success. The main elements of the programme's success are:

- Voluntary Agreements with Industry: Both the current and previous German governments have emphasised persuasion rather than legal measures in obtaining lower GHG emissions from industry. In March 1996, 15 German industry associations signed a declaration on preventing global warming. These associations represented over 70 per cent of industrial energy consumption and 99 per cent of the public power generation capacity. The declaration requires industry participants to

make an overall 20 per cent reduction in CO_2 emissions between 1990 and 2005. The agreement also contains specific sectoral commitments. For example, the automobile industry as a whole agreed to reduce CO_2 emissions by 25 per cent from 1990 levels by 2005.

However, if reports of the monitoring mechanism established by the government indicate that this target may not be reached, the government will introduce further taxes on industry's energy consumption. The government has repeated its intentions in several statements. On 16 November 1999, for example, Mr. Jürgen Trittin, Federal Minister for the Environment, spoke at the Royal Institute of International Affairs in London, where he stated that additional taxes are "no idle threat."[30] There is some criticism from various environmental organisations that the targets are too low although the monitoring reports indicate that the ease with which industry has met the target varies between different sectors.

Discussions are now under way to adjust the targets to fit the Kyoto Protocol timetable, examine the extent to which other greenhouse gases can be included, and widen the scope of industries included in the agreement.

- Promotion of Renewable Energy: In 1999, renewables contributed about 5 per cent of electricity generation. The government plans to double this share by 2010.[31] Legislation fixes premium prices for electricity from renewables. In February 2000, the "German Renewable Energy Law" was adopted by the Bundestag to change the method of pricing, which has not been sufficient to promote renewables to the desired extent, and also to exempt renewables from energy taxation. Government expenditure on renewables is increasing annually and in 1999 was around $21 million per annum. Spending is focused primarily on investment grants for use of non-conventional energy sources, such as wind power, photovoltaics, solar collectors, biomass, and biogas. Germany is already the largest producer and consumer of wind energy in the world. Wind is expected to produce 3.5 per cent of German electricity by 2010.

- Promotion of Combined Heat and Power and District Heating: The Combined Heat and Power and District Heating programme works to promote and modernise district heating systems and to encourage use of co-generation. The government is reviewing the mechanism for setting electricity prices from co-generation, which has not provided an adequate incentive for co-generation use. The government aims to double the share of energy production from co-generation and district heating by 2010.[32]

- Road Traffic Measures: Between 1992 and 1998, the German government made four major increases in petrol and diesel fuel taxes. The Green Party had an election commitment to treble such taxes but did not make it a condition for their participation in coalition government. The petrol tax increased by 10 per cent in 1999, and the government committed to annual increases until 2002. Several measures, largely implementing EU vehicle type approval legislation, will be taken on fuel and emission efficiency of vehicle engines.

- Reduction of Coal Use for Electricity: The government ended the exclusive long-term contract between the coal industry and electricity utilities. Total coal mining subsidies will be reduced gradually by almost half from 1997 to 2005.

- Increase in the Use of Natural Gas: Germany has two reservoirs of natural gas in the North Sea with total capacity of over 450 billion cubic feet. Gas is expected to start moving through the new pipelines in early 2000. The pipelines have been designed to carry gas from other reservoirs that may be found in the area as well. Germany also concluded several agreements with foreign producers of natural gas. A pipeline to the New Länder was completed in 1994 and an agreement on supplies of natural gas from Russia was signed in 1995. The German gas industry now has contracts with Norway, Russia, and The Netherlands. Discussions are being held about a possible pipeline to the Middle East through Turkey, although there are considerable political difficulties involved.

- Coordination with Länder and Municipal Government: There have been changes in German energy sector law to provide for adoption of energy-saving measures by municipalities. Technical measures already reduce emissions of greenhouse gases other than CO_2 in municipal waste management. All Länder and many municipalities in the west have taken steps to improve public transport and discourage use of private cars. Increasing "pedestrianisation" and the development of bicycle lanes, maintenance and extension of tramways (a common means of transport in Germany), and improvements in underground systems are now commonplace in Germany.

  Many Länder officials support electricity generation from renewables. In Berlin, for example, municipal officials and the area's power firm, Bewag Ag, have invested $22.5 million since 1997 in solar energy projects. Several Länder have formed voluntary pacts or partnerships with local industry covering environmental management schemes, promotion of renewables and co-generation, waste disposal, eco-audits, and traffic management, among other things. Bavaria, for example, has been one of the first provincial governments to form a voluntary pact with industry.

- Eco-Taxes: Increases in petrol and diesel taxes are substantially above the rate of inflation, with further increases envisaged annually to 2002 (and, if necessary, beyond). In November 1999, the Bundestag adopted "The Law on Continuing the Ecological Tax Reform" that provides for a further four-step increase in taxation from 2000 to 2003 on various fuels. At the time of writing, the government is completing all the legislative and constitutional processes required to introduce further taxation. The main elements of these proposals are incentives for efficient use of energy, increased use of renewables and co-generation, and exemptions on taxation for gas-fired power stations. The proposals include a package of higher taxation on energy use in industry. However, to gain acceptance by industry, the cost to industry will be more than offset by payments to reduce employer and employee contributions to the state pension schemes.

While the German government has focused on reducing CO_2, CH_4, and N_2O emissions, which make up over 98 per cent of emissions, it has taken measures related to other greenhouse gases as well. The government is particularly concerned that hydrofluorocarbons (HFCs) may be on the increase and has initiated an examination of trends and possible measures.

The government is reviewing its policy on exports to the developing world in relation to the Clean Development Mechanism (CDM).[33] Particular attention is being given to products sold in countries where the FRG's high GHG emission standards for products sold in Germany do not apply. The government is undertaking a study with the iron and steel industry on the contribution that industry can make to CDM.

Although the German government has not ruled out domestic emissions trading and will play an active role in discussions on the European Commission's "Green Paper" on the subject, it has no plans to develop domestic emissions trading mechanisms. Such mechanisms do not have much support, as yet, from German industry.[34]

Obstacles to Achieving Targets. In its comments to the IRT review of July 1997, the German government stated that "the measures taken so far within the framework of the CO_2 reduction programme do not suffice to achieve the CO_2 reduction target."[35] The government is committed to additional measures to meet the target but there are obstacles to overcome:

- Controversy over Nuclear Energy: After reunification, all nuclear power stations in the New Länder were shut down for safety reasons.[36] Following the election of the Social Democrat/Green Party coalition in 1998, commitments were made to phase out nuclear energy, which Chancellor

Schröder described as "socially unacceptable." However, nuclear energy contributes 30 per cent of electricity supply in Germany and its removal would place Germany's commitments on climate change in severe jeopardy. Chancellor Schröder later described progress in phasing out nuclear energy as "step-by-step."[37] In his 1999 speech to the Royal Institute of International Affairs, Mr. Trittin also stated that the introduction of other non-CO_2-emitting energy sources and achieving the Kyoto objectives are "pre-conditions" for replacing nuclear energy.[38]

- Unpopularity of Tax Increases: German authorities see a need to increase petrol and diesel charges and road haulage charges to achieve their objectives under the Protocol. However, German taxes in these areas are already higher than in neighbouring countries and three times higher than in the United States. As a result, there is hardly a petrol station for miles on the German side of the Luxembourg border because Luxembourg's fuel tax is so much lower. Germany is striving for greater tax harmonisation at the EU level in this area.

  Further energy taxes are being introduced, although some compromises have been required. The government has to steer between the demands of environmental groups and members of government who would like higher taxes, and the business community, which argues that further energy taxation breaches the spirit of industry's voluntary agreement with government. Indeed, the government's program faces criticism from a variety of different directions. Some industrialists argue that Germany has taken too large a share of the EU burden. The government faces additional criticism from various environmental groups that it is not taking a tougher stance on transport. Despite these disagreements, there is general agreement on the need to reduce GHG emissions. It is the means rather than the end that causes controversy.

- The German Coal Industry and the Use of Coal for Energy Production: The Social Democrat Party has managed to obtain a reluctant agreement for coal mine closures from its own party supporters and trade unions, but it is doubtful whether this agreement will hold for further closures. Nevertheless, liberalisation of the energy market (largely as a result of EU legislation, which Germany has strongly supported) has inevitably led to greater pressure to use cheaper energy resources — particularly natural gas.

Political Commitment. Germany has been a long-time proponent of action on climate change and had been prepared to take by far the biggest share of GHG emission reductions as part of the Bubble. The coalition government that now includes the Green Party would be particularly supportive of the Kyoto commitments. The government's position was made clear in the Coalition Agreement between the Social Democrat Party and the Green Party on 20th October 1998: "The new Federal Government will intensify its efforts in all areas of climate protection. We reaffirm the target of reducing CO_2 emissions by 25 per cent from 1990 levels to 2005."

Further statements have been made underlining Germany's commitment on all six greenhouse gases. However, there are competing pressures on government, particularly regarding the future of nuclear energy and coal production. Establishing new eco-taxes also has not been easy in light of public opposition, especially to gasoline tax increases. The main opposition party — the Christian Democrats — has opposed much of this taxation, although it still strongly supports actions to meet both the 2005 national target and the Protocol obligations.

Monitoring Procedures. The German government has adopted several procedures to monitor progress. An inter-departmental ministerial committee was formed to review the progress of the overall programme on climate change and take decisions (subject to legislative approval) on future plans.

The Rhineland-Westfalian Institute for Economic Research also scrutinises the agreements with industry annually on the government's behalf. Two monitoring reports have been published on developments in 1995-96 and 1996-97. The first report, published in July 1999, shows the agreements to be on target overall but also draws attention to limitations, particularly in data collection and verification of figures supplied by industry.[39] The report also points to sectors with particularly high emissions and notes the strong effect on CO_2 emissions from increased rolled steel production resulting from higher economic growth. The reports, which focus on CO_2 emissions, do not indicate that the target set for industry as a whole is onerous. However, more detailed examination shows a wide variation in the extent to which individual companies and industry sectors have met the targets. The government regards the targets as part of the step-by-step approach that includes discussions on the possibility of more variance in targets among industry sectors.

Conclusions. Germany sees long-term commercial advantages in climate change, particularly as it has a 20 per cent share of the global export market for environmental technology. Nevertheless, its support for the objectives of the Kyoto protocol is largely based on the concern of its government about the effects of climate change. Greenhouse gas emissions are expected to have fallen by around 17 per cent between 1990 and 2000 (and CO_2 to have fallen around 13 per cent). This leaves Germany only six years to reach its domestic target of 25 per cent in CO_2 emission reductions by 2005. The reductions to date have been in East Germany, but a decline in emissions is now expected in the former West Germany as well. The government does face significant political obstacles concerning nuclear energy, coal production, and the containment of traffic growth. At present, the government plans to achieve its targets through action within Germany and has not developed ideas on the use of international emissions trading. Consequently, the domestic target of a 25 per cent reduction in CO_2 emissions and the Kyoto Protocol target of a 21 per cent reduction of GHG are steep — but not necessarily impossible — tasks. Parts of the government's plan are only now coming into effect and much of the legislation presented in late 1999 and early 2000 has yet to be implemented. Further potential measures were announced in April 2000.

The political commitment is strong. This is underlined by the keenness of the German government to see the Protocol enter into force by 2002. This political commitment, which is more than rhetoric, goes across the party political divide, as does the determination to change the policies and measures if they are not delivering. Chancellor Schröder repeated this in his speech at the COP5 meeting in Bonn, and there is no reason to believe that this view would be changed by any likely successor.

III. The United Kingdom

Introduction. Although not as pivotal as Germany in reducing the EU's GHG emissions, the UK's role in the Bubble will be significant. The United Kingdom has the fourth largest GDP and the second largest volume of GHG emissions in the EU. The UK ranks fourth in total GHG emissions within the G-7, after the United States, Japan, and Germany. In 1990, the United Kingdom's GHG emissions were 775 mmt — approximately 18 per cent of the entire EU, 33 per cent of the highest emitter (Germany), and 22 per cent more than the next highest emitter (France).[40] In per capita terms, the UK's GHG emission level (13.1 mt) was marginally above the average for the member states.[41]

The United Kingdom is committed to reducing GHG emissions by 12.5 per cent relative to 1990 levels by 2008/12 and will make approximately 29 per cent of the EU's emissions reductions — second only to Germany. The UK's position on this issue is also important because of its traditional caution in signing international environmental commitments.

UK Emissions Sources (1990). CO_2 comprised about 80 per cent of the UK's GHG emissions, CH_4 about 15 per cent, and N_2O about 4 per cent. The remaining three greenhouse gases made up between 1 per cent and 2 per cent.[42] Coal and oil are the two primary sources of emissions in the UK. In 1990, coal produced around 65 per cent of electricity and oil around 11 per cent. Other less polluting sources of primary energy were natural gas, which in 1990 was responsible for only 1 per cent of electricity generation, and nuclear, which contributed 21 per cent. Renewables produced less than 1 per cent.[43] Oil was mainly used as a fuel for transport. Sources of emissions by sector are presented in Table 4.

Table 4

CO_2 Emissions Sources United Kingdom, 1990

	Percent
Power Stations	32
Industry	21
Transport	21
Residential	13
Services	5
Land Use Change	5
Refineries	3

Source: "Climate Change: Draft UK Programme," Department of the Environment, Transport and the Regions, February 2000, Annex C.

British Commitments on Climate Change. The British government set a target before the Kyoto protocol was negotiated to return its GHG emissions to 1990 levels by 2000. The UK commitment was "gas by gas" (i.e., it takes measures to return emissions of *each* GHG to 1990 levels by 2000).[44] In May 1997, the incoming Labour government adopted a target in its election manifesto — a 20 per cent reduction in CO_2 by 2010 compared to 1990 emissions levels. On the government's assumption that non-CO_2 gases would fall faster than CO_2, this reduction is in effect almost twice the Kyoto Protocol commitment of 12.5 per cent for all GHGs. The government reaffirmed its commitment to this target in its draft climate change programme, published in February 2000.[45]

Progress to Date. Between 1990 and 2000, the reduction in GHG emissions is estimated at 14.6 per cent.[46] This reduction resulted from a 9 per cent decrease in CO_2 emissions, a 31 per cent decrease in CH_4 emissions, and a 34 per cent decrease in N_2O emissions. Between 1995 and 2000, HFCs also decreased by 54 per cent and PFCs fell by 33 per cent. SF_6 emissions, however, have increased by 33 per cent. The changes in emissions by sector over the same time period are presented in Table 5.

Table 5

Changes in Greenhouse Gas Emissions by End User, United Kingdom (1990-2000)

	Percent Change	Total Share of Emissions	
	1990-2000	1990	2000
Business	-17	43	37
Transport	6	18	23
Domestic	-12	23	23
Agriculture, Forestry, and Land Use	-10	12	13
Public Sector	-14	5	5

Source: "Climate Change: Draft UK Programme," Department of the Environment, Transport and the Regions, February 2000, Table 2, page 6.

These reductions have been affected primarily by changes in fuel use for electricity generation over the same period:

- Coal's share *fell* from 65 per cent in 1990 to about 50 per cent in 1994 and 38 per cent in 1999.
- Oil's share *fell* from 11 per cent in 1990 to 5 per cent in 2000.
- Nuclear energy's share *increased* from 21 per cent in 1990 to 26 per cent in 2000.
- Natural gas' share *increased* from 1 per cent in 1990 to 28 per cent in 1999.[47]

The government publication "Energy Report 1998" predicted that the share of natural gas-fired generation might grow to as much as 60 per cent by 2003 and the share of coal might fall to under 10 per cent.[48]

Means of Achieving Targets. Fuel switching from coal to natural gas-powered generation has been the chief cause of emissions reductions in the UK to date. Indeed, by 2000 the United Kingdom has already achieved its target for 2008/12. However, government projections show an increase in GHG emissions between 2008 and 2012 unless further measures are taken, which the government has introduced to meet its national objectives and the Kyoto targets.[49] The government produced a consultation document in February 2000 with proposals for continuing or intensifying current policies and outlining new measures.[50]

Fuel switching from coal to natural gas, which has yielded about half the reductions in the period 1990 to 2000, will continue. Further emphasis will be placed on increasing the share of renewables in electricity generation and improving the productivity of nuclear energy. The programme also includes energy-savings measures such as voluntary agreements with industry, district heating and co-generation, and residential energy savings. These measures have already contributed almost one-quarter of the reduction in CO_2 emissions between 1990 and 2000. Energy taxes will also be applied to industry.

Non-CO_2 GHG emissions are also dropping as a consequence of these measures. Methane emissions will fall due to the decline in coal mining and measures relating to landfill waste. Methane emissions from dairy herds also fell by 8 per cent between 1990 and 2000 as a result of higher productivity and improved feeding. N_2O emissions are decreasing due to a decline in the manufacture of adipic acid (a chemical used in the production of nylon) and agricultural measures that reduced nitrogen fertilizer use by 10 per cent between 1990 and 1998.

Keys to Success. The main elements of the programme's success are:

- Liberalising the Energy Market: Government policy from the mid-1980s has transferred energy generation to the private sector and deregulated the energy market. The tie between mines and power stations was broken. Coal-fired power generation was gradually replaced by cheaper natural gas-fired generation. This policy was modified in October 1998 when the government announced that new natural gas-fired generation would normally be inconsistent with the

Government's energy policy concerns relating to diversity and security of supply.[51] The government later announced that its position on natural gas is "short term, temporary, and aimed specifically at protecting diversity and security of supply while the distortions in the market are removed."[52]

- Encouraging Renewables, Combined Heat and Power (Co-generation), and District Heating: After World War II, UK legislation, which took electricity production into state control, provided no incentive for co-generation. In contrast, the development of co-generation is now encouraged by government. The government plans to double the capacity of co-generation between 2000 and 2010. Production from renewables is about 2 per cent in 2000 and is forecasted to rise to 5 per cent by 2003. The government estimates that this increase will cut greenhouse gas emissions by about 1.5 per cent from 2000 levels.[53] The government's policy is to ensure that renewables will contribute 10 per cent of electricity generation by 2010, although this scenario is "subject to the cost to consumers being acceptable."[54]

  Generators will be obligated to supply electricity produced from renewable sources (and from "good quality" co-generation).[55] Electricity from renewables (with the exception of large-scale hydro) will be exempt from the energy tax (see below) and will benefit from promotion supported by the "Climate Change Levy Fund."

- Increasing Fuel Duty: Government policy, under both Conservative and Labour administrations, has been to increase fuel duty by 5 per cent more than inflation each year (called the "fuel duty escalator"). This has been supported by the introduction in 1999 of a lower tax on private automobiles of 1,100 cylinder capacity (cc) or less (about 8 per cent of vehicles in 1999). The government plans to introduce further changes in automobile taxation to encourage the use of fuel-efficient vehicles. However, the escalator will not apply for the next tax year (2000-01) because higher oil prices are expected to discourage automobile use.

- Introducing Value-Added Taxes on Fuel for Residential Use: Emissions from households account for 25 per cent of UK CO_2 emissions.[56] The Value-Added Tax (sales tax) on domestic fuel, which was introduced at 8 per cent in 1993, was raised to 17.5 per cent in April 1995. Following the change in government in 1997, the tax was reduced to 5 per cent.

- Implementing Measures To Reduce Landfill Waste: Measures were taken to promote waste minimisation, recycling, and increased energy recovery from waste. A landfill levy was introduced, with revenues earmarked for environmental projects or for offsetting employment taxes. The government aims to reduce the amount of industrial and commercial waste landfilled to 85 per cent of 1998 levels by 2005, recover 45 per cent of municipal waste by 2010, and recycle or compost 30 per cent of household waste by 2010.

- Introducing Energy Taxation: Revenue from the energy tax on industry will be recycled to reduce other industrial costs. This "Climate Change Levy" will also enable heavy energy users to gain 80 per cent reductions if they sign an agreement to deliver significant emissions cuts. The funds generated will be recycled into industry through reductions in contributions businesses make for employee state pensions and other benefits (National Insurance Contributions). The government has strongly resisted the proposal from the EU for an EU-wide energy products tax, largely on the grounds that such taxation should be left to the member states.

- Examining Domestic Emissions Trading: The government is working with industry to find ways of introducing a domestic carbon emissions trading system. Around 40 companies and trade associations have formed the UK Emissions Trading Group to examine/develop such a system.

"Climate Change: Draft UK Programme" (February 2000) outlines many of the strategies mentioned above. Following public consultation the government will prepare a final UK programme by autumn 2000 and "will then be ready to ratify the Kyoto Protocol."[57] However, the government also makes clear in the same document that it will ratify at the same time as all other EU member states.

Obstacles to Achieving Targets. The European Environment Agency states in its 1999 report that the UK "is exceeding largely its national objective to stabilize greenhouse gases emissions by the year 2000 at 1990 emission levels."[58] However, there are potential obstacles for 2000 to 2012 that could frustrate efforts to achieve the Kyoto Protocol targets. The UK's success to date has been due largely to the considerable reduction in coal burning. Fuel switching will have diminishing returns, leaving less scope for future reductions. The change of government in 1997 led to modification of some policies, such as the cut in the tax on fuel for residential use and the end of the freedom to replace coal with natural gas and nuclear energy for power generation. There were compensating changes, particularly the discouragement of the use of the automobile through petrol taxation. However, the government is moderating this policy, arguing that the increase in world oil price will act as a strong disincentive (although critics of the government claim the change reflects strong public opposition to higher petrol prices).

Political Commitment. The United Kingdom has been a long-time proponent of action on climate change and has been willing to take a significant share of the GHG emissions reductions as part of the EU Bubble. The government elected in May 1997 maintains this position, not least by giving responsibility for the subject to the Deputy Prime Minister, Mr. John Prescott. Since then, the Deputy Prime Minister has

shown a strong personal commitment and has put forward his views on the subject on many occasions. The Blair government also established the ambitious target of 20 percent reductions in CO_2 emissions from 1990 levels by 2010.

There are, however, competing pressures on the government, particularly on the transfer of electricity production from coal-based generation to natural gas and nuclear power and on taxation to restrain residential fuel consumption. Higher taxation on vehicles faces opposition from automobile owners and businesses. The government's tough restatement of its commitment and the clear presentation of measures in the February 2000 Draft Programme indicate that the UK intends to go beyond its Bubble target and achieve its national target of a 20 per cent reduction in CO_2.

Monitoring Procedures. The government will be under pressure from opposition parties to maintain its momentum and produce detailed monitoring figures. The only definitive commitment is a formal review in 2004.[59] Otherwise, the procedures in the government's climate change programme are vague and the Conservative Party has used this ambiguity as its main plank in attacking the government's proposals. It is likely that tighter procedures will have to be put in place.

Conclusions. The United Kingdom has made a clear political commitment to the Kyoto Protocol. Like Germany, it faces some political difficulties concerning nuclear energy, the decreased use of coal, the growth of domestic energy use, and the containment of traffic growth. The government's optimism regarding savings of emissions from domestic use is not universally shared because of its cut in tax on domestic energy use.[60] However, these difficulties do not, as yet, threaten the fulfillment of its commitment. Although the target of 10 per cent of electricity generation from renewables is ambitious, the detailed programme now produced suggests it may well be achieved. Although UK governments have been consistently opposed to the EU draft energy tax, the current government has introduced its own form of energy taxation on industry. The difficulties relating to coal-fired generation and nuclear energy are not as strong as in Germany. Despite the government's modification of policy on transferring to natural gas-fired generation, it has now confirmed that it does not expect much slow-down in the development of such production. It is expected that the government's original objective of GHG emissions being at 1990 levels in 2000 will be an overestimate and that figures for 2000 will show a 15 per cent reduction below 1990 levels.[61]

Consequently, the UK's Kyoto Protocol target (a reduction of 12.5 per cent of GHG emissions relative to 1990 levels by 2008/12) seems realistic. Meeting the target, however, will depend on the government carrying through the programme outlined in its February 2000 document confirming its view that a 20 per cent reduction in CO_2 could be achieved as a result of the measures outlined.

IV. The Netherlands

Introduction. The Netherlands is one of the smaller member states. Gross domestic product is equal to approximately 6 per cent of the EU total. In 1990, Dutch GHG emissions were 208 mmt — approximately 5 per cent of the EU and 17 per cent of the total level of emissions of its neighbour Germany.[62] In per capita terms, emissions are marginally higher (13.5 mt) than the average for the EU.

Given its size and, therefore, its small share of the overall EU total of emissions, the Netherlands may not seem at first glance to be central to the EU's objective to reduce greenhouse gases. However, the Netherlands is one of the six founding countries of the Common Market (formed in 1957 and now the EU). By virtue of having both a successful economy and being one of the strongest advocates of a more integrated Europe, the Dutch government is expected to take a lead on many EU issues. In particular, it is considered an environmental leader both within the EU and internationally. The Netherlands held the EU presidency in 1992 and 1997 and gave strong leadership during climate change negotiations. However, with relatively high economic growth and an economic base geared to high-energy use, the Dutch government's ambitions to reduce GHG emissions may be more difficult to realise than it envisaged.

Dutch Emissions Sources (1990). In 1990, CO_2 comprised about 78 per cent of greenhouse gas emissions from the Netherlands, CH_4 about 11 per cent, N_2O 9 per cent, and the remaining gases (PFCs, SF_6, and HFCs) 2 per cent. Natural gas provided 50 per cent of the energy supply, oil about 33 per cent, coal 10 to 15 per cent, nuclear about 1 per cent, and renewables 1 per cent (mostly from waste utilisation).[63]

The major emissions sources were energy production (30 per cent), industry (29 per cent), transport (16 per cent), the residential sector (13 per cent), and agriculture (11 per cent). Commercial transport is highly competitive and has played a major part in establishing the Netherlands as the leading distribution and refining centre for northwestern Europe. Because it is a major processing centre for petrochemicals and metals, the Netherlands has a highly energy-intensive industry structure. Emissions from bunker (aviation and marine) fuels were 25 per cent of total CO_2 emissions. The IRT noted that this is "the highest

percentage reported by Parties that have submitted communications."[64] Agriculture is a higher contributor of emissions than usual in Europe largely because of the heating required for greenhouses and for producing CO_2 for fertilisation. The price of gas and electricity for industry is generally low relative to other EU member states.[65]

Dutch Commitments on Climate Change. The main commitment of the Dutch government within the EU Bubble is a 6 per cent (about 12 mmt) reduction in CO_2 emissions by 2008/12 compared to 1990 levels. Before making this commitment, the Dutch government established a national target of a 3 per cent reduction in CO_2 emissions between 1990 and 2000. The Dutch target for CH_4 reductions is 10 per cent for the same period. The 2000 target for N_2O is a level no higher than that of 1990.[66] There are no specific targets for HFCs, SF_6, or PFCs, but the Dutch government plans to include these gases in its overall reductions programme.

Progress to Date. As the European Environment Agency stated in its recent report, the Netherlands CO_2 emissions in 2000 are expected to be 17 per cent higher than in 1990.[67] Not only will the Netherlands have failed to meet its own target of a 3 per cent reduction, but it will also fail to meet the overall EU objective of stabilising CO_2 emissions at 1990 levels by 2000.[68]

The Dutch government expects that CH_4 emissions will be reduced by about 30 per cent in 2000, largely exceeding the 10 per cent reduction objective. However, N_2O emissions in 2000 are expected to be 14 per cent higher than in 1990.[69]

Despite its disappointing performance, particularly on CO_2 emissions reductions, the Dutch government has two achievements. The first is the agreement with industry to save energy and increase production efficiency, which has saved about 6 mmt of GHG emissions from 1990 to 1997. The second is the doubling of co-generation capacity to 7,800 MW (covering in 2000 up to 40 per cent of installed electricity generation capacity) between 1990 and 1998.

Emissions have grown significantly, however, in the transport sector from 31 mmt in 1990 to 36 mmt in 1997.[70] There also has been no significant reduction in GHG emissions from the horticulture sector despite a 48 per cent improvement in energy efficiency in this sector between 1980 and 1998. The increase in efficiency is due to the use of small-scale co-generation, improvements to greenhouses, use

of residual heat, and improved productivity (i.e., higher crop production per square meter). Nevertheless, this improvement in efficiency has yet to see returns in a reduction of GHG emissions in this sector.

One reason for the failure of the Netherlands to achieve its emissions targets is the policy of cheap energy for industry relative to other EU countries, which goes back to the development of the natural gas reservoirs in the North Sea and Groningen. Relatively low oil prices between 1990 and 2000 and the liberalisation of the energy market in the EU have exacerbated this situation. In addition, the Netherlands has had one of the more successful economies in the European Union, with an economic growth rate above the average for the EU.

Means of Achieving Targets. The Dutch government has devised several scenarios to reduce emissions based on differing levels of economic growth. Using the current forecasts of economic growth, the government predicts that GHG emissions would increase by about 20 per cent between 1990 and 2008/12 without existing policy measures.[71] Given the considerable increase in Dutch emissions from 1990 to 2000, this forecast could be an underestimate.

To address the situation, the Dutch government has devised a policy package in three parts:

- Domestic measures planned or in operation.
- Measures outside the Netherlands to be taken at a later stage.
- Reserve Measures, which may be taken following future programme evaluations.

Domestic measures are designed to halve the shortfall by 2008/12. This is to be achieved primarily through energy conservation in the residential and business sectors and reductions in the carbon intensity of fuel, with greater reliance on renewable energy sources and transport measures.

The energy-savings programme includes increasing use of co-generation, reducing emissions from residential and commercial buildings, and providing energy performance advice to both residential and business users. The government's transport programme includes tax incentives for fuel-efficient passenger cars, road pricing (i.e., charging vehicles for the use of roads liable to congestion, particularly at peak periods), further taxes on private cars, stricter control of speed limits, and tax incentives to encourage fuel-efficient driving behaviour.

The main part of the government's programme to reduce emissions is an increase in the market share of renewables to 10 per cent by 2010.[72] The government also has voluntary agreements with industry to improve energy efficiency at coal-fired power stations and to reduce emissions from offshore gas production from gas venting. CH_4 emissions will be cut through increased recycling and increasing the use of waste for energy. As we have seen, the government also has a programme to improve energy use in horticulture.[73]

Measures Outside the Netherlands would follow the government's intention to apply the Kyoto Mechanisms (Joint Implementation, Clean Development Mechanism, and Emissions Trading). The Dutch government is taking as its lead the EU position that countries should make no more than 50 per cent of their total effort outside their own borders. Consequently, the Netherlands plans to achieve 50 per cent of its commitment through emissions trading. However, although the government has made a preliminary allocation of funds for this programme, no plan has yet been devised, pending clarification on the overall EU policy towards emissions trading.

Reserve measures will be prepared if emission reductions fall short of achieving the domestic target. However, reserve measures will not automatically go into operation in the event of a shortfall. The government's plans for 2002 and 2005 include a full evaluation of Dutch progress in reducing GHG emissions. Following each review, the government will decide if measures should be taken. The government has indicated the following actions are likely to be taken if new measures are needed:

- Raising the regulatory energy tax.
- Raising excise duties on motor fuels.
- Reducing N_2O emissions in the chemicals industry (depending on the successful development of a catalyst).[74]
- Beginning underground storage of CO_2 produced by several large industrial sources.[75]
- Instituting mandatory building inspections.

Keys to Success. Success depends on the following components of the government's strategy:

- Voluntary Agreements: The government has formed agreements with target industry groups, aided by regulations and investment support in the form of subsidies and positive tax incentives.

The larger, more energy-intensive companies are participating in a "benchmark covenant." These companies have committed to making their plants among the most efficient in the world by 2012. Beginning in 2000, less energy-intensive companies will be asked to take all energy conservation measures that have an internal rate of return of at least 15 per cent. Government funding will be provided to support these measures. The government considers this component to be one of the most potentially successful parts of its emissions reduction programme.[76] The government is also working on an agreement with the power industry to reduce CO_2 emissions from coal-fired power plants and to replace coal with wood for fuel in two power stations.

- Fiscal Incentives: Building owners and users will receive financial support for taking measures to improve energy efficiency following receipt of energy performance advice and for purchasing the most efficient appliances. Motorists are encouraged to use dashboard instruments that encourage fuel-efficient driving behaviour. These instruments are excluded from taxes on cars.

- Taxation: An energy tax was introduced in 1996 and has been raised every year since. The agreement between the parties in the Dutch coalition government is to increase the tax again in 2000 and 2001. Renewable energy is exempt. This ensures that the price of electricity from renewables is no higher than the price from other sources. Tax changes have been introduced to penalise commuting in cars and the use of company cars.

- Agricultural Measures: The government reached an agreement with the greenhouse horticulture sector to improve energy efficiency by 65 per cent between 1980 and 2010. The agreement also encourages the use of renewable energy and includes tax incentives. As indicated earlier, the effect on GHG emissions has been disappointing.

- Co-generation: The target for co-generation capacity is 8,000 MW in 2000 and 15,000 MW in 2010. The effect of the liberalisation of the energy market on co-generation in the Netherlands is uncertain.[77]

Obstacles to Achieving Targets. Tackling climate change is not easy in a country that is a leader in international road haulage, depends on energy-intensive industry, and has a cheap energy policy for industry. The Dutch government substantially underestimated the task of reducing emissions. Much will depend on the Dutch programme to increase energy taxation and on industry's ability to take advantage of its voluntary agreements and fiscal incentives. The main obstacle is the extent to which the electorate will accept tougher measures — particularly ones that could mean significant tax increases and restrictions for certain industries.

Political Commitment. Because the Netherlands constantly has to guard against rising sea levels, there is no doubt that action on climate change is strongly supported by the public and the government. At first sight, there are no aspects of the subject on which there appear to be political problems, with all major political parties agreed on the need for action on emissions. More than most other EU governments, the Dutch government has a strong belief that success in meeting the overall EU target depends on developing overall EU policies, especially on energy taxation.[78] In the absence of such policies, the Netherlands still appears determined to achieve its commitment on climate change. However, it is unclear whether that willingness to act will remain if tougher action is required, particularly because such action may involve burdens on businesses that have a heavy reliance on energy and have been major contributors to the Dutch economic success.

Monitoring Procedures. The Dutch government has instituted regular monitoring arrangements that are coordinated through the Ministry of Housing, Spatial Planning and the Environment. The Ministry makes regular reports to the Cabinet and has established a network of programmes through various Dutch institutes. Government reports are internal, but many of the reports from the institutes are published and made available to the public. In 1999, the government produced a comprehensive review of its position on GHG emissions. The review was designed for the public and did not disguise the problems being encountered.[79]

Conclusions. The level of CO_2 emissions will have increased by 17 per cent from 1990 to 2000 in contrast to the Dutch government's original commitment to reduce CO_2 by 3 per cent over the same period. The Kyoto target of 6 per cent reduction of GHG emissions between 1990 and 2008/12 seems highly unlikely to be achieved even taking into account the possibility of buying part of the obligation through emissions trading. Further action is built into the government's plans but it will be a hard task to put its programme on course. These plans will hit at some of the traditional strengths of the Dutch economy — transportation and its energy-intensive industry — and will likely involve further taxation. However, the Dutch commitment to the reduction of GHG emissions is very strong. In recent years, the Netherlands has shown a willingness to confront problems. This willingness can be seen by action in cutting wages and introducing labour flexibility to ensure high employment, economic growth, and competitiveness. Nevertheless, it is difficult to avoid being pessimistic about the ability of the Netherlands to achieve its obligations under the Kyoto Protocol.

V. Austria

Introduction. Austria is one of the smaller members of the European Union and joined the EU in 1995. Its gross domestic product is about 2 per cent of the EU total. In 1990, GHG emissions were 74 mmt,[80] approximately 1.7 per cent of the EU total and equivalent to 6 per cent of its neighbour, Germany. Austria's emissions are amongst the lowest in per capita terms (9.2 mt) in the EU; in 1990, they were approximately 30 per cent below the member state average.

Despite being a small country and having a small share of the overall EU total of emissions, Austria plays an important role in the EU's emissions reduction plan. The government has agreed to a significant cut (13 per cent) in GHG emissions between 1990 and 2008/12. By virtue of its geographical position, it is often regarded as an example by its Eastern European neighbours. Because of its strong reputation for environmental leadership, it is also regarded as a model by other European countries. Government policy relies heavily on renewables and forbids the use of nuclear energy; other member states are following these policies closely. There has been considerable public concern about the volume of traffic on the road — particularly en route from Italy to Germany. As a result, the government has invested heavily in rail transport for both passengers and freight. The EU's disapproval of the inclusion of the Freedom Party in the current coalition government assembled in February 2000 means all Austria's policies will be carefully scrutinised in the light of its commitments to EU and international programmes.

Austrian Emissions Sources (1990). In 1990, CO_2 made up about 78 per cent of GHG emissions, CH_4 about 17 per cent, and N_2O about 4 per cent, with the remaining three gases around 1 to 2 per cent.[81] The major source of CO_2 was power generation from coal, industrial emissions and transport. CH_4 emissions came from waste, estimated at 38 per cent, followed by agriculture (36 per cent) and land use (22 per cent). N_2O emissions sources were fossil fuel combustion (31 per cent), agriculture (37 per cent), and land use (29 per cent).

A significant feature of the Austrian energy position is its high reliance on renewables, which contributed around one-quarter of energy production in 1990.[82] Of this amount, hydropower accounted for

65 to 70 per cent of electricity production. Biomass (often through district heating, to which 10 per cent of the housing stock is connected) contributed around 12 per cent of total energy. Fossil fuels provided the bulk of the remaining energy. Coal use, which in 1994 represented nearly one-fifth of CO_2 emissions, is declining.[83] The government is phasing out subsidies for the small quantity of domestic brown coal production as well, but coal is imported on favourable terms from Eastern Europe. The supply of natural gas has been increasing. Nuclear power is banned by law.

Austrian Commitments on Climate Change. Within the EU Bubble, the Austrian government has committed to a 13 per cent (about 10 mmt) reduction in GHG emissions between 1990 and 2008/12. Austria initiated policies on climate change in the late 1980s. It subscribed to the Toronto Agreement that requires each country to achieve a 20 per cent reduction in CO_2 emissions between 1988 and 2005.[84]

Progress to Date. The latest data available show that CO_2 emissions increased by around 8 per cent from 1990 to 1998.[85] Taking into account that other greenhouse gases have fallen, the increase in overall GHGs should be less than 8 per cent. The latest official figures from the European Environment Agency (EEA) estimate that GHG emissions have increased by 1.5 mmt (2 per cent) over the period. However, the EEA appears optimistic about Austria's potential for achieving its Toronto target, implying Austria could achieve its Kyoto target.[86]

Means of Achieving Targets. The Austrian government has produced various scenarios on emissions forecasts with and without action and based on different economic growth rates. All scenarios clearly indicate that government targets cannot be achieved without additional measures. Without any measures, GHG emissions would increase by 8 per cent from 1990 to 2008/12.[87]

The Austrian government has therefore devised a policy package focusing on energy saving, transport, power generation, waste management, and agriculture and forestry. The government estimates that the energy-saving programme will yield 41 per cent of the emissions reductions. The programme addresses energy efficiency (or energy use) in industry, the residential building sector, district heating, and co-generation schemes. Action in the transport sector is estimated to reduce emissions by 13 per cent. These policies address zoning regulations, incentives to switch goods transport from road to rail, local transport management, investment in local transport systems, reduction in fleet fuel consumption, and

road pricing schemes. Changes in power generation will reduce emissions by at least 30 per cent and focus largely on investment in renewables. Waste management will reduce emissions by 13 per cent through improved management schemes and improved control over landfill emissions. Action on agriculture and forestry will reduce emissions by 1 to 2 per cent through improved management and propagation of wood products.

Keys to Success. The main features of the programme are as follows:

- Promotion of Renewable Energy: The Austrian government is increasing its investment in renewables, which already plays a major part in the energy supply in Austria. In particular, Austria is boosting its investment in heat pumps and biomass, biogas, small-scale hydropower, and wind power.

- Road Traffic Measures: In 1992, Austria introduced a new system of automobile taxation to encourage the purchase of energy-efficient vehicles. This is based on increasing the level of taxation on automobiles with higher levels of fuel consumption. For example, an automobile with fuel consumption of 3 litres per 100 kilometres is taxed at the minimum rate of 20 per cent. An automobile that uses 11 litres per 100 kilometres is taxed at 39.2 per cent.

  Austria has a large volume of transit traffic over the Alps between Italy and Germany and from east to west. To reduce traffic, motorway user charges (the "vignette") were introduced in 1997. In 1997, the "eco-point" system, which effectively limits the number of journeys that goods vehicles can make, was devised for vehicles with high NO_x levels. This system is intended to motivate manufacturers to modernise vehicle fleets. There has been considerable investment in both existing and new rail links with incentives to use rail for freight.

- Energy Saving in Buildings: Austria has revised its building codes for thermal efficiency in residential buildings. This action alone is estimated to contribute 15 per cent to the 2008/12 target.

- Energy Taxation: In May 1995, mineral oil tax rates were increased by between 50 and 150 per cent and a tax on liquid gas for heating was introduced.[88] For energy-intensive industries, an upper limit was introduced on the tax burden of 0.35 per cent of the net value added. Part of the revenue from these taxes is earmarked for local public transport systems.

- Agriculture and Forestry: Energy production based on biomass (mainly wood and wood waste) is a central feature of Austria's low GHG emissions policy. In 1998, there were 22,500 biomass-based heating systems with a total installed capacity of 2,200 megawatts, and 360 heat distribution systems. Austria also promotes biodiesel, which had a production of approximately 17,000

tonnes in 1997.[89] Action is being taken to protect forests from pollution and pests to ensure continued forestry production. However, because of a large increase in forestry between 1970 and 1990, little further increase is anticipated.[90]

- Waste Management: Since 1997, the Landfill Ordinance has limited the carbon content of new landfills, which has reduced CH_4 production as well. This policy will be extended to all landfills after 2004.

Obstacles to Achieving Targets. Although the Austrian winter creates a considerable requirement for heating, Austria's capacity for generation from renewables — particularly biomass and hydropower — places it in a strong position to reduce GHG emissions. However, there are considerable obstacles to progress:

- Subsidies for coal-powered generation are still higher than subsidies for hydropower. Action may be needed to phase out coal subsidies more rapidly than anticipated.
- The monopoly in energy supply has produced over-capacity and a delay in implementing new technologies.
- Cutting subsidies for commuting by automobile is politically unpopular.
- The policy forbidding nuclear power in Austria eliminates one no-carbon generation option.

Dr. Martin Bartenstein, former Austrian Minister for Environment, Youth and Family, stated at the COP5 meeting in Bonn that "emissions reduction from power generation by switching to nuclear power is not an option" (2 November 1999). Indeed, the Austrian government is taking a tough stance over the future of nuclear power in neighbouring countries currently in negotiation to join the EU, although these countries would have the right to export electricity to Austria after accession to the EU. This concern particularly applies to Slovenia, which shares a nuclear power station on its territory with Croatia.

Political Commitment. The environment has been a central political issue in Austria and is reflected in the government's attitude towards nuclear energy and transit traffic. Public concern about the effect of climate change on snow and water levels ensures Austria will continue to be among the leaders calling for action.

The Austrian government's commitment to its targets has been firm — so far. This commitment is underlined by statements from the new Austrian government. However, given its strength in renewables, Austria did disappoint other member states in not being prepared to assume a higher reduction target.[91]

Monitoring Procedures. In formulating policy, Austria has built a tradition of close government involvement with business and trade unions. This tradition is reflected in arrangements for combating climate change. The Ministry of the Environment has established a council of trade unions, chambers of commerce, and industry organisations (referred to as the "social partners") to review progress on climate change commitments. This council reports annually to the government. The Federal Environmental Agency collects data on greenhouse gases for the Council. The Austrian Council on Climate Change — an expert body that assesses implementation issues — undertakes a more independent check.

The policy of close cooperation between government, business, and labour has received much praise for contributing to Austria's economic regeneration since World War II. More recently, there has been concern that collusion is not always beneficial or objective. It remains to be seen if such concerns will lead to changes in consensus procedures.

Conclusions. Because of its substantial supply of renewable energy, at first sight Austria would not have significant problems in meeting its obligations. Essentially, its task is to continue with much the same policy in building up energy supply from renewables, improving energy saving in homes, and taking a firm line on transport. However, Austria starts from a position of a low per capita level of emissions and, consequently, diminishing returns from government action are possible. At the moment the signals are not clear. The latest figures from the European Commission on CO_2 emissions are not encouraging. Because of the high use of renewables for energy production, the Austrian public appears to believe that the country has no great problem from emissions from sources other than transport and could react against tougher measures.

VI. Spain

Introduction. Spain has a gross domestic product equal to 8 per cent of the EU total with the third lowest per capita income in the EU. In 1990, Spanish GHG emissions were 301 mmt, approximately 7 per cent of the EU total, making Spain the fifth highest emitter.[92] However, Spain's emissions level was the second lowest after Portugal in per capita terms (7.6 mt) and approximately 42 per cent below the average of the EU member states.

The low level of per capita emissions reflects the relatively low level of economic development and a per capita GDP approximately 20 per cent below the EU average. Reducing the disparities in economic development among member states has always been a central policy in the EU. [The creation of the Euro as a single currency, for (at present) 11 member states, has added to the importance of this policy.] The other member states accept that a reduction in Spain's emissions levels could threaten its economic development and worsen its already high level of unemployment.

This explains the agreement that Spain's target under the Bubble would be an increase in emissions of up to 15 per cent for 2008/12 relative to 1990. This increase is acceptable to the EU given the large reductions commitments assumed by Germany and the United Kingdom. Nevertheless, Spain has to ensure that it restricts emissions to the maximum allowable increase of 15 per cent.

The availability of statistics on Spanish GHG emissions is more limited than for other member states covered in this report. Spain has not fully met its obligations to forward statistics required under EU agreements to the European Commission and the European Environment Agency. The lack of data limits the extent of this analysis of Spain's ability to meet its Bubble target.

Spanish Emissions Sources (1990). In 1990, CO_2 comprised about 71 per cent of Spanish GHG emissions, CH_4 about 17 per cent, N_2O about 10 per cent, and the three other gases 1 per cent.[93] Spain is highly dependent on imported coal and oil for electricity generation. Oil provided the bulk of primary energy sources, nuclear about 14 per cent, and renewables (mainly biomass) less

than 1 per cent. Hydropower potential is limited due to recurrent droughts. The government subsidises Spain's limited coal production to protect energy security. In 1990, transport contributed about 30 per cent of CO_2 emissions.[94]

Spanish Commitments on Climate Change. Spain's main commitment within the EU Bubble is to restrict the growth of GHG emissions to no more than 15 per cent between 1990 and 2008/12. Before Kyoto, Spain's 1991-2000 Energy Plan (which assumes an average annual gross domestic product growth rate of 3.6 per cent in the 1990s) limited the growth of its energy-related CO_2 emissions to 25 per cent for the period of the Plan. Without such measures, CO_2 emissions could have increased by 45 per cent.[95] Although the share of emissions from non-CO_2 greenhouse gases is higher than for most industrialised countries, Spain has no specific emissions reduction targets for these gases. The government predicts that the level of non-CO_2 emissions will increase at a lower rate than that of CO_2.

Progress to Date. Between 1990 and 1995, CO_2 emissions rose by around 10 per cent, CH_4 emissions rose by 9 per cent, and N_2O emissions fell by 4 per cent. The government's forecast for 2000 is that the overall increase in emissions will be around 11 to 13 per cent over 1990 levels, while CO_2 emissions will be around 14 per cent higher than 1990.[96] Various Spanish environmental organisations have criticised these estimates, claiming that from their research the percentage is higher.[97]

The following developments have helped restrict Spain's growth in GHG emissions:

- Natural gas is expected to double its share of the total energy supply in 2000 over 1990 levels to about 12 per cent; it is also expected to account for about 15 per cent of electricity production this year. This development is largely due to new pipelines from North Africa and the establishment of natural gas networks. There is also a gradual replacement of coal and oil by natural gas in domestic heating and cooking.

- The government has been closing coal mines since 1990. Coal is no longer a primary energy source. The national Energy Plan had envisaged that coal would provide about 20 per cent of total energy in 2000.

- Energy efficiency in industry is improving. The Spanish Energy-Saving and Efficiency Plan adopted in 1992 had projected a 12 per cent increase in energy efficiency in the Spanish economy between 1990 and 2000. However, the final figure for 2000 is expected to be lower.

- The policy promoting co-generation and renewables for electricity production has been strengthened. There has been notable support for hydropower and solar photovoltaic projects. The government forecasts raising the share of renewables to 6 per cent of the energy supply by 2000.

In its 1996 report, the IRT stated that between 1990 and 1995, "promising results have been achieved in the co-generation and renewable energy programmes, while results on the energy savings and substitution programmes have not met expectations."[98]

Means of Achieving Targets. The government's programme is largely restricted to reducing emissions from the energy sector. The central thrust of Spanish GHG policy is increasing the use of natural gas, which in the 1970s was only 2 per cent of primary energy supply. Other aspects of the Spanish policy are as follows:

- All new government housing must meet high energy-saving standards.
- The government is increasing investment in public transport, especially rail infrastructure, which has been generally obsolete and non-competitive with road transport.
- The government has limited parking places in new buildings, increased parking space close to public transport stations, created preferential bus lanes in some cities, introduced liquefied natural gas as fuel for buses, and promoted biofuel through EU subsidies.
- Where coal mines remain open, the government maintains subsidies for coal production. However, the sale price of coal must reflect costs before subsidies. In practice, the government is paying for the losses of coal mines. In addition, duties have been abolished on imported coal.
- Several measures are enhancing the use of sinks. Forest coverage will increase by about 8 per cent over the period 1990 to 2000 to absorb carbon dioxide.[99]
- Government funding for the Energy-Saving and Efficiency Plan is supported by EU money. Spain, Greece, Portugal, and Ireland receive financial support from the EU through the Cohesion Fund for transport and environmental projects. However, the need to restrict GHG emissions competes with funding for other environmental priorities, particularly the need to increase the water supply in southern Spain.

A national climate change strategy is expected in mid-2000. A plan to promote renewables, announced by the Spanish National Institute for Energy in May 1999, is still waiting for government approval. These plans would include tax breaks, subsidies, and incentives for renewables. However, the Spanish press has reported that the government's Finance Ministry considers the cost of these proposals to be excessive.[100]

Obstacles to Progress. The main obstacle to restricting emissions is Spain's desire to improve its economic position vis-à-vis other member states. There is a general reluctance to pressure Spain to take any action that could inhibit economic progress. The other significant limitation relates to the potential for domestic energy production. Since 1984, there has been a moratorium on increasing nuclear power production, which has limited its share as a primary energy source to 14 per cent. This share is likely to decline, as old plants being phased out will not be replaced. Pressure from trade unions and others has restricted the government's ability to eliminate coal subsidies.

Political Commitment. Although it accepts the need for limiting GHG emissions, Spain believes the main responsibility for action lies with other member states given its need for economic development and low per capita emissions. Also, environmental concern has been generally lower in Spain than elsewhere in Europe. Motorway tolls were recently lowered in Spain as an anti-inflationary measure despite criticism of its environmental effects. However, attitudes may be changing. Southern Spain is extremely susceptible to land being overtaken by desert and water scarcity. There is general public recognition that this situation could worsen without action to combat climate change. There is increasing debate on environmental subjects — not least on the extent to which Spain is meeting its emission restriction obligations.

In terms of the gap between expenditure and payments, Spain receives the largest net contribution from the EU budget. Those member states that are net contributors to the EU budget — particularly Germany, The Netherlands, and the UK — have shown increasing reluctance to support increases in the EU budget and could pressure Spain to meet its Kyoto Protocol obligations as a quid pro quo for continued financial support.

Monitoring Procedures. The government created a National Climate Commission that provides the mechanism for coordination of climate change-related policies and sets the general framework for implementing Spain's national climate programme. Internal reports on emissions monitoring are produced. Some documentation is available to the public but appears to relate to periods three to four years behind the date of publication.

Conclusions. Spain's main problem is that faster economic growth and the reduction of unemployment may be incompatible with achieving its Kyoto objectives. During the 1990s, its emissions already appear to have increased by 11 to 13 per cent relative to the 2008/12 target. Consequently, the task of achieving Spain's Kyoto Protocol objective will not be an easy one.

Nevertheless, it appears that the rate of growth of emissions in the period 1995 to 2000 slowed considerably. The increasing use of natural gas and renewables, replacing oil and coal, should help the task but much will depend on the political will in Spain and on pressure from other member states of the EU. Expressions of public concern about the need to take action on climate change are emerging. It may be that a combination of this concern and EU pressure will ensure that the Spanish government takes further action. Nevertheless, it is clear that the subject takes a lower place on the political agenda in Spain than in other member states covered in this report.

VII. Conclusions

This report presents an analysis of the progress of five EU member states in achieving the targets their governments accepted as part of the Bubble under Article 4 of the Kyoto Protocol. It is not intended to draw conclusions for the EU as a whole. However, it does highlight the following points:

- Greenhouse gas emissions levels in the EU as a whole will be approximately the same in 2000 as in 1990. Consequently, to meet its obligation under the Kyoto Protocol, the EU must reduce GHG emissions by 8 per cent in the period 2000 to 2008/12. Given the European Commission's estimate that emissions will rise by 6 per cent unless measures are taken, the EU member states will have to take further measures to reduce overall emissions by 14 per cent between 2000 and 2008/12.

- Two of the five countries covered — Germany and the United Kingdom (the highest emitters) — will achieve their individual targets to stabilise CO_2 emissions in 2000 at 1990 levels. In contrast, the Netherlands — which had a national target of a 3 per cent reduction over this period — will increase its CO_2 emissions by about 17 per cent.

- To date, the main factors reducing the EU's overall emissions are the switch from coal to natural gas for electricity production, and the decline in production and the modernisation of residential, industrial, and commercial buildings in the former East Germany.

- Increasing co-generation schemes and the share of renewables in the total energy supply are major features of all five member state programmes. To achieve these targets, governments are providing renewables suppliers with financial support and favourable tax and regulatory treatment.

- Concerns about safety and costs have generally ruled out increasing the share of electricity produced from nuclear energy. There is especially strong hostility to nuclear energy from the governments of Germany, Austria, and Spain. However, the German government has stated that reducing its GHG emissions is a "pre-condition" to closing nuclear power plants.

- The use of coal for power generation has diminished in all five countries and further reductions are expected. Reduced coal use has been particularly pronounced in the United Kingdom and Germany — the two main producers of coal in the European Union.

- Most member states strongly emphasise the role of voluntary agreements with industry in achieving targets. Government incentives and taxes have usually supported these agreements.

- Agreement on an EU-wide energy products tax has not been reached. However, although some governments — especially the Netherlands — and the European Commission believe this failure is an obstacle towards progress in reducing emissions, the lack of agreement has not stood in the way of the introduction of energy taxes by member states using national legislation. In general, the objective of these taxes is to promote better environmental practices, rather than to increase the overall tax burden on industry.

- All five countries recognise that GHG emissions from transport will continue to rise and they aim to modify — rather than eliminate — this growth. Most member states have increased petrol and vehicle taxes and plan further increases. However, there are signs that public opposition to such measures will result in some modification of measures that discourage vehicle use.

- The public expenditure required to reduce greenhouse gases is not sufficiently clear from any of the five countries' plans — partly because GHG reductions result from programmes not solely related to climate change. Lack of public funding appears to be less of an obstacle than other issues in meeting emission reduction targets.

- Domestic emissions trading is under consideration in some countries. Only Denmark is currently implementing such a plan. So far, there have been few steps to develop international emissions trading schemes. The European Commission produced a "Green Paper" in March 2000 inviting the member states to arrive at a formal policy on both international and domestic trading. The Netherlands is the only country to have emissions trading as an integral part of its emissions reduction plan.

- Despite varying difficulties in achieving targets, the political commitment to reduce GHG emissions in each of the five member states is strong. Although there are some complaints — notably in Germany and Spain — that other countries should carry a greater share of the burden, there is general public support for the need to reduce emissions and governments are planning further measures in order to meet their commitments. However, there is a gap between commitment and performance and there are real questions regarding whether countries, even the UK and Germany, will deliver promised targets because of political difficulties in taking some measures.

- The prospect of meeting the obligations that these five countries accepted under the Kyoto protocol is unclear. The United Kingdom looks likely to achieve its target with the possibility of exceeding its target substantially. Germany has a harder task and has obstacles to overcome. Austria and the Netherlands have underestimated the task ahead. Indeed, the Netherlands is unlikely to meet its target. The position in Spain is difficult to assess because of the lack of relevant data. Nevertheless, it will require a greater effort to meet its target.

Endnotes

1. The six gases covered in the Kyoto Protocol are: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydroflurocarbons (HFCs), perflurocarbons (PFCs), and sulphur hexafluoride (SF_6).

2. The European Union (EU) has fifteen member states: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, Sweden, and the United Kingdom. Austria, Sweden and Finland did not join the EU until 1995, but adopted the EU measures referred to in this document.

3. Each Annex I party to the Kyoto Protocol must produce a communication every three years on its progress in controlling GHG emissions for the UNFCCC. This communication is reviewed by a team of experts who then produce a "Report on the In-Depth Review of the National Communication." An "In-Depth Review Team" or its report is referred to subsequently as the "IRT."

4. See Council Press Release (03-03-1997) Number 6309/97. One of the authors, John Gummer, represented the United Kingdom as Secretary of State for the Environment at this meeting.

5. See Council Press Release (19-06-1997) Number 9132/97.

6. COP refers to a "Conference of the Parties" to the UNFCCC. COP6 will be in November 2000.

7. This section is based largely on three "Communications" from the European Commission to the Council, the European Parliament, the Economic and Social Committee, and the Committee of the Regions: "Climate Change — The EU Approach for Kyoto" (Brussels 01.10.1997) (COM(97)481) (hereafter "1997 Communication"); "Preparing for Implementation of the Kyoto Protocol" (Brussels 19.05.1999) (COM(99)230) (hereafter "1999 Communication"); and "EU Policies and Measures to Reduce Greenhouse Gas Emissions: Towards a European Climate Change Programme (ECCP)" (Brussels 08.3.2000) (COM(00)88) (hereafter "2000 Communication").

8. "1999 Communication," Annex 1.

9. 1990 figures are shown because it is the base date for the obligations of member states under the Kyoto Protocol (and also for the EU's own commitment of 1990). The authors would have liked to provide comparative tables for each of the five member states covered but data was not available on a comparable basis.

10. "1997 Communication," page 4.9, Annex 1.

11. "1999 Communication," Policy-Makers Summary.

12. Ibid., page 3.

13. Environmental Agreement with ACEA (European Car Manufacturers Association), "Proposal for Council Decision Establishing a Scheme to Monitor the Average Specific Emissions of Carbon Dioxide from New Passenger Cars" (COM(95)689). See also "Monitoring System," European Commission, Brussels (COM(98)348) for reports on negotiations of emissions agreements with Japanese, Korean, and other firms outside ACEA.

14. Directive 1999/31/EC was agreed in April 1999 and has to be transposed by the member states into law by July 2001.

15. "Altener 2 Programme" (Brussels), see "Energy for the Future: Renewable Sources of Energy," White Paper for a Community Strategy and Action Plan (COM(97)599) (Brussels 26.11.97).

16. "Report from the Commission to the Council and the European Parliament on Excise Duty Reductions and Exemptions" (Brussels 14.11.96) (COM(96)549 final).

17. "Green Paper on Greenhouse Gas Emission Trading within the EU," European Commission (Brussels 08.03.2000) (COM(00)87). Emission trading is "the buying and selling of emission allowances. Article 17 of the Kyoto Protocol establishes trading of assigned amounts between Annex B Parties. It is expected that domestic and international schemes will be set up for industrial emissions trading" (*The Kyoto Protocol: A Guide and Assessment,* Michael Grubb with Christiaan Vrolijk and Duncan Brack. The Royal Institute of International Affairs, London 1999).

18. The object of the Danish government is to reduce CO_2 emissions in the energy sector from 28.9 mmt in 1997 to 20 mmt in 2003. The allocation principle is "grandfathering," i.e., allowances based on share of emissions from the relevant companies in 1994 to 1998. Given the implications of this allocation principle on competition — particularly within the energy industry — the system was examined, and subsequently approved, by the European Commission. For further information, contact the Ministry of Environment and Energy, Denmark. Tel: 00-45-33-92-67-00; Fax: 00-45-33-11-47-43; E-mail: ens@ens.dk; www.energyistyrelsen.dk.

19. Unless otherwise stated, all statistics on Germany refer to the area of the country after reunification. References to the "New Länder" refer to the former East Germany and references to "Länder" cover the state governments throughout Germany.

20. "Annual European Community Greenhouse Gas Inventory 1990-1996," prepared by the European Environment Agency for the European Commission, April 1999 (hereafter "EEA 1999 Report"). The three major greenhouse gases are CO_2, CH_4, and N_2O and are expressed in CO_2 equivalents.

21. Data in this section are largely from the IRT for Germany published in July 1997, particularly paragraphs 4, 21, 23, 24 and 25 (www.unfccc.de/resource/country/germany.html). Updated information provided by the more recent report of the IRT of 24 August 1999 (http://www.unfccc.de/resource/docs/idr/deu02.htm) and by information provided orally by the Federal Ministry of the Environment in January 2000.

22. IRT for Germany, 1997, paragraph 5.

23. "The 1999 Report of the Federal Republic of Germany for a Monitoring Mechanism of Community CO_2 and Other Greenhouse Gas Emissions Pursuant to the Council Decision 1999/296/EC" (hereafter "1999 FRG Monitoring Mechanism"), Table 3. In its annual report (1999), the EEA estimates that CO_2 reduction between 1990 and 2000 will be 11.5 per cent. However, current, as yet unpublished, estimates of German reductions provided by the Federal Ministry of the Environment in January 2000 indicate that this figure might be an underestimate of 1 to 2 per cent.

24. "1999 FRG Monitoring Mechanism," Tables 1 and 2.

25. IRT for Germany, 1997, paragraph 35.

26. Ibid., paragraph 38.

27. Ibid., paragraph 45.

28. "Fifth International Climate Protection Conference in Bonn: A Guide Published by the Federal Environment Ministry," Berlin, November 1999.

29. The Bundesrat is the upper house of the German Parliament and consists of representatives of the Länder.

30. Speech delivered by Jürgen Trittin on November 16, 1999 to the Royal Institute of International Affairs (hereafter "RIIA Speech, 1999"), London (www.riia.org).

31. Ibid.

32. Ibid.

33. Article 12 of the Kyoto Protocol provides a mechanism to allow assistance to less developed countries to achieve sustainable development and to contribute to the ultimate objective of reducing greenhouse gases.

34. From discussions with representatives of both the Federal Ministry of the Environment and the BDI (the German business association).

35. IRT for Germany, 1997, paragraph 9.

36. In Germany, as elsewhere, nuclear energy is a controversial subject. The authors take no side on this issue beyond recognising that nuclear energy does not create GHG emissions. There is the view that phasing out nuclear energy would not jeopardise a reduction in emissions in a recent publication (Hennicke, P. and D. Wolters. "2000: Klimaschutz und Atomaussteig-eine weltweite Perspektive," Energiewirtschaftliche Tagesfragen, Nr. 3,140-145).

37. "Because we trust in Germany's vitality...." Policy Statement by Gerhard Schröder, Chancellor of the Federal Republic of Germany, to the Bundestag, 10 November 1998.

38. "RIIA Speech, 1999"; In 1998, Germany's 19 nuclear power stations supplied approximately one-third of electricity and saved around 160 mmt of CO_2 — equivalent to the annual emissions of German motor traffic ("Nuclear Europe Worldscan," July/August 1999, pages 59 and 60). In its March/April 2000 edition, Eberhard Meller of VDEW states, "A greater threat to the nuclear industry than the impact of liberalisation for nuclear generation will be the intention of the German government to phase out nuclear by around 2020 after a maximum of 30 years operation... it will be impossible to meet the country's obligation to cut CO_2 emissions...," page 33.

39. Buttermann, Hans Georg, Bernhard Hillebrand, and Ulrike Lehr. "Second Monitoring Report: CO_2 — Emissions in German Industry 1996-1997," Rheinisch-Westfalisches Institut fur Wirtschaftsforschung, RWI-Papiere, Nr.57, Essen, July 1999.

40. "EEA 1999 Report." As shown in "1999 Communication," Annex 1.

41. Ibid.

42. IRT for the United Kingdom, 1996, Summary, paragraph 3.

43. Ibid., Summary, paragraph 2.

44. In other words, the UK applied the EU 1990 agreement to each GHG.

45. "Climate Change: Draft UK Programme," Department of the Environment, Transport and the Regions, February 2000 (hereafter "Draft UK Programme"). This is a consultation document with a final policy document envisaged for later in 2000. It is unlikely that there will be significant changes to the main lines of action on GHG emissions.

46. Ibid., page 46, paragraph 4. The government has deliberately taken 1995 as the base year for the three minor gases as allowed under the Kyoto Protocol.

47. IRT for the UK, 1996 and "Draft UK Programme."

48. "Energy Report 1998," HMSO 1998, Volume 1, page 15.

49. "Draft UK Programme," page 176.

50. "Draft UK Programme."

51. "Conclusions of The Review of Energy Sources for Power Generation and Government: Response to Fourth and Fifth Reports of the Trade and Industry Committee," Department of Trade and Industry, October 1998. It is notable that this document makes no reference to climate change objectives and in practice has led to no significant change in support for gas-fired generation.

52. "Draft UK Programme," page 57.

53. Ibid., page 60.

54. Ibid., "Introduction" under "Policies to Deliver Cuts in Emissions."

55. Ibid., page 61.

56. Ibid., page 25.

57. Ibid., Introduction, paragraph 19.

58. "Overview of the National Programmes to Reduce Greenhouse Emissions" (Topic Report 08/1999) from the Topic Center on the Emissions of the European Environment Agency (1999) (hereafter "EEA National Programmes, 1999").

59. "Draft UK Programme," page 162.

60. Ibid., page 48. The government forecasts a reduction in GHG emissions by end users from domestic sources of about 5 per cent over the period 1990 to 2010. However, Cambridge Econometrics (a UK economics consultancy company and think tank) is forecasting a 16 per cent increase in emissions from households over the same period ("UK Energy and Environment," Cambridge Econometrics, January 2000). This difference relates to the government's apportionment of the decline in emissions from electricity production between end users and Cambridge Econometrics' emphasis on increasing fuel use by domestic consumers. Another area of policy that is open to debate is the extent to which renewable energy can contribute 10 per cent of energy production by 2010 without considerable input of public investment.

61. "Draft UK Programme," page 46.

62. Data in this section are from the "EEA 1999 Report."

63. IRT for The Netherlands, July 1996, paragraph 2. Updated information provided by the Dutch government mainly from "The Netherlands' Climate Policy Implementation Plan: Part 1 Measures in the Netherlands," Ministry of Housing, Spatial Planning and the Environment, June 1999 (hereafter "Implementation Plan: Part 1").

64. Ibid., paragraph 2.

65. Ibid., paragraph 2.

66. Ibid., paragraph 5.

67. "EEA National Programmes, 1999."

68. "Implementation Plan: Part 1," page 23.

69. "EEA National Programmes, 1999."

70. "Measures in the Traffic Sector" from the government's fact sheet series, "The Netherlands' Climate Policy Implementation Plan" (hereafter "Series"). This is a series of fact sheets produced in June 1999. At the same time the Ministry of Housing, Spatial Planning and the Environment published also "Implementation Plan: Part 1," which covers the same information as the fact sheets.

71. "Summary and Readers' Guide," page 4, from "Series."

72. "Measures in the Sector Energy and Waste Disposal," from "Series."

73. "Measures in the Agricultural Sector," from "Series."

74. The development of catalysts in the chemical industry could lead to 90 per cent reduction in N_2O, which may be about 10 mmt CO_2 equivalent. For more detailed information see "Implementation Plan: Part 1," page 72.

75. The Netherlands has no experience of this to date but believes there is potential storage for about 3.3 mmt of CO_2 underground. It is examining experience in Norway and the United States. For further detail see "Implementation Plan: Part 1," page 73.

76. "Measures in Industry," from "Series."

77. "Measures in the Sector Energy and Waste Disposal," from "Series."

78. "Implementation Plan: Part 1," page 21.

79. Ibid.

80. Figures in this section are from "EEA 1999 Report."

81. Ibid.

82. Data in this section are largely provided by IRT for Austria, December 1996, paragraph 4. Updated information provided by the Austrian Ministry of Environment.

83. Schleicher, Stefan, Kurt Kraten, and Klaus Radunsky. "The Austrian CO_2 Balance 1997," Austrian Council on Climate Change, March 1999 (http://www.accc.gov.at/bilanz/bil97).

84. "International Conference on the Changing Atmosphere: Implications for Global Security," Toronto, Canada, 1988.

85. Schleicher, Stefan, Kurt Kraten, and Klaus Radunsky. "The Austrian CO_2 Balance 1998," Austrian Council on Climate Change, January 2000.

86. The EEA notes in its 1999 annual report ("EEA National Programmes, 1999") that if past action and future plans are considered, "it seems possible for Austria to reduce its CO_2 emissions...well below the Toronto target."

87. IRT for Austria, 1996.

88. Second National Climate Report from the Austrian Government (for UNFCCC) 1997 (www.unfccc.de/resource/country/austria.html), paragraph 5.3.1.4.

89. "Industriewissenschaftliches Institut," Bioenergie-Cluster, Vienna, 1998.

90. However, additional forest residues are available. Pichl, Puwein, Obernberger, Steininger, and Vorabergerr. "Erneuerbare Energieträger in Österreichs Wirtschaft," Österreichisches Institut fur Wirtschaftsforschung (WIFO), Vienna, 1999, Table 2.2.

91. Minutes of Evidence, "Fourth Report of the Environmental Audit Committee on Climate Change: UK Emission Reduction Targets and Audit Arrangements," HC 899, The Stationery Office, paragraph 36, page 10. The Rt. Hon. Michael Meacher to the Environmental Audit Committee, UK House of Commons, on the reduction in Austria's target, said "It is a matter of internal (Austrian) politics as to why the reduction was as great as it was. As you say, it came down from 25 per cent and it finally ended at 13 per cent, which is scarcely more than half. That is unquestionably disappointing."

92. Figures in this section are from "EEA 1999 Report."

93. IRT for Spain, March 1996. Updated information provided by the Spanish government.

94. IRT for Spain, paragraph 44.

95. IRT for Spain, paragraph 2.

96. "EEA National Programmes, 1999," Appendix on Spain.

97. ENDS Daily, 15/11/99, "Comisiones Obreras (CCOO), one of Spain's biggest trade union confederations, and environmental NGO 'Ecologists in Action,' independently calculates that Spain's carbon dioxide emissions rose by 22.8 per cent or 23.2 per cent, respectively, between 1980 and 1998." According to Carlos Martínez, CCOO, "technical experts" in the industry ministry "accept these figures."

98. IRT for Spain, paragraph 6.

99. Ibid., paragraph 48. A sink is a remover of atmospheric CO_2.

100. ENDS Daily, 15/11/99, Enrique José Vicente, Deputy Director General for Electric Power, Spanish Industry Ministry, said that "approximately $2.5 billion tax incentives for renewable energy producers included in the plan are considered 'excessive' by the finance ministry. Meanwhile, the finance ministry last week announced a 7 per cent reduction in tax on motorway tolls as an anti-inflationary measure, which, critics say will encourage car use and therefore fossil fuel consumption."