IRELAND
Climate Change

CO_2 Abatement Strategy

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EXECUTIVE SUMMARY OF THE
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IRELAND

submitted under Articles 4 and 12 of the
United Nations Framework Convention on Climate Change

In accordance with decision 9/2 of the Intergovernmental Negotiating Committee of the Framework Convention on Climate Change (INC/FCCC), the interim secretariat is to make available, in the official languages of the United Nations, the executive summaries of the national communications submitted by Annex I Parties.

Note: Executive summaries of national communications issued prior to the first session of the Conference of the Parties bear the symbol A/AC.237/NC/___.

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Introduction

1. Ireland signed the United Nations Framework Convention on Climate Change in Rio de Janeiro in June 1992 and ratified the Convention in April 1994. The Convention places a particular responsibility on developed countries to adopt policies and measures designed to mitigate climate change by limiting man-made emissions of greenhouse gases. It acknowledges, however, that within the developed countries, there will be differences in starting points and approaches, economic structures and resource bases and that there is a need for equitable and appropriate contributions as between different developed countries to the overall global effort.

European Union policy on climate change

2. Ireland is a member of the European Union (EU). The EU also signed the Convention in June 1992 and approved it in December 1993. The EU is committed to stabilizing carbon dioxide (CO_2) emissions in the Union as a whole at 1990 levels by the year 2000 and all member States are involved in the achievement of this objective. Like the Climate Change Convention, EU policy also recognizes that a number of member States, including Ireland, will need targets and measures which will accommodate necessary economic growth.

Climate Change - CO_2 Abatement Strategy

3. Within the framework of overall EU policy on climate change, Ireland launched its "Climate Change - CO_2 Abatement Strategy" in June 1993. This strategy includes a programme of measures in the areas of energy conservation, fuel use, transport, waste management and afforestation designed to limit the levels of carbon in the atmosphere and to improve the energy efficiency of our economy.

4. Ireland's ability to reduce CO_2 emissions, which is the principal man-made emission implicated in climate change, is restricted due to a number of structural factors. These include increased energy demand from economic expansion, reliance on peat, a carbon intensive fuel source, for about 14 per cent of our energy needs, our already high use of natural gas and the absence of a nuclear energy option.

5. Despite these structural factors, Ireland's CO_2 abatement strategy is based on the objective of limiting CO_2 emissions so as not to exceed 36,988 kilotonnes of CO_2 in the year 2000. This would represent an increase of 20 per cent above 1990 levels, or an increase of 11 per cent if account is taken of increased carbon sinks capacity. Since a continuation of

existing policies would indicate an increase greater than this, the achievement of the 20 per cent target will require a cooperative effort on the part of all the different sectors involved; from energy producers to industrial and commercial consumers to private citizens.

Energy

6. Energy policy can have a major impact on limiting CO_2 emissions. Within this sector a number of programmes are underway including:

(a) The ESB (Ireland's national electric utility) are pursuing an active policy to limit the growth in demand for electricity. Demand Side Management measures are being pursued to promote the more efficient use of energy by consumers in the domestic, industrial and commercial sectors. The intention is to manage load growth around the level of 3 per cent per annum while still catering for national economic expansion. These initiatives at a conservative estimate, should limit CO_2 emissions by 0.27 million tonnes of carbon (MTC) by 2000 and will also result in significant savings to customers. Improved maintenance and operation standards in order to improve efficiency are also being undertaken by the ESB.

(b) A significant amount of energy is used to heat buildings. Insulation standards incorporated in the building regulations (1991) for new buildings are expected to reduce CO_2 emissions from this source by 2 per cent by 2000.

(c) An enhanced energy conservation programme in all sectors, with assistance from EU structural funds, will be operated through a new energy body, the Irish Energy Centre.

(d) Initiatives under the EU SAVE (measures to improve energy efficiency) and ALTENER (measures to promote renewable energy) programmes will encourage the limitation of CO_2 emissions. Investigations are already under way into hydroelectricity, wind, wave, solar energies and energy crops as viable sources of renewable energy.

(e) The Irish Government is currently considering a proposal for a new 120 MW peat-fired power station, which would employ state of the art technology. This station, when combined with the phased decommissioning of the oldest and least efficient peat-fired units, would reduce the rate of carbon emissions from peat plants from 0.43 tonnes of carbon per megawatt hour in 1990 to 0.39 t C/MWh in the year 2000. In the interim, Bord na Mona (the national peat development company) is attempting, through research and development, to improve conversion efficiencies.

(f) Fuel switching (beneficial for CO_2 reduction) will be promoted by the continued extension of natural gas in the residential and industrial sectors, backed up by the new pipeline from the UK. In addition, a competitive scheme to secure an additional 75 MW of electricity from alternative energy sources before 1997 was introduced in April 1994.

Transport

7. Transport is a significant source of CO_2 emissions and measures in this area will play a key role in containing overall national CO_2 emissions.

8. The largest concentration of traffic is in the Greater Dublin area, where the principal objective is to improve public transport and reduce traffic congestion. The Dublin Transportation Initiative is developing a strategy for this purpose which takes full account of environmental impact factors. Arising from this strategy, provision has been made in the National Development Plan 1994-1999 and the Operational Programme on Transport for major investment in improved public transport and traffic management which will provide a greatly enhanced environment in the Dublin area. The current road investment proposals for Dublin are concentrated on the provision of a ring road around the city and the development of the main national routes radiating from the city. No further significant road development is planned along the city quays and the canal ring and apart from a small number of projects which are under construction/at an advanced stage of preparation, there are no further plans for major urban road investment in the centre city.

9. Dublin Bus is planning new services specifically to compete with the car in Dublin city. New high-specification energy-efficient buses are to be used on the new services and in the fleet generally. The National Development Plan and Operational Programme on Transport include a substantial renewal and development programme for the mainline railways involving the provision of modern rolling stock, track renewal and new signalling systems.

10. Because of the dispersed nature of Ireland's rural population, transport needs in rural areas will continue to be met primarily by private transport. Public transport links between and within the principal urban centres will be improved as resources permit.

11. The planned extension of the vehicle-testing scheme to light goods vehicles and private cars is also expected to have an environmental benefit as the maintenance of engines in good running order should contain emissions. Longer term benefits will come from the development of more energy efficient vehicles; the EU is considering measures to support and accelerate this development.

Waste

12. The decay of waste containing carbon results in emissions to the atmosphere of methane (CH_4) and to a lesser extent CO_2. The reduction of the volume of waste for final disposal is, therefore, of great importance and in this regard the Department of the Environment has recently published a recycling strategy for Ireland.

13. Two local authorities, Fingal County Council and Cork Corporation, are examining the potential of recovering and using methane from landfill sites. Other local authorities have been looking at the potential of using methane from sewage treatment plants.

Afforestation

14. Green plants act as a sink or trap for CO_2, thereby reducing the CO_2 content of the atmosphere. As Ireland is the least forested area within the EU, it is clear that greater afforestation has the potential to make a significant and cost effective contribution to our climate change strategy.

15. In recent years there has been a steady increase in the number of new areas planted, both by the public and private sectors. The Government's annual target for planting (afforestation and reafforestation) is 30,000 hectares. The Irish Programme for Government gives a commitment to maintain and build on this policy up to the year 2000. The programme is estimated to increase CO_2 absorption capacity by 0.8 MTC by the end of the decade. This will provide a substantial counter balance to the expected increase in carbon emissions over the same period.

Research

16. All of the aforementioned measures are backed up by an ongoing programme of research, development and demonstration. Policy is geared towards optimizing technology for the improvement of energy efficiency, the use of renewable energy sources and the development of cleaner technology.

17. At United Nations level, Ireland is a member of the Intergovernmental Panel on Climate Change (IPCC) and Irish scientists participate in various programmes on climate related research activities. At EU level, Irish enterprises and institutions actively participate in the Community's energy programmes JOULE and THERMIE. The EU STRIDE programme is promoting research in the forestry area. The national Environmental Protection Agency also has a major role in preparing environmental research programmes and the co-ordination of such research.

18. The Energy Policy and Environment Policy Research Centres at the Economic and Social Research Institute (ESRI) will also carry out research on economic aspects of the interaction between energy and the environment.

Vulnerability Assessment

19. In 1991 the Department of the Environment published a series of studies on the impact of possible climate change for Ireland. These studies covered a number of areas including agriculture, forestry and sea-level changes. The studies were republished in April 1994.

FINANCIAL MECHANISM OF THE CONVENTION

20. Ireland has become a participant in the Global Environment Facility and will make four annual contributions of £425,000.

INVENTORIES OF GREENHOUSE GASES

21. The total (net) national emissions of greenhouse gases in 1990, together with projections for the year 2000, are as outlined below. Data on bunkers for each of those years are also provided in brackets.

	CO_2	CH_4	N_2O	NO_2	CO	NMWOC
1990	30719	795850	42280	114610	428980	196570
(Bunkers)	(1172)	(100)	(160)	(5345)	(2187)	(364)
2000	36988	798660	43680	105140	321940	171400
(Bunkers)	(1535)	(0)	(0)	(7520)	(3070)	(530)

(Kilotonnes for CO_2, tonnes for other gases)

CONCLUSION

22. An Interdepartmental Coordinating Group, chaired by the Department of the Environment, is overseeing the implementation of the CO_2 abatement strategy.

23. The Department of the Environment and the Department of Transport, Energy and Communications have taken steps to increase the public awareness of climate change matters and to promote energy conservation. Further work will be undertaken in this area as resources and opportunities permit.

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2. GREENHOUSE GAS EMISSIONS INVENTORY - FOR 1990 AND PROJECTIONS FOR 2000

(not available electronically)

3. ADDENDUM TO IRELAND'S "CLIMATE CHANGE - CO_2 ABATEMENT STRATEGY"

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ADDENDUM TO IRELAND'S "CLIMATE CHANGE -

CO_2. ABATEMENT STRATEGY"

1. Introduction

Ireland signed the United Nations Framework Convention on Climate Change at the Earth Summit in Rio de Janeiro in June 1992 and subsequently ratified the Convention in April 1994. In accordance with Article 23 of the Convention, the Convention then entered into force for Ireland in July 1994

Ireland will be meeting its commitments under the Convention as part of the EU commitment to stabilise co2 emissions in the Community as a whole at their 1990 levels by the year FOOD. Ireland's contribution to the achievement of the EU target is set out in the document "Climate Change -CO_2 Abatement Strategy" which was published in June 1993 and that document forms the basis of Ireland's first communication under the Convention. Ireland's national CO_2 abatement strategy has been formulated with a commitment to limit the growth in CO_2 emissions to JO% over 1990 levels (or 1 loo if account is taken of increased sink capacity) by the year 2000. There have been a number of significant developments since the publication of the national strategy which should also be considered as part of Ireland's initial communication under the Convention.

2.1 Establishment of an Irish Energy Centre

An Irish Energy Centre is being established. The function of the Centre is to co-ordinate and implement the national energy conservation programme. The existing energy conservation programme is being significantly expanded, with assistance from EU - Structural Funds.

The Centre will develop a clear market identity of its own. The intention is that it will be regarded as independent and acting in the interests of suppliers, manufactures and consumers.

An Energy Advisory Board has been appointed by the Minister for Energy. This Board, which includes representatives of the main energy utilities and energy consumers, will examine the progress of programmes carried out by the Centre and will also advise the Minister in relation to policy and programmes in the fields of energy conservation and renewable sources of energy.

The main elements of the programme of the Irish Energy Centre, when fully in operation, will be to provide support to undertake energy audits, to provide aid, on a selective basis, for investments in energy efficiency, to provide technical advice in relation to energy efficiency and renewable sources of energy, to promote and undertake information campaigns and to undertake studies and pilot actions in relation to energy efficiency and renewable sources of energy.

2.2 Alternative Energy Sources

As part of its efforts to promote alternative energy sources, the Government has decided to secure an additional 75 megawatts of installed capacity from such sources before 1997 A competitive scheme is now in place to ensure that the alternative energy requirement is met from independent producers within the specified period. It is anticipated that, as a result of the competition, the following indicative breakdown will be achieved: windpower (30 MW); combined heat and power (20 MW); hydra (10 MW) and waste and other sources (15 MW).

2.3 Peat-Fired Power Developments

The Irish government is currently considering a proposal for a new 120 MW peat-fired power station in the East Midlands region. The proposed station would employ state-of the-art fluidised bed combustion technology and would have a conversion efficiency that is 1.5 times the average efficiency of the existing peat-fired plants. When combined with the phased decommissioning of the oldest and least-efficient peat-fired units, the overall impact will be a significant reduction in the amount of carbon

released per unit of electricity generated from peat. Carbon emissions will decline from O.43 tonnes of carbon per megawatt hour in 1990 to O.39 t C/MWh in the year 2000 and to O.35 t C/MWh by 2020.

In the interim Bord na Mona (the national peat development company) is attempting, through research and development on peat storage and stock protection, to improve the average quality of the peat delivered to the power plants, resulting in improved conversion efficiencies. The application of peat blending would also enhance power plant performance and reduce carbon emissions per unit of power produced.

2.4 Dublin Transportation Initiative

The Dublin Transportation Initiative (DTI) was set up to research and develop a transportation strategy for Dublin city and its environs. The DTI's final report, which is due to be published shortly, will recommend the implementation of a balanced and integrated strategy comprising the provision of an improved and enhanced public transport network (a light railway system and quality bus corridors) coupled with restraint on car commuters. Work has already commenced on the introduction of quality bus corridors.

2.5 Waste Recycling Strategy

The Department of the Environment has just launched a strategy for recycling domestic and commercial waste in Ireland in which the Government has adopted a general objective of diverting 20% of combined household and commercial waste away from landfill, through recycling, by 1999. The present diversion rate is just 7%.

3 Financial Mechanism/GEF

In relation to the financial provisions of the Convention, Ireland has become a participant of the Global Environment Facility: and will make four annual contributions of £425,000.

4. Inventories of greenhouse gases

Since the publication of the co, abatement strategy, further work has been undertaken on the compilation of greenhouse gas emission inventories. Accordingly, an inventory for 1990, together with projections for the year 2000 are enclosed with this communication. While there are some differences between the data contained in those tables and the corresponding data in the cot abatement strategy, it should be emphasised that both sets of data are consistent and that the differences are a result of the further work undertaken in this area.

October 1994

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4. IRELAND'S "CLIMATE CHANGE - CO2 ABATEMENT STRATEGY

PREFACE

Climate Change is an environmental issue of global concern. It has evoked a significant response from the international community in the form of the UN Framework Convention on Climate Change, signed on behalf of Ireland by the Taoiseach in June 1992. It is my intention that Ireland should ratify the Convention as soon as possible together with our EC partners.

EC policy on climate change has developed from principles set down in the Declaration on the Environment adopted at the European Council in Dublin in June 1990. The EC is committed to the stabilisation of CO_2 emissions in the Community as a whole by the year 2000. Community policy also acknowledges that Member States, like Ireland, whose development is incomplete should not be required to achieve stabilisation nationally but should be allowed targets and strategies which can accommodate their growth.

This document sets out Ireland's proposed contribution to the overall EC strategy on CO_2 abatement. A programme of measures is involved which will limit the growth in national CO_2 emissions and increase energy efficiency. Our accelerated afforestation programme will also contribute by providing a major increase in carbon sink capacity. On the basis of the measures contained in the strategy, it is estimated that the growth in Irish CO_2 emissions to the year 2000 will be contained to 20%, or to 11% taking account of increased CO_2 absorption.

The Programme for a Partnership Government provides that extra diligence will be exercised in relation to energy and the environment by minimising emissions, including CO_2, from industrial and electricity generating processes. This first national strategy on CO_2 abatement will be reviewed regularly in line with this commitment.

Michael Smith, T.D.,
Minister for the Environment,
June, 1993.

SUMMARY

The international community has determined on concerted action to address the problem of climate change. The United Nations Framework Convention on Climate Change (1992), which has been signed by Ireland, places a particular responsibility on developed countries to adopt policies and measures designed to mitigate climate change by limiting man-made emissions of greenhouse gases. The Convention sets an indicative target for developed countries of returning to earlier levels of these emissions by the year 2000. It acknowledges however that within the developed countries, there will be differences in starting points and approaches, economic structures and resource bases and that there is a need for equitable and appropriate contributions as between different developed countries to the overall global effort.

Carbon dioxide (CO_2) is the principal anthropogenic (man-made) emission implicated in climate change. Man made emissions of CO_2 in Ireland, as elsewhere, arise mainly from burning of fossil fuels to generate electricity and to meet other energy needs of the industrial, residential, transport and commercial sectors.

The EC is committed to stabilising the Community's CO_2 emissions at 1990 levels by the year 2000. All Member States are involved in the achievement of this objective. This report details Ireland's strategy and includes a programme of measures in the areas of energy conservation, fuel use, transport, waste management and afforestation designed to limit the levels of carbon in the atmosphere and to improve the energy efficiency of our economy.

Like the Climate Change Convention, EC policy also recognises that a number of Member States, including Ireland, need targets and measures which will accommodate necessary economic growth. Increased energy demand from economic expansion, as well as other structural factors such as reliance on peat, a high carbon content fuel, for about 15% of our energy needs, our already high use of low carbon natural gas, and the absence of a nuclear energy option, affect Ireland's ability to reduce CO_2 emissions.

The present strategy was not premised on the introduction of a carbon/energy tax. Important negotiations are in progress at EC level on a Commission proposal for an EC wide carbon/energy tax; the outcome will as appropriate be reflected in future reviews of the strategy.

Ireland's national strategy is based on the objective of limiting national CO_2 emissions to a maximum increase of 10.7 million tonnes of carbon (MTC) by the year 2000, an increase of 20% over the 1990 level, or an increase of 11% if account is taken of increased carbon sink capacity. Since a continuation of existing policies would indicate an increase greater than this, achievement of the 20% target will require a cooperative effort on the part of all the different sectors involved: energy producers, industrial and commercial consumers and private citizens. The strategy sets out appropriate sectoral policy measures and also addresses the possibilities for CO_2 sequestration by biomass and for further research.

Energy

Energy policy can have a major impact on limiting CO_2 emissions. Within this sector a number of programmes are under way including:

_ESB are pursuing an active policy to limit the growth in demand for electricity. Demand Side Management measures are being pursued to promote the more efficient use of energy by consumers in the domestic, industrial and commercial sectors. The intention is to manage load growth around the level of 3% per annum while still catering for national economic

expansion. These initiatives at a conservative estimate should limit CO_2 emissions by 0.27 MTC by 2000 and will also result in significant savings to customers. Improved maintenance and operation standards in order to improve efficiency are also being undertaken by ESB.

_A significant amount of energy is used to heat buildings. Insulation standards incorporated in the Building Regulations (1991) for new buildings are expected to reduce CO_2 emissions from this source by 2% by 2000.

_EOLAS, the National Agency for Science and Technology will continue to promote an on-going energy conservation programme in all sectors through education and awareness programmes.

_Initiatives under the EC SAVE (measures to improve energy efficiency) and ALTENER (measures to promote renewable energy) programmes will encourage the limitation of CO_2 emissions. Investigations are already under way into hydroelectricity, wind, wave, solar energies and energy crops as viable sources of renewable energy.

_A number of technical measures to limit carbon emissions from peat are being planned by Bord na Mona.

_Fuel switching (beneficial for CO_2 reduction) will be promoted by the continued extension of natural gas in the residential and industrial sectors, backed up by the new pipeline from the UK.

Transport

Transport is a significant source of CO_2 emissions and measures in this area will play a key role in containing overall national CO_2 emissions.

The largest concentration of transport is in the Greater Dublin area, where the principal objective is to improve public transport and reduce traffic congestion. The Dublin Transportation Initiative is developing a strategy for this purpose which takes full account of environmental impact factors. The current road investment proposals for Dublin are concentrated on the provision of a ring road around the City and the development of the main national routes radiating from the City. No further significant road development is planned along the City quays and the canal ring and apart from a small number of projects which are under construction/at an advanced stage of preparation there are no further plans for major urban road investment in the centre city.

Dublin Bus is planning new services specifically to compete with the car in Dublin City. New high-specification energy-efficient buses are to be used on the new services and in the fleet generally. Further development of commuter rail services to the west of Dublin is envisaged including the development of a commuter rail link along the South West Rail Corridor from Kildare to Dublin and investment in new rolling stock.

Because of the dispersed nature of Ireland's rural population, transport needs there will continue to be met primarily by private transport. Public transport links between and within the principal urban centres will be improved as resources permit.

The planned extension of the vehicle-testing scheme to light goods vehicles and private cars is also expected to have an environmental benefit as the maintenance of engines in good running order should contain emissions. Longer term benefits will come from the development of more energy efficient vehicles; the EC is considering measures to support and accelerate this

development.

Waste

The decay of waste containing carbon results in emissions to the atmosphere of methane (CH_4) and to a lesser extent CO_2. The reduction of the volume of waste for final disposal is therefore of great importance.

The Department of the Environment has recently published a major study on the development of a recycling strategy and has invited interested parties for their views on this study.

Dublin County Council and Cork Corporation are examining the potential of recovering and using methane from landfill sites. Other local authorities have been looking at the potential of using methane from sewage treatment plants.

Afforestation

Green plants act as a sink or trap for CO_2 thereby reducing the CO_2 content of the atmosphere. As Ireland is the least forested area within the EC, it is clear that greater afforestation has the potential to make a significant and cost effective contribution to our climate change strategy.

In recent years there has been a steady increase in the number of new areas planted, both by the public and private sectors. The Government's annual target for planting (afforestation and reafforestation) is 30,000 hectares. The Programme for Government gives a commitment to maintain and build on this policy up to the year 2000. The programme is estimated to increase CO_2 absorption capacity by 0.8 MTC by the end of the decade. This will provide a substantial counter balance to the expected increase in carbon emissions over the same period.

Research

All of the aforementioned measures are backed up by an ongoing programme of research, development and demonstration. Policy is geared towards maximising technology for the improvement of energy efficiency, the use of renewable energy sources and the development of cleaner technology.

At UN level, Ireland is a member of the Intergovernmental Panel on Climate Change (IPCC) and Irish scientists participate in various programmes on climate related research activities. At Community level Irish enterprises and institutions actively participate in the Community's energy programmes JOULE and THERMIE. The EC STRIDE programme is promoting research in the forestry area. The Environmental Protection Agency, which will be formally established later this year will have a major role in preparing environmental research programmes and the co-ordination of such research.

The Energy Policy and Environment Policy Research Centres at the Economic and Social Research Institute (ESRI) will also carry out research on economic aspects of the interaction between energy and the environment.

Conclusion

An Interdepartmental Coordinating Group, chaired by the Department of the Environment, will be established to oversee the implementation of this strategy.

A public awareness campaign relating to climate change will also be undertaken jointly by the Departments of the Environment and Transport, Energy and Communications. This will focus on how individual action in relation to energy consumption can help to alleviate the effects of climate change.

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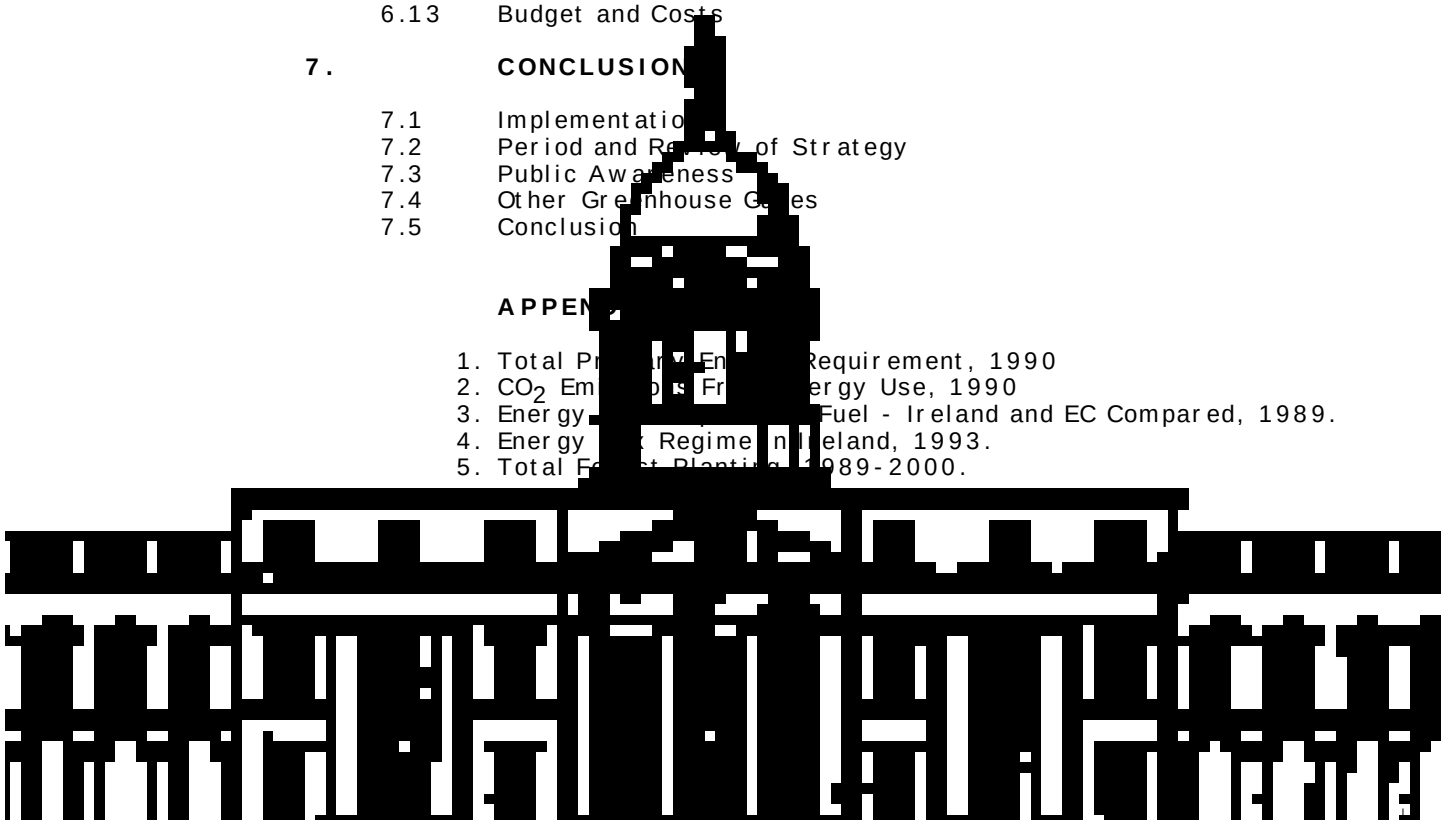

Chapter 1
Introduction

Climate Change

1.1 Climate change is one of the most important environmental issues facing the world today. The strategy detailed in this document is Ireland's contribution to international action, and in particular to action being prepared by the European Community and its Member States, to counter changes in climate arising from man-made emissions of the principal greenhouse gas, carbon dioxide (CO_2).

Climate Change and Ireland

1.2 The implications for Ireland of possible climate change scenarios were examined in a series of studies published by the Department of the Environment in December, 1991 entitled, 'Climate Change - Studies on the Implications for Ireland'. The studies estimated the effects of climate change scenarios on agriculture, forestry, the green mantle, hydrology, coastal areas and fisheries.

1.3 While inevitably the studies could not deal conclusively with many of the issues which arise in climate change impact assessment, they did suggest a number of general trends including the following:-

- broadly beneficial effects for the agricultural sector;

- the shellfish industry would also benefit from higher temperatures;

- peatlands would suffer serious damage on account of increased summer soil water deficits;

- lower rainfall levels would result in reduced river flows and less capacity to receive effluent discharges;

- reduced water supplies would be available in summer periods;

- modification of estuarine ecosystems would occur;

- existing problems of flooding in coastal areas would be exacerbated due to rising sea level;

- transport infrastructure and industries located close to the coast would be endangered by increased erosion or flooding; and

- there would be a less hospitable environment for salmon and sea trout.

Policy Response

1.4 The United Nations Framework Convention on Climate Change was signed in Rio de Janeiro (UNCED) in June, 1992 by the European Community and its Member States, including Ireland. The new Convention envisages concerted international action to mitigate climate change.

1.5 The Dublin Declaration on the Environment adopted during Ireland's EC Presidency in 1990 noted the special responsibility of the Community and its Member States to encourage and participate in international action to combat global environmental problems. As evidence of this intent, a joint Council of Community Environment and Energy Ministers held in Luxembourg in October, 1990, declared the EC's near-term objective as stabilisation of CO_2 emissions in general by the year 2000 at 1990 levels in the Community as a whole. It was recognised that countries with, as yet, relatively low energy requirements which could be expected to grow in step with their development would need targets and strategies which would accommodate that development while improving the energy efficiency of their economic activities. The Council also pointed to the potential of world forests to act as a sink for

greenhouse gases and, in this regard, advocated the initiation of vigorous programmes of forest protection and development.

The Objective

1.6 Ireland's CO_2 abatement strategy is designed to contribute to the realisation of the joint EC commitment to stabilise CO_2 emissions in the year 2000 at 1990 levels. It contains a series of measures in the energy, transport, waste, and forestry sectors which together will serve to limit the concentration of carbon in the atmosphere and improve the energy efficiency of the economy. The strategy also provides for further research into climate change and related issues.

1.7 The conclusions of the joint Energy/Environment Council of October, 1990 recognise that some countries would need CO_2 targets and strategies to accommodate their need for economic growth. This is in accordance with article 130r of the Treaty establishing the European Economic Community which requires the Community to take account, in preparing its action relating to the environment, of the economic and social development of the Community as a whole and the balanced development of its regions. Ireland's CO_2 abatement strategy is, therefore, designed around targets and measures which will accommodate necessary economic growth over the period of the strategy and facilitate economic and social cohesion within the Community, in addition to contributing to stabilisation of Community CO_2 emissions.

1.8 The measures detailed in the strategy limit as far as possible the growth in Ireland's CO_2 emissions in the period to the year 2000. Stabilisation of emissions in this time-frame is not, however, feasible in Ireland's circumstances due to a number of factors:-

_ Energy, as a factor of production, plays an essential role in economic activity. In 1992 Ireland's GDP per capita was 68.8% of the Community average GDP per capita. The strategy must, therefore, provide for necessary growth in energy consumption in order to allow economic development and convergence;

_ Ireland relies on peat - an indigenous fuel with a relatively high carbon content - for about 15% of its current energy requirements. This fuel is important for the security and flexibility of energy supply which it provides; the peat industry is also a major employer in midland and western areas, thereby contributing to balanced development within the country. While there will be a certain natural decline in peat consumption over the period, measures could not be contemplated which would abruptly compromise the role of indigenous peat in Irish energy supply;

_ Ireland's electricity industry is already highly dependent on natural gas, which has a relatively low carbon content, and therefore does not have the option available to other EC member states of large-scale increased use of natural gas for the purpose of CO_2 abatement; and

_ The nuclear energy option as a means of reducing CO_2 emissions is not a part of Irish energy policy due, inter alia, to concerns about safety and other environmental risks.

1.9 The objective of the strategy is to limit anthropogenic CO_2 emissions so as not to exceed 10.7 million tonnes of carbon (MTC) in 2000 an increase of 20% over the 1990 level of 8.9 MTC. When account is taken of the estimated growth in carbon fixation over the period due to expanded afforestation (see paragraph 5.6), the increase in the concentration of carbon in the atmosphere will be of the order of 1.0 MTC. (11% increase).

1.10 On the basis of the most reliable assumptions available at this point, the target of limiting growth in CO_2 emissions to the year 2000 to 20% can be achieved by the measures outlined in this strategy document. Forecasts based on technical assumptions linking historical growth in real GDP with growth in energy requirements, together with assumptions about the fuel mix, would point to an increase in CO_2 emissions in the year 2000 of over 20%. Having regard to the accepted development requirements of the Irish economy and the constraints which surround energy policy options, realisation of the objective of confining growth to 20% will require major efforts by all concerned - policy-makers, energy utilities, and above all, users of energy - to realise this significant improvement over the 'business as usual' scenario. Parallel with implementation of this strategy, the above forecasts will be subjected to ongoing refinement and validation and disaggregated forecasts for the various sectors concerned will be developed. This more detailed information will be supplied in updates of this strategy. The following chapters detail how the objective should be achieved.

Chapter 2

ENERGY POLICY AND MEASURES

Energy - Related CO_2 Emissions

2.1 More than 95% of anthropogenic CO_2 emissions in Ireland are from the combustion of fossil fuels. These fuels are used for electricity generation and to meet other energy needs of the industrial, residential, transport and commercial sectors (as well as for feedstock purposes in the case of natural gas). CO_2 also arises from cement/lime manufacture and landfill decay.

2.2 While energy demand in Ireland was stagnant in the first half of the 1980s, it rose later in the decade - a time of renewed economic growth in Ireland. The Total Primary Energy Requirement (TPER) in 1990 was 9.8 million tonnes of oil equivalent (MTOE) - see Appendix I. Ireland still has, however, a low per capita energy usage compared to the EC average. In 1990, total energy supply per capita was 2.80 TOE compared to 3.70 for the Community as a whole; this is 25% lower than the Community average (OECD Environmental Data, 1991). Related to this, Irish industry is not strongly energy - intensive: Industries, such as steel, non- ferrous metals, cement and glass are under - represented in the Irish industrial sector. The IDA (Industrial Development Authority) estimate that on average fuel and power constituted under 2% of the total turnover of manufacturing industries in 1990. Certain structural parameters such as a diffuse population, lack of economies of scale and infrastructural limitations act as a constraint on greater energy efficiency.

2.3 Preliminary estimates of Ireland's CO_2 emissions in 1990 from the combustion of fossil fuels are given in Appendix 2. Ireland's energy-related CO_2 emissions in 1990 are estimated at almost 8.5 MTC, with the largest contribution coming from oil (41%), followed by coal (25%), peat (21%) and gas (13%). On a sectoral basis, emissions from electricity generation (35%) and residential/commercial energy use (26%) were the main contributors; the level of emissions from the other sectors were industry (19%) and transport (19%). A further 1% is accounted for by energy for own use and losses in the system. Other anthropogenic sources of CO_2 include cement and lime manufacture and landfill decay; estimated emissions from such sources amounted to a further 0.4 MTC in 1990. Total anthropogenic emissions amounted, therefore, to nearly 8.9 MTC in 1990.

2.4 Ireland accounts for about 0.1% of the world's energy - related CO_2 emissions and, as mentioned above, has a low energy usage on a per capita basis. However, the structure of Ireland's energy supply means that per capita CO_2 emissions are at the average for the EC. This can be attributed to the fact that, while Ireland's energy supply structure is broadly comparable to that of the EC as a whole, 15% of energy needs is met by peat, which emits a high level of CO_2 per unit of energy; while in the EC in general, nuclear power, which does not emit CO_2, accounts for roughly the same proportion of energy requirements. The relevant figures are set out in Appendix 3. Apart from per capita measurements, there would be other bases which it would be appropriate to use in order to evaluate relative contributions to the climate problem. For example a base such as CO_2/KM_2 would show emissions of CO_2 in Ireland at less than half the EC average.

2.5 The rest of this Chapter is taken- up with measures to limit CO_2 emissions from the power generation, industrial, residential and commercial sectors. Chapter 3 deals with transport measures.

Fiscal Measures

2.6 In recent years increasing attention has been given to the use of economic and fiscal measures in order to achieve environment policy objectives. Such measures would generally be used to supplement more traditional regulatory, or 'command and control', approaches. Fiscal measures are seen to have two principal advantages. They can allow firms and individuals to reduce pollution where the costs of doing so are least, thereby achieving cost-effective pollution control; they also provide a continuing incentive to develop less polluting products and processes.

2.7 While to date taxation in Ireland has been used primarily for fiscal purposes, the environmental implications of the level and structure of the taxation system was also a consideration. In Ireland the high level of energy taxation must be presumed to result in a more efficient use of energy than would otherwise be the case. End user oil prices in Ireland are consistently higher than the EC average and this is partly due to the fact that taxes here are typically higher than the E.C. average. Other factors involved include Ireland's peripheral location, the dispersed nature of demand and diseconomies of scale within the country. Appendix 4 sets out the current tax regime applying to various energy products in Ireland.

Non-Fiscal Measures: Energy Demand

2.8 The high rate of growth in electricity consumption which has occurred in recent years reflects the general growth in the Irish economy over the period. Typical of such economic development is the shift in many sectors away from bulk fuels and into electricity. Electricity consumption increased at an average compound rate of 4.5% per annum between 1986 and 1989; demand growth for 1990 was 5.4%, 5.1% for 1991 and 4.1% for 1992. Sustained electricity demand growth of this order, under a business as usual (no change) scenario, is likely to pose difficulties on environmental grounds and also for the electricity utility itself. The traditional approach of planning to meet anticipated demand is being replaced by a more pro-active policy of moulding demand to reflect constraints faced by the energy supplier. The principal strategic objective of the Electricity Supply Board (ESB) will be to manage load growth towards the level of 3% per annum in the 1990s, while not constricting national economic growth; the demand growth rate will be 2.5% per annum in 2000 and following years.

2.9 Demand Side Management (DSM) programmes will accordingly play an increasing role in marketing strategies followed by the ESB. A marketing plan has been approved by the Board of the ESB which establishes realistic savings targets. The ESB will continue to promote actively the efficient use of energy by all its customers. Measures are being taken by the ESB to achieve improved end-use efficiencies, increased penetration of customer based combined heat and power and further tariff-based load management; cooperation is being sought from energy consultants and equipment specifiers such as architects and engineers. Amongst ESB initiatives in this area are the following:-

- in the domestic sector, the promotion of compact fluorescent lighting, lagging jackets for hot water cylinders, timers for immersion heaters, home insulation, draught-proofing of doors and windows, double-glazing and energy-efficient household appliances. 60,000 Compact Fluorescent Lamps (CFLs) were sold in 1991 and a further 100,000 in 1992;

- in the industrial sector, the encouragement of energy-efficient technologies such as

adjustable speed drives, energy- efficient motors, high frequency lighting, voltage controls for lighting systems, high efficiency reflectors in lighting systems and energy management systems. Energy efficiency is promoted through direct contact with the industries concerned, running the "eta" energy awards scheme for industry and holding seminars and exhibitions; and

- in the commercial sector, the promotion of awareness amongst all building occupants of the need to conserve energy, heating controls (thermostats and time switches), insulation, double- glazing, efficient air-conditioning systems, good housekeeping practices where refrigeration systems are in operation and in catering establishments, energy efficient appliances, compact fluorescent lighting and other efficient lighting options and total energy management systems for larger premises. ESB staff advise businesses on the most efficient use of energy in their enterprises.

2.10 These initiatives will be maintained and built upon by the ESB. New analytical techniques will be adopted in order to facilitate comparison of investments in demand management with investment in new plant ("least cost utility planning") and such comparisons will form the basis of investment decisions. A conservative estimate suggests that the DSM programmes will reduce CO_2 emissions by 0.27 MTC by 2000 and 0.4 MTC by 2010. In 1991, ESB efficiency programmes helped secure annual savings of 38 million kilowatt hours for customers. These programmes were even more successful in 1992 with customer savings of 82.2 million kilowatt hours.

2.11 Although there have been gains in industry's energy efficiency over the last decade, the industrial sector contributes about 19% of energy- related CO_2 emissions. Specific voluntary commitments to achieve energy savings will, therefore, be sought from Irish industry. The initiative will be pursued via industry's representative organisations.

2.12 Energy use associated with the operation of buildings represents some 45% of national energy use, of which space heating accounts for up to 80%. Over 3.1 MTOE were used in meeting the net energy requirements of buildings in 1989; CO_2 emissions associated with building energy use are estimated at 4 MTC in the same year. The statutory Regulations governing the construction of buildings require that 'A building shall be so designed and constructed as to secure, insofar as is reasonably practicable, the conservation of fuel and energy'. The Minister for the Environment arranged for a review to be carried out in 1990 by the Environmental Research Unit of his Department of thermal insulation standards and the range of buildings to which they apply. Following publication of a discussion document, new stringent insulation standards to limit heat loss through the building fabric are incorporated in the revised Building Regulations by means of the related Technical Guidance Document published in December, 1991. The new standards cover all building types. They are expected to reduce space-heating energy requirements in new buildings by up to 20%, and to cut down on corresponding CO_2 emissions by some 2% by the year 2000. The new requirements came into force on 1st June 1992. New energy saving measures are also being implemented under the Technical Guidance Document to control the output of space heating and hot water supply systems, and limit heat loss from hot water storage vessels, pipes and ducts in new buildings.

2.13 The more stringent thermal insulation standards also apply to new social housing schemes. Additional insulation to the extent

practicable is also being provided where local authority housing accommodation is being improved or modernised. Finally, it is policy that, where possible, gas-fired heating systems are installed as part of these remedial works. These measures should make a significant contribution to controlling CO_2 emissions.

2.14 Primary responsibility for energy conservation policy and measures at central Government level rests with the Minister for Transport, Energy and Communcations. The Department's ongoing energy conservation programme, much of which is implemented by EOLAS - the National Agency for Science and Technology - on the Department's behalf, is aimed at encouraging the efficient use of all forms of energy in all sectors of the economy in order to conserve scarce resources, to achieve financial savings and to protect the environment. Education and awareness campaigns aimed at specific sectors of the economy have for a number of years been a feature of the Department's programme. Sectors and groups are identified by reference to the expected amount of energy savings in that sector or group and promotional campaigns are tailored to the needs of each particular group.

The Department's existing programmes include:

- A selected group of companies has been invited to work with EOLAS support to develop a suitable auditing procedure and statement for energy accounts with a view to their publication in the companies' annual reports.

- Over 80% of electricity used by industry is consumed by electrically driven rotating machinery such as air and refrigeration compressors, fans and pumps, etc. A study to highlight the potential saving in this area is being undertaken.

- A survey of latest boiler technologies and controls with a view of identifying new initiatives for action in later programmes.

- The Energy/Environment Phone service provides free information, advice and leaflets on energy use to consumers in the domestic sector.

- The EOLAS Regional Energy Officers stationed in Dublin, Cork and Sligo promote energy management and energy saving in industry, commerce and the public sector.
- An education programme for schools/science teachers is currently being tested on a pilot basis. The pilot test will be evaluated with a view to the wider dissemination of the programme among schools.

- A programme of seminars and workshops on various topics is being held at EOLAS Headquarters.

- Financial assistance to 'Energy Action' which is a charitable group that draught-proofs the homes of the needy and elderly.

- The Fuel Efficiency Survey Grant Scheme is continuing. Under this scheme grants of up to one-third of the cost of engaging consultants to carry out fuel efficiency surveys in manufacturing industry, hotels, hospitals and third level institutions are provided. Grants are also provided in respect of feasibility surveys for switching from oil, and for combined heat and power projects.

- A Committee to Improve the Efficiency of Electricity End Use was set up in 1990 to achieve savings in this area. The ESB is represented on this Committee and, as

mentioned already, is actively promoting the efficient use of electricity by all its customers.

2.15 Under the Programme for a Partnership Government, energy conservation has been designated as an important priority and will be vigorously promoted throughout all sectors of the economy in the context of an overall integrated energy utilisation policy. Among the measures to be pursued will be the greater use of Combined Heat and Power including in health care institutions; the introduction of energy conservation programmes for all public buildings including local authority buildings and housing schemes, and the implementation of new regulations for energy certification. Consideration will also be given to other conservation measures such as increasing the number of condensing high efficiency boilers in service for both domestic and institutional use.

2.16 There is also a substantial element of private sector activity to influence energy demand. These include companies involved in attic and home insulation, draught-proofing, energy certification of buildings and energy management companies who supply and install energy conservation products (e.g. energy efficient boilers, energy management systems, lighting systems etc.) in the commercial and industrial sectors. Within the taxation system, interest relief is available in respect of loans for the improvement of a person's principal residence, including work to improve the energy efficiency of the dwelling.

2.17 Public lighting is another area which can make a contribution to energy conservation. The Minister for the Environment undertook a two year programme to replace street/road lights on national roads with modern, energy efficient SOX lanterns which is now completed. A total of over 2,300 lanterns were replaced by local authorities under the scheme in 1991, and a further 2,070 were replaced in 1992. In addition, light replacement programmes are being carried out by local authorities from their own resources. The Department is currently examining the possibility of replacing mercury lanterns (about 2,000) on national primary routes. It is expected that this would result in significant energy savings of 225 kilowatts annually

2.18 Local authorities consumed an estimated 2600 TJ in energy in 1991, costing around IR£32m, for the purposes of pumping, lighting, transport and buildings. During 1992 the Minister for the Environment brought to the attention of local authorities the environmental and financial benefits to be gained from more extensive replacement of inefficient lighting and the identification, in conjunction with the E.S.B., of electrical energy saving opportunities in their premises and plant. Dublin Corporation, the country's largest local authority, has an Energy Audit Group in operation to improve the efficiency of energy use within the Corporation.

2.19 As regards implementation of Community measures, the SAVE programme to achieve greater energy efficiency has three major axes - legal and administrative actions, a series of support programmes and a comprehensive information exchange programme. Two EC Directives concerning minimum efficiency standards for hot water boilers and the energy labelling of domestic appliances have now been adopted. These will be implemented in Irish law by the dates specified in these Directives. Under the programme Member States submit initiatives for funding on an annual basis. Five Irish projects were approved for support in 1992. Three EOLAS projects related to energy rating of houses, energy audits, and a pack for secondary schools were approved. Two were

proposed by the ESB on monitoring and targeting of energy use and on contract energy management. Ireland intends to continue with an active programme in this area.

2.20 A further directive under SAVE is under active consideration by the Commission aimed at encouraging the rational use of energy through a number of measures including energy certification of buildings; thermal insulation of new buildings; individual billing for energy consumption; energy audits of businesses; regular inspections of boilers and vehicles and the promotion of third party financing in the public sector.

Non-Fiscal Measures: Energy Supply

2.21 The ESB will invest in improved maintenance and operation standards in order to improve efficiency. Programmes have been initiated and resources committed towards optimising individual plant efficiencies and maximising overall plant availability (including availability of the most efficient plant). Savings on energy losses in the distribution network are being achieved by upgrading 10KV systems to 20KV; this programme will be implemented over the next five years.

2.22 In the medium term, new generating plant addition is likely to use high efficiency combined-cycle gas-fired units.

2.23 The ESB and Bord Gais Eireann (BGE) will support independent combined heat and power (CHP) projects. At present only about 1% of power generation makes use of techniques to utilise heat rejected in electricity generation; the corresponding figure for industrial electricity consumption is 5%. Fuel efficiency can, however, be more than doubled in this way so its use must be fully exploited where economically feasible. Ireland will therefore work to increase the contribution to more efficient electricity generation from such projects, particularly in certain process industries, hospitals and hotels. New, advanced packaged cogeneration plant is already in operation in a number of locations. As pointed out in paragraph 2.14 above, grants are available from the Department of Energy for feasibility surveys in respect of CHP projects. The development of CHP projects is being encouraged by the ESB by the introduction of improved tariff arrangements.

2.24 Through the usage of modern gas burning equipment, particularly when combined with computerised energy management systems, natural gas is also making a major contribution to the energy efficiency of many Irish businesses. BGE is the dominant fuel supply source for industry within the area served by the gas transmission network.

2.25 A variety of technical measures already in place or planned for implementation by Bord na Mona over the next few years will have the effect of reducing carbon emissions from peat combustion. The most significant involves a combination of measures in the production, storage and transport of milled peat which will have the effect of reducing the average moisture content from an historical average of 55% to 53%.

2.26 Although energy efficiency is an important element of this strategy, fuel-switching also has a role to play. In the generation of electricity, CO_2 emissions from peat (which emits the largest amount of CO_2 per unit of energy), will reduce as peat production declines; usage by the ESB will fall from 0.7 MTOE in 1990 to 0.5 MTOE at the end of the century. Overall peat consumption is forecast to fall from 1.4 MTOE in 1990 to 0.9 MTOE in the year 2000, a reduction of 28% in the period.

2.27 Natural gas, which emits a low level of CO_2, will continue to play an important role in electricity generation in the 1990s. A gas pipeline from the United Kingdom which is currently under construction and on target for completion by October, 1993 will, inter alia, enable future consumption to be met together with, it is hoped, further indigenous gas finds. The estimated cost of the pipeline is IR£290m and an EC grant of 35% has been approved for the project under the REGEN Initiative. The ESB is already dependent on gas for 27% of power generated- one of the highest percentages in the EC. In the interests of security of energy supply Ireland's dependence on gas for electricity generation will need to be balanced by the use of other fuels.

2.28 Natural gas will increasingly penetrate the residential and commercial sectors over the coming decade. BGE is involved in an extensive programme to extend gas supply to all non- gas domestic areas in the major urban population centres where it operates. Currently these areas are largely solid fuel consumers. Natural gas has achieved a dominant position in new housing development within the gas supply area. Volume gas sales to the domestic sector increased by 35% in 1991 over 1990 while volume gas sales in the industrial/commercial sector increased in 1991 by 5% over 1990. BGE will continue to target these premium areas and increase volume sales by displacing, principally, solid fuels. There will be consequential benefits in terms of reduced CO_2 emissions vis a vis the fuels it will displace.

2.29 Hydro- electricity at the moment represents 5% of the ESB's primary energy requirements and the ESB has recently initiated a mini- hydro development programme to exploit the generally small scale sites that remain. The average unit price paid by the ESB for electricity supplied to the national grid from all non- fuel autoproducers, including private hydro producers, was increased in 1991 from 2.93 pence to 3.6 pence per kilowatt hour - an increase of over 20%. These new rates, which will increase by 3% per annum up to the end of May, 1996 when the rates will again be reviewed, should give an added incentive for those contemplating new development projects in the area of renewable energy generally.

2.30 Other renewable options include wind, wave and solar energies and energy crops. The technical potential of wind power is significant: several small wind turbines have been installed on remote islands around the Irish coast. Ireland's first wind farm with an installed capacity of 6.45 MW, and located at Bellacorick, Co. Mayo became operational in October, 1992. The project will serve as a base for further developments in this area; its annual output of electricity is expected to be in the region of 17 million units. The Programme for a Partnership Government specifically states that the use of appropriate alternative energy sources will be promoted including quick growing forestry (biomass) and other environmentally- friendly energy sources such as small hydro- electric stations and wind power. As part of the process of implementing this policy, a consultative committee has been established to examine the potential for the development in Ireland of short rotation forestry and biofuel production from other crops and their utilisation for energy purposes.

2.31 There is another type of renewable resource: the naturally occurring supplies of heated ground water in the Dublin City Centre area. Through the use of heat pumps, energy has been extracted from these underground supplies and successfully used to heat a number of medium sized buildings in Trinity College, Dublin. In 1991 the Department of Energy commissioned a survey to establish the extent of

this resource in Dublin city; the survey identified four sites which show good prospects of producing economically usable sources of heat.

2.32 As regards implementation of Community measures, the ALTENER programme is concerned with the promotion of renewable energy sources in the EC. This five- year programme is aimed at limiting CO_2 emissions by encouraging the greater use of renewable energy sources to meet EC objectives. The programme is expected to provide support for defining technical standards and the creation of an information network in addition to training and sectoral activities. It is anticipated that under this programme Ireland will be able to expand the use of renewable sources outlined above and examine possibilities for additional alternatives.

Environmental Benefits

2.33 Energy conservation, in addition to improving energy efficiency, increasing security of supply and reducing dependence on fuel imports, also has obvious environmental benefits. Renewable sources of energy provide additional benefits. For example, the windfarm at Bellacorick will save in the region of 13,000 tonnes of CO_2 per annum which would otherwise have been produced on a continual basis from the burning of a fossil fuel such as oil. If the output from the windfarm replaced electricity generated from coal, the saving would be about 20,000 tonnes of CO_2.

Budget

2.34 In the period 1980- 1992 a total of IR£7.5 million has been invested by the Department of Transport, Energy and Communications in energy conservation activities. In addition, the total value of light replacement programme on national roads is IR£0.77m. Under the SAVE programme, five Irish projects with a total investment cost of IR£0.8m have been approved grant aid of IR£0.3 million approximately. In the case of the windfarm at Bellacorick, the total cost of this private development is IR£7.1 million of which 55%, up to a maximum grant of IR£3.9 million, has been made available under the EC Valoren Programme.

Chapter 3

TRANSPORT POLICY AND MEASURES

Policy

3.1 The transport sector accounts for about 19% of Ireland's energy-related CO_2 emissions, with road transport responsible for over 75% of CO_2 emissions from the sector. The sector is, of course, very important in economic terms. High transport costs have been identified as a source of competitive disadvantage for Ireland in international trade. Therefore, a major programme of EC structural fund-aided investment is underway, in the form of the Peripherality Operational Programme, 1989-93, to augment substantially Ireland's transport infrastructure, including the national road network and public transport. While the elimination of traffic congestion and improved public transport will help control CO_2 emissions, the number of vehicles on Ireland's roads seems set to grow over the coming years in response to rising real disposable income. This has clear implications for the overall level of CO_2 emissions from the transport sector. Furthermore, the effectiveness of measures in this area will depend to a great extent on agreement at EC level on Community-wide standards for CO_2 emissions from vehicles.

3.2 It is evident, nevertheless, that action must be taken in relation to the transport sector. This action will be taken in the context of established public policy to promote increased use of both rail and bus modes and with the objective of improving energy efficiency in the transport of goods and people. On a general level, the Minister for the Environment is considering the preparation of guidelines to planning authorities on the development plan-making and review process; the Minister may also, at a later date, consider issuing further guidelines addressing specific land-use planning policies in plans, which may help to limit/reduce CO_2 vehicle emissions by encouraging public transport and promoting more environmentally rational use of the private car. Ireland welcomes the Commission's Green Paper on 'The Impact of Transport on the Environment - A Community Strategy for Sustainable Mobility' and looks forward to positive involvement in the debate leading to the planned White Paper on the Future Development of Transport Policy in the Community.

Fiscal Measures

3.3 As with energy use generally, a high level of taxation is already borne by the transport sector in Ireland (vehicles and fuels). In addition, the taxation system includes a number of specific features which are relevant to the control of CO_2 emissions from transport:-

- a graduated road tax regime related to engine capacity, with larger cars being subject to higher levels of tax. The tax ranges from IR£92 for cars up to 1,000 cc to IR£800 per annum for all cars greater than 3,000 cc;

- the purchase of new cars is subject to Vehicle Registration Tax at a rate of 25.75% for cars not exceeding 2012 cc and 31.8% for cars over 2012 cc, as well as VAT at 21%;

- benefit-in-kind taxation of company cars increased significantly in 1992 and will be kept under review;

- the level of excise duty borne by diesel oil is less than that applying to petrol (see Appendix 4). Diesel engines are more fuel efficient and emit less CO_2 than petrol engines over a given journey, despite producing more CO_2 per gallon of fuel. The number of diesel vehicles on Irish roads is expected to increase as a proportion of total vehicles in the coming years.

Non - Fiscal Measures : Dublin Transportation Measures

3.4 The greater Dublin area is the most densely populated part of the country containing about one third of the population. Traffic congestion in Dublin is on a greater scale than in other urban areas. Consequently decisions on traffic management and transport infrastructure in this area have considerable scope for increasing energy efficiency and reducing the environmental impact of traffic. Substantial progress has been made in recent years in improving public transport services and reducing traffic congestion. The introduction of an electrified commuter rail service has been successful in encouraging a move away from private transport along the route of the service. The development of diesel based commuter rail services on existing mainline rail links serving Dublin has also been successful. The introduction of bus priority measures has increased the efficiency of the city bus services. General traffic management improvements such as close circuit television monitoring of traffic and higher on- the- spot fines for illegal parking have had major beneficial effects.

3.5 The current road investment proposals for Dublin are concentrated on the provision of a ring road around the city and the development of the main national routes radiating from the city. No further significant road development is planned along the city quays and the canal ring and apart from a small number of projects which are under construction/ at an advanced stage of preparation there are no further plans for major urban road investment in the centre city. In the planning of roads, special consideration will continue to be given to the requirements of bus- based public transport which accounts for 23% of morning peak hour traffic crossing the inner cordon between the Dublin canals.

3.6 The Dublin Transportation Task Force plans to build on the measures outlined earlier and to pay continuing and increased attention to traffic management and enforcement. Measures taken in this regard include more bus lanes, extension of the operating time of existing bus lanes, extension of the adaptive urban traffic control system, expansion of the closed circuit television monitoring system, the development of selective bus detection and the promotion of car pooling. Further development of commuter rail services to the west of Dublin is envisaged including the development of a commuter rail link along the South West Rail Corridor from Kildare to Dublin and investment in new rolling stock.

3.7 Dublin Bus is introducing new services specifically to compete with the car in Dublin City. New high- specification energy- efficient buses are being used on the new services and in the fleet generally. Already, the share of commuter travel into the city centre by bus has increased from 22% in 1990 to 24% in 1991, reflecting the increasing reliability and effectiveness of the service.

3.8 As regards planning for the future, Phase 1 of the Dublin Transportation Initiative (DTI) has been completed. This phase involved a review of previous studies, an assessment of the existing transport situation, a public consultation process and the preparation of terms of reference for Phase 2. The purpose of Phase 2 is the development of an ongoing transportation planning process, a strategy for the period to 2011 and a medium term investment/ implementation programme for the period 1994- 7, having regard to a range of considerations, including environmental factors (energy consumption, air pollution, noise etc.) The emphasis in the study is on an integrated and comprehensive approach. It is concerned with all transport modes (car, rail, bus, light rail

transport, cycling and walking) and will include alternative scenarios, such as those which may reduce the demand for travel. It deals not only with the provision of infrastructure and facilities but how they are most effectively used. In the case of roads, particular attention will be paid to traffic management and law enforcement. Two aspects of the study will be of particular relevance to CO_2 emissions: further measures to encourage increased use of public transport and to improve traffic management and enforcement. The DTI involves an extensive survey, market research and consultation programme. An interim report on Phase 2 was published in February, 1993, and the final report is intended for publication in July, 1993.

Non - Fiscal Measures : National Transportation Measures

3.9 Given the dispersed population in rural Ireland, transport needs will continue to be met primarily by private transport. However, public transport links between and within the principal urban centres will be improved as resources permit.

3.10 Railways have a valuable role to play in terms of preserving the quality of the environment, reducing road congestion and ensuring the more efficient movement of people and goods. Total direct State support to the railways amounted to over IR£1030m between 1980 and 1992. In addition, capital investment of almost IR£250m was made by the national railway company over the same period. The mainline rail network has been upgraded by improving track and signalling and providing high quality rolling stock. An Exchequer subvention is provided for maintenance of infrastructure and the operation of socially necessary services. Irish Rail also invest in new rolling stock, signalling equipment and other essential rail- related infrastructure. This commitment to the rail service has borne fruit : in 1991 there were nearly 26 million passenger journeys on the railways, the largest number since rail services were first introduced in Ireland.

3.11 Ireland plans further significant investment in railway plant and equipment over the coming years to build on the progress to date and, inter alia, contribute to control of CO_2 emissions. Projects include the upgrading of the Dublin/ Belfast railway line which will be carried out over the next five years. In December, 1991 the then Minister for Tourism, Transport and Communications (now Transport, Energy and Communications) announced the undertaking of an strategic study on the future investment needs and resources required for the rail network. The study is being carried out by CIE, the Department of Finance and the Department of Transport, Energy and Communications with the assistance of consultants. The results of the study will form an integral element in the formulation of an investment programme for the railways.

3.12 Bus Eireann provides public bus services outside of the Dublin area. The company has since 1987 consistently increased the number of passenger journeys it provides each year; the number of passenger journeys was over 87 million in 1991. Of particular importance are Expressway services. The company has concentrated on developing the Expressway network by opening up new routes, upgrading existing routes by increasing the frequency of services, and acquiring a fleet of modern high quality coaches. These steps have helped generate substantial growth in long distance travel by bus.

3.13 With regard to private transport, in January, 1992 the Department of Transport, Energy and Communications published a guide to the fuel efficiency of new cars and to fuel

efficient driving. A leaflet to publicise the guide was issued at the same time.

3.14 Compulsory roadworthiness testing helps ensure that engines are maintained in good running order. Such testing is being carried out for 45,000 heavy commercial vehicles over 1 year old (annual test). The scheme is being extended to include 50,000 light goods vehicles (including car-derived vans) over 4 years old (biennial test) in 1993/1994 and 550,000 private cars over 4 years old (biennial test) will be brought within the scheme on a phased basis by 1st January, 1998. The extension of testing is required by relevant EC Directives adopted in 1988 and 1991 respectively.

Environmental Benefits

3.15 The transport sector is recognised to have a wide-ranging - and sometimes beneficial - impact on the environment. It affects air, water and soil quality and produces noise and vibration. Among the air pollutants from transport sources are: CO_2, carbon monoxide, volatile organic compounds, and nitrogen oxides. The use of land for transport infrastructure and congestion constitute other significant environmental impacts. By promoting energy efficiency through improved traffic management and greater use of public transport the measures outlined in this chapter will contribute to the amelioration of adverse environmental effects of transport.

Budget and Costs

3.16 The Dublin Transportation Task Force budget for 1993 is IR£200,000. The Exchequer subvention for rail will amount to IR£93 million in 1993 and Irish Rail investment will amount to a further IR£27.7 million. The Exchequer subvention amounts to IR£4m for Bus Eireann and IR£8m for Dublin Bus in 1993.

Chapter 4
WASTE POLICY AND MEASURES

Waste Policy

4.1 When waste containing carbon (e.g. paper, foodstuffs, etc.) decays in the presence of air, the main gaseous products are methane (CH_4) and, to a lesser extent, CO_2. Most landfill sites receiving waste in Ireland are operated such that partial anaerobic conditions pertain within the waste mass and so both CH_4 and CO_2 are evolved. While waste-related emissions are small relative to total CO_2 emissions, measures are needed to limit CO_2 produced from this source. Policy will be based on the recognition of the importance of recycling as a means of reducing the amount of waste arising for disposal by means of landfill; it will also seek to utilise energy from waste so as to substitute for fossil fuels.

Non-Fiscal Measures

4.2 Ireland's low population density and peripheral location represent considerable constraints on achieving high levels of municipal waste recycling. While good facilities and viable markets exist in Ireland for recycling of glass and non-newsprint paper, facilities for the recycling of the other main recycables - newsprint, aluminium cans and plastics - do not for practical purposes exist here. A grants scheme for small scale recycling projects has operated since 1989 and has assisted a number of projects across most regions of the country. The Environment Action Programme developed certain further initiatives: the preparation of recycling schemes by all local authorities and a number of studies on recycling, including one on behalf of the IDA. A national programme for recycling of beverage containers has been in operation since 1987.

4.3 Concurrently with these initiatives, there has been a marked increase in recycling performance in relation to certain elements of the municipal waste stream. Glass recycling has grown from 7% in 1986 to over 20% at present. Recycling of aluminium cans has increased from a position of virtually nil to over 10% in the same period. Overall, 7% of the municipal waste stream is now recycled. These rates nonetheless fall considerably short of the rates being achieved or targeted in some EC member states. A national strategy to improve/optimise recycling performance is therefore necessary.

4.4 A major study was commissioned by the Department of the Environment in relation to this strategy and has now been published. The report, - 'Towards a Recycling Strategy for Ireland' assesses the overall potential for recycling from the Irish municipal waste stream, taking account of population distribution and other constraints, and makes recommendations as to how best this might be maximised. The study examined the following:

- the scope for improving markets for recyclable materials;

- an assessment of current collection and disposal arrangements and recommendations for improvements and/or new systems;

- recommendations on the setting of targets for improving national recycling performance and analyse possibilities for the financing of these targets;

- an evaluation the desirable roles of commercial/industrial interests and the voluntary/co-operative sector in promoting recycling activity.

- the feasibility of various possible legislative interventions including deposit schemes, take-back systems.

The Department of the Environment has asked industry, recycling operators, local authorities

and consumers for their views on the issues raised in the study. An effective national recycling strategy will then be designed, in consultation with those interested parties.

4.5 Landfill gas, which has a methane content of about 50 - 60%, has potential for use as a fuel. A total of about 1.8 million tonnes per annum of waste is landfilled in Ireland of which over 700,000 tonnes is disposed of to five landfill sites in Dublin and Cork City. Cork Corporation have installed a peripheral gas migration control system in their main landfill site. It is intended to look further at the potential for recovery and use of the gas from their site. Dublin County Council have investigated the potential of their four sites for gas exploitation and are in the process of developing the Dunsink site for gas recovery and electricity generation.

4.6 Similarly, methane from anaerobic sludge digestion at sewage treatment works can be used to generate electricity and heat. Methane is used for such purposes at Tullamore Treatment Works and this technology may be more widely applied over the coming years as part of the national programme to eliminate untreated sewage discharges. The emphasis on more widespread sewage treatment and the ending of the disposal of sludge at sea, will greatly increase the quantities of sludge available for land based disposal. Particular attention will focus on sludge treatment technologies which involve energy conservation and resource recovery. Anaerobic digestion plant are also used to generate biogas for energy purposes in the food processing and agricultural sectors, which utilise organic industrial sludges and animal manure slurries respectively.

Environmental Benefits

4.7 Intensified recycling activity will serve to minimise waste coming to landfill sites and, as long as such activity does not lead to corresponding increases in CO_2 emissions arising from the transport of waste or of recycled products, will play a beneficial role in abating CO_2 emissions. It will help extend the life of existing landfill sites, reduce the need for new ones and conserve natural resources. Recycling also offers scope for productive economic activity and employment. The use of energy from waste will lead to a corresponding reduction in the consumption of fossil fuels.

Chapter 5
CO_2 SEQUESTERING BY BIOMASS

Policy

5.1 Photosynthesis is a process by which green plants use the energy of sunlight to convert inorganic materials into organic matter which they then use for sustenance and growth. Using chlorophyll and the energy of sunlight, green plants break water into hydrogen and oxygen, and combine the hydrogen with CO_2 from the atmosphere to make sugars and release oxygen. Through photosynthesis, therefore, CO_2 is absorbed in biomass and oxygen is released to the atmosphere. Although much of this sequestered CO_2 is returned to the air when plants decompose, some of the dead plant material is buried and CO_2 is trapped. This is one of the processes by which the originally high CO_2 content of the atmosphere was reduced over the millenia.

5.2 To the extent that CO_2 is sequestered in this way it is not available to act as a greenhouse gas. A newly afforested area, therefore, acts as a sink for CO_2 and, while in time a certain balance between absorption and emission of CO_2 will ultimately be restored, nevertheless, by enlarging the area of afforestation the slow sequestration of CO_2 from the atmosphere is increased. The Climate Change Convention recognises the importance of policies and measures to protect and enhance greenhouse gas sinks and reservoirs as a means of achieving its objective of stabilising greenhouse gas concentrations in the atmosphere at a level which would prevent dangerous anthropogenic interference with the climate system. Ireland considers that action in relation to afforestation can make a significant and cost-effective contribution to strategies in relation to climate change.

Measures

5.3 The total effective forest area in Ireland is about 475,000 hectares or some seven per cent of the land area of the country. This represents a five-fold increase in the area under forest compared with just sixty years ago. It is hoped to increase this to ten per cent by the year 2000. Ireland remains, however, the least forested area within the EC which has an average of almost 25% of land area under forest; the corresponding figures for the OECD area and the world as a whole are 33% and 36% respectively (OECD Environmental Data, 1991). In the National Development Plan, 1989-93 the Government set as its target the doubling of the annual rate of planting (afforestation and reforestation) from 15,000 hectares in 1988 to 30,000 hectares in 1993.

5.4 Policy is being implemented primarily through the Forestry Operational Programme, 1989-93 agreed as part of the Community Support Framework for Ireland. Grants are now available for planting, woodland improvement, the reconstitution of woodland, forest roads, forest harvesting machinery, studies, pilot projects and publicity. Just over 23,000 hectares were planted in 1991. The figure for 1992 reached 24,000 hectares, rising to 27,000 hectares in 1993 and 30,000 hectares in 1994. Planting is carried out by both the public and private sectors. On average, 2,500 trees are planted per hectare.The operational programme is also linked to forestry measures in the Rural Development Operational Programme, which include grants for planned recreational forests, forest nurseries and farm forestry services.

5.5 The Government and the social partners reviewed progress in relation to afforestation in the context of preparing a strategy for the 1990s, the Programme for Economic and Social Progress (PESP). The PESP reaffirms the target of national planting of 30,000 hectares a year. The Programme for a Partnership Government proposes to maintain this level of annual planting to the year 2000. Appendix 5

sets out afforestation rates achieved in recent years and plans for the remainder of the century.

Environmental and Other Benefits

5.6 It is estimated that one hectare of sitka spruce will absorb 3 - 3.8 tonnes of carbon each year; the corresponding figure for broadleaved crops would be 2 - 2.6 tonnes. Most planting in Ireland is of conifers, mainly sitka spruce; only about 2% of current planting is of broadleaves but the long term target is 10%. The national forest currently absorbs approximately 1.4 MTC every year. With the planned expansion of the forest as detailed above, the level of annual absorption should increase to be of the order of 2.2 MTC by the end of the present century. This increase in absorption capacity of 0.8 MTC by the end of the present century will balance against a substantial proportion of the expected increase in carbon emissions over the period and is a significant contribution to meeting the challenge of climate change. Forestry also plays a major role in regional and economic development. It provides significant opportunities for non-farm employment in rural areas; in addition, many evaluations have shown the real net economic benefits to be gained from investment in forestry.

Budget and Costs

5.7 The total investment planned in forestry for the period 1989-93 is IR£220m. The level of EC participation amounts to nearly IR£90m. A continued high level of expenditure on forestry will be a feature for the remainder of the decade.

Chapter 6
RESEARCH

Policy on Research

6.1 For a CO_2 abatement strategy to be fully effective and to be capable of adaptation and improvement over time, it needs to be backed up by an on-going programme of research, development and demonstration (R, D and D). Experience with the international effort to develop and utilise alternatives to ozone-depleting substances, within the framework of the Vienna Convention and the Montreal Protocol, suggests that it is possible to make rapid progress in a short period of time in the carrying out and application of research intended to assist in the achievement of environmental policy objectives. As far as climate change is concerned, policy on research should be geared towards maximising the contribution of scientific endeavour to the improvement of energy efficiency, the use of renewable energy sources and the development and dissemination of environment-friendly technologies.

Subjects of Research

6.2 At UN level Ireland is a member of the Inter-governmental Panel on Climate Change (IPCC) and its scientists participate in the International Geosphere-Biosphere Programme on Global Change as well as other international climate-related research activities.

6.3 At Community level, it is recognised that R, D and D programmes need to be reviewed and intensified, while programmes of dissemination of technology such as THERMIE need to be enlarged. The third framework programme of research and technological development of the Community (1990-94) already covers R, D and D activities in appropriate areas. In particular, the specific programme in the field of non-nuclear energies (1991-94), which is a development and extension of the JOULE programme, will be pursued in the field of minimum-emission power production from fossil sources including the development of carbon abatement technologies, renewable energy sources and energy utilisation and conservation (including energy efficient transport).

6.4 Irish enterprises and institutions participate actively in the Community's energy programmes such as JOULE and THERMIE. Research contracts are ongoing in Irish universities under the JOULE programme. Since THERMIE commenced in 1990, 22 Irish projects have been supported. Most of these projects are in the rational use of energy category although the renewable area is also well represented. The JOULE and THERMIE programmes are promoted in Ireland by EOLAS which publicises the programmes and advises on applications for funding. EOLAS also highlights areas of particular relevance to Ireland. Irish organisations are well placed to participate in expanded EC programmes over the coming years. Among the projects supported under THERMIE were ones to:-

- construct an office building which will demonstrate the use of a range of energy efficient technologies to minimise fossil fuel derived energy consumption.

- demonstrate a new system of energy storage for refrigeration processes in a large brewery through using hydrated salts.

6.5 Amongst 44 energy-related R, D and D projects undertaken in the public sector in 1990 were ones to:-

- demonstrate the potential of unheated covered streets in educational establishments;

- evaluate the extent to which wind energy can technically and economically be fitted into power production systems;

- identify relevant research projects which may facilitate the penetration of wind energy;

- evaluate the geothermal potential of deep boreholes in Munster and Leinster;

- utilise geothermal resources in Mallow, Co. Cork; and

- demonstrate a 50 kw optimal hydro power generating station;

6.6 With regard to the future, research areas which have been identified for priority action include renewable energy resources, electricity demand management, energy use for space heating and energy in transport.

6.7 The Environmental Research Unit of the Department of the Environment will carry out research on energy efficiency in existing houses and an assessment of the possibilities for the reduction of CO_2 emissions in existing buildings. The project involves the modelling of a number of measures with the potential to reduce energy use and CO_2 emissions in a range of houses selected as representative of particular segments of the national housing stock in terms of construction, location, heating levels and use patterns. This selection would be based on existing data from surveys carried out by An Foras Forbartha and the ERU and the most recent Household Budget Survey. An appropriate model would be chosen for use in the work. The results of the project will be:

- quantified estimates of the likely effect of specific measures aimed at reducing CO_2 output in the domestic sector;

- an ability to assess quickly other possibilities for energy conservation or CO_2 reduction in the domestic sector which might be proposed from time to time;

- a module of a more general model of the housing sector which could be developed over time as a basis for assessing various policy options.

6.8 The Environmental Protection Agency (EPA) will be formally established later this year and will have as one of its major functions the preparation of environmental research programmes and coordination of such research. This will assist a more effective research effort in relation to the interaction between energy and the environment. Efforts to maximise national research capabilities and effectiveness have been hindered in the past by poor co-ordination between the various bodies and institutions involved in research. The establishment, with the encouragement of the Department of the Environment, in mid-1991 of the University Research Group on the Environment (URGE) to promote co-operation between the various third level institutions involved in environmental research was therefore a most welcome development. The main third level institutions both north and south of the border have affiliated to URGE and the group has compiled a directory of existing research capabilities and helps in identifying R and D priorities. The Department of the Environment has provided £30,000 on a matching funds basis to assist URGE in its work. It is expected that the group will play a major role in liaising with the EPA on the preparation of national research programmes.

6.9 In order to support the afforestation programme now underway in Ireland, significant investment is also being made in forestry-related research. Within the framework of the STRIDE operational programme (Forestry Sub-Programme), measures have been adopted to co-ordinate and strengthen existing research

facilities, improve participation in EC and other international research programmes and augment linkages between research and the forest industry.

6.10 Attention must be paid to research relating to climate change response strategies. The STRIDE programme also addresses this aspect: provision is made in the programme for the development of a coastal engineering and resources management centre based in University College, Cork. In addition, it is proposed under STRIDE to establish an hydraulics laboratory and coastal management support unit which will, inter alia, assist in the development of coastal responses to climate change. STRIDE is also providing funds towards upgrading research capabilities and establishing a research fund. Part of the resulting research will be of benefit to the climate change issue e.g., funding of a research project related to anaerobic co- digestion of a mixture of solid organic wastes for the purpose, inter alia, of biogas generation.

6.11 The National Coastal Erosion Committee, comprising officials from maritime local authorities and relevant experts, commissioned a study from EOLAS on the problems of coastal erosion. The results of the study will inform the development of policy in this area.

6.12 The Energy Research Centre, based at the Economic and Social Research Institute (ESRI) in Dublin, carries out research on economic aspects of the interaction between energy and the environment, including evaluation of the economic implications of measures to respond to climate change. Studies already published include 'Economic Effects of Carbon Taxes' (Policy Research Series Paper No.14) and 'Macroeconomic Impact of Environmental Policy on Acid Rain' (ESRI Medium Term Review 1991-1996)

Budget and Costs

6.13 Research contracts valued at IR£1.7 million are being carried out by Irish universities under the JOULE programme. Under the THERMIE programme, grant aid of IR£3 million was approved to Irish projects in 1992 bringing the total amount allocated under THERMIE since its commencement in 1990 to IR£7.4 million. Total expenditure on energy-related R, D and D in the public sector in 1990 is estimated to have been around IR£ 3.7 million, compared with IR£1.4 million in 1989; these figures would exclude R, D and D in private sector organisations. Of the 1990 expenditure, State funding accounted for IR£0.7 million, IR£1.8 million came from international public agencies (principally the EC) and industrial support totalled IR£1.2 million. The total cost of the STRIDE forestry measure is IR£1 million and of the hydraulics laboratory is IR£1.8 million.

Chapter 7
CONCLUSIONS

Implementation

7.1 The wide-ranging measures detailed in this strategy call for effective implementation and coordination. An Inter-Departmental Coordinating Group will, therefore, be established to oversee implementation of the strategy. It will be chaired by the Department of the Environment and include representatives of other Departments and agencies as appropriate.

Period and Review of Strategy

7.2 The strategy covers the period 1992-2000 and is geared towards controlling CO_2 emissions at the end of the century. The uncertainties which surround the science of climate change, and measures to counteract it, make it desirable that in addition to the on-going work in this area, provision should be made for formal review of the strategy. This will be done in accordance with the relevant monitoring arrangements agreed in the context of Community climate policy and the reporting requirements which will apply under the Climate Change Convention.

Public Awareness

7.3 An awareness campaign relating to climate change will be undertaken jointly by the Departments of the Environment and Transport, Energy and Communications. The campaign will be coordinated with existing energy conservation programmes. It will focus on how individual action in relation to energy consumption can contribute to the mitigation of global climate change.

Other Greenhouse Gases

7.4 Other greenhouse gases, apart from CO_2 and those already subject to regulatory controls, will require increasing attention in the near future. Work is near completion in the Environmental Research Unit of the Department of the Environment, on a national inventory of greenhouse gases for 1990.

Conclusion

7.5 The Irish national strategy contains a series of measures to control CO_2 emissions. While these entail considerable costs, they will also bring important environmental benefits and, by encouraging energy conservation, will improve the efficiency of the economy. Extensive afforestation will also contribute significantly to controls on the amount of carbon available to act as a greenhouse gas. These measures mark the start of national action to respond to the climate change problem and the dangers it poses to the global environment.

Appendix 1

Total Primary Energy Requirement, 1990 by Fuel

Fuel	Coal	Peat	Oil	Gas	Hydro	Total
			Million Tonnes of Oil Equivalent			
Sector						
Electricity	1.307	.667	.348	.848	.059	3.229
Industrial	.337	.033	.997	.803		2.170
Commercial		.005	.040	.544	.082	.671
Residential	.490	.683	.333	.126		1.632
Transport			2.016			2.016

Appendix 2

CO_2 Emissions from Energy Use, 1990 by Fuel and Sector

Fuel		**Coal**	**Peat**	**Oil**	**Gas**	**Total**
		Million Tonnes of Carbon				
Sector						
Electricity		1.277	.879	.286	.531	2.973
Industrial		.330	.037	.818	.418	1.603
Residential		.479	.800	.273	.079	1.631
Commercial			.005	.045	.447	.051
.548						
Transport				1.655		1.655

Appendix 3
Energy Consumption by Fuel - Ireland & EC Compared, 1989 (%)

	Coal	Peat	Oil	Gas	Nuclear	Other	Total
Ireland	25.3	14.7	43.0	16.4	0	0.6	100

Source: Economic and Social Research Institute

Appendix 4
Energy Tax Regime in Ireland, 1993

Source: Department of Finance

Fuel	VAT	Excise
Oil Products		
(i) Motor Spirit		
- leaded	21%	28.70 p/l
- unleaded	21%	26.14 p/l
(ii) Auto-diesel	21%	22.31 p/l
(iii) Gasoil	12.5%	3.73 p/l
(iv) Fuel Oil	12.5%	0.76 p/l
(v) LPG		
- Automotive	21%	5.675 p/l
- Other	12.5%	3.73 p/l
Natural Gas		12.5% -

Appendix 5
Total Forest Planting, 1989-2000

Year	**1988 (Actual)**	**1989 (Actual)**	**1990 (Actual)**	**1991 (Actual)**	**1992 (Actual)**	**1993 (Projected)**	**1994-2000 (per annum) (Planned)**
Hectares Planted (000s)	15	19	20	23	24	27	30

Sources: Department of Energy Data
Forestry Operational Programme, 1989-93
Programme for Economic and Social Progress, 1991
Programme for a Partnership Government