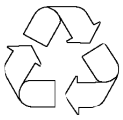
IRELAND

Second National Communication

under the

United Nations

Framework Convention on Climate Change



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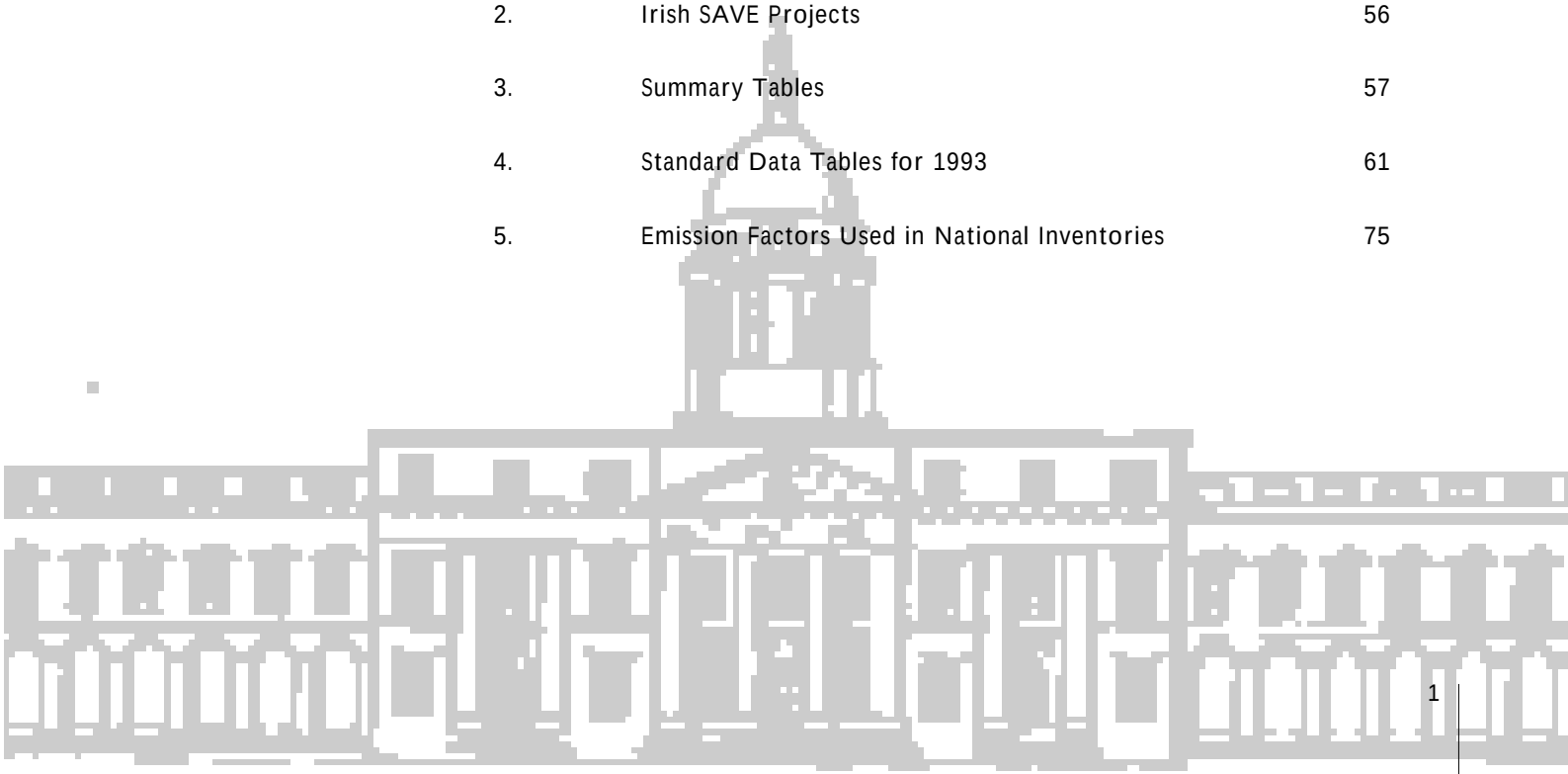


1. Executive Summary

Introduction

Within the framework of overall EU policy on climate change, Ireland launched its "Climate Change - CO_2 Abatement Strategy" in 1993. Ireland's carbon dioxide (CO_2) abatement strategy is based on the objective of limiting CO_2 emissions so as not to exceed 37 million tonnes of CO_2 in the year 2000. This is equivalent to limiting the increase in emissions to 20% above 1990 levels, or an increase of 11% if account is taken of increased carbon sinks capacity.

Ireland's National Sustainable Development Strategy recognises the EU position in the on-going AGBM negotiations, which is to seek a 15% reduction in developed country emissions of CO_2, CH_4 and N_2O taken together below 1990 levels by 2010. Ireland has indicated that it will contribute to the achievement of the overall EU reduction objective resulting from the Protocol negotiations by means of an indicative national objective of limiting the growth, in the period up to 2010, in its total emissions of CO_2, CH_4 and N_2O together (measured on a GWP100 basis) to 15% above their 1990 levels.

National Circumstances

In 1996 the population was just over 3.6 million. A high proportion of the population is concentrated in the younger age-groups. Growth in population is now being experienced. Population density of 51 persons per square kilometre is relatively low compared to other countries in the region. Approximately one-quarter of the population is concentrated in Dublin and the eastern region, and outside this region, Ireland has a highly dispersed and low density population structure.

The Irish economy is one of the most open economies in the developed world. With a small domestic market, it is heavily dependent on trade. A rapid pace of development and industrialisation has occurred in recent decades. Economic growth since 1990 has resulted in Ireland's GDP growing by 28% during the period 1990-1995.

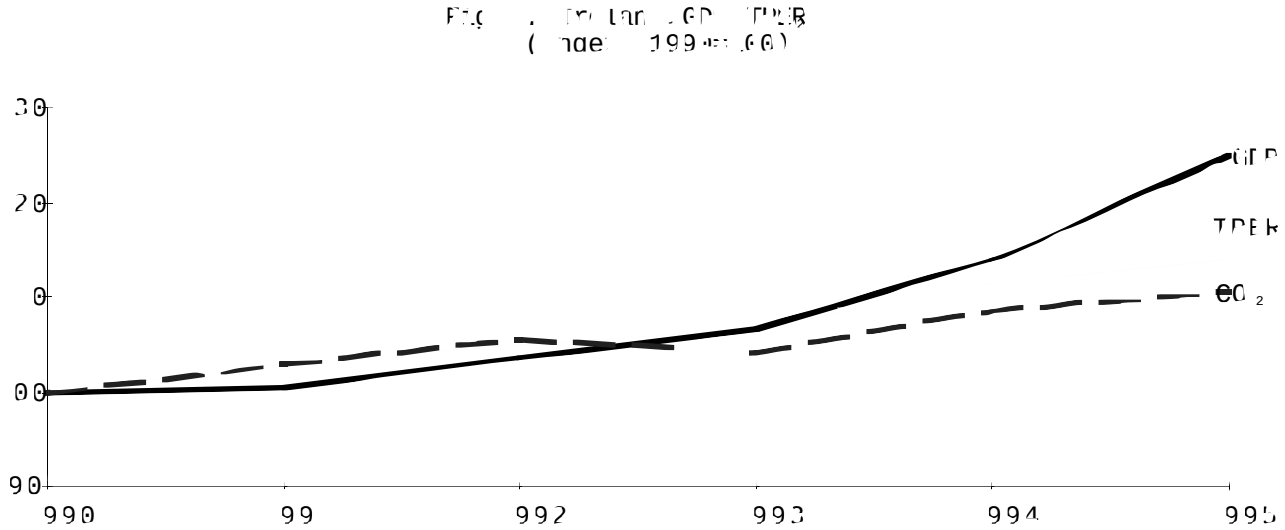


Fig. 1.2 Energy Intensity,
(Index: 1990=100)

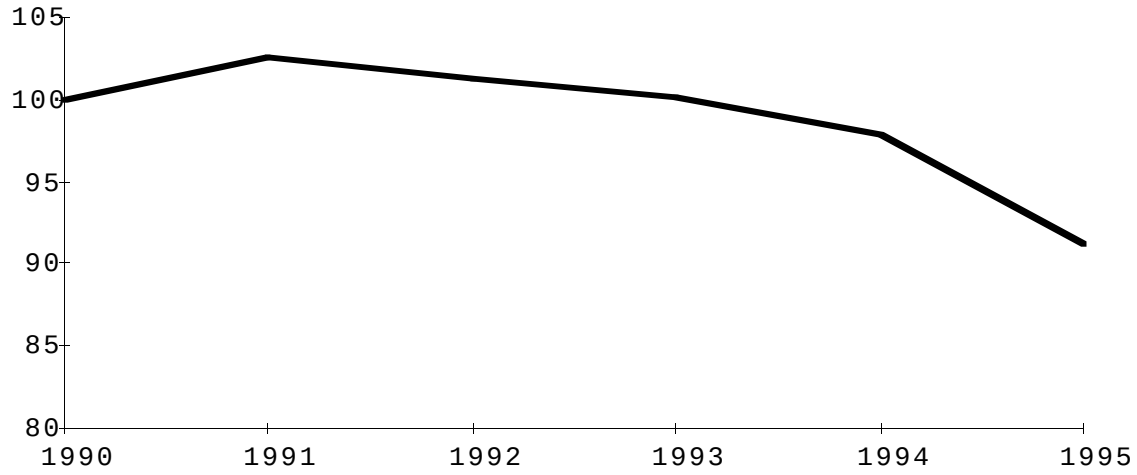
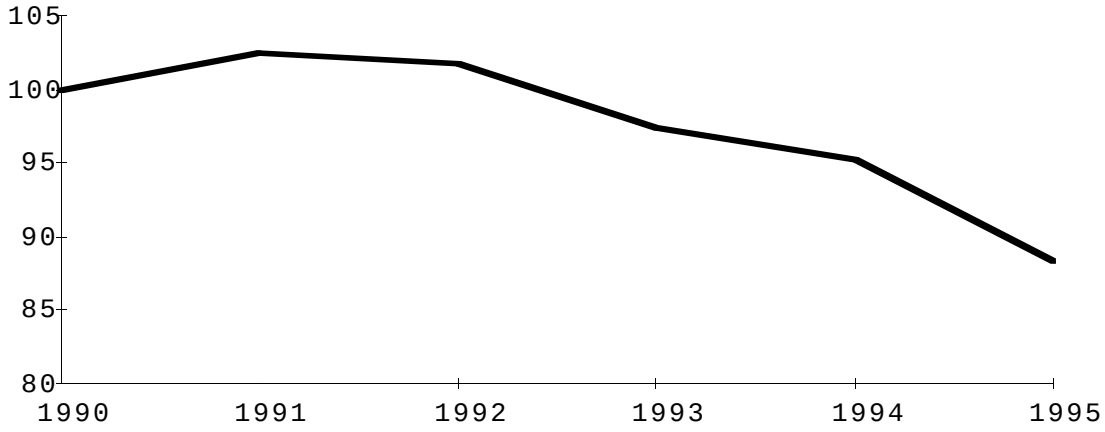


Fig. 1.3 Carbon Intensity, 19
(Index: 1990=100)



Between 1990-1995, the Total Primary Energy Requirement (TPER) increased from 9.4 million tonnes of oil equivalent (Mtoe) to 10.8 Mtoe in 1995, an increase of 15%.

Inventories of Greenhouse Gas Emissions and Removals

Ireland's gross CO_2 emissions rose from 30.7 million tonnes in 1990 to 33.9 million tonnes in 1995, an increase of 10.5% over the period. During the same period, CO_2 removals rose from 5.2 million tonnes to 6.2 million tonnes, corresponding to a 20.7% increase in sink size.

Methane (CH_4) emissions have remained relatively stable over the period 1990 - 1995, while nitrous oxide (N_2O) emissions have fallen by 11.4%.

Fig. 1.1 illustrates the relative trends in GDP, TPER and CO_2 emissions compared to the base year of 1990. While the level of economic activity in Ireland rose by 28% between 1990-1995, the total of all energy consumed

increased by 15% over the same period. At the same time, the corresponding increase in CO_2 emissions was 10.5%. This reflects both a decreasing energy intensity and carbon intensity of the Irish economy over the period 1990-95, as illustrated in Figs. 1.2 and 1.3.

When expressed on a Global Warming Potential basis with a 100 year time horizon, Ireland's gross emissions of CO_2, CH_4 and N_2O together in 1995 were approximately 4% above the 1990 level. If account is taken of the increased afforestation, the net increase in emissions was 2% over the period.

Policies & Measures

Policies and measures have been designed to improve general levels of efficiency of energy production and consumption. On the consumption side, measures are aimed at addressing efficiency and conservation in the industrial, residential, commercial and institutional sectors. In relation to energy supply and production, activities are directed at improving the efficiency of electricity production, reducing the level of carbon intensity and managing growth in demand.

In the area of energy conservation, the Irish Energy Centre (IEC) is playing a leading role in improving energy conservation and efficiency principally in Irish industry through its range of schemes. Both the 1991 Building Regulations and the current revision of these regulations pay increased attention to conservation of fuel and energy for heating purposes in housing. The IEC is also contributing towards the development of home energy rating. Implementation of the EU's SAVE programme, e.g. heating system inspection, appliance labelling and pilot/demonstration projects, is promoting the rational use of energy. A demand side management (DSM) programme undertaken by the national Electricity Supply Board is limiting the growth in electricity demand through a combination of efficiency gain programmes, combined heat and power (CHP) and differential electricity tariffs. Measures with respect to energy supply have included electricity production and distribution efficiency programmes. The carbon element of the national fuel mix is being addressed by fuel switching to natural gas, increasing the efficiency of peat-generated electricity and the development of a significant alternative and renewable energy policy.

Given Ireland's economic structure and population distribution, the transport sector plays a vital role in national economic and social terms. Policies in this area are aimed at improving the overall efficiency of this sector. The Operational Programme for Transport (1994-1999) provides for a planned investment programme for the national road and rail networks with the objective of reducing traffic journey times and idling or stop-start driving on national routes. The Dublin Transport Initiative (DTI) strategy contains a broad range of measures aimed at a significant shift in the use of the Dublin area transport towards public transport. A Dublin Transport Office has been established to coordinate the implementation of the DTI. In addition to the structural investment in public transportation, State financial support is provided towards the operation of public transport services.
Actions have also been taken to improve the efficiency of the national vehicle fleet. A car scrappage scheme has increased the car replacement rate, with an emphasis on smaller cars, by means of a vehicle registration tax refund. Substantial vehicle and fuel taxation applies in Ireland. Both vehicle registration tax and annual road tax are graduated in accordance with engine size and, implicitly, fuel consumption. In addition, excise duties on auto LPG and CH_4 are significantly below those applying to petrol and diesel.

An extensive national afforestation programme is continuing. Over the period 1990-1995, the total forest area was expanded by 20%. The Forestry Sub-Programme of the Operational Programme for Agriculture, Rural Development and Forestry will result in 10% of the total national land area being afforested by the year 2000, compared with approximately 1% at the start of the century. This is projected to increase to 17% of land area

by 2030, doubling the area under forestry in 1995.

Measures which address CH_4 emissions being undertaken in the waste sector include waste minimisation and landfill management. The national recycling strategy aims to divert 20% of waste from landfill by 1999. Other actions, including the Waste Management Act 1996, will introduce improved landfill management including increased utilisation of landfill gas and waste to energy facilities.

In the agricultural sector, codes of good practice with respect to fertiliser will help limit the release of N_2O to the environment.

Projections of Greenhouse Gas Emissions & Removals

The projections to 2010 are based on the energy balance available in February 1997 and on assumptions regarding national animal herds in 2010.

Emissions of CO_2 are projected to be 35 million tonnes in the year 2000 and 40.8 million tonnes in 2010. These correspond to levels which are approximately 14% and 33% respectively above the 1990 level. CO_2 removals are forecast to be 7.6 million tonnes by 2000 and 9.7 million tonnes by 2010 which is equivalent to an 88% increase in the size of the CO_2 sink over the period 1990-2010.

If account is taken of the increased sink size, the net increase in CO_2 emissions in 2000 and 2010 is projected to be 7% and 18% respectively above the 1990 level.

Projections for CH_4 indicate that emissions will rise slightly and then stabilise at their 2000 levels, approximately 3% above their 1990 level.

Compared to their 1990 levels, emissions of N_2O are forecast to decline by 11% by the year 2000 and to remain at that level to the year 2010.

When expressed on a GWP100 basis, emissions of CO_2, CH_4 and N_2O together are projected to be approximately 7% and 17% above the 1990 level by the years 2000 and 2010 respectively. If account is taken of increased afforestation, projections of net emissions for the three gases combined are estimated at approximately 2% and 9% above 1990 levels by the years 2000 and 2010 respectively.

Impacts & Adaptation

The Department of the Environment published in 1991 a series of studies on the impact of climate change for Ireland, based on assumptions which agreed broadly with the 1990 scientific assessment of the IPCC. The studies showed Ireland would share in the enhanced agricultural production potential of Northern Europe. The production options available would be increased, new crop options would be available, and the overall costs of agricultural production would be likely to be less than is the case at present. Similarly, higher temperatures and CO_2 levels are likely to enhance the productivity of our forests both directly and indirectly.

Ireland's "saucer-shaped" topography means that much of the centre of the country is flood-prone in its natural state along with some coastal regions. As a result, serious flooding would occur more frequently, last longer and be more widespread.

Climate change could also lead to water shortages occurring regularly and the duration of low water levels would be longer than at present. In addition, peatlands would suffer serious damage as a result of increased summer soil water deficits.

Much of the impact on Ireland of any rise in mean sea level will be associated with the increased severity of storms. Storms and storm surges will have a major impact throughout Ireland but particularly on the west coast. The largest proportion of storm-affected land is in the west of Ireland, but the most vulnerable areas may be in the east, where much of the shoreline has been developed for one purpose or another.

Overseas Assistance & Technology Transfer

Ireland is committed to making steady progress towards achieving the UN goal of increasing its Official Development Assistance to 0.7% of GNP. Net ODA disbursement reached $170 million in 1996, an increase of over 19% in real terms over 1995.

Ireland participates actively in efforts in the United Nations, the World Bank and in the EU to combat regional and global environmental problems and to advance international efforts to advance sustainable development and respect for the common global environment. Approximately 35% of Irish aid expenditure was channelled to multilateral development assistance activities in 1996, primarily through the EU, the World Bank and the various UN agencies.

Ireland is a party to the Global Environment Facility (GEF), which serves as the interim financial mechanism for the Climate Change Convention. It will subscribe £1.6 million to it over four years. Ireland is also an annual contributor to the three Climate Change Convention voluntary trust funds. It also makes an annual voluntary contribution to the Trust Fund for the Commission on Sustainable Development.

Research & Systematic Observation

There are 14 synoptic observing stations in Ireland, distributed principally around the coast. In addition, there are 80 climatological observing stations distributed throughout the country which make daily observations of temperature and rainfall; some also record elements such as sunshine, soil temperatures, and other weather phenomena.

The national meteorological service, Met Éireann, participated in FASTEX, an international experiment which used Shannon Airport as a base for a programme of intensive measurements on selected Atlantic depressions during January and February 1997. In addition, as part of an international measurement programme, the Global Atmospheric Gases Experiment (GAGE) commenced use of the Mace Head Atmospheric Research Station on the west coast in County Galway in March 1987 to measure radiatively important atmospheric trace gases.

Ireland also participates in the EU's Environment Programme (Environment and Climate) in the Fourth Framework Programme and maintains a national committee to liaise with the secretariat of the International Geosphere-Biosphere Programme (IGBP).

Education, Training & Public Awareness

Information on all environmental matters, including climate change is available in ENFO, Ireland's public information service on the environment which was established in 1990 to help protect and enhance the environment by promoting a wider understanding and fuller awareness of environmental issues.

A new award scheme, the Environmental Partnership Fund, has been launched to assist environmental awareness projects at local and national level, and to encourage partnership arrangements between local authorities and NGO/local community groups.

An annual Energy Awareness Week is organised by the Irish Energy Centre, in association with the Energy Advisory Board which aims to provide consumers with a clear understanding of the benefits of energy management and the opportunity to make real behavioural change.

2. Introduction

Ireland signed the UN Framework Convention on Climate Change at the "Earth Summit" in Rio de Janerio in June 1992, ratified it in April 1994, and submitted its first national communication in October 1994.

This second communication has been prepared in response to the relevant decisions of the Conference of the Parties to the Convention. It reflects policy developments since the first communication. It does not, however, take account of the results of a major consultancy study currently being undertaken to identify and evaluate the scope for intensifying existing policies and measures to limit and/or reduce greenhouse gas emissions and to make recommendations for the ongoing development of Ireland's greenhouse gas emissions abatement strategy, which will be reported on fully in the next national communication. Terms of reference for the study are contained in Appendix 1.

Ireland's climate change policy is established and implemented in the context of EU policy. In October 1990 the EU committed itself to the stabilisation of CO_2 emissions in the Union as a whole by the year 2000 at their 1990 levels. Within that overall stabilisation objective and similarly to the Convention, EU policy recognises that a number of Member States, including Ireland, whose economic development is incomplete will need targets and/or strategies corresponding to their economic and social development, while improving the energy efficiency of their economic activities.

Within the framework of overall EU policy on climate change, Ireland launched its "Climate Change - CO_2 Abatement Strategy" in June 1993. This strategy included 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.

"Sustainable Development - A Strategy for Ireland" was launched in April 1997. Climate change concerns have been integrated into this major national sustainable development plan, most specifically in the areas of energy, transport and forestry. The Strategy acknowledges that the developed world bears a disproportionate responsibility for the depletion and degradation of the global environment and must demonstrate leadership in the implementation of sustainable development policies. It provides a comprehensive framework which will allow sustainable development to be taken forward more systematically in Ireland. It emphasises that the process will require a continuing adaptation and review of policies, actions and lifestyles.

The Strategy recognises the EU position in the AGBM negotiations, which is to seek a 15% reduction in developed country 2010 emissions of CO_2, CH_4 and N_2O taken together below 1990 levels. Ireland has indicated that it will contribute to the achievement of the overall EU reduction objective resulting from the Protocol negotiations by means of an indicative national objective of limiting the growth in the period up to 2010 in its total emissions of CO_2, CH_4 and N_2O (measured on a GWP100 basis) to 15% above their 1990 levels.

Ireland's ability to reduce CO_2 emissions, which is the principal man-made greenhouse gas emission implicated in climate change, is restricted due to a number of structural factors. These include a low density dispersed population pattern, reliance on peat, a carbon intensive fuel source, for about 14% of our energy needs, our already high use of natural gas and the absence of a nuclear energy option.

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 37 million tonnes of CO_2 in the year 2000. This would represent an increase of 20% above 1990 levels, or an increase of 11% if account is taken of increased carbon sinks capacity.

Current energy projections (February 1997) indicate that Ireland's emissions of CO_2 in 2000 are expected to be approximately 35 million tonnes. This represents a 14%

increase above the 1990 level. Together with the sequestration of CO_2 under the afforestation programme, it is now expected that net national increase in CO_2 emission over the period 1990 to 2000 will be 7%.

Emissions of the other main greenhouse gases taken together, i.e. CH_4 and N_2O in 2000 are expected to be approximately the same as in 1990.

Table 2.1 summarises 1990 and 1995 (provisional) inventories of greenhouse gas emissions and projections for the years 2000 and 2010. The projections to 2010 are based on the energy balance available in February 1997 and on assumptions regarding national animal herds in 2010.

Ireland's CO_2 emissions in 1990 were approximately 30.7 million tonnes which represent approximately 1% of total EU emissions and 0.1% of global emissions. Provisional data for 1995 indicates that the growth in CO_2 emissions compared to levels at the start of the decade has been limited to approximately 10%.

The enhancement of the forestry sink has significant effects on total emissions, as can be seen in Table 2.2. Net emissions for the basket of CO_2, CH_4 and N_2O are 2% above 1990 levels in 1995, and are expected to remain approximately at this level for 2000.

Table 2.1 Irish Greenhouse Gas Emissions and Projections

Expressed on a gas-by-gas basis in Gigagrammes and on a Global Warming Potential basis (100 year time horizon) in Gigagrammes CO_2-equivalent

Year	CO_2	CO_2 index	CH_4	CH_4 index	N_2O	N_2O index	GWP Total	GWP Index	Forestry	Increase in Forest Sink
	Gg)		(Gg)		(Gg)		(Gg)		CO_2 (Gg)	(CO_2 Gg)
1990	30719	100	811.32	100	29.37	100	56861	100	-5160	
1995	33931	110	812.24	100	26.04	89	59060	104	-6230	1070
2000	34998	114	837.03	103	25.96	88	60623	107	-7580	2420
2010	40775	133	839.19	103	26.07	89	66480	117	-9690	4530

Table 2.2 Irish Greenhouse Gas Emissions on GWP100 Basis (Gg CO_2 equivalent)

	CO_2	CH_4	N_2O	Total	Index	Forest Sink	Net Total	Net Index
GWP Factor	1	21	310					
Year	Gg CO_2	Gg CO_2-equivalent	Gg CO_2-equivalent	Gg CO_2-equivalent		Gg CO_2	Gg CO_2-equivalent	
1990	30719	17038	9105	56861	100		56861	100
1995	33931	17057	8072	59060	104	-1070	57990	102
2000	34998	17578	8048	60623	107	-2420	58203	102
2010	40775	17623	8082	66480	117	-4530	61950	109

Fig. 2 Share of Total Greenhouse Gas Emissions

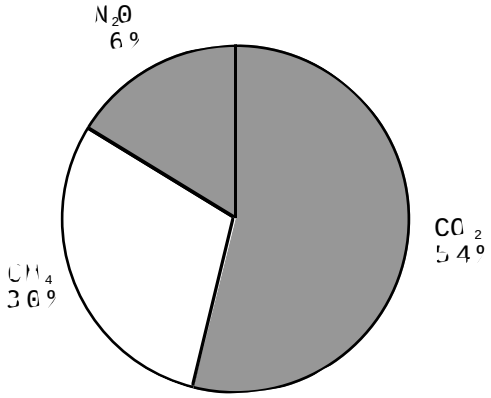
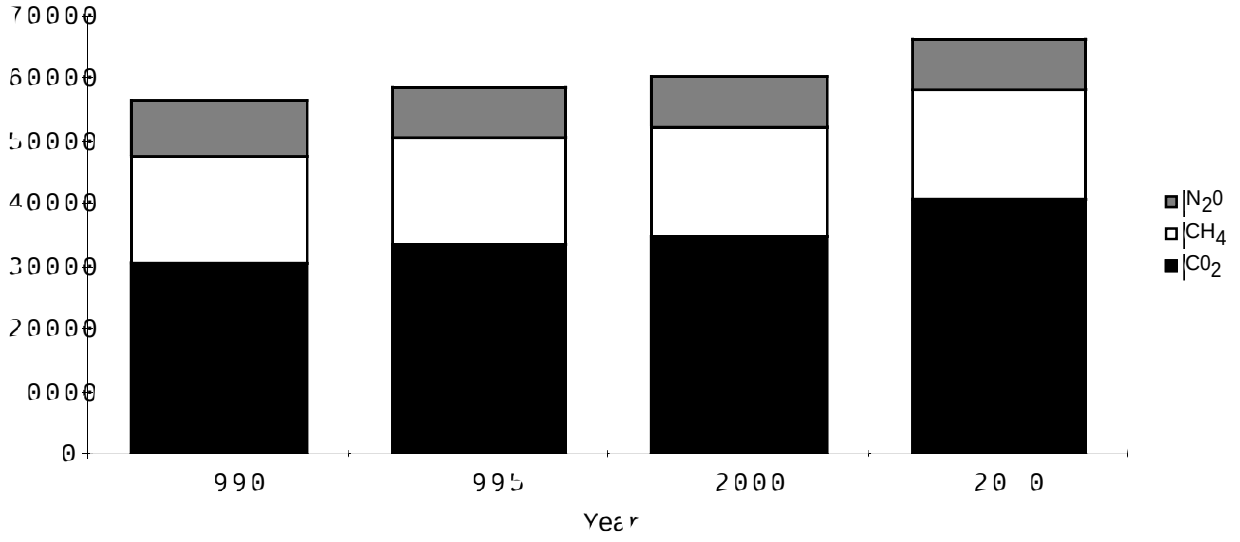


Fig. 3 Projected Greenhouse Gas Emissions to 2020
(Gg CO_2 equivalent)



3. National Circumstances

Physical Features

The island of Ireland is situated off the north-west coast of the continent of Europe between longitude $5^1/_2{}^o$ and $10^1/_2{}^o$ West and latitude $51^1/_2{}^o$ and $55^1/_2{}^o$ North. The total area of the island of Ireland is 84,421 square kilometres. The Republic of Ireland comprises 70,282 square kilometres. The greatest length of the island from the north to the south is 486 kilometres and the greatest width, from east to west, is 275 kilometres. There are 3,172 kilometres of coastline. The island comprises a large central lowland of limestone with a relief of hills and a number of coastal mountain ranges, between 300 - 800 metres high. The central lowlands are drained by slow moving rivers prone to winter flooding; the coastal mountains by many smaller, faster flowing rivers subject to spate flooding in storms.

Climate

Influenced by the relatively warm waters of the Gulf Stream and with the prevailing southwesterly winds coming from the Atlantic, Ireland has a temperate oceanic climate. The coldest months are January and February, with mean daily air temperatures of between 4^oC and 7^oC while July and August are the warmest, with mean temperatures of between 14^oC and 16^oC. May and June are the sunniest, averaging 5 to 7 hours sunshine per day. Rainfall is well distributed throughout the year. In low-lying areas average annual rainfall is mostly between 800 and 1200 millimetres but ranges from less than 750mm in some eastern areas to 1500mm in parts of the west. In mountainous areas annual rainfall may exceed 2000mm.

Population

In 1996 the population was just over 3.6 million. A high proportion of the population is concentrated in the younger age-groups, with approximately (44%) aged under 25 and approximately 27% aged under 15. Growth in population is being experienced for the first time in 150 years, with significant reductions in dependency ratios. Population density of 51 persons per square kilometre is relatively low compared to other countries in Europe. Approximately one-quarter of the population is concentrated in Dublin and the eastern region and outside this region, Ireland has a highly dispersed and low density population structure. Housing is generally one or two storey, detached or semi-detached, and in urban areas is mostly in low density suburbs (15 to 30 houses per hectare). Flats or apartments are now becoming more common, and prior to the coming into force of the Building Regulations in 1992 for new construction, insulation standards for housing were generally low. Only 31% of the population live in population settlements in excess of 100,000, as opposed to 35% of the population living in dispersed settlement patterns in rural areas. Comparative EU data shows that Ireland has the lowest population share living in settlements of between 2,000 and 100,000.

Economy

The Irish economy is one of the most open economies in the developed world. With a domestic market of only 3.6 million people, it is heavily dependent on trade; exports of goods and services alone amount to 90% of GNP. The rapid pace of development and industrialisation in recent decades has been in large measure due to foreign inward investment. Indigenous industries have also been growing quickly in recent years. Sustained economic growth since 1990 had led Ireland's GDP to grow by 28% over 1990 levels by 1995. As a member of the EU, Ireland is part of a large economic area in which goods, services, people and capital can move freely. As a result, Ireland's economic development is greatly influenced by the policies of her trading partners in the EU. Living standards have been converging to European levels over the past two decades. This convergence has become more marked in recent years. Per capita GNP rose from under 60% of the European average in 1970 to over 80% in 1995.

In 1995, over 70% of Irish exports were to the EU. The main areas of Irish exports are computer/electrical equipment, chemicals/pharmaceuticals and food/agricultural products which account for 21%, 18% and 17% of total Irish

exports respectively. The industrial sector in total accounts for 38% of GDP, 83% of exports and 28% of total employment. The highest growth rates in Irish industry over recent years have been in the high-technology sectors of computer equipment, pharmaceuticals and engineering, where overseas investment in Ireland has played a vital role. Overseas-owned companies employ about 100,000 people and account for 70% of total manufactured exports.

Despite the gradual decline in the relative importance of agriculture in the past few decades the sector remains the most important indigenous industry. Agriculture accounts for around 8% of GDP, 11% of employment and 21% of exports. This compares with approximate EU averages of 3% of GDP, 6% of employment and 9% of exports. The vast majority of farms are owned and operated by farming families with an average size of 26 hectares, although there is considerable diversity around this range. Of a total land area of 7 million hectares, 5 million hectares are utilised for agricultural purposes. With mild temperatures and relatively high rainfall, conditions are ideally suited to stock raising, with the result that cattle raising and dairying are by far the most important agriculture sectors. Livestock (mainly cattle) and livestock products (principally milk) account for around 87% of the value of gross agricultural output. Over half of the value of agricultural production is exported; however, for cattle and beef production the export proportion is higher, with over 80% of production going abroad.

The services sector in Ireland accounts for slightly over half of GDP and for 60% of employment.

In 1995, the total labour force was estimated at around 1.4 million, equal to 39% of the total population. This is lower than the EU average of approximately 43% due to the larger proportion of young people and relatively lower level of female participation in the labour force. The level of unemployment remains relatively high at approximately 13%, illustrating the importance of further sustained economic development.

Energy

Ireland has the only stand-alone electricity grid in the EU and limited indigenous energy resources. As a result, there is an emphasis on security of supply and on the development of peat, alternative energy resources and offshore natural gas in order to meet national energy requirements. While Ireland is totally dependent on imports for its oil supply, the proportion of primary energy derived from oil has declined significantly since 1980 in line with EU energy policy. In 1995, the proportions of the total primary energy requirement accounted for by oil, coal, natural gas and peat were 50%, 18%, 18% and 11%. All large-scale hydroelectric potential is fully utilised and indigenous natural gas resources are expected to be exhausted by 2003. However, new developments at Kinsale/Ballycotton, which are taking place at present, will, if successful further extend the economic life of the field. Being so dependent on imported fuel, i.e. all oil and coal, the indigenous resources of peat retain an importance for security of supply and socio-economic reasons. While renewable energy sources currently provide about 2% of the country's energy requirements, the Government has launched a renewable energy initiative with a view to substantially increasing the contribution of these sources. The nuclear energy option is not part of Irish energy policies because of concerns about safety.

Transport

Ireland's network of public roads extends for approximately 92,300km. There are 26km of road per 1,000 population; roughly twice as much as in Belgium, France or Denmark, and over three times as much as in the Netherlands, Italy or Spain, reflecting the dispersed nature of our rural population. The national roads represent 6% of the overall network but carry 38% of total road traffic. Regional roads (11% of the network) provide the main links between the national roads. The remainder of the network (83%) is made up of local roads which serve the transport needs and requirements of smaller urban areas and rural communities. The importance of road transport to economic and social

development of the country is illustrated by the fact that inland transport depends predominantly on roads which carry 96% of passengers and 89% of freight traffic. Vehicle numbers have quadrupled between 1960 and 1995 to a total of 1.3 million vehicles and are expected to increase into the early years of the next century. Ireland's level of car ownership remains considerably lower than the EU average; 27 per 100 population compared to 43 per 100 population in 1995.

Surface public transport services are provided by a statutory body, Córas Iompar Éireann (CIÉ) and its three subsidiary companies. Bus Átha Cliath provides an urban bus service for the Dublin conurbation. It caters for a population of over a million and over 175 million passenger journeys are made with the company each year. Bus Éireann provides public transport by coach outside the Dublin area through a network of inter-urban bus services, rural bus services throughout the country, and urban bus services in a number of cities. Over 65 million passenger journeys are made on Bus Éireann services annually. Iarnród Éireann (Irish Rail) operates a passenger and freight railway service in the Dublin area and between urban centres. It carries 26 million passengers annually. Railfreight carried over 600,000 tonne kms in 1995, of which 85% was import/export traffic.

4. Inventories of Greenhouse Gas emissions and removals

The national inventories of greenhouse gas emissions and removals for the years 1990-1994 inclusive and 1995 (provisional) are contained in Tables 4.1 - 4.6.

The emission estimates were prepared by the Environmental Protection Agency using the standard CORINAIR methodology and converted into the reporting format of the Intergovernmental Panel on Climate Change. The set of standard data tables presented in Appendix 4 underlying the summary report for 1993, as an example, illustrates the typical activity data and emission factors used in the compilation of the annual inventories. These tables show how the aggregated emissions were computed and the same methodology applies for all years. Emission factors used in the inventories are shown in Appendix 5.

For the principal greenhouse gases, CO_2, CH_4 and N_2O, the main activity data are national energy statistics provided by the Department of Transport, Energy and Communications and the Electricity Supply Board and agricultural and forestry statistics provided by the Department of Agriculture, Food and Forestry. Additional activity information is used as a basis for estimating the emissions of CO, NO_X and VOC. The emission factors for greenhouse gases are largely national emission factors but default values are applied where no national values are available. In the case of CO, NO_X and VOC, there is greater emphasis on emission factors provided through the CORINAIR Emission Factor Handbook but national emission factors are used for many activities.

According to the inventories, Ireland's gross CO_2 emissions rose from 30.7 million tonnes in 1990 to 33.9 million tonnes in 1995, an increase of 10.5% over the period. During the same period, CO_2 removals rose from 5.2 million tonnes to 6.2 million tonnes, corresponding to a 20.7% increase in sink size.

CH_4 emissions have remained relatively stable over the period 1990 - 1995, while N_2O emissions have fallen by 11.4%.

Inventories for nitrogen oxides (NO_X), carbon monoxide (CO) and non-methane volatile organic (NMVOC) compounds are also provided.

On a Global Warming Potential basis with a 100 year horizon (GWP100), the three greenhouse gases, CO_2, CH_4 and N_2O, accounted for 57%, 29% and 14% of emissions respectively in 1995.

While it has not been possible to include inventories for hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF_6) in the second national communication, arrangements are currently being made for estimation of their emissions. However, such emissions are considered to be relatively small.

For the most part, CO_2, NO_X and CO emission inventories are calculated on the basis of national energy balances, using national emission factors supplemented by emissions reported by utilities and some large-scale industry. Accurate data is maintained by all the sources for this information, and there is high confidence in the levels of accuracy for the emissions of CO_2. For NO_X and CO, uncertainties in the knowledge of usage patterns in the transport fleet reduce the levels of certainty to some degree. In relation to CO_2 assigned to international bunkers, the national energy balances do not distinguish between national and international bunkers; however, in practice there is relatively little intra-Ireland travel deriving from these bunkers and all are assigned to international bunkers.

CH_4 and N_2O emission inventories are largely based on national animal herd numbers, fertiliser use, energy balances and landfilled waste as appropriate.. However, the uncertainty in emission factors is by far the most important element in deriving estimates of CH_4 and N_2O emissions. For agriculture, the factors used are based mainly on research by the Irish Agricultural Research Institute (Teagasc) and are considered appropriate to Irish circumstances.

Forest sinks for CO_2 are calculated on the basis of national forest stock changes of different tree types for each year.

National growth factors are used, and these are normally higher than international default factors because of the favourable growing conditions in Ireland, and there is a relatively high degree of certainty attaching to the inventory. No calculations are made of the effects of afforestation or other changes in agricultural practice on the carbon content of soils.

Table 4.1 IRELAND 1990 Final

SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)
is not available electronically

Table 4.2 IRELAND 1991 Final

SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)
is not available electronically

Table 4.3 IRELAND 1992 Final

SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)
is not available electronically

Table 4.4 IRELAND 1993 Final

SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)
is not available electronically

Table 4.5 IRELAND 1994 Final

SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)
is not available electronically

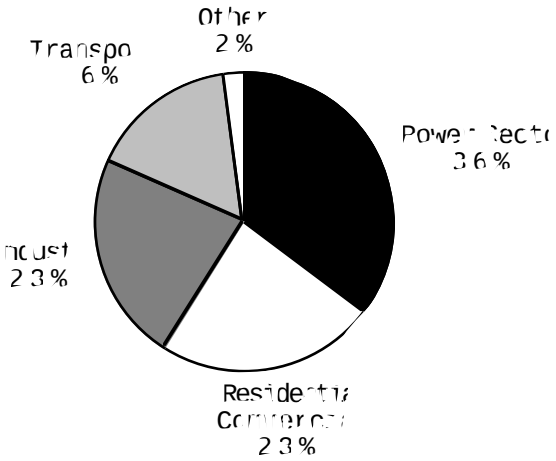
Table 4.6 IRELAND 1995 Final

SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)
is not available electronically

5. Policies and Measures

- CARBON DIOXIDE (CO_2)

Fig 5.1 CO2 Emissions by Sector



Energy consumption, through the combustion of fossil fuels, is responsible for more than 95% of anthropogenic CO_2 emissions in Ireland. In absolute terms, CO_2 emissions rose from 30.7 million tonnes in 1990 to 33.3 million tonnes in 1994 to 33.9 million tonnes in 1995, an increase of 10.5% over the period. Over the same period, the Total Primary Energy Requirement (TPER) increased from 9.4 million tonnes of oil equivalent (Mtoe) to 10.5 Mtoe in 1994 to 10.8 Mtoe in 1995 (provisional), an increase of 15%. A breakdown of the TPER for the years 1990, 1994 and 1995 (provisional) is shown in Table 5.1.

ENERGY SECTOR

The use of fossil fuels for the production of electricity and as an energy source in industry, agriculture, commercial and residential sectors is responsible for the greater proportion of CO_2 emissions in Ireland. Policies and measures are therefore targeted particularly at improving the general level of efficiency with respect to energy use. On the energy consumption side, measures are aimed at addressing efficiency and conservation in the industrial, residential, commercial and institutional sectors. In relation to energy supply and production, activities are directed at improving the efficiency of electricity production, reducing the level of carbon intensity and managing growth in demand.

Energy Conservation

Energy Advisory Board

The Energy Advisory Board was established in September, 1994 with the task of advising the Minister for Transport, Energy and Communications on matters of policy relating to energy efficiency, renewable energy and related research. It provides an invaluable forum in which the individual energy interests can come together, to allow for a more concerted, uniform and synergistic approach to energy efficiency thinking and action.

(1) Irish Energy Centre

The Irish Energy Centre (IEC) is a joint initiative of the Department of Transport, Energy and Communications and Forbairt. The Centre commenced operations during September, 1994 and is charged with the task of co-ordinating and implementing the national energy conservation programme.

Table 5.1 Fuel Breakdown of Total Primary Energy Requirement
(expressed in Mtoe)

Year	1990		1994		1995 (Provisional)	
Coal	2162	23%	1914	18%	1917	18%
Peat	1358	14%	1232	12%	1214	11%
Oil	4286	46%	5428	52%	5454	50%
Natural Gas	1446	15%	1739	16%	1916	18%
Hydro	59	1%	78	1%	63	1%
Other Renewables	110	1%	105	1%	179	2%
TPER	9420		10496		10743	

The role of the IEC is

- to co-ordinate and implement national objectives and policy relating to energy efficiency and renewable energy sources;
- to provide technical advice and support on energy matter issues to all sectors of the economy;
- to administer energy conservation grant schemes;
- to co-ordinate a range of promotional and educational initiatives;
- to promote a number of EU energy programmes in Ireland.

The total funding available to the Irish Energy Centre over the period 1994-1999 is £20.9 million. This will attract a further £13.1 million in non-exchequer expenditure, yielding a total of over £34 million. In comparison, £2.3 million was spent on energy conservation in the period 1987-1993.

IEC Programmes

The IEC's objectives are being achieved through the provision of grant support to individual companies and through the establishment of an infrastructure to provide technical advice and support. Compatibility between national and EU energy efficiency programmes is being ensured. Particular programmes being implemented by the IEC are described below.

Together the industrial and commercial sectors account for over two-fifths of Ireland's primary energy requirement. The industrial sector is generally receptive to energy efficiency initiatives. Promoting efficiency in the commercial sector can be a more difficult matter because energy costs are not usually a significant element of company expenditure and the capacity of in-house energy management is often low. Nevertheless, there is significant energy use in this sector and it is therefore targeted by the IEC.

Energy Audit Scheme

The Irish Energy Centre's Energy Audit Grant Scheme (EAGS) provides grant support to organisations that engage an outside consultant to carry out site energy audits and surveys. Financial support of up to 40% of the cost of the audit, subject to a maximum of £5,000 is available.

Energy Efficiency Investment Support Scheme

The Energy Efficiency Investment Support Scheme (EEISS) provides grant assistance to energy users in the industrial, commercial and institutional sectors for investment in energy efficient technologies. A grant of up to 40% of the cost of the measure subject to a maximum of £100,000 is available from the Irish Energy Centre. This scheme covers both the selective implementation of the recommendations of energy audits and also provides grant support for investment in targeted high savings' yield energy efficiency technologies. It is estimated that by the end of 1999, some 125,000 tonnes of CO_2 will be saved by projects supported under the EEISS.

Industrial Annual Self-Audit and Statement of Energy Accounts

The Self Audit Scheme is a voluntary agreement to which companies subscribe, centring on a public commitment to good energy management practices. The scheme, established in 1994, is administered by the IEC. Companies register to the scheme, committing to set out an energy management policy, the core of which will be an annual internal audit of their energy performance, coupled with a public statement of energy accounts, including targets and plans for the coming year. In this way, companies are given the opportunity to formalise their approach to good energy practice and to receive a public recognition of their efforts in this regard. So far, 26 companies, with a combined annual energy bill of more than £50 million, have registered. It is expected that approximately 30 more companies will be recruited in 1997, bringing the total energy bill close to £75 million. Total savings generated by the scheme are expected to be of the order of £12 million by 1999.

Table 5.2 Number of IEC Energy Audits & Grant Awards

Year	EAGS	EEISS
1994	14	0
1995	112	142
1996	203	141
1997 (part)	70	57
Total	339	340

Technical Advice and Support for Priority Technologies

In addition to supporting general projects, there have been periodic calls for proposals for investment in energy efficient technologies which are considered to have the widest applicability to the Irish market. Technologies which have been prioritised in this way include energy management systems, variable speed drives, heat recovery, modular boilers, monitoring and targeting and combined heat and power. Successful proposals qualified for financial support under these periodic calls.

Energy Conservation Programme for State Buildings

There are considerable opportunities for energy savings in public sector buildings. In 1995, an energy conservation programme for Government Buildings was launched, involving close co-operation between the Irish Energy Centre, the Office of Public Works and the Department of Transport, Energy and Communications. The aim of the programme is to reduce energy consumption in State Buildings by 10% over a 5 year period and with savings of £200,000 already achieved at the end of 1996, progress is on target.

Energy Awareness Week

An annual Energy Awareness Week is organised by the Irish Energy Centre, in association with the Energy Advisory Board. The week aims to provide consumers with a clear understanding of the benefits of energy management and the opportunity to make real behavioural change. This is achieved through an extensive education and awareness campaign. By 1999, Energy Awareness Week will have achieved cumulative energy savings of the order of £9.2 million in the domestic sector.

Table 5.3 Effects of Measures by Irish Energy Centre

Measure	Cumulative Impact by 1999	
	Financial (£M)	CO_2 (MT)
Grants	14.6	0.210
Self Audit	8.8	0.152
Boiler Programme	3.8	0.058
Public Sector	2.1	0.025
Energy Awareness Week	9.2	0.122
Regional/Renewables	1.4	0.004
Totals	40	0.571

(2) Energy Use in Buildings & Residential Sectors

It has been estimated that the energy use associated with the operation of buildings amounts to 45% of national energy use, and that 80% of this is used for space heating purposes. Evidently the impact of energy conservation in this area will be significant in a national context.

Building Regulations

Specific measures were included in the 1991 Building Regulations aimed at the conservation of fuel and energy. These Regulations provided guidance to the construction industry as to basic requirements in this area. The 1991 Regulations provided for new higher standards of thermal insulation to apply to all new buildings (except for very small buildings and buildings requiring little or no heating) and they also specify energy saving measures aimed at controlling the output of space heating and limiting the heat loss from hot water storage systems, pipes and ducts. It is expected that energy use in new buildings will be reduced by 20% as a result of these regulations with consequent savings in CO_2 emissions. By 1996, approximately 149,000 houses have been completed under these regulations. This represents approximately 12% of the total housing stock.

The Department of the Environment is currently undertaking a revision of the Technical Guidance Document for conservation of fuel and energy for the 1997 Building Regulations which will be issued in the near future. This revision involves a general clarification and "tightening-up" of existing guidance and the introduction of energy rating as an optional method of showing compliance for housing. It is estimated to give a further 5% reduction in energy use in the buildings to which it will apply. This will have only a marginal effect on overall building energy use in the short to medium term.

Home Energy Rating

The Irish Energy Centre supported a project to develop home energy rating package for use by corporate and residential building sector and homeowners which provides an indicator of energy efficiency of a housing unit in both absolute and relative terms. It is expected that energy rating, which will be backed up by publicity and promotion by the Irish Energy Centre, will help to improve public awareness and encourage owners, purchasers and developers to use the concept to achieve improved energy efficiency in new and existing homes.

The Electricity Supply Board (ESB) and Bord Gáis Éireann (BGÉ), the national electricity and gas utilities, promote energy efficiency in the new housing sector through Gold Shield and Home Energy Rated branding respectively.

Local Authority Buildings and Public Housing

A Department of the Environment study on energy efficiency in local authority buildings emphasised the financial savings that can be made from energy efficiency measures and called for the preparation of a programme for investment in energy efficiency measures by local authorities.

A circular, "Energy Conservation in Local Authority Dwellings", has been issued to public housing authorities by the Department of the Environment. Public housing authorities have been requested, in the context of the management of their housing stocks, to give greater priority to the need for increasing energy efficiency in their rented dwellings.

A series of guidelines is being prepared on aspects of design and construction of social housing (i.e., local authority and voluntary housing). The first guideline document on site selection was issued in April 1997. Further guidelines which are currently being developed will address issues such as scheme design, house types, access, water supply, landscaping, layout, plumbing, heating, etc. Energy conservation and sustainability issues will be addressed in this context.

Thermie Targeted Projects

Technical innovation in the housing market is being facilitated under the EU Thermie Programme. Financial institutions working with the Irish Energy Centre and public and private sector partners have commenced 2 projects (560 units on 16 sites). The projects aim to demonstrate technologies which are capable of improving on current regulations and practice by up to 40%.

Energy Action

Energy Action is a Dublin based charity, established in 1988, and who offer an energy conservation service to the needy and elderly free of charge. The Energy Action Programme is focused on simple cost-effective improvements aimed at improving the living conditions of the poor and elderly. This service involves attic insulation, draught proofing and the supply and fitting of both lagging jackets and smoke alarms.

In 1988, the Group worked on 600 houses; by 1996 this figure had risen to 1,400. Since 1988, the Group has worked on a total of 9,500 houses.

(3) Implementation of EU SAVE Programme

A major element in the EU's strategy to stabilise CO_2 emissions is the SAVE (Specific Actions for Vigorous Energy Efficiency) programme. The programme is designed to limit CO_2 emissions by coordinating the activities of the Member States. The SAVE programme is designed to promote the rational use of energy through the development of integrated energy saving policies both at community and national levels. Under the programme, progress is being made in the establishment of energy efficiency standards and regulations, national measures are being supported, and a co-ordinated information network is being established. One of the ways the programme achieves its objectives is through technical measures such as directives and standards on, inter alia, boiler efficiency, insulation, energy audits, performance standards and energy labelling. Implementation at national level of the EU SAVE programmes has resulted in the following measures.

Heating System Inspection and Maintenance

A number of companies, including Bord Gáis Éireann, operate heating installation inspection and maintenance schemes (including boiler inspections) for their customers. The Irish Energy Centre has initiated a number of measures relating to boiler services. These include a steam boiler system evaluation scheme, National Boiler Awards, and training for domestic boiler service personnel. In addition, a new association to regulate boiler services for industry and commerce is being established, to be called Register of Irish Boiler Engineering Companies (RIBEC). The overall aim of all of the boiler programmes is to target and create awareness among boiler users in all sectors. Cumulative savings of £5 million are expected by the end of 1999. In addition, the Council Directive in relation to efficiency requirements for new hot water boilers fired with liquid or gaseous fuels (92/42/EEC of 21 May, 1992) has been transposed into Irish law.

Labelling

The implementation of energy efficiency labelling of domestic appliances such as fridges, freezers, and washing machines in line with EU legislation will contribute to a reduction in the use of energy and reduce CO_2 emissions. In relation to these goods, a number of Directives associated with the SAVE Programme have already been transposed into Irish law, including Council Directive 92/75/EEC (22 September, 1992) and Commission Directive 94/2/EC (21 January, 1994).

The range of appliances to be covered by the labelling scheme will continue to be expanded. Over the next fifteen years, savings in excess of £500,000 per annum are expected to accrue as a result of energy labelling of household appliances.

Pilot/Demonstration Projects

Calls for pilot project proposals, to advance the theme of energy efficiency, are issued on an annual basis. Sixteen Irish SAVE Project Proposals have been adopted for EU financial support to date with the level of support per project in the region of 35%-60% (see Appendix 2 for details of each project). In 1996, SAVE entered its second phase, which will run to the end of the year 2000.

Local Energy Agencies

An element of SAVE II is directed towards regional and local public bodies and is aimed at making the most of local energy sources, improving energy efficiency and seeking optimum energy supply conditions for the regional an urban areas. The level of EU support for each agency is in the region of 50% and funding was provided for the establishment of seven local Energy Agencies:

County of Donegal Energy Agency;
Energy Agency of Cork County;
Regional Energy Agency of Kerry County;
Regional Energy Agency of Galway County;
Local Energy Agency of the City of Cork;
Local Energy Agency of the City of Dublin;
Regional Energy Agency of East Connacht Area.

Public Lighting

The advent of more modern, energy efficient public lighting allows reduced energy consumption while improving the quality of lighting on roads and in residential areas. When upgrading existing lighting stock on roads, local authorities are recommended to replace old lighting with energy efficient units.

(4) Demand Side Management

The national agency responsible for electricity generation, transmission, distribution and supply, the Electricity Supply Board (ESB), has undertaken Demand Side Management (DSM) activities since 1991 and has substantially achieved the DSM programme target of limiting by 1% per annum the overall growth rate of electricity. Increased demand in the period 1991-96 was contained to 4.95% p.a.

Three key strategies are used for DSM:

1. Efficiency Gain Programmes to promote a slower growth across the whole day demand profile through the use of most efficient technologies and practices by domestic, commercial and industrial customers.

2. Combined Heat and Power (CHP). The ESB and BGÉ have collaborated to promote CHP.

3. Electricity tariffs have been adjusted to give an incentive to customers to shift electricity load to low demand periods.

The strong growth in the consumption of electricity that has existed since the beginning of the decade has continued with an average annual growth rate of 4.95% p.a. over the period 1991-96. These growth rates were above the strategic objective of the ESB to manage load growth towards the level of an average of 3% per annum in the 1990s, while not constraining economic growth. The strong prevailing economic growth over the past number of years, together with the increasing trend, in line with other advanced economies, towards electricity and away from bulk fuels, are the principal reasons behind the growth in electricity demand.

Despite this growth in the demand for electricity, the DSM programmes have nevertheless helped limit the increase in the consumption of electricity and have contributed to the more efficient use of energy. It is estimated that these existing and new DSM measures helped secure annual savings of 102 million kilowatt hours in 1993 and 114 million kilowatt hours in 1994, leading to avoidance of emissions of CO_2 of 226,000 tonnes in 1993, 367,000 tonnes in 1994, 481,000 tonnes in 1995 and 616,000 tonnes in 1996.

Energy Supply

The energy and transformation sector was responsible for 35% of CO_2 emissions in 1990. This proportion rose to 39% by 1995. Ireland's isolated grid, dispersed population outside the Dublin area and energy production patterns poses considerable challenges to ensuring that a secure supply of electricity is provided and that transmission and distribution losses are kept to a minimum.

(1) Supply-Side Efficiency Activities

The ESB has initiated a number of activities to improve supply-side efficiency:

- An ongoing programme to maintain and improve generation plant efficiency has led to a gradual improvement in the overall system generating efficiency from 35.1% in 1989 to 35.74% in 1995. CO_2 emissions reductions on foot of this initiative were approximately 200,000 tonnes in 1995. Continued focus on efficiency and availability improvement at existing generating stations is expected to result in a 1% sustained reduction in CO_2 emissions.

- The anticipated commissioning in 1999 of a new highly efficient gas-fired Combined Cycle Plant to meet growing demand and replace older much less efficient plant will significantly improve system generating efficiency in time by displacing less efficient plant. This plant is estimated to be 50% more efficient than existing plant.

- A recently commenced transmission and distribution system renewal programme will entail expenditure of £230 million over 5 years on the upgrading of the standard distribution voltage from 10kV to 20kV for 25% of the network, leading to reduction in CO_2 emissions due to transmission losses of 60,000 tonnes p.a. by 2000.

(2) Improvement in Peat Conversion Efficiencies

Over recent years, the share of peat in electricity generation has declined from 16% in 1990 to 11% in 1995. In addition, the absolute level of peat consumed for electricity generation has declined marginally over the same period. At present there are seven peat powered generation plants in Ireland, but some of these plants are of a small scale and are becoming increasingly inefficient due to ageing technology. Despite the falling share for peat in the electricity generation fuel mix, peat will remain a significant fuel in electricity generation. The Government has decided that, for security of supply and socio-economic reasons, peat shall continue to make a significant contribution to the energy mix used to generate electricity.

However, it is also of the view that peat generated electricity should be produced in compliance with the best international environmental and generation standards and the Government has therefore decided to construct a new 120 megawatt peat-fired power station with EU financial support. The proposed station will use fluidised bed combustion technology and have a conversion efficiency that is 50% above the average efficiency of the existing peat fired plants and its development will be associated with the closure or upgrading of the existing older plants.

While there will, for a period, be a rise in total CO_2 emissions relative to 1990 levels from peat generated electricity, these absolute emissions will soon fall as the other peat plants are modernised or phased out. However, even before any work is done on the existing peat powered plants, the new plant will have the effect of reducing the amount of CO_2 produced per unit of electricity generated from peat. It is anticipated that there will be a 16% reduction in such emission rates from 1.687 tonnes of CO_2 per megawatt hour (tCO_2/MWh) in 1990 to 1.412 tCO_2/MWh in the year 2010.

Efforts are also being made, through research and development of peat storage and stock protection, to improve the average quality of peat delivered to power plants with the intention of improving conversion efficiencies. Bord

na Móna, the national body for developing and managing peatlands, has developed a new machine which can now cover and protect its stocks in a more efficient manner and in turn improve the energy conversion efficiency of peat.

(3) Fuel Switching to Natural Gas

The utilisation of natural gas, the least carbon intensive fossil fuel sources, is playing a significant role in the achievement of CO_2 emission limitation targets. The contribution of natural gas to Ireland's energy fuel mix has increased from 15% to 18% over the period 1990-1995, and it is expected to soon represent a higher share of total final consumption than either coal or peat. It already accounts for almost 29% of electricity generation.

Sales of natural gas to the domestic sector increased by 10% between 1993 and 1994. Industrial/commercial sales were static, gains being offset by reductions by one large customer. In relation to the extension of the gas distribution network, the following is a breakdown of the growth in the number of houses in the network and the number of customers.

Table 5.4

Year	Houses in Network Thousands	Customers Thousands
1990		
240	159	
1991	246	171
1992	274	189
1993	300	205
1994	330	223
1995	350	241
2000	475	325
2010	600	460

Bord Gáis Éireann (BGÉ), which is the sole natural gas supplier in Ireland, is continuously endeavouring to extend its gas network, to expand its customer base, and to ensure that natural gas is used as efficiently as possible. An aggressive marketing campaign is being pursued by BGÉ to extend the use of gas in the domestic market, allied to the extension of the gas supply network to non-gas areas in major towns and cities. In the industrial and commercial sectors gas oil and heavy fuel oil are being displaced by gas. The number of industrial/commercial customers has risen by almost 40% from 6162 in 1990 to 8560 in 1995.

Gas Interconnector

The completion of the Ireland/UK natural gas interconnector, in commercial use since 1995, has ensured that natural gas will be available in Ireland after the depletion of the Kinsale Head/Ballycotton reserves, expected in about 2003. New developments at Kinsale/Ballycotton, which are taking place at present, will, if successful further extend the economic life of the field.

(4) Alternative and Renewable Energy

In 1991 the renewable energy contribution to total primary energy demand, not including large scale hydro schemes, was 1.8%. By 1997, and as a result of support programmes such as the Alternative Energy Requirement schemes, it is expected that this figure will be in excess of 2.2%. In 1991, renewable energy, including large scale hydro, accounted for 5.8% of total electricity generating installed capacity. As a result of the Government's renewable energy programmes, this is set to increase to 10% (451MW) by the end of 1999 and 14% (771MW) by the year 2010.

In terms of actual electricity produced, 2% of electricity was generated from renewables in 1996. This will increase to 5% by the year 2010. The renewable energy programme will result in an annual reduction of 250,000 tonnes of CO_2 emissions.

A major review of renewable energy policy and programmes was carried out in 1995/96. This process led to the launch of a new long term renewable energy strategy, which sets targets for the securing of additional capacity up to the year 2010.

- A total addition of 100MW of installed electricity generation capacity from wind, hydro and biomass waste by the end of 1999. Subject to EU approval this investment programme will be supported by the Economic Infrastructure Operational Programme.

- Up to £1 million is expected to be made available under the Operational Programme for a pilot wave energy conversion plant

- Targets have been set of 31 MW per annum from wind and hydro for the years 2000-2010. Targets will also be set for biomass/waste to energy for this period.

The long term renewable energy strategy allows direct sales by renewable energy generators to electricity customers, commits to the development of a renewable energy small scale support scheme and guarantees electricity market access for EU Thermie funded renewable energy projects.

Alternative Energy Requirement Scheme (AER 1)

A first direct step towards meeting the above targets was the Alternative Energy Requirement Scheme (AER 1).

The AER 1 competition resulted in the offer of 34 Power Purchase Agreements for an additional electricity generation capacity of 111 MW, broken down as shown in Table 5.5. This scheme comprised a combination of price support and grant aid, and the cost, estimated at £70 million will be transparently identified and passed on to the consumer by the ESB. Implementation of these projects is now proceeding.

Table 5.5 Results of AER 1

Technology	Capacity
Wind	73 MW
CHP	22 MW
Landfill Gas and Waste	12 MW
Hydro	4 MW
Total	111 MW

Alternative Energy Requirement 2 (AER 2)

Under AER 1 certain technologies were not represented in the successful group of projects, in particular biomass. A number of biomass projects were submitted under the scheme but they were not competitive enough to secure Power Purchase Agreements. In December 1995, a second AER competition was launched to support the development of biomass and or 'waste to energy' technology. The competition is now complete and has resulted in the offer of a contract for the construction and operation of a waste fuelled electricity generation plant of 30MW installed capacity.

Alternative Energy Requirement 3 (AER 3)

The first renewable energy competition (AER 3) subsequent to the long term strategy was announced in March 1997. This competition seeks to secure an additional 100 MW of installed electricity generation capacity from renewables, broken down as shown in Table 5.6.

Table 5.6 Targets for AER 3

Technology	Capacity
Wind	90 MW
Hydro	3 MW
Biomass/Waste	7 MW

In addition, AER 3 also seeks tenders for the construction and operation of the wave energy to electricity pilot plant.

Combined Heat and Power

During the period 1990-1995, there were additions to CHP capacity in Ireland with a total of almost 7 MW installed at 7 sites and a further 5 MW planned. Particular progress has been made in the health area with a total of 25 systems having been installed to date in both private and public general hospitals. At the end of 1995, there were 34 CHP installations operating in Ireland with a combined electrical capacity of 70 MW or about 1.5% of total national production in 1994. In March, 1995, eight new schemes were approved under the AER 1 and the net additional capacity will be 22 MW.

Unlike some other EU countries, the utilisation of district heating is relatively low in Ireland. This is due in part to its population settlement distribution as well as the lack of potential for investments in this area. The majority of electricity power stations in Ireland are located in areas remote from urban concentrations and so are not suitable for district heating purposes. In addition, in the urban areas where power stations are located, energy infrastructure investment has been made in recent years, principally in modernised gas networks. By 1995, CO_2 reductions due to CHP programmes since 1990 amounted to 100,000 tonnes per annum.

Renewable Energy Information Office

In 1995, the Renewable Energy Information Office (REIO) was established as a national service of the Irish Energy Centre. The Office is charged with the task of promoting renewable energy development and providing information on all aspects of renewable energy use.

The Office has prepared the ground work for promoting renewables among resource owners, co-operatives and financiers and has established itself as a facilitator to tackle the obstacles to renewable energy development.

Services provided by REIO include the dissemination of information on renewable energy development, policies and programmes to all sectors. The office organises targeted seminar and workshops designed to aid the removal of market barriers to renewable energy development. Conferences to date have included the topics of planning permission, project financing and grid connection issues.

Pilot Projects

An aspect of Ireland's involvement in the EU's Altener programme is participation by Irish bodies in projects funded by Altener. In 1993, the first year of Altener's operation, two of the four Irish projects submitted received support amount to over 95,000 ECU. In 1994, five of the Irish projects were approved with the support amount to just under 400,000 ECU. In 1995, 6 Irish projects with support amount to 550,000 ECU were approved. This represents a very successful Irish participation in Altener. In 1996, a total of 8 projects supported by the EU to the value of 832,477 ECUs were announced.

Planning Guidelines for Wind Energy

Ireland's first wind farm in County Mayo, completed in October 1992, has an installed capacity of 6.45 MW, the total output of which is sold to the ESB. The technical potential to utilise wind power was recognised in the CO_2 Abatement Strategy and this was borne out by the fact that wind power was the most successful energy source under the first Alternative Energy Requirement (AER 1) where projects to a total of 73 megawatts were approved. To assist the development of the industry and the implementation of Government policy in relation to the development of renewable sources of energy, the Department of the Environment published Planning Guidelines on Wind Farm Development in September 1996 to assist planning authorities, An Bord Pleanála (the independent planning appeals board), developers and the general public by providing guidance on dealing with wind farms within the planning system. The guidelines provide that each planning authority's statutory development plan should incorporate a

policy statement, setting out the authority's policies and objectives in relation to wind energy/wind farm development, including an acceptance of the importance of wind energy as a renewable energy source.

Hydro-Electricity

The ESB hydro-electric schemes contribute 220MW or over 5.5% of national generating capacity (4000 MW). There are about 120 small hydro schemes, operated by independent producers, and 34 of these supply approximately 10 MW to the National Grid.

TRANSPORT SECTOR

The transport sector accounts for slightly under one-fifth of total CO_2 emissions. CO_2 emissions in 1995 were 6.2 million tonnes (provisional), an increase of 1.3 million tonnes or 27% on 1990 levels.

Ireland's transport system is heavily dependent on roads. 89% of freight traffic and 96% of passenger traffic are carried on roads with rail traffic accounting for most of the balance. Ireland's dispersed and low density rural population structure and its relatively short average journey lengths are the principal reasons for such a reliance on roads and on private transport. The transport sector is of vital importance to the economic development of the country. Ireland's position on the periphery of the EU and the small size and open nature of its economy makes it an essential requirement that an adequate transportation system, both within Ireland and between Ireland and neighbouring states, is provided, so that Irish exporters can compete effectively on the European and other markets.

Measures are being undertaken in the transportation sector which are aimed at reducing transport intensity, - decoupling growth in transport from economic growth. However, there are fundamental difficulties in reducing transport growth in Ireland in the context of the stage and current pace of Irish economic development. In recognition of the potential of transport to impact on the environment a study has been commissioned to assess current environmental impacts (especially quantitative impacts) and map out ameliorative options including the use of pricing instruments. The results of this study should be available in 1998. In the interim, a far higher share of funding is awarded to public transport under the current programming period (1994-1999) with the public transport share up from 5% to 25% of total transport infrastructure spending compared to the 1989-1993 period. In addition and as detailed below, the DTI process marks a direct and specific intervention to address transport issues in the largest urban centre.

Measures to limit CO_2 emissions from the transport sector in Ireland are focused on:

- improving the efficiency of the rail and road transportation systems;
- promoting public transport and other alternatives to the private car in major urban areas such as Dublin; and,
- reducing the age profile and improving the fuel efficiency of private cars.

Having regard to our population structure and other economic and social factors, the level of car ownership in Ireland is expected to rise over the remainder of the decade as economic growth levels remain strong. As a consequence, CO_2 emissions from the transport sector are expected to increase to around 6.7 million tonnes of CO_2 in the year 2000.

A Report on Energy Efficiency Opportunities for Transport in Ireland was commissioned by the IEC to examine international experience and to help inform policy formulation in the area of transport and energy and was launched in June 1996. The findings of this report will form the basis of a planned examination of energy efficiency policy objectives in the transport sector.

Operational Programme for Transport

The Operational Programme for Transport (1994-1999) provides for a planned investment programme in the road and rail networks, in Dublin area transportation measures and in other transport modes.

Road Network

As no viable alternative to road transportation exists for much of the population, and with most of the journeys being undertaken in private rather than public transport, efforts to limit emissions from road traffic will concentrate on improving the road network to allow for more efficient driving. In addition efforts will also be made to improve the efficiency of the national vehicle fleet and to reduce the age profile of the fleet.

The overall target in the Operational Programme is to complete the development of the national primary road network by 2005 and to provide an inter-urban travel speed on completion of 80kph. At the end of 1993, 35% of the network was adequate or improved and the objective is that this will be extended to 53% by the end 1999, with the improvement of a further 11% underway.

The main purpose of the investment, which will total approximately £1.6 billion, is to:

- improve the road network between the main urban centres
- to remove bottlenecks on those routes
- to reduce urban congestion by the provision of new river crossings, ring-roads and relief roads

This investment will reduce traffic journey times and also reduce the period of idling or stop-start driving on national routes. As well as contributing to a safer road network, these road improvements will also allow for the more efficient use of motor vehicles and will thereby help limit the CO_2 and other emissions from the transport sector. Total time savings of 204 minutes are projected for the four national route corridors as a result of the improvements.

Rail Network

Ireland has some 2,000 kilometres of railway lines and all of the major cities and majority of the towns with a population of over 2,000 people are served by the rail network.

As part of the Operational Programme for Transport, over £275 million will be invested in the rail network and on new rolling stock over the period 1994 to 1999 including on upgrading the track system, on ancillary infrastructure investment and new signalling and on the replacement of the oldest locomotives with new and more energy efficient engines. The purpose of this investment is to provide a faster and more efficient rail transportation system and to cater for an increase in passenger numbers and journeys. While rail caters for only a small percentage of passenger and freight traffic in Ireland, it secures almost a quarter of end-to-end passenger journeys on the routes where it competes directly with the road network. The investment in the railway system is designed to build on this. While options for extension of the rail network do not exist, the investment in the rail network will contribute substantially to maintaining the competitiveness of the existing network and to securing a larger share of the transportation market on those routes.

Dublin Area Transportation Measures

On account of its size and population density, efforts to limit CO_2 and other emissions from transport in Dublin will have an impact at national level. There is also a greater scope for alternative modes of transport to the private car in Dublin than is the case in any other part of the country. The greater Dublin area has experienced major changes in the past 25 years. However, increasing traffic congestion, pollution, environmental degradation, inner city decline and, on the positive side, the success of the electric railway system (the DART) provoked a reappraisal of the transport system.

In response to these developments, the Dublin Transportation Initiative (DTI) was established to investigate the transport system and to bring forward appropriate proposals. Following substantial public consultation, the DTI concluded in August 1995 that, in the absence of significant investment, travel would increase by about 19% in the ten years to 2001, the relative use of public transport would decline further, the level of accessibility to the city centre and other areas would also decline, and atmospheric pollution from private and public transport would increase substantially.

The DTI had three central objectives:

- to produce a long-term transportation strategy to 2011 for the greater Dublin area;
- to prepare a medium term investment and implementation programme for the period ending 1999; and,
- to put in place a continuous transportation planning process.

DTI Recommendations

The achievement of the objectives of the transportation strategy recommended by the Dublin Transportation Initiative requires a significant shift in the use of the transport system towards public transport. The DTI strategy contains a combination of measures with the main public transport elements of the strategy as follows:

- the construction of a light rail network in two phases: a core network of three lines (39 km) to Tallaght, Ballymun, and Cabinteely followed by a second phase (17 km) to Dublin Airport/Swords and Finglas;
- the introduction of a eleven Quality Bus Corridors (140 km);
- the extension and upgrading of the DART network;
- the extension and upgrading of the commuter rail services;
- provision of integrated ticketing for public transport;
- the development of park-and-ride facilities at nine locations;
- provision of a combination of on-street and off-street public transport interchange in the city centre;
- the completion of the Dublin C-Ring motorway which will allow traffic to avoid passing through Dublin city centre;
- the development of a Dublin port access tunnel directly linking the port and the C-Ring motorway;
- restrictions on inner city road development and long term parking facilities; and
- preparation of land use planning guidelines for the Greater Dublin Area.

The coordinated response is being led by the Dublin Transportation Office (DTO). The DTO was established in November, 1995. It operates through a Steering Committee, a Local Authority Committee and a Consultative Committee; it has a core staff of experts in transport modelling, land use and transport planning, and traffic management who are under the control and supervision of the Director of the Dublin Transportation Office. The DTO is representative of the principal implementing agencies: the Departments of the Environment, and Transport, Energy and Communications; the National Roads Authority; CIÉ; An Garda Siochána; Dublin Corporation; and the County Councils of Dun Laoghaire Rathdown, Fingal, Kildare, Meath, South Dublin and Wicklow.

The functions of the DTO are to:

- co-ordinate and monitor the implementation of the

DTI Strategy by various agencies, including collection of statistical and other survey data, and also co-ordinate such activities by any or all of the designated bodies;

- ensure public awareness and participation at all stages;
- provide a continuing input to an ongoing strategic planning process, including review and updating at regular intervals of the DTI Strategy;
- carry out modelling, evaluation, consultation and other technical services in relation to land use and transportation planning, and audit the transportation planning activities of the designated agencies; and
- offer advisory and technical support services related to land use and transportation planning, and administer related grant schemes.

Funding

The DTI Final Report estimated the total capital cost for the implementation of the programme to the year 2011 at £1.28 billion. This included £444 million on national roads and the C-Ring and £410 million on the light rail transit (LRT) system. Table 5.7 summarises the investment programme.

Table 5.7 DTI Capital Cost Estimates to 2011
(£ million inclusive of VAT and excluding financing costs in 1994 prices)

Management Measures	133.2
Quality Bus Corridors	102.4
Light Rail Transit	410.3
Other Public Transport	31.1
National Roads and C-Ring	443.8
Other Road Schemes	160.2
Total	1281.0

Provision has been made in the National Development Plan and in the Operational Programme for Transport 1994-1999 for an investment programme of approximately £626 million so as to enable substantial progress to be made on implementation of the public transport elements of the Dublin Transportation Initiative. This funding includes provision for expenditure of up to £200 million in respect of the priority phases of the light rail network. Approximately £34 million will also be available for traffic management measures, including cycle routes/facilities, bus interchange, improved pedestrian facilities and city centre improvements.

Implementation

Implementation of the public transport elements of the Dublin Transportation Initiative is being actively pursued along with the undertaking of a range of traffic management measures. Already, three Quality Bus Corridors have been implemented and the planning of others is at an advanced stage. Detailed planning work for the priority phases of the light rail network is also moving ahead quickly and legislation was enacted in July 1996 to provide a comprehensive legal framework for the development of a light rail network in Dublin. The extension of the DART suburban rail service to Greystones was also announced in June 1995.

The implementation of the comprehensive transport measures provided for in the DTI Strategy will provide a greatly improved environment when compared with a do-minimum approach which assumes no new public transport investment or improvements in traffic management. In particular, evaluations carried out by the DTI study team using transportation modelling indicate that peak hour CO_2 emissions could be reduced by 5% for the year 2001 and by 11% for the year 2011 when compared with a do-minimum position in those years. During the off-peak period, modelling indicates that the DTI Strategy is less effective due to the lower levels of diversion to public transport. This reflects the more dispersed nature of trip making in that period compared with the peak and the effect that rising car ownership will have upon public transport usage. Therefore, even with improved public transport and traffic management,

impact measures for the DTI Strategy in the off-peak period show an increase in CO_2 emissions of 6% and 4% for the years 2001 and 2011 respectively when compared to the do-minimum scenario.

Public Transport Support

Financial support is provided by the State towards the provision of socially necessary but financially unviable public transport services. In the past ten years a total of over £1 billion has been provided by way of annual Exchequer subvention to CIÉ with £105 million provided in 1997 compared to £111 million in 1990. Approximately 90% of the annual subvention goes to support the rail network.

CIÉ, which is responsible for providing bus and rail services throughout Ireland, gives careful consideration to the fuel consumption and emission characteristics of new buses and railway locomotives when purchasing decisions are being made. The best forecasts currently available to CIÉ predict that on average, across all their services, specific energy consumption per traffic unit (i.e. Energy/Passenger kms plus Tonne kms) will be reduced by the order of 10 per cent between 1993 and 2000. This will reduce CO_2 emissions from this source by 0.9% per annum (totalling 6.5%) over the period.

Behavioural Measures

Fuel efficiency in transport can be improved by modifying consumer behaviour. The initial purchase decision is open to influence in terms of car size and efficiency. There is also significant potential to modify behaviour in use through selective car usage and better driving practice. The Irish Energy Centre has included transport in Energy Awareness Week with a view to the development of these factors.

Alternative Fuels

The use of alternative fuels in the transport sector is also being developed. The performance of biodiesel manufactured from rapeseed oil for standard diesel engines is being evaluated under the ALTENER Programme and has been used on a pilot basis. It is not yet economically viable. In addition, BGÉ has introduced new compressed natural gas (CNG) vehicles to its commercial fleet in Dublin and Cork, and BGÉ and Dublin Bus have agreed in principle to a demonstration of city bus operation on natural gas for a limited period expected to commence in 1997.

In order to promote the use of alternative transport fuels, excise duty relief for approved biofuel pilot projects between January 1996 and end 1998 is allowed in accordance with EU Directive 92/81/EEC as amended.

Car Scrappage Scheme

The number of registered motor vehicles in Ireland increased from 1.1 million in 1990 to 1.3 million in 1995. 79% of those vehicles are private cars with goods vehicles accounting for a further 11%. Ireland's level of car ownership remains considerably lower than the EU average; 27 per 100 people compared to 43 per 100 people in1995. In line with increasing standards of living, the number of motor vehicles on Irish roads is expected to rise over the remainder of the decade.

A significant contribution can be made in the short to medium term to limiting CO_2 emissions from the transport sector by replacing older inefficient motor vehicles with modern cars with engines of reduced cubic capacity.

There is scope to increase the car replacement rate in Ireland. The average age profile of the Irish vehicle fleet is higher than the EU average, with over 44% of private cars being at least 6 years old and 17% being 10 years old or more. Rising disposable income levels will, to some extent, help reduce the average age of cars on Irish roads.

In 1995, a special incentive was introduced to encourage the scrapping of old cars. A £1,000 refund of vehicle registration tax is available to owners of private cars over 10 years old who buy a new car and dispose of the old car for scrap. During the period July 1995 - March 1997, over 29,000 cars

have been scrapped under the scheme, representing 16% of all new car sales. There is evidence that the scheme has skewed the market towards smaller cars and hence it is expected there will be less CO_2 emitted from more efficient cars replacing older units. Over 80% of all cars bought under the scheme are small cars. This scheme has been extended to the end of 1997.

While the number of cars on Irish roads is expected to increase over the remaining part of the decade, the level of emissions from the transport sector is not expected to rise at a similar rate as fiscal measures and economic growth levels will increase the proportion of more efficient and low emission new cars on the roads.

Fuel Efficient Vehicles

In the longer term, more effective means of limiting emissions from the transport sector will come from the development of more fuel efficient vehicles together with the provision of low emission fuels. Ireland is strongly supportive of the voluntary agreement being currently discussed by the EU Commission with the auto industry on the improvement of vehicle fuel efficiency as part of the Community strategy for reducing CO_2 emissions from passenger cars through improved fuel economy.

Vehicle Testing

Measures are also in place concerning the roadworthiness testing of vehicles and their engines. A properly tuned engine will reduce fuel consumption - the EU estimates the overall savings could be around 5% - and this has an overall beneficial effect on CO_2 emission levels. Roadworthiness tests are carried out on heavy commercial vehicles over one year old on an annual basis and on light goods vehicles over four years old on a biennial basis. It is intended to extend road worthiness testing to private cars over four years old as early as possible in 1998. Cars will be tested on a biennial basis.

Vehicle & Fuel Taxation

Pending the establishment of EU measures to improve the fuel efficiency of vehicles, the Irish government is committed to aligning Irish vehicle tax provisions more closely with this objective. The following taxes apply to vehicles and vehicle fuel.

(i) Vehicle Registration Tax

Vehicle Registration Tax (VRT) is charged on the first registration of a new or used (imported), vehicle in the State. VRT is charged as a percentage of the retail open market selling price (OMSP) of the vehicle, including all taxes. The OMSP for vehicles is the price which, in the opinion of the Revenue Commissioners, the vehicle might be expected to fetch in open sale.

The current rates of VRT are:

Category A vehicles (essentially cars and similar vehicles) with an engine capacity exceeding 2,500 cc at 29.25%, and for those with engine capacity not exceeding 2,500 cc at 23.20%. A minimum charge of £250 applies.

Category B vehicles (essentially car-derived vans, some motor caravans and some crew-cabs) at 13.30%. A minimum charge of £100 applies.

(ii) Annual Road Tax

A graduated annual road tax regime also applies to motor vehicles in accordance with engine size. The tax ranges from £92 for cars up to 1,000 cc to £800 per annum for all cars greater than 3,000 cc.

(iii) Value Added Tax (VAT)

VAT at the rate of 21% is also levied on initial car sales. In addition to these taxes on cars, 21% VAT is also levied on all motor propellants.

(iv) Excise Duties

Various excise duties are also levied on propellants. The approximate rates in 1997 are as indicated in Table 5.8.

Table 5.8

Motor Propellants	Excise Duty (pence per litre)
Petrol Leaded	32.8
Petrol Unleaded	29.4
Petrol Super Unleaded	32.4
Auto Diesel	25.6
Auto LPG and Methane	5.7

When the incidence of excise duties and VAT is combined, the average percentage of tax as part of the final price for leaded and unleaded petrol and diesel in 1997 is 62.2%, whereas for Auto LPG, it is 32.3%. Excise duties on fuels were equivalent to 0.73% of GNP in 1995 and represented almost 2.2% of Government taxation.

Land Use Planning

Transport policy and planning and land use policy are fundamentally linked. In forthcoming Guidelines on the scope and content of development plans, planning authorities will be encouraged to take a more strategic view of settlement patterns, development needs and major infrastructural services, combining, in an appropriate manner, the statutory five yearly review of the development plan with a coherent longer-term rolling plan. State funding for infrastructure development will not be provided in the event of overzoning, to avoid excessive suburbanisation and inefficiencies in the use of land, energy and transport. The preparation of land use planning guidelines for the Greater Dublin Area was part of the package of proposals announced by the Government in response to the publication of the DTI Final Report. Strategic Planning Guidelines for the Dublin and the mid-eastern regions are to be drawn up on foot of this commitment and a parallel commitment given in the local government programme, "Better Local Government - A Programme for Change", published in December 1996. It is intended also to draw up similar guidelines in the other regions.

FORESTRY

Ireland will continue to increase its level of afforestation up to the end of the decade and beyond. Over the period 1990 to 1995, 95,000 hectares were afforested. In addition, as part of the forestry cycle, a total of a further 20,000 hectares have been replanted in the five years from 1991 up to the end of 1995. The total forest area in Ireland at the end of 1995 was 570,000 hectares, which represents 8% of the total land area of the country.

Afforestation Programme

The Forestry Sub-Programme of the Operational Programme for Agriculture, Rural Development and Forestry 1994-1999 has an annual afforestation target of 25,000 hectares. By the year 2000, the total forest area is forecast to be 695,000 hectares which represents 10% of the total national land area. This compares with a figure of approximately 1% at the start of the century.

A long-term forestry strategic plan provides for 20,000 hectares of new afforestation per annum for 2000-2030. These proposals will increase forest area to 895,000 hectares by 2010 and to 1.2 million hectares by 2030, doubling the area under forest in the State from approximately 8% to 17%.

On average, around 2,500 trees are planted per hectare in Ireland. While conifers, mainly Sitka Spruce, represent around 84% of the forest estate and 80% of current planting, an increase in diversity and in the planting of broadleaves is being encouraged. Broadleaf planting has increased from 3% of all planting in 1990 to 20% in 1995.

Following the 1993 Helsinki Conference on the Protection of

Forests and in accordance with the Rio Forest Principles, a national sustainable forestry plan is currently being developed. This will contain national criteria and indicators by which progress towards sustainable forest management can be measured.

Draft planning guidelines on forestry development were issued by the Department of the Environment in January 1997. The guidelines, which will be published in their final form later this year, are intended to help planning authorities, in conjunction with the Forest Service of the Department of Agriculture, Food and Forestry in guiding forest development at local level. A sustainable forestry plane and a code of best practice are being prepared by the Forest Service and these, in conjunction with the strategic plan and new guidelines mentioned above, are designed to ensure that all forestry is carried out in a sustainable way, thus realising the benefits of increased forestry while having due regard to environmental and social imperatives.

Carbon Sequestration

Having regard to Irish climate, soil conditions and age profile of the national forest stock, it is estimated that, subject to a variability of 10% to 15%, one hectare of Sitka Spruce (yield class 18-20) absorbs 3.3 tonnes of carbon per year while broadleaves (yield class 4) absorb 1.3 tonnes of carbon per year. Having regard to these absorption rates, the national forests are, therefore, estimated to have absorbed 6.2 million tonnes of CO_2 in 1995, up from 5.2 million tonnes of CO_2 in 1990, an increase in the level of absorption of approximately 20%. When this is offset against the rise in gross CO_2 emissions, the net increase in emissions since 1990 was 7% by 1995. It is projected that annual absorption will be 7.6 Mt CO_2 in 2000, or approximately 45% above the 1990 level and 9.7 Mt CO_2 in 2010, or approximately 88% above the 1990 level.

Interdepartmental Group on Fiscal Measures for Environmental Purposes

In 1996, the Minister for Finance established an Interdepartmental Working Group to consider and put forward options for environmental taxation measures for the 1997 Budget. Preliminary work in this regard was carried out during 1996, but owing to time constraints and the complexity of the issues involved, only relatively minor changes were made in the 1997 Budget, including increased excise duties on petrol and diesel. However, the Minister for Finance also announced in the 1997 Budget that the Interdepartmental Working Group would be retained and would continue to examine, on an ongoing basis, options for fiscal measures towards environmental objectives. Issues which are being addressed by the group include the scope for financial measures to promote greater efficiency in energy use (including energy conservation in the industrial, domestic and transport sectors) and fiscal incentives to encourage greater use of alternative energies.

Consultancy Study on Greenhouse Gas Emissions

In addition to the ongoing development of measures described above, a major consultancy study has been commissioned to identify and evaluate the scope for intensifying existing policies and measures and undertaking additional measures to limit and/or reduce greenhouse gas emissions and to make recommendations for the ongoing development of Ireland's greenhouse gas emissions abatement strategy. Terms of reference are in Appendix 1.

OTHER ACTIONS

- METHANE (CH_4)

Fig. 5.2 CH_4 Emissions by Sector, 1990

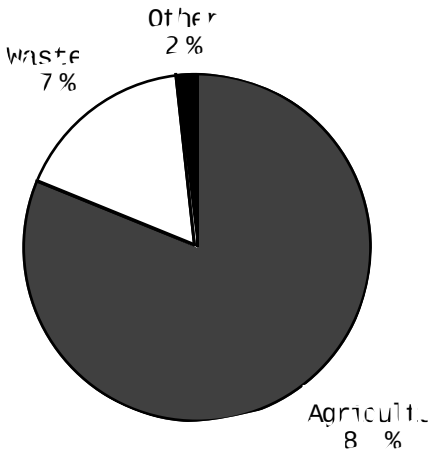


Table 5.9 Irish Greenhouse Gas Emissions (calculated on a GWP100 basis and expressed in $KTCO_2$)

Year	CO_2		CH_4		N_2O		Total
1990	30,719	54%	17,038	30%	9,105	16%	56,861
1995	33,931	57%	17,057	29%	8,072	14%	59,060
2000	34,998	58%	17,578	29%	8,048	13%	60,623

As can be seen from Table 5.9 above, CO_2 alone is responsible for over one-half of Irish greenhouse gas emissions measured on a Global Warming Potential basis with a 100 year horizon.

This contrasts with the EU breakdown between these gases, where CO_2 is approximately 80% of total emissions. The higher proportion of non-CO_2 gases arises from the importance of the agricultural sector in the Irish economy.

After CO_2, CH_4 is the most important greenhouse gas. Around 0.8 million tonnes of CH_4 were emitted in 1990 with agriculture and landfill waste being the major contributors. Agriculture is responsible for the largest single share of CH_4 emissions, approximately 80%.

Agriculture

Table 5.10 shows the trend in animal numbers over the period 1980-1995. Total CH_4 emissions in 1990 from agriculture were 640,250 tonnes and are expected to be 654,690 tonnes in 2000. Stabilising animal populations and improved feed quality is expected to contribute to the stabilisation of direct livestock CH_4 emissions.

Table 5.10 National Livestock Estimates (million)

Year	1980	1990	1995	2000
Cattle	6.909	6.816	7.122	7.122
Sheep	3.291	8.539	8.369	8.369
Pigs	1.030	1.194	1.550	1.550
Poultry	9.904	11.33	13.25	13.25

However, it is clear that the level of emissions arising from agriculture is more dependent on the number of animals. On the basis of current projections overall animal numbers are expected to remain at current levels at least until 2000. Slurry or manure are other sources of CH_4 emissions. It may be possible to limit these emissions by improved management. However, the small size of Irish farms may result in such arrangements being less cost-effective than elsewhere. Nevertheless, state grants are available to assist farmers to provide appropriate storage facilities; in addition, an improved scheme of capital allowances for investment in pollution control facilities has been introduced recently.

Waste

Landfill waste accounts for approximately 17% of CH_4 emissions. Efforts to reduce emissions of CH_4 are incorporated in a number of programmes. It is considered that these measures will assist in limiting CH_4 emissions in 2000 to their 1990 level.

(1) National Recycling Strategy

The strategy 'Recycling for Ireland' (July, 1994) concentrates on municipal (i.e. household and commercial) solid waste (MSW) and has set as its main objective the diversion of 20% of waste from landfill by 1999 by recycling. The total quantity of MSW arising in 1995 was 1,503,000 tonnes. The major biodegradable constituents are organic waste (some 442,000 tonnes) and paper (some 509,000 tonnes). The material targeted for diversion include some 20% of the biodegradable waste streams. The Recycling Strategy is directing its efforts to packaging waste, the compostable fraction of MSW, and newsprint.

The targets relevant to the reduction of CH_4 emissions are as follows:

- Paper packaging: 73,000 tonnes to be recycled per annum
- Organic fraction: 100,000 tonnes to be composted per annum
- Newsprint: 25% to be recycled (some 20,000 tonnes)

The recycling of paper packaging will be facilitated by REPAK which is an organisation established by industry to co-ordinate and finance the recycling of packaging waste. Achievement of these targets will ensure compliance with the EU directive on Packaging and Packaging Waste. Paper is the only putrescible material targeted by REPAK whose objective will be to recycle 73,000 tonnes per annum of paper packaging. Composting arrangements, mainly by local authorities, will drive the diversion of organic waste from landfill.

(2) Grant Assistance for Recycling Facilities

The Department of the Environment is offering grant assistance (under the Operational Programme for Environmental Services, 1994-99) of some £18.6 million to assist better waste planning and the provision of waste recovery and hazardous waste management facilities. The assistance is being offered to both local authorities and private enterprise. Composting facilities, both home composting and municipal composting, are given high priority for assistance.

(3) Utilisation of Landfill Gas

Included in the AER 1 and 2 schemes (see section on CO_2) are five landfill gas utilisation schemes, representing a combined capacity of 11,804 kilowatts. One scheme is operational, while testing is ongoing at the other sites.

(4) The Waste Management Act 1996

This was enacted in 1996. The Act will contribute to limiting of CH_4 emissions from landfills through:

- waste management planning,
- measures to promote prevention and recovery,
- waste facility licensing.

The Act will require all local authorities to produce and update Waste Management Plans containing objectives on waste prevention and minimisation and waste recovery.

The Act also imposes an obligation on all persons involved in activities of an agricultural, commercial or industrial nature to take all reasonable steps to prevent and minimise the production of waste. Specifically,

- regulations are being developed to minimise or prevent particular wastes, to control or recover packaging waste, to require a producer, distributor or retailer to collect or take back waste, to require retailers to charge for packaging,
- measures to support recovery and recycling programmes,
- measures to encourage public authorities and other

bodies to carry out waste audits and to produce plans with the objective of reducing or preventing waste generation.

Licensing of Waste Facilities

The introduction of licensing in 1997 will ensure that high environmental standards are applied in relation to the design and operation of landfill sites and will ensure adequate containment and control of landfill gas. There is a move to larger, centralised landfill sites and it expected that most of these will have either active landfill gas control systems (where the gas is pumped out of the site and flared-off by the use of flarestacks) or, where practicable energy recovery systems.

(5) Codes of Good Practice for Landfilling

The EPA is currently developing Codes of Good Practice by way of criteria for the selection, investigation, monitoring and operation of landfill sites. These codes will assist in upgrading the design and operation of landfill sites to ensure adequate containment and control of landfill gas. For larger landfill sites these codes will recommend active landfill gas control systems be installed.

(6) Waste to Energy Facilities

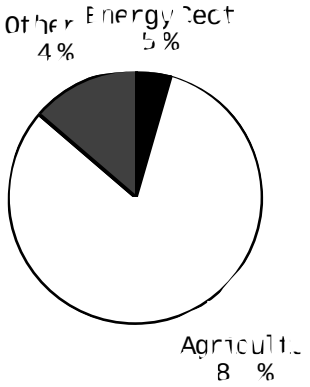
As part of the development of alternative energy sources in Ireland, the Department of Transport, Energy and Communications announced in March 1997 approval for a power generation plant using 480,000 tonnes per annum of municipal waste as the principal feedstock. The plant, which is subject to planning permission and EPA licensing will have a capacity of 30 MW.

Gas Distribution

BGÉ has also implemented measures to improve its distribution system to limit gas wastage. Bord Gáis's network replacement programme (at a rate of 3% p.a.) and breakage monitoring have led to reductions in gas leakage from this source.

- NITROUS OXIDE (N_2O)

Fig 3.2 N_2O Emissions by Sector



Emissions of N_2O in Ireland are estimated to be approximately 30,000 tonnes in 1990 and it represents approximately 16% of Irish greenhouse gas emissions expressed on a GWP100 basis.

Agriculture

The agriculture sector is responsible for over 80% of N_2O emissions. N_2O emissions primarily arise from soils as a natural process of nitrogen circulating in the environment, but the use of nitrogen fertilisers, slurries and manures enhances this effect. High N_2O emissions related to fertiliser use result from the climatic conditions of Ireland. The relatively high level of rainfall and high water capacity of a large proportion of agricultural soil gives rise to higher demand for fertiliser use as well as a higher N_2O loss due to its application in wetter conditions. Consumption of nitrogenous fertilisers increased from 275,000 tonnes in 1980 to just over 428,000 tonnes in 1995. There is evidence that the efficacy of the utilisation of nitrogen from fertiliser application is decreasing as the quantity used increases.

Fertiliser Use Recommendations

To overcome current and potential pollution problems, a Code of Good Agricultural Practice to Protect Waters from Pollution from Nitrates was published in July 1996 by the Ministers for Agriculture, Food and Forestry and the Environment. This includes recommended nitrogen application rates from artificial fertilisers, integrated with the use of organic slurries and manure. Nutrient Management Plans at farm and catchment levels have also been introduced and have been given a statutory basis in the Waste Management Act, 1996. Enhanced publicity by local authorities, farm organisations and State organisations for correct fertiliser usage is also planned.

These measures are expected to lead to a reduction in the amount of artificial nitrogen fertiliser used in 2000.

- HFCs/PFCs/SF_6

There is not as yet a comprehensive inventory of the use and emissions of these gases in Ireland. However, it is considered that their use in Ireland is relatively low. Work is currently being undertaken in order to estimate their use and emissions in Ireland and the results of this study will be communicated separately to the secretariat. One source of SF_6 which has already been identified is the ESB. It is estimated that its typical annual replenishment requirement of SF_6 is less than 0.5 tonnes which is less than 0.5% of its total in use.

6. Projections of Greenhouse Gas Emissions and Removals

Projections of greenhouse gas emissions and removals for the years 2000, 2005 and 2010 are provided in Tables 6.1 - 6.3.

Projections to 2010 are based on energy balance projections available in February 1997 and on assumptions regarding national animal herds to 2010.

For the energy scenario on which CO_2 projections are based, no satisfactory model for statistical correlation between TPER, and factors in the economy such as GDP, population and demographic changes was available. However, analysis of data from 1980 suggested an annual TPER growth at around half that of GDP growth, and this was considered realistic for the exercise. GDP growth rates at around 4% per annum to 2010 were assumed.

Projections for the forest sink were calculated on the basis of estimates of future plantings, drawing on the national plans for forestry.

For CH_4 and N_2O, no significant changes in animal numbers, in accordance with the methodological guidelines for this communication, were assumed. Projections for those gases are therefore subject to considerable uncertainty.

Emissions of CO_2 are projected to be 40.8 million tonnes in the 2010, which is 32.7% above the 1990 level. CO_2 removals are forecast to be 9.7 million tonnes by 2010 which is equivalent to an 87.8% increase in the size of the CO_2 sink.

If account is taken of the increased sink size, the net increase in CO_2 emissions are projected to 18% above the 1990 level.

The projections of CO_2 emissions are based on forecast energy balances provided by the Department of Transport, Energy and Communication.

Projections for CH_4 indicate that emissions will rise slightly and then stabilise at their 2000 levels, approximately 3% above their 1990 level.

Compared to their 1990 levels, emissions of N_2O are forecast to decline by 11% by the year 2000 and to remain at that level by the year 2010.

Forecasts for CH_4 and N_2O are largely dependent on the agriculture sector in Ireland and, in particular, the national cattle herd. If account is taken of developments arising from the reform of the EU's common agricultural policy, recommendations for the use of fertiliser, and integrated pollution prevention and control, it may well be possible that future emissions of CH_4 and N_2O will be below those indicated in the current projections.

On a GWP100 basis, the three greenhouse gases, CO_2, CH_4 and N_2O, will account for 61%, 27% and 12% respectively of national emissions by the year 2010. If account is taken of increased afforestation, projections of net emissions for the three gases combined are estimated at approximately 2% and 9% above 1990 levels by the years 2000 and 2010 respectively.

Table 6.1 IRELAND 2000 Projections

SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)
is not available electronically

Table 6.2 IRELAND 2005 Projections

SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)
is not available electronically

Table 6.3 IRELAND 2010 Projections

SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)
is not available electronically

7. Impacts and Adaptation

The Department of the Environment published in 1991 a series of studies on the impact of climate change for Ireland. The contributors were provided with the following working assumptions, on which to base their conclusions:

- $2^{o}C$ increase in average annual temperature;
- 5% to 10% increase in winter precipitation and 5% to 10% decrease in summer precipitation;
- 18cm rise in mean sea level.

In addition, 'best' and 'worst' case scenarios were assumed for examination as follows:

- $1^{o}C/3^{o}C$ increase in average annual temperature;
- little change/5% increase in annual average precipitation;
- 9cm/30cm rise in mean sea level.

These assumptions agreed broadly with the consensus reached by Working Group 1 of the Intergovernmental Panel on Climate Change (IPCC), published in 'Climate Change - The IPCC Scientific Assessment' (July 1990).

More recent studies undertaken for Europe (ECSN) and for the United Kingdom in 1995 indicate that no significant change is needed to the conclusions reached in 1991. These are summarised below.

Agriculture

Ireland would share in the enhanced agricultural production potential of Northern Europe. The production options available would be increased, new crops could be cultivated, and the overall costs of agricultural production would be likely to be less than is the case at present.

Forests

Higher temperatures and CO_2 levels are likely to alter the productivity of our forests both directly and indirectly. Higher temperatures with associated moisture could increase productivity provided the species adapt or alternative equally productive species are found. However, if the climate is drier, the alternative species might not be so productive. The influences at work will include changes in the rates of photosynthesis, in water use efficiency, in photosynthate allocation, and possible increase in damage from injurious agencies.

The Green Mantle

The green mantle environment would be influenced directly by the combined factors of increasing CO_2, increasing average annual temperature, and changing patterns of precipitation. In general, elevated CO_2 concentrations lead to plants getting larger more quickly, so that increased plant production, higher standing biomass, and an increased ratio of roots to shoots might be expected.

Peatlands, however, would suffer serious damage where increased summer soil water deficits lead to accelerated decay rates of peat; it seems likely that northwestern areas run less risk of such damage than midland and southern areas. Moreover, the rate of addition of plant debris to peat formation will decrease. This would lead to a gradual shift from a wet sphagnum dominated system to a drier dwarf-shrub or grass dominated heath. The deterioration of peatlands would be the most deleterious outcome of climate change in Ireland and would lead to additional CO_2 releases to the atmosphere.

A change in climate would also result directly in a corresponding change in the distribution patterns of many species throughout Ireland.

Hydrology and Freshwater Resources

Ireland's "saucer-shaped" topography means that much of the centre of the country is flood-prone in its natural state, owing to the relatively poor carrying capacities of rivers of small gradient. Some coastal regions, too, are prone to floods of a relatively "flashy" nature, because of the higher rainfall and the steeper river gradients. Serious flooding would occur more frequently. In areas which currently

experience regular flooding, it would be of greater severity and duration, while some areas, currently flood-free might experience flooding on an occasional basis.

Climate change would bring new challenges in the husbanding of our freshwater resources. Lower average summer water flow rates in river catchments, especially in the midlands, east and north, would result in less recharge for reservoirs during the summer period. Water shortages would occur regularly and the duration of low water levels would be longer than at present.

Sea Level

Much of the impact on Ireland of any rise in mean sea level will be associated with occasional storms. Storms and storm surges will have a major impact throughout Ireland but particularly on the west coast. Approximately 176,000 hectares or 0.25% of the Republic of Ireland are believed to be at risk from sea-level rise. This includes land that will be eroded, flooded, engulfed, or subject to environmental change. The largest proportion of this land is in the west of Ireland, but the most vulnerable areas may be in the east, where much of the shoreline has been developed for one purpose or another.

While much of the Irish coast will be affected by sea-level rise, those areas with human activities will be most seriously at risk. Human use of the Irish coast is quite intense, and there are often competing demands. It is estimated that over 50% of the population in 1991 resided in coastal areas. However, low-lying areas around the main cities - Dublin, Cork and Galway - have seen significant increases in population since 1971, much of it along the shoreline. In several places, especially south of Dublin, transport routes follow the coast and could be endangered by increased erosion or flooding. Fishing, aquaculture and tourism all rely, to some extent, on coastal locations, and all are of considerable economic importance to the country.

The cost of "protecting", by building sea-defences, is estimated to range up to £270,000m (1990 prices). Other strategies include abandonment of land, stronger planning control in coastal areas, fiscal or financial penalties for coastal developers, or softer non-engineering protective measures.

Fisheries

The effects of climatic change on the physical oceanography of the waters in the vicinity of Ireland are very uncertain. It follows that the possible consequences for fisheries are largely speculative - all the more so since Irish coastal waters tend to represent a transition zone, with many species at or near their southern or northern extremes.

A general warming of the coastal waters would probably result in shifts in the range and distribution of commercial species and also changes in their migration patterns and in predator/prey relationships. The consequences for aquaculture will be varied. In the case of shell-fish, the consequences of climatic change might be expected to be generally beneficial.

Coastal Zone Management Study

A coastal zone management strategy study, commissioned by the Departments of the Environment, the Marine, and Arts, Culture and the Gaeltacht to make recommendations for a national policy for the coastal zone, will be completed shortly. There will be a public consultation process, leading to the initiation of a strategic approach to a comprehensive national policy for the sustainable use of the coastal zone, covering such areas as:

- marine environmental protection and resource management;
- development, planning and land use;
- coastal protection; and
- conservation of habitats and biodiversity.

8. Overseas Assistance and Technology Transfer

A four-year strategy plan for Ireland's bilateral aid programme, Irish Aid, adopted in 1993, identified the environment as one of the key concerns and priority areas for the expanding aid programme. An environmental impact assessment (EIA) is now a standard part of project appraisal and review and systematic attention is given to environmental questions at all stages of project implementation.

A number of projects funded by Irish Aid address environmental protection in developing countries and seek to enhance their capacity to manage the environment in a sustainable manner. These projects range from reafforestation projects involving the replanting of indigenous species to improved land use projects which promote local efforts to improve controlled grazing and prevent deforestation in endangered areas. In addition to these specific interventions, Ireland promotes environmental management as a mandatory component of all development interventions.

Irish bilateral aid is primarily directed towards Africa, where it is concentrated on six priority countries. The countries are Zambia, Tanzania, Ethiopia, Lesotho, Mozambique and Uganda.

Ireland has adopted measures to honour the UNCED commitment on finance. It has been steadily increasing the volume of its development aid programme and the Irish Government is committed to making annual increases in Ireland's Official Development Assistance (ODA) with a view to making steady progress towards achieving the UN goal of 0.7% of GNP. Net ODA disbursement reached $170 million in 1996, an increase of over 19% in real terms over 1995. The ODA/GNP ratio, which was below 0.20% at the beginning of this decade, rose to 0.29% in 1996 from 0.28% in 1995. It is expected to reach a projected 0.31% in 1997.

Ireland participates actively in efforts in the UN, the World Bank and in the EU to combat regional and global environmental problems and to advance international efforts to advance sustainable development and respect for the common global environment. Approximately 35% of Irish Aid expenditure was channelled to multilateral development assistance activities in 1996, primarily through the EU, the World Bank and the various UN agencies.

The EU is a leading force for progress at international level in efforts to deal with global environmental problems and to promote the pursuit of sustainable development. Ireland is a participant in an EU initiative (amounting to 3 billion ECU, including new and additional funding) to strengthen assistance to developing countries in the field of sustainable development and increasing funding for Agenda 21.

Ireland is a party to the Global Environment Facility (GEF), which serves as the interim financial mechanism for the Climate Change Convention. It will subscribe IR£1.6 million to it over four years under the first replenishment, having made its first contribution of IR£425,000 in 1996. Ireland is also an annual contributor to the three Climate Change Convention voluntary trust funds. It also makes an annual voluntary contribution to the trust fund for the Commission on Sustainable Development.

The Electricity Supply Board (ESB) has provided assistance in improving the operation efficiency and environmental performance of electrical systems in a number of countries. For the most part, these projects have been located in countries with economies in transition, as well as in the Middle East and Africa. Financial support is provided by the World Bank, the EBRO, the Irish Government and the EU. The principle areas of activities of these projects are;

- power plant design and refurbishment;
- transmission and distribution systems management;
- management and organisation;
- environmental management systems and audits.

9. Research and Systematic Observations

Systematic Observation

There are 14 synoptic observing stations in Ireland at present. They are distributed principally around the coast of Ireland. In addition, there are 80 climatological observing stations distributed throughout the country.

The synoptic stations are operated by Met Éireann, the Irish meteorological service, and in many cases make hourly observations of all the main weather elements. The inland stations sometimes close during the evening and/or night, but there is partial instrument record covering these periods. A programme of installing automatic weather stations to restore full coverage is underway.

The climatological stations make daily observations at 0900 UTC of dry and wet bulb temperatures, maximum and minimum temperatures, and rainfall; some also record elements such as sunshine, soil and earth temperatures, and weather phenomena. These stations are operated by a variety of organisations and individuals who supply their readings to Met Éireann on a monthly basis where the data is quality controlled and archived.

The most important long-term stations in Ireland include the observatory at Valentia, in County Kerry, and at the Ordnance Survey in the Phoenix Park in Dublin, where records go back for well over a century.

Met Éireann participated in FASTEX, an international experiment which used Shannon Airport as a base for a programme of intensive measurements on selected Atlantic depressions during January and February 1997. Evaluation of the results should lead to increased knowledge of the genesis, tracks and intensification of depressions in the Atlantic, especially those which undergo sudden and dramatic deepening.

As part of an international measurement programme, the Global Atmospheric Gases Experiment (GAGE) commenced use of the Mace Head Atmospheric Research Station on the west coast in County Galway in March 1987 to measure radiatively important atmospheric trace gases. An upgrade of instrumentation took place in February 1994. In October 1994, a fully automated gas chromatograph-mass spectrometer was installed at Mace Head. Continuous measurements of CO_2 have taken place at Mace Head since July 1992, through collaboration with the Centre des Faibles Radioactivities, France. (The average increase in CO_2 between July 1992 and December 1995 is 1.85 ppm/year.) Aerosols, which are assuming an increasing importance in the global climate area as a result of their potential cooling effect, are also measured at Mace Head. The entire GAGE database comprising every calibrated measurement including pollution events is accessible at the Carbon Dioxide Information and Analysis Centre at the US Department of Energy, Oak Ridge National Laboratory.

As a contribution to the Global Ozone Observing System total column ozone has been measured at Valentia Observatory since 1993; a Brewer spectro-photometer and ozonesonde ascents are employed. In addition ultra-violet radiation is measured at three locations.

Research

In the area of research, Irish efforts have addressed the areas of energy efficiency, alternative energy sources, and the effects of climate change. Academic work is being carried out in Ireland with respect to rainfall change scenarios, changing wind climatologies and coastal research on the impacts of sea level change.

The Irish Energy Centre participates in the EU's Joule/Thermie Programme (research and technological development and demonstration). The Centre is also involved at a European level with a number of other energy related organisations. Emphasis is placed on adapting technologies, developed elsewhere, to Irish conditions; on exploiting renewable resources; and on research addressing issues specific to Ireland, where appropriate.

From 1990 to 1994 non-nuclear energy research projects were co-ordinated under the EU Joule Programme, with both

first time technical demonstration projects and those which require assistance to penetrate the market (dissemination projects), being supported under the Thermie Programme. Since 1990, over £15 million has been received by Irish companies and universities, with a net investment in excess of £35 million. Both Joule (research) and Thermie (technical demonstration), were concluded in December 1994.
The EU's Fourth Framework Programme, adopted in 1994, has continued to provide opportunities for research and for demonstration projects under a new non-nuclear energy RTD+D Programme, Joule-Thermie. All technology demonstrations projects previously supported under Thermie have been incorporated into a new Joule-Thermie programme. The programme covers the rational use of energy, renewable energy sources and fossil fuel conversion. Irish projects received over £3 million support from Joule-Thermie during 1995/96. The programme is scheduled to run up to the end of 1998.

Ireland also participates in the EU's environment programme (environment and climate) under the Fourth Framework Programme. This programme is focused on global change research and on new technologies for environmental protection. As part of the programme, work is carried out in Ireland on projects investigating the basic processes of climate change, atmospheric physics and chemistry, and hydrological and hydrogeological risks associated with climate change.

Ireland maintains a national committee to liaise with the International Geosphere-Biosphere Programme (IGBP). Currently, there are seven core projects which address a number of thematic areas related to climate change. The Irish committee for the IGBP liaises with most of these programmes by appointing members of its committee to follow developments and bring them to the attention of researchers in the relevant disciplines within Ireland. The Department of the Environment provides financial support to the Irish Committee for the IGBP.

10. Education, Training and Public Awareness

EDUCATION

A number of education initiatives are run by the Irish Energy Centre which are aimed at both primary and secondary level students.

Energy Watch Awards

The Energy Watch Awards is a scheme run by the IEC aimed at transition year students (c. 16 years of age) to promote energy awareness and energy efficiency measures. The IEC has produced and distributed a detailed pack for schools entitled "Energy Conservation and the Environment" which has formed the basis of the transition year projects to date.

Energy Watch Day

For primary schools, the IEC organises an Energy Watch Day, during which students undertake simple energy saving activities in the school and home. The IEC also works with the Department of Economic Development in Northern Ireland on the schools initiative.

Significant progress has been made in heightening the presence of the IEC in this sector. A recent survey indicated that 16% of educators now recognise the IEC as a supplier of teaching materials, while 20% now view the Centre as a source of information on teaching about energy. These figures compare with previous figures of 10% and 7% respectively.

TRAINING

The IEC organises seminars, workshops and prepares case studies to encourage and promote energy efficient practices in various sectors.

Building Energy Management Systems

The IEC has identified Building Energy Management Systems as one technology which can contribute significantly to reducing energy consumption. Building Energy Management workshops are held in various parts of the country throughout the year. Additionally, case studies are prepared and issued by the IEC.

Regular Inspection of Boilers

Seminars are held regularly which address boiler efficiency problems in the industrial, commercial and public sectors. In addition, an awards scheme has been launched to highlight and reward excellence in the field of good boilerhouse practice. The awards scheme acknowledges the very important of the service company in assisting organisations in boilerhouse maintenance.

A steam boiler initiative has been developed which focuses directly on the current status of boiler and burners and the opportunities that exist to realise energy savings through improved and regular maintenance.

It is anticipated that this initiative will contribute £3 million in annual savings towards an overall target of £5 million from boiler efficiency measures during the life of the programme.

PUBLIC AWARENESS

Environmental Partnership Fund

The Department of the Environment has recently launched a new scheme, the Environmental Partnership Fund, to assist environmental awareness projects at local and national level, and to encourage partnership arrangements between local authorities and NGO/local community groups. This replaces existing funding mechanisms which over the recent years have provided significant funds to support environment awareness building by NGOs.

Activities which fall under the criteria of the new scheme include environment competitions, newsletters and other educational initiatives. In particular, projects which educate or inform local communities on more environmentally sustainable practices are encouraged. These might also

include NGO/local authority seminars or exhibitions to highlight atmospheric pressures on the environment.

The Department of the Environment has also provided specific financial assistance to Earthwatch in 1996 and 1997 towards the costs of holding Round Table discussions on climate change. These Round Tables have promoted useful dialogue between those involved in policy formulation, the NGOs, and the main players in the energy and industry sectors.

Environment Bulletin

Another important means of raising public awareness about environmental issues generally is the Environment Bulletin which is published quarterly by the Department of the Environment and distributed free of charge to a mailing list of 8,000. Climate concerns are addressed regularly and a special feature on energy conservation, to coincide with Energy Awareness Week, has been included.

Public Information on Climate Change

Information on all environmental matters, including climate change is available in ENFO, Ireland's public information service on the environment which was established in 1990 by the Department of the Environment to help protect and enhance the environment by promoting a wider understanding and fuller awareness of environmental issues. All ENFO services are provided free of charge.

ENFO collects and maintains up-to-date and authoritative information on all aspects of the environment and has been visited by over 350,000 people to date. On average, 400 requests for information on various aspects of the environment are received each week by post, fax or telephone. The majority of requests for information are answered on the same-day basis by ENFO from its own resources. The numbers who continue to avail of the information service offered by ENFO is an indication of the high level of interest and concern for the environment. The information service is available on a nationwide basis.

ENFO provides information in a variety of ways. These include a query-answering service, information leaflets, a video-lending service, exhibitions, lectures and other activities. The facilities available at the ENFO centre include a reference library with a reference database and on-line access to international databases. The reference database comprises bibliographic information in relation to all books, reports and journal articles held in the ENFO library. The system provides a convenient means of identifying the range of material available on any particular topic, e.g. climate change, and of selecting the most appropriate documents for the enquirer. On-line connections to the ENFO data base are in place in 36 public libraries. These libraries are spread over all local authority areas and provide a well-distributed network of access points to the ENFO database. Database access via the internet will be available later this year.

ENFO also provides information sheets on Global Warming; Air Pollution; The Greenhouse Effect; and Sea Level Changes in Ireland. As with all 79 of ENFO information leaflets, these are distributed nationwide free of charge and are available on the Internet at http://kola.dcu.ie/~enfo. ENFO has also published an Education Pack on Air which was distributed to all primary and second level schools in the country and provides teachers with useful support materials.

IEC Information Leaflets

The IEC publishes a wide range of information leaflets aimed at the domestic and industrial sectors which are available from the Irish Energy Centre, Glasnevin, Dublin 9.

"Householders Booklet - Be Your Own Energy Manager"

A booklet aimed at promoting awareness amongst householders and providing information on actions to save energy has been produced and distributed by the IEC. The main impact of this measure is to identify target groups and provide a base for measuring effectiveness.

"Our House" TV Series

The IEC has been a long time sponsor of the Our House television series and has conducted research which indicates that the programme audience are very receptive to the improved energy efficiency message and will in fact respond to the message with action. This research was conducted in relation to the booklet "Householders - Be Your Own Energy Manager". The programme had a weekly audience in excess of 460,000.

Energy Awareness Week

An annual Energy Awareness Week is organised by the Irish Energy Centre, in association with the Energy Advisory Board. The week aims to provide consumers with a clear understanding of the benefits of energy management and the opportunity to make real behavioural change. This is achieved through an extensive education and awareness campaign. By 1999, Energy Awareness Week will have achieved cumulative energy savings of the order of £9.2 million in the domestic sector, and a cumulative saving of 0.122 Mt CO_2.

IEC Transport Awareness

Through its support of "National Walk to Work Day" and the launch of the launch of the "Driving Tips Motoring Wheel" the IEC promotes energy efficient transport options which the individual can choose.

Appendix 1
Consultancy Study Terms of Reference

The Departments of the Environment and Transport, Energy and Communications are jointly carrying out, as an input to the review and update of the strategy published in 1993 and to the ongoing development of Ireland's greenhouse gas emissions abatement strategy, a study to identify and evaluate the scope for intensifying existing policies and measures, and undertaking additional measures to limit and/or reduce greenhouse gas emissions.

Terms of Reference

(a) assess and quantify the scope for limiting and/or reducing greenhouse gas emissions in Ireland in the periods up to 2005, 2010 and 2020;

(b) assess and evaluate the scope for the intensification of existing policies and measures contributing to the containment of greenhouse gas emissions;

(c) identify, assess and evaluate possible additional policies and measures to contain greenhouse gas emissions, including in so far as possible and appropriate indicative cost/benefit information in respect of each of the policies and measures identified;

(d) analyse possibilities for a suitable mix of measures for the containment of greenhouse gas emissions;

(e) conduct (a) to (d) above for at least the six sectors listed below, while having regard, in particular, to their energy intensity, cross-sectoral and multi-sectoral implications, potential for demand management and fuel switching towards less CO_2 intensive fuel:

- energy
- industry
- transport
- residential
- commercial
- agriculture;

(f) assess the potential for Ireland to implement policies and measures jointly with other Parties.

The Study is being carried out by Economic Resources Management (UK), together with the Economic and Social Research Institute (Ireland) and Byrne O Cléirigh (Ireland). The Report is expected to be finalised later in 1997.

Appendix 2
Irish Save Projects

Energy Rating of Houses

Energy Environment Package for Schools

Annual Self Audit and Statement

Demonstration of Targeting and Monitoring of energy use in Ireland

Implementation of contract energy management by an electricity utility - an investigative project.

Programme to maximise the impact of domestic labelling.

Educational energy 'package' for householders.

Pilot study to access consumer response to a range of Demand Side Management measures in Ireland.

The use of energy rating as a home energy costs indicator.

Pilot study to investigate how to overcome existing barriers to Demand Side Management implementation.

Joint Energy Rating for Primary Schools

Influence of mode choice on transport energy savings.

Pay as you drive car sharing.

Exploring marketable Energy efficiency solution packages for existing houses.

Good practice programmes in energy management for local authorities

Europrice - Energy Efficiency of Urban Road Pricing Investigation in Capitals of Europe

Appendix 3
Summary Tables

Table 1. Summary of Policies & Measures *is not available electronically*

Table 2. Summary of projections of anthropogenic emissions of CO_2 (gigagrams) *is not available electronically*

Table 3. Summary of projections of removals of CO_2 by sinks and reservoirs (gigagrams) *is not available electronically*

Table 4. Summary of projections of anthropogenic emissions of CH_4 (gigagrams) *is not available electronically*

Table 5. Summary of projections of anthropogenic emissions of N_2O (gigagrams) *is not available electronically*

Table 6. Summary of projections of anthropogenic emissions of precursors (gigagrams) *is not available electronically*

Table 7. Financial Contributions *is not available electronically*

Appendix 4
Standard Data Tables for 1993

STANDARD DATA TABLES UNDERLYING SUMMARY REPORT (TABLE 7A) FOR 1993

Standard Data Table 1	
1 A Fuel Combustion Activities	Sheets 4,5,7,8,11,12 and 13
1 B Fugitive Emissions	
Industrial Processes	
Agriculture	Sheets 4A & 4B and Sheet 4D
Land Use Change and Forestry	Sheet 5A
Waste	Sheet 6A, 6C and 6D

STANDARD DATA TABLE 1

Energy: 1 A Fuel Combustion Activities (Sheet 4) - Detailed Technology Based Calculation *is not available electronically*

Energy: 1 A Fuel Combustion Activities (Sheet 5) - Detailed Technology Based Calculation *is not available electronically*

Energy: 1 A Fuel Combustion Activities (Sheet 7) - Detailed Technology Based Calculation *is not available electronically*

Energy: 1 A Fuel Combustion Activities (Sheet 8) - Detailed Technology Based Calculation *is not available electronically*

Energy: 1 A Fuel Combustion Activities (Sheet 11) - Detailed Technology Based Calculation *is not available electronically*

Energy: 1 A Fuel Combustion Activities (Sheet 12) - Detailed Technology Based Calculation *is not available electronically*

Energy: 1 A Fuel Combustion Activities (Sheet 13) - Detailed Technology Based Calculation *is not available electronically*

Energy: 1 B2 Fugitive Emissions from Fuels (Oil and Natural Gas) *is not available electronically*

STANDARD DATA TABLE 2

Industrial Processes

STANDARD DATA TABLE 4

Agriculture: 4A&4B Enteric Fermentation & Manure Management

STANDARD DATA TABLE 4

Agriculture: 4D Agricultural Soils

STANDARD DATA TABLE 5

Land Use Change & Forestry: 5A (Sheet 1) Changes in Forest and Other Woody Biomass Stocks - Annual Growth Increme

STANDARD DATA TABLE 6

Waste: 6A Solid Waste disposal on Land, 6C Waste Incineration, 6D Other Waste

Appendix 5
Emission Factors used in National Inventories

CO_2 Emission Factors (Net Calorific Value Basis)

	Tonne/TJ
SOD PEAT[a]	104.00
MILLED PEAT[b]	115.00
PEAT BRIQUETTES[a]	98.86
COAL	85.65
KEROSENE	71.40
GASOIL/DIESEL	73.30
FUEL OIL	76.00
GASOLINE	70.00
LPG	63.70
NATURAL GAS	54.94

[a] Virtually all residential use

[b] Power generation