Ireland's report on Demonstrable Progress under Article 3.2 of the Kyoto Protocol

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Summary

The European Union (EU) has been to the forefront in promoting international cooperation to tackle climate change through mitigation efforts to control greenhouse gas emissions, and through promoting adaptation measures to counter the adverse effects of climate change that are inevitable due to historic and present emissions. Ireland is committed to meeting its greenhouse gas limitation target for the purposes of the Kyoto Protocol. This will be achieved through the continued implementation of domestic policies and measures and the use of the Protocol's flexibility mechanisms. The National Climate Change Strategy (NCCS), which was published in October 2000, forms the basis for Government policy and action in relation to climate change. This Strategy is currently being reviewed to take stock of developments since then and to examine options for achieving further abatement of greenhouse gas emissions in the future.

Overview

This report sets out progress achieved in meeting Ireland's commitments under the Kyoto Protocol.

- Chapter 1 outlines Ireland's domestic framework for delivering policies and measures to fulfil its Kyoto commitment.
- Chapter 2 looks at trends in, and projections of, Ireland's greenhouse gas emissions.
- Chapter 3 details specific sectoral policies and measures that have been undertaken and how they will help Ireland to meet its Article 3 commitments.
- Chapter 4 describes how Ireland is fulfilling its other commitments under the Kyoto Protocol.

Chapter 1 - Policies to address Climate Change

1.1 Ireland's target and its international context

The ultimate objective of the 1992 United Nations Framework Convention on Climate Change (UNFCCC) is the stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Acknowledging that change in the Earth's climate and its adverse effects are a common concern of humankind, the Convention reflects the determination of the Parties to protect the climate system for present and future generations. Thus, the Convention sets the context and provides the basis for ongoing development of global action to tackle climate change. Ireland is a Party to both the Convention and the Kyoto Protocol.

Under the 1997 Kyoto Protocol, the 15 Member States then in the EU agreed to an emissions reduction target of 8% from 1990 levels to be achieved over the period 2008–12. At Kyoto, the EU adopted this overall target on the basis that reduction commitments for individual Member States would be differentiated to reflect their differing national and economic circumstances, as provided for under Article 4 of the Kyoto Protocol. Council Decision 2002/358/EC subsequently set out legally binding differentiated reduction targets for each Member State. According to this burden-sharing agreement, Member States have either to reduce their emissions to an agreed percentage below 1990 levels or limit their emissions to an agreed maximum above 1990 levels. Ireland's target is to limit its emissions to no more than 13% above its 1990 levels.

Ireland's target to limit emissions to 13% above 1990 levels, will be met through:

- a variety of measures to reduce emissions throughout the economy, including those set out in the National Climate Change Strategy (2000) and measures adopted subsequently by Government;
- emissions reductions, or purchase of carbon allowances in lieu of reductions, by installations participating in the EU Emissions Trading Scheme; and
- use of the Kyoto Protocol flexible mechanisms by Government to acquire credits for carbon reductions elsewhere in the world.

1.2 National Climate Change Strategy

Since the National Climate Change Strategy was published in 2000, the policy context for the principal greenhouse gas emitting sectors has changed significantly. New policies and measures have been introduced, some of which were envisaged by the Strategy, while others derive from measures agreed at European Union level.

Other proposals in the Strategy have not been implemented in light of further analysis as to their suitability in an Irish context. The Climate Change Strategy is currently undergoing a review, with the objective of updating its provisions to reflect the current policy context, and to clearly identify Ireland's pathway to Kyoto compliance.

Table 1.1 sets out the contribution of significant adopted policies and measures prior to March 2006. The estimates of emissions reductions from these measures are based on revised projections of greenhouse gas emissions to 2012 across all sectors included in the National Climate Change Strategy, which were completed in March 2006 and are published in 'Determining the Share of National Greenhouse Gas Emissions for Emissions Trading in Ireland 2008-2012', by ICF Consulting & Byrne Ó Cléirigh[1]. A more detailed description of sector specific policies and measures, and their impact on overall emissions are outlined in Chapter 3.

1.3 Emissions Trading In Ireland

A significant contribution to the achievement of Ireland's Kyoto target will be made by firms from the energy and industry sectors that are covered by the EU Emissions Trading Scheme (ETS). Collectively these firms account for some 33% of Ireland's total greenhouse gas emissions. A three-year pilot phase of the scheme commenced in 2005. The first full period of emissions trading will begin in 2008 and will operate over the duration of the Kyoto commitment period from 2008 – 2012.

Under the Scheme, responsibility for a portion of each EU Member State's national emissions reduction targets is placed on individual emitters of greenhouse gases, primarily large industrial and power generation facilities. The Scheme provides an incentive for individual installations to reduce their emissions through having the amount of carbon dioxide they can emit capped. Installations that succeed in reducing their emissions below the capped level can sell surplus allowances. For some, it may be more cost-effective to purchase allowances arising from emissions reductions by other firms than to reduce their own emissions. The key rationale behind emissions trading, therefore, is to achieve emissions reductions at least cost through a market mechanism.

1 The report is available to download from http://www.environ.ie

Since November 2005, firms in the ETS have been able to purchase credits, with some exceptions, from the Kyoto Protocol's project-based mechanisms - Joint Implementation (JI) and the Clean Development Mechanism (CDM) - to provide a cost-effective way of achieving compliance with their target under the scheme[2]. As well as being able to purchase credits, firms can now invest in projects to reduce emissions inside or outside the EU through JI or CDM and convert the credits they earn from those projects into allowances that can be used for compliance under the EU scheme. Only credits earned from CDM projects can be used for compliance during the first trading period (2005-2007). Credits from both JI and CDM projects may be used by firms in the Scheme once the Kyoto commitment period commences in 2008[3].

The Government has recently set directions for the next period (2008-2012) of the EU Emissions Trading Scheme and a National Allocation Plan for this period has been prepared by the Environmental Protection Agency and submitted to the European Commission. Confirmation by European Commission of the Plan is expected before end 2006.

1.4 Government use of the Kyoto Protocol Flexible Mechanisms[4]

The flexible mechanisms available under the Kyoto Protocol allow the Government to acquire allowances arising from emission reduction initiatives elsewhere in the world. The Government recognises that greenhouse gas emissions are not limited by national boundaries; the effect is global rather than local. A tonne of carbon dioxide released or reduced anywhere in the world will have the same effect on the climate system. The mechanisms included in the Kyoto Protocol are designed to ensure that a global problem can be addressed in a global manner. The Government will use this option as an element of its overall response to meeting its emissions target.

The National Treasury Management Agency (NTMA) has been designated as purchasing agent on behalf of the State and it is intended that the purchasing

2 European Communities (Greenhouse Gas Emissions Trading) Amendment Regulations 2005, (S.I. 706 of 2005).

3 The Environmental Protection Agency has been designated as Focal Point and National Authority for Joint Implementation (JI) and Clean Development Mechanism (CDM) projects, respectively. The role of the Agency will be to approve participation by private or public entities in JI or CDM project activities. The Agency will publish guidelines setting out its approval procedures for participation by Irish entities in JI and CDM projects.

4 The Kyoto Protocol provides for three flexible mechanisms to lower the overall costs of achieving emissions targets: Joint Implementation (Article 6), the Clean Development Mechanism (Article 12) and International Emissions Trading (Article 17).

activities of the Agency will be underpinned by Exchequer funding provided through a National Carbon Fund. Legislation is currently being prepared to provide a statutory footing for the Carbon Fund. An initial provision of €20 million for the purchase of credits has been made by the Government and will be supplemented, as necessary, up to and throughout the commitment period.

The Government does not propose to stipulate the type of credit or allowance that the NTMA should purchase or to direct the NTMA to purchase credits from a particular type of project or particular host countries. It is envisaged, however, that the activities of the Agency in its role as the purchasing agent for the State will be directed by a number of guiding principles. The primary objective will be to provide for the timely purchase of sufficient carbon credits to allow Ireland to meet its target for the purposes of the Kyoto Protocol in the commitment period 2008-2012.

1.5 European Climate Change Programme

The European Climate Change Programme (ECCP)[5] is the European Union's strategy to implement the Kyoto Protocol, complementing the efforts of Member States. Effective common and co-ordinated policies and measures under the ECCP, as well as being an important avenue for the EU to meet its overall commitment, are also an important element of Member States' strategies to achieve the required emission reductions. In October 2005, the European Commission launched a new phase of the ECCP, to explore further opportunities to exploit cost-effective emissions reduction options, building on existing initiatives, but also examining the potential contribution of carbon capture and storage, controlling emissions from aviation and an integrated approach to reducing CO_2 emissions from light vehicles.

1.6 Meeting Ireland's Kyoto Commitments

The annual reduction in greenhouse gas emissions from existing measures - those adopted or under implementation prior to March 2006[6] - over the 2008 - 2012 period is estimated to be almost 8 million tonnes.

5 http://europa.eu.int/comm/environment/climat/eccp.htm

6 Updated projections for greenhouse gas emissions to 2012 across all sectors included in the National Climate Change Strategy were completed in March 2006 and are published in *Determining the Share of National Greenhouse Gas Emissions for Emissions Trading in Ireland 2008-2012*, by ICF Consulting & Byrne Ó Cléirigh. Report available at http://www.environ.ie

Measure	Average annual reduction 2008-2012 Mt CO_2e
CAP reform – full decoupling	2.40
Afforestation	2.08
Renewable Energy Directive[7]	1.30
Landfill gas power generation or flaring	0.70
EU – car manufacturers voluntary agreement	0.48
Building Regulations Part L & EPBD[8]	0.30
Dublin traffic measures (e.g. Port Tunnel)	0.27
Biofuel excise relief	0.25
Implementation of Landfill Directive	0.06
Modernisation of natural gas network	0.06
Motor taxation / fuel labelling	0.05
Total	**7.95**

Table 1.1: Annual reduction of adopted measures on full implementation

Even with existing policies and measures already implemented or expected to be implemented up to 2012, projections show that Ireland will continue to face an average annual shortfall in its Kyoto target of some 7.174 million tonnes of CO_2e in the 2008-2012 period. In summary, this shortfall (which is referred to as the distance to target) is capable of being met through:

- further measures to be decided on by the Government, over and above those in Table 1.1,
- emissions reductions, or purchase of carbon allowances in lieu of reductions, by installations participating in the EU Emissions Trading Scheme; and
- use of the Kyoto Protocol flexible mechanisms by Government to purchase carbon allowances.

In March 2006, the Government decided on the proportion of Ireland's distance to target that will be borne by participants in the EU Emissions Trading Scheme. This decision was required so that the National Allocation Plan (the distribution of emission allowances among the participants) could be finalised by the mid-year deadline for submission to the European Commission. As shown in Table 1.2 below, this sector will be responsible for 3.02 million tonnes per annum of the national

7 Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources in the internal electricity market, which requires Ireland to generate 13.2% of its electricity from renewable sources by 2012.

8 Directive 2002/91/EC on the energy performance of buildings

distance to target, through a combination of internal emissions reductions or the purchase of allowances.

Million tonnes per annum	Emissions Trading Sector	Rest of economy	TOTAL
Average annual emissions 2008-2012 without any action	25.658	44.548	70.206
Share of reduction	3.02	4.154	7.174
Target	22.638	40.394	63.032

Table 1.2: Approach to meeting Ireland's Kyoto Protocol target

The Table shows that the balance of the distance to target, i.e. 4.154 million tonnes per annum, is to be addressed across the whole economy. Any emission-reducing measures that are adopted over and above those set out in Table 1.1, will count under this heading. Whatever balance remains will be met by Government purchases of carbon credits. The flexible mechanisms of the Kyoto Protocol enable Governments to make rational economic choices between domestic emission reductions or purchases of credits for reductions elsewhere in the world.

Chapter 2 - Trends and Projections of Greenhouse Gas Emissions

2.1 Greenhouse gas emission trends 1990-2004

Inventories of greenhouse gas emissions are compiled and published annually by the Environmental Protection Agency[9]. The latest available inventory covers the period 1990 - 2004 and has been published in National Inventory Report 2006. This report shows that emissions have fallen from a peak of 26.9% above 1990 levels in 2001 to 23.1% above 1990 levels in 2004. The recent decline is due, inter alia, to:

- Increasing use of natural gas in the power generation sector;
- The closure of ammonia and nitric acid production plants in 2002; and
- Reduction in the size of the national herd.

Figure 2.1 illustrates emissions trends across relevant economic sectors from 1990 to date and projections of emissions to 2012. Figure 2.2 expresses sectoral emissions as a percentage of total emissions in 1990 and 2004. Over the period since 1990, long-term trends in individual sectors are apparent. The transport sector, in particular, has seen sustained increases over the period, with total emissions in the sector, increasing by 144% between 1990 and 2004. The increase is almost entirely attributable to road transport, annual emissions from which have increased from 4.79 million tonnes to 12.13 million tonnes over the period.

In the energy sector, predominantly through power generation, emissions increased by approximately 35% between 1990 and 2004. However, a downward trend has been evident since 2001.

In agriculture, emissions increased on a steady basis throughout much of the 1990s but began to decline in 1999 arising from reduced livestock numbers and fertiliser use. Emissions in the sector were slightly lower in 2004 in comparison to 1990 emissions.

In the residential sector, while total energy consumption (including electricity consumption) has been increasing, direct emissions, which excluded electricity consumption, have fallen by 10% between 1990 and 2004. This fall is a result of shifting fuel consumption from solid fuel towards cleaner fuels such as natural gas, as well as the adoption of strengthened energy efficient standards for new buildings.

9 See http://coe.epa.ie/ghg/

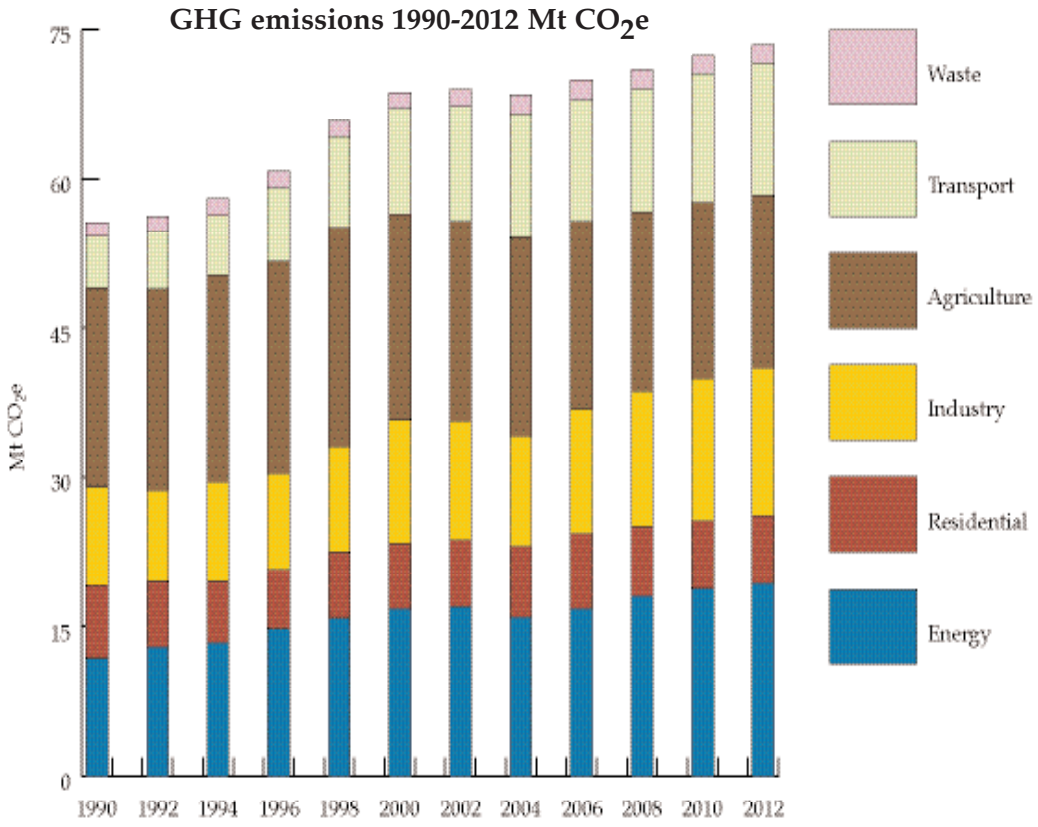

Figure 2.1: Trends and projections in sectoral emissions 1990-2012

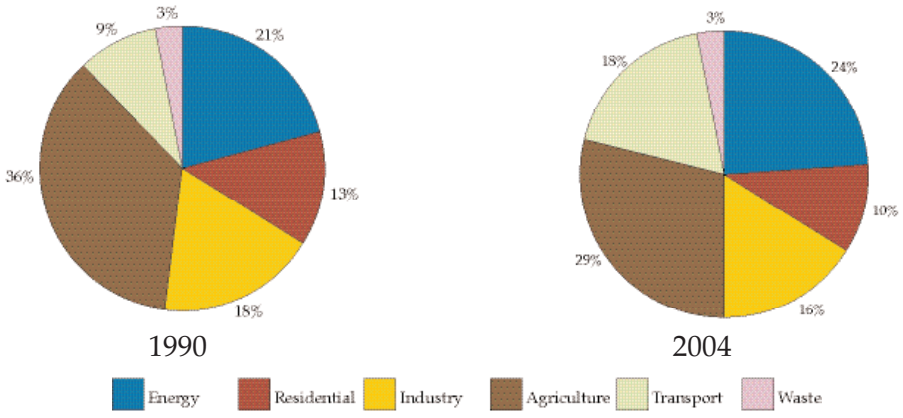

Figure 2.2: Sectoral emissions as percentage of total in 1990 and 2004

As illustrated in Figure 2.3 greenhouse gas emissions derive from four distinct sources - fossil fuel combustion; agricultural production and land use; industrial processes and 'F' gases; and waste management. By far the largest of these sources is fuel combustion, which accounted for 65% of emissions in 2004 and is forecast to increase to 68% during the Kyoto commitment period, 2008-12. However, due to the high level of emissions from agricultural production (29% in 2004), fossil fuel combustion contributes a smaller proportion of overall greenhouse gas emissions than is the case in most other developed counties. For the EU as a whole, the average level of fossil fuel combustion was 80% in 2004.

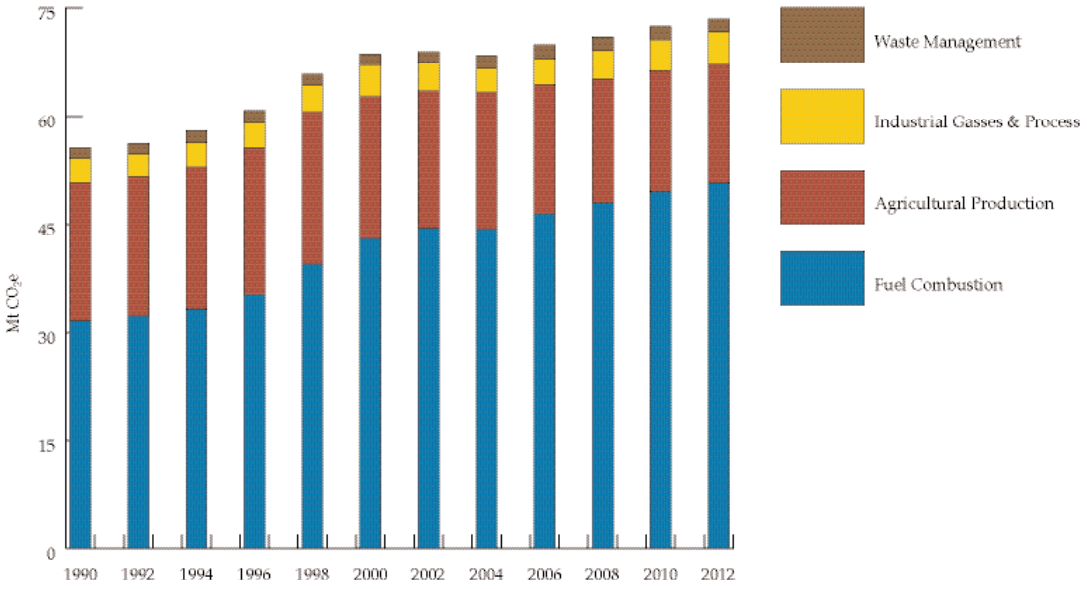

Figure 2.3: Trends and projections in sectoral emissions 1990-2012

2.2 Projections of greenhouse gas emissions

Updated projections for greenhouse gas emissions to 2012 across all sectors included in the National Climate Change Strategy were completed in March 2006 and are published in *Determining the Share of National Greenhouse Gas Emissions for Emissions* Trading in Ireland 2008-2012, by ICF / Byrne Ó Cléirigh.[10]

10 *Determining the Share of National Greenhouse Gas Emissions for Emissions Trading in Ireland,* ICF Consulting and Byrne Ó Cléirigh Consulting, March 2006. Available on www.environ.ie.

It is expected that, without any additional action, the recent downward trend in annual emissions would be reversed over the Kyoto Protocol commitment period (2008 – 2012) due to projected economic growth and consequent increased demand for energy, construction materials and transport services.

Based on policies and measures already implemented or expected to be implemented up to 2012, projections show that Ireland will continue to face an average annual shortfall in its Kyoto target of some 7.174 Mt of CO_2 equivalent. This updated forecast distance to target takes into account all adopted and / or implemented policies and measures to the end of 2005. Projections for all years between now and 2012 are predicated on existing policies and measures delivering quantified emission reductions over this period. The forecasted target depends also on macro-economic forecasts underpinning the projections, any deviation from which will impact on projected emissions. Figure 2.4 sets out the projected average annual emissions from individual sectors over the 2008 – 2012 period, including the contribution of sinks during the 2008-2012 period, which is calculated to reduce emissions by an average of 2 Mt CO_2e per annum.

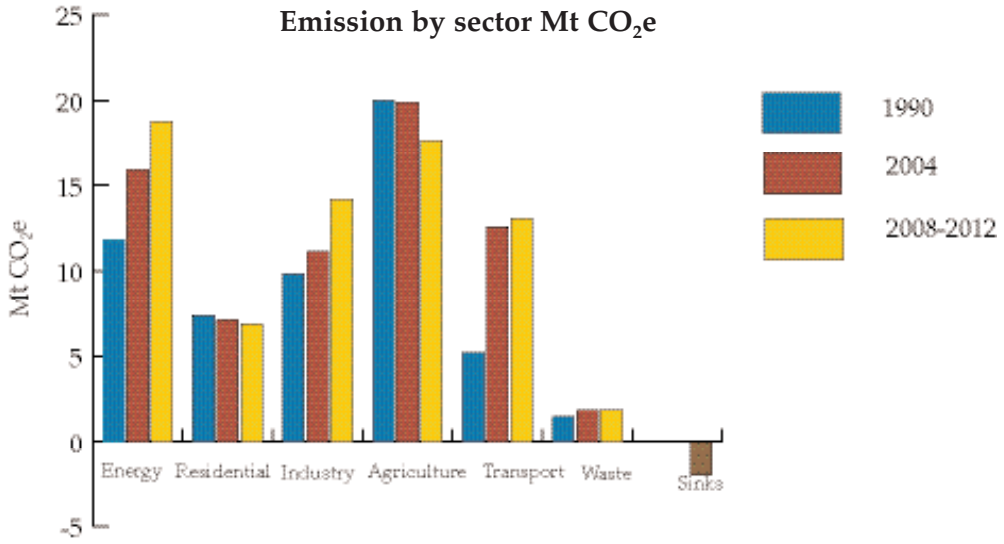

Figure 2.4: Total greenhouse gas emissions by sector 1990, 2004, 2008-2012

2.3 Greenhouse gas emissions and economic growth

Ireland is amongst the most successful EU Member States in achieving a decoupling of emissions growth from economic growth since 1990. In 2004, emissions per unit of GDP were 48% of their level in 1990.[11]

[11] This measures tonnes of greenhouse gas emissions, as reported by the EPA, per million €Euro of domestic output (GDP). Emissions values are those for 2003 as the latest available year. For the EU, 1991 is taken as the base year, due to the lack of GDP figure for the former East Germany in 1990.

Despite Ireland's success in decoupling greenhouse gas emissions from economic growth, Ireland's per capita emissions remain significantly higher than other EU Member States: in 2004 emissions per capita were 17 tonnes in comparison to an EU-15 average of 11 tonnes. This can be attributed, inter alia, to Ireland's high reliance on fossil fuels for power generation, the size and nature of the agriculture sector, very high per capita cement production and a relatively high level of international fuel bunkering[12]. Figure 2.5 illustrates the decoupling of Ireland's greenhouse gas emissions growth with its economic growth since 1990.

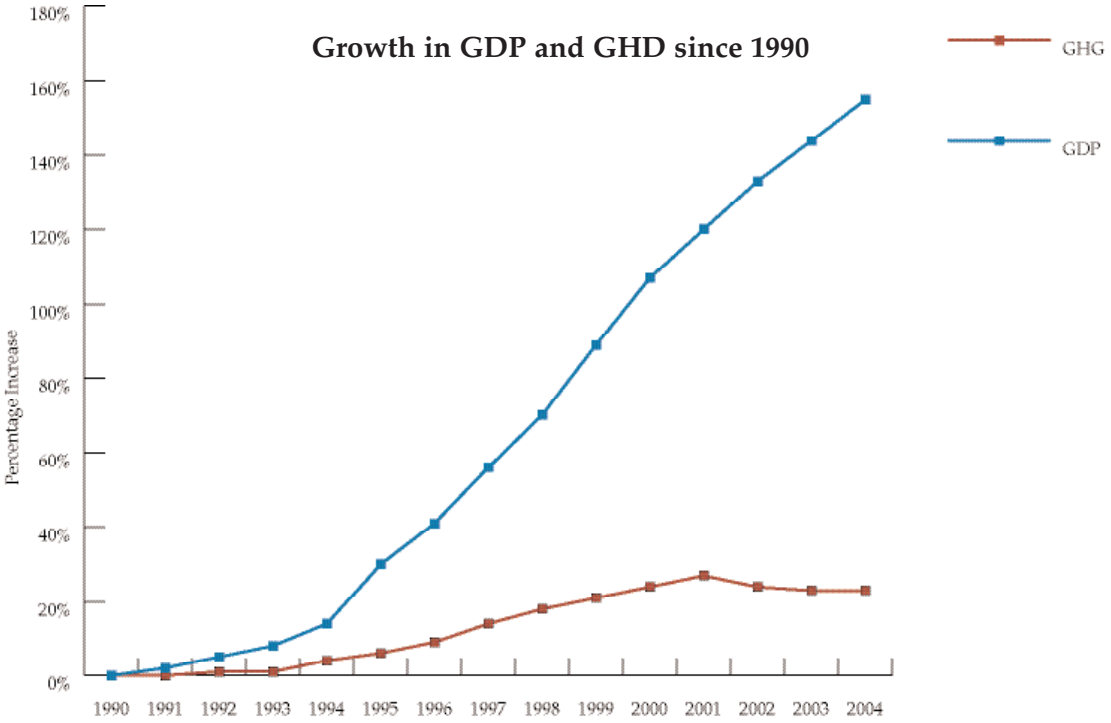

Figure 2.5: Relationship between economic growth and CO_2 emissions

2.4 Meeting our Kyoto Commitments

The Government has decided on the proportion of Ireland's distance to target for the 2008-2012 period that will be borne by the sectors of the economy covered by the EU Emissions Trading Scheme. The emissions trading sector in total will address a minimum 3.02 million tonnes per annum of the national distance to target, through a combination of internal emissions reductions, or the purchase of allowances directly through the EU Scheme or through the Kyoto Protocol flexible mechanisms.

12 Fuel that is bought by private motorists and hauliers in the State but consumed elsewhere, predominantly in Northern Ireland and Britain.

The remainder of the national distance to target will be met through a combination of additional measures elsewhere in the economy, in addition to availing of the Kyoto Protocol flexible mechanisms by the State. Table 2.1 below illustrates this apportionment.

Table 2.1: Approach to meeting Ireland's Kyoto Protocol target

Million tonnes per annum	Emissions Trading Sector	Rest of economy	TOTAL
Average annual emissions 2008-2012 without any action	25.658	44.548	70.206
Share of reduction	3.02	4.154	7.174
Target	22.638	40.394	63.032

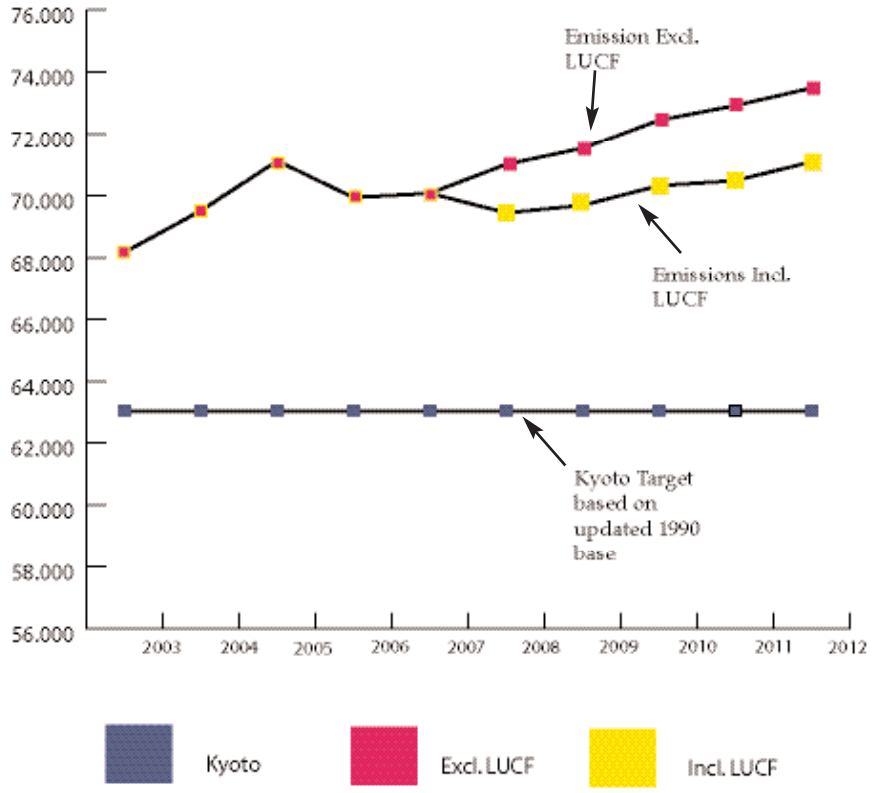

Figure 2.6 'With Measures' Scenario - GHG Emissions Projections 2002-2012

3.1 Energy Sector

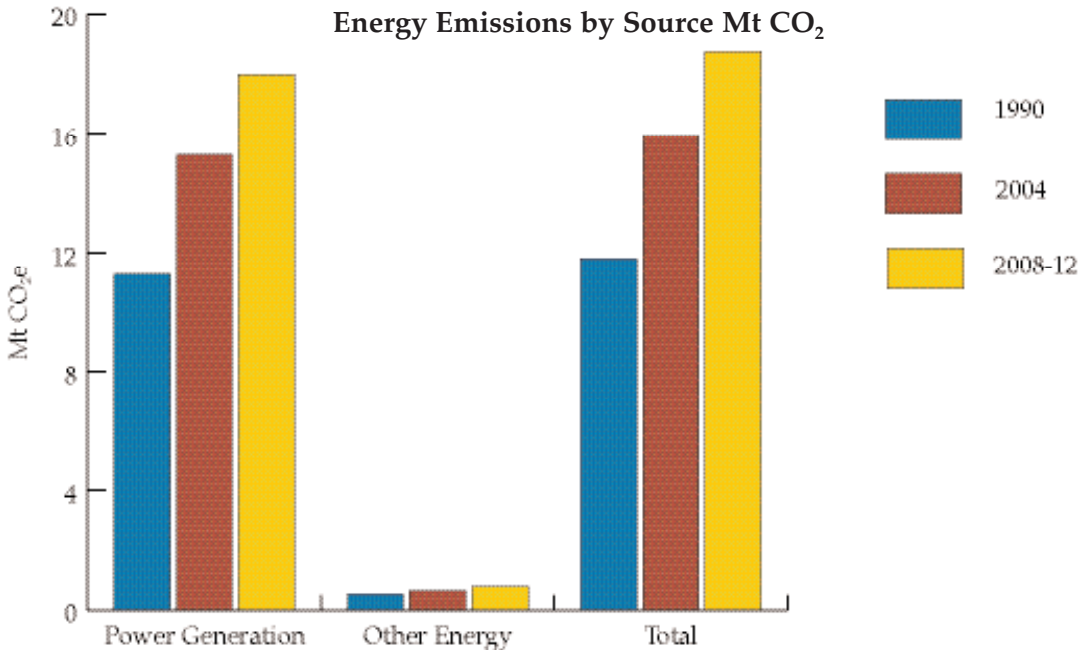

Figure 3.1: Energy Emissions by Source Mt CO_2e

3.1.1 Trends and Projections

Emissions from this sector arise from electricity generation, oil refining, gas production and distribution[13] and solid fuel production. Of these, electricity generation accounted for 96% of total emissions from the sector in 2004, with CO_2 from power generation making up 93% of total energy sector emissions. Electricity demand and therefore emissions have risen rapidly in line with economic growth since 1990, with total emissions for the energy sector increasing by 35% between 1990 and 2004. Based on latest available projections, greenhouse gas emissions from the sector are forecast to increase from 11.81 Mt CO_2e in 1990 to an average of 18.75Mt CO_2e during the period 2008 – 2012. While these projections include all adopted and implemented policies, including national targets for the contribution of renewables to electricity supply, the effect of the Emissions Trading Scheme is not included in these projections.

3.1.2 CO_2 intensity of Electricity

Despite the increased electricity demand over the period since 1990, in recent years

[13] This does not include emissions from gas transmission, a high-pressure network in which fuel is combusted. Emissions from this activity are included in transport emissions. Emissions from gas distribution relate to losses due to leakage of methane from pipes.

there has been a degree of decoupling between electricity production and emissions growth, due to the increased contribution of high efficiency electricity generation such as natural gas powered plants and of renewables to electricity generation. The downward trend in the CO_2 intensity continued in 2004 arising from the closure of the older, less efficient, Shannonbridge and Lanesboro peat-fired power plants and the increased contribution of wind to electricity generation. A 22% increase in the renewables contribution to electricity generation in 2004, which brought its overall share to 5.2%, was primarily due to the new connections of wind farms to the national grid. The carbon intensity of electricity has therefore fallen (particularly since 1994) from 925g CO_2/kWh in 1990 to 624g CO_2/kWh in 2004, reflecting the increase in the efficiency of electricity supply. This is illustrated in Figure 3.2 below.

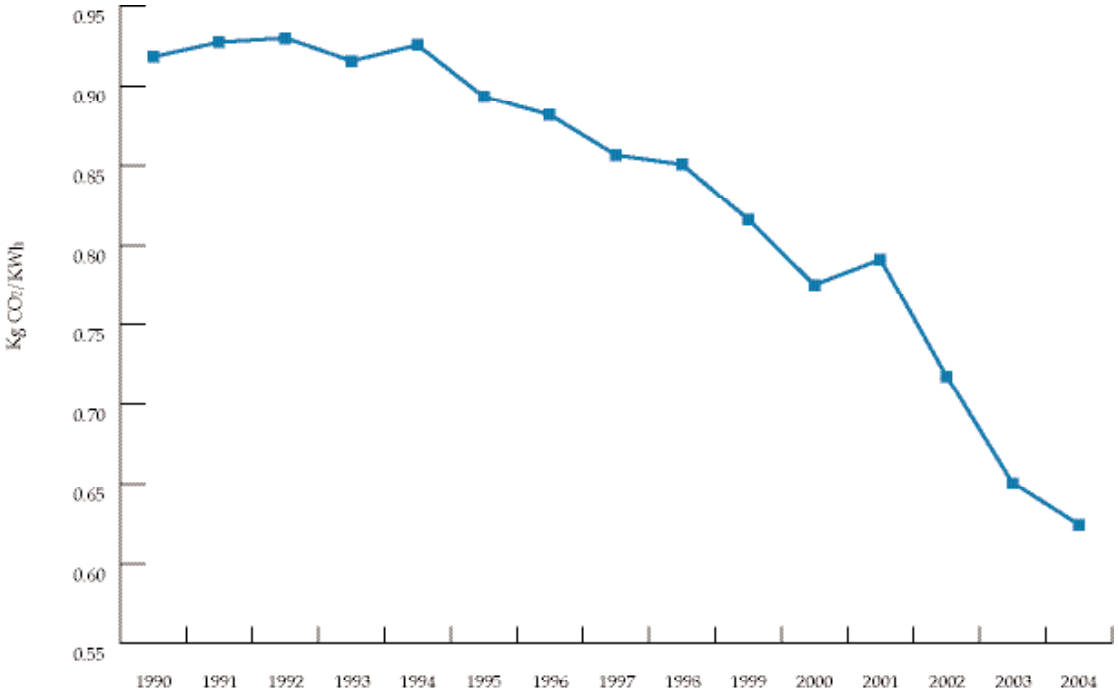

Figure 3.2 - CO_2 intensity of electricity

3.1.3 Current Energy Policy Context

The Government has published a Green Paper on energy policy[14], which sets out a policy framework for the long-term development of the energy sector in Ireland, including the development of an all-island energy market, having regard to an overarching requirement to, inter alia, maintain security of electricity supply in the context of Ireland's continually rising demand for energy.

14 *Towards a Sustainable Energy Future for Ireland*, Department of Communications, Marine and Natural Resources www.dcmnr.gov.ie/Energy/Energy+Planning+Division/Energy+Green+Paper.htm

Projections by Sustainable Energy Ireland show Ireland's total energy needs[15] growing by an estimated 38% between now and 2020, and total electricity generation growing by 27.5%. Ireland's high dependency on fossil fuel imports, particularly oil and natural gas, is expected to continue with oil and natural gas contributing almost 87% to total energy supply in 2020 and gas contributing 71% to fuel used in electricity generation by 2020. The contribution of more CO_2-intensive fuels such as peat and coal to Ireland's total energy requirements is expected to decline to just under 7% by 2020.

A key component of Ireland's energy policy in the years ahead will therefore be the need to place increasing emphasis on the measures to further encourage energy consumption using renewable sources and less CO_2-intensive fuels. Equally, it will be important to strengthen energy efficiency measures in order to reduce overall energy consumption and to ensure that Ireland's demand for electricity does not exceed the available generation capacity. These issues are also being informed by wider international developments in energy policy including the recent publication of EU green papers on energy efficiency[16] and on a European strategy for sustainable, competitive and secure energy[17].

The European Commission's green paper on energy efficiency, Doing More With Less, concludes that the EU as a whole could save 20% of energy consumption by 2020 resulting in savings estimated at €60 billion. Half of the savings identified in the green paper could be reached by full implementation of already adopted legislation on energy efficiency in buildings, domestic appliances and energy services. The green paper points out that the capital and running costs of energy efficiency measures to save 1 megawatt of electricity are many times cheaper than those of generating an additional megawatt of power and notes that higher employment from efficiency measures and ongoing savings will boost the economies of Member States. The Government is actively engaged in discussions at EU level to examine how best to take forward the proposals set out in the Green Paper and is preparing a major national energy efficiency campaign, which will aim, through changing energy consumption behaviours, to reduce waste, use more energy-efficient equipment and processes, and use energy more wisely.

15 This includes energy for electricity generation and energy requirements across all other sectors of the economy. Source: *Energy in Ireland 1990 – 2004* SEI, January 2006

16 Green Paper on Energy Efficiency or Doing More With Less, European Commission, 2005. COM (2005)265.

17 A European Strategy for Sustainable, Competitive and Secure Energy, European Commission, 2006. COM(2006)105.

3.1.4 Policies & Measures

3.1.4.1 Fuel switching

This includes a broad set of measures aimed at using less carbon intensive fuels throughout the economy including power generation, such as substituting for coal, peat and oil; expansion of combined heat and power and renewables; and expansion of the gas supply network. Emissions from the energy sector are influenced by the Government's policy of ensuring fuel security in electricity generation through fuel diversity. This has led the Government to decide to continue coal-fired electricity generation at Moneypoint and to approve the commissioning of three new peat-fired power plants supported by a Public Service Obligation (PSO) levy.

The replacement of the last of the remaining older peat-fired power stations with three new peat power stations by December 2005 provided about 350Mw of generating capacity. While peat burning contributes about 10% of greenhouse gas emissions arising from electricity generation, the existence of new plant means that peat is currently being burned in the most efficient way possible.

3.1.4.2 Emissions Trading Scheme

All fossil fuel based electricity generation plants in Ireland are included in the EU Emissions Trading Scheme. The operation of the scheme is described in more detail in Chapter 1. When the industry sectors covered by the scheme are included, it will address approximately 3Mt CO_2 of Ireland's overall distance to its target for the purposes of the Kyoto Protocol during the 2008-2012 period. The Scheme provides flexibility to firms in meeting the caps placed on individual installations. If internal emission reductions are not cost-effective, firms may meet their obligations through the purchase of allowances that become available due to reduced emissions by other firms in the Scheme or allowances arising from the Kyoto Protocol's project-based mechanisms.

3.1.4.3 Gas production and distribution

The gas transmission network has continued to expand in Ireland with the completion of the Dublin-Galway-Limerick ring-main pipeline and a second interconnector with the United Kingdom. The pipeline from Belfast to Derry, serving the Coolkeeragh power plant and five towns along the route has also been completed. The Dublin-Belfast pipeline, which will also serve five towns in Northern Ireland en route, is under construction and will be completed in October 2006. The Mayo-Galway pipeline from the Bellinaboy Corrib Gas terminal in North Mayo to the gas network at Galway, is expected to be completed in late 2006.

Approximately 90% of the Bord Gáis Éireann distribution network comprises new polyethylene pipe. The network now extends to 9,316 kilometres, compared with the 3,000 kilometres when BGÉ took over from the former town gas companies.

Fugitive emissions from the network are expected to fall despite continued expansion of the network, due to the replacement of older cast-iron piping on the network. Total fugitive emissions are projected to be 0.046Mt of CO_2e by 2009 compared with 0.103 Mt in 2001.

The commencement of production in the Corrib gas field will increase the level of indigenous gas supplies, making a positive contribution to Ireland's security of supply. Emissions of 0.04 Mt CO_2e per annum in the period 2008-2012 are attributable to production at Corrib.

3.1.4.4 Renewable Energy

Ireland is required to ensure that 13.2% of gross national electricity consumption comes from renewable sources by 2010[18]. Achieving this target will play an important role in Ireland's pathway to Kyoto compliance, although this contribution must be viewed in the context of continued growth in the overall demand for electricity over the Kyoto commitment period. When achieved, the target will represent about 1450Mw of installed capacity, of which 846Mw is currently in place, including 574 Mw of wind capacity, and a further 630Mw with grid connection agreements. The Government's recent decision to move to a new Renewable Energy Feed in Tariff (REFIT), which replaces the previous competitive tendering programme, will help to stimulate further development of the renewables market, not just for wind energy, but for a range of other technologies, including biomass and biomass-powered CHP. This new support structure complements initiatives such as the new grid code connection conditions and enhanced technical grid control to accommodate the increased number of wind-generated electricity suppliers on the system. This support structure is also complemented, for wind energy, by the publication of Wind Energy Development Guidelines in June 2006. The Guidelines provide a context within which planning authorities may consider the development of wind energy projects through the development plan process on a consistent basis throughout the country. Building on Ireland's existing EU target, the Government recently signalled its intention to set a new national target of 15% by 2010 and to build upon this with more ambitious targets for 2020.

The development of an all-island electricity market will result in increased interconnection between the two jurisdictions, which will provide a stronger, larger grid to accommodate renewable energy development. As part of the development of an all-island electricity market, the relevant Ministers jointly published a 2020 Vision for Renewable Energy consultation paper in 2005 to inform the development an all-island renewable energy market. Separately, an all-island Grid Study is examining

18 Directive 2001/77/EC

the system and economic effects of renewable electricity levels between 15% and 30% on an all island basis for 2020.

Wave / ocean energy

The Government has recently launched an Ocean Energy Development Strategy, to be led by Sustainable Energy Ireland and the Marine Institute, to promote the development of an ocean energy strategy in Ireland, including support for initial research and development through to full commercial application. The first phase of the strategy has already seen the deployment of a scale model testing device at a test site at An Spidéil, County Galway. The ocean energy resource available to Ireland indicates a potential to supply 100% and 6% of the forecasted all-Ireland electricity demand from wave and tidal energy sources respectively. While it is not yet known how much of this could be exploited economically, it is estimated that some 84 Mw of installed capacity could exist by 2020, displacing some 90,000 tonnes of CO_2[19].

Co-firing in power generation

Co-firing at power stations has the potential to reduce CO_2 emissions from fossil fuel generation. Alternative fuels, such as biomass or meat and bone meal, result in less CO_2 emissions and, unlike fossil fuels, are renewable energy resources. It has been estimated that co-firing the three peat-burning stations with 24% wood biomass could reduce emissions by up to 500,000 tonnes per annum. A technical feasibility trial conducted in 2003 successfully burned wood biomass with peat at concentrations up to 32%, with no negative impact on boiler efficiency. As well as reduced CO_2 emissions, co-firing with biomass would also have a positive environmental impact in reducing emissions of the air pollutants sulphur dioxide (SOx) and nitrogen oxides (NOx).

3.1.4.5 Combined Heat and Power

There is currently 282Mw of installed Combined Heat and Power (CHP) capacity in Ireland. As a proportion of national electricity consumption, Ireland has one of the lowest rates of CHP deployment in the EU. In the absence of additional support to assist CHP penetration, capacity would be expected to continue to grow slowly and perhaps even contract, due to a range of factors including unfavourable fuel prices, high connection charges and investment uncertainty. Recognising this problem, the Government recently announced an €11 million scheme to promote the deployment of CHP in the industrial, commercial and public services sector, including CHP from both fossil-fuel and sources such as biomass. The programme will provide capital grant support for the installation of CHP units and metering technologies, and is designed to encourage fossil fuel-fed CHP up to 1 Mw in size and any size biomass fed CHP. It is intended that this scheme will be the primary instrument for promoting

19 *Ocean Energy in Ireland*, Department of Communications, Marine and Natural Resources, 2005.

the development of CHP. Separate initiatives to promote more widespread deployment of CHP include an examination by the Commission for Energy Regulation of potential physical and regulatory barriers to becoming a CHP generator and work by SEI on a substantial information campaign on the benefits of CHP.

3.1.5 Improving energy efficiency

3.1.5.1 Efficiency of electricity supply

The efficiency of electricity supply is a measure of the amount of fuel inputs required to provide a unit of electricity for final consumption. In Ireland, electricity supply efficiency is at 41% (2004), meaning that 59% of the potential energy contribution from fuel input at the generation stage is lost. While a small proportion of this is as a result of the generating plants' own use, the majority of the energy potential is lost through transmission losses and electricity transformation. There has been a sharp increase in electricity generation efficiency since 2001, with a rise from 35% to 41% due to the replacement of older generating plant with more-efficient gas and peat plants, and the increasing contribution of renewables to electricity generation. Further efficiencies can be expected in the future as additional high efficiency gas-fired power plants comes on line and continue to displace less efficient generating capacity. Three new plants in total are either planned or in construction since the 2004 generation efficiency figures were published. While some of this new capacity will meet forecasted increased demand for electricity, it will contribute greater overall efficiency in electricity generation.

3.1.5.2 Transmission and distribution losses

The remainder of losses in energy potential arising from electricity generation result from transmission and distribution losses. Transmission losses are incurred on the transmission system as electricity is transported from generators across the electricity grid. The cost of transmission losses acts as an incentive for generators to locate where losses are low; transmission losses are paid for by the generators, based on estimated losses and on their location on the grid. This system therefore benefits distributed generation such as windfarms, which are located nearer to the electricity end user.

Due to the intermittent nature of wind power, however, there will continue to be a need to have power available to travel on the transmission lines into those areas when the wind is not blowing consistently so there is still a need for high voltage power lines, which enable large quantities of energy to be transported in bulk while minimising losses. In order to actively manage the level of losses on the transmission system, the Transmission System Operator has a preference for 220 kv lines and

operates the power system within all international standards. Where possible, the system utilises voltages at the upper band of those standards. Losses as a percentage of electricity distributed are forecast to reduce from current levels due to the planned changeover of rural medium voltage networks to 20kV operation, which will increase from just over 20% of the medium voltage network at present to around 70% by 2010. This is projected to result in savings of 132 GWh at the generation stage.

3.1.5.3 Demand Side Management

The establishment of Sustainable Energy Ireland (SEI) in 2002 means there is now a dedicated body to promote and assist environmentally and economically sustainable production, supply and use of energy across all sectors of the economy. SEI programmes include the Large Industry Energy Network (LIEN), a voluntary networking initiative of 85 of the largest commercial energy users in Ireland; the Energy Agreements Programme, which assists companies achieve certification to the Irish Standard on Energy Management; and the Public Sector Investment Programme.

3.1.5.4 Promotion of efficient energy use by energy suppliers

The recently-adopted EU Directive[20] on energy efficiency in end-use and energy services requires energy suppliers to offer electricity and other energy supplies to end-use consumers as part of a comprehensive package of energy services. The Directive includes targets to improve energy efficiency by 1% per annum from 2008. Measures covered by the directive include management of customer demand for electricity for inter alia, appliances and space and water heating, and promotion of lower consumption at peak times. With appropriate pricing, the Directive proposes that electricity consumers would be encouraged to reduce their energy consumption over time and the energy suppliers would also be incentivised to promote reduced energy consumption among their customers through competition between energy suppliers. Such a framework may also be extended through a system of tradable 'white certificates' issued for a given quantity of energy saved.

3.1.5.5 Electricity Supply Board (ESB) Customer Supply Energy Efficiency Programmes

ESB Customer Supply has been directly engaged in promoting the benefits of greater energy efficiency to its customer since 1991. It is estimated that between 1991 and 2005, the cumulative saving in direct costs to business, industry and residential customers (lifetime savings) has been in the region of 6,300 GWh. The Winter Peak

20 Directive 2006/32/EC

Demand Reduction Scheme (WPDRS) was introduced from Winter 2003/04 as an incentive to business customers to reduce electricity consumption during the power system's peak hours (5pm - 7pm) in winter months (November - February). The Scheme provides incentives for customers to reduce their electricity consumption and to establish stable patterns of energy consumption. The level of incentive increases with the amount of energy saved.

3.1.5.6 Regulation Targets

As part of the energy industry restructuring, the Commission for Energy Regulation sets measurable targets for ESB Customer Supply to achieve energy efficiency gains in end-use of electricity. These targets are agreed between ESB Customer Supply and CER at the beginning of each year and the performance against target is reported to CER at the end of each year. Residential targets are achieved through specific energy efficiency promotions, including promotional support for energy efficient products, targeted direct marketing and dedicated inserts with ESB Customer supply bills. Separate business targets are also agreed annually. In addition to the mechanisms geared towards residential customers, these targets are achieved through, inter alia, the provision of a range of energy management services for business customers.

3.1.5.7 Intelligent Energy Europe programme

The EU Intelligent Energy Europe (IEE) Programme is aimed at tackling mainly non-technological barriers to the market uptake of energy efficiency, renewable energy and more sustainable transport measures. It covers 3 thematic areas: energy efficiency (SAVE); renewable energy sources (ALTENER); and energy aspects of transport (STEER). Irish projects have received part funding for projects in all three fields, in partnership with organisations in other eligible Member States. Among the organisations which have recently received support is the Tipperary Energy Agency,[21] for its projects to develop a standardised energy check for use by Small to Medium size Enterprises (SMEs) for quick identification of potential savings in energy use, and to develop a framework for encouraging the growth of markets for bio-fuels as a low carbon fuel for local authorities and other public sector transport fleets across the EU.

21 http://www.tea.ie

3.2 Transport Sector

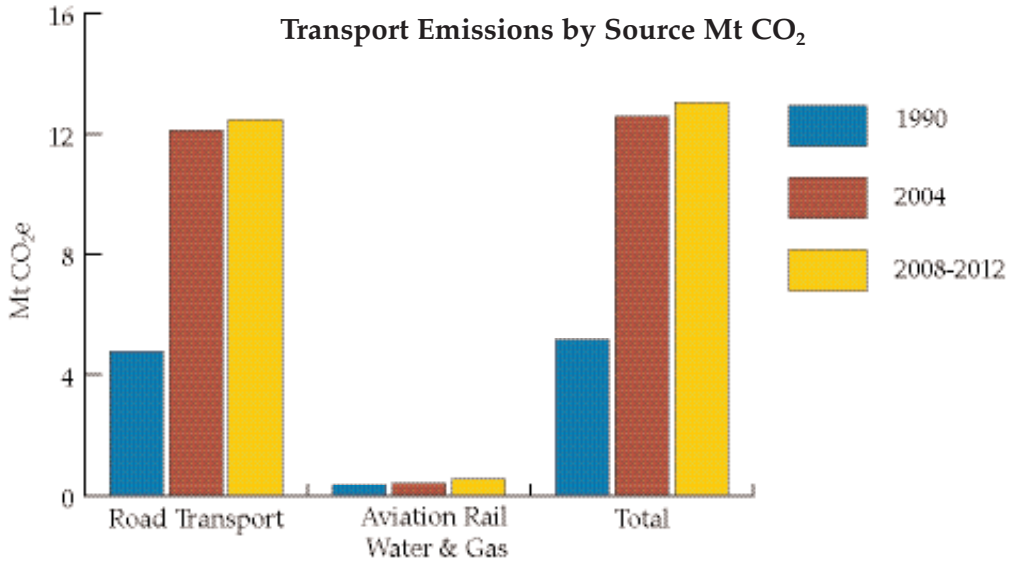

Figure 3.3 - Transport Emissions by Source Mt CO_2e

3.2.1 Trends and Projections

The National Climate Change Strategy (2000) envisaged that greenhouse gas emissions in the transport sector would increase further both in absolute terms and as a proportion of total greenhouse gas emissions. Since 1990, the transport sector has been the fastest growing contributor to national greenhouse gas emission levels, with a growth rate of over 144% between 1990 and 2004. Transport is the third largest contributor to national greenhouse gas emissions, accounting for 18.4% of the total in 2004.

Road transport contributes the vast majority of emissions from the transport sector in Ireland, accounting for 96% of the 12.58 Mt of CO_2e released in 2004. Smaller quantities of emissions arise from rail, domestic marine, domestic civil aviation and natural gas transmission.

The growth in transport emissions has primarily been caused by increased fuel consumption in the road transport sector. This can be attributed to a number of inter-linking factors associated with Ireland's significant economic growth in recent years, including growing population, increased demand for housing leading to urban sprawl, increased commuting, larger air passenger numbers through our airports and increased freight movements. More people are travelling more often, and there are more vehicles on our roads. People are buying larger private vehicles as disposable income increases, which is offsetting technological fuel efficiency improvements.

Emissions in 2004 increased by 6.1% on the previous year, reflecting continuing growth in road traffic. The number of vehicles on our roads grew by 21% between 2000 and 2004 alone. The number of private cars increased by almost 20% in that period, with the number of goods vehicles increasing by over 30%. This upward trend in the national vehicle fleet, which is related to the link between transport demand and economic growth, is expected to continue: Irish car ownership levels, at 397 per 1000 population in 2004, are well below the EU-15 average of 488 cars per 1000 (in 2001). Without any further measures to tackle emissions from transport, emissions are projected to continue to increase to an annual average of 13.03 Mt in the period 2008 – 2012.[22]

The growth in emissions from the transport sector has been inflated by fuel bunkering, i.e. where fuel is bought by private motorists and hauliers withing the State but consumed elsewhere, mostly in Northern Ireland and Britain. International reporting guidelines require that emissions be reported on the basis of domestic sales rather than domestic consumption. The Department of Environment, Heritage and Local Government estimates that in 2004 10% of petrol and 25% of diesel sold was consumed outside the State, equating to 2.2 Mt CO_2e of emissions. On this basis it is estimated that emissions from domestic consumption in road transport increased from 5.2 Mt CO_2e to 10.0 Mt CO_2e between 1990 and 2004, an increase of 92%.

3.2.2 Policies and Measures

The National Climate Change Strategy (2000) divided measures for the transport sector into three broad categories. These are :

- measures to improve the fuel efficiency of the fleet of private and commercial vehicles in Ireland, including the increased penetration of low carbon technologies;
- measures to influence behaviour to promote modal shift from private to public transport; and
- measures to maximise the efficiency of the existing and future transport network in Ireland.

3.2.2.1 Fuel Efficiency Measures

Technological Improvements

Improving the fuel efficiency of the passenger vehicle fleet is a key part of reducing emissions from the transport sector since private cars will remain an important

[22] Current projections do not include expected decrease in greenhouse gas emissions arising from the implementation of Transport 21 during the period covered by the Kyoto Protocol and in future years.

means of personal mobility, particularly in rural and isolated areas. Technological advances within the automotive industry will be critically important in bringing more fuel efficient, novel and clean technologies to market. However, in the absence of an indigenous automotive industry, Ireland is a technology taker and has little ability to influence the development of cleaner vehicle technology on its own. Nevertheless, the Government recognises the key role of innovative technologies (such as alternative fuels and more fuel efficient engines) in reducing tail-pipe CO_2 and air pollutant emissions over the long term. In particular, the Government supports the EU Voluntary Agreement between car manufacturers and the European Commission as a cost-effective and efficient means of increasing the fuel efficiency of passenger cars.

The EU strategy to reduce CO_2 emissions from passenger cars includes a commitment to reach - by 2010 at the latest - an average CO_2 emission figure of 120 g/km for all new passenger cars marketed in the Community. The EU is pursuing this target through, inter alia, voluntary agreements with car manufacturers; voluntary agreements were negotiated between the EU Commission and the European, Japanese and Korean car manufacturers to reduce CO_2 emissions to 140g/km by 2008-2009. The difference between the 140g/km target and the EU target of 120g/km is to be achieved by two other measures; the 1999 legislation on fuel economy labelling and fiscal measures. Major additional efforts are required to deliver the target of reducing CO_2 emissions to 140g/km by 2008–2009, to which the industry has committed itself.

Between 1995 and 2003, CO_2 emissions from new passenger vehicles are reported to have been reduced by on average of 12%[23]. However, the contribution of technological improvements to reducing emissions from transport in Ireland has been lost due to a purchasing trend toward vehicles with larger engine sizes.

3.2.2.2 Fuel Economy Labelling

Since 2001, fuel economy and CO_2 information for new cars must be displayed in car salesrooms. This requirement enables consumers to make purchasing decisions informed by these particular environmental indicators. The Society of the Irish Motor Industry now publishes a *Guide to Passenger Vehicles' Fuel Economy and CO_2 emissions*[24], which contains fuel economy and CO_2 emissions information for all vehicles on sale in Ireland.

3.2.2.3 Alternative fuels

Alternative fuels such as biofuels offer the potential to reduce the environmental impact of the transport sector. In April 2005, the Government announced a scheme

23 *Implementing the Community Strategy to Reduce CO_2 Emissions from Cars: Fifth annual Communication on the effectiveness of the strategy*. 2005.

24 http://www.simi.ie/admin/files/SIMIemissionguide2004.pdf

for the provision of excise relief on biofuels. This was extended following an announcement in the 2006 Budget to a five year (2006 – 2010) biofuels excise relief package worth in excess of €200m. It is expected that the extended programme will result in Ireland achieving 2% market penetration of biofuels by 2008 and will bring about a reduction of over 0.25 Mt of CO_2e annually. To complement this scheme, Transport 21 provides funding for pilot projects to make cleaner, more environmentally-friendly vehicles available, embracing public transport, the haulage industry and taxis. These initiatives include pilot projects for biofuels and hybrid-electric technologies. These pilot projects will be used to guide future policy development, particularly in relation to public transport investment.

3.2.2.4 Vehicle Registration Tax and Annual Motor Tax

Both Vehicle Registration Tax (VRT) and annual motor taxation for private vehicles are based on engine size, which is related to fuel consumption and CO_2 emissions. The National Climate Change Strategy proposed rebalancing VRT and motor tax so that they are more closely aligned to actual tailpipe CO_2 emissions. A 50% relief in VRT for hybrid-electric cars was introduced in 2001. This was augmented in Budget 2006 with an extension of this relief to flexible fuel vehicles for a two-year period from January 2006. Motor tax does not currently distinguish between technologies that provide greater CO_2 efficiency for a given engine size. The Government is currently assessing the feasibility of rebalancing VRT even further and also motor tax in line with CO_2 emissions as a means of addressing emissions from the transport sector.

3.2.2.5 National Car Test (NCT)

Car testing was introduced in Ireland in 2000 to improve road safety and environmental protection and to comply with EU legislation making car testing compulsory in all EU member states. The National Car Test (NCT) is conducted every two years on vehicles. This regular evaluation of cars is, inter alia, ensuring that vehicles are maintained and operated as fuel efficiently as possible. The number of cars to undergo a full NCT test has increased from 274,355 cars in 2000 to 624,619 cars in 2005. The nationwide first-time pass rate for full tests has averaged around 52%.

3.2.2.6 Fuel efficiency measures in public transport

Incorporating sustainability considerations into the day-to-day operations of Coras Iompar Éireann (CIÉ), the National Public Transport Agency, and its companies is important in terms of improving performance and efficiency. The need to report on sustainability issues, and, in particular, on progress in testing the feasibility of alternative fuels such as biofuels, has been agreed between CIÉ and the Department of Transport.

A significant proportion of both the Dublin Bus and Bus Éireann fleets have been replaced in recent years as part of the public transport investment programme. This has delivered significant fuel efficiency gains by introducing newer and more fuel-efficient vehicles into the fleets.

Dublin Bus and Bus Éireann continuously review the use of alternative low-carbon fuels. Dublin Bus trialed the use of Liquid Petroleum Gas (LPG) and Compressed Natural Gas (CNG) fuelled buses in 1998 – 1999. It was concluded that it would not be commercially viable, because of the pricing structures and maintenance costs at the time, to proceed with these fuel options. However, both companies are currently piloting the use of biofuels in a number of buses in Dublin and Cork. The need to achieve reductions in greenhouse gas emissions and the increasing cost of fuel has led to a review by both companies of cleaner fuel alternatives. These pilot initiatives will complement the Transport 21 projects that aim to test the feasibility of a range of biofuels, hybrid-electric vehicles and eco-driving.

3.2.3 Modal Shift

3.2.3.1 Investment in and use of public transport

Significant investment in public transport under the National Development Plan (NDP) has already been made since the National Climate Change Strategy (2000) was published. This includes substantial investment in upgrading the public transport system and particularly in increasing the capacity of urban public transport. There has also been significant investment in improved traffic management, particularly bus priority measures. The current transport investment programme under the NDP, which is due to expire at the end of 2006, will be augmented by Transport 21, which provides for total capital funding of over €34 billion over the next ten years and represents a major rebalancing of investment in favour of public transport (about €16 billion of the total funding). This record level of investment in public transport will provide choice and an alternative to the private car, particularly in the major urban areas, thereby encouraging a modal shift from the private car to less polluting and less energy-intensive forms of transport such as public transport.

Modelling of the impacts of Transport 21[25] in the Greater Dublin Area shows a reduction of almost 20% in fuel consumption and CO_2 emissions during rush-hour in 2016 compared to business as usual. This will be as a result of modal shift from

[25] A modelling study of the potential impacts of Transport 21 in the Greater Dublin Area during rush hour in 2016 was carried out by the Dublin Transportation Office in July 2005. The modelled scenario considers the full investment plan in place in the Greater Dublin Area without any additional tolls or road charging.

private cars to public transport and includes the contribution of associated demand management measures. The saving equates to CO_2 savings of around 0.016Mt per year from 2016.

3.2.3.2 Light Rail, DART and Suburban Rail

The two Luas light rail lines began operation in 2004. Luas carried over 22 million passengers in its full first year of operation. A survey of Luas users, carried out by the Rail Procurement Agency (RPA) in 2005 indicates that 24% of those surveyed have switched from private modes of transport (e.g cars, motorcycles and taxis).

The number of passengers carried by Iarnród Éireann (i.e. DART, Dublin outer suburban, the Cork-Cobh line and mainline services) increased by approximately 19% between 2000 and 2005,

Over the period of investment in Transport 21, Ireland's public transport system will be transformed with a particular emphasis on developing an integrated network. Public transport capacity will almost double in the Greater Dublin Area with seven new Luas (light-rail) projects, DART (suburban rail) extensions, two Metro lines and a significant expansion of the bus network.

More frequent intercity rail services will be introduced under Transport 21 providing services every hour on the Dublin-Cork route, every hour at peak on the Dublin-Galway and Dublin-Limerick routes and improved services on all other routes. The Western Rail Corridor will be re-opened from Ennis to Claremorris, enabling rail travel between the cities of Galway and Limerick. In parallel, the Rural Transport Initiative will be made permanent following the completion of the pilot period in 2006. Funding will be increased on a phased basis, with initially a doubling of the cash provision in 2007 compared with 2005. The Department of Transport is engaging in a public consultation in 2006 as part of the process of developing rural transport policy for the period post-2006.

3.2.3.3 Bus Services

Sustained investment has also taken place in the road transport network which has benefited and improved bus services. The total number of passengers (excluding school journeys) carried by Bus Éireann increased by approximately 20% between 2000 and 2005. Similarly, Dublin Bus increased the number of passengers (excluding school journeys) carried by almost 8% between 2000 and 2005.

Transport 21 will see a doubling of bus priority measures in the Greater Dublin Area (GDA) with a 60% increase in bus capacity. Significant capital funding for the purchase of a large number of new buses in the GDA will be provided. The cities of

Cork, Galway, Limerick and Waterford will also benefit from funding for city bus services, a range of traffic management, bus priority and car restraint measures, including Green Routes / Quality Bus Corridors (QBCs), Park and Ride facilities, cycle paths and improved pedestrian facilities.

3.2.3.4 Roads Investment

It is well recognised that vehicles forced to travel at reduced speeds will be less fuel efficient than may be optimally possible. A high quality road network reduces inefficiencies such as bottlenecks and congestion, thereby delivering positive benefits in terms of improved journey times, reduced environmental impacts and more efficient energy use. The quality of the roads infrastructure will therefore play an important role in moderating CO_2 emissions from road transport.

Exchequer investment in national roads was €7.8 billion over the period 1997 – 2005, with over €1.4 billion invested in 2005. Since 2000, a total of 57 projects (354kms) have been completed. Work is currently in progress on 27 projects (300kms) with in excess of 50 projects (over 700kms) at various stages of planning.

The national road network will be significantly upgraded over the next 10 years under Transport 21, removing bottlenecks, reducing congestion and improving journey times. The five major interurban motorways (linking Dublin with Belfast, Cork, Galway, Limerick and Waterford) will be completed by 2010. The Atlantic Road Corridor from Letterkenny through Sligo, Galway, Limerick, Cork and Waterford will be developed, connecting the Gateway cities identified in the National Spatial Strategy. The rest of the national primary network will also be upgraded. National secondary routes, which are particularly important for regional development, will also be improved. This upgrading of the national road network will substantially reduce journey times while at the same time increasing reliability. This will play an important role in improving the efficiency of the transport sector.

3.2.3.5 Cycling facilities

Almost €30m has been spent on provision of cycling facilities in the Greater Dublin Area over the period 1994 – 2005, which has delivered 220km of cycle lanes. Despite this, the number of people cycling to work and school has continued to fall - although less so where there has been most investment. Under Transport 21, support will continue for the cycling network and improved pedestrian facilities in cities such as Dublin, Cork, Galway, Limerick and Waterford, as mentioned above. However, a more integrated approach will be required changing the focus from investment in infrastructure alone to the development of more widely based strategies to encourage and facilitate increased walking and cycling as healthy and environmentally friendly options.

3.2.3.6 Freight

Road freight accounts for the bulk of Irish freight transport. Analysis[26] of goods vehicles shows that 41% of vehicles are less than four years old. This is positive from an emissions viewpoint, as newer vehicles are more fuel-efficient and have reduced emission levels. The road haulage sector is pre-disposed to maintaining fuel-efficient operations, since fuel represents a significant cost for the sector. In addition, the new EU Driver Training Directive includes logistics and route planning modules for road hauliers, which will help to improve the efficiency of road freight operations and thereby reduce emissions.

Iarnród Éireann has held consultations with business interests in order to identify freight activities best suited to rail transport. The company has developed a business plan that includes the targeting of trainload traffic, increasing the existing profitable business but withdrawing from those businesses that are heavily loss-making. The company has made significant progress in growing the rail freight business in areas where it holds a competitive advantage over road haulage.

In relation to testing alternative fuels, Transport 21 provides funding for hauliers to pilot a range of biofuel blends and energy efficient driving styles as a means of addressing CO_2 emissions from road freight operations in Ireland.

3.2.3.7 Tax exemption for public transport commuting

The TaxSaver Commuter Ticket Scheme was initiated in 1999, and can be availed of by any employer or employee. Under the scheme, employers and employees may receive tax relief on the cost of annual bus, Luas or rail tickets. The incentive is a positive way to encourage more people to choose public transport for their journeys. In 2004 over 1300 companies (public and private sector) availed of the scheme offered by Dublin Bus, Iarnród Éireann and LUAS.

3.2.4 Demand Management

3.2.4.1 Relationship between transport and spatial policies

Demand-side measures, correctly targeted, seek to maximise the efficiency of the transport network by managing the demand for travel and influencing patterns of commuting behaviour. Demand management comprises a range of measures, including :

- land use policies that bring homes, workplaces and services closer together or facilitate better links with public transport, cycling or walking;
- soft measures to reduce car use including car sharing, flexible working and individual or workplace travel plans; and

26 *Bulletin of Vehicle and Driver Statistics,* DEHLG 2004

- fiscal measures to encourage sustainable travel behaviours and discourage unsustainable travel once the relevant infrastructural investment has taken place.

The Dublin Transportation Office (DTO) has been engaged in formulating policy recommendations in relation to demand management for the Greater Dublin Area (GDA)[27]. The recommendations on demand management are being designed to focus on policies that will help the Government and the local authorities in the GDA to respond to growing travel demand, in general, and to specific problems such as long distance commuting. In this regard, road pricing and congestion charging are options to be considered as elements in the possible range of policies for managing traffic demand.

3.2.4.2 National Spatial Strategy

The Department of Transport developed a set of Guiding Principles to guide and inform new transport policies and strategies, which include facilitating a closer integration between land-use planning and transport investment. The daily peak demand for passenger transport is inextricably linked to the places where people live and work. The choice of these places is in turn influenced, in part, by spatial, land use and planning policies

The Guiding Principles recognise that the National Spatial Strategy[28] to 2020 is a key backdrop to all transport plans and policies. The integration of spatial development and transport investment should support more sustainable travel patterns for individuals and business, including facilitating a modal shift to more sustainable forms of transport (e.g. public transport, cycling and walking) and delivering net benefits in terms of reduced environmental and health costs. The National Spatial Strategy notes that transport's role in supporting balanced regional development is to:

- build on Ireland's radial transport system of main roads and rail lines connecting Dublin to other regions, by developing an improved mesh or network of roads and public transport services;
- ensure, through building up the capacity and effectiveness of Ireland's public transport networks, that increases in energy demand and emissions of CO_2 and other air pollutants arising from the demand for movement are minimised;

27 Greater Dublin Area Travel Demand Management Study. Dublin Transportation Office. 2004.

28 The National Spatial Strategy. 2002 – 2020. People, Places and Potential. Department of the Environment, Heritage and Local Government.

- allow internal transport networks to enhance international access to all parts of the country, by facilitating effective interchange possibilities between the national transport network and international airports and sea ports;
- address congestion in major urban areas by increasing the use of public transport;
- address decisions on land use and development which must take account of the existing public transport networks or support the emergence of new or augmented networks.

The National Spatial Strategy will be given regional effect through the Regional Planning Guidelines and Local Authority Development Plans. It is estimated that a 2.5% reduction[29] in passenger kilometres travelled on implementation of the National Spatial Strategy will contribute to an annual saving of around 0.075 Mt of CO_2 emissions over the period 2008 – 2012. This reduction in emissions will arise because of shorter commuting distances and a shift to public transport, cycling and walking. Passenger journeys undertaken by public transport will also have associated CO_2 emissions. However, the distances travelled are anticipated to be shorter and emissions much less compared to private car travel.

3.2.4.3 Regional Planning Guidelines

The Regional Planning Guidelines, which will be implemented by local authorities, will be of benefit in aligning land-use planning and transport investment. The transport planning perspectives will continue to provide an input to reviews of the Guidelines and local authority development plans.

3.2.4.4 Cork Area Strategic Plan

The Cork Area Strategic Plan (CASP) provides an excellent example of successful land-use planning, with appropriate use of rail, bus and cycle solutions. The Department of Transport is committed in Transport 21 to the implementation of the CASP including investment in rail infrastructure and in bus priority Green Routes as envisaged in the CASP. The areas East and North of Cork city in the Cork Area Strategic Plan (CASP) provide good examples of successful land use and transport planning. Development adjoins to existing urban areas and to existing transport infrastructure - for example to rail lines where the particular strengths of rail can be exploited by operating from and to substantial catchment areas and on routes where rail has a competitive advantage over road transport.

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[29] Based on a study commissioned by the UK Department of Transport, Visioning and Backcasting for UK Transport Policy (VIBAT) 2006 which estimates a 2 – 10% reduction in passenger kilometres travelled as a result of a range of measures to make urban areas more attractive by using strategic and local urban design to reduce dependence on car travel.

The Cork Area Strategic Plan 2001 - 2020 states that "There will be a major growth corridor in the northern and eastern part of the Metropolitan area between Blarney and Middleton. This will help achieve greater social inclusion by improving access to public transport, jobs and services, amenities and a wider range of housing. The location for the development must be close to the existing rail system in order to avoid the traffic gridlock that would occur if a simple roll out of the City were to be adopted as a policy."

3.3 Built Environment and Residential

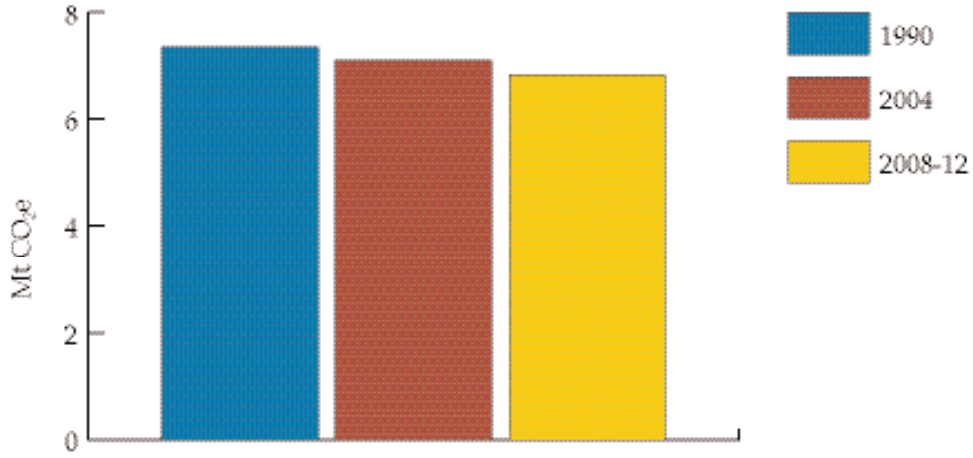


Figure 3.4 - Residential Emissions Mt CO_2e

3.3.1 Trends and Projections

This sector comprises both residential housing stock and all non-residential buildings in the commercial and services sectors, including in the public sector.[30] Recognising that a proportion of all energy consumed by the non-residential built environment relates to the provision of space and water heating and the use of appliances, policies and measures directed at the non-residential element of the built environment are considered in this section.

For the purposes of reporting greenhouse gas emissions, this sector only includes emissions arising from direct energy consumption in private dwellings for space and water heating. Greenhouse gas emissions arising from non-residential buildings, such as those in the commercial and public sector, are included in the Industry, Commercial and Services sector. Greenhouse gas emissions in the residential element of this sector comprised approximately 10% of total greenhouse gas emissions in 2004. Emissions arising from the production of electricity for use in the residential and other sectors, including electricity use for space and water heating, are attributed to the energy sector, while emissions from petrol and diesel use in private cars are attributed to the transport sector.

While energy consumption, excluding electricity use, rose by 23% between 1990 and 2004, mainly due to an increase of 44% in housing stock in the State from

30 The National Climate Change Strategy included total emissions from the commercial /services sub-sector with industry emissions

approximately 1.01 million units to approximately 1.44 million in 2004, direct emissions associated with non-electricity energy use fell by almost 4% from 7.355 Mt to 7.099 Mt during this period. Emissions from the average dwelling fell by 30% between 1990 and 2004.[31] This fall is a result of a significant shift away from solid fuel use towards less carbon-intensive fuels such as natural gas as well as the adoption of strengthened energy efficient standards for new buildings under the national building code.

This shift has been driven by a number of factors, including, inter alia, the availability of natural gas, the ban on the sale and marketing of bituminous coal in certain urban areas and higher income levels resulting in a higher emphasis on convenience over price.

Continued decreases in emissions are projected for the period 2008-2012, due to ongoing improvements in building efficiencies and continued fuel switching. Average annual emissions from the sector are projected to be 6.833 Mt CO_2e or 7% below the 1990 level, despite a forecasted increase in total household numbers to 1.74 million by 2012. By 2012 average emissions per household will have fallen to 55% of their 1990 level, or 3.86 tonnes per household.

Policies and Measures

3.3.2 Improved Spatial and Energy Use Planning

3.3.2.1 National Spatial Strategy

The National Spatial Strategy, published in 2002, aims to achieve a better balance of social, economic and physical development across Ireland. The Strategy provides a 20-year framework for planning at national, regional and local level. Balanced regional development requires that the full potential of each region to contribute to the overall performance of the State be developed on a sustainable economic, social and environmental basis. Good spatial planning has the potential to deliver beneficial environmental impacts in areas such as transport and a general holistic approach to continued spatial development. The National Spatial Strategy will therefore contribute to preparing Ireland for more stringent emission reduction requirements in the future, in particular through reducing the dependence on private car-based transport through more sustainable spatial planning.

31 Source: SEI, 'Energy In Ireland 1990 –2004.'

At national level substantial progress is being made in implementing the NSS, which is having an increasing influence on policies and programmes across a range of Government Departments and agencies. At regional level, a key policy bridge between national development priorities and local planning has been put in place with the adoption of Regional Planning Guidelines. These provide a strategic framework for local planning. At county and city level, strategic land use and planning frameworks for a number of Gateways are in place, with work well advanced on others.

The potential impact of the National Spatial Strategy in terms of achieving more balanced regional development has been underscored by the Government's decision in July 2005 that the regional dimension of the next National Development Plan, now in preparation, will be broadly based on the NSS. The priorities of the NSS and regional planning guidelines have also been recognised in the Government's 10-year investment plan for transport, Transport 21.

3.3.2.2 Development Plan Guidelines

Draft Guidelines for Planning Authorities on the preparation of County and City Development Plans were published for public consultation in April 2006. The Draft Guidelines emphasise the importance within such plans of creating a clear strategic framework for the proper planning and sustainable development of the relevant area consistent with the longer-term aims set out in the NSS and regional planning guidelines. It is intended to finalise the Guidelines in the Autumn.

The Planning and Development Act 2000 provides that a development plan may include objectives for promoting design in structures for the purposes of flexible and sustainable use, including conservation of energy and resources.

3.3.2.3 Residential Density Guidelines

Planning Guidelines on Residential Density were published in 1999. The guidelines are intended to assist planning authorities, An Bord Pleanála, developers and the general public by providing guidance on the benefits of higher residential density in appropriate locations and on the safeguards required in promoting greater residential density generally.

The Guidelines on Residential Density give effect to Government policy of encouraging more sustainable urban development through the avoidance of excessive suburbanisation and the promotion of higher residential densities in appropriate locations, especially in conjunction with improved public transport systems. The Guidelines set out in a detailed manner the locations appropriate for higher residential densities, the range of densities appropriate to various locations and the need to achieve a high quality of residential environment.

The Guidelines stress that firm emphasis must be placed by planning authorities on the importance of qualitative standards in relation to design and layout in order to ensure that the highest quality of residential environment is achieved. Planning authorities have generally reviewed and varied their Development Plans as necessary to give full effect to the recommendations and policies contained in the Guidelines.

The 1999 Residential Density Guidelines (published in 1999) will be reviewed and updated on the basis of experience to date with the existing guidelines, changed demographics and settlement patterns and forecasted changes. The updated guidleines will also reflect the need for building sustainable communities and the outcome of a research study on apartments size and space standards.

3.3.3 More Energy Efficient New Buildings

Amending Part L (Conservation and Fuel Energy) Building Regulations were made in 2002, providing for higher thermal performance and insulation standards for dwellings. Higher standards for new dwellings, envisaged in the NCCS to be implemented in two phases (2001 and 2005), were implemented in a single step with effect from 1 January 2003. The amending Part L Regulations 2002 also set higher thermal performance for replacement doors, windows and rooflights (roof windows) in existing houses with effect from 1 July 2003. These measures were estimated to reduce CO_2 emissions by 250,000 tonnes by the end of 2012.

Further amending Part L Regulations made at the end of 2005 to incorporate higher thermal performance/insulation standards for new non-domestic buildings (such as offices, shops, factories and leisure centres) will commence on or after 1 July 2006. This will lead to an additional 45,000 tonne reduction in CO_2 emissions per annum by the end of 2012.

It is estimated that both the 2002 and 2005 amendments to Part L of the Building Regulations will together give a total reduction of CO_2 emissions in excess of the projection in the original NCCS i.e. by more than 0.3Mt per annum by 2012. This is due to the increase in the annual volume of new house building- from less than 50,000 house completions in 2000 to more than 80,000 house completions at present.

Higher thermal performance/insulation standards under Part L have significant economic and social benefits, in addition to the environmental benefits set out above. For example, the higher standards for new dwellings operative from 1 January 2003 are estimated to reduce the energy requirements for domestic space and water heating by 23%-33%, depending on the size and type of dwelling. Such energy saving would be particularly beneficial for low-income families affected by fuel poverty. In the case of commercial buildings, the lifetime cost of operating and maintaining a

building is a multiple of the initial capital cost. Accordingly, additional investment in energy saving technology at the construction stage could represent good value for money

EU Energy Performance of Buildings Directive (EPBD)

Amending Part L Building Regulations were made in December 2005[32] to partly transpose Articles 3, 4, and 5 of the Energy Performance of Buildings Directive[33]. The Regulations also provide the legal basis for the introduction of revised energy performance assessment methodology (Domestic Energy Assessment Procedure or DEAP) for new dwellings. This expresses the energy performance of the building as a single parameter- CO_2/m^2 per annum and provides explicit recognition of the possible contribution of high-efficiency boilers, e.g. condensing boilers, and renewable energy technologies.

3.3.3.1 Building Energy Ratings

The NCCS proposed an energy efficiency rating for older, pre-Building Regulations, dwellings. This proposal has been superseded by the Energy Performance of Buildings Directive requirement for a Building Energy Rating (BER) for all categories of buildings. The Action Plan for the implementation of the EPBD in Ireland[34] proposes to phase in BER as follows:

- BER of new Dwellings, with effect from 1 January 2007
- BER of new Non- Domestic Buildings, with effect from 1 January 2008,
- BER of existing buildings, when sold or let, with effect from 1 January 2009.

A BER certificate or "label" will allow prospective tenants or buyers to objectively compare the energy performance of a building. An Advisory Report attached to the BER certificate will set out cost effective ways of improving building energy performance for the information of building owners and landlords in planning future upgrade works

3.3.2.6 Sustainable and Energy Efficient Buildings and Low Energy Housing

3.3.2.6.1 House of Tomorrow:

This SEI programme stimulates the uptake of energy-efficient practices in building design and construction. The programme funds designers and architects who work on "clusters" of buildings (normally 10–100 buildings) with considerably improved energy use parameters, typically 20–40% better than the requirements of the current Building Regulations.

32 Building Regulations (Amendment) Regulations 2005 (S.I. No. 873 of 2005)

33 Directive (2002/91/EC)

34 See http://www.epbd.ie

3.3.2.6.2 Energy Efficiency Design and Technology:

To promote sustainable energy efficiency in housing, the Department of the Environment, Heritage and Local Government is now funding the inclusion of a variety of energy efficiency technologies on a pilot basis, in a number of social and voluntary housing schemes.

Policy is aimed at directly funding energy efficient practices in design and construction of social housing provided by local authorities or the voluntary and co-operative housing sector as part of the capital funding for such schemes while ensuring that the energy efficient proposals meet the approval of SEI.

Example include:

Tralee Town Council recently completed construction on a 64 house social housing scheme and community facility/crèche at Rathass, as part of the SEI House of Tomorrow' programme. The Scheme includes a variety of innovative energy solutions in a number of houses to reduce running costs for tenants, including under floor heating supplied by geothermal heat pump, solar panels and efficient gas condensing boilers run on Liquid Petroleum Gas. The combination of increased levels of insulation and the use of innovative energy practices produces energy savings of over 40% for the scheme.

York Street Apartment Development - this brownfield Dublin city centre development for Dublin City Council, supported by Sustainable Energy Ireland under the House of Tomorrow Programme, will include 66 new apartments arranged in five blocks with communal spaces on the ground floor. Each block will have a district heating system with a central condensing gas boiler. Domestic hot water will be provided by 5 solar thermal panels with back-up from highly efficient gas boilers at peak loads. The well-insulated fabric and highly efficient heating system with solar panels will result in a reduction of 51% of CO_2 emissions, energy savings of 51% and fuel cost saving of 70% compared to apartments constructed to normal standards. Other environmental design features will include; shallow plan blocks for good daylighting and natural ventilation, dual aspect apartments and dual aspect living spaces, adaptable glazed balconies on south and west facades, green roofs to control water seepage and attract wildlife, renewable energy, energy conservation, life cycle usage, rain water harvesting and waste management.

Killarney Court, Dublin - The provision of 105 residential units by Cluid Housing Association through renovation and refurbishment illustrates various best practice strategies to lessen the impact on the environment. The renovation of an existing building saves considerably on the energy consumption and use of new materials,

which would have otherwise been expended in demolition and new build. Location within centre city with a wide range of amenities within walking distance reduces car dependence and energy consumption. Reduced energy consumption is achieved by upgrading previously uninsulated external walls and roof with thermal insulation to comply with current standards. Planted landscaped areas and playground provide improved residential amenity and use natural run off and soakage to deal with rainwater. Replacing single-function use with a multi-functional renovated building with onside employment (3 workshops, offices and shop) and community hall, increases local access to employment and facilities, lessening car dependence.

3.3.2.6.3 Design of Large Buildings:

The Energy Performance of Buildings Directive requires that the economic and technical feasibility of alternative/renewable energy systems be assessed during the design of large buildings over 1,000 m^2. This will be operative from 1 January 2007. Sustainable Energy Ireland has published a national feasibility study covering a wide range of large buildings. SEI will also publish free software to enable designers undertake the relevant feasibility assessments.

3.3.2.6.4 Design Guidelines for Social Housing:

Guidelines for Social Housing provide that all social housing incorporate whole house heating properly designed and using efficient systems while having due regard to the preferences of the likely occupants. The standards of insulation required have been progressively improved in line with improvements in the Building Regulations. The improved thermal performance and insulation standards will deliver reduced heating costs for the occupants of local authority dwellings and reduce greenhouse gas emissions due to lower energy requirements. A review of the design guidelines is currently underway and it is expected that revised guidelines will be published during 2006.

3.3.2.6.5 Greener Homes Scheme:

The Greener Homes Scheme, launched in 2006, provides assistance to homeowners who intend to purchase a new renewable energy heating system for either new or existing homes. The scheme is administered by Sustainable Energy Ireland and aims to increase the use of sustainable energy technologies within Irish homes over the next five years. It is estimated the full uptake of the funding available under the scheme will reduce CO_2 emissions by 20,500 tonnes annually. Householders can receive grant assistance to install renewable heating systems (solar, biomass or heat pump based) that meets their particular needs in terms of heat demand, budget and environmental considerations. There has been significant public interest in this grant scheme and around 3,500 grant applications were received since its announcement in March 2006.

3.3.3 Improved Efficiency of Existing Buildings

It is generally argued in Europe that the housing stock consists primarily of older, less efficient dwellings and that, consequently, the relatively small annual addition to this stock, as represented by new house-building to higher energy performance standards, has a limited impact on overall energy efficiency of the housing stock. This is less true in Ireland because of the house construction boom since the mid 1990s. We are now building new dwellings at the rate of around 20 per 1000 population or about 5 times the EU average. About 38% of our housing stock has been built since modern building regulations were introduced in 1992 and this proportion will be significantly higher by 2012.

Reducing Energy Consumption in Existing Houses

3.3.3.1 *Building Regulations:* The requirements of Part L of the Building Regulations apply both to "change of use" situations and to material alterations, i.e. major refurbishments that have implications for structure or fire safety. Part L also applies to window replacement in existing buildings.

3.3.3.2 *Local Authority Housing Regeneration Programme:* Upgrading and redevelopment of the existing local authority housing stock is carried out through a combination of new build, refurbishment and demolitions. In 2006 over €233 million is being made available across the various regeneration programmes administered by the Department of Environment, Heritage and Local Government. Regeneration programmes have involved the refurbishment or construction of over 1,000 units since 2000.

3.3.3.3 *Area Regeneration Programme:* Dublin City Council received a grant of €82.5 million (1997 prices) under the Area Regeneration Programme. This programme, which is now complete, consisted of once-off upgrading of high density older housing complexes - mainly flats at various locations around the city and was linked to the development of a strong estate management programme to overcome chronic social problems associated with many flat complexes. Typical works included window replacement, installation of central heating, repairs to roofs and precinct improvement works. Over the lifetime of the programme, over €100 million was provided to local authorities to undertake work on over 9,500 units.

3.3.3.4 *Central Heating Scheme:* A special programme for the installation of central heating in local authority rented dwellings which lacked such facilities was introduced in July 2004. Some €42 million has been paid to date and a further €35 million has been allocated to the scheme in 2006. Under the Programme, the Department of the Environment, Heritage and Local Government pays to the

housing authority a grant of €5,600 or up to 80% of the cost, whichever is the lesser, in respect of the provision of central heating facilities and related energy improvement and smoke detection measures in each eligible dwelling. The balance of the cost is met by local authorities.

3.3.3.5 *Remedial Works Scheme:* Under the Remedial works Scheme, which was introduced in the mid-1980s, capital assistance is made available to local authorities to fund major refurbishment works to groups of their rented dwellings. Since 2000, 2650 housing units have benefited under the remedial works scheme.

3.3.3.6 *Low Income Housing Programme:* This SEI programme aims to facilitate co-ordinated action to ensure that homes which are subject to fuel poverty have access to cost-effective heating, hot water and lighting through the installation of energy efficiency measures. Delivered primarily through the Warmer Homes Scheme, actions in low-income housing are designed actively to develop, promote and champion responses to fuel poverty issues within the context of national housing and sustainable energy policies. Budget 2006 provided an additional €2 million funding for the installation of insulation in households experiencing fuel poverty.

3.3.4 Improved Efficiency of Appliances

Energy Labelling

Energy labelling of appliances, to enable consumers to compare energy consumption of product alternatives, is designed to promote the uptake of more energy-efficient and therefore cheaper appliances. Requirements for energy labelling are laid down in a series of EU Directives and currently apply to washing machines, driers, combination washer driers, fridges, freezers fridge freezers, dishwashers, ovens and air conditioners. Under the Regulations, suppliers and distributors are required to produce the labelling material and to ensure accuracy. Retailers are required to ensure that all display models carry the correct energy labels.

3.3.5 Demand Side Management

Controlling the demand for energy consumption in the residential sector will benefit not only the consumers of energy in terms of reduced costs, but will also help to reduce Ireland's overall energy requirement and reduce the pressure on existing electricity generating capacity. As well as programmes directed towards the industrial and commercial sectors, Sustainable Energy Ireland provides advice to residential customers on reducing their energy consumption, including a home energy survey to identify areas in which the greatest energy savings can be made.

3.3.6 Changing Fuel Mix

Between 2000 and 2005, an additional 162,357 residential customers have been added to the Bord Gáis natural gas network, an increase of 46%. In addition, 5,204 new industrial and commercial customers have been added in the same period. The completion of the Dublin-Galway-Limerick ring main pipeline together with a second interconnector between Ireland and Scotland and the commencement of work on a North/South interconnector has driven the increased number of households connecting to the natural gas network.

3.3.7 Public Sector Buildings

Public Sector Investment Programme

This programme aims to stimulate the application of improved energy efficiency design strategies, technologies and services in public sector building construction and retrofit projects. It facilitates the delivery of significant energy efficiency improvements in the design and specification of new-build and refurbishment construction. The programme is in the process of establishing energy management bureaux to encourage the provision of contracted energy control and management for public sector buildings which lack the scope to provide the service from internal resources, and help public sector organisations to manage their energy consumption and costs. Two bureaux are now fully operational: the first is located in the Office of Public Works, covering over 150 of the largest buildings in the central Government offices estate; the second covers the main third level colleges in Dublin: UCD, Trinity, Dublin Institute of Technology and Dublin City University. Work has commenced in establishing a Bureau that incorporates the five Dublin Academic Teaching Hospitals: St. James' Hospital, St. Vincent's Hospital, Beaumont Hospital, The Mater Hospital and the Adelaide and Meath Hospital. These hospitals are some of the largest users of energy within the health sector.

The Energy Performance of Buildings Directive requires that a BER certificate be displayed in all public service buildings, including existing older public buildings. This will become fully operative from 1 January 2009.

3.4 Industry, Commercial and Services Sectors

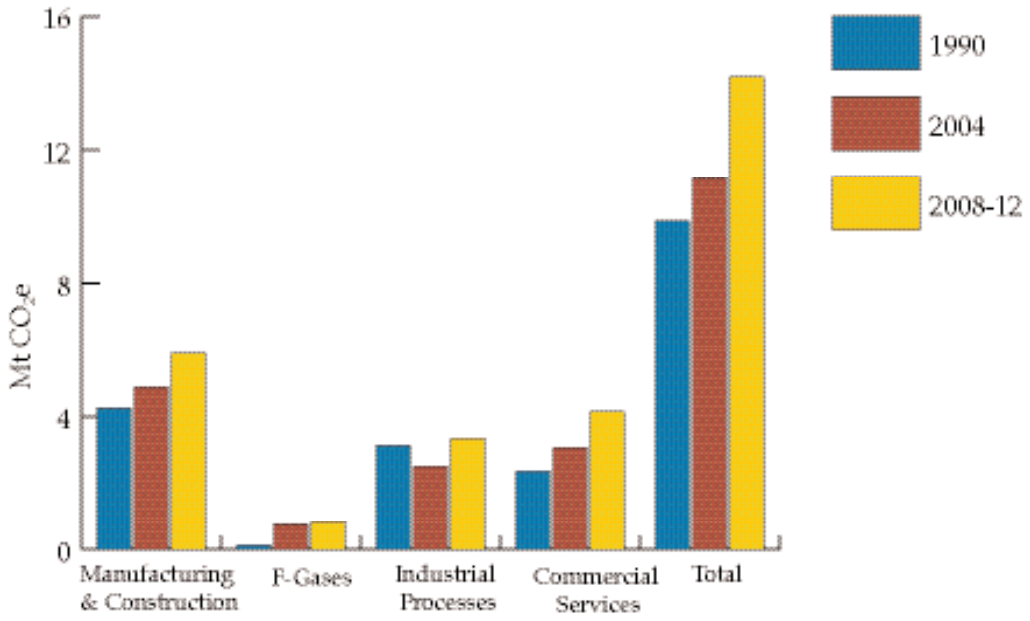


Figure 3.5 - Industry Emissions by Source Mt CO_2e

3.4.1 Emissions Trends and Projections

Emissions from this sector arise from a range of sources, but predominantly from the combustion of fossil fuels for either heating or as part of industrial processes. In addition there are substantial amounts of CO_2 released during the production of cement, lime and periclase. Other more potent greenhouse gases, collectively known as fluorinated or F-gases, are released from a wide variety of commercial and industrial activities such as refrigeration and the production of semiconductors.

Emissions from the sector as a whole grew by 13% between 1990 and 2004. Within the overall increase, however, emissions from the commercial / services sector grew by 29% and emissions from industry grew by 8%. While not exactly analagous, the CSO census of industrial production records that industrial production has increased by some 330% over the same period. Within industry, process emissions fell by 20% due to the cessation of fertiliser manufacturing in Ireland. However, this masks a 126% increase in process emissions from cement, lime and periclase production driven mainly by large increases in cement production to support strong demand for construction materials.

Emissions from this sector are projected to increase by 33% between 2004 and 2012 with strong growth in all areas, particularly in cement production and the commercial and services sub-sector.

3.4.2 Policies and Measures

3.4.2.1 Emissions Trading

The EU Emissions Trading Scheme, introduced in 2005 for energy and large industrial emitters, covers 100% of industrial process emissions and approximately 80% of combustion-related emissions from manufacturing industry. The small number of commercial installations included in the Scheme account for less than 2.5% of emissions from the commercial/services sub-sector. The operation of the trading scheme is described in more detail in chapter 1.

3.4.2.2 Investment Analysis

The Department of Enterprise, Trade and Employment has established an Inter-Agency Group, comprising representatives of enterprise development agencies, to explore options for determining the impact of inward and indigenous investment proposals/decisions by the development agencies. The Group is considering mechanisms for assessing the greenhouse gas impacts of investment proposals. It is intended to establish a mechanism for factoring the carbon emissions impact of proposed projects into decisions on grant-aid provided by the development agencies under the Department of Enterprise, Trade and Employment for industrial projects.

3.4.2.3 Energy Efficiency Measures

Sustainable Energy Ireland provides a range of advice to promote energy awareness and efficiency for the industrial and commercial sectors, as well for other energy users. For example, the Building Energy Manager's Resource Guide, published by SEI, provides a range of advice for those responsible for energy management in organisations. Information on SEI programmes specifically geared to the industrial and commercial sectors is set out below.

3.4.2.3.1 Negotiated Agreements

In 2002 and 2003, Sustainable Energy Ireland engaged in a pilot Negotiated Agreements programme involving 26 companies. The pilot programme estimated efficiency gains over business as usual of 5.4% (individual agreement), 16.4% (collective agreement) and 17.1% (technology agreement). A key incentive for the introduction of negotiated agreements was a proposed exemption from any carbon tax that might be introduced. Following the 2004 Government decision not to introduce a carbon tax, SEI has re-focused its work in this area on the development of Energy Management Action Plans and, with the National Standards Authority of Ireland, on a new Energy Management Standard.

3.4.2.3.2 Large Industry Energy Network

Now in its eleventh year, this programme is a voluntary networking initiative of eighty-five of the largest industrial energy users in the country, with an annual energy spend of approximately €300 million. The LIEN Programme focuses on improving competitiveness by reducing energy costs and assists companies in meeting environmental and regulatory requirements. A structured approach to energy auditing and management, and an annual statement of energy accounts, which is a condition of membership of the network, is a valuable tool for driving energy efficiency. The industry participants report energy performance, progress and target realisation. Information and experience, to achieve best practice, are shared through fora including workshops, members' internet sites, networking, courses, and case studies.

3.4.2.3.3 Energy Agreement Programme

The recently launched Energy Agreements Programme is based on the Irish Standard on Energy Management Systems (IS 393). By joining the Energy Agreement Programme, companies undertake to work towards achieving certification to IS 393, supported by tailored advice from SEI. IS 393 requires that energy is managed by companies through formalised structures to achieve significant savings in energy use and greenhouse gas emissions. The Standard covers all aspect of a company's approach to managing its energy costs and use. It is designed for large energy intensive enterprises, which may be more exposed than others to changes in energy costs. It is expected that 20 of Ireland's largest industrial energy users will have signed up to the Energy Agreements Programme by the end of 2006. It is expected that Sustainable Energy Ireland will eventually attract 60 to 100 of the largest industrial energy users in Ireland, with an annual energy bill of €2 million qualifying for participation. With full participation, annual savings in greenhouse gas emissions arising from the scheme are conservatively estimated to be 150,000 tonnes. A parallel Energy Management Action Programme (EMAP) is in place for those companies who may not have the resources to commit the audit requirements necessary to obtain IS 393.

3.4.2.4 Fuel Switching

Conversion of industrial and commercial fuel consumption to lower carbon intensive fuels is encouraged by a range of Government programmes. These support the deployment of renewable energy, which as well as promoting the increased contribution of renewable electricity to the share of national electricity generation, also promote the uptake of renewable energy for electricity and heat in the commercial and industrial sectors. The introduction of a renewable energy feed-in tariff (REFIT), for example, includes separate tariffs for biomass and landfill gas biomass.

The Government recently announced a new commercial bioheat grant aid scheme to provide up to €22 million for the installation of wood chip and wood pellet boilers in large buildings and commercial enterprises. The Commercial Bioheat Scheme recognises that high equipment and installation costs for renewable energy systems have prevented many businesses from switching to such systems. The scheme will support the conversion to renewable energy in up to 600 premises. When fully implemented, approximately 600,000 megawatt hours of wood fuel will be used annually to displace in the region of 60 million litres of heating oil per year. This will result in the reduction in CO_2e emissions of about 160,000 tonnes each year.

3.4.2.5 Process Substitution

Recognising that process emissions from the cement and associated sectors are a significant contribution to emissions, amounting to 2.5 Mt in 2004, the National Climate Change Strategy proposed the development of a negotiated agreement between the industry and Government to stimulate the introduction of lower clinker content cement in Ireland. However, companies within the cement sector are now included in the EU Emissions Trading Scheme, the price signals from which act as sufficient incentive for the introduction of appropriate emissions abatement.

The recent study for Government on greenhouse gas emissions projections[35] also examined cost-effective abatement options available to sectors covered by the EU Scheme and concluded that cost-effective process substitution in cement manufacturing could result in significant reductions in greenhouse gas emissions , if all identified options were fully implemented. It is recognised, however, that is for individual installations in the Emissions Trading Scheme to achieve emission reductions in the most cost-effective manner available to them.

3.4.2.6 IPPC Licensing

The 2003 Protection of the Environment Act introduced provisions enabling the EPA to consider greenhouse gas emissions as part of the Integrated Pollution Prevention and Control (IPPC) licensing regime. In addition, the European Commission is preparing general BREF documents[36] on energy efficiency in the context of the IPPC Directive to provide information on the development of best practice for energy systems that are used in a variety of industrial processes.

35 *Determining the Share of National Greenhouse Gas Emissions for Emissions Trading in Ireland 2008-2012,* March 2006, ICF Consulting and Byrne O Cléirigh.

36 *Best Available Techniques (BAT) Reference Documents.*

3.4.2.7 Fluorinated Greenhouse Gases

The most potent of all greenhouse gases comprise SF6 and the families of gases known as HFCs and PFCs. Collectively known as F-Gases, their use has grown more then three-fold between 1995 (the base year for these gases) and 2004. Although less than 1% of total emissions in Ireland in 2004, there is an upward trend of emissions of F-gases, attributable to increased semiconductor production, refrigeration and air-conditioning. The phasing out of CFCs, for the purpose of complying with the Montreal Protocol on substances that deplete the ozone layer, has also been a factor in increased use of HFCs and PFCs as alternatives.

In some cases, the use of F-Gases is unavoidable, given the lack of alternatives to replace ozone-depleting substances being phased out under the Montreal Protocol.

3.4.2.8 EU Measures to control F-Gases

In April 2006, the EU Environment Council adopted a regulation on fluorinated greenhouse gases and a directive on emissions from air conditioning systems in motor vehicles following an agreement reached with the European Parliament earlier in the year.

These measures are aimed at introducing cost-effective mitigation measures for the use of fluorinated greenhouse gases. The measures are expected to reduce projected emissions of fluorinated gases across the EU by around 23Mt of CO_2e by 2010, and even greater reductions thereafter.

F-Gases Regulation:[37] the regulation provides for a number of measures to control emissions of F-gases. Operators will be required to prevent, detect and repair leakages from a list of specified stationary applications and to maintain adequate records on the quantity of F-gases installed in an application and records related to maintenance, servicing and final disposal. Appropriate arrangements, underpinned by training and certification for relevant personnel, must also be put in place for the recovery and recycling or destruction of gases. Appliances containing F-gases can only be placed on the market if they bear a label indicating the chemical names of these gases and the quantity contained, and stating that they are covered by the Kyoto Protocol. In addition, the regulation introduces prohibitions and other restrictions for certain products containing F-gases. The regulation will apply with effect from 4 July 2007.

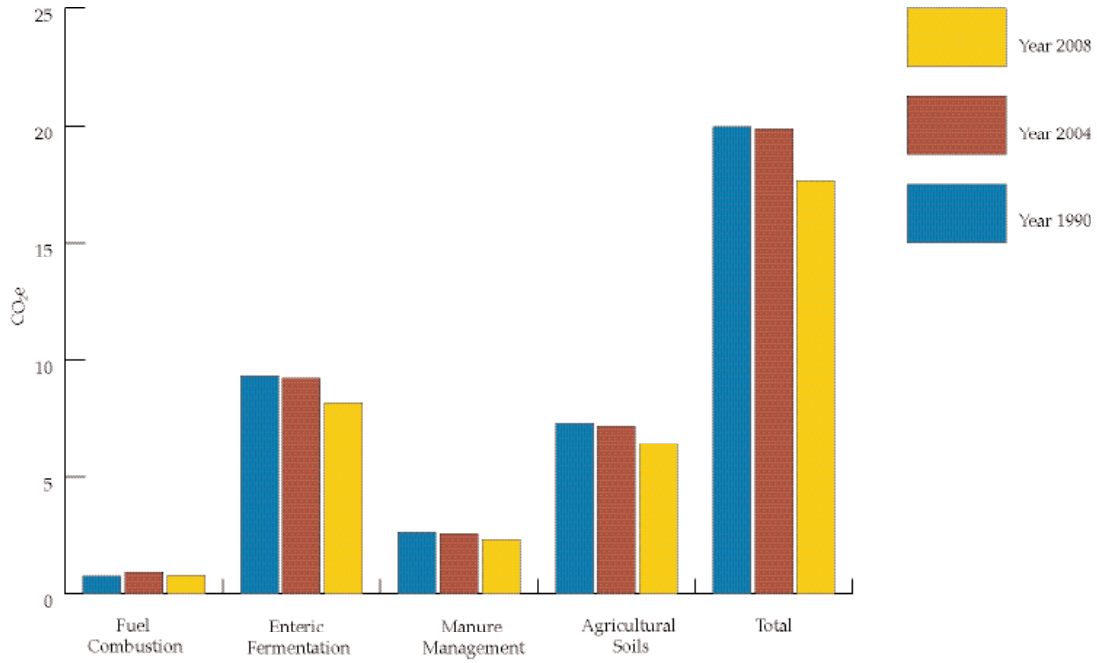
[37] Regulation 842/2006/EC on certain fluorinated greenhouse gases.

Mobile Air-Conditioning Directive:[38] vehicles with air-conditioning units use a refrigerant known as HFC-134a, which has a global warming potential of 1300 times that of CO_2. Because air-conditioning units in cars have the potential to leak, this directive places restrictions on the types of units fitted to vehicles before they can be approved for sale. Gases with a global warming potential of greater than 150 will be prohibited from use in air-conditioning units from 2011 onwards. The directive also provides for harmonised leak detection tests and limits on the retrofitting and refilling of mobile air conditioning units. The directive amends the European Whole Vehicle Type Approval Directive, which sets out Member States' obligations to achieve compliance with technical requirements before vehicles are placed on the market.

38 Directive 2006/40/EC relating to emissions from air-conditioning systems in motor vehicles and amending Council Directive 70/156/EEC.

3.5 Agriculture Sector

Agriculture Emissions by Source Mt CO_2



3.5.1 Trends and projections

Emissions from the sector consist mainly of non-CO_2 greenhouse gases, N_2O and CH_4, and arise from four distinct processes:

- Methane (CH_4) release during enteric fermentation - part of the digestion process in ruminant animals.
- Management of animal manures results in emissions of methane (CH4) and Nitrous Oxide (N_2O).
- Nitrogen inputs to soils from the use of natural and synthetic fertilisers results in emissions of Nitrous Oxide (N_2O) from agricultural soils.
- Combustion of fossil fuels resulting in emissions of CO_2, CH_4 and N_2O.

Total emissions from the sector have remained virtually unchanged over the period 1990 (19.979 Mt CO_2e) to 2004 (19.881 Mt CO_2e) although there was a sustained increase in emissions from 1990 to a peak of 22.014 Mt CO_2e in 1998. Substantial reductions have taken place in the period from 1999 to 2004. Emissions are closely linked to livestock numbers and sales of nitrogenous fertilisers and have tended to track these over the period.

Research by the FAPRI-Ireland Partnership[39] in 2003 in light of the reform of the EU Common Agriculture Policy (CAP) concluded that given full decoupling of aid from production - the option chosen by Ireland - across the EU 15, emissions from agriculture would decrease to a level 16% below that recorded in 1990. This research was based on full decoupling by all 15 member States.

In 2006, following a review of these projections and using a more advanced tier two level IPCC methodology to calculate emissions of methane, overall emissions from the sector are now forecast to fall to an average 17.644 Mt CO_2e per annum, some 12% below 1990 levels, throughout the Kyoto commitment period 2008-2012. The projections assume that full decoupling of agricultural support from production, which began in Ireland on 1 January 2005, should lead to reduction in livestock numbers, and a consequent reduction in emissions. The analysis takes account of the precise level of decoupling that will operate in all EU Member States but excludes reform of the EU sugar regime. The analysis does not include the effect of a World Trade Organisation agreement as part of the Doha round, as the shape of any such an agreement remains unknown.

3.5.2 Policies and Measures

Overview

The positive contribution of farming and agricultural policy to reducing greenhouse gas emissions and increasing levels of carbon sequestration is an important element of Ireland's response to its greenhouse gas emissions reduction target for the purposes of the Kyoto Protocol.

The link between the production of agricultural output and public goods such as the rural landscape, cultural or heritage features, biodiversity and greenhouse gas absorption is reflected in what has been termed the European Model of Agriculture. This idea stresses the multifunctional character of European agriculture and provides a justification for Government's role in support of agriculture and its provision of public good outputs. The public good provided by agriculture also reinforces the role that agriculture will play in sustainable rural development. The development of tourism in Irish rural areas will be contingent on the continued environmental health of rural Ireland to which agriculture makes, and will continue to make, an important contribution.

39 Food and Agricultural Policy Research Institute, 'The Luxembourg CAP reform Agreement: Analysis of the Impact on EU and Irish Agriculture,' 2003, www.tnet.teagasc.ie/fapri.

A critical consideration in national climate change policy is to balance the environmental objective of greenhouse gas emissions reductions with the economic and social objective of promoting the development of a rural economy, which sustains the maximum number of farm families and rural households.

3.5.2.1 Common Agricultural Policy

The National Climate Change Strategy proposed a reduction in methane equivalent to a 10% reduction in livestock numbers below business as usual 2010 projections, with an appropriate balance to be maintained between direct reductions in livestock numbers and reductions in methane emissions per animal.

The decision by Government to adopt full decoupling of direct payments from production will result in significant reductions in emissions from the sector. A new direct payment scheme, the Single Farm Payment Scheme, was introduced on 1 January 2005 to replace the Livestock Premia and Arable Aid Schemes. The introduction of this scheme provides greater freedom to farmers to make production decisions that more closely correspond with market signals. This will incentivise farmers to improve efficiencies of inputs. Recipients of the single payment must be in compliance with five statutory environmental management requirements (SMRs) as well as other SMRs, and maintain land in 'Good Agricultural and Environment Condition' (GAEC).

3.5.2.2 Policies to reduce livestock numbers

Prior to the introduction of the Single Farm Payment, a number of developments had an influence on livestock numbers and age profile, which had an impact on greenhouse gas emissions:

- Extensification premium: the qualifying criteria for payment under this scheme encouraged farmers to farm at a lower stocking rate in order to receive a higher rate of payment.
- Special Beef Premium: since 2000 stricter scheme eligibility criteria were applied to farmers applying under this scheme, in the form of lower stocking rate density limits.
- The payment basis for the Disadvantaged Areas Compensatory Allowances Scheme was changed from a headage basis to an area basis, thereby removing the inducement for farmers to maximise stocking levels.
- Interim Commonage Framework plans introduced in 1998 reduced stock numbers by 30% on commonages in six western counties. Permanent destocking arrangements were put in place for commonages in the final Commonage Framework Plans introduced in 2002.

3.5.2.3 Suckler Cow Premium

Additional eligibility criteria facilitated a reduction in the average age of the suckler herd and the number of calves born by allowing an increasing number of heifers to be eligible for payment. Increasing the number of heifers (younger animals) eligible for payment should have had the effect of reducing methane emissions per animal.

3.5.2.4 Animal Husbandry

One of the factors that influences methane emissions from the dairy herd is longevity of the cows, which is influenced by the health and fertility of the cows. As yields per cow increase there is a tendency for fertility to reduce, thereby leading to an increase in the number of replacements kept on farms. Teagasc has an ongoing research programme aimed at improving fertility levels in the dairy herd. They are also focused on improving grazing techniques and pasture management in both dairying and beef systems with a view to identifying the best and most environmentally sustainable management systems that facilitate increased productivity, improving output per unit of input. In addition, an important part of the Teagasc research and advisory programme focuses on improving the uptake of various technologies that will have the effect of increasing outputs and reducing inputs. Improvements in efficiencies, which flow from this work, should lead to a reduction in the production of greenhouse gases per unit of output.

3.5.2.5 Animal diet

Research is ongoing to evaluate a range of measures that could be used to reduce emissions per animal. Examples of such measures are increasing the level of oil or organic acids (e.g. fumaric or malic acids) in the diet. Field scale research with beef cattle has shown that reductions of circa 20% in daily enteric methane output are possible when coconut oil is added to the diet at a rate of 250 grams per day. However this practice is likely to be feasible only in part of an animal's life (i.e. the finishing winter when concentrates are being fed which allow delivery of the oil), and thus the reduction in lifetime emissions would be 5-6%. Coconut oil is expensive and the measure will likely have some cost of implementation at farm level, depending on the relative costs of oil, other feedstuffs and the value of beef output. The economics of providing incentives for the use of coconut oil in the diet of the beef herd to reduce methane emissions will be the subject of a cost-benefit analysis by the Department of Agriculture and Food. Automatic adoption by farmers cannot therefore be assumed. The feasibility of using other cheaper oils e.g. soya oil may also be worth exploring.

Organic acids have also been shown to reduce enteric methane emissions when added to the diet of beef cattle, but synthetic acids are expensive. Current research is looking for ways to increase natural levels of organic acids in the diet. Replacing roughage or forage feeds with concentrates may reduce enteric methane emissions, but in some circumstances, it could actually increase the emissions. Research has commenced to evaluate the use of alternative forages to grass silage in the diet of beef cattle. With regard to dairy cows, further work needs to be carried out to determine how milk quality and composition would be affected by these strategies

Manure management and agricultural soils

3.5.2.6 Environmental Legislation

Agricultural activities in certain areas are already subject to local by-laws implemented by local authorities. In some instances, by-laws may include a requirement for nutrient management planning. Nutrient management planning is a compulsory feature of IPPC licensing. IPPC licensing is implemented by the EPA, and applies to intensive pig and poultry units.

3.5.2.7 Rural Environmental Protection Scheme (REPS)

REPS is a voluntary scheme designed to compensate and reward farmers for delivering environmental benefits. There were 46,500 farmers participating in REPS at the end of 2005 (34 % of all farmers), each implementing a nutrient management plan. The number of REPS participants is projected to reach 55,000 by end-2006 (40 % of all farmers). This is providing a more sustainable farming environment, improving the management of organic manures and chemical fertilisers and reducing nitrous oxide emissions. Nutrient Management Planning, a cornerstone of REPS, establishes farming practices that lead to greater efficiency in the use of nitrogenous fertiliser. This is achieved by minimising nutrient losses from agriculture and making better use of the nutrients in animal manures.

An analysis of the 2002 National Farm Survey (NFS) revealed that chemical nitrogen use on REPS farms was 65 kg/ha; the average for similar non-REPS farms being 95 kg/ha. Use of organic nitrogen on REPS farms was 91 kg/ha, slightly less than similar non-REPS farms, which had an average of 94 kg/ha. The analysis shows an average decrease of circa 45% in chemical nitrogen use on extensive REPS farms using nutrient management planning. This points to the efficacy of nutrient management planning as a means of reducing chemical nitrogen. The Department of Agriculture and Food will continue to encourage farmers to join REPS.

REPS Planners are now required to identify areas suitable for forestry during preparatory work for REPS plans, identifying farm areas appropriate for afforestation on environmental, agricultural, forestry and socio-economic grounds. This will continue to be the case for the programming period 2007 to 2013 and REPS participants wishing to avail of forestry initiatives will be fully accommodated. The new Rural Development Regulation, coming into effect on 1st January 2007, also provides for additional payments to beneficiaries who undertake forest-environment commitments beyond the existing requirements. The Department of Agriculture and Food is examining ways to utilise this new provision so that afforestation on REPS farms can be made more attractive

3.5.2.8 Good Farming Practice

All farmers participating in schemes such as Compensatory Allowances, On-Farm Investment, Installation Aid or Rural Environment Protection and transferees under the Early Retirement Scheme must practice farming in accordance with the environmental requirements set out in the Good Farming Practice booklet published by the Department of Agriculture and Food in August 2001. Key aspects of the Good Farming Practice include nutrient management and restrictions on applications of organic and chemical fertilisers.

3.5.2.9 EU Nitrates Directive

The introduction of Regulations to implement the EU Nitrates Directive places limits on the amount of livestock manure which may be applied to land. It also stipulates the timing and method of application and sets requirements on the storage and management of manures. The Regulations, which come into force on 1 August 2006, set down legal maximum limits for fertiliser applications (organic and chemical) based on stocking rate, crop requirements and soil type. This will lead to more efficient use of nitrogenous fertiliser and to a reduction in N_2O emissions.

3.6 Waste Management

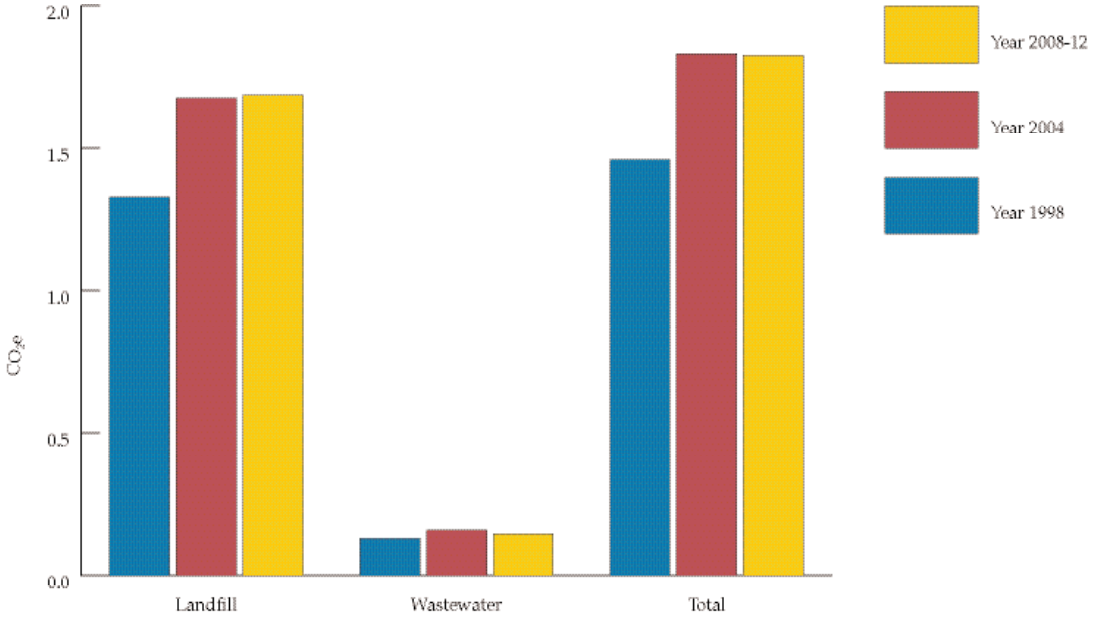


Figure 3.7 – Waste Emissions by Source Mt CO_2e

3.6.1 Trends and Projections

Emissions from the waste sector consist mainly of methane (CH_4) from the anaerobic decomposition of solid waste that has been deposited in landfill sites. In addition small amounts of methane and nitrous oxide arise from wastewater treatment. With increased levels of waste generation, emissions rose steadily through the 1990s and this pattern would have continued if it were not for a step change reduction in the level of emissions arising from the introduction of landfill gas capture for power generation in 1997. Improved landfill gas management through flaring since 2001 is also contributing to a reduction in methane emissions. However, emissions have again begun to increase as the additional volumes of waste being sent to landfill over the period during which gas is produced through anaerobic decomposition have overtaken the incremental rate at which methane capture systems are being introduced. Consequently emissions in 2004 were 1.83 Mt CO_2e - 26% above their 1990 level.

Emission forecasts compiled by the Department of the Environment, Heritage and Local Government for the waste management sector have been prepared on the basis of both historical records and future estimates of waste arisings, together with past management practices and the future management objectives that are set out in the *National Strategy on Biodegradable Waste* and which will be given practical effect through the Regional Waste Management Plans. The calculations assume the

implementation of Regional Waste Management Plans and that target levels for diversion of municipal biodegradable waste away from landfill will be achieved. Average emissions from the sector, including landfill and wastewater are projected at 1.83 Mt per annum by 2012, up from 1.46Mt per annum in 1990.

3.6.2 Policies and Measures

National policy is to regard waste as a resource. This is reflected in our commitment to developing a recycling society. It is also reflected in the Government giving priority to incineration with energy recovery over landfill for dealing with residual waste. In examining the potential for waste management policies to contribute to emissions reductions, the Government is cognisant that climate change impacts are only one of a number of environmental impacts that derive from solid waste management options. Local factors, such as the availability of existing waste management facilities, markets for recyclables, as well as geographic, demographic and socio-economic factors, must also be considered. In overall terms, source segregation of municipal solid waste (MSW) followed by recycling (for paper, metals, textiles and plastics) and composting or anaerobic digestion of putrescible wastes, gives the lowest net generation of greenhouse gases, compared with other options for the treatment of bulk MSW.

Waste Licences issued for landfill sites by the Environmental Protection Agency invariably require the preparation of evaluation reports by the licensee on the viability of landfill gas collection, flaring and / or energy production. Gas collection and energy generation is undertaken at high gas-yield sites and modern enclosed ground flares are installed at landfill facilities possessing sufficient gas potential to support combustion. In addition, the waste licensing system requires the modernisation of older facilities via the implementation of conditioning plans that are designed to increase the operational standards of landfill sites through a process of continuous improvement.

The generation of heat and electricity from waste in thermal treatment plants and landfill gas plants is targeted to displace CO_2 emissions from fossil fuel based plants. The contribution such an approach can make to energy and climate change policy is reflected in the projected outputs from the proposed Dublin waste to energy plant. This will have the capacity to produce 60Mw of electricity, which is enough to service the needs of 50,000 homes. In addition it will be capable of meeting the heating needs of a further 60,000 homes by means of district heating.

3.6.2.1 Diversion of biodegradable waste from landfill

The deposition of biodegradable waste in landfill produces methane, with the potential for generation of gas being determined by the amount of degradable

organic carbon in wastes, which in turn depends on the quantity and composition of the waste material present. Gas production in landfill occurs predominantly over a 21-year period and is greater in well-managed landfill sites where the potential for aerobic decomposition is more limited. Ireland is obliged under the EU Landfill Directive[40] to ensure that no more than 35% of 1995 levels of biodegradable municipal waste is landfilled by 2016.

Ireland's approach to achieving the targets is set out in the *National Strategy on Biodegradable Waste*. Published in April 2006, the Strategy sets out the Government's approach to reducing the amount of biodegradable municipal waste (BMW) going to landfill and encouraging measures aimed at the prevention, recycling and recovery of biodegradable municipal waste. The Strategy requires that 80% of projected arisings of biodegradable municipal waste be diverted from landfill by 2016 and is based on the integrated waste management approach established as Government policy since publication of the national policy framework document *Changing Our Ways* in 1998. Under this approach, the preferred options for dealing with biodegradable municipal waste, based on the internationally recognised waste hierarchy, are:

- prevention and minimisation – avoiding generation of waste;
- recycling – mainly of paper and cardboard but also of textiles;
- biological treatment – mainly of kitchen and garden waste including composting; and
- residual treatment – thermal treatment with energy recovery or by way of mechanical-biological treatment.

3.6.2.2 Renewable Energy from waste - landfill gas capture

Waste biomass encompasses not only the biodegradable fraction of municipal and industrial waste, but also the biodegradable fraction of products and residues from agriculture, forestry and related industries. There is potential within biodegradable municipal waste management to make a contribution to renewable energy generation through the development of active supply chains and from synergies with other biomass materials and fuels e.g. to co-fire peat power plants or cement kilns.

In addition, landfill gas accounts for the majority of the currently installed 28 Mw of generation from biomass including 4Mw of capacity at the Ringsend waste water treatment plant, opened in 2004. The level of landfill gas capture is increased through the implementation of the technical requirements of the Landfill Directive, and

40 Directive 99/31/EC

utilisation for electricity generation is supported by Government policies and incentives aimed at increasing the penetration of renewable electricity in Ireland. The new Renewable Energy Feed-In Tariff support scheme includes price supports of up to €70 per MwH for landfill gas electricity generation. However, the technical upper limit of 50% on the amount of landfill gas that can be recovered will ultimately limit the greenhouse gas mitigation potential of this measure.

3.6.2.3 Role of local authorities

Local authorities have particular responsibilities in relation to waste management and play a key role in the implementation of the greenhouse gas emission reduction measures proposed for the waste sector through:

- adoption of best international practice in implementing modernised waste management practices, as set out in the national policy framework document *Changing Our Ways*; including vigorous implementation of Waste Management Plans and the introduction of use-related charges for both commercial and domestic waste.
- Installation of landfill gas recovery systems.

3.7 Land Use, Land Use Change & Forestry

3.7.1 Trends and projections

The Irish afforestation programme will play an important role in carbon sequestration during the first and any subsequent Kyoto carbon reporting periods. While the NCCS envisaged that sequestration under Article 3.3 would account for a total of 1.0 Mt CO_2, per annum between 2008 and 2012, it is now forecast that, with the levels of afforestation that have occurred since 1990, the average rate of sequestration in qualifying forests over the Kyoto first commitment period will be 2.074 Mt CO_2 per annum. This revised forecast is based on approaches and methodologies for accounting of sequestration agreed to by Kyoto Protocol parties, particularly in the Marrakech Accords, the Good Practice Guidance of the Intergovernmental Panel on Climate Change, and on research and modelling of carbon sequestration in Irish forests undertaken by COFORD, the National Council for Forest Research and Development. Current afforestation will have little effect on levels of sequestration during the first commitment period, as forests grow relatively slowly as they establish themselves over the first five years or so. However, in the period after 2012, they will make a substantial contribution to climate change mitigation.

3.7.2 Policies and Measures

3.7.2.1 Afforestation Programme

One of the aims of Ireland's forest policy is to encourage planting by providing an annual premium to farmers and land owners that compensates for income foregone from conventional farming, and the long pay back periods associated with forestry. Ireland has had, on a per capita basis, one of the most intensive afforestation programmes in the developed world since 1990, funded jointly by the Government and the EU, under successive accompanying measures to CAP reform. Since 1990, some 244,000 hectares have been afforested, with deforestation of approximately 1,500 hectares over the same period. Despite this rate of planting, however, Ireland remains one of the least forested countries in the EU. At the end of the year 2004, the national forest estate stood at 680,000 ha. This represents about 10% of the area of the country, compared to the 35% average throughout the other EU Member States.

3.7.2.2 Integration of REPS and forestry

The administration of REPS requires planners to identify farm areas appropriate for afforestation. As an important contributor to carbon sequestration, new ways of promoting greater synergy between REPS and forestry are being examined with a view to increasing the level of afforestation on REPS farms.

3.7.2.3 Development of domestic forest energy markets

Policies aimed at promoting renewable energy (in the form of heat and electricity) from biomass will create a market for thinnings and residues (both in-forest and from saw-milling). Research is required to develop effective production methods. Furthermore policy to encourage the development of production, processing and marketing infrastructure will be required if forest energy is to compete effectively against fossil fuels.

3.7.2.4 Government support for increased rates of afforestation

Government and EU policy has an important role to play in the rate of afforestation through grant aid to private forestry. While rates of afforestation have slowed to around 10,000 hectares per annum in recent years, this still represents one of the most vigorous afforestation programmes in Europe. A full review of forestry strategy is underway and will be completed in 2006.

4. Measures to Meet other Kyoto Protocol Commitments

4.1 Adaptation

Parties to the UN Framework Convention on Climate Change are developing a five-year programme of work on adaptation to assist all Parties, in particular developing countries, to improve understanding and assessment of impacts, vulnerability and adaptation, and to make informed decisions on practical adaptation actions and measures to respond to climate change on a sound, scientific, technical and socioeconomic basis, taking into account current and future climate change and variability.

To date, national policy has focused primarily on mitigating greenhouse gas emissions, i.e. reducing or limiting emissions in line with Ireland's commitment to contribute towards achieving the objective of the United Nations Framework Convention on Climate Change and the Kyoto Protocol. While this global mitigation effort is vital in terms of delaying and reducing the impact of climate change and in keeping the requirement for adaptation manageable, change is already being observed and more is inevitable due mainly to current and historic levels of greenhouse gas emissions. The need for action on adaptation is therefore beyond question.

In developing appropriate policies to adapt to the impact of climate change in Ireland, a key consideration will be the factoring of predicted climatic changes into policymaking. Assessment of the impact of climate change must become integrated into the formulation and development of policy in all sectors. The impact scenarios provided through the research programme underlines the importance of considering climate change impacts in policy-making. Unless the potential impacts of climate change are integrated into key policy areas, Ireland runs the risk of undermining its international competitiveness in the years ahead, as well as bequeathing a landscape and quality of life to succeeding generations vastly inferior to what might have been the case.

In developing policy on adaptation to climate change, a key objective will be to guide future integration of climate change considerations into policy-making and to provide policy-makers with a framework to factor the climate change impacts into policy proposals. It is envisaged that policy-making will ultimately be required to have regard to the potential climate change impact, in much the same way as existing policy proposals must consider the potential impact on operational and insurance costs.

4.1.1 Climate Change Impacts in Ireland

The Environmental Protection Agency, through the Environmental Research, Technological Development and Innovation (ERTDI) research programme, has

provided some €6.4m towards climate change research in Ireland in the areas of mitigation, adaptation, basic science and observations. Specific objectives for the investment in climate change adaptation research include the provision of analyses of projected climate change and its impacts for Ireland and development of analytical capacity in this area. Reports published to date include *Climate Change: Scenarios and impacts for Ireland*[41], and *Climate Change: Regional climate model predictions for Ireland*[42].

Climate change research has been undertaken in a number of thematic areas, including modelling, data management, and development of scenarios and impacts. Work in these areas is guided by priorities identified in the National Climate Change Strategy and in *Ireland's Environment: a Millennium Report* published by the Environmental Protection Agency in 2000, as well as priorities identified by the research community and wider stakeholders. Research funded by ERTDI is primarily carried out by universities and institutes within Ireland, but funding has also been provided for studies in the UK, European institutions and the US.

The approach to climate change impacts research has been to provide analysis of current trends in climate change indicators. Development of future climate scenarios with high spatial resolutions (typically high resolution products are based on downscaling of coarse resolution global climate models) are required. Analysis of impacts based on these outputs and identification of vulnerabilities will inform future policy on adaptation.

The Climate Change Indicators for Ireland[43] report shows climate change-associated trends are evident in the meteorological and ecological records. These include increasing average temperature, changes in rainfall patterns and a lengthening of the growing season.

Climate Change: Scenarios and Impacts for Ireland is a major assessment of the possible impacts of climate change on Ireland. It examines the possible magnitude and likely impacts over the course of the 21st century by:

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41 *Climate Change: Scenarios and Impacts for Ireland*. Report for the Environmental Protection Agency by the Department of Geography, NUI Maynooth and the Department of Botany, TCD, 2003 funded under the Environmental RTDI Programme 2000 – 2006.

42 *Climate Change: Regional climate model predictions for Ireland.* Report for the Environmental Protection Agency by Climate Chane for Ireland, 2005. Fuynded under the Environmental RTDI Programme, 2000-2006.

43 *Climate Change Indicators for Ireland.* Report for the Environmental Protection Agency by the Department of Geography, NUI Maynooth and the Department of Botany, TCD 2002. Funded under the Environmental RTDI Programme 2000 – 2006.

- establishing scenarios for future Irish climate based on statistical downscaling of global climate model projections for rest of the century, and
- using projections to assess probable impacts on key sectors such as agriculture, forestry, water resources, coastal and marine environments and on biodiversity.

The study identifies areas of vulnerability to climate change and addresses likely adjustments in the operation of environmental systems in response to such change. It concludes that, in sectors such as agriculture, some new opportunities may arise through increases in certain crop yields. In other areas such as water resource management, long term planning strategies will be necessary to adapt to adverse impacts. Long lead-in times for adjustment characterise many sectors, for example in forestry, and the study highlights the importance of advance warning arrangements to trigger appropriate responses. By anticipating change, the study concludes that it may be possible to adopt adaptation strategies that minimise the adverse impacts and maximise the positive aspects of global climate change.

The study poses specific scenarios that suggest significant climate change can be anticipated in Ireland over the next half century. These scenarios anticipate that by 2050 there will an increase in January temperatures of 1.5ºC, winter conditions on the north coast and the north midlands will be similar to those currently experienced along the south coast; July temperatures will increase by approx 2.5ºC, and there will be marked reductions in summer rainfall by 25 – 40%. Furthermore, the study highlights possible impacts of these scenarios in key areas such as agriculture, water supply, marine coastline and the natural environment. In terms of agriculture, this may result in droughts and the need for increased irrigation. The viability of certain crops, such as potatoes, may be threatened. Other impacts highlighted include pressures on the water supply infrastructure in the Greater Dublin Area, the likelihood of increased frequency of flooding in the West, general effects to the marine environment as a result of higher water temperatures, threats to the coastline due to higher sea levels, and general threats to ecosystems and biodiversity.

While many of the climate change impacts identified in the study are likely to occur despite mitigation measures that might be put in place now, Ireland must ensure that it moves expeditiously to optimise its ability to accurately predict and adapt appropriately to these impacts. The study underlines the importance of developing and implementing mitigation policies at international and national level, and adaptation measures at national and local levels.

The Climate Change: Scenarios and Impacts for Ireland study employs downscaling of sophisticated global climate prediction models. While global models provide

information on future climate conditions, outputs from such models are coarse – Ireland, for example, is represented by a small number of grid squares. More detailed outputs and analyses are required to inform planning requirements at smaller regional and local scales. Regional Climate Models offer a solution to this requirement by taking spatially coarse climate predictions from global models and producing detailed analyses for targeted areas. This will increase national capacity to dynamically analyse future climate conditions in Ireland and their impacts at local level.

A study published in 2005 *Climate Change: Regional climate model predictions for Ireland* prepared by the Community Climate Change Consortium for Ireland (c4i), provides an analysis of future Irish climate conditions for the period 2012-2060 using a regional climate model. The study applies data from this model to assess the impact of climate change on river discharge and local flooding in the River Suir catchment area. One of the conclusions of applying the model in this way is that a predicted increase in winter rainfall was found to increase the risk of future flooding in the area. Other conclusions from the study include the following general scenarios:

- ***Temperature:*** General warming with mean monthly temperature increasing by between 1.25º and 1.5º. The largest increase will occur in the South East and East, with the greatest warming occurring in July.

- ***Precipitation:*** Most significant changes will occur in June and December. Rainfall in June will decrease by about 10% compared to the present while December values show increases ranging between 10% in the south-east and 25% in the north-west.

- ***Storms:*** Increased frequency of storms over the North Atlantic in the vicinity of Ireland by about 15% compared to current conditions.

The first report from the c4i project confirms and expands on the findings in the *Climate Change Scenarios and Impacts for Ireland* study. Established in 2003, c4i has enabled the development of a regional climate modelling facility in Met Éireann. The new capacity will contribute to national efforts in climate change research, will support the community of environmental scientists and will assist policy makers in planning to adapt to climate change.

Further analyses of climate scenarios are being conducted under the auspices of C4i which will examine the impacts for agriculture and water management, focusing on river basin districts. This analysis is being carried out by Met Éireann and the National University of Ireland (Maynooth) and will become available in 2006. This will be further developed in subsequent years. Ongoing work includes analysis of river and coastal flooding (storm surges) as well as analysis of change in surface wind for the wind energy community.

Increasing attention is also being given to the occurrence of extreme events. The impacts of extreme floods, storms and heat waves have been observed globally in recent years. They can be more damaging than gradual or average changes, which are more easily predicted by climate models. New approaches to statistical and probabilistic analysis of extreme events are being developed to better inform decision making on associated risks and likely impacts.

4.1.2 Existing Measures

The potential for climate change impacts are already being addressed in a number of policy-making areas. The 2004 report of the Flood Policy Review Group,[44] established following serious flooding in parts of the country in the latter part of 2002, recognised the need to devise a clearly defined and comprehensive policy approach to flooding nationally and a precise definition of the roles and responsibilities of the various stakeholders involved. Climate change is identified as one of the key elements that need to be addressed when assessing future flood relief measures in Ireland. Following the report, the Government appointed the Office of Public Works (OPW) as the lead agency to implement flooding policy in Ireland and the OPW is currently developing a strategy to manage flood risk in conjunction with other relevant State agencies. The strategy is likely to involve non-structural measures such as storage and better flood forecasting and warning, but will also include structural works particularly where flooding is already a problem. OPW has a programme of flood defence schemes at different stages of development. One aspect of this strategy is the need to raise awareness about how to prepare for potential flooding. A website launched this year[45], will soon be augmented with details of available flood records since the early 1900s which will provide a public record of flood risk areas.

Local Authorities now have the power to consider adaptation initiatives in relation to their development plans. The Planning and Development Act, 2000, empowers planning authorities to provide, in their development plans, that development in areas at risk of flooding may be regulated, restricted or controlled. If development is

44 http://www.opw.ie/whatsnew/PDF/Published%20Report.pdf

45 http://www.flooding.ie

proposed in a flood-risk area, the risk of flooding can be carefully evaluated and planning permission refused, if necessary.

4.2 Cooperation in Scientific and Technical Research

National climate change research has developed significantly under the National Development Plan (NDP) 2000-2006. The EPA investment in climate research is of the order of €7m over the NDP period. Linked infrastructure development, investments from other state agencies, as well as input from European and bilateral projects, are estimated to be of a similar order. Research projects are largely carried out in the university sector but these are also carried out by specialised state agencies and consultancies. This investment has resulted in the development of national capacity and provision of important information on a range of climate issues.

4.2.1 International participation

Ireland recognises the international nature of climate change and the need to participate in global efforts. The Irish Committee on Climate Change (ICCC) coordinates activities in relation international bodies such as the International Geosphere -Biosphere Programme (IGBP). A Surface Ocean-Lower Atmosphere Study (SOLAS) group has recently been established in NUIG. The development of national climate research capacity has enabled greater national participation in IPCC activities. A number of Irish scientists are lead or review authors in the forthcoming fourth assessment report (AR4). Ireland also hosted an IPCC workshop on uncertainly and risk in 2004 as part of the AR4 development process.

Ireland participates in the European Union Global Monitoring for the Environment and Security (GMES) Advisory Council (GAC) and in the Group on Earth Observations (GEO) plenary meetings and has provided support to this development which is regarded as a support for GCOS. Ireland is also a part of the European Space Agency Earth Observations Programs.

4.2.2 Systematic Observation

A number of national bodies/organisations are engaged in systematic observations including Global Atmospheric Observing Systems. Met Éireann has primary responsibility for meteorological/climatological observations listed below. Responsibility for terrestrial and oceanographic observations is divided among a number of State agencies including the EPA, Marine Institute, universities and other academic institutions. The EPA, Met Éireann and the Marine Institute have established a process to develop a national GCOS plan in response to the GCOS 10 year implementation plan. As part of this process an international review of national Global Atmospheric Watch was undertaken in 2005. This report is available from http:\\erc.epa.ie\.

Table 4.1 Atmospheric Observations

	GSN[1]	GUAN[2]	GAW[3]
Number of stations	2	1	2
Operating Now	2	1	2
Operating to GCOS standards	Yes	Yes	Yes[4]
Expected to be operating in 2007	2	1	2
Providing data to international centres	2	1	2

Notes

1 Met Éireann stations WMO numbers 03953 and 03980.

2 WMO station number 03953

3 Mace Head (53° 20'N 9° 54'W) is a Global GAW site operated by the National University of Ireland, Galway. WMO station number 03953 is operated by Met Éireann

4 Steps are being taken to address a small number of issues identified in the international review of these sites

Table 4.2 Participation in the global oceanographic observing systems

	VOS	SOOP	TIDE GAUGES	SFC DRIFTERS	SUB-SFC FLOATS	MOORED BUOYS	ASAP
For how many platforms is the Party responsible?	15	0	5	0	0	5	0***
How many are providing data to international datacentres?	15	0	0	0	0	5	0
How many are expected to be operating in 2007?	15	0	8 to 11	0	0	6	0

* Reports on GTS only.

** Part of EUCOS SURFMAR

4.3 Financial Assistance to Developing Countries and Technology Transfer

Ireland's Official Development Assistance (ODA) has continued to increase since the publication of Ireland's Third National Communication in 2003. In 2003, total ODA stood at €446 million, in 2004 it had increased to €489 million and 2005 figures are expected to be in the region of €545 million. This represents 0.40% of GNP. At the Millennium Review Summit in 2005, Ireland committed to reaching the UN target of 0.7% ODA by 2012.

Table 4.3: ODA Volumes 2003-2005

ODA Volumes 2003-2005 €m		
Year	TOTAL ODA	ODA as % GNP
2003	445,705	.40
2004	488,923	.40
2005	545,000	.41

Ireland's development assistance is focused on the Least Developed Countries, particularly those in sub-Saharan Africa. Ireland has bilateral development programmes with Lesotho, Ethiopia, Mozambique, Tanzania, Uganda and Zambia. Irish Aid also has a programme in South Africa and in Timor Leste and Vietnam.

The bulk of Ireland's assistance to developing countries is administered by Irish Aid, located in the Department of Foreign Affairs. The Departments of Agriculture and Food, Environment, Heritage and Local Government, and Enterprise Trade and Employment also contribute to Ireland's ODA. In the last number of years since the publication of Ireland's Third National Communication, Ireland, like a number of other donors, has been working towards a more programmatic and harmonised approach to development cooperation. Ireland is committed to honouring the Paris Declaration on Aid Effectiveness agreed in March 2005. In order to make aid more effective the Declaration states that developing countries will exercise effective leadership over their development policies and strategies and coordinate all development activities. Donor countries should then base their support on these country-owned and led strategies and policies, and work with other donors to ensure harmonised, transparent and cost effective responses to priority needs.

In practical terms, commitment to aid effectiveness involves aligning bilateral assistance with the national poverty reduction strategies of partner governments. This often results in providing financial support to sectors such as health, education and agriculture, or directly to the government's central budget through Direct Budget Support. The essence of the approach is that developing countries should prioritise their development needs and that donors should respond to these rather than their own priority issues. This new approach has obvious implications for reporting on bilateral climate related funding in two key ways:

1) Climate change must be stated as a national priority in order to receive bilateral funds; and
2) It is often difficult to segregate spending on climate change as it may be disbursed through support to the central budget or to a key sector such as agriculture or water.

Given the shortage of references to climate change in the development policies and poverty reduction strategies of Ireland's partner countries, there are a limited number of bilateral climate change programmes to report. However, Ireland does support a wide range of activities, programmes and sectors which have benefits for countries addressing climate change. Many activities related to agriculture, health, infrastructure, water resource management and recovery and disaster prevention have positive impacts in terms of adaptation to climate change. For example, Ireland spent over US$21 million on agriculture in its programme countries in 2004. Many of the activities supported such as crop diversification, irrigation and the introduction of new crop varieties can make a positive contribution to adaptation to climate change. As it is not possible to put an accurate figure on Ireland's total bilateral contribution to climate change in developing countries, this report focuses on presenting illustrative examples of the types of initiatives supported.

Irish Aid has started to raise awareness of climate change and the risks to development posed by the impacts of climate change in its programme countries. It also supports programmes that build the capacity of policy makers to integrate mitigation and adaptation to climate change into national development plans. Through these efforts Irish Aid hopes to raise awareness of the need to raise the policy profile of climate change in developing countries.

Within its bilateral programme, Ireland supports a range of activities which promote sustainable management of natural resources. Many of these contribute directly to adaptation to climate change, for example agriculture diversification, water resource management, vulnerability assessment and risk reduction. Irish Aid is committed to

the EU Action Plan on Climate Change in the Context of Development Cooperation and has recently drafted an Environment Policy for Sustainable Development which will soon be adopted and will enhance efforts to mainstream environmental issues into all aspects of the programme.

Ireland also supports climate change activities through multilateral programmes and through support to international agencies. Funding administered through these channels has continued to rise on an annual basis since the Third National Communication. Ireland continues to provide funds to the GEF and in 2005 it also contributed to the Least Developed Countries Fund and the Special Climate Change Fund. Ireland is committed to the Bonn Declaration and has committed funds towards the US$410 million from 2005 to 2008. As a result new and additional funds amounting to US$2,900,000 were made available in 2005.

As part of Ireland's ODA, the following contributions were made in the years 2003-2005.

Table 4.4: Financial contribution to the Global Environment Facility

Contribution US $ million			
	2003	**2004**	**2005**
Global Environment Facility	1.3	1.3	1.3
SCCF			.55
LDCF			2.0
Trust Fund for Participation	0.25		.1

An overview of funds made available to multilateral institutions and programmes is presented in Table 4.5.

Table 4.5: Financial contributions to multilateral institutions and programmes

Institution or Programme	Contributions US $m		
	2003	2004	2005
1. World Bank	6.4	6.3	9.0
2. IFC			
3. ADB			
4. Asian Development Bank			
5. EBRD			
6. I-A DB			
7. UNDP	15.3	15.5	
8. UNEP	1.6	1.6	1.6
9. UNFCCC Funds			
LDCF			2.0
SCCF			.55
10. Others			
LEG			.02
LDCF workshop			.05
Multilateral - Scientific, Technological, Training Programmes			
UNITAR		.15	.18
REEEP			.25
CGIAR	7.5	8.4	4.2

4.3.1 Bilateral cooperation

Over the reporting period interventions designed to improve environmental sustainability were implemented in a number of Irish Aid programme countries. Many of these contribute directly to preparing for and adapting to climate change.

In Tanzania, Irish Aid has supported the Tanga Coastal Zone and Conservation Development Programme over a number of years. This programme, implemented by the IUCN, promotes sustainable fishing practices and has contributed to a significant improvement in coral reef health and fish stocks. In addition, seaweed production has been introduced as a new source of income for women. Mangroves have been replanted and are managed to protect the coast from erosion and storms. Tanga is the only region in Tanzania where the area under mangrove has increased in the past decade. These measures will help local people to adapt to climate change through

income diversification, improved management of their resources and protection of the coastline.

Irish Aid supports the national Productive Safety Nets programme in Ethiopia - US$ 6.9 million was contributed in 2005. The programme targets the most vulnerable members of society who suffer from chronic food insecurity due to drought, soil erosion and degradation and unviable land holdings. The programme addresses hunger, malnutrition and destitution through the provision of cash and food for work. A central focus of the programme is on improving the natural environment, primarily through soil and water conservation activities. Ultimately, the programme hopes to assist chronically poor households to climb out of poverty and to have access to the natural resources they need to survive. Finding ways to cope with vulnerability under current conditions will help communities to adapt to the increasingly harsh conditions expected due to climate change.

Starting in 2005, Ireland is funding the Ethiopian Bale Eco-region Sustainable Management Programme in collaboration with the Norwegian and Dutch Governments. The programme supports improved planning and management of the largest area of Afroalpine habitat on the African Continent. This area forms the watershed of the Bale Massif, which is critical for the livelihoods and well-being of hundreds of thousands of people in the lowlands of southeast Ethiopia and Somalia. The Herenna Forest, covering the southern part of the mountains, is the second largest stand of moist tropical forest in Ethiopia. The forests together with the Afro-alpine plateaux are host to a globally unique and diverse fauna and flora, including several rare and endemic species. By putting in place measures to sustainably manage the Eco-region, the programme will reduce the vulnerability of the ecosystem and its plant, animal and human inhabitants to the impacts of climate change. Irish Aid is supporting this programme over a period of 6 years, starting with USD $404,000 in 2005.

4.3.2 Support to environmental organisations

UNEP

In 2002 Irish Aid entered into a three year Trust Fund arrangement with UNEP focusing on Sub-Saharan Africa. USD $ 1.6 million was provided to UNEP each year for activities related to:

- The protection of freshwater resources
- Access to environmental information for decision-making
- Protection of coastal and marine environment (with an emphasis on coastal and marine fisheries management)

- Conservation of biological diversity (with an emphasis on monitoring of land cover, protected areas and indigenous vegetation change)

All of these activities helped to increase our knowledge of natural systems and to develop systems to manage resources sustainably and reduce vulnerability to environmental stresses such as climate change.

International Institute for Environment and Development

In 2005, Irish Aid entered into a funding arrangement with the International Institute for Environment and Development (IIED). Irish Aid supports activities related to biodiversity, climate change and capacity building. For example the Poverty and Conservation Learning Group focuses on bringing the conservation and development communities together to better face the challenges posed to biodiversity conservation, including climate change.

Ireland's contribution to the IIED will also support action-oriented research on how to mainstream environmental sustainability into Budget Support and Sector–wide Approach processes. This is particularly important, as donors will continue to find it difficult to provide funds for climate change on a bilateral basis until it is a priority in partner countries.

Consultative Group on International Agricultural Research (CGIAR)

Irish Aid Provides funds to CGIAR for agricultural research which addresses many aspects of adaptation to climate change including crop development, livelihood diversification and water resource management. Irish Aid supports the International Water Management Institute (IWMI), the International Livestock Research Institute (ILRI), The International Food Policy Research Institute (IFPRI) and the International Centre for Research in Agro Forestry (ICRAF). Ireland provided US$7.5 million to CGIAR in 2003 and US$8.5million in 2004.

4.3.3 Multilateral and international initiatives

Adaptation

Least Developed Countries

In 2005, Irish Aid provided funds to assist the UNFCCC secretariat to hold a workshop on the Least Developed Countries Fund in Bonn. The workshop successfully brought Parties together to discuss the purpose and modalities of the fund. Ireland welcomed the operationalisation of the fund at COP11 and contributed US$ 2 million to the fund in 2005. In addition, Irish Aid provided funds to the UNFCCC's Least Developed Countries Expert Group (LEG) in 2004 and 2005 to

facilitate the provision of technical guidance and advice to LDCs on adaptation strategies and plans to address Climate Change. The LEG plays in an important role in supporting LDCs to address climate change in their own countries.

CAN/IIED

Irish Aid supported a Climate Action Network (CAN)/ IIED initiative on adaptation to climate change in developing countries in 2005. Irish Aid provided financial support amounting to US$18,000. The consortium held several events at COP11 focusing on adaptation to climate change, the challenges facing developing countries and ways to strengthen planning for climate change.

Adaptation and Mitigation

UNITAR –Climate Change Capacity Development Programme

Over the period 2003 to 2005 Ireland granted US$ 333,684 (€276,000) to the United Nations Institute for Training and Research (UNITAR) for its Climate Change Capacity Development Programme. This programme aims to improve the participation of Developing Countries in the UNFCCC process and more specifically:

- to support the timely implementation of the UNFCCC and the Kyoto Protocol by Developing Countries
- to enable better coordination and integration of national climate policies with sustainable development policies
- to contribute to the sound implementation of donor-funded climate initiatives in Developing Countries.

The programme has met with considerable success in developing methodologies and training programmes to build capacity to climate-proof development, thus safeguarding donor investments. It has focussed on south-south collaboration and on training for trainers to ensure lasting capacity development in the field of Climate Change. Decision makers, high-level government officials and technical staff have been targeted to increase their capacity to integrate Climate Change policies into the overall dimensions of sustainable development.

Renewable Energy and Energy Efficiency Programme (REEEP)

Ireland announced funding of €0.21m to REEEP (Renewable Energy and Energy Efficiency Partnership) in 2005. REEEP is a Public-Private partnership and was launched at the Johannesburg World Summit on Sustainable Development in August 2002. It has been developed via an intensive consultation process in 2003 covering a wide range of stakeholders at the national and regional levels.

By providing opportunities for concerted collaboration among its partners, REEEP aims to accelerate the marketplace for renewable energy and energy efficiency. Its goals are to:

1) Reduce greenhouse gas emissions
2) Deliver social improvements to developing countries and countries in transition, by improving the access to reliable clean energy services, and by making REES more affordable
3) Bring economic benefits to nations that use energy in a more efficient way and increase the share of indigenous renewable resources within their energy mix.

Funding from Ireland has been prioritised for projects in least developed countries, and in particular its programme countries of Ethiopia, Lesotho, Mozambique, Tanzania, Uganda and Zambia.

4.3.4 Civil Society partnerships

Irish Aid provides a substantial amount of ODA through partnership with Civil Society Organisations. In 2004 expenditure through civil society partnerships exceeded US$ 80 million. In recent years more strategic, programmatic cooperation with civil society organisations has increased the effectiveness of spending. The Multi-Annual Programme Scheme is an arrangement begun in 2003 which provides longer term programmatic funding to five NGOs. Two of these, in particular, focus on sustainable natural resource management and disaster risk reduction. Through their programmes these NGOs and the local civil society organisations that they work with in developing countries carry out a wide range of activities which address livelihood vulnerability and disaster preparedness. It is not possible to put concrete figure on the amount spent on climate change-related activities through these partnerships but it is substantial.

Some examples include a drought management programme in Kenya, an agricultural recovery and diversification programme in Angola, an emergency preparedness in Ethiopia and capacity building to address natural disasters in West Africa.

4.3.5 Emergency and Recovery

Irish Aid's Emergency and Recovery Programme addresses disaster risk reduction and disaster preparedness. Funds are provided to multilateral institutions and civil society organisations to build community and government capacity to respond to and plan for disasters. It is not possible to give an accurate value for funding to climate change related activities but a growing awareness of climate change is reflected in the projects and programmes supported.

4.3.6 Technology Transfer

Ireland provides development assistance in line with the priorities expressed by partner countries. To date requests for assistance in the area of technology are primarily in connection with water supply, transport infrastructure and agriculture. An innovative programme in Ethiopia carries out operational participatory research with farmers, extension workers and government officials to identify, develop and disseminate new agricultural technologies. Some of the successful technologies such as soil conservation techniques are based on traditional practices. Other new technologies are related to new crop varieties and irrigation.

In addition to ODA, private companies also provide technology and advice to developing countries, particularly in the energy sector. Due to the range of funding sources no precise figure is available for funding attributed to technology development and transfer. Ireland's support to REEEP is worth mentioning again here as an example of Ireland's support for technology transfer. REEEP brings the private and public sectors together to facilitate the financing, development and transfer of renewable energy technologies. Ireland believes that this type of public-private collaboration is essential for the development of appropriate and environmentally sound technologies and to facilitate their application and use in developing countries.

4.3.7 Overview of Bilateral and Regional Financial Contributions related to the Implementation of the Convention (US$)

2003

	Mitigation	Adaptation		
Recipient Country/Region	**Energy**	**Capacity Building**	**Coastal Zone Management**	**Vulnerability/ risk reduction**
Tanzania			660,000	
Africa + Asia		111,228		

2004

	Mitigation	Adaptation		
Recipient Country/Region	**Energy**	**Capacity Building**	**Coastal Zone Management**	**Vulnerability/ risk reduction**
Tanzania			660,000	
Ethiopia				4,200,00
Africa + Asia		111,228		

2005

	Mitigation	Adaptation		
Recipient Country/Region	**Energy**	**Capacity Building**	**Coastal Zone Management**	**Vulnerability/ risk reduction**
East & South Africa	250,000			
Tanzania			700,000	
Ethiopia				7,300,000
Africa + Asia		111,228		

4.4 Ireland's National Greenhouse Gas Inventory

The Environmental Protection Agency performs the role of inventory agency in Ireland and has for many years been responsible for compiling the annual inventories and for submitting the results to meet UNFCCC and EU reporting requirements. Significant progress was achieved during 2005 to consolidate the Agency's role in this regard as part of general improvements to develop a formal national system for implementation of the Kyoto Protocol. In addition to complying with the UNFCCC reporting guidelines, the National Inventory Report is intended to inform Government departments and institutions involved in the national system, as well as other stakeholders in Ireland, of the level of emissions and the state-of-the-art of Irish greenhouse gas inventories as they prepare for the challenge to comply with commitments under Kyoto Protocol. The in-depth analysis of key sources and the up-to-date trend data provides useful support for the implementation of the Government's strategy to limit the increase in emissions in key sectors. An informative inventory report allows data suppliers to become fully aware of the importance of their contributions to the inventory process and serves to identify areas where improvements in input data can be achieved.