

IRELAND

NATIONAL CLIMATE CHANGE STRATEGY 2007-2012



Ireland

National Climate Change Strategy

2007 - 2012



Table of Contents

Taoiseach's Foreword.....	4
Minister's Foreword.....	5
Executive Summary	7
Section 1 – The Challenge of Climate Change	
Chapter 1 - Introduction	12
Chapter 2 – What Ireland is doing.....	15
Section 2 – Sectoral Analysis	
Chapter 3 – Energy Supply.....	20
Chapter 4 – Transport	22
Chapter 5 – Residential	25
Chapter 6 – Industry, Commercial and Services.....	28
Chapter 7 – Agriculture, Land-use and Forestry.....	31
Chapter 8 – Waste	33
Chapter 9 - Public Sector	35
Chapter 10 – Cross-Sectoral Action	38
Section 3 - Adaptation	
Chapter 11 – Adaptation to Impacts of Climate Change.....	44
Section 4 - Monitoring and Review	
Chapter 12 – Implementation, Reporting and Review	48
Annexes	
Annex 1 - Greenhouse Gas Inventory and Projections.....	52
Annex 2 – Science and Impacts	54
Annex 3 – National policy for State purchase of Kyoto Units.....	56
Glossary of Terms.....	58



Foreword by An Taoiseach, Bertie Ahern, T.D.

Climate change is among the greatest challenges of our time. The debate is no longer about whether climate change is happening: we now know that it is. The recent report from the Intergovernmental Panel on Climate Change reinforces our understanding of the scale of action required.

Reducing greenhouse gas emissions is a global priority and requires committed international action and cooperation. As a global community we need to reach a collective view on how to share the burden of the challenges ahead.

At the recent European Council, I and other EU Heads of Government agreed that we must continue to show leadership to the rest of the world in tackling climate change. We set ambitious targets for the reduction in greenhouse gas emissions within the EU. We will cut these emissions by at least 20% on 1990 levels by 2020. We are also committed to a reduction of 30% by 2020 provided that other developed countries undertake comparable reductions and the more advanced developing countries make a contribution in line with their capabilities.

Ireland supports the level of ambition represented by these targets. We will contribute fully to their achievement.

Our more immediate target under the Kyoto Protocol is to limit our emissions for 2008-2012 to 13% above the 1990 level. The continuing growth in our economy is undoubtedly putting upward pressure on emissions. But systematic and coherent action under our energy and climate change policies will enable Ireland to meet this target.

With challenges also come opportunities. There is great scope for improving the functioning of energy markets and for increasing investment in energy efficiency and renewable sources; as well as for better use of finite fossil fuels.

However, the scale of the challenge facing us means that we must also look beyond the energy sector to achieve the necessary reductions in greenhouse gases. This Strategy involves a cross-cutting approach and includes targets in the transport, residential, industrial, waste and agricultural sectors. Responsibility must be shared by a wide range of actors, including the public sector, which must lead by example.

To achieve the targets set will also necessitate voluntary changes in behaviour by individual citizens in small ways through, for example, increasing their use of low-energy light bulbs and by driving in a more fuel-efficient manner. This is an area where everyone can and must play a part if we are to be successful in protecting the environment for the next generation.

This National Climate Change Strategy 2007-2012 builds on the commitment to sustainable development set out in *Towards 2016* and the National Development Plan 2007-2013 and is one of a number of inter-related Government initiatives that will address energy and climate change issues. These include the White Paper on Energy, the Bio-Energy Action Plan and the forthcoming Sustainable Transport Action Plan. Taken together, these measures will support environmental sustainability, underpin our competitive position and enable us to meet our global responsibilities.

Bertie Ahern, T.D.
Taoiseach
April 2007



Foreword by Minister for the Environment, Heritage and Local Government, Dick Roche, T.D.

Across the world, the scientific, economic and political analysis of climate change is converging. There is overwhelming scientific consensus on the cause of global warming and the actions necessary to counteract it. There is a developing economic consensus that failure to act will be many times more costly than taking the necessary steps now. And political consensus is growing, led by the European Union, on the urgency and scope of the required global response.

Ireland is playing its part in enabling the European Union to meet its commitments on reducing greenhouse gas emissions. We are also ready to take on the greater challenges that lie ahead.

The Ireland of 2007 is remarkably different from that of 1990. Our economy has grown by 150%. Our population has increased by almost three-quarters of a million and the number at work by 800,000. There has been a phenomenal rate of infrastructural development and housebuilding. It was inevitable that increased activity on that scale would result in some increase in our greenhouse gas emissions. This was recognised by our partners in the European Union when an 8% reduction target was set for the EU as a whole for the 2008-2012 period as compared to 1990. Ireland's target within that was set at a limit of 13% above the 1990 level, to allow for our exceptional rate of growth and development.

The 2008-2012 emissions target is challenging, not just for Ireland but for some of the most environmentally advanced countries in Europe. The most recent data show that, in 2005, we stood 25% above 1990 emissions. We must therefore achieve, in the 2008-2012 period, an average reduction of some 12 percentage points from the current level. This places Ireland in the mid-range of the EU-15 countries in terms of our distance to target.

Ireland will meet its 2008-2012 climate change target.

This National Climate Change Strategy 2007 - 2012 sets out a range of measures, building on those already in place under the first Strategy. It shows clearly that the necessary emission reductions will be delivered, primarily through action within our jurisdiction.

We will, along with most of our partners in the EU burden-sharing agreement, bridge a small part of the gap through use of the flexible mechanisms in the Kyoto Protocol. Doing so allows Ireland to receive credit by supporting the development of clean technology in the developing world. Climate change is a global problem. A tonne of carbon removed from the atmosphere in any part of the world has an equally positive effect. The response to climate change must therefore be on a global scale. The flexible mechanisms in the Kyoto Protocol are integral to that global response.

While the achievement of our 2008-2012 commitment is a key objective of this Strategy, we must also ensure that Ireland is positioned for the greater challenges of the post-Kyoto period.

The European Union is now pursuing international agreement on reductions of 30% on 1990 emissions across all developed countries by 2020. Even in the absence of such an agreement, the EU has committed itself to a unilateral reduction of at least 20%. The EU also accepts the scientific analysis that much deeper cuts will be needed in later decades.

Ireland's precise target for 2020 will be determined in conjunction with our fellow EU member-states. As with the 2008-2012 target, the EU has committed itself to drawing up a burden-sharing agreement which takes account of differing national circumstances. As 1990 will remain the base-year against which targets are set, Ireland's relative under-development in 1990 will continue to be a factor which must be taken into account in the burden-sharing agreement. There is no doubt, however, that whatever target is eventually agreed for Ireland will require us to intensify our action to reduce emissions.

The Government considers that we must begin that intensification now. We need to build on the momentum of measures that have been introduced, such as supports for the use of renewables in energy supply. We also need to tackle areas where progress has been slow - most notably in the transport sector.

The measures set out in this Strategy will represent a significant extra effort across all sectors. They also reflect a whole-of-Government approach which embeds climate change considerations in the development of all relevant sectoral policies. There are close synergies between this Strategy and other key policy statements such as the Energy White Paper and the forthcoming Sustainable Transport Action Plan. Many of the research programmes funded under the National Development Plan will help us develop further measures in areas such as energy technology - for example, Ireland aims to become a world leader in the harnessing of ocean energy.

The transition to a low-carbon world is unavoidable. It is a transition which requires management: otherwise, less effective or more disruptive measures could be proposed for implementation without delivering the necessary results.

Ireland, which owes much of its economic success to innovation, creativity and flexibility, has the ability to adapt quickly and, indeed, to gain competitive advantage from being to the fore. The Government will continue to provide the leadership, direction and resources to ensure that we do so.

Dick Roche, T.D.

Minister for the Environment,
Heritage and Local Government
April 2007

EXECUTIVE SUMMARY

The Global Challenge

There is now a scientific consensus that global warming is happening, that it is directly related to man-made greenhouse gas emissions, and that we have little time remaining to stabilise and reduce these emissions if we are to avoid devastating impacts on our planet.

There is also an economic consensus that the costs of inaction will greatly outweigh the costs of action, and that progressive climate change policies, based on innovation and investment in low-carbon technology, are consistent with global economic growth.

Ireland's Response

Ireland, as a member of the European Union, is committed to a concerted response to this challenge. As our contribution to the EU's commitment under the Kyoto Protocol, we must limit the growth in our emissions to 13% above the 1990 levels in the 2008-2012 period. The EU has adopted a much more challenging reduction target for 2020. While Ireland's precise contribution within this new framework has yet to be agreed, it is likely to require a reduction to below our 1990 emission levels.

This National Climate Change Strategy 2007-2012 follows on from the first national strategy, published in 2000 and reviewed in 2002, and takes account of the public consultation process which followed the further review in *Ireland's Pathway to Kyoto Compliance* (2006).

The purpose of this Strategy is twofold:

- to show clearly the measures by which Ireland will meet its 2008-2012 commitment; and
- to show how these measures position us for the post-2012 period, and to identify the areas in which further measures are being researched and developed to enable us meet our eventual 2020 commitment.

Through innovation, energy efficiency and more sustainability in our personal choices, we can achieve the necessary lowering of the carbon intensity of our economy without sacrificing competitiveness, economic performance or quality of life.

Meeting our 2008-2012 Commitment

The Strategy shows, sector by sector, that the range of existing and additional measures which have already been developed, will reduce Ireland's greenhouse gas emissions by over 17 million tonnes (Mt) of carbon dioxide equivalent in the period 2008-2012.

	Mt CO ₂ equivalent
Reduction from existing measures	8.66
Reduction from additional measures	4.953
Use of flexible mechanisms	3.607
TOTAL	17.22

Table 1: 2008-2012 emission reductions

The quantified reductions include 13.6 Mt (or 79%) resulting from domestic action and 3.6 Mt (or 21%) credited to the Government in return for investing in emission-reduction projects in developing economies. These credits arise under the flexible mechanisms which are an integral part of the Kyoto Protocol since the environmental benefit of a given emission reduction is the same irrespective of where on the planet it is achieved. The Protocol therefore allows countries determine the most cost-effective balance between domestic reductions and investing in reductions elsewhere.

Table 2 shows that the combined effect of all quantified measures will be more than adequate to meet Ireland's Kyoto commitment.

	Mt CO ₂ equivalent ¹
Emissions without any measures	79.829
Existing measures	8.66
Projected emissions after existing measures	71.169
Less: Kyoto target	63.032
Distance to target	8.137
Additional measures	4.953
Flexible mechanisms	3.607
Total additional effect	8.56

Table 2: Achievement of the distance to target

There will be further reductions, not included in these calculations, as a result of measures which cannot be separately quantified, such as awareness campaigns, and measures planned but not yet finalised, such as the rebalancing in 2008 of motor tax and VRT in favour of low-emission vehicles.

Looking forward to 2020

The European Union has committed itself to reducing its greenhouse gas emissions to 20% below 1990 levels by 2020. It has also committed to a reduction to 30% below 1990 levels if there is a global agreement on comparable reductions elsewhere.

Ireland's commitment for 2020 will not be known until the completion of international negotiations on a new agreement and the EU's internal discussions on burden-sharing among the Member States. For illustrative purposes only, Table 3 shows the implications of two possible commitments. In each case, Ireland's new commitment is assumed to be pro-rata to the cut required by the EU as a whole. For example, an EU commitment to 20% below 1990 levels represents a 13% cut on its Kyoto target. A pro-rata cut in Ireland's Kyoto target would require a reduction to 2% below our 1990 emissions, giving a target of just under 55 Mt. Similarly, our target would be 14% below 1990 levels, or 48 Mt, if it were to be pro-rata to an EU reduction of 30%.



	Pro-rata to EU target of 20% cut on 1990	Pro-rata to EU target of 30% cut on 1990
2020 emissions before post-2006 measures	74.12	74.12
Additional measures quantifiable to date	10.107	10.107
New 2020 baseline	64.013	64.013
Possible 2020 target	54.7	48.0
Balance required from unquantified and further measures	9.313	16.013

Table 3: possible 2020 scenarios (all figures are Mt CO₂ equivalent)

The basis for Table 3 is set out in detail on page 18. Post-2006 measures quantified in this Strategy are projected to reduce annual emissions by 10.107 Mt by 2020. The remaining gap is estimated at 9.313 Mt under the first scenario and 16.013 Mt under the second.

The means by which this gap will be bridged include:

- measures which are planned but have yet to be quantified, such as those in the forthcoming Energy Efficiency Action Plan and Sustainable Transport Action Plan;
- measures which cannot be quantified, such as awareness campaigns;
- intensification of the EU Emissions Trading Scheme for the post-2012 period;
- potential use of the Kyoto Protocol's flexible mechanisms beyond 2012; and
- further measures to be developed by the Government, which will be informed by the substantial research programmes now underway.

The Government will update this analysis through an annual Implementation Status Report, which will detail the further measures as they are developed. It will also publish the third National Climate Change Strategy in good time to ensure that Ireland is well placed to meet its post-Kyoto commitments.

KEY ADDITIONAL MEASURES

The following are the principal measures in this Strategy, over and above those already in place when the review of the first National Climate Change Strategy was published in 2006. As the Strategy draws together the Government's collective effort across all sectors to tackle climate change, some of these measures are also included in recent policy statements such as the Energy White Paper and Budget 2007.

Energy Supply (Ch 3)

- 15% of electricity to be generated from renewable sources by 2010 and 33% by 2020
- Biomass to contribute up to 30% of energy input at peat stations by 2015
- Support for Combined Heat and Power projects
- National Ocean Energy Strategy

Transport (Ch 4)

- Modal shift to public transport as a result of Transport 21 investment
- Rebalancing of VRT and motor tax, supported by improved mandatory labelling
- Introduction of biofuels obligation scheme in 2009
- CIE to be required to move to biodiesel blend
- National efficient driving awareness campaign
- Sustainable Transport Action Plan to be published in late 2007
- Support for inclusion of aviation in EU Emissions Trading Scheme

Residential (Ch 5)

- Revised Building Regulations in 2008 to aim for 40% improvement on current thermal performance standards
- Building Energy Rating certification introduced from 2007
- Grants for renewable energy heating under Greener Homes Scheme
- Levy on incandescent bulbs to encourage shift to low-energy bulbs
- Smart meters to be supplied to all electricity customers
- Energy efficiency measures to be funded in social housing programmes

Industry, Commercial and Services (Ch 6)

- Building Regulations and Building Energy Rating
- Energy Agreements Programme
- Bioheat and CHP programmes
- Support for eco-efficient technology and practices

Agriculture, Land-use and Forestry (Ch 7)

- REPS 4 scheme will support carbon sequestration and reduction of emissions from fertilisers
- Support for improved manure management
- Feasibility of anaerobic digestion to be explored
- Top-up to EU premium for energy crops
- New supports for afforestation
- Biomass Harvesting Scheme

Waste (Ch 8)

- Use of waste biomass in energy production
- Support for waste-to-energy projects under REFIT scheme

Public Sector (Ch 9)

- Energy Efficiency Programme with target of 33% energy savings across public sector by 2020
- Biomass heating in schools
- All street lighting and traffic lights required to be energy efficient
- All public sector fleets to be required to move to biofuel blend
- Carbon offsetting of all official air travel

Cross-sectoral (Ch 10)

- €15m multi-annual Climate Change Awareness campaign
- Examination of incentives and disincentives
- Assessment of potential for domestic offset schemes
- Major funding for research programmes

Adaptation (Ch 11)

- Flood risk strategy being developed
- Overall national adaptation strategy to be developed by 2009

Implementation, Reporting and Review (Ch 12)

- Commission on Climate Change to provide high-level advice to Government on progress and to increase awareness in all sectors
- High Level Group on Climate Change to coordinate implementation
- Guidance on cost-benefit appraisal of emission reductions
- Implementation Status Report, including further measures, to be published each year and presented to Joint Oireachtas Committee
- Periodic review by Cabinet Committee
- Third National Climate Change Strategy to focus on post-Kyoto commitments



Section 1 - The Challenge of Climate Change



Chapter 1 - Introduction

THE CLIMATE CHANGE CHALLENGE

Science of Climate Change and Impacts of Expected Changes

The Intergovernmental Panel on Climate Change (IPCC), was established in 1988 by the United Nations Environment Programme (UNEP) and the World Meteorological Organisation (WMO). Its First Assessment Report, issued in 1990, confirmed the scientific basis for concern about climate change. The first part of its Fourth Assessment Report (AR4), *The Physical Science Basis* (2007), concludes that warming of the climate system is unequivocal. This is linked to increases in the atmospheric concentration of long-lived greenhouse gases, particularly carbon dioxide, methane and nitrous oxide. These far exceed pre-industrial levels as a result of emissions to the atmosphere by human activities.

Some of the key conclusions, based on observations and measurements, in the recent AR4 report include:

- the Earth has warmed by 0.76°C on average during the last 100 years with eleven of the last twelve (1995-2006) being the warmest on record;
- global average sea level rose at an average rate of 1.8mm per year over the period 1961 to 2003 with a rise of 3.1mm per year over the period 1993 to 2003, very likely due to thermal expansion and input of fresh water from melting of Greenland and Antarctic ice sheets; and
- there have been significantly increased precipitation amounts in some areas with more intense and longer droughts in others. The frequency of heavy precipitation has increased and hot days, hot nights and heat waves have become more frequent.

The AR4 report also addresses projections of future changes in climate on the basis of no additional initiatives to reduce greenhouse gas emissions. Continued emissions at or above the current rates would cause further warming leading to a projected rise in the global average temperature by 2100 of 1.8°C - 4.0°C. This would result in increases in average air and ocean temperatures, widespread melting of snow and ice, rising sea levels, regional precipitation increases and decreases, and increased frequency of extreme weather events. It is also reported that even if greenhouse gas concentrations were stabilised at 2000 levels, warming and sea level rise would continue at least until the end of the century due to the timescales associated with climate processes and feedbacks.

Unchecked climate change would have dramatic adverse effects on peoples' lives, the environment and the prospects for growth and development. It would affect rainfall water supplies and water quality, agricultural production, and the built environment. Hundreds of

millions of people are vulnerable to flooding due to sea level rise and coastal erosion. Ecosystems are vulnerable to climate change with the risk of extinction for certain species, loss of tundra and certain forest areas, and changes in marine life due to ocean acidification and increased ocean temperatures. Human health will be affected due to climate-related diseases and temperature extremes.

Ireland's future climate will change in line with global changes. A recent report from the Environmental Research Centre of the EPA *Implications of the EU Climate Protection Target for Ireland* (2006) notes that some short-term benefits may occur in agriculture and food production if global mean temperatures are limited to a 1°C increase above pre-industrial levels. However, widespread negative effects are projected for the agricultural and marine environments, for plant and animal distributions, and for water resources with higher temperature increases. Sea level rise will also negatively impact certain coastal areas due to inundation and erosion.

Economic Imperative for early action

The 2006 economic review by Sir Nicholas Stern² brought an important new dimension to the EU and wider international climate change agendas. It estimates that the cost of not taking action to address climate change will be in the range of 5%-20% of global GDP, equivalent to the Great Depression of the 1930s. By contrast, the cost of addressing climate change now could be about 1% of GDP by 2050 – demonstrating that the costs of inaction greatly outweigh the costs of an early and effective international response.

The European Commission makes the case that progressive climate change policies are consistent with global economic growth. Investment in a low-carbon economy will require around 0.5% of total global GDP over the period 2013-2030. This would reduce global GDP by only 0.19% per year up to 2030 – a fraction of the expected annual global GDP growth rate of 2.8%. The Commission has estimated that even a 30% reduction target for 2020, as part of a broad international agreement, would only reduce the EU's annual growth rate by 0.19% per year, without taking into consideration valuable co-benefits in areas such as air quality, human health, energy security and commercial opportunities in new energy markets³.

International framework for action

The Framework Convention on Climate Change was agreed at the 1992 United Nations Conference on Environment and Development in Rio de Janeiro and has been ratified by 190 countries. It sets an overall framework for intergovernmental efforts to address climate change. Its ultimate objective is the stabilisation of greenhouse gas concentrations in the atmosphere at

² Stern Review on the Economics of Climate Change, HM Treasury (2006).

³ Limiting Global Climate Change to 2 degrees Celsius: The way ahead for 2020 and beyond, European Commission, COM (2007) 2.



a level that would prevent dangerous anthropogenic (or man-made) interference with the climate system. It requires Governments to:

- gather and share information on greenhouse gas emissions, national policies and best practices;
- launch national strategies for addressing greenhouse gas emissions and adapting to expected impacts, including the provision of financial and technological support to developing countries; and
- cooperate in preparing for adaptation to the impacts of climate change.

Under the Convention, industrialised countries were expected to take the lead in modifying longer-term trends in emissions. However, commitments by industrialised countries to stabilise their greenhouse gas emissions at 1990 levels by the year 2000 were not legally binding.

The member countries subsequently decided that the Convention should be augmented by an agreement with stricter demands for reducing greenhouse-gas emissions. In 1995, Governments began negotiations on a protocol - an international agreement linked to the existing treaty, but standing on its own.

In 1997, a Protocol to the Framework Convention on Climate Change was adopted at a UN climate conference in Kyoto, Japan. It entered into force in February 2005.

The Protocol's major feature is that it includes mandatory greenhouse gas emissions reduction targets for the world's leading economies, including Ireland. These targets range from -8% to +10% compared to 1990 levels, with a view to reducing their overall emissions of greenhouse gases by at least 5% below 1990 levels in the commitment period 2008 - 2012.

To balance these binding commitments, the agreement offers flexibility in how countries may meet their targets. For example, they may partially compensate for their emissions by increasing "sinks" - forests, which remove carbon dioxide from the atmosphere. This may be accomplished either in their own territories or in other countries. They may also meet part of their targets by investing in foreign projects that result in emission reductions through the Clean Development and Joint Implementation mechanisms provided for in the Protocol.

Ireland in the European Union

The European Union has been proactive in promoting a concerted international response to climate change. This involves mitigation efforts to control greenhouse gas emissions, as well as the promotion of adaptation measures to counter the adverse impacts of climate change that are already inevitable.

The European Union and its Member States are parties to both the Convention and the Kyoto Protocol. Under the Protocol, the 15 Member States then in the EU have a binding collective emission reduction target of 8% below 1990 levels, to be achieved over the period 2008-2012.

The EU has an internal burden-sharing agreement to meet its 8% target by distributing different targets to its Member States. Targets for individual Member States range from a 28% reduction by Luxembourg and 21% reductions by Denmark and Germany, to a 25% increase by Greece and a 27% increase by Portugal. Ireland's target is to limit its average annual emissions to no more than 13% above 1990 levels over the five-year period.

The means by which Ireland will comply with this commitment is set out in detail in Chapter 2.



Looking beyond 2012

The Kyoto Protocol sets out commitments for industrialised countries for the period 2008-2012. Ireland fully supports the position of the European Union on the urgent need for a global and comprehensive post-2012 agreement to build on the Kyoto Protocol and bring about the longer-term emission reductions that are required to limit the increase in global mean average temperature to 2 degrees Celsius above the pre-industrial level.

While the international negotiations will be complex, the European Union wishes to see the process completed and a new international agreement in place by the end of 2009 so that there will be certainty about future commitments well in advance of the end of the Kyoto period.

For the purposes of the international discussions on a post-2012 climate agreement, the European Union has set out a very clear starting position. The Union believes that developed countries should continue to take the lead in responding to climate change by committing to collectively reducing their greenhouse gas emissions by 30% (compared to 1990 levels) by 2020.

At its 2007 Spring meeting, the European Council committed the European Union to a reduction of 30% of its greenhouse gas emissions by 2020 (compared to 1990) as its contribution to a global, comprehensive agreement for the period beyond 2012, provided that other developed countries commit themselves to comparable emission reductions and economically more advanced developing countries adequately contribute according to their responsibilities and respective capabilities. In addition, it made a firm independent commitment to achieve at least a 20% reduction, without prejudice to its position on a post-2012 international agreement.

It agreed that the contributions of Member States to the overall target will be differentiated in a manner to reflect fairness and transparency, and taking into account national circumstances. The European Commission is to carry out, in close cooperation with Member States, a technical analysis of the socio-economic and other parameters which will provide a basis for detailed discussions on the contributions which individual Member States will be expected to make towards the committed 20% reduction, and for whatever further EU commitment emerges from the international discussions on a post-2012 agreement.

While the actual emissions reduction targets which Ireland will face in the period up to 2020 and beyond are not yet known, the following assumptions can be made:

- Ireland will be expected to achieve further significant greenhouse gas emission reductions in the post-2012 period;
- actions taken to meet 2012 targets will have a major bearing on preparations for more challenging targets post-2012;
- there will have to be radical changes across the economy, particularly in relation to the way Ireland produces and uses energy, in the built environment and in transport; and
- energy for transport is the most immediate significant issue.

The challenge now for Ireland is to plan and implement effective action across all sectors to achieve a progressive lowering of the carbon intensity of the economy. Through innovation, energy efficiency and more sustainability in our personal choices, Ireland can meet whatever post-2012 target is eventually agreed, without sacrificing competitiveness, economic performance or quality of life.

Chapter 2 – What Ireland is doing

This National Climate Change Strategy 2007-2012 follows on from the first national strategy, published in 2000, and takes account of the public consultation that followed the review in *Ireland's Pathway to Kyoto Compliance* (2006). Details of the submissions received in that process can be found at www.environ.ie.

This chapter summarises the measures by which Ireland will meet its commitment to limit its greenhouse gas emissions over the 2008-2012 period to 13% above 1990 levels. The measures are examined in more detail in the sectoral chapters that follow.

THE UNDERLYING PRINCIPLES

Ireland is meeting its commitment through a variety of domestic measures to reduce emissions throughout the economy, including participation in the EU Emissions Trading Scheme by all energy and large industry sources. Through the flexible mechanisms in the Kyoto Protocol, Government purchases of carbon allowances will supplement these measures.

Ireland's National Allocation Plan 2008-2012 will provide the administrative framework for participation by Irish installations in the second phase of the EU Emissions Trading Scheme.⁴ It is based on a detailed analysis of the most cost-effective balance between these approaches. The use of market-based instruments such as the EU Emissions Trading Scheme and the Kyoto Protocol flexible mechanisms is fundamentally aligned with both the principles of the Protocol itself, and the approach of the European Union and other Member States to meeting their commitments. This approach recognises that reducing greenhouse gas emissions can and should be achieved in an efficient, cost-effective and equitable manner.

In deciding on emission-reduction measures, the Government must take account of other policy objectives in the various sectors of the economy. While some of these are mutually supportive of the need to tackle climate change (for example, policies on more sustainable use of energy), in other cases the Government must find the appropriate balance between divergent goals. To that end, this Strategy is based on the following principles:

- the need to take a long-term view having regard to likely future commitments and the economic imperative for early action;
- the promotion of sustainable development, including through integration of climate change considerations into all policy areas;
- the protection of economic development and competitiveness, utilising market-based instruments with the exploitation of new markets and opportunities;



- the maximisation of economic efficiency both on a macro-economic basis and within sectors; and
- an equitable approach to all sectors, having regard to the relative costs of mitigation between sectors.

This Strategy will therefore achieve Ireland's existing and future commitments through an integrated approach utilising the full range of policy options, including:

- economic instruments such as taxation and emissions trading with broad sectoral and/or cross-sectoral application which seek to introduce a price signal for emissions of greenhouse gases;
- a broad range of policies and measures using other instruments such as regulation and other incentives towards behavioural change, tailored specifically to relevant sectors;
- a vigorous and appropriate pursuit of common and co-ordinated policies and measures implemented at EU and wider international levels; and
- participation in international emissions trading.

⁴ Available to download at www.epa.ie.

MEETING OUR KYOTO COMMITMENT

Existing measures

Table 2.1 summarises measures that were already in place by early 2006, and were therefore taken into account in the analysis⁵ that underpinned the review paper *Ireland's Pathway to Kyoto Compliance* and Ireland's National Allocation Plan 2008-2012 as submitted to the European Commission in July 2006. The Table shows the estimated emission reductions on foot of each measure for the year 2010, which is used as a proxy for the 2008-2012 average.

Existing Measures	Reductions in 2010 (Mt CO ₂ equivalent)
Energy Supply	
Electricity generation from renewable sources	1.3
Modernisation of natural gas network	0.06
Transport	
Technology Improvements	0.48
Rebalancing of motor taxes and fuel economy labelling	0.05
Dublin Traffic Measures	0.27
Mineral Oil Tax Relief for biofuels	0.27
Residential	
Building Regulations 2002	0.36
Industry, Commercial and Services	
Building Regulations 2005	0.045
Large Industry Energy Network	0.145
Agriculture, Land use and Forestry	
CAP reform – decoupling of support from production	2.4
Forest sinks	2.08
Waste	
Diversion of biodegradable waste from landfill	0.7
Landfill Gas Capture	0.5
Total	8.66

Table 2.1: emission reductions from existing measures

Additional measures

Table 2.2 summarises the additional measures that are examined in more detail in the sectoral chapters that follow. These include:

- measures which have been put in place since early 2006, and were not therefore included in the analysis underpinning *Ireland's Pathway to Kyoto Compliance* and the National Allocation Plan 2008-2012;
- further measures set out in subsequent Government policy statements or in this Strategy; and

- reductions arising from the participation of Irish installations in the 2008-2012 phase of the EU Emissions Trading Scheme.

Additional Measures	Reductions in 2010 (Mt CO ₂ equivalent)
Energy Supply	
Increase in electricity from renewables to 15% by 2010	0.17
Emissions Trading Scheme	2.42
Transport	
Modal Shift through Transport 21	0.51
Alignment of transport investment with spatial planning	0.083
Biofuels obligation – 5.75% by 2010	0.5
Efficient driving awareness campaign	0.13
Residential	
Greener Homes	0.037
Buildings Regulations 2008	0.12
Industry, Commercial and Services	
Emissions Trading Scheme	0.6
Energy Agreements Programme	0.037
F-Gases Regulation	0.024
Commercial Bioheat Programme	0.16
CHP Deployment Programme	0.162
Total	4.953

Table 2.2: emission reductions from additional measures

Government use of the Kyoto Protocol's flexible mechanisms

The Kyoto Protocol includes mechanisms to allow countries gain credit for investment in emission reductions elsewhere. These mechanisms recognise that reductions in emissions have exactly the same benefit in terms of tackling climate change regardless of where in the world they occur. They also allow parties to the Protocol meet their commitments in the most cost-effective way available to them. A majority of the Member States in the current EU burden-sharing agreement will be using the flexible mechanisms for compliance purposes in the 2008-2012 commitment period.⁶

The Kyoto mechanisms, especially the Clean Development Mechanism, are of particular importance to developing countries as they can provide the funding for modern clean technologies.

The Government has designated €270 million under the National Development Plan 2007-2013 for investment under the flexible mechanisms. This is in addition to an initial investment of €20m in 2006. For every tonne of greenhouse gas emissions that is reduced or avoided through investment, Ireland will receive an allowance which can be used to offset an equivalent amount of emissions here.

In the National Allocation Plan, as submitted to the European Commission, the Government has committed

⁵ Analysis carried out by ICF Consulting & Byrne Ó Cléirigh and published in *Determining the Share of National Greenhouse Gas Emissions for Emissions Trading in Ireland 2008-2012*, Department of the Environment, Heritage and Local Government, 2006.

⁶ See *Greenhouse gas emission trends and projections in Europe 2006*, European Environment Agency, 2006.



to purchases of up to 18.035 million allowances over the 2008-2012 period, an average of 3.607 million per year, and it is expected that the designated funding will be sufficient for that requirement. The National Treasury Management Agency will act as the purchasing agent for the State, subject to the guidelines set out in the Purchasing Framework, which is at Annex 3.

Combined effect of all measures

Table 2.3 shows that the full range of measures will reduce Ireland's Greenhouse gas emissions by over 17 million tonnes per annum, approximately 20% of which will be from the purchase of credits.

	Mt CO ₂ equivalent ⁷
Reduction from existing measures	8.66
Reduction from additional measures	4.953
Use of flexible mechanisms	3.607
Total	17.22

Table 2.3: combined effect of all measures

Distance to target

Ireland's Kyoto target is calculated to be 63.032 million tonnes of CO₂e on average over the 2008-2012 period.

The analysis underpinning both *Ireland's Pathway to Kyoto Compliance* and the National Allocation Plan as submitted to the European Commission concluded that the average annual distance to target in that period, after taking account of existing measures, would be 7.174 million tonnes of CO₂e.

In its initial decision in November 2006 on Ireland's National Allocation Plan, the European Commission considered that Ireland had underestimated its projected emissions from the transport sector. The Government has re-examined its projections in the light of reported emissions for 2005 which have subsequently become available. The Government considers it prudent to accept the Commission's assessment and has therefore revised its average projection of annual transport emissions in 2008-2012 upwards by 983,000 tonnes to give a total distance to target of 8.137 million tonnes.

Table 2.4 shows that the combined effect of additional measures and use of the flexible mechanisms will be more than is required to enable Ireland to meet its Kyoto Protocol commitment to maintain emissions within 13% of 1990 levels.

	Mt CO ₂ equivalent ⁸
Emissions without any measures	79.829
Existing measures	8.66
Projected emissions after existing measures	71.169
Less: Kyoto target	63.032
Distance to target	8.137
Additional measures	4.953
Flexible mechanisms	3.607
Total additional effect	8.56

Table 2.4: Achievement of the distance to target

All projections are inevitably subject to some degree of forecasting error. This applies both to the projected emissions in each sector and to the projected effect of the emission reduction measures, and may equally involve over-estimations or under-estimations. The projections are, however, based on the best information and analysis that is available to the Government from the relevant expert sources.

It must also be borne in mind that a number of measures included in this Strategy will have positive effects which cannot be separately quantified and cannot therefore be included in the above tables. Examples include awareness campaigns, spatial and planning policies, and farm measures under the Rural Environmental Protection Scheme. The tables also exclude measures which will be quantifiable when their details are finalised – for example, measures to be included in the forthcoming Energy Efficiency Action Plan and the rebalancing of VRT and motor tax to favour low-emission vehicles which will be implemented from 2008.

Overall, the Government is satisfied that the measures in this Strategy, along with the provision made for the use of the flexible mechanisms, will be more than adequate to meet Ireland's Kyoto commitment. This will enable the use of the flexible mechanisms to be commensurately reduced, or alternatively will enable allowances to be carried forward for use in the post-2012 period.

7. Measures have been quantified for 2010, which is used as a proxy for 2008-2012.

8. Measures have been quantified for 2010, which is used as a proxy for 2008-2012.

LOOKING FORWARD

Ireland's commitment in the post-Kyoto period will not be known until the completion of both the international negotiations on a new agreement and the European Union's internal discussions on burden-sharing among the Member States. The scenarios in Table 2.6 are therefore illustrative only but show the implications of two possible commitments:

- In the first scenario, Ireland's new commitment is assumed to be pro-rata to the cut required by the EU as a whole in moving from its Kyoto commitment of 8% below 1990 levels to a new commitment of 20% below 1990 levels (i.e. the unilateral commitment agreed at the Spring European Council). A pro-rata cut in Ireland's Kyoto limit of 13% above 1990 levels would take us to 2% below 1990 levels by 2020⁹. This equates to an emission level of 54.7 million tonnes.
- In the second scenario, Ireland's new commitment is pro-rata to an EU move to 30% below 1990 levels, to which Europe is willing to commit in the context of a satisfactory international agreement. In that case, Ireland's 2020 target would be 14% below 1990 levels.¹⁰ This equates to an emissions level of 48 million tonnes.

The analysis¹¹ underpinning Ireland's National Allocation Plan 2008-2012 included projections of greenhouse gas emissions to 2020. These indicated that emissions across the economy would be 74.1 million tonnes per annum, before account was taken of any measures beyond those in place in early 2006.

The effects of the measures included in Table 2.2, which will contribute over 5 million tonnes of emission reductions in the 2008-2012 period, have also been quantified to 2020. The assumption has been made that the effect will hold steady, including in relation to the EU Emissions Trading Scheme, except where an additional effect can be estimated on foot of targets adopted by Government, as in the Energy White Paper. The post-2012 effects of the latter targets make a significant contribution to the projected reduction of 10.107 million tonnes on foot of the quantified additional measures. Table 2.5 shows the additional contribution of measures, on the basis of targets included in the Energy White Paper and an initial estimation of the effects of demand side management measures in the transport sector by 2020.

Measure	Contribution by 2020
Extension of electricity from renewables to 33%	3.26
Biofuels use to 10% of transport fuels	0.878
12% renewables share in heating sector on basis of existing programmes	0.276
Transport demand side management measures	0.74
Total	5.154

Table 2.5: additional effect of 2020 targets with existing measures (all figures are Mt CO₂ equivalent)

Table 2.6 shows that the gap which would remain to be bridged is 9.313 million tonnes under the first scenario and 16.013 million tonnes under the second.

	Pro-rata to EU target of 20% cut on 1990	Pro-rata to EU target of 30% cut on 1990
2020 emissions before post-2006 measures	74.12	74.12
Additional measures quantifiable to date	10.107	10.107
New 2020 baseline	64.013	64.013
Possible 2020 target	54.7	48.0
Balance required from unquantified and further measures	9.313	16.013

Table 2.6: possible 2020 scenarios (all figures are Mt CO₂ equivalent)

The means by which this gap would be bridged include:

- measures which have yet to be quantified, such as those in the forthcoming Energy Efficiency Action Plan and Sustainable Transport Action Plan;
- measures which cannot be quantified, such as awareness campaigns;
- intensification of the EU Emissions Trading Scheme for the post-2012 period;
- potential use of the Kyoto Protocol's flexible mechanisms beyond 2012; and
- further measures to be developed by the Government, which will be informed by the substantial research programmes now underway and described in detail in Chapter 10.

The Government will be publishing an Implementation Status Report on the National Climate Change Strategy each year, beginning in 2008. In addition to reviewing progress on implementation, this report will update projections of emissions and quantification of emission reduction measures. It will also detail the further measures which have been introduced or which are in the process of development.

Through this report, the analysis in this chapter will be updated annually, in respect of progress towards both our Kyoto commitment and towards positioning ourselves for our post-Kyoto targets.

Finally, the Government will publish the third National Climate Change Strategy in good time to ensure that Ireland is well placed to meet its post-Kyoto commitments.

9. The EU must cut emissions by 13% to move from 92% to 80% of 1990 levels. A pro-rata reduction would take Ireland from 113% to 98%.

10. The EU must cut emissions by 24% to move from 92% to 70% of 1990 levels. A pro-rata reduction would take Ireland from 113% to 86%.

11. See footnote 5.

Section 2 – Sectoral Analysis



Chapter 3 – Energy Supply

INTRODUCTION

The Government has published a White Paper, *Delivering a Sustainable Energy Future for Ireland*, which sets out the broad energy policy framework for the long-term development of the energy sector, including power generation, and energy use in transport and the built environment. There are significant synergies between the White Paper and this Strategy.

The White Paper recognises that energy policy must make a substantial contribution to reducing greenhouse gas emissions through energy efficiency improvements, changes in the fuel mix and the increased use of renewable energy. Investment in modern energy infrastructure, including the progressive deployment of emerging technologies will, over the longer term, contribute to greater reductions in emissions by increasing the efficiency and sustainability of energy consumption.

GREENHOUSE GAS EMISSIONS

Emissions from the energy supply sector arise predominantly from electricity generation. Other sources include oil refining, gas production and distribution, and solid fuel production. Electricity generation accounted for 96% of energy sector emissions in 2005. The energy sector as a whole accounted for approximately 23% of total emissions in 2005.

EMISSION REDUCTIONS IN THE SECTOR

	Reductions in 2010 (Mt CO ₂ equivalent)
Existing Measures	
Electricity generation from renewable sources	1.3
Modernisation of natural gas network	.06
Sub-total: measures accounted for in 2006 projections	1.36
EU Emissions Trading Scheme	2.42
Increase in electricity from renewables to 15%	0.17
Total Reduction	3.95

Table 3.1: Quantified measures to reduce emissions

Emissions Trading Scheme

The Government's overall approach to the Emissions Trading Scheme for 2008-2012 is set out in Chapter 10. Of the overall annual reduction of 3 million tonnes expected from the ETS, a potential emissions reduction of 2.42 million tonnes is attributed to the energy supply sector.

Electricity from Renewables

Electricity generation from renewable sources provides the most effective way of reducing the contribution of power generation to Ireland's greenhouse gas emissions. The Government has therefore established ambitious

national targets for the contribution of renewables to power generation; 15% of electricity consumed will be from renewable sources by 2010 and 33% by 2020. These are above and beyond existing EU targets. Annual emissions savings of 1.47 Mt will be achieved on foot of the Government's 15% target for 2010.

Existing incentives to help Ireland achieve these targets, such as the Renewable Electricity Feed-in-Tariff (REFIT) Scheme, will be underpinned by strategic planning and investment in infrastructure. The Government will also provide support for research, development and deployment of emerging technologies such as tidal and wave power. Other constraints to the development of renewable energy are also being addressed, for example, with the publication in 2006 of Wind Energy Development Guidelines for Planning Authorities and new grid code connection conditions. Following the completion of the All-Island Grid Study, the Government will, jointly with Northern Ireland, set a further all-island renewable energy target for 2020 to complement the national target of 33%. Figure 3.1 shows the increasing share of renewables in electricity generation to 2020.

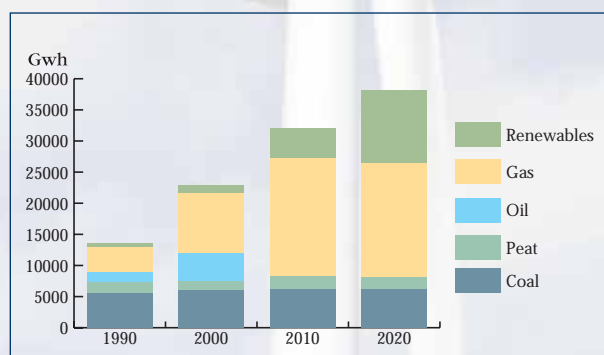


Figure 3.1: Electricity Generation by fuel¹²

Co-firing with biomass in power generation

The Government supports co-firing of biomass with peat in power generation as a means of reducing greenhouse gas emissions and introducing additional diversity into the fuel mix for power generation. The Government has established a target for biomass to contribute up to 30% of energy input at peat stations by 2015, which will contribute to the achievement of the overall renewable electricity target of 33% by 2020. It is estimated that achievement of this target could reduce emissions from peat stations by 900,000 tonnes per annum by 2015. The Government will amend the REFIT scheme to allow biomass from co-firing to avail of the tariff.

For the 2008-2012 period, the peat stations are included in the EU Emissions Trading Scheme and any reduction in emissions as a result of co-firing in this period will be captured by reductions attributed to the Scheme. The Government will further assess how its co-firing target will be included in the 'bubble' for the next phase of the emissions trading scheme after 2012.

12. Source: *Energy in Ireland 1990-2005*, SEI, 2006.

Improvements in generation efficiency

The efficiency of electricity generation, measured as the amount of fuel inputs required to provide a unit of electricity for final consumption, will continue to be improved in line with recent trends to commission additional high -efficiency gas-fired power plants to displace less efficient generating capacity.

Infrastructure development programme

Investment in the region of €7 billion in the electricity and gas networks is envisaged under the National Development Plan 2007-2013. Ongoing investment in electricity networks will continue to reduce losses of electricity, as a percentage of electricity distributed. This investment will be underpinned by analysis to ensure that investment in electricity transmission and distribution networks can accommodate the Government's target for electricity generation from renewables by 2020. Analysis is also underway to assess the potential for various forms of distributed electricity generation, and the implications for the electricity transmission and distribution networks.

Gas transmission and distribution

Following the completion of the North-South gas pipeline, as part of the all-island market developments, the natural gas network will continue to be extended over the 2008-2012 period, where it is cost-effective and economic to do so. A major upgrade programme for the existing natural gas transmission and distribution network will be completed by 2009. The replacement of older cast-iron piping will result in a reduction in fugitive emissions from the network with estimated annual emissions savings of 0.06 Mt in 2008-2012.

Combined Heat and Power

It is recognised that the potential benefit of Combined Heat and Power (CHP), particularly in the commercial and public services sectors, is constrained by economic factors. The Government is acting to stimulate its development with support under the CHP Deployment Programme, which includes support for small scale CHP and large-scale biomass-fed CHP, and additional research and development supports. The Government's ambition for CHP is underpinned by a target to achieve an installed capacity of 400 Mw by 2010 and 800 Mw by 2020. The achievement of the 2010 target will reduce greenhouse gas emissions by 162,000 tonnes on average over the 2008-2012 period. This saving is attributed to the Industrial, Commercial and Services sector for the purposes of this Strategy.

Electricity Demand side management

Electricity Demand Side Management (DSM) programmes have a key role to play in delivering energy efficiency by enabling electricity suppliers and network operators to plan better, and to manage and modify customer demand. The experience to date of schemes such as

the Winter Peak Demand Reduction Scheme shows that substantial savings can be made in electricity costs to business and residential customers. A comprehensive and fully costed DSM Plan will be finalised in 2007, which will include the progressive provision of real-time electricity displays linked to meters to provide information to consumers on electricity usage and its cost.

LOOKING FORWARD

The Government's National Ocean Energy Strategy envisages that Ireland will become a world leader for the development and deployment of ocean energy technologies. The Government is working to realise this long-term ambition with ongoing research into the energy conversion potential and the technical risks of deploying such technologies in the Irish marine environment. An initial target of 500Mw of installed ocean energy capacity by 2020 has been set by the Government as part of its overall renewable electricity target. The development of ocean energy will be supported through the Energy Research Sub-Programme under the National Development Plan 2007-2013, which will see a total investment of €149 million over the period covered by the NDP. Research into ocean energy is also envisaged under the Discovery Research Measure which forms part of the Marine Research Sub-Programme.

The potential of emerging technologies to allow for cleaner generation of electricity from coal over the longer term is recognised by the Government. While carbon capture and storage offers potential in the Irish context, the process is still at the technology demonstration stage internationally and its use on a commercial scale remains to be demonstrated. The Government will keep the potential of clean coal technologies under review in light of international technical and regulatory developments.

The ESB's coal-fired power station at Moneypoint, Co. Clare, is the single biggest source of greenhouse gas emissions in the State. However, its continued operation is fundamental to maintaining an appropriate level of diversity in the national fuel mix for electricity generation so as to ensure security of electricity supply. Given its size in greenhouse gas emissions terms and its importance to the economy, it is essential that the plant operates at maximum efficiency when measured against best available technologies. The scope for the introduction of clean coal technologies and the potential for the use of carbon capture and storage, whether in new plant or by way of refitting existing plant, will be pursued in the period to 2020, in line with the pace and scale of technological and commercial development, as well as planning frameworks, in relation to these technologies.

Chapter 4 – Transport

INTRODUCTION

Transport plays a pivotal role in supporting economic growth and balanced regional development and there has been a strong correlation between economic growth in Ireland and energy consumption and greenhouse gas emissions in the transport sector.

However, it is imperative that growth in emissions in the transport sector is decoupled from economic growth in order for the transport sector to move along a more sustainable path. Recent growth rates in emissions from the transport sector highlights the need for a broad mix of policies and measures, which will achieve a modal shift to public transport, walking and cycling, as well as increased fuel efficiency in both personal and freight transport.

The Government aims to develop a sustainable transport system that will promote economic competitiveness by removing infrastructural bottlenecks and achieving a diverse fuel mix, whilst increasing social cohesion, access to peripheral rural areas and reducing environmental impacts, including greenhouse gas emissions.

GREENHOUSE GAS EMISSIONS

Transport emissions accounted for approximately 19% of total emissions in 2005. Overall between 1990 and 2005, transport emissions increased by 160%, with road transport accounting for the vast majority of that growth. The growth in emissions from the sector can be attributed to economic prosperity, increasing population and employment, urban expansion, reliance on private cars, long distance commuting, larger air passenger numbers and greater freight transportation, particularly by road. A proportion of total emissions from road transport are also attributable to international fuel bunkering, or 'fuel tourism,' arising from cross-border fuel price differentials.

EMISSION REDUCTIONS IN THE SECTOR

	Reductions in 2010 (Mt CO ₂ equivalent)
Existing Measures	
Technology improvements	0.48
Mineral Oil Tax Relief for biofuels	0.27 ¹³
Dublin Traffic Measures	0.27
Rebalancing of motor taxes and fuel economy labelling	0.05 ¹⁴
Sub-total: measures accounted for in 2006 projections	1.07
Modal Shift through Transport 21	0.51
Alignment of transport investment with spatial planning	0.083
5.75% biofuels use in transport fuels	0.5
Efficient driving awareness campaign	0.13
TOTAL	2.293

Table 4.1: Quantified measures to reduce emissions

Modal shift through Transport 21

The provision of infrastructure through the continued implementation of Transport 21, a €34.3 billion capital investment framework for the transport system for 2006 to 2015, will result in a switch from private to public forms of transport. Overall €18.5 billion will be invested in the national roads programme while €15.8 billion will be provided for public transport projects and for regional airports.

Preliminary modelling of the reduction in emissions from implementation of Transport 21 suggests a potential annual average reduction of almost 0.51 million tonnes of CO₂ in 2010. The capital investment will complement the National Spatial Strategy 2002-2020 and Regional Planning Guidelines by better integrating land-use planning and spatial development, and concentrating development in close proximity to transport infrastructure. The effect of this will be to further reduce annual greenhouse gas emissions by 0.083 million tonnes by 2010. As the investment window for Transport 21 stretches to 2015, additional reductions that have yet to be quantified are expected to be realised after the end of the Kyoto commitment period.

An integral part of planning for future public transport provision will require encouraging commuters to move from private car use to more sustainable modes of travel. Existing traffic management measures in urban areas, such as quality bus corridors and park-and-ride facilities, will be enhanced under Transport 21 with further bus priority measures, car restraint measures, park and ride facilities, and improved cycling and pedestrian facilities. Modelling of the effect on emissions due to implementation of demand-side measures in the latter stages of the Transport 21 investment period shows an additional reduction in emissions, with an indicative reduction of 0.74 million tonnes by 2015.

Transport 21 will facilitate a switch to more sustainable modes of transport such as public transport, cycling and walking, and create greater certainty in knowing where best to focus higher density development within the greater Dublin metropolitan area, as well as concentrating development in the hinterland in strategically placed dynamic urban conurbations. The Cork Area Strategic Plan (CASP) provides a model for successful integration of land-use planning and public transport development in urban settlements and their hinterlands.

Fuel efficiency

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 means of personal mobility. Technological advances within the automotive industry will be critically important in bringing more fuel-efficient technologies and alternative fuel technologies to market. Because Ireland is a technology taker, it has little ability to influence the development of cleaner vehicle technology on its own.

13. Updated from *Ireland's Pathway to Kyoto Compliance* in light of revised projections for transport sector.

14. This estimation pre-dates and does not take account of the Budget 2007 announcement. The analysis will be updated when the extent of the tax rebalancing is confirmed.



The Government does, however, support initiatives such as the EU objective of limiting average emissions from private cars to no more than 120g/km by 2012 through improvements in vehicle engine and other technology improvements. Emissions savings in Ireland of 0.48 million tonnes are projected from such improvements. In addition, the National Car Test helps ensure that cars are maintained and operated as fuel efficiently as possible.

VRT and motor tax

From 2008, the basis for assessing both vehicle registration tax and motor tax will be more closely aligned with CO₂ emissions. This is intended to provide further incentives for consumers to choose fuel-efficient cars with lower CO₂ emissions.

The restructuring of these taxes to reflect the climate impact of individual vehicles will be supported by enhancing the existing mandatory labelling system to provide more information on CO₂ emission levels and on fuel economy.

The Government will also consider the extension beyond December 2007 of the existing preferential VRT treatment currently available to series production hybrid-electric, flexible fuel and electric vehicles.

Biofuels

The existing Mineral Oils Tax Relief (MOTR) II Scheme, which aims to place 163 million litres of biofuels on the market at a cost of over €200 million, will achieve the indicative target of 2% by 2008, as set out in the Biofuels Directive, and will achieve emissions savings of 0.27 million tonnes. This will be complemented, from 2009, with the introduction of a biofuels obligation scheme, requiring that biofuels represent a given volume of overall sales, while allowing the market the flexibility to organise the appropriate mix of fuels offered at the supplier level. This will enable Ireland to achieve the EU target of 5.75% biofuels market penetration by 2010 and provide a solid basis for achieving the Government's target of 10% penetration by 2020. Achievement of the 2010 target will reduce emissions by an additional 0.5 million tonnes in 2008-2012.

The Government will support the market uptake of biofuels in publicly owned fleets by requiring the CIE transport companies to move existing fleets to a 5% biodiesel blend and to ensure that all of their new fleet purchases are capable of using biofuels at blends of at least 30% as quickly as is feasible. Hybrid technologies will also be implemented as part of future fleet replacement once production capacity increases.

Efficient driving

The promotion of smooth and safe driving at lower engine revolutions can contribute to increased fuel efficiency and lower greenhouse gas emissions. A national efficient driving awareness campaign will be implemented, building on existing initiatives such as Power of One. Studies have shown that up to a 20% improvement in fuel efficiency can be achieved by more efficient driving. Potential emissions savings from such a campaign are estimated to be 0.13 Mt CO₂ per annum by 2010.

Commuting patterns

The Government recognises and supports the role of employers in promoting more sustainable travel patterns among employees, for example through the highly successful TaxSaver Commuter Ticket Scheme. The Government will support the development of workplace travel plans, building on existing pilot projects, to encourage reduction in private car commuting, use of car sharing and flexible working in individual workplaces. These will be supported by an information campaign, funded under Transport 21, on mobility management and sustainable commuting.

Road freight

The EU Driver Training Directive 2003/59/EC aims to improve the efficiency of road freight operations by including logistics and route planning modules for road hauliers. Under Transport 21, funding has been provided for the modification of 50 selected vehicles to run on 100% pure plant oil (PPO) in a scheme being carried out under the aegis of the German-Irish Chamber of Industry and Commerce. It is expected that this will provide a replicable model for the development of localised supply chains between hauliers and biofuel producers.



LOOKING FORWARD

The Government intends to publish a Sustainable Transport Action Plan in late 2007 and propose an optimal policy mix, which will ensure the delivery of a sustainable transport system. It is intended that this Action Plan will propose a number of sustainable mobility indicators and targets for reducing both greenhouse gas emissions and energy consumption from the transport sector over the period to 2020.

This Action Plan will use a multi-criteria approach, which will balance the need for economic efficiency, reduced environmental impact and social cohesion as well as proposing the appropriate institutional arrangements requisite to deliver a sustainable transport system.

An integral component of ongoing analysis of investment needs for the transport sector will be the development of a national capacity to model impacts on traffic flows, as well as environmental impacts such as greenhouse gas emissions. Steps to put this in place will be initiated during the development of the Sustainable Transport Action Plan, undertaking a more in-depth modelling of the emissions reduction associated with the Transport 21 investment programme.

An Intelligent Transport Systems Strategy, currently being developed by the Department of Transport, will integrate the application of information and communication technologies (ICT) for use in transport management strategies to provide for optimum integration of transport systems. The Strategy will include provision for measures such as integrated ticketing and real-time journey information.

Consideration will be given to the potential introduction of fiscal measures, including road pricing or congestion charging, to reduce transport demand, once adequate supply-side infrastructure is in place.

The Government supports, in principle, having regard to Ireland's peripheral status, the inclusion of aviation and maritime emissions in future restructuring of the EU Emissions Trading Scheme (ETS). Emissions from aviation are projected to continue to grow to more than double present levels by 2020. While emissions from international aviation are not covered by the Kyoto Protocol, initiatives taken now to address the contribution of aviation to climate change will ensure that they do not cancel out the successful reduction of emissions from other sectors over the longer term. The Government is working with other EU Member States to include aviation in the EU Scheme on the basis of the proposal presented by the European Commission in 2006. The Government will also support any future EU framework to address emissions from the maritime sector, such as the possible inclusion of the sector in the third phase of the ETS.

Chapter 5 – Residential

INTRODUCTION

Ireland's housing stock is relatively new. About one third of the current stock was built over the past ten years and this proportion will grow significantly. It is estimated that some 600,000 new homes will be required to meet demand up to 2015. Measures to reduce emissions from the sector are geared towards increasing energy efficiency. At the level of the individual residence, the focus is on construction standards and energy technology. On a broader scale, the Government's recent policy statement *Delivering Homes, Sustaining Communities* places an emphasis on sustainable residential development including energy efficient housing development layouts, and sustainable urban and rural settlement patterns that can help to minimise transport-related energy consumption.

GREENHOUSE GAS EMISSIONS

Emissions from the residential sector accounted for 10.2% of total emissions in 2005. They are based on direct energy consumption for space and water heating in this sector.¹⁵ Emissions associated with domestic electricity consumption are attributed to the energy sector. While there have been record numbers of house completions in recent years, emissions from the average dwelling have fallen by approximately 30% since 1990, primarily as a result of strengthened energy efficiency standards for new buildings and shifts from solid fuels to natural gas for heating.

EMISSION REDUCTIONS IN THE SECTOR

	Reductions in 2010 (Mt CO ₂ equivalent)
Existing Measures	
Building Regulations 2002	0.36
Sub-total: measures accounted for in 2006 projections	0.36¹⁶
Greener Homes	0.037
Building Regulations 2008	0.12
TOTAL	0.517

Table 5.1: Quantified measures to reduce emissions

EMISSION REDUCTIONS IN NEW BUILDINGS

Residential Density Guidelines

The Government will replace the current Residential Density Guidelines with Guidelines on Sustainable Residential Development. These will be issued in draft for consultation in Autumn 2007. The new guidelines will encourage more energy-efficient housing layouts by, inter alia, setting more quantifiable sustainable development standards, maximising access to sunlight and daylight, facilitating greater movement by pedestrians and cyclists, facilitating use of public transport, and using efficient energy supply (such as combined heat and power), where appropriate.

Building Regulations

The Building Regulations are steadily enhancing the thermal performance standards of new and refurbished buildings. The first thermal performance requirements in national building regulations came into force in 1992 and since then, the energy efficiency of new buildings has increased significantly. SEI estimates that the nominal space heating demand of an Irish home built to the 2002 standard is 76% less than that of an equivalent home built in the 1970s although much of that saving is likely to have been displaced by higher internal temperatures. The current standards are expected to achieve an annual emissions saving of 360,000 tonnes in the period 2008-2012.

The Government has commenced a full review of the scope, structure and form of the current building regulations to prepare for the next revision to the Part L thermal performance requirements. This review will examine the scope for extending the coverage of Part L to include a requirement for high efficiency boilers, renewable energy systems, energy efficient lighting, as well as the scope for tighter insulation and air infiltration requirements. Revised Part L standards will come into force in 2008 and will aim to achieve up to a 40% improvement on current standards. These higher standards can be expected to achieve additional emissions savings of up to 120,000 tonnes per annum in the period 2008-2012.

Compliance with Building Regulations is mandatory for all providers of new buildings and major improvement works to existing buildings. The Government is working to achieve strengthened compliance with the regulations. The anticipated enactment of the Building Control Bill in 2007 will strengthen the legal enforcement powers of Building Control Authorities (Local Authorities), with increased maximum penalties for breaches of the Building Regulations.

Building Energy Rating

From 1 January 2007, an energy rating requirement for new dwellings, in the form of a Building Energy Rating (BER) certificate, has been introduced. This certificate will also be introduced for new non-domestic buildings from 1 July 2008 and for existing buildings when being let or sold from 1 January 2009. A BER gives an objective scale of comparison for the energy demand and CO₂ performance of buildings, which will allow prospective tenants or buyers to objectively compare the energy performance of buildings and factor energy performance and costs into purchase or tenancy decisions. 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.

15. Emissions relating to residential construction and the manufacture of construction products are included in the relevant sector, based on the source of emission.

16. This figure has been updated from *Ireland's Pathway to Kyoto Compliance*, in light of revised estimates on numbers of dwellings affected.



EMISSION REDUCTIONS IN EXISTING BUILDINGS

Greener Homes Scheme

The Greener Homes Scheme, launched in 2006 and administered by Sustainable Energy Ireland, will provide €47 million over five years for grant assistance to homeowners who intend to purchase a new renewable energy heating system for either new or existing homes. Over 13,000 applications have been received since the scheme commenced and it is expected to result in annual emissions savings of 37,000 tonnes by 2010.

The Government has recently introduced regulations to provide exemptions from planning permission for the installation of micro-renewable technologies for homeowners. These exemptions apply to wind turbines, solar panels, heat pumps and biomass, subject to certain conditions in each case, and are designed to encourage the uptake of cleaner and cheaper energy from small-scale renewable sources in domestic dwellings. The exemptions will, in many cases, complement grant support provided in the Greener Homes Scheme.

Switch to low-energy light bulbs

Traditional incandescent light bulbs are extremely inefficient; modern CFL bulbs use 80% less energy for equivalent light and last up to 15 times longer. While they are therefore more economical for the consumer in the long-run, their initial cost is higher. The European Commission intends to bring forward a proposal for an EU-wide ban on incandescent bulbs, but this may take a number of years to be agreed and implemented.

To bridge the gap, the Government will introduce an environmental levy on incandescent bulbs, to reduce their price advantage and encourage consumers to switch to CFL bulbs. The intention, as with the very successful plastic bag levy, is to alter consumer behaviour rather than to generate revenue, but any income from the new environmental levy will be channelled through the Environment Fund to support climate change awareness initiatives. It is estimated that emissions savings of up to 230,000 tonnes could be achieved if every household replaced 6 conventional bulbs with CFL bulbs. Further savings could be achieved in non-residential buildings. These savings are not included in Table 5.1 as reduced electricity generation is accounted for as an emissions reduction in the Energy Supply Sector.

Smart meters

Smart meters have demonstrable potential to deliver benefits for energy consumers, including more flexible tariffs offering greater choice and energy saving opportunities, and remote meter reading resulting in reduced costs and full accuracy. Smart meters can also facilitate the incorporation of on-site generation at consumer premises, including renewable generation. The Government will initiate steps in 2007 to roll out the provision, over the next five years, of smart meters for all electricity customers in both new and existing housing stock.

Awareness Initiatives

Consumer information plays a key role in driving energy efficient behaviour. Support for energy awareness initiatives is provided through Sustainable Energy Ireland campaigns and through the national Power of One awareness campaign. This campaign will be sustained over the next three years at national, regional and community level as well as across economic sectors.

Existing awareness initiatives will be complemented from 2007 with the launch of a €15 million multi-annual climate change awareness campaign which will be closely coordinated with complementary initiatives such as the Power of One campaign and various schemes being undertaken by Sustainable Energy Ireland.

Efficiency of appliances

Energy labelling of appliances, to enable consumers to compare energy consumption of product alternatives, is designed to promote the uptake of more energy-efficient appliances. Requirements for energy labelling are laid down in a series of EU Directives. 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. Labelling requirements are to be introduced in a number of additional product categories by 2010.

Energy labelling is underpinned, at the EU level, by the eco-design directive, which provides a formal mechanism for establishing product standards for energy efficiency. Products that do not meet the requirements may not be placed on the market. The European Commission is implementing a three-year programme to develop eco-design requirements for product groups offering the highest potential for energy efficiency improvements, including water heaters and boilers, computers, fridge-freezers, dishwashers and washing machines.

Energy efficiency of social housing

The Best Practice Guidelines, *Quality Housing for Sustainable Communities*, published in March 2007, focus on promoting high standards in design, construction, environmental performance and durability. Sustainable development can be achieved through settlement patterns that are planned in accordance with urban design principles that create high quality neighbourhoods at a density which supports schools, shops and amenities within easy walking distances of dwellings. The guidelines advocate that climate sensitive design should take account of orientation, topography and existing features of the site of a proposed development so as to control wind effects, while optimising the benefits of sunlight and solar gain. Designing for sustainability involves achieving energy efficiency at the design, manufacture, and construction

stages and during the lifetime of the dwellings. The guidelines set the ambition of optimising the energy performance of new homes with the aim of reducing emissions and improving energy efficiency by 40%.

Energy efficient practices that meet the approval of SEI will be funded as part of social housing projects through existing capital programmes such as the Local Authority Housing Regeneration Programme and the Central Heating Scheme, and future programmes to be developed. As the benefits of innovative practices are validated through implementation experience, they will be included in recommended guidelines.

A proposed audit of social housing stock will provide an important incentive to continual improvement of the general quality, including the energy efficiency of social housing. It will also provide a basis for considering the potential for further cost-effective measures to be readily employed to improve the sustainability of housing.

The particular circumstances of low income households require coordinated 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. The SEI Warmer Homes Scheme is the primary intervention in this area.

LOOKING FORWARD

The Government is committed to supporting the adoption of new technology and innovative approaches to design and construction of dwellings. The development and implementation of future measures will be informed by evidence regarding quality and performance characteristics being achieved in practice. The potential for improved sustainability of new housing will be explored, building on the experience of energy performance and rating requirements. Initiatives may be advanced on the basis of voluntary codes with the construction sector with a view to ultimate incorporation into the Building Regulations.

Chapter 6 – Industry, Commercial and Services

INTRODUCTION

The strength of Irish business is key to the long-term strength of Ireland's economy. While economic growth has been remarkable in recent years, the energy efficiency of the economy has also increased significantly. Through further efficiency gains and through innovation, the sector can contribute to emission reductions and can also exploit the domestic and international opportunities presented by the emergence of low-carbon technologies.

The Government is adopting a multi-faceted approach to addressing the diverse sources of emissions in this sector, including economic instruments, regulation, increasing energy efficiency awareness and support for technology deployment.

GREENHOUSE GAS EMISSIONS

The sector contributes to greenhouse gas emissions mainly through direct fossil fuel combustion for heating and emissions that arise in the course of various industrial processes. The sector is also the main source of emissions of industrial gases, in particular through use in refrigeration, air conditioning and in the electronics sector. Emissions from the sector, which include emissions from the Public Sector for inventory purposes, accounted for 17% of total emissions in 2005.

EMISSION REDUCTIONS IN THE SECTOR

Measures	Reductions in 2010 (Mt CO ₂ equivalent)
Building Regulations 2005	0.045
Large Industry Energy Network	0.145 ¹⁷
Sub-total: measures accounted for in 2006 projections	0.19
EU Emissions Trading Scheme	0.6
Energy Agreements Programme	0.037 ¹⁸
F-Gases Regulation	0.024
Commercial Bioheat Programme	0.16
CHP Deployment Programme	0.162
Total	1.173

Table 6.1: Quantified measures to reduce emissions

Emissions Trading Scheme

The Government's overall approach to the EU Emissions Trading Scheme for 2008-2012 is set out in Chapter 10. Of the overall annual reduction of 3 million tonnes arising from the ETS, a potential emissions reduction of 0.6 million tonnes is attributed to this sector – the balance arising in the energy sector.

Building Regulations

The introduction of more stringent energy performance requirements for non-residential buildings, through amendments to Part L of the Building Regulations from July 2006, will lead to significant annual savings on energy use and CO₂ emissions. This is complemented by

a requirement for a feasibility assessment of alternative heating and energy supply systems for buildings over 1000m² before construction begins. The requirement under the European Performance in Buildings Directive to assess the overall energy performance in the design of new non-domestic buildings will be introduced in July 2008 and is intended to promote the development of optimum energy solutions at the design stage.

Building Energy Rating

Building facilities managers will have an additional tool to assess energy consumption in a building with the introduction of Building Energy Rating (BER) for new non-domestic buildings for sale or rent from 1 July 2008 and for existing buildings for sale or rent from 1 January 2009. The BER will provide a transparent assessment of a building's energy performance and the measures that may be put in place to increase performance.

Regulating industrial gases

The EU Regulation on Fluorinated Greenhouse Gases introduces prohibitions and other restrictions for certain products containing such gases, including requirements for operators of appliances that use F-gases to prevent, detect and repair leakages from a list of specified stationary applications and maintain adequate records. The main provisions of the Regulation apply from July 2007 and the Government is working with stakeholders to ensure the smooth implementation of the regulation in Ireland.

Vehicles with air-conditioning units that use a refrigerant known as HFC-134a (which has a global warming potential of 1300 times that of CO₂) are a particular concern. To address the potential consequences of leakage of this refrigerant, the EU Mobile Air Conditioning Directive places restrictions on the types of units fitted to vehicles before they can be approved for sale. The principal effect of the Directive in Ireland is that the provisions in respect of leak detection and refilling of air conditioning units must be implemented by January 2008.

Supporting the achievement of greater energy efficiency

The Government will shortly publish a comprehensive Energy Efficiency Action Plan to deliver a significant reduction in energy demand for Ireland by 2020, building on achievements to date. Programmes will target energy efficiency across all sectors, including business, with the public sector expected to lead by example with an energy efficiency target of 33% by 2020.

The national energy efficiency awareness campaign - Power of One - will continue over the next three years at national, regional and community level. Tailored elements for the business sector will be introduced, and the campaign will be extended to an all-island campaign during 2007.

17. This was not quantified in *Ireland's Pathway to Kyoto Compliance*. Total emissions savings associated with the Large Industry Energy Network are estimated at 195Kt, but approximately 25% is covered by ETS.

18. Total emissions reduction associated with Energy Agreements Programme is 150Kt, but approximately 75% is covered by ETS.



The Irish Standard for Energy Management, (IS 393), promotes energy consciousness in all aspects of business, from design and specification, through procurement, operation and maintenance. Companies that sign up to IS 393 deploy formalised structures to achieve significant energy savings. The Government will work to promote the adoption of the Standard in all workplaces and will, in particular, support its implementation in small and medium enterprises (SMEs).

The Energy Agreements Programme, managed by SEI, is based on IS 393. By joining the Energy Agreements Programme, companies undertake to work towards achieving certification to IS 393, supported by tailored advice from SEI. It is expected that the Programme will eventually attract 60 to 100 of the largest industrial energy users in Ireland to participate. Potential annual savings in greenhouse gas emissions arising from the scheme are conservatively estimated to be 150,000 tonnes by 2010, approximately 75% of which are associated with firms in the Emissions Trading Scheme.

A parallel Energy Management Action Programme (EMAP) is in place for those companies that may not have the resources to commit the audit requirements necessary to obtain IS 393. EMAP can simplify the process for companies towards obtaining IS 393.

Increasing energy costs and environmental regulation are recognised as posing particular challenges for SMEs. There is often significant untapped potential for energy efficiency gains in this sector that are not

being realised due to resource and time constraints. SEI provides tailored advice for SMEs to reduce their energy consumption and will, from 2007, extend the energy agreements programme to the SME sector. In Budget 2007, SEI was allocated an additional €3m specifically to engage in energy efficiency actions with the SME sector.

The SEI-managed Large Industry Energy Network, a voluntary network involving the largest industrial energy consumers in Ireland who together account for around 40% of the total annual industry energy expenditure in Ireland, will continue to improve the competitiveness of its members by reducing energy costs and assisting companies in meeting environmental and regulatory requirements. The experience gained in the network is being used to implement other energy management programmes for the business sector. On the basis of energy efficiency gains by members of the network, emissions in 2010 are expected to be 195,000 tonnes less than would otherwise have been the case.

The business sector is increasingly recognising that strong environmental performance makes good business sense and firms may wish to communicate that their adoption of the superior energy performance practices also demonstrates their commitment to addressing climate change. Building on existing expertise in State agencies such as EPA and SEI, the Government will support and advise businesses that seek proactively to reduce their greenhouse gas emissions.

Support for the deployment of alternative energy

The €26 million commercial bioheat support scheme for renewable heat technologies enables companies and small businesses to obtain grants for the installation of wood chip and wood pellet boilers in large buildings and commercial premises. The scheme is being rolled-out over a five-year period and will support conversion to renewable energy in up to 600 installations depending on overall project sizes. The scheme is being extended in 2007 to enable community and voluntary groups to apply for funding and to include other renewable technologies such as solar and geothermal. By 2010 emissions savings of 160,000 tonnes are expected in a full year from this programme.

The €11 million Combined Heat and Power (CHP) programme provides grants for the installation of CHP units. The scheme is aimed at small-scale units (up to 1 Mw), which can be deployed in hotels, leisure centres, small hospitals, offices or commercial buildings, which have a substantial heat requirement. The programme is running over a five-year period. A target deployment of 400Mw by 2010 has been set by the Government, with a further target of 800Mw by 2020. By 2010 emissions savings of 162,000 tonnes are expected in a full year from this programme.

The Government is examining options to enable the planning system to play a more active role in encouraging renewable energy uptake in the industrial, commercial and agricultural sectors. As a general rule, it is intended that where possible, exemptions from planning requirements will be provided. Where planning considerations relating to specific technologies or sectors preclude exemption, the Department of the Environment, Heritage and Local Government will provide guidance to planning authorities. Where exemptions are provided, the Government will ensure that these complement existing supports provided for the installation of renewable technologies, such as the Commercial Bioheat Scheme.

Innovation and markets

Increasing consumer awareness of climate change and the greenhouse gas emissions associated with products placed on the market will require businesses to address changing expectations of the environmental impact of their products and services. The integration of environmental considerations into business planning is fundamental to the future success of the business sector. *The Strategy for Science, Technology and Innovation 2006-2013* sets out the Government's approach to supporting R&D to enable enterprise innovation in Ireland.

A range of supports, such as Enterprise Ireland's Environmental Management Grant Scheme and the Environmentally Superior Products Initiative, are in place to support the adoption of eco-efficient technologies and practices. These are aimed at improving the

strategic capability of business, in particular SMEs, in the management of their environmental issues, and developing and exploiting the market opportunities that improved environmental performance can provide.

The Environmental Research Technological Development and Innovation (ERTDI) Programme, which is funded by the Department of the Environment, Heritage and Local Government and operated by the Environmental Protection Agency, supports a wide range of projects to improve the level of research and development work on environmental technologies and eco-innovation in Ireland. As part of the overall ERTDI, the Cleaner Green Production Programme (CGPP) works directly with industry to prevent and minimise the impact of industrial activities on the environment.

The Department of the Environment, Heritage and Local Government will, in conjunction with other Government Departments and Agencies, continue to participate in the EU process to implement the European Environmental Technologies Action Plan (ETAP), which will include the objective of ensuring that the greatest possible level of environmental research and development output will be disseminated to, and taken up by, Irish industry.

The Government will aim to build on existing supports to ensure that businesses can:

- exploit the innovation and market opportunities provided by energy efficient and low-carbon technologies;
- avail of potential opportunities for investment abroad through the Kyoto Protocol's project-based flexible mechanisms; and
- provide energy efficient goods and services through the Government's green public procurement action plan.

LOOKING FORWARD

Ireland will work with its EU partners through the forthcoming review of the Emissions Trading Scheme to ensure that it continues to work in a way that will deliver emissions reductions consistent with criteria such as cost-effectiveness, equity, flexibility and maintaining competitiveness.

The review is intended to inform the preparation of a legislative proposal to amend the Emissions Trading Directive for the operation of the scheme after 2012. The Emissions Trading Scheme will therefore remain a central element of the EU's long-term strategy to address climate change.

Chapter 7 – Agriculture, Land-use and Forestry

INTRODUCTION

The agriculture and forestry sectors have a key role to play in addressing climate change, through emission reductions and sequestration and also through the development of renewable energy resources. Emissions from the sector are closely linked to livestock numbers and use of fertilisers.

GREENHOUSE GAS EMISSIONS

The agriculture sector contributed almost 28% of Ireland's emissions in 2005. Total emissions have been declining since 1999 and this is projected to continue through the Kyoto Protocol commitment period and beyond to 2020. Emissions are predominantly non-CO₂ gases and arise primarily from enteric fermentation in animals, management of animal manures and agricultural soils.

EMISSION REDUCTIONS IN THE SECTOR

Measures	Reductions in 2010 (Mt CO ₂ equivalent)
CAP reform – decoupling of support from production	2.40
Forest sinks	2.08
TOTAL	4.48

Table 7.1: Quantified measures to reduce emissions

Impact of Common Agricultural Policy Reforms

The decision by Government to adopt full decoupling of direct payments from production is projected to reduce emissions by 2.4 million tonnes per annum in the 2008-2012 period. The impact of CAP reform will continue beyond 2012 and will be an important factor in Ireland's post-Kyoto strategy.

Rural Environment Protection Scheme

The proposed new REPS 4 scheme, for the period 2007-2013, will not only benefit the environment in terms of water quality or biodiversity, but will also take account of climate change issues. The planting of broadleaf trees will contribute to carbon sequestration. The planting of new hedgerows and the rejuvenation of degraded hedgerows are also expected to be beneficial. Emissions from fertilisers will be reduced, for example through organic farming and by encouraging greater uptake of nitrogen by soil.

Manure Management

Improved farming practices, resulting in better utilisation of nutrients, have the potential to reduce nitrogen applications without significant impact on output levels. The regulations implementing the EU Nitrates Directive will lead to more efficient use of nitrogenous fertiliser and therefore will reduce emissions.

The Government will work to promote awareness among farmers of the benefits of low emission trailing shoe technology for slurry spreading, which reduces

the need for additional chemical nitrogen and will develop mechanisms aimed at increasing the uptake of this technology.

Anaerobic Digestion

The Government recognises that there are a number of financial and technical obstacles to the extensive use of anaerobic digestion. Scope for farm-scale anaerobic digestion is somewhat limited with the main potential in the pig sector. Most cattle manure is already recycled successfully on-farm as fertiliser and needs no further processing. The price at which the energy resulting from anaerobic digestion can be sold raises further questions of viability. The Government will however closely monitor the feasibility of anaerobic digestion in light of experience from the existing Farm Waste Management Technology Demonstration Scheme. Possibilities for centralised anaerobic digestion will be explored with various interests – farmers, suppliers of animal feed inputs, processors – in the context of addressing requirements under the Nitrates Regulations for the intensive agriculture sectors.

Support for reduced emissions in other sectors

In many cases, policies and measures adopted in the agriculture sectors contribute to the reduction of carbon dioxide emissions in other sectors of the economy, such as the electricity, transport and heat sectors, by substituting for fossil fuels and fossil fuel based products. Crops and forest products, grown for use as energy crops or renewable raw materials, have the potential to contribute to the achievement of multiple policy objectives. This is recognised in the recently published Bioenergy Action Plan for Ireland, which sets out an integrated strategy for the delivery of the benefits of Ireland's potential bioenergy resources. Increased use of bioenergy resources will contribute to the achievement of Ireland's renewable energy targets as set out in the White Paper, *Delivering a Sustainable Energy Future for Ireland*.

Energy crops

The Government recognises that support is required for the production of energy crops throughout their lifecycle. €8 million is being provided through a Bioenergy Scheme for establishment grants to plant miscanthus and willow. Establishment costs are estimated at €2,900 per hectare and the proposed grant rate is up to 50% of the costs associated with establishing the crop.

Under the EU Energy Crops Scheme, energy crops may qualify for an EU Premium aid of €45 per hectare provided they have a bioenergy end-use. The Government is providing an additional national top-up of €80 per hectare to the existing EU premium, bringing the overall premium to €125 per hectare. The €80 additional payment will apply for 3 years and will be subject to a maximum ceiling per producer over the



three years. The current maximum area per producer is 37.5 hectares, but this is under review. €6 million is being provided for the energy crop top-up in the period 2007–2009.

The Government has allocated €2.5m in funding for research to, inter alia, identify and select plant varieties and crop production and management systems that are most suited to bio-fuel production in the Irish context.

Under the Research Stimulus Fund Programme operated by the Department of Agriculture and Food, grant assistance of €1.5 million has been allocated to five projects that relate directly to biofuels and energy crops.

Forest wood energy

By far the largest and most readily available biomass resource currently available is from the national forest estate, in the form of thinnings. There is significant potential for wood fuel to displace fossil fuel, particularly in the generation of heat. As a fuel, it can be used in log, wood-chip or pellet form. The Government is committed to the national forestry strategy and will work to develop the wood fuel economy.

A €1.2m Biomass Harvesting Scheme is also being put in place to provide grants towards the purchase of wood biomass processing machinery, such as wood chippers and forest residue bundlers.

Sequestration Potential of Land-use and forestry

Approximately 10% of Ireland's land area is currently covered by forests, with a current target to increase this

to 17%. Forest areas established as a result of grant aid under the State / EU funded afforestation schemes since 1990 are expected to contribute an annual average of 2.074 million tonnes over the Kyoto period. These sequestration estimates will be subject to ongoing review.

In addition to the main afforestation programme, the Rural Development Programme also includes new forestry measures such as the Forest Environment Protection Scheme (FEPS), which encourages farmers to combine the establishment of high nature-value woodland with their participation in REPS. A separate agro-forestry initiative to encourage more on-farm planting is also being put in place. The indicative costs of afforestation under the proposed Rural Development Plan for the period of 2007–2013 are approximately €906 million.

LOOKING FORWARD

In 2007 the Government will conduct an analysis of "research needs" required to support the development of potential future measures to reduce emissions from the sector and also to identify potential climate change adaptation measures. This analysis will inform the call for projects for consideration under the Department of Agriculture and Food's Research Stimulus Fund and under the Public Sector Research Programme of the Strategy for Science Technology and Innovation.

Potential strategies to reduce methane emissions from livestock, in particular by manipulating animal diets, have been identified by recent research. While the effectiveness of these techniques has been confirmed, the economic and practical implications have to be clarified. Further work is continuing, to identify the impacts of husbandry techniques and a range of dietary intervention techniques.

Policies aimed at promoting renewable energy (in the form of heat and electricity) from forestry will create a market for thinnings and residues, in the form of by-products from the forest and the mills. Research is required to develop effective production methods.

Sequestration from non-forests sinks may prove valuable in the post-Kyoto period. A programme of research will be undertaken to increase our understanding of the sequestration potential of sinks, to identify which sinks may be vulnerable in future to carbon dioxide losses and to identify and encourage land management practices which seek to optimise the sequestration potential of non-forest sinks.

The Government recognises that market-based mechanisms may provide scope to deliver additional emissions reductions in the sector and will keep them under review in light of developments at EU and international level.

Chapter 8 – Waste

INTRODUCTION

National policy is to regard waste as a resource. This is reflected in our commitment to developing a recycling society and in the priority given to the diversion of waste from landfill. The implementation of these policies has a positive side-effect in reducing greenhouse gas emissions.

GREENHOUSE GAS EMISSIONS

Emissions from the waste sector consist mainly of methane from the anaerobic decomposition of solid waste that has been deposited in landfill sites. Small amounts of methane and nitrous oxide arise from wastewater treatment. Improved landfill gas management through capture for power generation since 1997 and through flaring since 2001 is contributing to a reduction in methane emissions. Waste accounted for 2.5% of total emissions in 2005.

EMISSION REDUCTIONS IN THE SECTOR

Existing Measures	Reductions in 2010 (Mt CO ₂ equivalent)
Diversion of biodegradable waste from landfill	0.7
Landfill Gas Capture	0.5
Total Reduction	1.2¹⁹

Table 8.1: Quantified measures to reduce emissions

Diversion of biodegradable waste from landfill

Ireland is obliged under the EU Landfill Directive to ensure that no more than 35% of 1995 levels of biodegradable municipal waste is landfilled by 2016.

Ireland's approach to achieving this target is set out in the *National Strategy on Biodegradable Waste* (2006). 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 generating the 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.

Recovery and Recycling

Significant energy savings derive from recycling activity. However, given Ireland's current dependency on overseas recycling infrastructure, many of these CO₂ savings currently arise outside of Ireland. Government policy recognises the value of a more developed recycling infrastructure in Ireland. To this effect, a Market Development Group was established by Government in 2004 with a view to identifying market opportunities for materials recovered for recycling. A Market Development Programme – focusing on the priority waste streams of paper, plastic and organics - is currently being finalised and will be published shortly. Further analysis will be undertaken, following the commencement of this programme, of the potential for emissions savings to be attributed to recycling of recovered materials.

Race Against Waste

In 2003, the Government launched a major new public awareness and information campaign entitled Race Against Waste. The campaign aims to drive home the message that there is a serious waste management challenge facing Ireland and that everyone has a responsibility to respond and improve our attitudes and practices. The campaign features initiatives and practical measures that can be taken by individuals and businesses in helping to solve waste management problems.

The success of Race Against Waste has been based on the fact that it is far more than an information campaign. It directly engages specific audiences who are creating waste - communities, businesses, large organisations and homes - with the objective of improving environmental behaviour. Race Against Waste provides advice and operates programmes that help people to take action to reduce, reuse and recycle.

Landfill Gas Capture

Waste licences issued for landfill sites by the Environmental Protection Agency 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.

The level of landfill gas capture is increased through the implementation of the technical requirements of the Landfill Directive, and utilisation for electricity generation is supported by the Renewable Energy Feed-In Tariff (REFIT) which promotes the increased penetration of electricity from renewable sources in Ireland. The Government is working to expedite the installation of landfill gas recovery and flaring/use at all existing sites under EPA licensing control.

19. These figures have been updated from *Ireland's Pathway to Kyoto Compliance*, in light of further analysis by the Department of the Environment, Heritage and Local Government.



Waste-to-energy

Waste biomass encompasses not only the biodegradable component of municipal and industrial waste, but also the biodegradable fraction of products and residues from agriculture, forestry and related industries. The recently published Bioenergy Action Plan sets out an integrated strategy for harnessing the energy potential of all bioenergy sources, including waste biomass, to make a contribution to renewable energy.

To assist in the development of waste to energy projects, the Government is extending REFIT to allow support for the renewable portion of mixed renewable and non-renewable generation. This will allow waste-to-energy projects to obtain support for the renewable portion of the generated electricity. This type of hybrid support mechanism is fully consistent with the overall 'hierarchy of waste' treatment approach.

Hazardous waste

The main greenhouse gas emissions associated with hazardous waste arise from transportation, particularly in the case of exported wastes. The Environmental Protection Agency is responsible for planning for the management of hazardous waste. Its *National Hazardous Waste Management Plan (2001)* is currently under review. The review process will give consideration to how a revised plan might contribute to reducing greenhouse gas emissions.

LOOKING FORWARD

The Government will continue to encourage the timely implementation of non-hazardous waste management plans by local authorities to provide optimised waste to energy solutions compatible with national waste policy goals, including the *National Strategy on Biodegradable Waste*.

While substantial volumes of biodegradable municipal waste will be diverted from landfill as a result of high

levels of recycling and biological treatment, significant quantities of residual waste will remain. To maximise the recovery of useful materials and energy from residual waste, the *National Strategy on Biodegradable Waste* identifies thermal treatment with energy recovery as the preferred option in most Waste Management Plans adopted by local authorities. The *National Strategy on Biodegradable Waste* also recognises, particularly in the shorter term prior to the development of adequate thermal treatment capacity, a potential role for mechanical biological treatment (MBT). MBT should be expected to contribute to national energy recovery policy. In the absence of energy recovery potential, fully stabilised waste may be sent to landfill where alternative and more suitable treatment solutions are not available.

In accordance with the methodologies developed by the Intergovernmental Panel on Climate Change (IPCC), the CO₂ emissions resulting from the combustion of biodegradable waste are considered carbon neutral and are not counted for the purposes of Kyoto obligations. In addition, generation of heat and electricity from waste in thermal treatment plants reduces the need to produce this energy from fossil fuels and will therefore displace CO₂ emissions from these sources. By exploiting an indigenous energy source, waste-to-energy plants make a contribution to national security of energy supply.

In the current process of revising the Waste Framework Directive (2006/12/EC), mechanisms are being considered which would encourage waste-to-energy plants to increase efficiency to a level comparable to conventional power plants, thereby allowing the energy content within waste to be transformed into electricity and heat for beneficial use in accordance with Best Available Techniques. The Government supports this approach, in the context of the waste hierarchy, which will minimise climate impacts through the sustainable management of waste.

Chapter 9 - Public Sector

INTRODUCTION

The public sector is the biggest landowner, property owner and tenant in the State and also owns the largest fleet of transport vehicles. It has a key leadership role in adopting high energy efficiency standards and practices that can lead by example and drive change through the wider community. It also plays an important role in creating markets and supply chains for renewable technologies, through setting high standards of energy efficiency in its public procurement of goods and services.

GREENHOUSE GAS EMISSIONS

Emissions attributable to the public sector arise from energy use in public sector buildings. These are not reported separately in the annual EPA National Inventory Report, and are therefore included in emissions from the Industry, Commercial and Services sector for the purposes of this Strategy. While emissions for the public sector can be derived from energy consumption data for the services sector, there is a lack of comprehensive data on energy consumption in public sector buildings. The collation of specific data will be essential for developing a greater understanding of future progress in reducing emissions from this sector.

EMISSION REDUCTIONS IN THE SECTOR

Overall target

The White Paper, *Delivering a Sustainable Energy Future for Ireland*, has set a target of 33% energy savings across the public sector and commits the Government to the introduction of an Energy Efficiency Programme, with targets and standards, for Government Departments, State Agencies, Local Authorities, the Health Service and the public sector overall. The Government will require the public sector to lead the way on energy efficiency with a mandatory programme of efficiency measures, including the sole use of energy efficient lighting in offices, schools, hospitals and other public buildings.

In light of this commitment, the Government has agreed that the public sector should achieve a reduction in greenhouse gas emissions equivalent to a 33% saving in energy use by 2020. Every public service organisation will be required to adopt specific targets for reducing emissions, and to measure and report progress in their annual reports.

Public sector offices

The Office of Public Works, as the property manager for central Government buildings, is in a key position to effect significant energy savings in its existing building stock and to encourage the market towards the construction of more sustainable buildings. In parallel with the planned levy on incandescent bulbs (see Chapter 5), the Government will require the exclusive purchase of CFL light bulbs for use in public bodies by the end of 2007.

The OPW has developed a multi-tiered strategy to reduce energy consumption and thereby reduce greenhouse gas emissions:

- Heating Fuel Conversion Programme – to convert the heating systems in approximately 20 large State buildings from their existing fossil fuel burners (oil/natural gas) to biomass burners within 12 months.
- Energy awareness – OPW is currently rolling out a pilot staff energy awareness campaign in 20 buildings, with a target to reduce energy consumption by 10% through local energy conservation campaigns, energy workshops and close monitoring of the performance of heating/air conditioning equipment. It is then proposed to roll the energy awareness campaign out to staff in 250 large OPW buildings.
- Energy efficient design of new buildings – The scope for improving energy efficiency in new buildings is very significant and the design stage of new buildings can considerably improve the energy efficiency of the building over their entire lifetime with little or no additional construction costs. The procurement process for decentralisation is enabling OPW to leverage its office accommodation specification to include higher standards of energy saving and sustainable construction, including the greater use of bio-energy to fulfil the heating and energy requirements of buildings.
- Leased accommodation - OPW is currently examining ways of adapting this specification to the Dublin leased accommodation sector with a view to encouraging and promoting energy efficiency and sustainability in accommodation being offered in the city.

The SEI public sector investment programme aims to stimulate the application of improved energy efficient design strategies, technologies and services in public sector building construction and retrofit projects. The programme is also 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.

A key requirement of the Energy Performance in Buildings Directive is the display of a Building Energy Rating in public service buildings over 1000 m², even when the building is not being placed on the market. Display of the rating will provide information regarding the actual energy use of the building by the current occupant and can also be used to show improvements over time. This will encourage transparency of energy performance by the building occupier and represents a motivational approach to the energy rating of existing large public service buildings. This requirement will



come into effect for all new public service buildings from 1 July 2008 and to applicable existing large public service buildings from 1 January 2009.

Offsetting official air travel

Pending the inclusion of aviation in the Emissions Trading Scheme, the Government has decided that it will voluntarily introduce a carbon offsetting scheme for all air travel on Government business, including flights by Ministers and by civil servants, from the beginning of the Kyoto commitment period in January 2008. Practical arrangements will be put in place to enable each Department to compute annually the emissions associated with its air travel and to make a contribution to an appropriate fund to secure verified emission reductions of an equivalent amount. For example, the Department of the Environment, Heritage and Local Government has calculated that its 2006 air travel would have given rise to a contribution of the general order of €5,000 if such a scheme were already in place.

Schools

The Government will commence a programme of installing biomass heating in schools, starting with 8 schools in the summer of 2007, with a view to expanding this on a significantly wider scale on a national basis. The Department of Education and Science has already developed a number of generic school designs with SEI, which minimise energy use and costs in new schools. This design will be implemented in 40 new schools, which will be capable of being 2 - 3 times more efficient in energy terms than best international normal standards.

Local authorities

Local authorities can have a significant influence over emissions in their local areas, both directly in relation to reducing emissions through their own energy use and procurement activities, in raising awareness and stimulating action in local communities, and indirectly through the exercise of their housing, planning and other statutory functions. The Government has made a commitment that all street lighting and traffic lighting, an area that falls under local authority control, should be energy efficient.

Local authorities are supported by local energy agencies, which provide advice on energy-related matters to households, businesses and to public sector bodies in their respective areas. Local energy agencies also promote renewable energy and energy efficiency at local and regional levels. A number of agencies are working to establish targets for energy conservation and the use of renewable energy technologies within their respective regions.

This Strategy addresses the interaction of spatial and planning policies with climate change considerations in more detail in Chapter 10. The planning functions of local authorities and the role of regional authorities in relation to regional planning guidelines are key considerations in this regard. Decisions by local authorities on the location, design and construction of domestic and commercial developments and of related economic and social activity can have a significant affect on greenhouse gas emissions.

The procurement role of local authorities offers significant potential to address environmental and energy efficiency considerations. In the procurement of

social housing, for example, the Best Practice Guidelines on *Quality Housing for Sustainable Communities* note that appropriate design decisions in relation to dwelling layout, levels of insulation, amount and orientation of glazing, utilisation of solar energy, heating system and fuel type, construction materials and measures to limit the use of potable water can contribute to ensuring sustainability.

Public sector fleets

The Government is developing a Sustainable Transport Action Plan. Promoting fuel efficiency and the increased use of biofuels in publicly owned fleets will play a crucial role in efforts to reduce greenhouse gas emissions of the transport sector. As part of the Action Plan, public sector fleet operators will be required to publish strategies to reduce emissions from their fleets.

Dublin Bus is currently piloting the use of 5% biodiesel blend in vehicles in Dublin. This trial, which uses over 1,000 litres of biodiesel blend per week, is proceeding without any major technical difficulties. The CIÉ group consumes approximately 2 million litres of diesel per annum and the Government has asked the company to move all the existing fleet to 5% bio-diesel blend and to plan to achieve a 30% bio-diesel blend in all new buses.

Building on the initiatives of Cork and Dublin City Councils, the Government will work to ensure that existing transport fleets of local authorities use biofuels at up to 5% blends and that newly purchased vehicles are capable of using biofuel blends of up to 30%.

The operators of a number of other fleets in public ownership have already decided on a greater use of biofuels. In addition to a number of local authorities, the introduction of biofuel of a 5% blend for the entire

fleet of the National Parks and Wildlife Service of 160 vehicles will be completed during 2007. These initiatives by the public sector hold the potential to promote the uptake of biofuels in Ireland and will advance progress towards the national 2009 biofuels obligation target.

Public Procurement

The Government will publish its Action Plan for Green Public Procurement in 2007. The total Government purchasing budget is over €10 billion per annum, giving significant leverage to procurers in the public sector to 'move the market' towards the competitive provision of sustainable products and services. The action plan will underline how high environmental standards must be an integral element of value for money across the whole range of public purchasing. Therefore the importance of training for buyers in the public sector will be highlighted, as well as the concepts of life cycle costing or whole life costing, energy efficiency and sustainability standards.

LOOKING FORWARD

The Government will work with both local and regional authorities to enhance existing coordination arrangements with central Government and state agencies to ensure that they are supported to develop the necessary competencies in relation to climate change mitigation and adaptation issues. This will include the development of indicators that reflect the contribution of local authorities to addressing greenhouse gas emissions, in particular their energy consumption.

Chapter 10 – Cross-Sectoral Action

INTRODUCTION

The sectoral measures set out in previous chapters will be supported by a range of actions to contribute to reducing greenhouse gas emissions across the economy.

Awareness

The Government will introduce a multi-annual awareness campaign on climate change in 2007. A minimum of €15m will be spent over five years, which will be made available from the Environment Fund. This campaign will build on the experiences of existing highly effective campaigns such as *Race Against Waste* and will exploit synergies with the Government's ongoing energy efficiency campaign *Power of One* and various schemes being undertaken by Sustainable Energy Ireland. The campaign will:

- raise general public awareness of climate change, its causes and impacts;
- promote behaviour change to lower emissions; and
- include sub-campaigns to focus on stakeholders in specific sectors and to work in partnership with them on specific programmes and initiatives tailored to achieve emission reductions in their sectors.

TAXATION

The taxation system can make a contribution to reducing greenhouse gas emissions by encouraging behavioural change or investment in energy-efficient technology. In appropriate circumstances, taxation-based measures may be more effective in reducing emissions than other mechanisms, such as regulations or grant-based mechanisms. A range of taxation measures are already in place or will shortly be introduced. These include:

- amending the VRT and motor tax systems to take greater account of environmental issues, in particular CO₂ emissions;
- a five year excise relief scheme for biofuels, costing over €200 million, which commenced in November 2006;
- 50 per cent VRT relief for hybrid vehicles, flexible fuel vehicles and electric vehicles;
- extending the qualifying period for the scheme of corporate tax relief for corporate equity investments in certain renewable energy generation projects; and
- extending and enhancing the Business Expansion Scheme and the Seed Capital Scheme which can, among other manufacturing areas, be used for investment in companies engaged in renewable energy generation and recycling.

The Government will continue to examine other tax incentives or disincentives where these can be shown to have a clear cost-benefit in reducing greenhouse gas emissions.

EMISSIONS TRADING

EU Emissions Trading Scheme

The EU Emissions Trading Scheme, which came into operation in January 2005 on a three-year pilot phase basis, is the EU's flagship response to its international commitments under the Kyoto Protocol. Under the Trading Scheme, the carbon dioxide emissions of approximately 12,000 installations across the EU are controlled on a cap and trade basis. Over 100 Irish installations are participating in the Scheme.

The key economic rationale behind emissions trading is the use of market mechanisms to ensure that emissions reductions for the purpose of achieving a pre-determined environmental outcome are achieved at minimum cost. Emissions trading is a highly efficient means of breaking down national caps into sector-specific or individual business targets. It is particularly well suited to climate change because its effectiveness is independent of any particular region of the world where emission reductions are achieved.

This Strategy sets out the contribution of the energy and industry sectors for the second period covered by the scheme, 2008-2012, based on the overall effort of 3.02 million tonnes proposed in Ireland's National Allocation Plan for the 2008-2012 period. The plan has received an initial assessment by the European Commission and is currently being examined in light of further initiatives taken by Ireland, particularly in relation to Ireland's planned use of the Kyoto Protocol flexible mechanisms. The Government is of the view that the allocation proposed in the Plan as submitted to the Commission is appropriate. If the Commission requires any changes in the allocation the contribution of the energy and business sectors will increase commensurately.

Kyoto Protocol Flexible Mechanisms

Kyoto Parties who chose to purchase carbon credits in lieu of domestic emission reductions are availing of flexible mechanisms provided in the Protocol. Governments, as well as installations participating in the EU Emissions Trading Scheme, can acquire carbon credits by investing in approved projects under the Joint Implementation and Clean Development Mechanisms Articles 6 and 12 respectively of Kyoto Protocol. Provision also exists in Article 17 of the Protocol for Government-to-Government carbon trading.

In respect of the Kyoto Protocol commitment period 2008-2012, Ireland can purchase allowances any time up to the end of 2012. The Government has signalled its intention to purchase up to 3.6 million allowances in respect of each of the five years of the Kyoto Protocol commitment period 2008-2012.

The purchase of carbon allowances is not a substitute for reducing domestic emissions but is a valid approach to supplementing domestic action for the purpose of compliance with the Kyoto Protocol. Therefore, the

possible purchase of up to 3.6m allowances per year over the Protocol commitment period 2008-2012 is very much an upper limit. To the extent that additional measures introduced to secure further cost-effective emission reductions across the economy are successful, the Government will face a lower purchase requirement or alternatively will have more allowances to carry forward for use in the post-2012 period.

Domestic Projects

Domestic offsetting refers to projects to reduce emissions that could be carried out in Ireland in accordance with certain rules. As generally conceived, credits would be issued by the host Government in return for verified emissions reductions. Much interest has been expressed about the possibility of introducing a scheme for domestic projects in Ireland for sectors of the economy outside the EU Emissions Trading Scheme. Such a scheme could also be linked to the Emissions Trading Scheme to allow credits to be used for compliance by participants in the EU scheme. This would have the added attractiveness of extending the concept of emissions trading to additional sectors in which the potential for further emissions reductions might exist.

As Ireland's emissions are currently significantly above the Kyoto target, the economic effectiveness of such projects must be given careful consideration. In examining the potential for such schemes in Ireland, the Government will consider:

- whether they can achieve cost-effective emissions reductions that are verifiable, permanent and additional to those that would otherwise take place with existing measures;
- whether they can provide ongoing incentives for emissions reductions, for example, through technological innovation;
- whether such reductions could be accounted for in Ireland's national inventory of greenhouse gas emissions and thus lead to real reductions in Ireland's distance to target; and
- whether the potential benefits of the schemes would justify the administrative costs, which are likely to be significant.

The Government will undertake an assessment of sectors that offer the most potential for domestic projects, having regard to the criteria set out above, and taking account of existing sectoral support mechanisms and their contribution towards the targets already set out in this Strategy. The feasibility of such projects will be kept under ongoing review in the light of experience in other countries.

Spatial and planning Policies

The *National Spatial Strategy 2002-2020* is based on a sustainable development policy framework. Two of its key principles are intended to minimise transport-related energy consumption i.e.:

- maximising access to, and encouraging use of, public transport, cycling and walking; and
- developing sustainable urban and rural settlement patterns and communities to reduce distance from employment, services and leisure facilities and to make use of existing and future investments in public services; including public transport.

The National Spatial Strategy is also promoting the physical consolidation of large urban areas, which is required to provide an efficient system of public transport in light of the substantial investment that is planned under Transport 21.

The Minister for the Environment, Heritage and Local Government has powers under planning legislation to issue guidelines to planning authorities. A series of guidelines have been issued which support climate change policies:

- **Residential Density Guidelines (1999):** give effect to the Government policy of encouraging more sustainable urban development through avoiding excessive suburbanisation and promoting higher residential densities in appropriate locations, especially in conjunction with improved public transport systems. The Guidelines detail the type of 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.
- **Guidelines on Sustainable Residential Development:** The 1999 Guidelines will shortly be updated with Guidelines on Sustainable Residential Development, which will be issued in draft for consultation in Autumn 2007. The new guidelines will encourage more energy-efficient housing layouts by, for example, setting more quantifiable sustainable development standards, maximising access to sunlight and daylight, facilitating greater movement by pedestrians and cyclists, facilitating use of public transport, and using efficient energy supply (such as combined heat and power), where appropriate.
- **Wind Energy Guidelines (2006):** these supersede 1996 guidelines and are aimed at maximising the development of renewable energy sources. All development plans are encouraged to incorporate a statement of the planning authority's policy in relation to wind energy, particularly by indicating areas considered suitable or unsuitable for wind energy, thus providing greater certainty for potential developers.
- **Planning and Development Regulations 2007 – Micro Renewable Energy Technologies:** Regulations were recently made to amend the exempted development provisions of the Planning and Development Regulations 2001. These will encourage the uptake of cleaner and cheaper energy from small-scale renewable sources in

domestic dwellings. Exemptions, apply to wind turbines, solar panels, heat pumps and biomass subject to certain conditions in each case.

RESEARCH AND OBSERVATIONS

Research

The substantial programme of climate-change related research which was funded under the 2000-2006 National Development Plan has enabled the establishment of new research expertise and capacity in Ireland and produced a considerable body of scientific knowledge. Key contributions include:

- improved understanding of sources and sinks for greenhouse gases and improved reporting under the UNFCCC and the Kyoto Protocol;
- improved understanding of climate change impacts on Ireland and adaptation needs;
- contributions to understanding of the basic science of climate forcing, for example “global dimming” linked to pollutant impacts on cloud formation;
- development of new observation systems and data provision; and
- provision of socio-economic analyses of policy options.

The Government will build on this research base and will further develop expertise and capacity with a range of climate change research initiatives in the 2007-2013 period.

An unprecedented level of funding has been committed by the Government to realise the objectives of the *Strategy for Science Technology and Innovation*, with €6.1 billion provided under the Science, Technology and Innovation Programme of the National Development Plan. Many of the State-funded research programmes will address climate change either directly, or indirectly through the contribution to research in, for example, the energy or agri-food sectors.

The main aim of climate change research is to enhance scientific understanding of climate change issues in support of the development of policy responses that are appropriate for Ireland, in the context of the development of EU and wider international actions on climate change. This research will have a variety of objectives:

- provision of a scientific basis for achievement of a sustainable greenhouse gas emissions profile for Ireland;
- provision of analyses of climate change impacts, key vulnerabilities and identification of sustainable adaptation options;

- identification, development and promotion of socio-economic and technological solutions to mitigate climate change and to adapt to adverse impacts of unavoidable climate change;
- development of analyses of air, land, ocean, exchanges processes and their drivers (including future climate conditions); and
- development of climate observations and analysis systems.

The EPA has established a national climate research data archive under its Environmental Research Centre (ERC) of Excellence. This archive contains a range of data from greenhouse gas emissions to future climate change scenarios²⁰. The EPA will continue its role of coordinating climate change research and dissemination of outputs in the 2007-2013 funding period. Enhanced coordination both with other agencies and with the academic community will be established.

A key role of publicly funded research is its potential to inform policy-making and increase understanding and awareness of the issues among the wider community. Research will support ongoing analysis by Government of climate change issues and facilitate the extension of climate change considerations in decision-making. Research outputs will also support decision-making by local authorities, businesses, community groups and the public on actions to address climate change and provide information to inform private sector investment decisions on climate change issues.

Significant linkages also exist between climate change and other issues, particularly with air quality in relation to ozone depleting substances, transboundary pollutants and particulate matter. Where such links exist, efficient use of resources and analyses will be promoted in order to avail of the co-benefits and cost saving.

The development of effective responses to climate change is ongoing in many countries throughout the world. Ireland will seek to cooperate with EU Member States and more widely, with countries such as the United States and New Zealand, in developing national policies and measures to reduce greenhouse gas emissions. Engagement with EU and international processes is required to provide access to larger infrastructures and analysis systems that are not otherwise available. Such contacts promote the widest possible dissemination of research outcomes, enable Irish researchers to fully participate in international research coordination activities and provide lessons and opportunities for Ireland.

20. <http://www.epa.ie/EnvironmentalResearch>

In seeking to build on this research base, and further develop expertise and capacity on climate change, a new climate and atmosphere analysis centre will be established under the remit of the Environmental Protection Agency. This new centre will strengthen analytical capacity in support of current and emerging regulatory and monitoring activities on climate change and wider atmospheric protection issues. It will provide support for implementation of policies and measures to reduce greenhouse gas emissions through:

- the provision of a focal point for analysis and assessment of greenhouse gas emissions and sinks and wider atmospheric issues;
- linking outputs from research, regulatory and monitoring activities and bridging gaps between these areas;
- the provision of new analytical capacity which will link to similar centres and activities within Europe and more widely; and
- regulatory activities and assessment of the effectiveness of policy responses.

Climate Observations

The UNFCCC has identified the crucial role of high quality systematic observations in assessing the characteristics, rate and impacts of climate change.

In response, the World Meteorological Office (WMO), the Intergovernmental Oceanographic Commission (IOC) of UNESCO, the United Nations Environment Programme (UNEP) and the International Council for Science (ICSU) established the Global Climate Observing System (GCOS) to ensure that the observations and information needed to address climate-related issues are obtained and made available to all potential users. GCOS have identified a suite of essential climate variables required at a global level in order to understand climate change and variability. They have also highlighted the need for preservation and analysis of historic data.

In Ireland, Met Éireann has a long history of high quality meteorological observations and climate variables, which will be sustained and developed to provide a basis for understanding of climate change in Ireland and responses to climate change by key ecosystems and economic sectors.

The Government is committed to developing an appropriate framework within Met Éireann to ensure that Ireland has an adequate and modern capability for climate observations. This will enable Met Éireann to protect, digitize and process all available past climatological observations and ensure all available past climatological records are comprehensively analysed and available for further utilisation. These high quality climatological data are essential to detect changes in the climate system and in its variability, particularly in its extremes, and to continue to verify the prediction models. Met Éireann will lead the further development

of observation systems and will work with other State agencies, including the Marine Institute and EPA, to enhance the climate observation network in Ireland and utilise the most advanced data collection and communication systems for these purposes.²¹

Met Éireann will develop new capacity to protect, digitize and process all available climatological observations and ensure these are comprehensively analysed and available for further utilisation. These data are also used for validating climate models, particularly their ability to simulate the past climate.

Climate Prediction

The ability to make high quality long-term predictions about future climate underpins all planning and adaptation strategies to reduce the adverse impacts of unavoidable climate change. This implies availability of high quality, high resolution, climate information on multi-decadal time scales including information on future variability and extreme climate events.

The Community Climate Change Consortium for Ireland (C4I) project, lead by Met Éireann, has developed climate modelling for Ireland. This integrates large-scale global analyses and outputs from Global Climate Models and dynamically downscales these to provide meaningful information and prediction for the climate at local scales in Ireland.

To date, the C4I project has produced several projections of climate conditions for this century and applied this information to various applications such as the study of river flooding potential. This is a crucial component of national capacity required to inform policy development, sectoral planning and investment in key infrastructure.

Internationally, significant efforts are continuing to improve the quality and performance of global and regional climate models. Sustained efforts are required in Ireland to maintain and develop climate modelling and downscaling capacity in order to ensure that these improvements inform decision-making.

Future work includes the development of more sophisticated climate predictions for Ireland to permit high resolution impacts studies focused on agriculture, forestry, transport, water resources, natural hazards (including extreme events), as well as issues such as potential for renewable energies.

The aim is to inform planning by key economic sectors such as agriculture, forestry, energy and transport and for investment, inter alia, in national infrastructure, construction and flood mitigation.

The Government is committed to sustaining and developing a climate-modelling framework within Met Éireann, building on the C4I project, with links to national and international research in this area, to ensure that Ireland has an advanced capability for prediction of future climate conditions.

21. This will advance GCOS related observation in Ireland such as those carried out under Global Atmospheric Watch (GAW), Global Ocean Observing System (GOOS), and Global Terrestrial Observing System (GTOS) programmes.



Section 3 - Adaptation



Chapter 11 – Adaptation to Impacts of Climate Change

International Context of Adaptation

In addressing global warming, the primary focus of national, EU and wider-international agendas to date has been the mitigation of greenhouse gas emissions in order to prevent dangerous interference with the climate system. Some climate change is, however, inevitable due to historic and current emissions of greenhouse gases. For this reason, adaptation is no longer a policy option – it is a fundamental element of the global response to climate change.

The objective of adaptation is to reduce vulnerability to climate change, thereby reducing its negative impacts. It should also enhance the capability to capture any benefits of climate change. Hence, adaptation, together with mitigation, is an important response strategy.

The Intergovernmental Panel on Climate Change will shortly publish a report on impacts, adaptation and vulnerability, as part of its Fourth Assessment Report. This report further develops scientific understanding of impacts and adaptation associated with climate change.

Impacts on Ireland

The Irish climate is experiencing changes which have been found to be consistent with those occurring at a global scale and there is increasing confidence that these changes are largely attributable to global warming.

Mean annual temperatures in Ireland have risen by over 0.7°C over the period 1890-2004. This increase largely occurred in two periods, between 1910 to the 1940s and from the 1980s onwards, with the rate of warming since 1980 of 0.42°C per decade. In Ireland, 6 of the 10 warmest years have occurred since 1995, the warmest year in that period being 1997.

The 2002 report, *Climate Change: Indicators for Ireland*,²² 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.

The 2003 report, *Climate Change: Scenarios and Impacts for Ireland*,²³ 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 establishing scenarios for future Irish climate, based on statistical downscaling of global climate model projections for the middle and last quarter 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 report 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. By anticipating change, it may be possible to implement adaptation strategies that minimise adverse impacts and maximise the positive aspects of climate change.

The report posits 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 be an increase in January temperatures of 1.5°C, winter conditions in Northern Ireland and the north midlands will be similar to those currently experienced along the south coast; July temperatures will increase by approx 2.5°C, and there will be marked reductions in summer rainfall by 25 – 40%.

Furthermore, the report 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 that will affect farming generally, including the viability of crops such as potatoes. Other impacts 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.

A further 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 2021-2060 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 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 1.25°C and 1.5°C. 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 in the range of 10-25%.
- Storms: increased frequency of severe 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 *Climate Change: Scenarios and Impacts for Ireland*. Established in 2003, C4I

22. Prepared for the Environmental Protection Agency by the Department of Geography, National University of Ireland (Maynooth) and Department of Botany, Trinity College Dublin.

23. Prepared for the Environmental Protection Agency by the National University of Ireland (Maynooth).



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.

A recently published report from the Environmental Research Centre of the EPA, *Implications of the EU Climate Protection Target for Ireland (2006)*, provides an assessment of what the EU target to limit global mean temperatures to not more than 2°C above pre-industrial levels may mean for Ireland. The report notes that Ireland will experience significant climate change impacts below 2°C, many of which are now unavoidable. Some short-term benefits may occur in agriculture and food production if global mean temperatures are limited to a 1°C increase above pre-industrial levels. However, widespread negative effects are projected for the agricultural and marine environments, for plant and animal distributions, and for water resources with higher temperature increases. Sea level rise will also negatively impact certain coastal areas due to inundation and erosion.

Further analysis of climate scenarios by Met Éireann, the National University of Ireland (Maynooth), and other research centres, will examine the impacts for agriculture and water management, focusing on river basin districts. 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.

Adaptation Measures

The 2004 report of the Flood Policy Review Group 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 important 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 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.

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

As part of a comprehensive policy position on climate change, the Government is committed to developing a national adaptation strategy over the next two years. This strategy will provide a framework for the integration of adaptation issues into decision-making at national and local level.

Ireland has also engaged in an exchange of information on impacts and adaptation activities through the British-Irish Council. This initiative has focused on exchanging data on research projects which have improved the understanding of climate change impacts at a local level.



Section 4 - Monitoring and Review



Chapter 12 – Implementation, Reporting and Review

IMPLEMENTATION

The Government has decided to establish a Climate Change Commission to monitor and assess Ireland's progress in addressing climate change and to increase awareness in all sectors of the opportunities and challenges presented by the transition to a low-carbon economy. The Commission will be attached to the National Economic and Social Development Office and will report annually to Government through an appropriate Cabinet Committee.

Overall coordination and implementation of the National Climate Change Strategy will be the responsibility of the Department of the Environment, Heritage and Local Government. In general, implementation of measures at sectoral level will be the responsibility of the relevant Government Departments and agencies.

The Government has agreed that a new High Level Group on Climate Change, comprising senior officials from relevant Government Departments, will be established to coordinate the implementation of the Strategy. This will supersede existing inter-Departmental climate change coordination arrangements. Sub-groups will be established, as necessary, to secure implementation of specific measures that require enhanced policy coordination across sectors and may involve appropriate expertise from State agencies.

Other existing cross-Departmental arrangements and structures will also be utilised as appropriate, to secure the implementation of this Strategy.

The Department of the Environment, Heritage and Local Government will work closely with Local and Regional Authorities, through existing coordination arrangements, to secure implementation of specific aspects of this Strategy at local level.

The implementation principles set out in chapter 2 will underpin the implementation of the Strategy.

COSTS

Where possible, the Strategy identifies the Exchequer costs associated with specific measures but it is recognised that the overall costs of the Strategy will be spread across the economy as a whole and indeed are likely to impact in some way on every household. It would clearly be impossible to attempt to quantify the total cost.

However, the measures in the Strategy also present opportunities for savings across the economy, right down to the individual household. Energy efficiencies, in particular, will reduce living costs for households and improve the profitability of enterprises, competitiveness and employment opportunities.

More importantly, it is quite certain that, for society as a whole, the costs of inaction would greatly outweigh

the cost of action. This was the central message of the Stern report. On a global level, this message concerns the potentially devastating costs of unchecked climate change. At a national level, we must assume that purchasing carbon allowances will become very much more expensive as deeper reductions are sought in the post-2012 period. It therefore makes economic sense to invest now in placing ourselves on a lower-carbon path for the future.

Guidance will be prepared for Government Departments and Offices on appraising the costs and benefits of greenhouse gas mitigation policies. These will be used in conjunction, where appropriate, with existing guidelines for Departments and Offices on conducting Regulatory Impact Analysis.

REPORTING AND REVIEW

A detailed reporting template will be developed to monitor implementation of the measures in this Strategy. This will form the basis of an Implementation Status Report which will be published annually.

The Department of the Environment, Heritage and Local Government will coordinate the preparation of this annual report. On completion, the Minister for the Environment, Heritage and Local Government will arrange for the report to be laid before both Houses of the Oireachtas, prior to presenting it to the Joint Oireachtas Committee on the Environment and Local Government. The first such report will be prepared in 2008 in respect of 2007.

As discussed in Chapter 2, this Report will also update emission projections and quantifications of emission reduction measures and detail the further measures which have been introduced or which are in the process of development.

REPORTING IRELAND'S EMISSIONS

Progress towards meeting Ireland's Kyoto Protocol target is monitored through various international and domestic processes. These ensure that Ireland's progress can be robustly assessed against international best practice and transparently compared to other countries. The two main mechanisms for assessing progress against Ireland's targets are the annual greenhouse gas inventory and the biennial greenhouse gas emissions projections.

International

Each year Ireland reports its greenhouse gas inventory under both the United Nations Framework Convention on Climate Change and the EU Monitoring Mechanism. These inventories are subject to an annual technical review. In addition, Ireland is required to submit periodic national communications to the UNFCCC, which report on action being taken to address climate change. UNFCCC parties are currently on the fourth

cycle of national communications and these will be assessed by the UNFCCC, including country visits by review teams.

Information on Ireland's projections of greenhouse gas emissions must be reported to the EU every two years. This report must include quantitative information on the effects of policies and measures included in projections. The next report is due in 2007. On the basis of information submitted by Member States, including annual updates of recent emissions, the European Commission publishes an annual report on progress towards achieving Kyoto targets by the EU and its Member States.

Data on each year's emissions in the EU Emissions Trading Scheme are also published in the first half of the following year. This information is published simultaneously by all Member States to ensure that the release of market-sensitive data is communicated as transparently as possible.

Domestic

Inventories of Ireland's greenhouse gas emissions are published annually by the EPA in its National Inventory Report. The national arrangements for preparing emissions inventories is governed by the National Atmospheric Inventory System framework²⁴ which sets out the overall institutional framework for the preparation of greenhouse gas inventories by the EPA. The role of each key data provider in this framework is agreed through memoranda of understanding with the EPA.

The preparation of emissions projections has, to date, been undertaken on a consultancy basis for the Government. Experience has shown that this is an extremely data-intensive process and involves the engagement of a range of Government Departments and agencies as well as various actors in the private sector. The assumptions underpinning projections are also subject to regular change as new or amended policies and measures are adopted by Government. Projections in the transport sector, particularly in light of reported emissions in 2005, are considered to require a more robust basis. The development of a national capacity to model, inter alia, the environmental impacts of the Transport 21 investment programme will be initiated in 2007.

The Government is committed to the development of an appropriate and robust structure for the preparation of greenhouse gas emissions projections to provide policy-makers with regularly updated information on projections. The Government has therefore decided that the Environmental Protection Agency will assume a new role with responsibility for preparing projections of greenhouse gas emissions.

The EPA will build on their existing role as inventory agency and will be tasked with preparing emissions projections on an annual basis. Projections will be consistent with macroeconomic forecasts and with projections of activity in sectors such as energy, industry, agriculture and forestry. Projections will also be consistent with policies and measures in place in the relevant sectors and will include quantitative estimates of the effect of policies and measures on emissions consistent with the requirements of the EU Monitoring Mechanism. The EPA will also prepare the report, required every two years under the EU Monitoring Mechanism, on Ireland's greenhouse gas projections.

The Government is committed to an ongoing programme of improvement in the quality of projections, underpinned by relevant sector-specific research, so that policy-makers can avail of robust projections of greenhouse gas emissions and are informed of any need to intensify policies and measures or adopt additional ones.

Looking Forward

The Government will publish the third National Climate Change Strategy in good time to ensure that Ireland is well placed to meet its post-Kyoto commitments.

24. See www.epa.ie



Annexes



Annex 1 - Greenhouse Gas Inventory and Projections

Inventories

The annual inventory estimate of emissions of the six greenhouse gases controlled by the Kyoto Protocol provides the basis for assessing national progress towards Ireland's target of limiting emissions to 13% above those of the base year over the period 2008 to 2012. The base year for Ireland's commitment is 1990 for carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O) and 1995 for the fluorinated or F-gases (HFCs, PFCs, SF₆).

Carbon is sequestered (absorbed) by plants and soils. Under the Kyoto Protocol, carbon sequestered by afforestation, reforestation, and deforestation since 1990 may be accounted for and used to offset emissions. Additional activities (including forest management, cropland management, grazing land management and revegetation) will be the subject of further research in Ireland to determine their potential to act as sinks as part of any post-Kyoto regime.

To arrive at an overall estimate of national emissions, estimates of each of the gases are adjusted to reflect their global warming potential and then aggregated (expressed as millions of tonnes of carbon dioxide equivalents or Mt CO₂e). The amount of carbon sequestered resulting from afforestation, reforestation and deforestation is subtracted to arrive at the overall net emissions for a particular year.

The inventory is compiled by the Environmental Protection Agency in collaboration with a range of state and other bodies with the relevant expertise in each of the sectors of the economy responsible for greenhouse gas emissions. The institutional, legal and procedural arrangements for its compilation are set out in the National Atmospheric Inventory System²⁵. Provisional estimates for the previous year but one are reported to the European Commission in January each year and final estimates to the UNFCCC by mid April each year.

The inventory estimate is subject to continual improvement as, for example, better data sets or estimation methodologies resulting from national or other research becomes available. For consistency any revisions are applied to the full time series of estimates (1990 to current year). The assigned amount for Ireland under the Kyoto Protocol is 113% of base year emissions. This was translated into an absolute figure in the national Assigned Amount Report, which was submitted to the UNFCCC in December 2006. This report is due for review by a UNFCCC review team in April 2007, a process which will finalise in absolute units (Mt CO₂e) Ireland's Kyoto target.

Projections

Emissions projections provide a forecast of future emissions and are a valuable analytical tool to inform both how Ireland will comply with its Kyoto obligations and Ireland's position in post Kyoto negotiations.

The table below sets out Ireland's inventory of greenhouse gas emissions between 1990 and 2005, together with existing projections of emissions to 2020 on a sectoral basis. Projections are based on *Determining the Share of National Greenhouse Gas Emissions for Emissions Trading in Ireland 2008-2012*, prepared for the Government by ICF Consulting & Byrne Ó Cléirigh and published in March 2006. As discussed in Chapter 2, these projections have been updated to take account of revised projections for transport emissions.

An annual average of emissions in each year of the Kyoto Commitment period 2008-2012 is used here for consistency with analysis in Chapter 2 on how Ireland will meet its target for the purposes of the Kyoto Protocol.

The table shows the effect on projections of additional quantified measures, listed in Chapter 2, for 2008-2012, 2015 and 2020.

	1990	1995	2000	2005	2008-2012	2015	2020
Energy	11.85	14.11	16.80	16.32	18.749	19.66	20.52
Transport	5.18	6.32	10.95	13.46	13.992	15.12	16.48
Residential	7.35	6.40	6.55	7.12	6.833	6.59	6.82
Ind/Com/Services	9.78	10.04	12.79	11.95	14.194	15.55	17.05
Agriculture	19.75	20.81	20.39	19.32	17.644	17.07	17.05
Waste	1.46	1.69	1.64	1.78	1.831	1.50	0.85
Carbon Sinks					-2.074	-3.350	-4.65
Total with existing measures	55.37	59.37	69.13	69.95	71.169	72.14	74.12
Total with additional measures					66.216	66.447	64.013

Table 1: Inventories and projections (Mt CO₂e) by sector

25. See www.epa.ie

To date, emissions projections have been produced periodically to inform significant policy decisions. However, with the end of the Kyoto period now less than six years away, it is important that projections are produced annually to refine estimates over time and provide an ex-ante assessment of whether the scope or range of additional policies and measures will need to be adjusted to ensure cost-effective compliance with Kyoto obligations.

The EPA will develop annual national emission projections, in collaboration with relevant state and other bodies to ensure consistency with macroeconomic forecasts, with projections of activity in all sectors including energy, agriculture, industry and forestry. It is important that the assumptions for national projections are consistent with national inventories reflecting changes as appropriate, such as reducing emission factors over time as policies and measures continue to take effect.

The EPA will compile the annual projections to be consistent with UNFCCC guidelines for the preparation of National Communications²⁶ and the provisions of the EU Monitoring Mechanism and its implementing provisions²⁷ including reporting specific indicators for projections.

26. UNFCCC Guidelines for the Preparation of National Communications, Pt II. (FCCC/CP/1999/7).

27. European Parliament and Council Decision 280/2004/EC and Commission Decision 2005/166/EC, respectively.

Annex 2 – Science and Impacts

The United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) established the Intergovernmental Panel on Climate Change (IPCC) in 1988²⁸. The IPCC provides comprehensive, objective, open and transparent assessments of the scientific, technical and socio-economic information relevant for the understanding of climate change. The IPCC does not carry out its own research, nor does it monitor climate related data or other relevant parameters. Its reports are based on material that has been published in peer reviewed scientific literature. IPCC assessment reports are compiled by three working groups in the areas;

- (a) scientific basis of climate change (human and natural);
- (b) potential impacts and adaptation options; and
- (c) options for mitigation of climate change e.g. by reducing greenhouse gas emissions.

The IPCC also produces Good Practice Guidelines for compilation of greenhouse gas inventories and special reports on issues of specific interest for policy makers e.g. carbon capture and storage.

The IPCC First Assessment Report published in 1990 confirmed the scientific basis for concern about human induced climate change. It played an important role in the establishment of the UNFCCC, which was adopted at the Earth Summit in Rio de Janeiro in 1992 and entered into force in 1994. The IPCC Second Assessment Report, published in 1995 was a key input to the adoption of the Kyoto Protocol to the UNFCCC in 1997. The Third Assessment Report (TAR), published in 2001, confirmed and emphasised the findings of the previous reports. Its Fourth Assessment Report (AR4) is being published in stages during 2007.

Fourth Assessment Report

The AR4 Working Group I report *The Physical Science Basis*, was released in February 2007. The Working Group II report on *Impacts, Adaptation and Vulnerability* is due to be released in April 2007 and the Working Group III report on *Mitigation of Climate Change* will be released in May 2007. A synthesis report combining the findings from all of the reports will be published in November 2007.

The Physical Science Basis

The WG I report confirmed the main findings of the TAR with many results being better quantified and with a higher level of confidence. The report finds that warming of the climate system is unequivocal. This is evident from observations of increased global average air and ocean temperatures, widespread melting of snow and ice, and rising global mean sea level. It attributes the observed warming with a “very high confidence” to “the net effect of human activities since 1750”. Key

conclusions, based on observations and measurements, include:

- the concentration of carbon dioxide, methane and nitrous oxide have increased as a result of human activities and the concentration of carbon dioxide and methane in 2005 far exceeds the natural range over the last 650,000 years;
- the Earth has warmed by 0.76°C on average during the last 100 years with eleven of the last twelve years (1995-2006) being the warmest on record. Europe has warmed by almost 1°C since 1990 and at a rate faster than the global average;
- the average temperature of the global ocean has increased as deep as 3000m. Such warming causes seawater to expand, contributing to sea level rise;
- global average sea level rose at an average rate of 1.8mm per year over the period 1961 to 2003. Mountain glaciers and snow cover have declined, contributing to sea level rise. Losses from the Greenland and Antarctica ice sheets are very likely to have contributed to sea level rise of 3.1 mm per year over the period 1993 to 2003;
- long-term changes have been observed at continental and regional scales including changes in Arctic temperatures and ice, precipitation amounts, ocean salinity and wind patterns;
- average Arctic temperatures increased at almost twice the global average rate in the past 100 years, Arctic sea ice has shrunk by 2.7% per decade and temperatures at the top of the permafrost layer have generally increase by up to 3°C since the 1980s;
- significantly increased precipitation has been observed in eastern parts of North and South America, northern Europe and northern and central Asia. More intense and longer droughts have been observed over larger areas since the 1970s, particularly in the tropics and subtropics. The frequency of heavy precipitation events has increased and widespread changes in extreme temperatures have been observed with hot days, hot nights, and heat waves more frequent; and
- the equilibrium climate sensitivity, defined as the global average surface warming following a doubling of carbon dioxide concentrations (relative to pre-industrial levels) is likely to be in the range 2°C - 4.5°C with a best estimate of about 3°C.

The WGI report also provides more advanced and detailed projections of future climate conditions than were possible for the TAR. The projections are based on a series of greenhouse gas emission scenarios. These do not include analysis of international initiatives to address climate change.

28. See www.ipcc.ch

The report finds that continued emissions of greenhouse gases at or above current rates would result in greater changes to the global climate system over this century than those observed to date. It finds that if atmospheric concentrations of greenhouse gas had been stabilised at 2000 levels warming and sea level rise would continue at least until the end of this century due to the timescales associated with climate processes and feedback. Key projections include:

- a temperature increase of 0.2°C per decade for the next two decades with a warming of 1.8–4.0°C by 2100 (the full uncertainty range is 1.1-6.4°C). This is expected to be greatest over land and across most northern latitudes;
- global average sea level rise in the ranges 18–38cm for the low emissions scenario and 26-59cm for the high emissions scenario. These may be underestimates due to the fact that the models do not include the full effects of changes in ice sheet flow;
- sea ice is projected to shrink with summer sea ice in the Arctic disappearing in some projections by the end of the century;
- it is very likely that hot extremes, heat waves, and heavy precipitation events will continue to become more frequent and likely that future tropical cyclones will become more intense;
- precipitation decreases are likely in most subtropical regions with increases very likely in high latitudes; and
- increasing atmospheric carbon dioxide concentrations lead to increasing acidification of the ocean.

Climate Change Impacts

The forthcoming IPCC WG II report is expected to confirm and strengthen the key messages of the TAR in relation to impacts and vulnerabilities, including that physical and biological systems on all continents are being affected by climate change, particularly through temperature increases.

The main changes to physical systems are reduced snow cover, increased ice-melt and thawing of permafrost, a more intense hydrological cycle, rising sea-level, and warming of oceans, seas, lakes and rivers. For biological systems a 'greening' of vegetation in spring and increased net primary production, and shifts in ranges and changes in algal, plankton and fish abundance associated with rising water temperatures as well as related changes in ice cover, salinity, oxygen levels and circulation are expected.

It attributes observed changes to anthropogenic emissions of greenhouse gases and provides guidance to the Parties to the UNFCCC on key vulnerabilities that could constitute "dangerous anthropogenic interference" with the climate system and urges actions to alleviate and avoid key impacts and risks.

Impacts of Climate Change for Ireland

Generally, the Irish climate is experiencing changes consistent with those occurring at a global scale. Ireland can expect future temperature changes to also reflect changes that occur at a global level. Current climate research in Ireland and a brief synopsis of some recent outputs is described in Chapter 11.

The EU considers that the objective of the UNFCCC, to stabilise atmospheric greenhouse gas concentrations at a level that would prevent dangerous anthropogenic interference with the climate system, can be achieved if the greenhouse gas stabilisation level limits the global temperature increase to 2°C above pre-industrial levels. The EPA Environmental Research Centre report titled *Implications of the EU Climate Protection Target for Ireland* states that the 2°C target is an appropriate 'guard rail' for avoiding dangerous climate change in relation to major climate impacts. The report also outlines the main impacts of climate change for Ireland by sector. The impacts are both positive and negative, depending on the magnitude and the rate of global temperature change. While some benefits can be achieved if global mean temperatures are limited to a 1°C increase, above this level there are widespread negative effects. The table below, taken from the report, is a summary of the potential impacts and vulnerabilities for Ireland. Further research on impacts is ongoing under the EPA's research programme and planned under the recently announced Public Sector Research Fund of the Strategy for Science, Technology and Innovation.

Up to 1°C	Up to 2°C	Greater than 2°C
Longer growing season	Increased likelihood and magnitude of river flooding	Sea level rise due to thermal expansion of oceans, melting of the GIS, collapse of the WAIS
Potential for new crops, e.g. soybean	Reduced soil moisture and groundwater storage	Loss of coastal habitats due to inundation and increased erosion
Increased production of existing cereal and grass crops	Water shortages in summer in the east which will impact upon reservoirs and soil management	Increased incidence of coastal flooding
Earlier breeding of animals and birds	Increased demand for irrigation	More intense cyclonic and extreme precipitation events
Heat stress will have an impact on animal and human health	Change in distribution of plants and animals, e.g. decline and possible extinction of cold Arctic species	
Negative impact on water quality, e.g. reduction in quantity of water to dilute pollution	Fisheries could be affected as fish stocks are sensitive to small changes in temperature	
	Increased frequency of forest fires and pest infection	

Table 1: Summary of potential impacts and vulnerabilities for Ireland²⁹.

²⁹ Source: *Implications of the EU Climate Protection Target for Ireland*, EPA, 2006.

Annex 3 – National policy for State purchase of Kyoto Units

NATIONAL POLICY FRAMEWORK FOR THE PURCHASE OF KYOTO UNITS BY THE STATE FOR THE PURPOSE OF COMPLIANCE WITH THE KYOTO PROTOCOL IN THE COMMITMENT PERIOD 2008-2012

Introduction

This document sets out the institutional arrangements and policy context within which Ireland will purchase Kyoto Units³⁰ sufficient to enable it to meet its greenhouse gas emissions limitation target for the purposes of the Kyoto Protocol in the commitment period 2008-2012.

Background

For the purposes of the Kyoto Protocol, Ireland is committed to limiting average annual greenhouse gas emissions in the period 2008-2012 to 13% above 1990 levels.

Parties to the Kyoto Protocol may achieve their individual targets through domestic actions and use of flexible mechanisms provided for in the Protocol. The Protocol requires that use of the flexible mechanisms be supplemental to domestic actions.

The *National Climate Change Strategy 2007-2012* provides the national policy framework for addressing greenhouse gas emission reductions and ensuring that Ireland meets its target for the purpose of the Kyoto Protocol.

The Government has decided that it will use the Kyoto Protocol flexible mechanisms to purchase up to 3.607 million Kyoto Units in respect of each year of the 2008-2012 period. This requirement will be revised as necessary in light of future projections and the impact of any additional measures to reduce greenhouse gas emissions.

Kyoto Protocol Flexible Mechanisms

A key component of the Kyoto Protocol was the introduction of three flexible mechanisms to reduce the overall costs of achieving emission reductions for those Parties with emission reduction or limitation targets. These mechanisms - Joint Implementation, the Clean Development Mechanism and International Emissions Trading - are described in more detail below. The mechanisms enable Parties to purchase Kyoto Units from other Parties or to invest in cost-effective opportunities to reduce emissions or increase sequestration through projects in other countries. While the cost of reducing emissions varies considerably between projects and between countries, the effect for the atmosphere of limiting emissions is the same irrespective of where the action occurs.

Joint Implementation (JI): provided for under Article 6 of the Protocol, enables Parties with reduction commitments or private investors to implement projects that reduce emissions in other Parties with reduction commitments, in return for credits. Credits generated using the JI mechanism can be used by the investing Party or private entity (particularly within the EU Emissions Trading Scheme) for compliance purposes. The tradable unit under the JI mechanism is an Emissions Reductions Unit (ERU).

Clean Development Mechanism (CDM): provided for under Article 12 of the Protocol, enables Parties with targets to participate in projects that reduce emissions or contribute to sequestration in those Parties that do not have targets under the Protocol. The mechanism is aimed primarily at developing countries and is intended to assist them in achieving sustainable development through, for example, access to cleaner or more energy efficient technologies. Credits generated using the CDM mechanism can be used by the investing Party or private entity for compliance purposes. The tradable unit under the CDM mechanism is a Certified Emissions Reduction (CER).

International Emissions Trading: provided for under Article 17 of the Kyoto Protocol³¹, enables Parties that have a greenhouse gas emissions limitation or reduction target under the Protocol to acquire Kyoto Units from those Parties that have reduced their emissions beyond their target under the Protocol. The tradable unit under emissions trading is an Assigned Amount Unit (AAU).

National Focal Point for JI and National Authority for CDM

A requirement of Parties to the Kyoto Protocol is the designation of a Focal Point and a National Authority for the purpose of the JI and CDM mechanisms respectively. Under the Kyoto Protocol (Flexible Mechanisms) Regulations 2006 (S.I. 244 of 2006), the Minister for the Environment, Heritage and Local Government has designated the Environmental Protection Agency as both the Focal Point and National Authority in Ireland. 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. Decisions made by the Agency on individual proposals to participate in JI or CDM projects shall be final. Project approval must also be sought in the intended host country.

30. A credit or allowance, equivalent to one metric tonne of carbon dioxide, issued pursuant to the Kyoto Protocol and the decisions adopted pursuant to the United Nations Framework Convention on Climate Change and to the Protocol. A credit is equivalent to one tonne of carbon dioxide that has already been removed. An allowance refers to a right to emit the equivalent of one tonne of carbon dioxide at some point in the future.

31. Emissions trading under Article 17 of the Kyoto Protocol is distinct from the EU Emissions Trading Scheme. Operators in the EU Scheme may, however, use credits from the JI or CDM mechanisms for compliance with their obligations up to a percentage of their allocation, which is to be specified in the National Allocation Plan for the Member State in question.

Establishment of registry under the Kyoto Protocol

In accordance with decisions adopted by Parties to the Kyoto Protocol, the 2006 Regulations (S.I. 244 of 2006) provide for the establishment of a national registry and the designation of the Environmental Protection Agency as the national registry administrator. The function of the national registry is to ensure accurate accounting of the issuance, holding, transfer, acquisition, cancellation and retirement of Kyoto Units.

National Purchasing Agent

The National Treasury Management Agency is the designated purchasing agent for the State and will administer and manage purchases of Kyoto Units on behalf of the Government. A dedicated Carbon Fund has been established for this purpose.

The role of the Agency as purchasing agent is established on a statutory footing under the Carbon Fund Act 2007. The Act provides for the purchasing agent to perform all functions associated with the management of the Carbon Fund, including appropriate accounting for expenditure having regard to public financial procedures, subject to guidelines and/or direction from the Minister for the Environment, Heritage and Local Government.

Funding of the purchase of Kyoto Units

Funding for the purchase of Kyoto Units will be provided from the Central Fund to the Carbon Fund, also established under the 2007 Act. In the course of the annual estimates process, provision will be made in the Vote of the Department of the Environment, Heritage and Local Government to repay the Central Fund.

The Government has designated €270 million for investment in the flexible mechanisms under the National Development Plan 2007-2013. This is in addition to an initial investment of €20m in 2006.

Framework for the purchase of Kyoto Units

The National Treasury Management Agency shall purchase Kyoto Units on behalf of the State. All purchases shall be made in accordance with the following objectives:

- that they contribute to the ultimate objective of the United National Framework Convention on Climate Change, i.e. *stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system*;
- that risk is minimised, particularly in relation to the timely delivery of credits; and
- that they represent good value for money.

The National Treasury Management Agency may use the following mechanisms to purchase Kyoto Units:

- direct purchase of Kyoto Units from other Kyoto Protocol Annex B Parties;
- direct investment in joint implementation and clean development mechanism project activities;
- investment in managed funds; and
- direct market purchases of Kyoto Units;

or a combination of some or all of these, subject to ensuring that, in accordance with decisions adopted by the Parties to the Kyoto Protocol:

- any surplus Kyoto Units held by the State at the end of the 2008-2012 commitment period can be banked and used in a subsequent commitment period of the Kyoto Protocol or any successor treaty; and
- Ireland does not use emissions reduction units or certified emissions reductions generated from nuclear facilities, for the purpose of meeting its Kyoto Protocol commitments.

The Minister for the Environment, Heritage and Local Government may, having regard to the objectives set out above, enter into bilateral agreements for the purpose of acquiring Kyoto Units pursuant to Article 17 of the Protocol. The Minister may direct the National Treasury Management Agency to purchase Kyoto Units that may become available on foot of any such agreements.

Subject to further direction from the Minister for the Environment, Heritage and Local Government, the Agency may sell Kyoto Units if this is necessary to ensure compliance with decisions adopted pursuant to the Kyoto Protocol for the accounting of assigned amounts under Article 7, paragraph 4 of the Protocol.

All Kyoto Units purchased by the National Treasury Management Agency shall be registered in the national registry managed by the Environmental Protection Agency. Kyoto Units entered into the national registry will be accounted for by the Environmental Protection Agency to ensure compliance with Ireland's commitments for the purposes of the Kyoto Protocol.

This policy framework constitutes the initial direction from the Minister for the Environment, Heritage and Local Government to the National Treasury Management Agency.

April 2007.

Glossary of Terms

Adaptation (to climate change) The taking of measures to cope with the effects of climate change, rather than the action taken to reduce emissions.

Anaerobic decomposition / digestion The breakdown of organic materials in the absence of air (oxygen). CH₄ is a by-product, either vented to the atmosphere or used as an energy source.

Anthropogenic Human induced; as a result of human actions.

Base year The year against which commitments under the Kyoto Protocol are measured. Emissions levels in 1990 set the basis for determining the national limitation target of 13% (a base year of 1995 will be used for the industrial gases).

BAT Best Available Techniques under the EU Integrated Pollution Prevention and Control (IPPC) Directive (96/61/EC).

BMW Biodegradable Municipal Waste.

CAP Common Agricultural Policy (of the EU).

CDM Clean Development Mechanism.

CH₄ Methane. The second most significant greenhouse gas. Naturally occurring and also arising from human activity.

CHP Combined Heat and Power. The waste heat from electricity generation is put to another useful purpose.

Climate change The global climate system is subject to natural variation. In the context of the UNFCCC and Kyoto Protocol, what is meant is that change in climate attributable to human activity arising from the release of greenhouse gases into the atmosphere and which is additional to natural climate variability.

CO₂ Carbon Dioxide. The main greenhouse gas arising from human activities, and also naturally occurring. Atmospheric concentrations have risen from about 280ppm prior to the industrial revolution to about 380ppm now.

CO₂-equivalent (CO₂e) Where gases other than CO₂ are referred to, for comparison purposes these are converted to their equivalence in global warming terms to CO₂. Sequestration rates of carbon are quantified in terms of CO₂ removed from the atmosphere. See also, Global Warming Potential.

COFORD National Council for Forest Research and Development.

Commitment period The Kyoto Protocol provides that Parties' targets are to be achieved over the 5-year period 2008 – 2012 (the "first commitment period"). Targets for future commitment periods (post 2012) are yet to be negotiated.

COP Conference Of the Parties (to the UNFCCC) ,which meets annually. The 13th Conference (COP13) is to meet in Indonesia in December 2007.

Demand Side Management In the energy sector, the management and reduction of energy use through incentives and other measures to reduce and/or manage more efficiently customer demand for energy.

Emissions trading In the context of the EU Emissions Trading Scheme or the flexible mechanisms of the Kyoto Protocol, this refers to the buying and selling of allowances to emit a defined quantity of greenhouse gases or credits that represent a quantity of greenhouse gas already reduced.

ENFO The Environmental Information Service. ENFO is a public information service on environmental matters, providing public access to wide-ranging and authoritative information on the environment. ENFO was established in September 1990 and is a service of the Department of the Environment, Heritage and Local Government. Website: <http://www.enfo.ie>.

Enteric fermentation That part of the digestive process in ruminant animals (cows, sheep) where bacteria and other gut flora convert parts of the grass to a usable form for the animal. CH₄ is a by-product and expelled from the animal.

EPA Environmental Protection Agency. Website: <http://www.epa.ie>.

Flexible mechanisms The three flexible measures that are provided for in the Kyoto Protocol viz. Emissions Trading, JI (Joint Implementation) and the CDM (Clean Development Mechanism).

Fossil fuel Peat, coal, fuels derived from crude oil (e.g. petrol and diesel) and natural gas are called fossil fuels because they have been formed over long periods of time from ancient organic matter. All contain varying amounts of carbon, and in the recovery of energy from the fuel through combustion in the presence of air, the carbon combines with the oxygen to form CO₂, which is vented to the atmosphere.

Fuel Bunkering Also known as 'fuel tourism' this refers to fuel that is bought in Ireland by private motorists and hauliers but consumed outside Ireland.

GDP Gross Domestic Product.

Global Warming Potential (GWP) Greenhouse gases have different efficiencies in retaining solar energy in the atmosphere and also have different lifetimes in the atmosphere, before natural processes remove them. To compare the different greenhouse gases, emissions are calculated on the basis of their Global Warming Potential (GWP) over a normalised time horizon, giving a measure of their relative heating effect in the atmosphere. The 100 year time horizon (GWP100) is generally used and that provided for in relation to the Kyoto Protocol. The

IPCC has developed these GWPs; all are expressed as GWP100:- CO₂ is the basic unit. (GWP of 1). CH₄ has a global warming potential equivalent to 21 units of CO₂, i.e. a GWP of 21. N₂O has a GWP of 310. Compounds in the HFC family have GWPs in the range 140 to 11,700. PFCs have GWPs in the range 6,500 to 9,200. SF₆ has a GWP of 23,900.

Greenhouse gas A gas in the atmosphere that freely allows radiation from the sun through to the earth's surface, but traps the heat radiated back from the earth's surface towards space and reradiates it back to the earth's surface. The heating effect is analogous to the manner in which the glass of a greenhouse traps the sun's radiation to warm the air inside the greenhouse. Most greenhouse gases occur naturally and are a necessary part of the global climate system, but their concentrations can be increased by human action, causing climate change.

HFCs Hydrofluorocarbons. *See Industrial gases.*

Industrial gases The three non-natural greenhouse gases and gas families.; HFCs (Hydrofluorocarbons), PFCs (Perfluorocarbons) and SF₆ (Sulphur Hexafluoride). These are more potent than the naturally occurring greenhouse gases and did not exist in the atmosphere before the industrial age. There are a number of individual HFCs and PFCs within these "families" of gases.

IPPC Integrated Pollution Prevention and Control, in the context of licensing under the Environmental Protection Agency Act 1992.

IPCC Intergovernmental Panel on Climate Change. This is the authoritative scientific source on human interference with the global climate system. Website: <http://www.ipcc.ch>

JI Joint Implementation

kt Kilotonne (1,000 tonnes). 1,000 kt = 1 Mt

Kyoto Protocol The second international agreement (1997) on climate change, setting binding limitation and reduction targets for developed countries. It is a Protocol to the UN Framework Convention on Climate Change. Text of Protocol at: <http://www.unfccc.int>.

Modal shift In the transport sector, move from the use of one mode of transport to another (e.g. greater use of public transport, rather than private cars for commuting).

Mt Million tonnes.

MW Megawatt = 1,000 kilowatts.

NDP National Development Plan 2007 – 2013.

N₂O Nitrous Oxide. The third most important greenhouse gas. Naturally occurring and also arising from human activity.

PFCs Perfluorocarbons. *See Industrial gases.*

Ppm Parts per million.

PSO Public Service Obligation. An obligation placed on utility undertakings (generally in the energy sector) which takes account of general social, economic and environmental factors.

REPS Rural Environment Protection Scheme.

Sequestration (of carbon) The removal of CO₂ from the atmosphere and the storage of the carbon, generally by growing plants (e.g. by the fixing of carbon in the organic compounds which make up the body of a tree). It can include storage of carbon in associated soils and litter. Non-organic mechanisms for carbon sequestration are not considered by the Strategy.

SEI Sustainable Energy Ireland. The national agency for energy efficiency and renewable energy information, advice and support.

SF6 Sulphur Hexafluoride. *See Industrial gases.*

Sink The reservoir in which sequestered CO₂ is stored, e.g. forestry. There are a number of natural sinks for CO₂ (e.g. the oceans, the natural biosphere) but sequestration by natural mechanisms is not relevant to the Kyoto Protocol.

UNFCCC UN Framework Convention on Climate Change, the first international agreement (1992) on action to tackle human-induced climate change. Website of the secretariat and text of the Convention at: <http://www.unfccc.int>.

VRT Vehicle Registration Tax.

With measures Projection encompassing, for the purposes of this Strategy, implemented and adopted policies and measures at the time of completion of latest set of projections in March 2006.

With additional measures Projection encompassing policies and measures adopted since March 2006.



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